Task 5 Final Report

on

SNEP Workshop: Developing & Evaluating Promising Technologies: Pushing the Ball Forward on I/A Septic Systems

for

Task Order 68HE0120F0031
Southeast New England Program (SNEP) Technical Assistance: Local Implementation Project Assessment, Project Dashboard Revisions, Webinars and Workshops

Prepared for:

U.S. Environmental Protection Agency, Region 1

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August 5, 2021

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1 Executive Summary

1.1 Workshop Purpose

Recognizing the need for broader implementation of innovative and alternative (I/A) septic systems—also referred to as alternative and experimental (A/E) technologies or advanced treatment units (ATUs)—to help address the widespread degradation of coastal water quality from excess nutrient loading, EPA's Southeast New England Program (SNEP) and the Atlantic Coastal Environmental Sciences Division of the Office of Research and Development hosted a three-day workshop series to provide a fundamental knowledge about I/A systems, understand their strengths and weaknesses, and identify key action steps to overcome barriers to wider use. The workshop consisted of three sessions starting with a panel discussion about I/A pilot projects and lessons learned, followed by presentations about the current state of I/A system performance, and culminating in a discussion about barriers and potential solutions for I/A system implementation.

1.2 Workshop Session Key Points

Session 1: Dipping Our Toes in the Water: Learning from Pilots

Pilot projects have demonstrated that I/A system technologies can significantly decrease the total nitrogen load in onsite wastewater treatment effluent,[1,2,3] in some cases by as much as 90–95%.[4] Although these reductions are significant, questions remain about the continued performance and longevity of these I/A systems and, as a result, there is reluctance to fully adopt or mandate I/A systems on a broad scale. Some of these questions relate to the lack of monitoring data required

[1] Buzzard's Bay West Falmouth pilot
[2] Reclaim Our Waters initiative
[3] Martha's Vineyard NitROE pilot
[4] NitROE systems

to establish performance standards. Monitoring is expensive and time-intensive, but is required to receive approval for installation. The approval processes for both Massachusetts and Rhode Island are multi-tiered and require the installation of several pilot systems (three to 50 depending on the state and level of approval), as well as multiyear monitoring of system performance (two to three years depending on the state and level of approval) to obtain system performance data. The lack of regional data sharing further exacerbates the difficult approval process. The costs associated with development, testing, approval, installation, and operation and maintenance (O&M) present significant concerns to municipalities and state agencies, as well as small-scale developers, particularly with respect to the increased financial burden on homeowners.

Session 2: Swimming in our Lanes: Current State of I/A System Performance

When considering installing or upgrading to an I/A septic system, it is important to consider the local watershed needs, site specifications, and discharge limits. The five best available I/A technologies (see page 19) as of June 2021 can achieve effluent total nitrogen concentrations <12 mg/L, and some have provisional approval in Massachusetts and Rhode Island.[5] In addition to performance standards, the cost of I/A system installation, operation, and maintenance plays a significant role in the decision-making process of homeowners and municipalities. The estimated costs (in $/kg N removed) for I/A systems are higher than centralized wastewater treatment facilities based on current installation, operation, and monitoring cost estimates,[6] although the costs are extremely variable. In some circumstances (e.g., large properties with deep water tables), non-proprietary soils-based systems (also known as layer cakes) are an inexpensive option with the potential to substantially reduce effluent total nitrogen concentrations (<10mg/L). One of the biggest concerns with I/A systems is their O&M because, unlike standard systems, most I/A systems require trained personnel to ensure performance standards are met and a higher level of maintenance is achieved, both of which result in higher costs to the owners. To address these concerns, it may be necessary to establish municipal, county, or state Responsible Management Entities (RMEs), which are legal entities responsible for providing various managerial, financial, and technical services to ensure effective management of decentralized

[5] Provisionally approved systems in Rhode Island and Massachusetts.
[6] Merrill, N.H., Piscopo, A.N., Balogh, S., Furey, R.P., Mulvaney, K.K.. 2021. "When, Where, and How to Intervene? Tradeoffs Between Time and Costs in Coastal Nutrient Management." *Journal of the American Water Resources Association* 328– 343. https://doi.org/10.1111/1752-1688.12897.

wastewater treatment systems. There are several possible RME models[7] (see page 25), but the ultimate goal is to reduce the risk and the cost to the I/A system owner.

Session 3: Synchronized Swimming: What is Needed for I/A System Development and General Use

The Session 3 breakout group discussions centered on the barriers to broad-scale implementation of I/A systems. The most common barriers (see page 38) largely focused on the financial aspects of developing, installing, and operating I/A systems, regulatory and operational guidance (e.g., performance standardization, RMEs), burdensome approval processes, and performance uncertainties. These issues contribute to a general reluctance for mandated upgrades and broad acceptance of I/A system technologies by municipalities and their residents. That reluctance is exacerbated by the lack of a stable market for I/A systems with state-approved I/A technologies and licensed installers and operators. It is clear that cost concerns and risk mitigation need to be addressed to advance the implementation of I/A systems. Although grant funding provides significant support for developing I/A technologies and upgrading I/A systems, additional long-term, sustainable funding mechanisms are lacking, and incentive programs will be necessary to encourage broad-scale adoption by municipalities and homeowners.

The creation of regional or municipal RMEs will reduce the risk to homeowners of implementing an I/A system and diminish the costs of O&M. Partnerships between federal, state, and municipal agencies; I/A developers; and agencies and homeowners are necessary to help build trust and create a stable market that provides high-performing I/A systems that meet regulatory standards. In addition, non-governmental organizations can leverage their networks and local expertise to assist with communicating the need for I/A systems to homeowners and residents in plain language and advocate for the best available or most suitable technologies. Some of these partnerships exist with collaborative infrastructure—such as the Massachusetts Department of Environmental Protection (MassDEP) or the Massachusetts Alternative Septic System Test Center (MASSTC)—but not at a scale needed to achieve broad-scale implementation.

[7] For further information refer to "Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems"

1.3 Action Steps to Overcome I/A System Implementation Barriers

To help states, municipalities and homeowners overcome barriers to implementing I/A systems, EPA could:

- Support states and municipalities in the creation of RMEs, and provide guidance similar to its efforts with the Indian Health Service.
- Assist with incentive and grant programs for adoption and implementation of I/A systems more broadly.
- Help establish and maintain regional data-sharing agreements and facilitate data sharing.
- Facilitate stakeholder workshops to identify data gaps and monitoring needs.
- Elevate the importance of I/A technologies in addressing water quality issues, and define the positive results and benefits from I/A system implementation at broad scales.
- Incentivize I/A technological advancements with technology grants.
- Subsidize initial O&M costs until sufficient systems are installed to necessitate the establishment of an RME.

2 Workshop Summary Report

2.1 Introduction

In recognition of the widespread degradation of coastal water quality from excess nutrients, largely from traditional septic systems, EPA's Southeast New England Program (SNEP) and the Atlantic Coastal Environmental Sciences Division (ACESD) of the Office of Research and Development (ORD) hosted a three-day workshop series on innovative and alternative (I/A) septic systems to discuss the opportunities, barriers, and benefits to implementing I/A septic systems. The workshop participants focused their discussion on the potential for I/A septic systems to support municipal sewering plans, the implementation of these systems, and testing their real-world applications. The goals of the workshop were to provide a fundamental knowledge about I/A systems, understand their strengths and weaknesses, and identify key actions to overcome the barriers preventing implementation and adoption of I/A systems.

In addition to EPA staff, the workshop participants included representatives from various state and municipal entities, non-governmental organizations (NGOs), and academia. Panelists and presenters were chosen for their experience researching and developing I/A technologies, implementing those technologies, and administering municipal- and county-level onsite wastewater treatment regulations and plans. For a complete list of presenters and panelists, their affiliations, and their areas of expertise, refer to the workshop agenda in Appendix A.

Each daily session of the workshop consisted of presentations and panel discussions highlighting pilot studies, I/A technologies, implementation successes and challenges, and economic considerations for municipalities and homeowners. These presentations and discussions set the stage for breakout group sessions that gathered stakeholder and practitioner input regarding their experiences with I/A pilot projects, implementation and installation, barriers and challenges, successes, and opportunities for improvement. The breakout group sessions helped identify I/A technological and implementation barriers, potential solutions to overcoming those barriers, and possible EPA actions that would help facilitate a path forward. To gauge current knowledge about I/A systems, the participants' views on the value of I/A systems, and the value of the workshop itself, the participants responded to poll questions at the beginning and/or end of each daily session administered through the Mentimeter software.

This workshop summary report provides an overview of each daily session, including a brief review of the panel discussions or presentations, breakout group topics and outcomes, and the polling questions asked during that session and their results. The summary report describes overall breakout group outcomes in further detail, focusing on barriers, solutions, and EPA's role moving forward. As previously noted, the workshop agenda is included for reference in Appendix A. The workshop presentations can be found on the workshop website and a complete list of workshop participants can be found in Appendix B. Other resources noted in the workshop chat windows can be found in Appendix C.

2.2 Session Summaries

2.2.1 Session 1—Dipping Our Toes in the Water: Learning from Pilots

Wednesday, June 2, 2021, 9:00 a.m.–12:00 p.m.

Objective: To hear from recent I/A pilots and increase collaboration and knowledge sharing between pilot representative organizations.

Polling Questions

There were two polls for the workshop participants to better understand their knowledge of I/A septic systems and the ease with which they can obtain further information. The first poll stated:

1. "*I would describe my knowledge of I/A systems to be…"*

The results indicated that the majority (66%) of the responding participants (36 of 55 responses) claim to have "Excellent" to "Good" knowledge of I/A systems (Figure 1).

2. "*If I wanted access to more information about I/A systems, I would know where to look (or who to contact).*"

Over half (59%) of the responding participants (27 of 46) chose "Yes" while 15 chose "Somewhat" (Figure 2).

