Protecting Adirondack Waters from Septic System Pollution

A White Paper by the Adirondack Council

How Adirondack Park Residents, Local Communities and State Officials Can Work Together to Upgrade Septic Systems, Protecting Adirondack Waters

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Table of Contents

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Introduction

This report documents what Adirondack communities, residents, and state officials are doing to protect the Park's precious, clean waters as well as provide paths forward to mitigate and reduce pollution sources in the Park. It identifies opportunities to scale up successfully tested programs to resolve the unaddressed situation of septic system pollution where untreated or only partially treated sewage still negatively impacts the state's iconic Adirondack lakes, rivers, and pure drinking water resources.

Since the 19th Century, for more than 135 years, the State of New York in partnership with owners of private lands in the Adirondacks, have invested in protecting the clean water and wildlands of the State. Since 2015, the State of New York awarded $152 million in clean water and drinking water funds for wastewater treatment plants and sewer systems infrastructure projects to treat human waste streams for twenty-five larger communities in the Adirondacks.

However, the majority of the one hundred plus Adirondack communities are smaller and rely on individual septic systems to treat homeowner's and small business wastewater. Several communities have piloted programs to address failing septic systems. Scaling those local programs up to reach across the Park would benefit millions of people and protect public health.

The clean water in the 6 million-acre Adirondack Park's 2,800 lakes and ponds, more than 1,500 miles of rivers and an estimated 30,000 miles of brooks and streams is the lifeblood for the people, wildlife, and communities of the Park. The purity of this water is threatened by pollution including untreated or partially treated sewage flowing from failing septic systems.

Efforts are underway to make sure cross-state air pollution does not increase and bring back acid rain, poisoning Adirondack Lakes. Efforts are under way to address the over application of road salt, contaminating lakes and drinking water. Efforts are continuing to strengthen protections to address the threats of climate change and aquatic invasive species. This report documents success efforts to address failing septic systems, that if scaled up could address this threat park-wide, benefiting both residents and visitors, the natural world, and the economy.

A significant percentage of the Adirondack region's wastewater is treated by private septic systems, even within larger watersheds, such as Lake George and Lake Champlain, which has several sewage treatment plants. The Lake George Basin has centralized wastewater treatment systems in Village of Lake George, the Towns of Bolton and Hague as well as the Town of Ticonderoga. With state grant funds and local investments, Lake George is building a new sewage treatment plant and improving its sewer lines. Bolton and Ticonderoga have done recent upgrades to their plants and improvements in Hague are being planned. However, even with this infrastructure in place, there is still more than 6,000 single family home septic systems

designed to treat their waste prior to entering the environment and local waterways in the basin. These systems are the centerpiece of the Lake George Septic System remediation program.

As in Lake George Basin, many of the communities in other watersheds with an abundance of single-family home septic systems are facing similar challenges. Residents along lake shores from Saranac Lake to Long Lake to Raquette Lake and other pristine water bodies across the region too have failing septic systems and water quality issues. The importance of maintaining and properly operating these onsite wastewater treatment systems for property owners can be just as important for local water quality as the upgrading and maintenance of community owned wastewater treatment plants and sewer systems in those areas. In fact, many of these home systems are failing or have failed and as a result, do not properly treat incoming waste, adding to pollution levels in localized areas.

The impacts of failing septic systems on Adirondack lakes, rivers and streams are widespread. Water quality concerns range from e-coli levels to nitrogen and phosphorus loads as well as other pollutants. The result can be unsafe pollution levels for swimming, impacts to fish and wildlife and in most severe cases emergence of Harmful Algal Blooms (HABs). These ecological impacts can adversely impact social values such as property values, surrounding community's quality of life, and the local economy which relies on tourism.

In order to empower private property owners to make informed decisions regarding their individual septic systems, an education component is needed for both landowners and local governments. Whether it is septic system maintenance, design or assistance with replacement and construction. This information will be critical for the long-term protection of local waterways, groundwater, and aquifers. Most importantly, local governments across the Adirondacks need assistance putting in place education programs as well as local ordinances to ensure private septic systems are frequently inspected. Not only when properties are sold, but also for long-term homeowners on a regular basis. Also, low- and no-interest financing options and other incentives including state grant funds can help residents invest in the long-term health of their septic systems should be explored.

The purpose of this white paper is to:

- Provide local homeowners in the Adirondack Park with septic systems a link to model septic guides as well as critical information and available resources to keep their systems working properly. Provide similar guidance to small businesses who also rely on small scale septic and/or other types of small treatment systems.
- Provide residents and local governments with examples of communities (such as Inlet, Lake George, Bolton Landing, Queensbury and Lake Placid) that have model septic evaluation, assistance, technologies, and regulations to ensure their residents are keeping their systems up to date and where needed mitigating them.
- Provide recommendations for local, county and state officials regarding a comprehensive and coordinated approach to assist, oversee and in some cases fund septic system mitigation efforts at the regional and local level as well as establishing programs to increase water quality monitoring in Adirondack lakes and rivers.

Homeowners' Resources for their Septic Systems

Property owners are generally conscientious about maintenance of systems that directly impact their lives: heating, cooling, plumbing and electrical, communications equipment, emergency power systems, etc. Onsite wastewater treatment systems are too often out of sight out of mind and overlooked. Like any other utility system, an older and/or unmaintained septic system will require investment to keep it functioning properly. The key to preventing septic system failure is proper maintenance. Proper care of any septic system requires day-to-day maintenance as well as periodic management and repairs. The Fund for Lake George Self Septic System Guide is recommended reading for all its Lakeshore residents with a septic system:

SafeSepticSystems.org website

Some additional resources that are on-line for homeowners to help them maintain their septic systems in the Adirondack Park include:

- **Links for Homeowners to educational guides for maintaining septic systems.**

https://www.lakegeorgeassociation.org/protect/lake-friendly-living/septic-system-care/

http://yates.cce.cornell.edu/resources/your-septic-system-overview-maintenance

https://usfoundation.net/wp-content/uploads/2018/05/septic-booklet.pdf

- **Links for Homeowners for design of new or replacement of old septic systems**

https://www.health.ny.gov/environmental/water/drinking/wastewater_treatment_systems/docs/design_handbook.pdf

https://www3.epa.gov/npdes/pubs/homeowner_guide_long.pdf

https://www.epa.gov/septic/types-septic-systems

Several Adirondack local county and town officials have assistance programs for managing home and business septic systems. By contacting local government officials, one can find help in the form of information and local guidance to maintain your septic system. One example of a local program exists in the Lake George watershed: a collaboration of local non-profit environmental group with local officials. This program is clearly the most extensive program of its kind in the region and is led by The Fund for Lake George. As referenced above with its "safe septic" website and guide, this partnership created by The Fund for Lake George has a Safe Septic Guide that covers all the issues associated with septic systems including the necessary steps for remediation and maintenance.

