

BioMaze[®] Advanced Septic Treatment Systems:

Evaluating Nitrogen Reduction Efficacy and Organic Matter Conversion to Mitigate Harmful Algal Blooms (HABs)

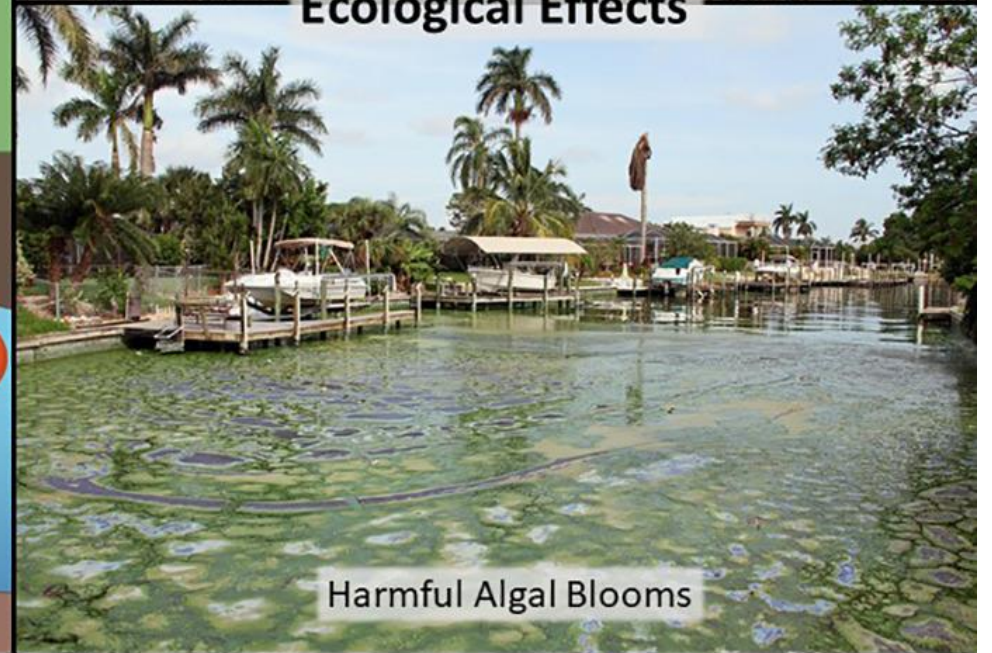
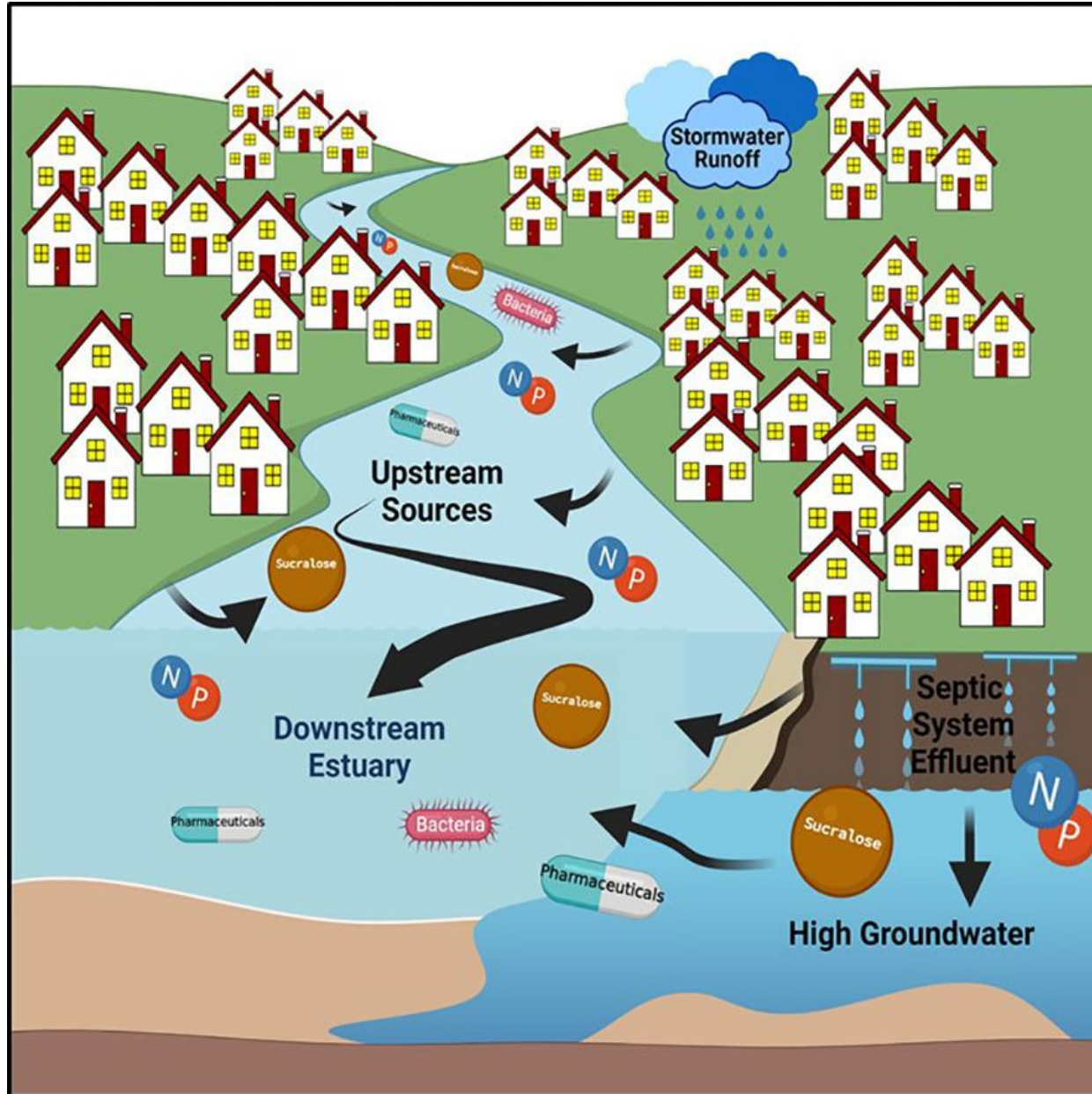
Dr. Wendy Anderson, Principal Investigator
Institute for Water and Environmental Resilience
Stetson University