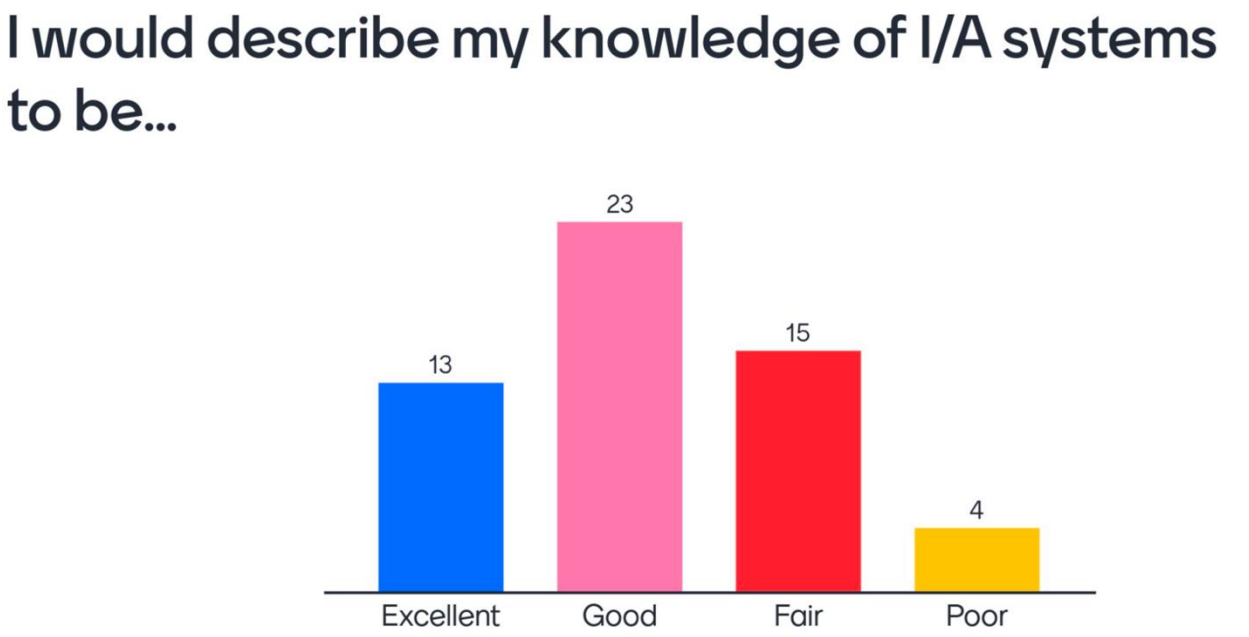

Figure 1. Poll results showing workshop participants' knowledge of I/A systems at the beginning of the workshop.

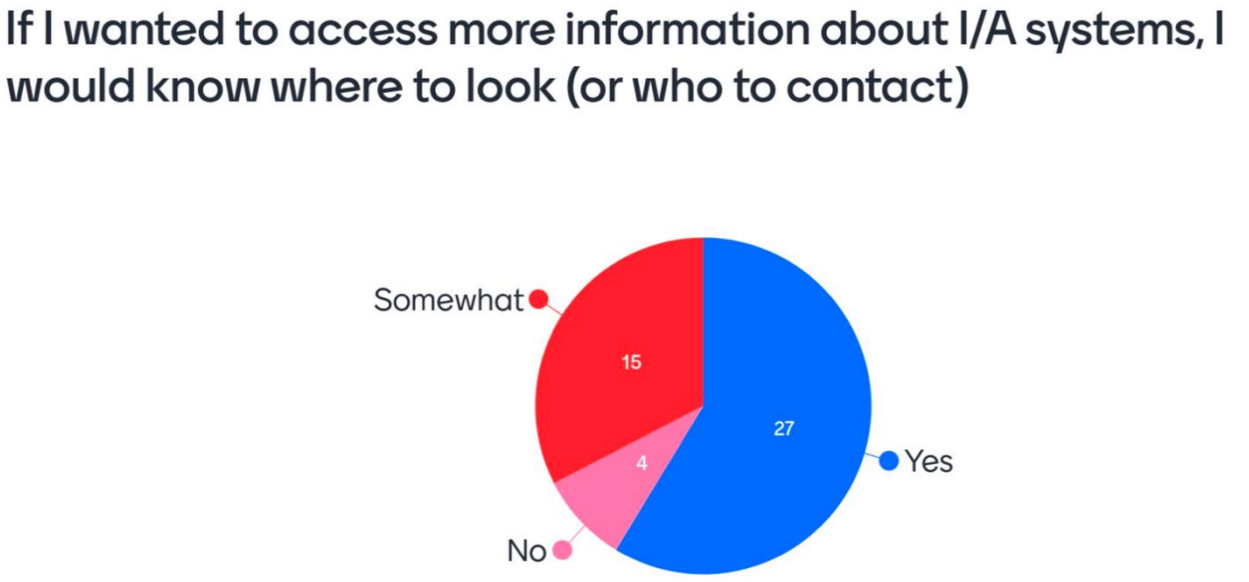

Figure 2. Poll results illustrating workshop participants' views on the availability of information about I/A systems.

Getting Our Feet Wet: Panel Discussion

The first session of the workshop started with a panel discussion about recent I/A pilots and the approaches taken to determine suitable siting, technologies needed, and incentivization options.

Following a brief description of their projects, the panelists answered questions from the workshop participants.

Maureen Thomas, Buzzards Bay Coalition—Panelist

Ms. Thomas provided a brief summary of the "West Falmouth Harbor Nitrogen-Reducing Septic System Demonstration Project," one of several I/A projects being implemented by the Buzzards Bay Coalition, in which 30 existing septic systems around West Falmouth Harbor were upgraded to the best available nitrogen-reducing systems that resulted in 70% removal of effluent nitrogen meeting or exceeding the 12 mg/L standard. Ms. Thomas also noted that additional funding was received from EPA's Southeast New England Program (SNEP) to install 12 pilot layered soil treatment areas ("layer cake"), a system designed to remove nitrogen in the leach field using a layered combination of sawdust and sand. Both programs provided subsidies to the homeowners to incentivize participation in the pilot studies. Those subsides varied from $5,000 to $15,000 depending on the phase of the pilot study and homeowner residence status (year-round versus part-year). Additional assistance was provided to year-round resident homeowners that may not have the same resources as part-year resident homeowners. Social pressure from neighbors and successful previous installations further incentivized participation. The pilot programs demonstrated that high functioning I/A systems can be installed in residential areas without a significant aesthetic impact on the property, but funding these pilot programs via grant funding was not likely to be sustainable long-term, nor would it be at a sufficient scale to meet the nitrogen reduction targets. The pilot program also established that influent numbers are much higher than what has been reported for septic systems in the Massachusetts Estuaries Project (MEP). Additionally, Ms. Thomas noted that local regulations requiring the installation of these systems are needed to further incentivize I/A system adoption. Ms. Thomas then fielded questions regarding the determination of target nitrogen reduction standards, cluster system installations, the implementation and installation costs, and homeowner recruitment:

- The Massachusetts Department of Environmental Protection (MassDEP) is working to develop regulatory nitrogen levels and effluent standards, but the West Falmouth project had a technical committee that set a high standard (70% reduction or 12 mg/L) in order to test the efficacy of high-performing I/A technologies.

- Certain circumstances are ideal for cluster systems for multiple homes (e.g., island communities with available land).
- Installation costs can be difficult for homeowners to cover because nitrogen reduction technology can be very expensive. Operation and maintenance costs can be significantly more expensive than standard systems ($400–$600/year).
- Homeowner recruitment consisted of letters and fact sheets sent to houses identified as priority properties and a vendors fair was held to help homeowners learn about I/A systems. Letters were followed by phone calls and site visits.

Specific questions and answers:

- *Did systems meet the 12mg/l goal?*

  Yes, they are meeting their goals, but the systems are not perfect (removing over 70% of nitrogen in the pilot systems).

- *How did the pilot study team get private homeowners to participate?*

  They held a vendors fair to demonstrate I/A technology and provide information to homeowners, developed a decision support tool to provide information about costs, and assisted with permitting, technology choices, installation, and post-installation monitoring. Subsidies were very effective methods of encouraging participation.

- *Would people participate in the pilot study again?*

  Yes, because there is a significant amount of social pressure to help improve the water quality in the harbor. In addition, proof that the systems work helped convince people to participate in the program.

- *Is testing done on site or in Buzzards Bay?*

  The effluent is tested monthly onsite and there is the Buzzards Bay Coalition's Baywatchers water quality monitoring program in the bay during the summer.

- *Are there reports available to the public?*

  Yes, a publication is available for the first 20 systems in Phase 1, with other reports to come.

- *In Rhode Island and Massachusetts, 19mg/l is the target. How did you decide on 12mg/l?*

The pilot study team worked with a technical committee to set a higher standard of 70% reduction and 12mg/L, focusing on high-performing technologies.

- *When does it make sense to use cluster systems for multiple homes?*

  It depends on land availability, so it is not always possible even when it would make sense. There are current studies examining this possibility for remote island communities.

- *Are regulations made at the state or municipal level?*

  MassDEP, has a group that is addressing regulatory levels and standards. It might be difficult for each municipality to do it, although some have.

- *Are there certain transaction costs that are daunting for homeowners? For the commission?*

  Installation costs are really difficult for homeowners. Nitrogen reduction technology is costly and operation and maintenance costs $400–$600 per year, which is a lot more than standard systems.

Marcia Degen, Virginia Department of Health—Panelist

Dr. Degen described how Virginia adopted best management practices (BMPs) to achieve total maximum daily load (TMDL) targets based on the recommendations of an expert panel. Virginia's goal was to achieve a 50% reduction in effluent nitrogen concentration, but they recognized that a significant testing and monitoring effort was required to characterize the performance of standard septic systems and potential I/A systems. To assist in that data collection, the Chesapeake Bay states, with the assistance of EPA, established a data sharing agreement that allowed any of the states to use data to validate I/A system performance. Dr. Degen also highlighted that the affordability of operating and maintaining a system (especially in low-income situations), along with responsibility for system oversight, will be challenging moving forward.

Following Dr. Degen's brief description of Virginia's approach to I/A system implementation, she answered questions regarding regulatory issues, incentivization programs, and determination of appropriate I/A system technologies:

- The state oversees all onsite wastewater treatment in Virginia and has defined effluent nitrogen levels depending on the size of the system.

- The state has grant programs to assist with I/A system installations when repairs are needed to existing systems and an operations and maintenance (O&M) program to help homeowners with those costs, especially in low-income communities.
- The state uses the NSF 245 standard (50% reduction in total nitrogen) to determine if an I/A system is a viable and acceptable solution for a particular location.

Specific questions and answers:

- *Can you describe the process in terms of how new technologies are implemented?*

  Virginia uses the NSF 245 standard; monitoring of nitrogen reduction is done by an independent third party. They are also moving towards field testing and will possibly test 12 systems quarterly for a year. If effective, then those systems can be considered viable.

- *What systems are in place to incentivize homeowner participation in programs?*

  The bulk of the systems are not installed in coastal properties because the watershed is so big. Virginia took the approach that if property owners needed to upgrade their system to an alternative system (because of water table height or geology, etc.), the owners need to make sure the system was nitrogen-reducing because nitrogen-reducing systems result in a higher quality effluent and smaller footprint and are thus beneficial to their property.

- *Are cluster systems being used in Virginia?*

  Virginia considered requiring the use of cluster systems in certain areas, but ultimately determined that they couldn't do that. To be economically viable, it is suggested that clusters contain 10–15 homes. Property owners also need to pay for some type of management system. Community systems might be a good option, but large alternative systems require a licensed operator.

- *Does the state regulate or do towns?*

  The state does the regulation.