Below is a description and some excerpts from this **Lake George Model Septic Program Partnership** taken from **The Fund for Lake George's** own website:

The Fund for Lake George Safe Septic System Program

Among the main sources of increasing nutrients are aging and antiquated septic systems. According to survey and site analyses conducted in the southern Lake George Basin by The FUND for Lake George Waterkeeper program, two-thirds of local residential systems have exceeded their life expectancy of 30-40 years, are designed improperly, and/or suffer from a lack of maintenance — creating what is literally a growing threat to our Lake's still-pristine water quality. There are around 6000 private septic systems in the Lake George Basin.

The majority of the Lake George Basin, or watershed, is rural, without centralized utilities like municipal wastewater collection and treatment systems. The basic function of a wastewater treatment system is to properly treat all wastewater that goes down any drain before it enters the natural environment. In areas without centralized wastewater collection and treatment systems, property owners must have their own individual onsite treatment systems. The function is the same as a centralized wastewater treatment system: to treat all wastewater to safe levels meeting recommended contaminant levels before it is discharged into the environment. Onsite wastewater treatment systems are also known as septic system for homeowners' individual wastewater or sewage disposal.

The FUND for Lake George has been the leader in protecting the water quality and clarity of Lake George from the impacts of inadequate wastewater treatment on both municipal and private fronts. The FUND's science-based advocacy documented excessive algae growth in Dunham's Bay that prompted our partnership with residents there and with the Town of Queensbury to adopt the first septic system management district in the Lake George Basin. The Town of Queensbury established a district and became the responsible management entity with oversight of septic system operation and maintenance. The FUND incentivized the replacement of antiquated systems at Dunham's Bay by investing in a matching grant program and conducting algae monitoring to demonstrate improved water quality.

In a State-funded partnership, The FUND also administered the Town of Lake George Septic Initiative Program. This partnership produced a data-based algorithm to prioritize areas for system inspection and possible replacement. This new system applied site suitability analysis, existing septic system evaluation, and algae monitoring indices to prepare a prioritization map for the Town to use in effectively addressing the issue. This program was designed for application throughout the Lake George Basin and these actions and findings became the basis of the Safe Septic System program 's elements.

The Safe Septic System Program features homeowners' guides, local assessments, and financing for replacement investments. Elements and findings include:

- ***The SafeSepticSystems.org website, an online guide to help homeowners ensure their systems are not harming the Lake.***

- ***The need for the loan assistance and educational materials for septic system owners came to the forefront last year with the findings from a major assessment of near-shore systems in the Town of Lake George, conducted in coordination with the Town by The FUND's Lake George Waterkeeper program, with funding from a New York State Department of Environmental Conservation grant.***

- ***The assessment found that two-thirds of the systems were either near or past their estimated life expectancy or there was no information available on the age. More than half of the systems reviewed had no record of maintenance or pump-out, and/or have never been pumped out.***

- ***An outreach program to educate homeowners with these findings and resources including distributions of educational material and hosting of local workshops.***

- ***Financing for homeowners was determined to be critical to this program's implementation. To address this need, Glens Falls National Bank & Trust Company and Adirondack Trust Company in partnership with the program have each developed special financing programs for qualified property owners whose septic systems need to be replaced. The lifespan of a typical septic system is 30-40 years, and replacement costs can range from $17,000-$30,000, depending on system specifications, size requirements, and site conditions.***

The Fund for Lake George Safe Septic System program is truly a model program with elements for the region to consider replicating and building upon in communities across the Adirondack Park. However, while it addresses major components of a septic system maintenance and mitigation strategy to protect Lake George's water quality, there are additional elements still to be considered and implemented. One key issue beyond inspections of septic systems for properties being sold is the need for periodic inspections of all existing septic systems on Lake George. With a recent HAB outbreak in Harris Bay, a group of citizens and organizations have called for a mandatory inspection program to be established for all property owners who have operational septic systems on the Lake. Such a program can then identify which systems have failed and timelines needed to repair or replace them to protect the water quality of the Lake.

A second component is to seek State funding for matching grants to homeowners. Under the NYS Septic System Replacement Grant program housed in NYSEFC, the specific county which the town and water body reside in must be an approved administrator of this funding program. Lake George is mainly in Warren County which was approved as a participating county in 2021 with Lake George as their priority water bodies to protect under the program. This determination of a priority water body needs collaborative, with guidance given to Warren County by NYSEFC for an approved county administrator of the program. Washington and Essex County shoreline areas of Lake George were also made eligible for the program. While the recently created public/private partnership for low interest loans with local banks to residents is also an important tool in Lake George's model program, only a few homeowners have taken advantage of this program citing the need for more state grant funds to the region.

Finally, Lake George area towns are not the only local communities to enact local ordinances in their zoning codes to help ensure septic systems are working properly and require inspections prior to transfer of ownership. Examples are outlined below, which present an opportunity build upon these efforts park wide. Details on New York State's Septic System Replacement Funding Program and implications for the Adirondack Park region is also reviewed.

Model Local Ordinances and Inspection Practices in Adirondack Communities including Transfer Laws and Inspection Requirements

As recently enacted in the Towns of Bolton and Queensbury, new Septic Inspection Transfer Laws require property sellers to obtain a detailed inspection of their onsite wastewater treatment system (OWTS) by a certified professional or a town-designated official. During a real estate transfer, the homeowner is required by law to disclose any information about failing infrastructure on the property, including the OWTS. Therefore, when the time comes to sell your property and the existing septic system is inspected and determined to be deficient, the cost of replacement shall be borne by the seller or this cost can be factored into the final sale price of the property. If the sale of your property is being contemplated, this law makes your decision quite easy. C***opies of Queensbury and Bolton ordinances/inspection rules are available for review.***

As noted earlier, a coalition on Lake George community, lake shore association and non-profit organizations have called for mandatory inspections for all residents on the entire Lake George shoreline. With the emergence of a Harmful Algae Bloom (HAB), the coalition cited that the governor had mentioned in his 2018 State of the State Address that toxic algae endangers upstate surface and drinking water and highlighted the importance of a septic inspection program to address them. The coalition also cited statistics from the Queensbury law, requiring septic system inspections upon transfer of properties. Eighty percent of the septic systems inspected by the town since January 2019 were found to need either major or minor repair. Furthermore, a Fund for Lake George study found about two-thirds of the residential septic systems on Lake George have exceeded their life expectancy of 30 to 40 years, are designed improperly, or are not maintained. These statistics are based on nearly 6,000 on-site wastewater systems in the Lake George watershed. The initiative for Lake-wide mandatory inspections has support from Lake George Mayor Robert Blais, Lake George Supervisor Dennis Dickinson, Queensbury Supervisor John Strough and Bolton Supervisor Ron Conover as well as The Lake George Association and other environmental group partners including the Adirondack Council.

