



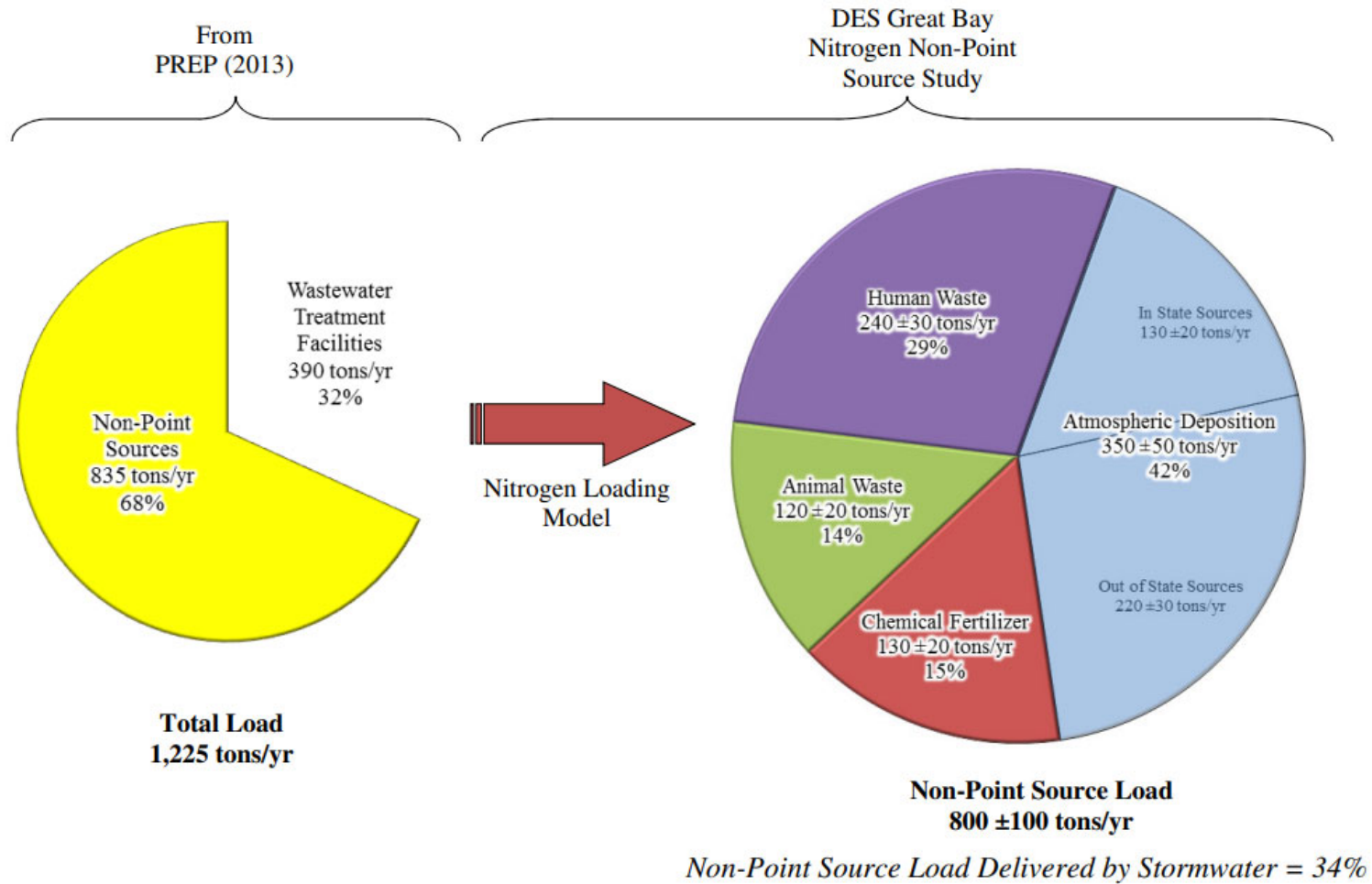
# Advanced Septic System Technologies Feasibility Study