Adam Turner, Martha's Vineyard Commission—Panelist

Mr. Turner discussed how the Martha's Vineyard Commission (MVC) determined that reduction in total nitrogen from septic systems was a priority and identified potential nitrogen-reducing technologies via a conference with I/A technology representatives. The MVC realized that many

septic systems did not meet the advertised effluent standards and suggested that state agencies (e.g., MassDEP) should decrease effluent standards to help ensure adequate nitrogen removal. MVC funded the development and testing of an I/A system (NitROE™) that removed 90–95% of total nitrogen from septic effluent.

Similar to the other panelists, Mr. Turner addressed questions specific to the work of MVC, such as homeowner participation, funding, and determination of appropriate I/A systems:

- The MVC encouraged homeowner participation by providing subsidies for mandated upgrades and demonstrated that the NitROE™ system was highly effective and had low maintenance costs.
- The MVC receive funding from the state of Massachusetts, the town of Tisbury, and the MVC.
- The MVC was hoping to achieve the greatest reduction in nitrogen in development of the I/A system, so there was no standard set. The system was tested at the Massachusetts Alternative Septic System Testing Center (MASSTC).

<u>Specific questions and answers:</u>

- *How did the MVC fund their systems?*

  They received a small energy grant from Massachusetts. The town of Tisbury funded a grant to the Commission, and the commission itself funds some work.

- *How did the MVC recruit homeowners?*

  They used a similar process as the Buzzard's Bay Coalition by providing subsidies for mandated actions by the town. Their system was relatively simple, so the major cost was with monitoring. The effectiveness of the systems encouraged people to participate, and the community recognized the need to do something to help protect the coastal water.

- *Are there reports available?*

  Yes. Contact Adam for reports.

- *Was there a set standard at the beginning?*

  No. The MVC just wanted to work to reduce the nitrogen loading. The testing center allowed them to see how effective their I/A system was.

- *When does it make sense to do a cluster system?*

  On Martha's Vineyard, clustered communities would be the best scenario.

- *Are there certain transaction costs that are daunting for homeowners? For the commission?*

  Although those maintenance and operation costs can be high with some systems, those costs are low with the system used in the pilot study.

- *What is the system name?*

  NitROE ™

Wading into the Water: Working Together—Breakout Groups

This breakout group session aimed to gather input from workshop participants regarding what still needs to be learned and tested in the I/A pilot studies. The participants were divided into six groups and asked to answer or comment on seven questions stemming from the panel discussion about I/A pilot studies. Those questions and a summary of the participant responses are as follows:

1. What is your reaction to the panel? How might their experiences compare to your experiences?

   - **The costs associated with developing, testing, installing, monitoring, operating, and maintaining I/A systems was a common discussion point through all breakout groups.** Prior to approval, there is a significant amount of monitoring required to establish that the I/A system technology meets the expected standard. Although remote monitoring systems would help decrease the overall costs, they require significant upfront investment for the equipment. Grant programs and low-interest loans can help with technology development and installation costs, but operation and maintenance (O&M) costs can be significant.
   - **Responsible Management Entities (RMEs) seem like the best option for ensuring that I/A systems are meeting operational standards and that necessary routine maintenance is performed to maintain that level of operation.** In addition, RME's have the potential to reduce O&M by operating at a larger scale and result in a similar

cost to homeowners as a typical sewer fee. At this point, it is not clear who should be the RME (e.g., municipality, county, state, other).

- **The data requirements for I/A system approvals are particularly challenging because of the relatively few systems being installed and the high cost of data collection and monitoring.** Data sharing between states would significantly increase data availability and shorten the time required to move through the approval process. Data collection is complicated further by the need to convince enough homeowners to install pilot I/A systems. Homeowners are understandably reluctant to invest in new and evolving technology, so incentive programs are vital components of these pilot studies.
- **Community engagement and education is critical to advancing I/A technology and implementing I/A systems on a sufficient scale to see significant reduction in nitrogen loading.** People may be willing to pay extra to help protect the coastal waters, but they need assurance that the technology is effective and that there will be support available for O&M of the systems. Since these are specialized systems with new technology, the expectation cannot be that the homeowner is responsible for O&M.
- **I/A systems should not be promoted as the only option to achieve improved water quality.** The development and implementation of I/A system technologies clearly has the potential to reduce nitrogen loading to coastal waters, but it should be presented as a possible solution that considers the particular circumstances and goals both at the local scale and embayment scale.

2. <u>What seems most promising and challenging about the use of I/As from the pilots?</u>

- The most promising aspect of I/A systems from the pilot studies is that they can **significantly reduce the concentration of nitrogen released from onsite wastewater treatment system effluent.** Demonstrating the effectiveness of these systems encourages homeowners to install these systems despite the increased cost. The effectiveness provides justification to regulatory agencies to modify standards or mandate improved nitrogen removal on system upgrades or new installations.
- There are several challenging aspects to I/A systems that relate to costs. As noted above, the **costs span the complete spectrum from development, monitoring, installation,**

and O&M. Costs associated with installing and monitoring enough systems to obtain sufficient data for system approval is a significant challenge.

- Breakout groups also discussed the **lack of homeowner education** around these systems as a significant challenge, along with the need to better illustrate water quality data for different target audiences.

3. What other questions about pilots do you still have?

   - Do any of the pilot studies consider the amount of effluent discharged in addition to the nitrogen concentration, since larger discharges will still contribute significant amounts of nitrogen to the environment?
   - What are the limitations for data sharing across states and the region?

4. What would you want to learn?

   - What are the criteria for monitoring and O&M?
   - What are the financing options and opportunities for incentive programs, RMEs, and O&M?
   - What are impacts of effluent standards on water quality? Are the standards sufficient to improve water quality?
   - As new technologies emerge, can effluent standards be lowered? How can lower standards be established?
   - Are I/A systems effective when it comes to removing contaminants of emerging concern (CECs) and phosphorous?

5. How do we move past pilot projects?

   - More data need to be collected regarding the performance of I/A systems before the I/A community can move past pilot projects. This requires establishing monitoring criteria and protocols that allow for data sharing and comparison.
   - Clear and consistent mandates/regulations need to be established to ensure that homeowners are protected when investing in I/A systems. Homeowners need protections for installation and performance as well as O&M.

6. How do we go from pilot to broader implementation?

- See answers to question #5 (above).

7. What are regional needs?

    - Better communication about the need for I/A systems, the pros and cons of different I/A technologies, and the expectations of owners and operators.
    - Monitoring approaches that are cost- and time-effective.
    - Better understanding of the effluent standards and the impact on water quality.
    - A financial structure to implement I/A systems.
    - A structure to define owner and operator requirements and obligations.
    - Although there is some disagreement regarding the extent of regulation and I/A system implementation mandates, there is a perceived need to revisit Title 5 regulations to allow replacement of existing septic systems with I/A systems.
    - There is a perceived need to revisit regulations around the approval process for I/A system technologies in order to provide more options and foster broad-scale implementation. However, concerns about I/A system reliability and its ability to meet performance standards have led to some disagreement about easing the approval process and regulations.

2.2.2 Session 2—Swimming in our Lanes: Current State of I/A System Performance

Thursday, June 3, 2021, 9:00am–12:00pm

Objective: To learn about the current state of I/A system performance and limitations and determine what is needed to develop these technologies to make them available for general use.

Polling Questions

There were three polls for the workshop participants to better understand their thoughts on the potential value and benefits of I/A systems, their concerns about implementing I/A systems, and potential opportunities for using I/A systems.

1. "*Do you believe that I/A systems are a promising technology that should be pursued for nutrient attenuation?*"

Of the 32 responding participants, 26 (81%) answered "Yes" and the remaining 6 (19%) answered "Somewhat" (Figure 3).

2. "*What are some of your concerns regarding the implementation of I/A systems?*"

The answers were displayed in a word cloud (Figure 4), with the most common concerns being the "cost," "financing," "maintenance," "regulations," and "permitting."

3. "*What are some of the opportunities you see in using I/A systems?*"

The answers were again displayed in a word cloud (Figure 5), which indicated that "jobs," "flexibility," "nitrogen reduction," and "water quality" were the most common opportunities.

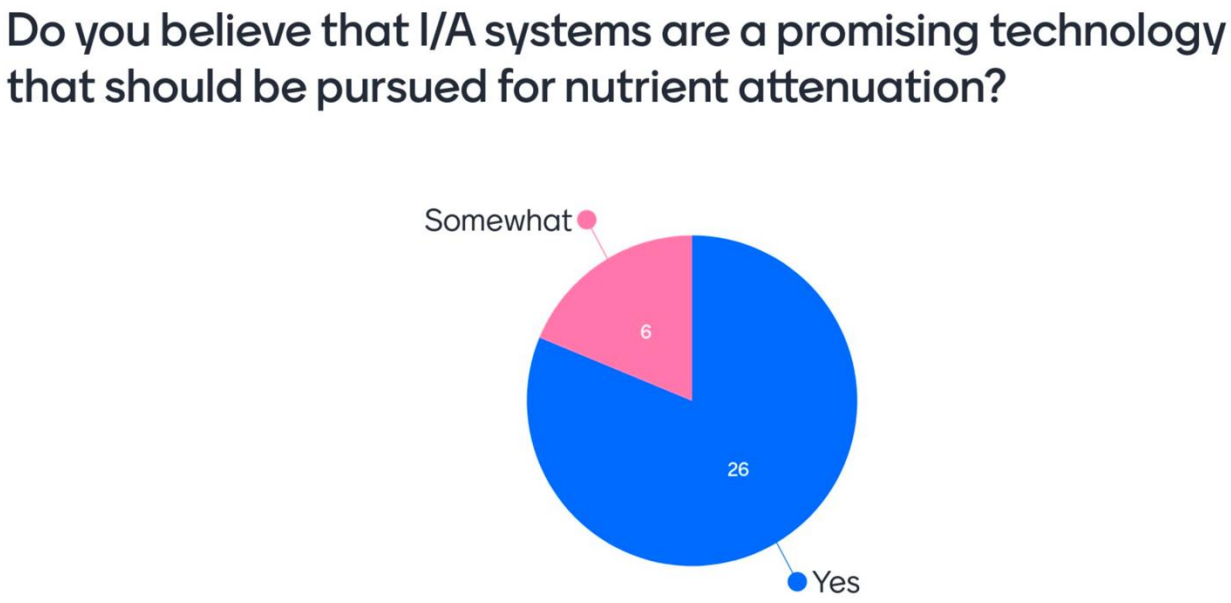

Figure 3. Poll results showing to what extent the workshop participants think I/A systems have the potential to reduce nutrient loading.