Beyond Lake George and following the lead of Bolton and Queensbury, other towns in the basin have considered similar legislation. The Towns of Horicon, Inlet and North Elba/Lake Placid now have similar requirements for septic system inspections prior to property sales. Additionally, North Elba and Inlet require inspections of existing septic systems, near drinking water supplies, every 3-5 years. Finally, in the fall of 2020, Warren County considered their own transfer law calling for a septic system inspection program.

In addition, Clinton County in the northern Adirondacks have established some of the most comprehensive review requirements for septic systems under their new construction provisions

or replacement requirements. These guidelines could be an additional model for other counties and municipalities in the Adirondack Park to review and consider for their building codes. Also, with recent identification of some Harmful Algal Blooms in other Adirondack lakes, there is an effort by those local lake associations to further their own protection efforts by having new local ordinances that in turn mandate annual inspections of existing septic systems.

Also, for new construction, all Adirondack Communities under Adirondack Park Agency regulations must have professionally designed on-site wastewater systems in their new project application. **Section 574.4** states local sewage disposal standards must be followed unless otherwise provided in the permit. Individual sewage disposal systems associated with a project shall be designed, installed, and maintained in accordance with the standards of the Commissioner of Health set forth in the booklet Waste Treatment—Individual Household Systems filed by the New York State Department of Health (NYSDOH) as Appendix 75-A to Volume 10 (Health (A)) of the Official Compilation of Codes, Rules and Regulations of the State of New York, and with the additional standards set forth in Appendix Q-4 of these regulations.

These regulations may or may not provide proper guidance for new systems, but the larger question remains around how to ensure existing systems are maintained and operating properly. Many experts have noted that these DOH regulations are overdue for regulatory updates and revisions to address current needs and new technologies. NYSDOH's regulations are primarily focused on drinking water impacts, but overall environmental impairments are equally important and need to be considered. Again, counties in New York State that have updated their own requirements could be used in such a review of and any future updates considered at NYSDOH.

As for funding assistance in replacing septic systems for homeowners and small businesses, New York State enacted the Septic System Replacement Fund under the NYS Water Infrastructure Improvement Act (WIIA). The program is managed by the Environmental Facilities Corporation in consultation with NYSDEC and NYDOH. Funds have been appropriated annually for EFC to distribute to eligible countries and in 2021 a total of $15 million was approved. The program has Counties apply to become eligible managers for the program by having a priority water body listed and then becoming the application agent for distribution of these state grant funds to homeowners. Counties are then given an allocation each year of grants funds they are able to distribute.

The following is a summary of this program from NYSEFC's website.

The State Septic System Replacement Fund Program provides funding to replace cesspools and septic systems in New York State. This grant program's goal is to reduce the environmental and public-health impacts associated with the discharge from cesspools and septic systems. The program targets cesspools and septic systems in close proximity to priority waterbodies. The program further states that potential county applicants should reach out to the local contact for the state program to determine application process and eligible projects for that county.

Thirty-nine counties are now currently eligible for use of the Septic System Replacement Fund. Participating counties are responsible for reviewing and evaluating the applications

and determine financial assistance awards based on the program criteria. The following considerations are made under this determination including property's location in relation to a waterbody, impacts to groundwater used as drinking water, and the condition of the property owner's current septic system. After evaluating the applications and making the funding decisions, participating counties notify the property owners of their grant awards by sending them award letters. The state provides participating counties with funds to work with local property owners. Participating counties provide grants to reimburse the property owner for up to 50% of the costs (at a maximum of $10,000) towards their eligible septic system projects of:

- ***replacement of a cesspool with a septic system; or***
- ***installation, replacement or upgrade of a septic system or septic system components.***
- ***installation of enhanced treatment technologies, including installing an advanced nitrogen removal system.***

As of 2020, only one Adirondack County, Essex County in the Willsboro shoreline area of Lake Champlain, was approved eligible to manage the program. However, in April of 2021, this list grew with five more counties being approved including Warren County for Lake George, Washington County for Lake George, Hamilton County for Lake Eaton, Clinton County for Isle LaMotte and Herkimer County for North Winfield Creek and its tributaries. Essex County designation was also expanded to include their shoreline areas for Lake George.

However, there are many additional areas in the Adirondacks that have priority water bodies to consider and need to be part of this program. The program fits the demand for the Adirondack region, but the funding of these grants to local residents is currently just beginning and yet to be fully implemented. In contrast, Suffolk County on Long Island, which has the most comprehensive program in NYS, was approved with a million dollars for homeowners grants in December of 2020 to address reductions in nitrogen pollution from septic systems to implement the Long Island Nitrogen Reduction Plan.

There are further lessons that can be learned from other watershed areas in New York State in addressing septic system issues. Some of the Finger Lakes have extensive septic review and installation requirement regulations to protect water quality. For examples, the Keuka Lake Watershed Improvement Cooperative has one of the most comprehensive approaches in New York State. They require periodic certified inspections of existing septic systems, inspections of septic systems six months prior to any property transfers and certified inspections of holding tanks on a regular basis. They also have stringent rules for new or replacement systems during new construction. Seneca Lake presents another example in the Finger Lakes region where local governments and lake associations have collaborated to create extensive water quality monitoring and septic system remediation efforts. In fact, Steuben and Yates counties have taken additional steps and are also approved counties under the NYS's Septic System Replacement Program. It is important to note that the majority of the Finger Lakes are designated as priority water bodies by New York State under the Septic System Replacement Program which should be case for more lakes and water bodies in the Adirondack Park as noted earlier.

Currently, most local governments in the Adirondack Park beyond Lake George and other areas highlighted do not have a truly comprehensive approach to manage existing on-site septic

systems for homeowners and small businesses in close proximity to local lakes and streams. Municipalities lack the resources and outreach capacity for local education, compliance, and assistance as well as resources to monitor lake water quality and apply for priority water body status under the New York State program. In many instances, a water quality problem such as unsafe bacteria levels at a public beach or a Harmful Algal Bloom is a cause for alarm and needed action. These are symptoms of a preventable nitrogen, phosphorus, and other pollution problems. It is time for a comprehensive Adirondack Park wide program to be developed with local governments, counties, the Adirondack Park Agency, and New York State to put in the needed monitoring resources, policy guidance, and remediation strategies to address this growing water quality issue. Again, there are models that can be followed and possible grant funds available to achieve this goal, but a regionally based approach is warranted to incorporate these approaches and best practices as well as take advantage of new technologies.

Septic System Technologies: Existing Systems & New Innovations

Septic systems are known as Onsite Wastewater Treatment Systems (OWTS) and refer to systems of various configurations and technologies that treat the wastewater generated on associated properties. An OWTS is part of a property's utility matrix for essential services. However, unlike these other essential services, septic systems are too often overlooked and taken for granted since their wastewater collection and treatment function is out-of-sight and out-of-mind—until a problem arises. In Appendix A, there is a review of existing and conventional septic systems that has been taken from the Fund for Lake George's Septic System Design Manuel as well as a listing of alternative septic systems technologies from other sources.