BioMaze Project Teams

- Stetson IWER Grant Management and Field-Testing Team
- RioVation --BioMaze Product Design Team
- DEP and DOH Oversight and Permitting Teams

Nutrient pollution and HABs



Relative contribution of septic tanks

REVIEW OF THE EPA'S ECONOMIC ANALYSIS OF FINAL WATER QUALITY STANDARDS FOR NUTRIENTS FOR LAKES AND FLOWING WATERS IN FLORIDA



Loading by Source Type - Phase II

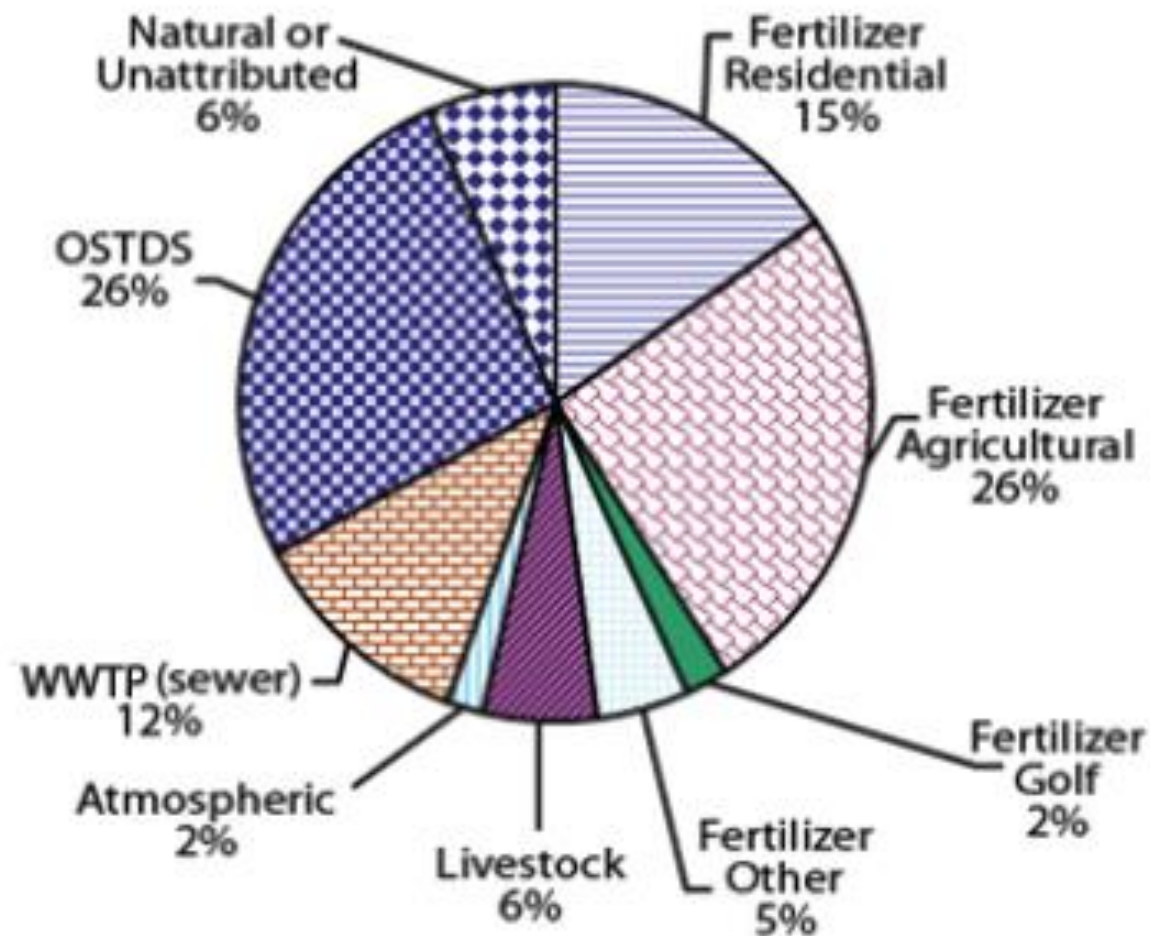


FIGURE 1-7 Relative Contribution of the Nitrogen Load by Sector to the Wekiva River in the middle St. Johns basin. OSTDS = on-site sewage treatment and disposal system (septic system). Legacy nutrients were not specified in this analysis.

SOURCE: MACTEC (2010).

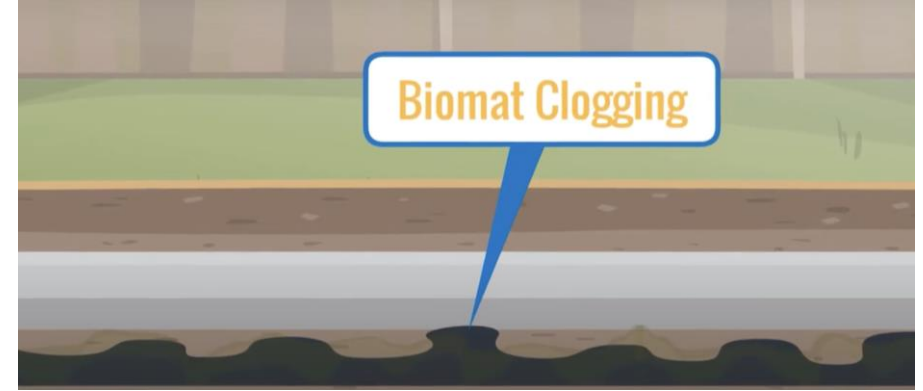
Policy requiring upgrades of systems

- HB 1379 (2023) Environmental Protection Bill
 - Properties in basins with impaired water bodies
 - Connect to sewer if available
 - Lots on 1 acre or less must upgrade to ENR-ATUs to reduce nitrogen in effluent by 50-65%
 - Must regularly maintain septic tanks
 - Failed systems **MUST** upgrade right away in many areas
 - Timeline is not specified for areas outside of IRL basin
- Costly for homeowners **AND** taxpayers
- Need for cost-effective solutions with minimal disruption to landscapes