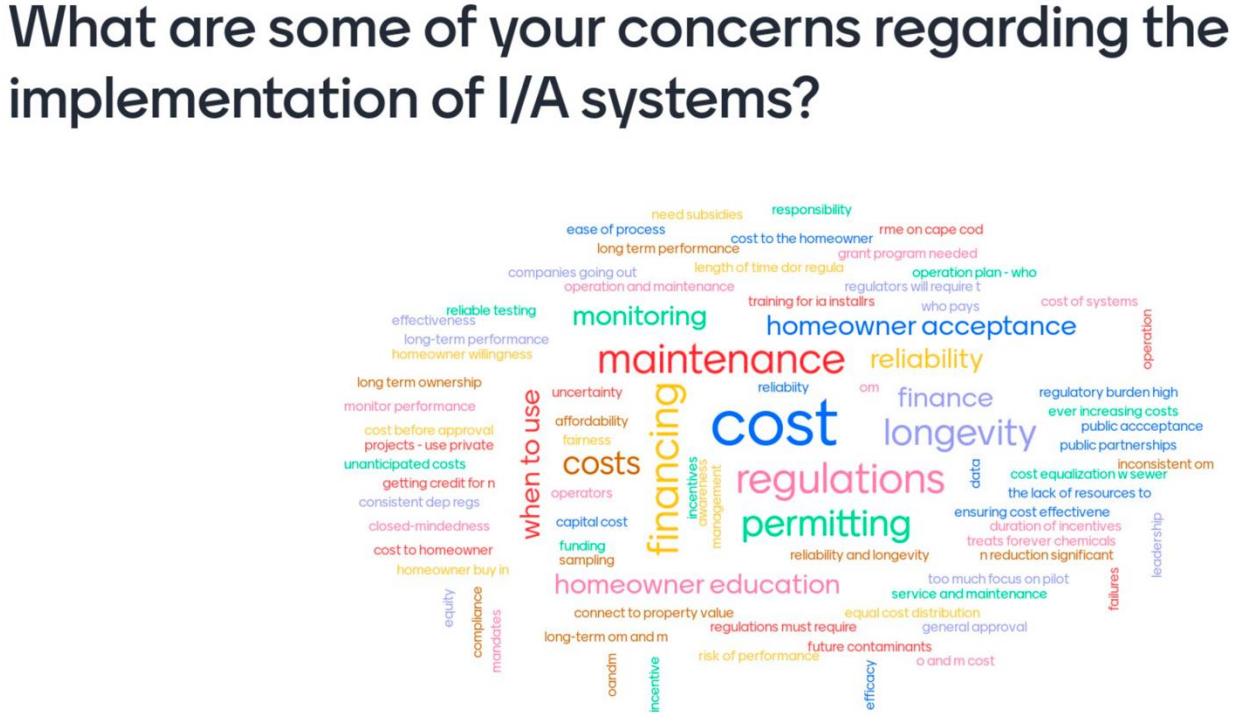

Figure 4. Word cloud results illustrating the workshop participants' concerns regarding implementing I/A systems.

Figure 5. Word cloud results illustrating the opportunities that workshop participants see in using I/A systems.

On the Starting Blocks: Current State of I/A Systems Performance—Presentations

The second session of the workshop consisted of presentations from regional practitioners and EPA researchers describing current I/A system implementations, best available technologies, cost comparisons of pollution abatement between I/A systems and sewers, and RMEs. The speakers and their affiliations can be found in the workshop agenda in Appendix A and their presentations can be viewed on the workshop website. Below is a summary of the presentations and associated discussions.

Brian Baumgaertel, MASSTC—Presenter

Title: "Best Available Technology: Using I/A to Clean Up Our Watersheds"

Mr. Baumgaertel discussed the importance of considering watershed-specific needs, site specifications, and discharge limits when choosing the best I/A system to suit individual needs. He provided a list of the five best available I/A septic technologies[8] currently being used in the region:[9]

1. FujiClean: 11.4 mg/L TN. Used in Suffolk County, New York.
2. Nitrex™: 2.5 mg/L TN. Provisional approval in Massachusetts; tested at MASSTC.
3. NitROE™: 10.8 mg/L TN. Provisional approval in Massachusetts; tested at MASSTC
4. Hydro-Action™: 10.6 mg/L TN. Used in Suffolk County, New York
5. Non-Proprietary Soils-Based Systems (Layer Cakes): Some designs able to get <10 mg/L TN.

The characterization of these technologies as the "best available" is based on current data. As new data become available, some technologies may be excluded from or added to this

[8] Inclusion of a technology on this list is not to be construed as a positive endorsement of any kind by the U.S. Environmental Protection Agency, the Barnstable County Department of Health and Environment, or the Massachusetts Alternative Septic System Test Center.
[9] Provisionally approved systems in Rhode Island and Massachusetts.

list. Also, there may be other available technologies that are better suited in some situations based on the site-specific needs and nitrogen reduction goals.

Nate Merrill, Atlantic Coastal Environmental Sciences Division at ORD-Narragansett

Title: "Estimating and Evaluating I/A Septic System Costs and Performance"

Dr. Merrill discussed the need to define the costs associated with I/A systems and centralized wastewater treatment facilities to accurately compare the costs and benefits with each system. I/A systems are intended as a tool to improve water quality, but it is important to compare them in terms of the cost of pollution abatement. In order to compare "apples to apples," it is necessary to compare the $/kg N removed for a given I/A system versus centralized wastewater treatment facilities. The costs for nitrogen removal can be broken down into private costs (to the homeowner), public costs (to the government), and social costs (to the public). Social costs can be broken down further into capital (equipment and installation; typically financed), O&M, and monitoring (e.g., sampling, staff time). When costs are considered in $/kg N removed, high-performing I/A systems (<~10 mg N/L) are more expensive per kg of nitrogen abated than centralized facilities, based on current cost estimates of installation, operation, and monitoring (Merrill et al., 2020[10]). The costs *have the potential to be comparable* if low effluent targets are met (~10 mg N/L for I/A systems and ~3 mg N/L for centralized facilities) and installation costs for I/A systems can be held below ~$40,000. However, private and public costs can be highly variable and they are not fully realized in improved water quality at the coast.

Considering the costs and performance of I/A system technologies, the best approach to achieve nitrogen reduction goals would be to consider all management practices in the context of the specific needs and goals of the individual homeowner, municipality, and adjacent coastal water bodies.

Specific questions and answers:

[10] Merrill, N.H., Piscopo, A.N., Balogh, S., Furey, R.P., Mulvaney, K.K. 2021. "When, Where, and How to Intervene? Tradeoffs Between Time and Costs in Coastal Nutrient Management." *Journal of the American Water Resources Association* 328–343. https://doi.org/10.1111/1752-1688.12897.

- *When you estimated costs for sewer hookups, was there an accounting for the cost of hookups and emissions from construction and operation?*

  There was no accounting for costs associated with construction and operation emissions; plumbing (i.e., hookup) costs for the house were included at $5,000 as an example.

- *Can new construction reduce the cost of installing I/As?*

  Yes, because of cost efficiencies and shared costs.

Alissa Cox, University of Rhode Island

Title: "Non-Proprietary Passive N-Reducing Layered Soil Treatment Areas Piloted in RI"

While I/A systems have the potential to achieve significant reductions in N-loading to our watersheds, current available technologies can be cost prohibitive and their performance and O&M is inconsistent, limiting their success. Dr. Cox discussed the merits and drawbacks of layered soil treatment areas (LSTAs) as a relatively inexpensive I/A option for reducing N-loading in N-sensitive watersheds. Building on previous successes with LSTAs in Barnstable County, Massachusetts, it was suggested these should be considered for regulatory approval in Rhode Island. The approval process in Rhode Island is complex and requires significant long-term monitoring of 10–50 systems. Funding is one of the biggest issues in reaching final approval, not only because of the installation and O&M costs, but also because funds need to be kept available in the event that a poorly functioning experimental system needs to be replaced, in order to alleviate risk to the homeowners participating in the experimental programs.

Although there are clear benefits to LSTA technology, drawbacks include that they have a significant spatial footprint, they require a deep water table, and their performance is diminished in cold temperatures. As with all management practices, the particular site conditions and local/regional water quality goals should be taken into consideration when choosing an I/A technology like LSTAs and/or other nitrogen reduction actions.

<u>Specific questions and answers:</u>

- *Is there a future where you wouldn't need a traditional septic system for LSTAs?*

Hopefully, there will eventually be no I/As between existing septic systems and LSTAs, but there will be a need for a pump in the septic tank to push the water into and through the LSTA.

- *Can you rely on a gravity dose system instead of the pump?*

  Gravity feeding would not work because the water would move too slowly through the system and the sand layer would not do its job effectively. The pumps do not run all that frequently, and potential long-term electrical issues need to be considered in a larger emergency management situation (i.e., extended period of electrical outage).

- *Will LSTAs eventually replace I/As?*

  No, because you need a big area for LSTAs and a relatively deep water table, which is not available in a lot of coastal areas, but LSTAs may help replace some I/As in other areas. Installation is critical for proper performance.

- *How is LSTA effluent sampled?*

  Through sample pipes that extend to the pea stone level of the LSTA.

- *How long do LSTAs last?*

  They can last decades if the moisture level remains high enough to prevent composting of saw dust, which is on par with regular systems.

- *Does low alkalinity inhibit performance?*

  Yes. It is an issue because the nitrification process needs specific alkalinity levels.

- *Can I/A systems be considered for using state revolving fund (SRF) money?*

  Massachusetts does allow the use of SRF funds as loans for older "failed" systems that need replacement; sometimes loans are at 0%. Charlestown, Rhode Island, also does the same thing for failed systems, but not necessarily for I/A systems.

Zee Crocker, Barnstable Clean Water Coalition

Title: "Current Capabilities of I/A Technologies"

Mr. Crocker discussed the need for a portfolio of nitrogen-mitigating technologies, including I/A systems, to improve the health of the Three Bays Estuary on Cape Cod, Massachusetts. High-

performing, low-maintenance I/A systems would be required to remove the ~22,000 kg N/yr needed to improve estuarine health. Ideally, these systems would be cost-competitive with sewering, be failsafe for power outages, and have the capacity to be monitored in real time. Mr. Crocker pointed to the current I/A systems being used in Suffolk County, New York, achieving reductions beyond the 19 mg/L nitrogen effluent standard approved in Massachusetts. He also discussed preliminary data from NitROE™ system installations in Massachusetts, noting this system achieved an average of 90% reduction in total nitrogen (TN). The Barnstable Clean Water Coalition decided to use the NitROE™ system in their pilot program because it was modular and could be retrofit to an existing standard system. Prior to installation, the study team conducted detailed monitoring to determine the most appropriate location for installation of 15 systems. In the Town of Wellfleet, Massachusetts, estimated installation costs for sewers range from $100,000–150,000 per parcel compared to estimated I/A system installation costs of $25,000–35,000. Considering the substantial costs to homeowners for installation alone, there needs to be incentives (e.g., grants, tax exemptions) to install I/A systems where they can be most effective at reducing nitrogen loading. There are proposed changes to the Wellfleet Board of Health Regulations suggesting such incentives for "enhanced" nitrogen reducing systems (effluent concentration <10 mg N/L).