Conventional systems comprise of a septic tank, a distribution system, an absorption field including the needed receiving soils. More advanced systems are known for expanded design features as well as new innovative module wastewater treatment systems known as Enhanced Treatment Units (ETU's) that can come with a number of features. These alternatives and augmentations include:

- Ultraviolet Light Treatment (UV).
- Elevated Mound System.
- Pressurized dosing which pumps effluent more efficiently thru Leach field.
- Plastic Chamber system in Leach field.
- Sand filters prior to Leach field.
- Standard Aerobic Treatment Systems and Advanced Aerobic Treatment Systems with four chamber design for increased breakdown.
- Membrane Bioreactors Units.
- Drop distribution and irrigation system using a filtering mechanism.
- Constructed wetlands as receiving area after distribution of effluent over a lined rock and sand based receiving area prior to the wetland area.

The appropriateness of these systems is dependent on local environmental conditions and a site review. There are barriers with these new technologies whether related to local and state regulations or in the lack of installers with access to these types of alternative systems. These barriers can also drive up their costs for installation and maintenance. All in all, a comprehensive

review and adoption of improvements to conventional septic systems designs as well as new innovative systems should be a priority for the Adirondack region, as well as New York State.

New York State Adirondacks Water Quality Monitoring and Septic System Program Needs: Concepts for the Future

With the scope of septic system failures increasing and water bodies being adversely impacted including more Harmful Algal Blooms (HABs) being detected in the Adirondack region, a focused state assistance program is warranted for the region to help address these issues. Current needs include funding for more water quality monitoring and expanded lake surveys, technical assistance for Adirondack Park counties to educate residents, and more access to state grant programs such the NYS's Septic System Replacement Program. Furthermore, there is a need for a coordinated regional approach that calls upon counties to provide data to become a program partner as established on Eastern Long Island for the State's successful Long Island Nitrogen Reduction Program. In the Adirondacks, the use of New York's Clean Water Infrastructure Funds and technical staff in conjunction with the State's HABs program are needed due to the limited resources in these rural Adirondack counties and towns. Building on these efforts, the region will need resources to identify the scope of the problem, provide education and outreach capacity to homeowners and businesses, assist local governments with model ordinances and to access existing statewide funding stream that has not been used to its capacity to help implement a cost share mitigation option with Adirondack residents.

With more identification and data collection key to the success of any clean water program, the first step is qualifying for state assistance for the funding the replacement and mitigation of failing septic systems in the Adirondack Park. It is critical to dramatically increase the monitoring of water quality in water bodies throughout the region. As done for acid rain in the past and currently maintained by New York State's Department of Environmental Conservation, a similar approach with funding and staff resources needs to be established for Adirondack lakes, rivers, and streams especially where septic systems are prevalent.

To address this need, a coalition of research institutions, regional academic institutions and environmental groups have called for a $6 million ($2 million per year for 3 years) state budget investment to establish a long-term lakes and water bodies monitoring program. The State budget request would support a collaborative partnership between institutions engaged in academic research including Cornell CALS, the Adirondack Lake Survey Corporation, Paul Smith's College, Adirondack Watershed Institute, SUNY ESF, Rensselaer Polytechnic Institute with support from non-governmental Adirondack organizations including the Adirondack Council. This investment has the potential of impacting over 500 lakes, rivers, and streams in the Adirondack Park.

This survey is titled the Climate Change and Adirondack Lakes Ecosystems (SCALE) program. It has the potential to guide management and mitigation efforts for decades to come. The proposed program will not only address pollutants and degradation from local sources whether e-coli, phosphorus, or nitrogen, but also address indicators on issues around climate

change, road salt, acid rain, invasive species, and other threats to local water bodies. Communities can only prepare and adapt to changing and threating conditions when they understand what the current condition of their lakes are. These efforts can answer why some lakes are climate-resilient and why others are impacted more by local pollution sources becoming profoundly degraded. This type of water quality monitoring can be a cornerstone for counties, local towns, and New York State to address septic system issues and other natural resource threats to the water bodies in the Adirondack Park.

With this information in hand, counties can identify priority water bodies, apply for state-wide assistance funds, and integrate these efforts with larger scale clean water infrastructure projects associated with sewer systems in the Park. This information can also be the cornerstone for education to homeowners and small businesses on meeting their needs to address emerging issues from their own septic systems. As proven in Lake George, a comprehensive private/public institutional water quality monitoring program has many benefits and has enabled them to create outreach and educational programs for their residents and officials. This approach is essential to designate additional priority water bodies in the Adirondack Park so more counties can be eligible to administer grants under the NYS's Septic System Replacement Program.

Much like the statewide Harmful Algal Bloom (HAB) program under the State's Clean Water Program Fund, the Adirondacks need a coordinated state response and strategy to address these emerging water quality issues from septic system pollution to other emerging threats in a comprehensive fashion. In fact, in the State's HAB priority response areas, strategies to address failing septic systems are a key policy component in the recognition of the inputs of phosphorous and nitrogen pollution. Whether public education, technical assistance, model ordinances and septic guidelines, or funding opportunities to help finance improvements, such a coordinated approach across these Adirondack rural counties is critical. The fact remains that these counties lack the overall resources to take on this challenge by themselves in a comprehensive fashion.

And it is not only the homeowner's septic system that needs to be evaluated and mitigated where needed, but also small businesses attached to their properties. Properties that house small motels, cabins and diners may require general SPDES Permits from the NYSDEC with review from the NYSDOH under the New York State Design Standard for Intermediate Sized Wastewater Treatment Systems (published March 5, 2014). Any system discharging more than 1,000 gallons per day falls into this category, but state resources are lacking to monitor general permit compliance or water quality issues associated with these septic systems. These systems should be included in any Adirondack Park wide septic system monitoring, inspection and remediation program designed for homeowners.

An additional approach to establishing a more comprehensive program is to create a collaborative effort by all counties in the Adirondack Park to take advantage of New York State's Septic System Replacement Fund to address septic system needs. Instead of each county applying individually under the program, a comprehensive plan and shared services plan could be developed so that all critical and threatened waterways in the Adirondack Park are eligible for funding to homeowners and small businesses. Many of the watersheds have multiple counties within their boundaries with vastly different levels of staff resources. Under the New York State Department of State, there are consolidation of shared services grants available that could fall

under such a plan. Not every county in the Adirondack Park has the resources to administer such an effort of public education, inspection or even qualifying for the Septic System Replacement Program, but through a comprehensive plan and shared services model, a more cohesive collaborative approach could be developed. This application process could be established under the umbrella of the Association of Adirondack Counties and Towns or under another Adirondack Park based association creating a team of qualified professionals from some of the large counties and towns to pursue and take advantage of this opportunity.