Geosyntec   
consultants

December 21, 2023

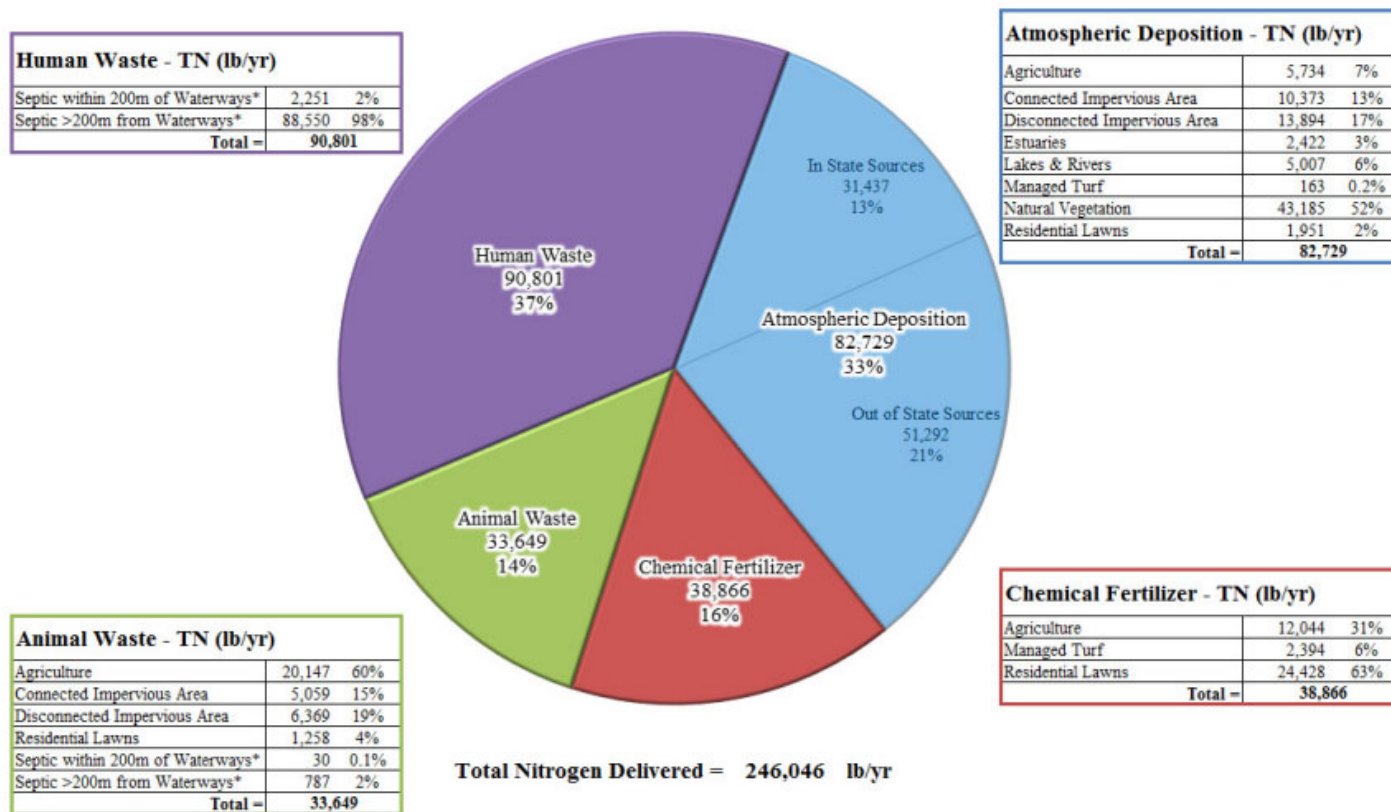


Figure ES: Summary of Non-Point Source Nitrogen Loads to the Great Bay Estuary



**Figure 22: Outputs of Non-Point Source Nitrogen by Source Type and Land Use Type for the Exeter River Watershed**

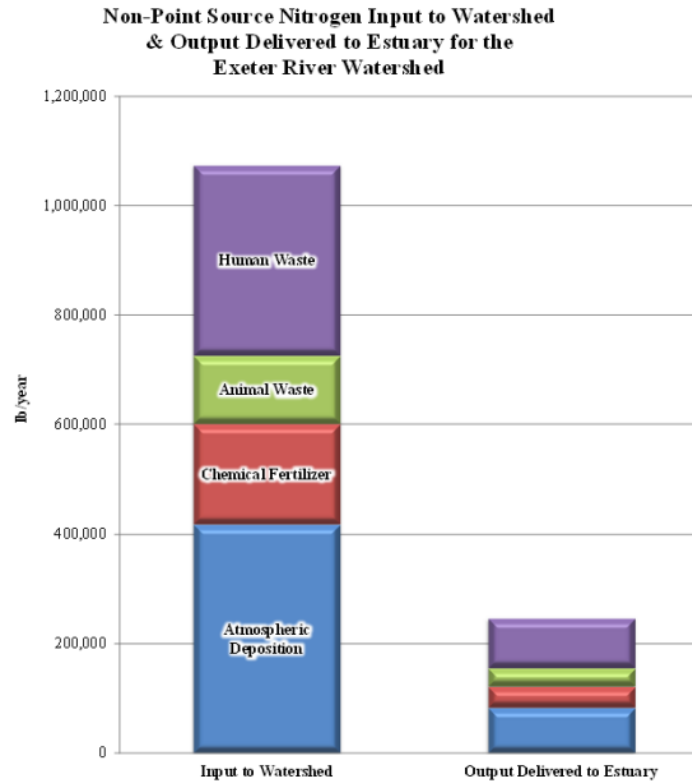
**Non-Point Source Nitrogen Delivered to Estuary  
Total Load by Source Type and Land Use Type for the Exeter River Watershed**



\*Waterways include estuaries and 5<sup>th</sup> order or larger streams

Great Bay Nitrogen Non-Point Source Study  
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Figure 13: Inputs and Outputs of Non-Point Source Nitrogen by Source Type for the Exeter River Watershed