Considering the significant reduction in nitrogen loads needed to improve coastal water quality in some areas, enhanced I/A systems may be the best option to achieve the desired results. However, because of the significant costs associated with enhanced nitrogen reducing systems, it is necessary to provide incentives to encourage homeowner participation (e.g., financial assistance and demonstration of realized improvement in coast water quality).

<u>Specific questions and answers:</u>

- *What type of continuing monitoring is performed since nitrogen monitoring is not cheap and requires maintenance?*

  The pilot study team is currently trying to understand this in their test sampling.

- *What has been the biggest challenge in planning for a watershed pilot that uses multiple technologies?*

Barnstable Clean Water Coalition is trying to make a very well-controlled experiment so that they can get the best results and advance the development of I/A technologies. They funded the entire project so they could control all the variables.

Julia Priolo, Suffolk County Department of Health Services

Title: "Suffolk County's Reclaim Our Water Initiative"

Ms. Priolo discussed Suffolk County's Reclaim Our Waters Initiative, a program with the objective of replacing standard septic systems and cesspools with nitrogen-reducing systems. The need to protect the county's sole source aquifer, along with N-loading from onsite septic systems leading to the impairment of three major water bodies, motivated the county-wide phased wastewater treatment upgrades. Although upgrades to I/A systems are voluntary, the county facilitated upgrades by establishing a county-wide RME and providing grant funds to homeowners to make the upgrades. The program began by piloting different I/A technologies, and currently has seven approved I/A system technologies. Over the past four years, ~800 systems have been upgraded because of the county-wide program, but sustained funding is a continual struggle.

Successful broad-scale implementation of I/A systems can be achieved when there is a commitment from state, county, and municipal agencies to facilitate and support improvement efforts with dedicated funding and the creation of RMEs to encourage participation of and reduce the burden on homeowners. Communicating the economic and social importance of healthy coastal waters helps justify the allocation of funds by the state, county, municipality, and individual to take mitigation and restorative actions.

<u>Specific questions and answers:</u>

- *Are there incentives for systems that remove more nitrogen than the 19mg/l standard?*

  No.

- *How well have homeowners accepted the use of I/As on their properties?*

  Homeowners implementing voluntary upgrades have been grateful for the government assistance. Homeowners are less happy with required upgrades, but still glad to have the

county's support. The biggest complaint is that grants are considered taxable income, but Suffolk County Department of Health Services is trying to change that.

- *What mechanisms do you use to communicate with homeowners?*

  Suffolk County Department of Health Services have a dedicated website especially for this program. Phone conversations and education seems to be very effective.

- *Is seasonality considered when a decision to install and I/A is made?*

  Not necessarily at this point.

- *Have you seen repair or performance issues?*

  Not as much with newer systems installed later in the program.

Patty Daley, Cape Cod Commission

Title: "Responsible Management Entities for I/A Systems"

Ms. Daley discussed RMEs as legal entities responsible for providing various managerial, financial, and technical services to ensure effective management of decentralized wastewater treatment systems. She described the five EPA RME models:

1. *Homeowner Awareness Model:* The homeowner is the system owner and permittee. This requires minimal management and is appropriate for standard systems outside of N-sensitive embayments, but is likely insufficient to ensure permitting of I/As to meet TMDLs.
2. *Maintenance Contract Model:* The homeowner is the system owner and permittee. This requires more complex O&M by trained operators. Although suitable in some N-sensitive sites, it is likely insufficient to ensure permitting of I/As to meet TMDLs.
3. *Operating Permit Model:* The homeowner is the system owner and permittee. A licensed operator is encouraged to ensure highest operational performance. This model may require process monitoring. Operating permits require periodic renewal.
4. *RME Operation and Maintenance Model:* The homeowner is the system owner and RME is the permittee. This model is similar to the Operating Permit Model in that the RME is responsible for O&M for a fee. This model reduces permit and administrative burden on MassDEP.

5. *RME Ownership Model:* The RME is the system owner and permittee, and is responsible for O&M. This model has the highest level of control on system performance.

There are several conceptual models for RMEs and each should be considered in the context of the specific needs of the homeowner and municipality, as well as the scale of I/A system implementation. Considering the increased O&M costs and technical expertise required for effective I/A system operation, RMEs will play an important role in the successful broad-scale implementation of I/A systems by reducing the risk to and responsibility of the homeowners. Despite the obvious benefits of RMEs, questions remain regarding the creation of RME (i.e., private, state, county, or municipal) and how the RMEs will be funded.

Specific questions and answers:

- *What are pros and cons for regional RMEs (town-based or county-based)?*

  Cost efficiencies are one of the most important pros for RMEs.

Getting into Our Lanes: Working Together—Breakout Groups

In this breakout group session, the goal was to receive input from workshop participants regarding what is needed to implement I/A systems. The participants were divided into six groups and asked to answer or comment on five questions stemming from the presentations about the current state of I/A system performance, their limitations, and their implementation needs. Those questions and a summary of the participant responses are as follows:

1. Do you have a perspective regarding I/A implementation that was not discussed in the presentations?

   - There was no mention of site-specific approvals or single system installations, potentially because there is little contribution to system performance data from single-system installations.
   - No mention of recycling or reuse of wastewater as an incentive despite the potential future need for water resources.
   - Perhaps not enough importance placed on public outreach/communication and education regarding the need for improved onsite wastewater treatment, all the costs

associated with I/A systems, and the responsibilities of the owner, operator, and agencies. Centralized wastewater treatment facilities (and other public utilities) are viewed as infrastructure and therefore receive public funding and regulation, whereas I/A systems are still not viewed that way. Municipalities, counties, and states have been slow to fully adopt I/A systems, even in areas where sewers are not viable options.

- The cost/risk (poor performance risk) balance is too great for many homeowners and is confounded by systems not performing to the standards claimed by manufacturers.
- Can state agencies act as RMEs? Would that require significant staffing?

2. <u>How can we reduce risks assumed by towns/states and homeowners?</u>

    - The regulatory agency should ensure that homeowner risk is mitigated.
    - I/A system designers and installers should be held responsible for system performance. Often installers do not follow up with homeowners. The market for installers/designers could improve if there were more options, but there is already a shortage of trained I/A system personnel.
    - Trust between regulatory agencies, towns, and residents needs to be established or improved for homeowners to feel comfortable assuming the risk and cost of installing I/A systems. If homeowners can feel assured that their risk and expense will be covered if a system fails, they will be more likely to adopt the I/A systems more broadly.
    - The risk could be diminished if it were spread county-wide. The county could assist with data management, monitoring, and maintenance oversight.

3. <u>Where can these systems be complementary to traditional wastewater infrastructure?</u>

    - Where sewering is not viable or not likely to be accomplished for many years.
    - Suffolk County examined the sewer districts to see which ones had extra capacity. It also looked closely at the regional waterbodies and was able to prioritize areas in which I/A systems were most needed and could be most effective.
    - Economic analyses could help determine where the I/A systems would provide the most cost-benefit for the expected performance and improvement to the environment.

An economic analysis could help determine if clustering is a viable option versus individual systems.

- Perhaps groundwater recharge areas should be considered for I/A system installations in order to retain the water locally versus exporting it outside of the watershed.

4. When it comes to open-source technologies, what steps can be taken to build a market for these systems? What sectors could be involved in this process?

    - Mandating I/A systems will help create a need for a I/A market. Establishing a market should help control and possibly reduce the costs.
    - Construction and design professionals need to adopt I/A technologies, so it is no longer a "niche" market.
    - The market could be improved by building better public-private relationships. Using bidding processes can help foster the interaction between municipalities and I/A manufacturers and installers. Perhaps agencies (e.g., EPA) could foster those relationships by offering grants to build those partnerships.
    - The approval process needs to be shorter because it is difficult to sustain pilot projects for long periods of time with grant funding. In so many cases, funding is the limiting factor in advancing technologies because there needs to be some financial security to replace failed pilot I/A systems.

5. How do we support the development of promising technologies so that they become more available?

    - It is vitally important to get public buy-in and provide assurances that the risks of these technologies are minimal.
    - Funding support is critical to advancing promising technologies because monitoring is so expensive, but monitoring is so critical to understanding the performance of new I/A technologies.
    - Defining target nitrogen levels would establish goals for new technologies.
    - Regulating I/A technologies would ensure that they meet required standards and there would be more trust in the systems. Regulations would drive innovation to meet those standards (e.g., California emission standards for automobiles).

- A strong I/A market would drive innovation for manufacturers to remain competitive. A standardized ranking system could help structure the market and prices.
- There are a handful of I/A systems that are fully ready, but there are many more technologies that are waiting to be tested but lack the resources to run pilot programs.

2.2.3 Session 3—Synchronized Swimming: What is Needed for I/A System Development and General Use

Thursday, June 10, 2021, 1:00 -5:00pm

Objective: Explore solutions to key challenges preventing more widespread I/A development and implementation.

Polling Questions

There were three polls for the workshop participants to gauge their knowledge of I/A pilot studies, the effectiveness of I/A systems to improve water quality, and the workshop's value in creating actionable steps to push I/A systems forward. The first poll stated:

1. "*I would describe my knowledge of I/A system pilot projects to be…*"

The majority of the respondents (19 of 27; 70%) answered "Excellent" or "Good" (Figure 6), an increase of 4% compared to the results from the same question asked at the beginning of the three-day workshop (Figure 1).

2. "*Could alternative nutrient-remediating technologies like I/A systems assume a critical role in addressing regional water quality issues?*"

The respondents indicated overwhelmingly (26 of 29; 90%) that alternative nutrient-remediating technologies could play a critical role, especially if barriers to their development and implementation could be addressed (Figure 7).

3. "*Was this workshop useful for producing actionable steps to address barriers to the development and implementation of I/A systems?*"

The majority of the participants (22 of 30; 73%) answered “Yes” with the rest answering “Somewhat” (Figure 8).