Another element of a regional approach could be to develop Park-wide mandatory septic system inspection program including inspections for when property transfers occur as well as exiting homeowners. This approach can be integrated in a regional plan for local governments lead by regional county governments with state support. Further elements could be in promoting new innovations in septic system alternatives and designs when considering septic system replacement needs. State agencies could aid in the analysis of these new innovations and update their regulatory requirements to meet technological advancements. In cases where local conditions have dramatically changed, an analysis of best practices could be conducted, and alternative approaches adopted.

This is especially relevant where local environmental conditions are no longer suitable and changes in the use of homes clustered on lake shores have evolved from seasonal to year-round use. This is prevalent when facilities expand their services and activities along a given lakeshore. The stress in receiving soils and environmental features may warrants small clustered localized treatment systems using these new technologies available when warranted or an extension of existing sewer lines. Such an approach was recently used at the Silver Bay YMCA conference facility on Lake George. They have installed a membrane bioreactor system which now collects and treats all of the Silver Bay facilities' needs including all guest cottages, the recreation centers, the main inn, and the conference center. This technology is considered a community-type system and scalable to growth and/or expanded use.

Whether these module systems could be used, or a review of nearby sewer lines conducted, certain condition warrant more centralized treatment. In fact, the extension of sewer lines has proven to be successful in several communities using New York State WIIA and WQIP grant funds in the past several years. For example, Ticonderoga extended its municipal system to include all the on-site systems along Baldwin and Black Point roads addressing 300 units on the shores of Lake George. Hague has invested in similar connections to centralized wastewater treatment system for lakeshore homes.

A few examples of communities looking to extend sewer lines to on-site residential systems include the Town of Moriah on Lake Champlain and the Rockhurst community on southern shore of Lake George. The Village of Lake George is also reviewing extending its sewer line to its residents and small businesses north of the hamlet along Route 9N. It is important for communities in their clean water infrastructure planning processes to consider and to determine the feasibility of sewer line extensions where appropriate while not having an adverse impact on current zoning restrictions and density limitations.

Key to the success of all these approaches would be the full engagement of local government officials and lake shore associations. These key players are at the forefront of septic system issues in the Adirondack Park and must be part of the design and implementation of any regional initiative. Local governments and lake shore associations need to work together to update their septic system inspection and remediation ordinances while being important partners in developing a regional approach to address septic system failures. Their firsthand experiences and efforts can be aided and supported by Adirondack counties through such a collaborative plan. Model ordinances could be shared as well as a multi-county initiative for identifying priority areas and access to state funds. Pilot programs with environmental partners to advance new innovative technologies could be pursued with lake associations and their residents. Future successes to mitigate septic system failures will come from a bottom-up process supported by local associations, county and state governments through their engagement and support.

Finally, a comprehensive approach to septic system needs in the Adirondack Park could also investigate local funding mechanisms for assistance to local governments, their residents, and small businesses. One example to review and consider is from the State of Maryland where there are modest annual local permit fees for septic systems that are used to in turn help finance services and improvements for homeowners with septic remediation needs. A regional fund or an individually created municipal funds could be evaluated based on models in other parts of the country and used to augment state funds for program implementation. One consideration for local governments could be to use permit fees in critical watersheds to create a revolving fund for septic system inspections on a rotating basis thus providing a service to residents in return. There are many variations to consider from fees supporting these local inspections to creating local bonding efforts to help residents with more direct assistance payments to them as well as supporting other consolidation of local services under a comprehensive septic system program.

Conclusion: An Agenda Moving Forward

In summary, it is time for the communities and local leaders in the Adirondack Park in partnership with the State of New York to take on the issue of failing septic systems in the region. As noted, there is a comprehensive State program with local governments to plan and invest in Clean Water Infrastructure needs for Wastewater Treatment Plants and Sewer Systems to combat water quality issues which has investing hundreds of millions of dollars in grants and low-interest financing in the Adirondack Park. There is no reason that a similar approach to scale could not be taken for these sources of pollution in the Adirondacks which present a clear and documented threat to the region's water quality. It is logical to create access to the State's Septic System Replacement Program and other services through a regional initiative to take on these challenges with septic systems park-wide.

This white paper clearly documents the need to embark upon a proposed comprehensive approach to this issue ensuring is a bottom-up local and regional initiative while having strong support from the state. All the Lakes and Rivers in the Adirondack Park with their pristine nature should be designated priority water bodies for septic remediation programs with adequate tools and resources available and provided to Adirondack Communities and its residents. Such a comprehensive approach needs to include key elements including but not limited to:

- Development of a regional collaborative plan to address septic system failures in the Adirondack Park which build upon educational outreach efforts to local residents and innovative approaches developed in the Lake George region and other watersheds. This approach could include a circuit rider for technical assistance and a plan development for local communities with or without wastewater treatment plants coordinated with a park-wide research program recommended below.
- State grant funding to assist in developing such a comprehensive plan and consider consolidation of services across local government where appropriate.
- Establishment of an Adirondack Park wide water quality monitoring program in partnership with academic institutions, research organizations and the state to identify priority needs and threats including identifying Harmful Algae Blooms.
- Creation of ordinances across the Adirondack Park for mandatory periodic inspections on existing septic systems as well as when properties are transferred.
- Promotion of new technologies where feasible and review of module systems to address needs of clustered lake shore developments where environmental conditions warrant.
- Extension of existing sewer lines with state WIIA and WQIP grant funds where feasible and appropriate to address septic system failures and mitigate environmental conditions that no longer support such activities.
- Engagement of Lake Associations and Local Government leaders throughout the Adirondack Park in developing this comprehensive approach and implementing it.
- And finally embark on an effort to ensure more Adirondack Counties are eligible under New York State's Septic System Replacement Program creating access to more state grant funds to help replace septic systems for Adirondack residents in need.

The adoption of this proposed comprehensive approach will require the involvement of all impacted parties in the Adirondack Park as well as resources and funds from state and local governments to augment investments to be made by local homeowners and small businesses. These new partnerships and resulting investments are considered as a small price to pay when the alternative is the degradation of Adirondack lakes and rivers whose water quality and very existence is the backbone of the regional economy. The investments made today will be returned in dividends tomorrow not only for local residents but for all those who travel to the Adirondack Park to enjoy its wonderous water resources. One only has to look at the successes of the historic New York State Clean Water Infrastructure Program under WIIA/WQIP infrastructure grants to local communities for their wastewater treatment plant and sewer systems to see the true benefit of investments to protect our water resources. With over a $150 million in capital clean water improvements that already been committed over the past five years, it is important to note the majority of these gains would not have been possible without the collaborative leadership provided by the State of New York in partnership with local governments.