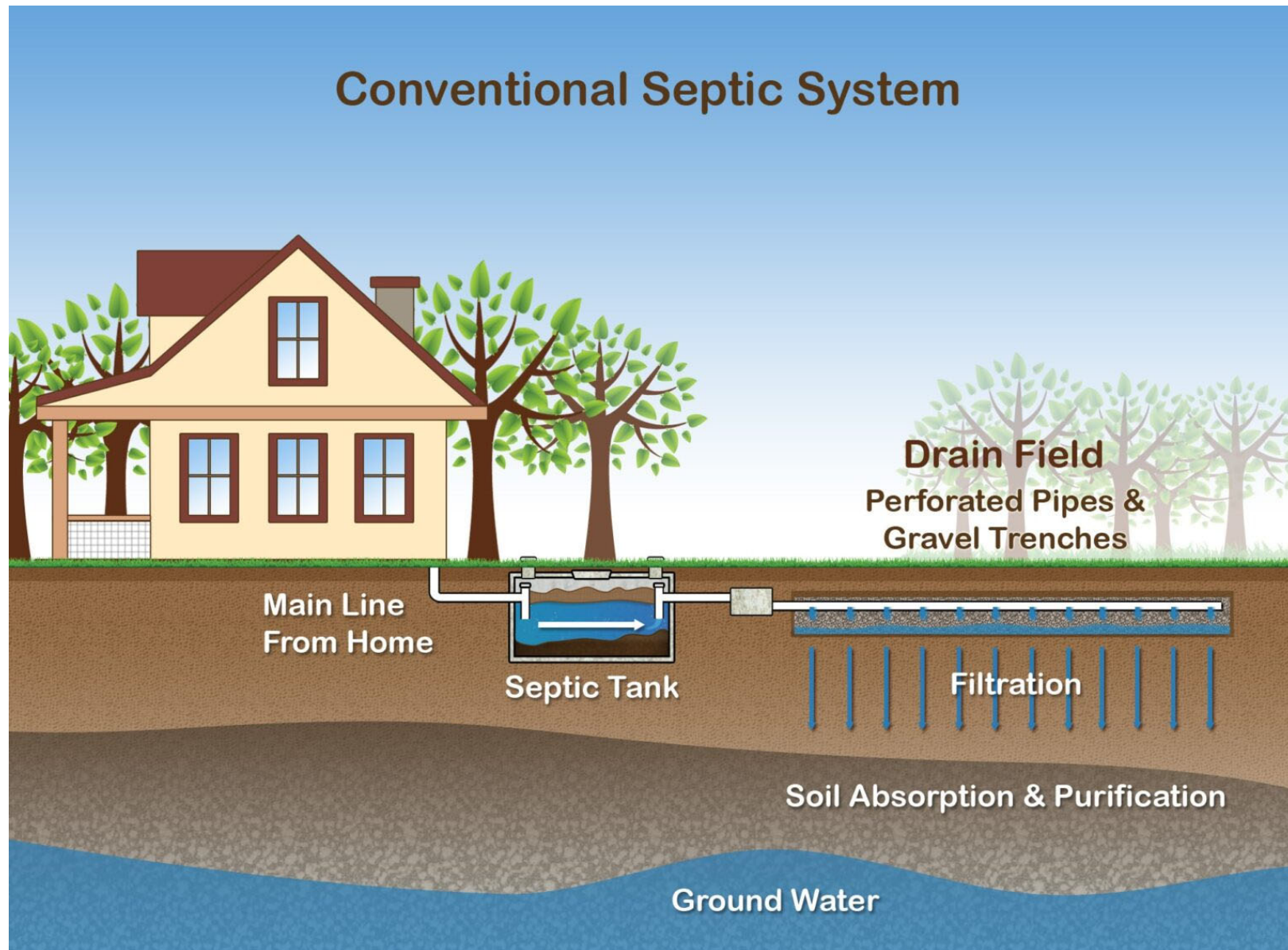


Source	Input to Watershed TN (lb/yr)	Output Delivered to Estuary TN (lb/yr)	TN Lost During Transport
Human Waste	347,770 32%	90,801 37%	74%
Animal Waste	124,644 12%	33,649 14%	73%
Chemical Fertilizer	183,790 17%	38,866 16%	79%
Atmospheric Deposition	417,899 39%	82,729 34%	80%
<b>Total =</b>	<b>1,074,102</b>	<b>246,046</b>	<b>77%</b>

STRATEGY	TARGET LAND USE/SOURCE	DESCRIPTION OF IMPLEMENTATION	SUMMARY OF PROGRESS
<p><b>Septic System Program</b></p>	<p>Septic</p>	<p>The Town will investigate the feasibility of an incentive-based private septic system replacement/upgrade program. The Town anticipates developing a loan forgiveness program, where private property owners could borrow the cost difference between a traditional system and an advanced treatment system for targeted nitrogen removal.</p> <p>As part of the program, the Town will develop a map of locations of current septic systems within 250 feet of a receiving water. The Town will incorporate outreach and education to the property owners in these areas and make them aware of this program. The Town will also conduct outreach during the Site Plan and Subdivision review process for new development or redevelopment projects.</p> <p>Following development of the program, the Town will evaluate next steps for implementation of the program.</p>	<p>The Town applied for and received grant funding to assist with investigating the feasibility of an incentive-based private septic system replacement/upgrade program.</p> <p>The investigation will include:</p> <ul style="list-style-type: none"> <li>- Identification of septic systems users within the Town and mapping the locations of these systems.</li> <li>- Development of a suitability criteria for potential retrofit locations</li> <li>- Literature review of advanced septic system technologies targeted at removal of nitrogen</li> <li>- Regulation review to determine potential amendments to allow for the use of advanced septic systems</li> <li>- Funding mechanism</li> <li>- Incentive program framework</li> </ul> <p>The Town will prepare a feasibility study report at the end of the investigation which will be completed in 2023.</p>