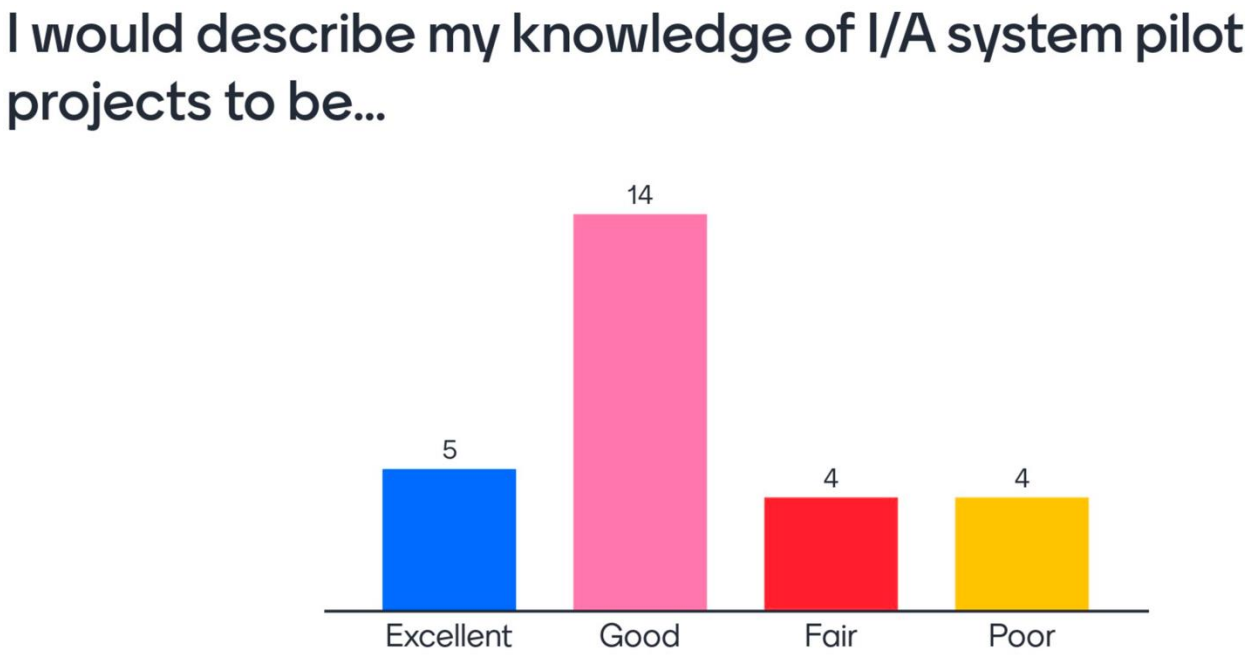

Figure 6. Poll results for workshop participants’ knowledge of I/A system pilot projects.

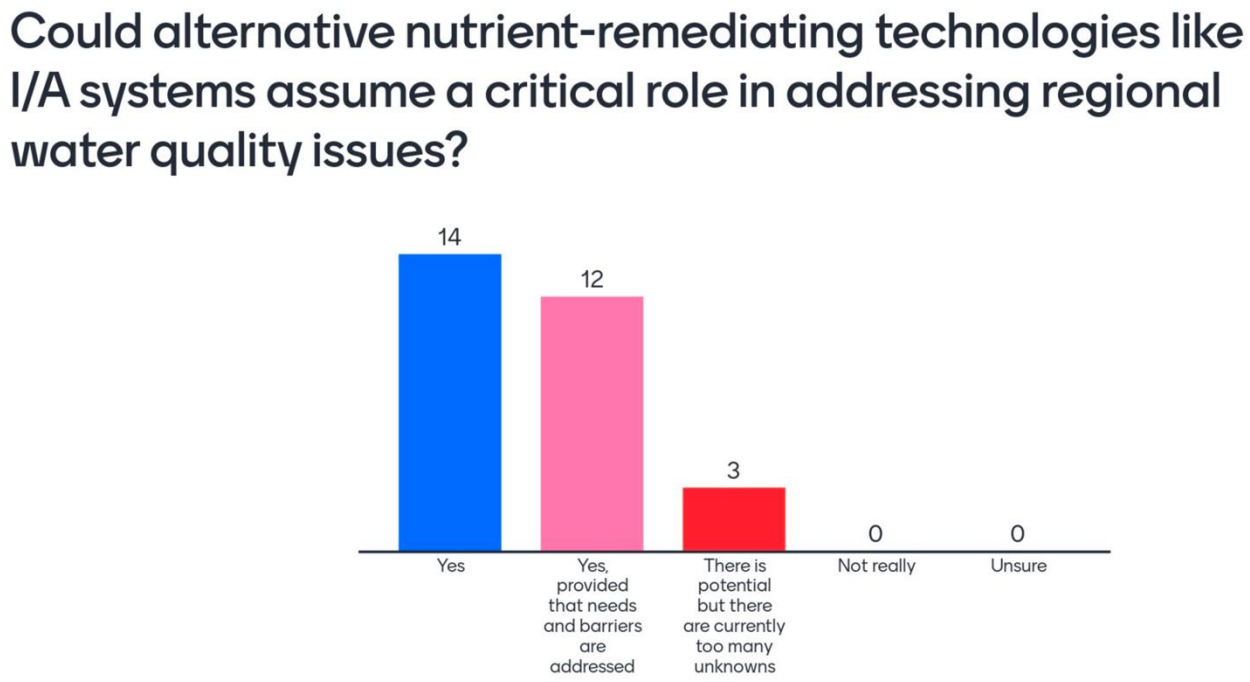

Figure 7. Poll results showing the workshop participants’ thoughts on potential role for alternative technologies helping to improve water quality.

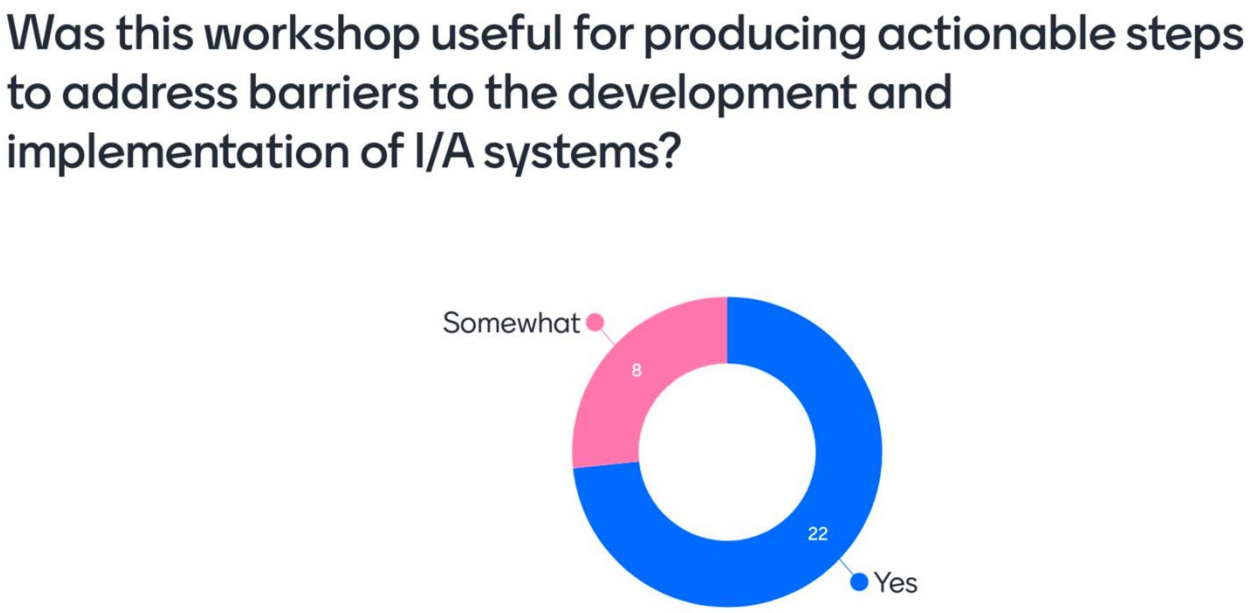

Figure 8. Poll results illustrating the workshop participants' stances on the usefulness of the workshop toward advancing the development and implementation of I/A systems.

Going into the Deep End: Barriers to Implementation—Panel Q&A

The final session of the workshop consisted of a question-and-answer period for regional practitioners that included municipal and state representatives as well as industry and non-governmental organization representatives. The speakers and their affiliations can be found in the workshop agenda in Appendix A. The panelists were asked the same three questions by the EPA workshop facilitators in addition to questions posed by the workshop participants. Those questions and their summarized responses are shown below.

Rob Steen, Barnstable Department of Public Works

1. What is your role in the process of I/A system development and implementation?

   Developing a comprehensive wastewater management plan to meet TMDLs.

2. What do you need from others?

The acknowledgment that we're all on the same team and working toward the same goals. Additionally, there is a need to look at nitrogen on a loading basis and not a flow basis. This can be achieved by working with boards of health to think outside the box, as this is somewhat outside of our jurisdiction.

3. What do others need from you?

   Local regulations that are receptive and conducive to new technologies.

4. What are some examples of implementation programs that work?

   Partnerships with NGOs that can advocate for I/A technologies and standards have had success because municipalities and states are limited in their capacities to advocate for or endorse specific technologies or manufacturers. That advocacy can help secure the necessary funding to implement I/A systems at the pilot scale and eventually on a broader scale.

Participant questions and answers:

- *What are some examples of systems that "work better"?*

  Barnstable has a plan in place that is funded to start addressing onsite wastewater. The county has a supportive town council, but is not necessarily well-versed in I/A system technologies. They need to have NGOs advocate for those technologies since the government employees can't do that. The town is taking an adaptive management approach that provides options to achieve nitrogen reductions beyond just the installation of I/A systems (e.g., pond dredging, cranberry bog/wetland conversion, etc.).

Joanne Throwe, Throwe Environmental

1. What is your role in the process of I/A system development and implementation?

   Providing technical assistance to communities as part of her role in the EPA SNEP Network, which offers no-cost technical assistance to communities throughout the SNEP region. Throwe focuses on finance.

2. What do you need from others?

The development of incentive programs to help people fund these activities without relying so heavily on grant funding. Throwe discussed The Bay Restoration Fund that enabled Maryland property owners to upgrade wastewater systems, and Suffolk County's sales tax that is funding wastewater improvements.

3. What do others need from you?

   Assistance with informing the dialog at the state and municipal levels.

4. How did Maryland generate funds for the I/A implementation program?

   It created the Bay Restoration Fund, a dedicated funding source for counties to use in addressing wastewater treatment issues. They also provided low interest rate loans from the SRF for septic upgrades.

5. How do we get all systems up to a specific standard, and can SRFs be used to help with that?

   SRFs may or may not be able to help (in the form of low- or no-interest loans) depending on the state and the rules, but SRFs are underutilized. Some municipalities have special funds dedicated to septic and wastewater treatment upgrades, but they need a comprehensive plan and specific regulatory standards for those funds to be used effectively.

Participant questions and answers:

- *How did Maryland generate funds for I/As?*

  The Bay Restoration Fund was created to help fund septic issues—a dedicated funding source that counties can use towards their programs. Counties can also SRFs to provide low-interest loans for septic upgrades.

- *Could SRF water quality money be used to help towns set up RMEs?*

  It depends on the state's interest in prioritizing the establishment of RMEs for funding.

- *How do we get all systems up to a specific standard and can SRFs be used to help with that?*

  SRFs are loans so they may or may not help, but they are often underutilized. SRF funds have been used for around two decades for onsite wastewater treatment system repairs in Rhode Island—there is a low-interest loan program administered through The Rhode Island Infrastructure Bank called the Community Septic System Loan Program (CSSLP).