Benefits to Selected Participants

- Free septic system pump-out and inspection
- Free BioMaze system installation
- System performance improvement (possible)
- Drainfield rejuvenation (possible)
- Reduction in sludge production and thus fewer pump-outs in the future (possible)
- If system performs as designed, it is hoped that the state will approve the products to meet ENR-ATU requirements. Thus, participants will have an approved system installed that fulfills the future upgrade requirements.



RioVation® BioMaze®

- Introduce product history and current performance goals



The four BioMaze configurations in this study:



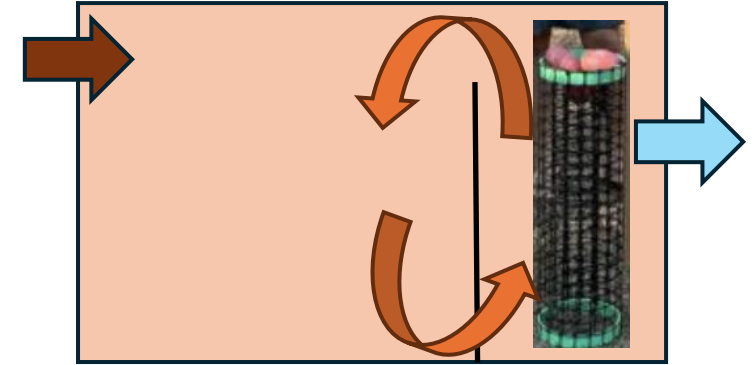
Figure 2 - BioMaze® Model BM2624



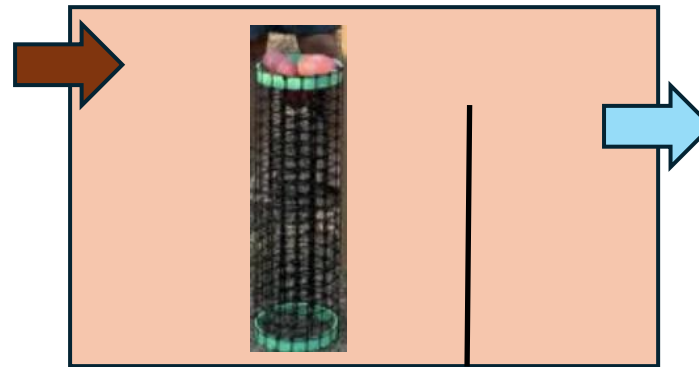
Rendering of RioVation® BioMaze® BM2624 Installed in a Two Compartment Septic Tank