A blueprint for the future protection of our Adirondack waters is what is now needed to stem the tide of the on-going water quality degradation impacted by septic systems and other sources. The Adirondack needs a clean water "Marshall Plan" focusing on our failing septic systems and in coordination with our efforts to address other water quality pollution sources and threats. With this in hand, these critical issues can be addressed and conquered which in turn will protect our Adirondack waters and communities for generations to come.

Appendix A: Septic System Technologies: Existing Systems Commonly Used as well as Innovations and New Approaches

The following is information gathered and are excerpts from numerous association web-site sites and resources researched on available traditional septic systems currently in use as well as new technologies being developed, utilized, and installed across the country.

Review of Existing and Most Used Septic Systems and Regulations

A conventional home septic system usually consists of piping, a septic tank, a distribution system, the subsurface infiltration system (aka absorption field, disposal field, or leach field), and the receiving soils. These system components include:

- **Septic Tank:** The septic tank provides primary treatment in a buried watertight tank, where heavier solids settle out and lighter solids and grease float to the top. Organic solids are partially treated in the septic tank in anaerobic conditions by bacteria, and the gases generated from the treatment are vented back through the plumbing system of the dwelling. The size of the septic tank is determined by the number of bedrooms in the dwelling, a measure of the number of occupants. The septic tank is designed to eliminate direct flow-through (short-circuiting) with a down turned pipe called a sanitary tee at the tank's inlet and outlet. The outlet may also include an effluent filter to allow only clarified or filtered effluent out of the tank, retaining the solids and scum. Most septic tanks have an internal baffle, or partial wall, to keep solids away from the outlet.

Older septic tanks may be undersized and made of steel, which is no longer used. Steel tanks typically have a capacity of 500-gallon and suffer from structural failure as well as corrosion from the harsh environment. Much older tanks, called cesspools, were built with laid up concrete blocks in a staggered configuration, allowing wastewater to seep out of the sides of the "tank" without treatment. Old cesspools combined the operation of the septic tank and dispersal area in one structure. Cesspools are no longer an acceptable wastewater treatment option.

- **Distribution Systems:** Once the wastewater has received primary treatment through the septic tank, the effluent is conveyed to the subsurface absorption area via gravity or pumping. Where there is a sufficient grade difference between the septic tank outlet and the septic absorption area, gravity flow will be used. Wastewater leaves the septic tank and flows by gravity into a flow splitting device called the distribution box (or d-box) that distributes flow to the absorption area or field. Distribution boxes are small concrete structures that are installed close to ground level. Distribution boxes installed in very shallow excavations should be insulated to prevent freezing during low usage periods in cold climates. It is important to know the location of the distribution box for future maintenance access.

  Gravity dispersal of wastewater is favored by homeowners since the system contains no moving parts. However, many sites do not have the requisite open land area, elevation, or soil depth for a conventional gravity system. Where gravity distribution is not feasible, a pump-up system is required. Proximity to surface water, shallow depth to groundwater,

shallow soils, and limited open land area readily adjacent to the house all factor into a design engineer's decision to utilize a pump-up system where the absorption field is remotely sited, potentially uphill from the main residence. In this type of system, the effluent from the septic tank flows into a downstream pump station that is sized to distribute wastewater over the entire absorption area and allows for a resting period between doses for soil re-aeration and organic materials breakdown. Pump stations, especially two-pump stations, are reliable, and are equipped with both audible and visible alarms to alert the homeowner if the water high level is reached.

- **Absorption Area and Absorption, Leach, and Disposal/Infiltration Fields:** For onsite wastewater disposal with a conventional treatment system, treatment of sewage is accomplished in the native soils. At a minimum, solids are collected in the septic tank and some digestion of organic materials occurs there, but most of the wastewater treatment is expected to take place in the receiving soils. Adequate soils are critical for the proper operation of an onsite wastewater treatment system. The size of the absorption area depends upon the rate at which water enters the soil, called the infiltration capacity. This is determined by a percolation test performed by a professional when the wastewater disposal system is designed and/or installed.

  There are several options for absorption fields that can be either trench or bed systems. Trench systems include a distribution box connected to perforated pipes in lateral rows bedded in stone-filled trenches and covered with native soils and grass. The number and length of the laterals is dependent upon the quantity of wastewater being treated daily. This measurement is based on the number of bedrooms and the infiltration capacity of the soils, as well as other site conditions. Every site must be individually evaluated by a design professional to assure proper operation of the absorption field. Absorption beds serve the same function as the trench system, with several laterals of perforated pipe installed in a single large excavation filled with stone and usually operate with a pump system. Alternatives to the traditional "stone and pipe" absorption area include gravel-less systems. These systems still require a properly sized and -maintained septic tank for primary treatment. Lightweight PVC infiltration chambers, geotextile sand filter systems, and geo-filter shallow pressure systems are available and have been used on difficult sites where construction access may impact soil structure and function.

- **Importance of Soils in Septic System Design:** Soils are the most important element for onsite wastewater treatment systems. A minimum depth of four feet of soil is required for a system to provide adequate treatment. For conventional septic systems, soils provide the bulk of biological and chemical processing of wastewater. Soils that allow water to flow through too quickly, as occurs with sandy soils because of their rapid infiltration rates, or too slowly, as with heavy clay soils, prevent adequate treatment. Areas with shallow soils (less than four feet) lack the depth needed for microorganisms in the soil to successfully remove nutrients and pathogenic organisms and may have limited oxygen exchange. Emphasis must be placed on the fact that that wastewater effluent requires adequate contact with natural soil bacteria for biological treatment. These soil bacteria consume many of the nutrients and pathogenic organisms found in the wastewater. The soil bacteria need sufficient time to properly consume contaminants. Soils that are too

sandy or too shallow do not permit effective treatment. If soils are poorly drained and the absorption area is continuously filled with effluent, the soil bacteria suffocate from lack of oxygen making system inadequate.

Enhanced Treatment Systems/Units (ETU's), New Innovations and Enhanced Technologies Available to Consider for New and Replacement Systems