Massachusetts has a similar program called the Community Septic Betterment Fund. Cape Cod has a dedicated water protection fund with money provided by a short-term rentals tax.

- *Could Massachusetts establish a coastal restoration fee to help our coastal communities?*

  There is a need to understand the costs and then prioritize how much Massachusetts is willing support programs. This need would define how much the fee would have to be. It's important that the state (and towns) have "skin" in the game—they need to contribute to make this a reality.

Kevin McDonald, The Nature Conservancy in Suffolk County, Long Island, New York

1. What is your role in the process of I/A system development and implementation?

   Helping tell the story that the current situation was not effectively helping to protect or restore embayments. Mr. McDonald helped develop and run ad campaigns to highlight the danger of inaction (e.g., impacts to tourism) without specifically placing blame. He helped organize a coalition and encourage politicians to appropriate funding to improve water quality. Additionally, as part of a non-profit, his job is to make people "uncomfortable"—the job of a non-profit is to make people uncomfortable so there is change.

2. What do you need from others?

   There is a need for people to trust the entire community working to develop and implement I/A systems (i.e., municipal and state agencies, developers, and NGOs). Others need to not get stuck on funding hiccups. It is standard practice to say that grants are needed, but putting measures up for public consideration can be effective too. Water is the top polled environmental issue for concern among Americans.

3. What do others need from you?

   The people need to be able to trust the entire community working to develop and implement I/A systems (i.e., municipal and state agencies, developers, and NGOs).

4. Additional discussion points:

Echoing what Joanne said—this is all about money. How do you raise it? How do you allocate it? It is easy for people to say what should be done, but then politics interfere. Additionally, there is a need to make the application process for new systems easier.

Muhamad Freij, Rhode Island Department of Environmental Management

1. What is your role in the process of I/A system development and implementation?

   Establishing A/E (alternative and exploratory) regulations and providing approvals.

2. What do you need from others?

   There is a need for an O&M program. Currently, for residential systems, A/Es (also known as I/As) go in the ground and there is no follow-up. Additionally, we need to educate the public about N-loading.

3. What do others need from you?

   There is a need for an O&M program.

4. What is driving the installation of I/A systems in Rhode Island if TMDLs are not the motivation?

   There was a big push to mitigate nitrogen loading in southern Rhode Island, particularly around the coastal ponds (i.e., critical resource areas). Although nitrogen loading from septic systems and cesspools is a big issue, there are several other sources of nitrogen (e.g., stormwater discharge, animal waste, and fertilizer).

Participant questions and answers:

- *Nitrogen TMDLs are not the motivating factor in Rhode Island. What is making I/A septic systems go into the ground in Rhode Island since TMDLs are not the motivator?*

  There is a big push to mitigate nitrogen loading in the southern portion of Rhode Island (i.e., critical resource areas), particularly around the coastal ponds. There are a lot of cesspools that are continually being upgraded, and any development in critical resource areas needs nitrogen-reducing systems installed. Other areas of the state where there are high water tables require advanced nitrogen treatment—not just restricted to southern critical resource

areas. It is important to recognize that there are other sources of nitrogen loading, including animal (domestic and wild) feces and fertilizer.

Mary Beth Chubb, MassDEP

1. What is your role in the process of I/A system development and implementation?

   Overseeing the I/A program and providing approvals for any system outside of Title 5 regulations. Ms. Chubb ensures that the I/A systems will function properly and have longevity for the owner and the environment.

2. What do you need from others?

   There is a need for more information on I/A system O&M and performance data. If a system is underperforming, municipalities should provide this information to MassDEP in writing so that MassDEP may follow up.

3. What do others need from you?

   There is a need for information on the requirements for I/A system approvals, technical assistance in the approval process, and assistance addressing nitrogen impairments for embayments. MassDEP is currently working with a stakeholder group to draft standards and recommendations for embayments since they are not currently outlined in Title 5 regulations (310 CMR 15.000: Septic Systems). MassDEP is working to expand the definition of N-sensitive areas.

4. How can the state of Massachusetts take the lead in implementing I/A systems instead of leaving it up to municipalities?

   The state of Massachusetts is limited in its ability to mandate I/A systems because it is a home rule state, but it has been trying to assist towns when possible.

Participant questions and answers:

- *How do nitrogen-sensitive areas in Massachusetts compare to Rhode Island (critical resource areas)?*
    - Massachusetts uses TMDLs to inform and draft revisions to Title 5 standards.

- *How could Massachusetts take the lead rather than leaving it up to all the towns?*

  Massachusetts is a home rule state and is limited in what they can do with respect to mandating I/A system implementation.

Swimming in Your Lane: Working Together (Part 1) and Synchronized Swim: Working Together (Part 2)—Breakout Groups

The final breakout group session consisted of two parts. Part 1 involved identifying barriers to implementing I/A systems and Part 2 sought possible solutions to those barriers. The participants were divided into six groups and asked to provide their feedback on these issues based on what they learned in the workshop and their own experiences. A summary of their responses follows:

1. What is preventing towns and states from moving forward with I/A installations?

   - **Achieving I/A approval is a burdensome process**, and **most towns are reluctant to require or implement I/A systems without general approval**.
   - **The lack of data sharing further exacerbates the burdensome approval process.** Without data sharing, more pilot systems need to be installed to gather the necessary data to create performance standards.
   - **There is general reluctance for an entity to take the lead and mandate I/A system upgrades and standards.** The reluctance stems from the potential risk and financial burden placed on the homeowner. Without leadership, there is no mechanism for standardizing monitoring and data collection that could be shared widely.
   - In addition to the initial installation costs, **O&M costs are a significant burden on owners and operators.** Adding monitoring costs on top of those basic costs makes the burden even greater.
   - **A general lack of confidence in the I/A technology** and its reliability, performance, and benefit for the cost.
   - **It can be difficult to convince the public they should care about nutrient loading in our coastal waters** when mitigation actions will cost them money.

2. What are some of the risks or challenges you perceive regarding the widespread implementation of I/A systems?

- Although the cost of I/A systems is significant, **the lack of mandated septic upgrades will prevent widespread implementation.** Considering the costs and risks associated with upgrading septic systems, people are unlikely to shell out thousands of dollars unless they are mandated to do so.
- **Without aggressive standards (<19m/L), there is little incentive to improve technologies that will have a meaningful impact.** Without a demonstrated impact on water quality, it becomes even more difficult to make a convincing argument for widespread implementation.
- Most common barriers to implementation of I/A systems:
    - Financial burden: development and testing, installation and O&M, monitoring.
    - Lack of regulations and standards, no centralized authority, no RMEs.
    - Performance uncertainty and system failure.
    - Burdensome approval process and a lack of data sharing.
    - Political will.

3. <u>When it comes to the implementation of I/A systems, what do you need from others? What do others need from you?</u>
    - **There is a need for state agencies to establish consistent and attainable standards.** Those standards will drive technology and help build confidence in the market. Standardized monitoring would help compare various technologies and assist with data sharing.
    - The approval process can be shortened and simplified if regional data can be used to establish I/A system performance. **A regional data sharing agreement should be in place to improve data accessibility.**
    - **The risk to homeowners needs to be reduced to encourage I/A system installation.** The risk and cost could be diminished by using RMEs for I/A system O&M.
    - **Encourage new I/A technologies to advance and build trust in the market.**
    - **States need to send out the Clean Watersheds Needs Survey (sent by EPA), in which states should include their needs to help get I/As on the radar and elevate their prioritization.** There is an unofficial category for decentralized needs on this survey.

4. What steps can be taken to build capacity for the implementation of I/A systems?

    - **States, counties, and/or municipalities should create and maintain a list of approved I/A installers** that are appropriately licensed or permitted.
    - **Offer incentives or grants to support the installation of I/A systems in new constructions**, not just for upgrades.
    - **Create a strong and stable I/A market** containing technologies that are approved by federal and state agencies.
    - **Allow data sharing to shorten or ease the approval process**.
    - **Federal and state agencies can foster the development of RMEs to operate and maintain I/A systems**—reducing cost, risk, and responsibilities of homeowners.

5. Where are partnerships between sectors going to be critical to address these barriers?

    - State agencies and technology test centers (e.g., MassDEP and the MASSTC) can establish system performance.
    - Federal agencies (e.g., EPA) and state agencies, as well as state agencies and municipalities, can build trust and support between each other.
    - I/A technology developers and state/federal agencies can set standards that drive technological advances, as well as assisting with the permitting process.
    - NGOs and state/federal agencies, along with a real estate and construction partnership with municipalities and homeowners, can help advocate for I/A technologies and communicate the need for I/A technologies and education about these technologies.

6. Does the collaborative infrastructure for addressing these barriers already exist? How can EPA help build collaboration?

    - The collaborative infrastructure only partially exists in some places (e.g., Suffolk County, New York).
    - EPA could support states and municipalities in the creation of RMEs, and provide guidance similar to their efforts with the Indian Health Service.
    - EPA could assist with incentive and grant programs for adoption/implementation of I/A systems more broadly.

- EPA could help establish and maintain regional data sharing agreements and facilitate data sharing.
- EPA could facilitate stakeholder workshops to identify data gaps and monitoring needs.
- EPA should elevate the importance of I/A technologies in addressing water quality issues, and define the positive results and benefits from I/A system implementation at broad scales.
- EPA could incentivize I/A technological advancements with technology grants.
- EPA could subsidize initial O&M costs until sufficient systems are installed to necessitate the establishment of an RME.

APPENDIX A: Workshop Agenda

Developing & Evaluating Promising Technologies: Pushing the Ball Forward on I/A Septic Systems
Workshop Series

June 2, 2021

Session 1: Dipping Our Toes in the Water: Learning from Pilots

9:00 - 9:10 **Welcome**
Marty Chintala, EPA ORD & Jeri Weiss EPA Region 1

9:10 - 9:30 **Framing: Review of Recent IA pilot projects**
Tim Gleason, EPA ORD

9:30 - 10:20 **Getting our Feet Wet: Panel Discussion**
Tim Gleason, EPA ORD

Maureen Thomas, Buzzards Bay Coalition **Adam Turner**, Martha's Vineyard Commission

Marcia Degen, Virginia Dept. Of Health

10:20 - 10:30 **Break**

10:30 - 11:30 **Wading into the Water: Working together**
What do we still need to learn and test using pilots?