- Identify septic system users
- Develop suitability criteria
- Develop list of advanced septic system technologies
- Recommend regulatory updates
- Identify funding mechanisms and incentive programs
- Summarize findings in a feasibility report

# What are septic systems?



# Septic Systems in Exeter

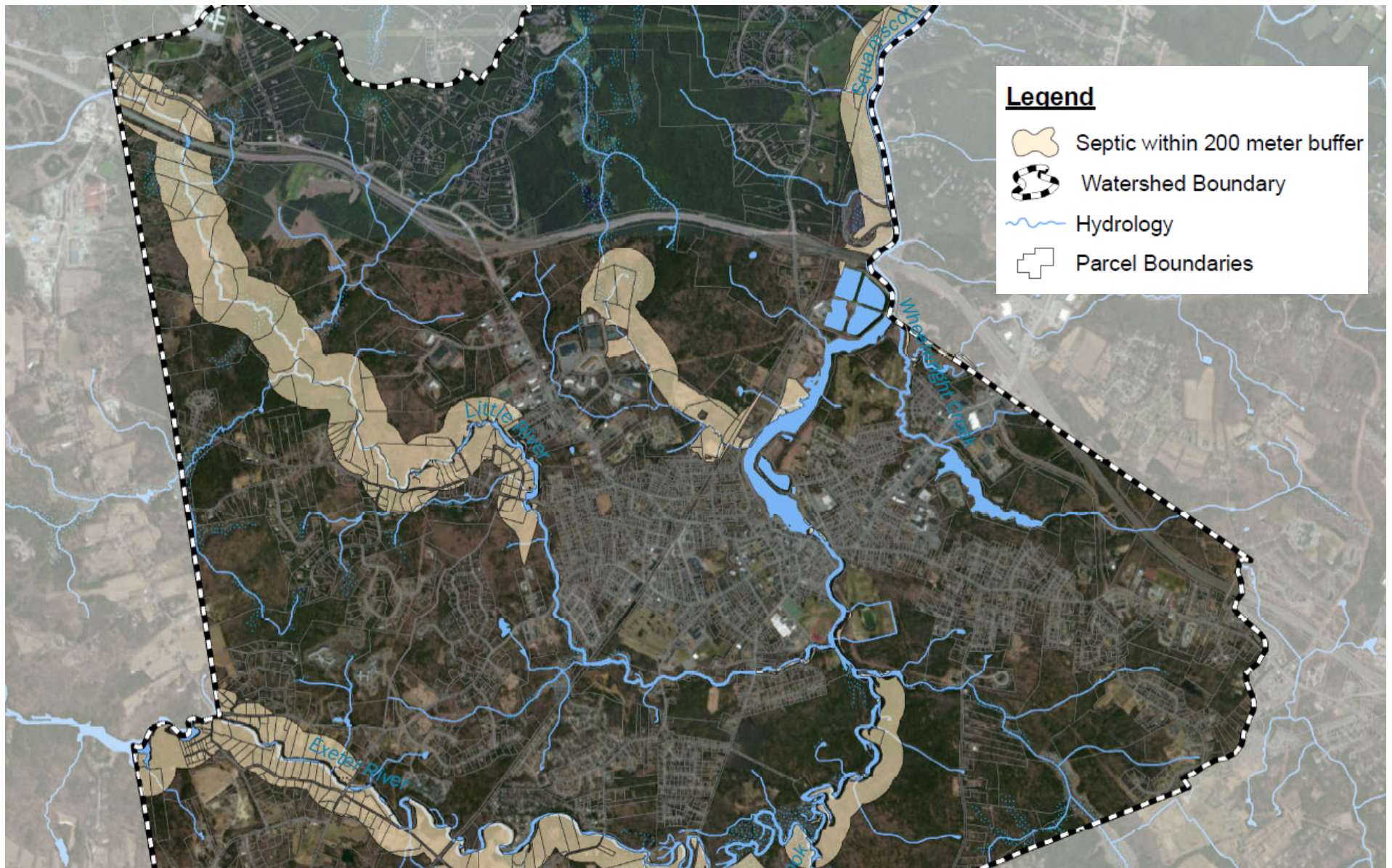




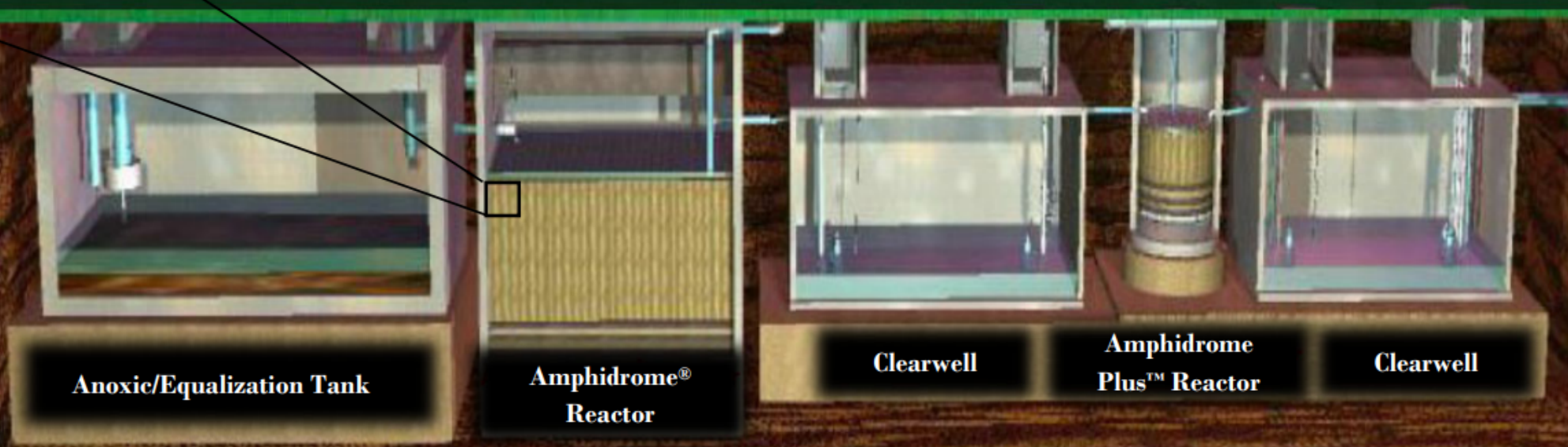
Table 1. Suitability Criteria

Criteria	Description
Location	<p>Systems close to sensitive ecological areas, such as wetlands, rivers, lakes, and ponds, and proximity to drinking water supply wells should be prioritized for upgrades due to their potential for higher impact on water quality.</p> <p>Establishing a sensitive area setback and incorporating this into location regulations would be necessary.</p>
Existing Nitrogen Contribution	<p>Areas with high nitrogen contributions from septic systems or receiving water impaired due to nitrogen contributions from septic systems, especially those exceeding public health standards.</p>
Estimated Nitrogen Reduction	<p>Projects with the potential for high estimated nitrogen load reductions should be prioritized.</p>
Underlying Soil Type or High Groundwater	<p>Areas with sandy soils and high groundwater should be prioritized.</p>
Population Served by System	<p>Community septic systems or septic systems serving multi-family homes, which tend to have higher loading rates, should be prioritized.</p>
Project Readiness	<p>Ability and timeline of a project to be built should be prioritized.</p>
Effectiveness of Current System	<p>Systems which are poor working condition or in failure should be prioritized.</p>
Regulatory Compliance	<p>Compliance with local environmental regulations and requirements for new developments or redevelopment is necessary when upgrading to advanced systems.</p>