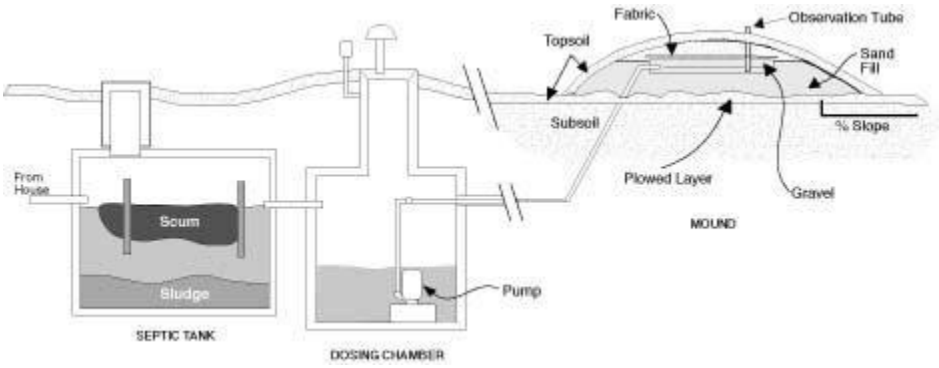
The systems noted above employs a conventional septic tank/absorption field system, where the native soils perform the bulk of the treatment. These systems have been in use for decades, are passive with no moving parts, and require minimal maintenance. They are, however, limited in their ability to provide groundwater and surface water protection, especially in nutrient sensitive and pristine watersheds. Thus, new innovations and approaches to septic system design accomplish treatment "in a box," via a modular unit known as an enhanced treatment unit (ETU). In nutrient-sensitive watersheds in the Adirondacks and other sensitive water bodies in the State, there is growing interest in and support for enhanced treatments units and expansion of enhanced onsite wastewater treatment systems. Enhanced systems include a wide variety of pre-engineered treatment components, all of which provide for the oxidation of organic material and ammonia, and reduction of suspended solids and pathogens.

Many of these systems include a recycle mechanism to reduce nitrate concentrations, a critical component of onsite systems for pristine Adirondack lakes to prevent degradations if soils prevent traditional systems from being effective. Many of these enhanced treatment systems provide for effluent disinfection, most often in the form of ultraviolet (UV) light disinfection. In addition, the use of ETUs can reduce the size of an absorption field by up to a third. Enhanced treatment systems generate more solids than conventional systems and need to be monitored and pumped out periodically. Even with this in increase in maintenance requirements, ETUs can offer landowners considerable savings over conventional septic systems.

Effluent from an ETU onsite must still be discharged into the site's native soils. The improved effluent quality of wastewater treated through an ETU lets native soils simply disperse (rather than treat) the effluent. In some applications, this allows for a reduced infiltration area of as much as 33%. Even so, the reduced infiltration area must still have adequate infiltration capacity to prevent ponding of the effluent. Some of these systems are rather new to New York State, yet their use has been documented in other states. Design professionals can describe the benefits and limitations for each of these systems, as well as others that may become available.

One option to ensure an adequate absorption area is to augment or amend the native soils with imported soils or materials that either slow down infiltration or "fluff up" the existing soils to achieve acceptable infiltration rates. Soil augmentation must be done by a design professional after having the native soils tested and characterized by a reputable soil testing laboratory. Once the native soils are characterized, the design professional, in conjunction with the homeowner's contractor, must locate off-site soils to bring to the site. Upon completing the process, the new absorption field can be installed.

A second and more involved option is the installation of an elevated, or mound, system. With a mound system, proper soils are imported to the site, in sufficient quantity for the required depth. The area is feathered to meet the surrounding grade and then the distribution piping is installed into the newly constructed mound. A mound system usually requires a pump station, and the required area for the mound is larger than that required for an at-grade absorption area.



Mound Systems typically cost two to three times as much as a conventional septic system and require extra monitoring and maintenance. Source: Ohio State University Extension.

Additional Innovations and Alternative Septic Systems

There are a wide range of alternative septic systems on the market and new ones arriving all the time. Some are geared more to community systems serving several homes and are usually monitored and maintained professionally by a service company.

Some alternative systems are well-suited to individual homes, although the cost, complexity, and maintenance of these systems need to be carefully considered. Most use electric pumps or siphons as well as filters, all of which need more monitoring and maintenance than a traditional system.

Some larger community systems use pre-treatment of the effluent before it reaches the leach field, a mini version of a sewage-treatment plant. But most single-home systems rely on bringing in natural or manufactured materials that require less surface area for leaching than the poorly draining native soils would require. There are many variations and combinations of systems and components used including:

- **Pressurized dosing**: This uses a holding tank and pump to force the effluent though the distribution piping more evenly and in controlled doses, improving the performance of

the leach field. It can be used to rehabilitate a leach field or in combination with other systems such as a mound system, sand filter, plastic leach fields, or drip irrigation.

- **Plastic chamber leach field**: This is a standard septic system with an alternative leach field, which may be downsized in some jurisdictions, making it well suited to small building sites. The half-pipe plastic chambers create the void for effluent flow, so no gravel is needed. One example, the Infiltrator System, has been in use for over 20 years, and according to the company can support traffic loads with only 12 inches of compacted cover. The additional cost of the plastic components is partly offset by the savings on gravel and smaller size of the drain field.

- **Sand filter:** This is a large sand-filled box, 2-4 ft. deep, with a watertight liner of concrete or PVC. The sand is used to pre-treat effluent, by filtration and aerobic bacteria, before disposal to the leach field. The boxes are usually partially or fully in the ground but can also be above-grade when required. In the most common configuration, a pump and controls are used to evenly dose the effluent on top of the filter, although gravity distribution is possible in some cases. The treated effluent is collected at the bottom where it is pumped or gravity-fed to the drain field. Some sand filters recirculate the effluent back to the tank several times before distributing it to the drain field.

  Most sand filters are used for pre-treatment, but they may also be designed as the primary treatment. This is called a "bottomless sand filter" as the effluent passes directly into the soil beneath the filter (see photo above). Sand filters must be well-engineered and constructed, and properly maintained, to avoid frequent clogging of the sand. Read more on **Sand Filters**.

- **Aerobic treatment systems:** These systems use an aerobic process to treat the effluent, typically using a multi-chamber concrete tank placed underground. The most complex systems contain four chambers to collect, aerate, purify, and pump the effluent. The first chamber acts like a smaller version of a traditional septic tank. In the second "treatment" tank, an air pump is used to constantly inject air into the effluent. The air supports the growth of aerobic bacteria which process sewage more efficiently than the anaerobic bacteria in a typical septic system. In some systems, a third and fourth chamber are used to further clarification and pump out the purified water. So-called "fixed-film" systems also use a synthetic media filter to enhance the bacterial process.

When properly maintained, aerobic systems can produce higher quality wastewater than a traditional system and may include an added disinfectant before the purified wastewater is discharged. Discharge may be to a reduced-size drain field or sprayed over a large area in rural settings. Technically these are mini sewage-treatment plants rather than septic systems, which rely mainly on anaerobic treatment. They are often referred to as ATU's (aerobic treatment units). These systems are expensive to install and maintain, so are mainly used where high-quality treatment is needed in a limited area or with poor soils. They are becoming more common on waterfront properties. Read more on **Aerobic Treatment Systems**.