11:30 - 11:45 **Group Discussion**
Marty Chintala, EPA ORD & Jeri Weiss EPA Region 1

11:45 - 12:00 **Wrap-up of Next Two Sessions**
Tim Gleason, EPA ORD

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Session 2: Swimming in our Lanes: Current State of I/A System Performance

9:00 - 9:15 **Welcome**
Marty Chintala, EPA ORD& Jeri Weiss EPA Region 1

9:15 - 10:00 **On the Starting Blocks: Current State of I/A Systems Performance**
Tim Gleason, EPA ORD

Brian Baumgaertel, MA Alternative Septic System Test Center

Nate Merrill, Atlantic Coastal Environmental Sciences Division at ORD-Narragansett

Alissa Cox, University of Rhode Island

10:00 – 10:10 **Break**

10:10 - 11:00 **On the Starting Blocks: Current State of I/A Systems Performance**

Zee Crocker, Barnstable Clean Water Coalition

Julia Priolo, Suffolk County Department of Health Services

Patty Daley, Cape Cod Commission

11:00 - 11:45 **Getting into Our Lanes: Working Together**
Identify what is needed for implementation of I/A systems

11:45 - 12:00 **Wrap-up**
Marty Chintala, EPA ORD& Jeri Weiss EPA Region 1
Tim Gleason, EPA ORD

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Session 3: Synchronized Swimming: What is needed for I/A System Development and General Use

1:00 - 1:20 **Welcome**
Marty Chintala, EPA ORD & Jeri Weiss EPA Region 1
Laura Erban, EPA ORD

1:20 - 2:30 **Going into the Deep End: Barriers to Implementation**
Laura Erban, EPA ORD

Mary Beth Chubb, Mass Department of Environmental Protection

Rob Steen, Barnstable Department of Public Works

Joanne Throwe, Throwe Environmental

Kevin McDonald, The Nature Conservancy

Muhamad Freij, RI Department of Environmental Management

2:30 - 3:10 **Swimming in Your Lane: Working Together**

3:10 - 3:20 **Break**

3:20 - 3:30 **Synchronized Swim Lesson: Setting the Stage for Solutions**
Laura Erban, EPA ORD

3:30 - 4:15 **Synchronize Swim: Working Together**

4:15 - 4:30 **Report Out**
Marty Chintala, EPA ORD; Jeri Weiss EPA Region 1**;** Laura Erban, EPA ORD

4:30 – 5:00 **Next Steps and Wrap-up**
Laura Erban, EPA ORD; Marty Chintala, EPA ORD; and Jeri Weiss EPA Region 1

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APPENDIX B: Participant List

Name	Organization
Catherine Allen	U.S. EPA, Office of Water
Cristin Ashmankas	State of Vermont, Agency of Natural Resources, Department of Environmental Conservation, Drinking Water and Groundwater Protection Division
Alex Azevedo	U.S. EPA
James Barsanti	Massachusetts Department of Environmental Protection
Brian Baumgaertel	Massachusetts Alternative Septic System Test Center
Eric Beck	Rhode Island Department of Environmental Management
Erik Bedan	Connecticut Department of Energy and Environmental Protection
Derek Belanger	Tighe & Bond
Marcel Belaval	U.S. EPA, Region 1
Walter Berry	U.S. EPA
Derek Betts	Nassau County Soil and Water Conservation District
Joel Blanco-Gonzalez	U.S. EPA
Holly Brown	Massachusetts Department of Environmental Protection
Sara Burns	The Nature Conservancy
Olivia Calandra	Nassau County Soil and Water Conservation District
Doug Canody	Virginia Department of Health
Sheri Caseau	Martha's Vineyard Commission
Marty Chintala	U.S. EPA, Atlantic Coastal Environmental Sciences Division
Marybeth Chubb	Massachusetts Department of Environmental Protection
Stewart Chute	Connecticut Department of Public Health
Chris Clapp	The Nature Conservancy
Amanda Clark	Connecticut Department of Public Health
Stuart Coleman	Wastewater Alternatives and Innovations
Christina Comfort	Wastewater Alternatives and Innovations
Nora Conlon	U.S. EPA, Region 1
Joe Costa	Buzzards Bay National Estuary Program
Katherine Coughlin	North Shore Land Alliance
Alissa Cox	University of Rhode Island
Zenas Crocker	Barnstable Clean Water Coalition
Victor D'Amato	Tetra Tech, Inc.
Antoanela Daha	Connecticut Department of Energy and Environmental Protection
Patty Daley	Cape Cod Commission
Marcia Degen	Virginia Department of Health
Mary Dever	U.S. EPA, Region 1
Ian Dombroski	U.S. EPA, Region 1

Name	Organization
Brian Dudley	Massachusetts Department of Environmental Protection
Kelsey Dumville	U.S. EPA, Region 1
Richard Emberley	New Hampshire Department of Environmental Services
Laura Erban	U.S. EPA
Brenda Escobar	U.S. EPA, Region 1
Carlos Esguerra	Connecticut Department of Energy and Environmental Protection
Heidi Faller	U.S. EPA
MaryJo Feuerbach	U.S. EPA, Region 1
Mohamed Freij	Rhode Island Department of Environmental Management
Luis Gamboa	The Goodyear Tire and Rubber Company
Susan Glassmeyer	U.S. EPA
Tim Gleason	U.S. EPA, Office of Research and Development
Andrew Gottlieb	Association to Preserve Cape Cod
Greg Graves	Norwalk Wastewater Equipment Company
Tom Groves	National Onsite Wastewater Recycling Association
Jennifer Hause	West Virginia University Energy Institute
Sara Heger	University of Minnesota
Chip Heil	E&C Enviroscape, LLC
Kristina Heinemann	U.S. EPA, Region 2
George Heufelder	Barnstable County Department of Health and Environment
Scott Horsley	Horsley Water Resources Consultant
Michelle Jenkins	New England Interstate Water Pollution Control Commission
Lauren Jones	Connecticut Department of Energy and Environmental Protection
Sue Kiernan	Rhode Island Dept of Environmental Management
Sara Kinslow	U.S. EPA, Region 1
Kathleen Knight	Connecticut Department of Energy and Environmental Protection
Brian Lafaille	Rhode Island Department of Environmental Management
Marianne Langridge	New England Water Environment Association
Denis LeBlanc	U.S. Geological Survey
Fat Piu Lee	Horsley Witten Group, Inc.
Stephen Leighton	Falmouth Water Quality Management Committee
Tara Lewis	Cape Cod Commission
Hayley Lind	U.S. Geological Survey
Pio Lombardo	Lombardo Associates, Inc.
George Loomis	New England Onsite Wastewater Training Program, University of Rhode Island

Name	Organization
Jennifer Loughran	Barnstable Clean Water Coalition
Zach Lowenstein	U.S. EPA
Kevin McDonald	The Nature Conservancy
Sean Merrigan	Connecticut Department of Public Health
Nate Merrill	U.S. EPA
Chris Miller	Brewster Department of Natural Resources
Muhumed Ahmed Mohamed	SOS Children's Villages, Somalia
David Morgan	U.S. EPA
Kate Mulvaney	U.S. EPA, Atlantic Coastal Environmental Sciences Division
Kris Neset	Center for Disease Control, National Center for Environmental Health, Water, Food, and Environmental Health Services Branch
Drew Osei	Massachusetts Department of Environmental Protection
Meredith Outterson	Eastern Research Group, Inc.
Alex Owutaka	U.S. EPA, Region 7
Jennifer Palmiotto	National Rural Water Association
Ernest Panciera	Rhode Island Department of Environmental Management
Tim Pasakarnis	Cape Cod Commission
Matthew Pawlik	Connecticut Department of Public Health
Korrin Petersen	Buzzards Bay Coalition
Alexandra Phillips	Eastern Research Group, Inc.
James Plummer	New England Interstate Water Pollution Control Commission
Anne Powell	Virginia Department of Health, Office of Environmental Health Service
Julia Priolo	Suffolk County Department of Health Services
Margherita Pryor	U.S. EPA
Kristen Rathjen	Science Wares
Adam Reilly	U.S. EPA
Colby Richardson	Eastern Research Group, Inc.
Jaime Rizo	Missouri Department of Natural Resources
Bianca Ross	U.S. EPA
Alexie Rudman	U.S. EPA, Oak Ridge Institute for Science and Education
Laurie Ruszala	Yarmouth Water Department
Joachim Schneider	Wastewater Alternatives and Innovations
Martha Sheils	New England Environmental Finance Center
Shasten Sherwell	U.S. EPA
Emily Shumchenia	E&C Enviroscape, LLC
Jeremy Simmons	Washington Department of Health
Daniel Smith	AET Tech
John Smith	KleanTu, LLC

Name	Organization
Robert Steen	Barnstable Public Works Department
Sharon Steiner	NSF International
Hannah Stroud	Eastern Research Group, Inc.
Eric Swenson	Nassau County Soil and Water Conservation District
Maggie Theroux Fieldsteel	Innovative Water Solutions
Maureen Thomas	Buzzards Bay Coalition
Joanne Throwe	Throwe Environmental
Eric Turkington	Falmouth Water Quality Management Committee
Adam Turner	Martha's Vineyard Commission
Amber Unruh	Town of Barnstable
Bruce Walton	New England Water Environment Association
John Waterbury	Falmouth Water Quality Committee
Jeri Weiss	U.S. EPA, Region 1
Liz Whitcher	U.S. EPA, Region 1
Christina Stringer	New England Interstate Water Pollution Control Commission

APPENDIX C: Other Resources

Session 1: June 2, 2021, Chat Window Resources

1. "Recommendations of the On-Site Wastewater Treatment Systems Nitrogen Reduction Technology Expert Review Panel: Final Report"

   http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2014/10/owts_expert_panel_final_report_02-17-14.pdf

2. "Drip Irrigation and Peat Treatment System On-site Wastewater Nutrient Removal BMP Expert Panel Report"

   https://www.chesapeakebay.net/channel_files/26340/osww_bmp_report_4-30-18.pdf

3. "Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems"

   https://www.epa.gov/sites/production/files/2015-06/documents/septic_guidelines.pdf

Session 2: June 3, 2021, Chat Window Resources

1. Human Dimensions of Water Quality Research

   https://www.epa.gov/water-research/human-dimensions-water-quality-research

2. Barnstable Water Resources

   https://barnstablewaterresources.com/

Session 3: June 10, 2021, Chat Window Resources

1. Southeast New England Program Network

   https://snepnetwork.org/

2. Maryland legislation establishing resilience authorities that may issue and sell state and local tax-exempt bonds for resilience infrastructure projects and other related financing purposes.

   https://trackbill.com/bill/maryland-senate-bill-457-local-governments-resilience-authorities-authorization/1872594/

3. Maryland Bay Restoration Fund

   https://mde.maryland.gov/programs/water/bayrestorationfund/pages/faqs.aspx

4. Rhode Island Infrastructure Bank Community Septic System Loan Program (CSSLP)

   www.riib.org/

5. Massachusetts Community Septic Management Program

   https://www.mass.gov/guides/the-community-septic-management-program

6. United States Innovation and Competition Act of 2021

   https://www.congress.gov/bill/117th-congress/senate-bill/1260