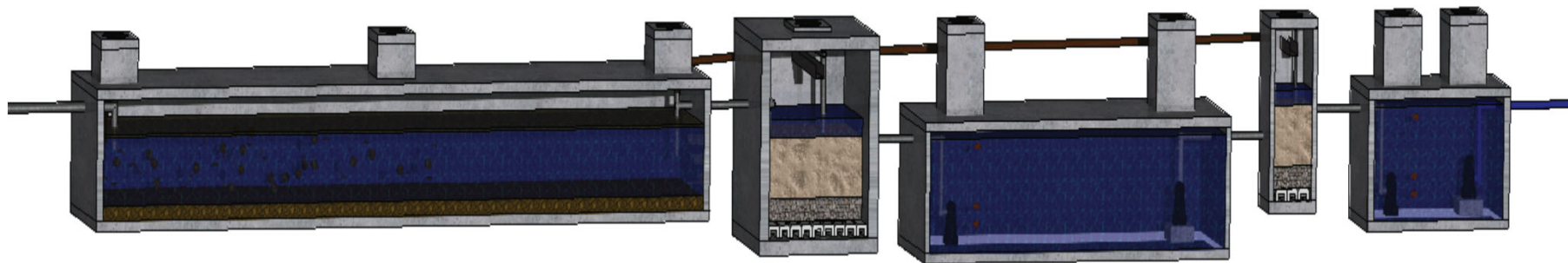
# Advanced Treatment Technologies: Two Different Technologies



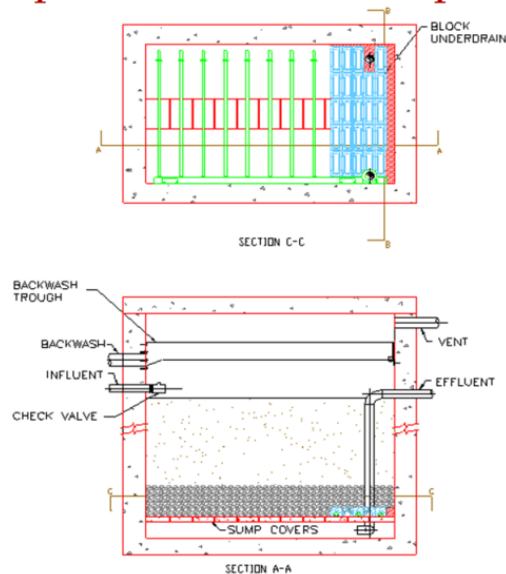
Biologically Active Filter (BAF) treatment system, technology utilizes both filtration to remove suspended solids and a high biomass concentration within attached-growth biofilms to treat BOD, ammonia, and nitrates in effluents from a wide variety of applications.



- Highest Level of Nitrogen Removal of any system available
- Low Visual Impact
- Small Footprint
- Media is submerged in liquid - nitrification reaction unaffected by air temperature
- All effluent filtered through deep sand bed



## Amphidrome® Reactor Specifications



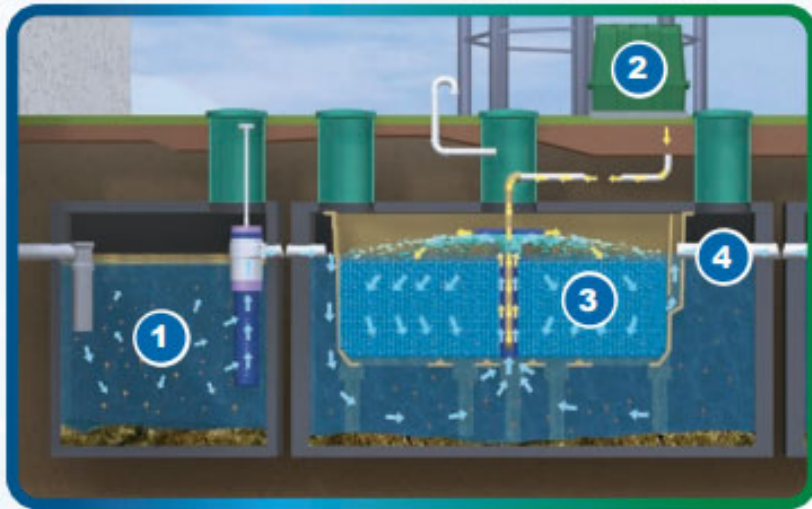
- Design loading @ 20°C
  - 40 lbs. NH<sub>3</sub>-N / 1000 ft<sup>3</sup> media
  - 150 lbs. BOD<sub>5</sub> / 1000 ft<sup>3</sup> media
- Reactor underdrain provides intermittent aeration
  - Optimal O<sub>2</sub> reqs lead to non-continuous blower operation
- Systems designed individually based on loading
- Rectangular or circular reactors
- Influent can be hydraulically fed or pumped
- Tailored for specific site and application constraints