- **Membrane Bioreactors:** Membrane bioreactor' (MBR) is generally a term used to define wastewater treatment processes where a perm-selective membrane, e.g., microfiltration or ultrafiltration, is integrated with a biological process − specifically a suspended growth bioreactor. MBRs differ from 'polishing' processes where the membrane is employed as a discrete tertiary treatment step with no return of the active biomass to the biological process. Almost all commercial MBR processes available today use the membrane as a filter, rejecting the solid materials which are developed by the biological process, resulting in a clarified and disinfected product effluent. A membrane bioreactor is essentially a version of the conventional activated sludge (CAS) system. While the CAS process uses a secondary clarifier or settlement tank for solid/liquid separation, an MBR uses a membrane for this function. This provides a number of advantages relating to process control and product water quality. While traditionally used in large scale municipal and industrial wastewater treatment facilities, this technology has been scaled to now be used in smaller scale module units and augment septic systems.

- **Drip distribution/irrigation:** This uses a pump to distribute effluent through a filtering device to an array of shallow drip tubes spread over a large area. A pretreatment unit is usually required to deliver relatively clean water to the system. The water may use to water a lawn or non-edible plants, which remove the nitrogen from the wastewater. This type of system can be used with shallow soils, clays, and on steep slopes. Because the tubes are near the surface, freezing can be a problem in cold climates. As with other alternative systems, expect high installation costs, along with extra monitoring and maintenance costs.

- **Constructed wetlands.** For the ecologically minded who want to play an active role in recycling their wastewater, these can work in almost any type of soil. The system uses a man-made shallow pond, which is lined and filled with rock, tire chippings, or other media. The media provides a habitat for special plants that treat wastewater and provide a pleasant environment. Wastewater from the septic tank is distributed by a perforated pipe across the media bed, where plant roots, bacteria, and other microorganisms break down the pollutants. A second pipe at the back of the wetland collects the treated water. The homeowners must plan to spend time planting, trimming, and weeding the wetlands area.

Costs Associated with New Septic Systems

Conventional septic systems can range in costs depending on scale and size of project area. These traditional septic systems can cost between $8,000 and $30,000 per home depending on site conditions and constraints. More advanced systems built on top of traditional systems can range higher including quotes above $50,000 depending on volume of use. As always, you are encouraged to do your homework, find an experienced design professional, have detailed discussions with that design professional, engage an experienced contractor, and monitor the construction to gain an awareness of how the system operates and how best to maintain it. Upgrading or replacing a septic system is a big investment and with proper operation and maintenance it will serve the homeowner for many years to come.

As for new alternative systems listed above and in the current marketplace, their costs depend on scale, soils and whether they are independent of an existing system and/or design to totally replace them. There are also regulatory concerns due to the fact that some new systems are not universally approved by current regulations in New York State. Below is a system Comparison and Cost Analysis provided by the Fund for Lake George on more common approaches used as well as advanced systems to address septic system issues.

Excerpts from The Fund for Lake George 2020 Septic Initiative System Comparison and Costs Analysis

Costs for a new or replacement onsite wastewater treatment system will depend upon a variety of factors, including type and size of system, project schedule, site constraints, weather and time of year, contractor's availability, and equipment lead time.

The types of systems previously described are summarized in the table below, listing the pros and cons of each system. Additionally, the second table compares four types of systems by their respective costs to design, construct, and maintain.

Also note that the costs presented in this table and graph are based upon recent residential projects for three-bedroom systems design with favorable site conditions. The project costs for the enhanced treatment option are from the Dunham's Bay district and based on replacing the existing septic tank with a specific ETU model with connecting to the existing distribution facilities. A variety of options are available, so have a detailed discussion with the design professional to explore all of them. Even for a conventional septic system replacement, local contractors quote between $8,000 and $60,000, depending on site conditions and constraints. As always, you are encouraged to do your homework, find an experienced design professional, have detailed discussions with that design professional, engage an experienced contractor, and monitor the construction to gain an awareness of how the system operates and how best to maintain it. Upgrading or replacing a septic system is a big investment and with proper operation and maintenance it will serve the homeowner for many years to come.

2020 Septic Initiative System Comparison

Type of System	Pros	Cons
Conventional System (Septic Tank/Absorption Field)	• Operates passively without mechanics or electricity (except for pumping situations) • Easier to maintain. • Relatively inexpensive • More familiar to construction contractors	• Not suitable for every site • Requires periodic maintenance (septic tank pump out & solids removal) • Tank effluent high in pathogens, soluble and particulate organic matter requiring more treatment by soils. • Requires larger system footprint. • Gravity systems tend to have uneven distribution to soils. • Does not have an alarm to warn owner if not functioning properly.

2020 Septic Initiative System Comparison

Type of System	Pros	Cons
Enhanced Treatment Unit System (ETU)	• Well-suited for difficult sites (poor soil quality, shallow bedrock, high groundwater) & sensitive environments • Produces higher quality effluent compared to conventional system. • Can reduce system footprint (up to 33%) requiring less site disturbance. • Does not require soil for treatment. • Protects highly vulnerable water resources. • Can extend life of absorption field. • Equipped with an alarm to notify owner when not functioning	• Expensive to operate. • Expensive equipment • Requires electricity. • Requires maintenance contract. • Requires special design and possibly special contractor. • Subject to system upsets under heavy loads or when neglected. • Requires seasonal system start-up
Gravel-less System (Chamber System, Eljen In-Drain, Presby)	• Can reduce system footprint (up to 25%) • Reduces construction impact/compaction of existing soil structure. • Produces better quality effluent. • Easier to install on steeper slopes. • Reduces trench width. • Eliminates fine materials from gravel that clogs soil pores.	• Requires special fill (specified sand) under system. • Can result in flow path problems with short circuiting limiting treatment area used

Present Worth Analysis

Options	Conventional Septic System w/Gravity Distribution to New Absorption Field	Conventional Septic System w/Pumped Distribution to New Absorption Field	Conventional Septic Tank & New Gravel-less Absorption Field	Enhanced Wastewater Treatment Systems w/Existing Distribution
2020 Capital Cost	$20,000	$30,000	$28,000	$17,000*
5 Years O&M Cost	$500	$500	$500	$1,200*
Engineering Costs	$2,500	$3,000	$3,500	$3,500

In considering which approach to take, one must work with a septic system professional to determine the best conditions of the site with its environmental features in question and which approach is then most environmentally and economically feasible. In addition, local and state regulations must be taken into consideration.

Endnote from SETEC: The installation cost of a septic system can vary widely depending on the site and soil conditions, the installer, and the type of drain field that is installed. These ranges are only a guide for you to compare relative costs of the different types of systems commonly installed. On average you can expect to pay $4,000-$6,000 for a conventional septic system, $6,500-$8,500 for a conventional septic system that requires a pump,

Anything other than a conventional septic tank and drain field system. Most often they involve some kind of aerobic sewage treatment in addition to a septic tank. Site and soil conditions usually dictate whether an alternative type of system is required. $10,000-$15,000 for an alternative septic system that requires pretreatment into conventional drain field lines, and $20,000-$24,000 for an alternative septic system that requires pretreatment into drip irrigation.

Contact SETEC Soil and Technology, Inc. (540 381-0309) for recommended installer.