- Flocculant filtration
- No intermittent air
- Anoxic conditions for NO<sub>3</sub> reduction
- Achieves TN < 3 mg/L of effluent leaving system



- The BioMicrobics FAST<sup>®</sup> (Fixed Activated Sludge Technology) is a leading biological treatment process in the onsite wastewater field.
- In a FAST<sup>®</sup> system, the blower is the only moving part required for the treatment process, requiring no replacement parts over the life of its operation.
- The control panel powers the blower with SFR<sup>®</sup> (Sequencing Fixed Reactor), UV disinfection compatibility, and external alarm features.

## HOW IT WORKS!



- 1 Settling Zone:** Settleable solids sink to the bottom of the tank and scum rises to the top. A SaniTEE<sup>®</sup> screen prevents trash from entering the treatment tank.
- 2 Aeration:** An above-ground blower introduces oxygen into the tank, facilitating a robust circulation of oxygenated wastewater through the media.
- 3 Submerged Media:** Abundant self-regulating microbes attached to the media decompose organic matter, nutrients, and pathogenic organisms in the wastewater.
- 4 Discharge:** Treated water exits the system after passing a built-in baffle.

### Advantages of the system:

- Only one moving part
- Simplest maintenance procedure of any advanced system
- >90% reduction of BOD and TSS
- Up to 50% reduction of TN
- Lessen the impact of harmful bacteria
- Residential, commercial, and retrofit applications

Program	Description of Incentive
Multiple counties in Florida – Septic Upgrade Incentive Program <sup>12</sup>	<p>Provides a reimbursement, of up to \$7,000.00 per existing home.</p> <p>Addresses wastewater, such as septic to sewer connections, that are not attaining standards for nutrient levels or are in a defined area of interest.</p> <p>Subject to funding availability with a State grant from the Florida Department of Environmental Protection (FDEP). Program is available until the \$2,541,000 of FDEP grant funding is thoroughly exhausted or September 30, 2025. Per the FDEP funding agreement all sitework and inspections must be completed by August 29, 2025.</p> <p> </p>



Program	Description of Incentive
Maryland's Nitrogen-Reducing Septic Upgrade Program <sup>13</sup> –  Bay Restoration Fund	<p>Grant assistance program based on income criteria. The allowable grant costs can be for capital cost of the system and up to 2-years of operation and maintenance of the system. Homeowners can receive up to 100% of funds if the household income is less than \$300,000 or 50% for household income above \$300,000.</p> <p>For new construction, the grant program only covers the cost differential between a conventional system and an advanced treatment system.</p>

- Establish an area of priority septic systems that would be considered if an advanced septic system technology were to be established.
- Establish regulations to encourage the use of advanced septic system technologies in the priority septic system area.
- Implement a pilot program to plan and install an advanced septic system in the Town.
- Coordinate with NHDES to understand what steps the state is taking to approve advanced septic system technologies for use in New Hampshire.
- Provide education and outreach to users of septic systems on advanced septic system technologies.
- Provide education and outreach to users of septic systems on steps the state and Town are taking to mitigate water quality impacts from septic systems in priority areas.

# Questions?

## CONTACT

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