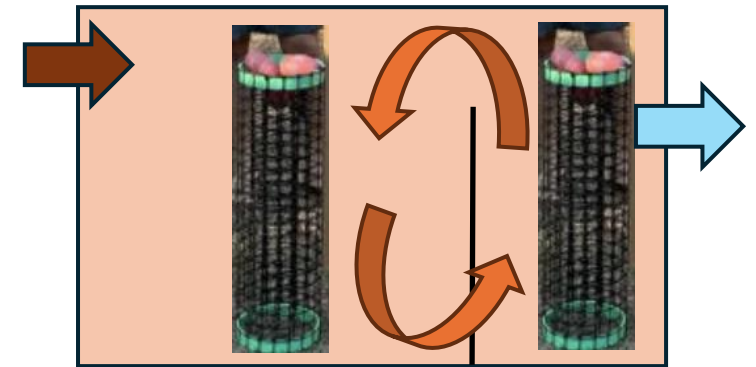
Single Compartment



Double with Recirculation



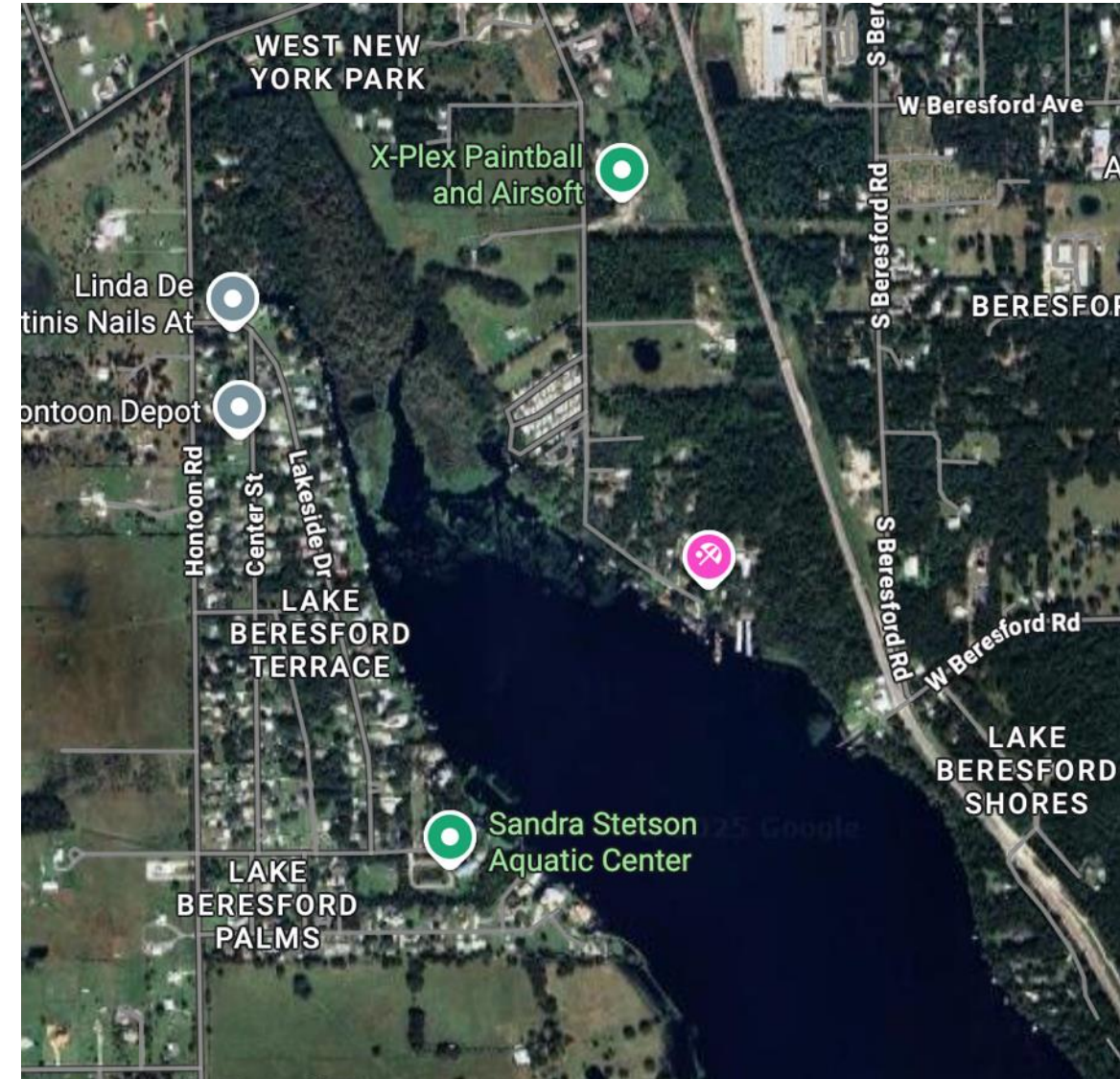
Double Compartment



Double with Recirculation +
Extra Media

Target area for study

- Standardize study parameters within the neighborhoods of Lake Beresford Terrace and Lake Beresford Palms
- Proximity to Lake Beresford, an impaired waterbody
- Elevation of water table



Timeline for entire study

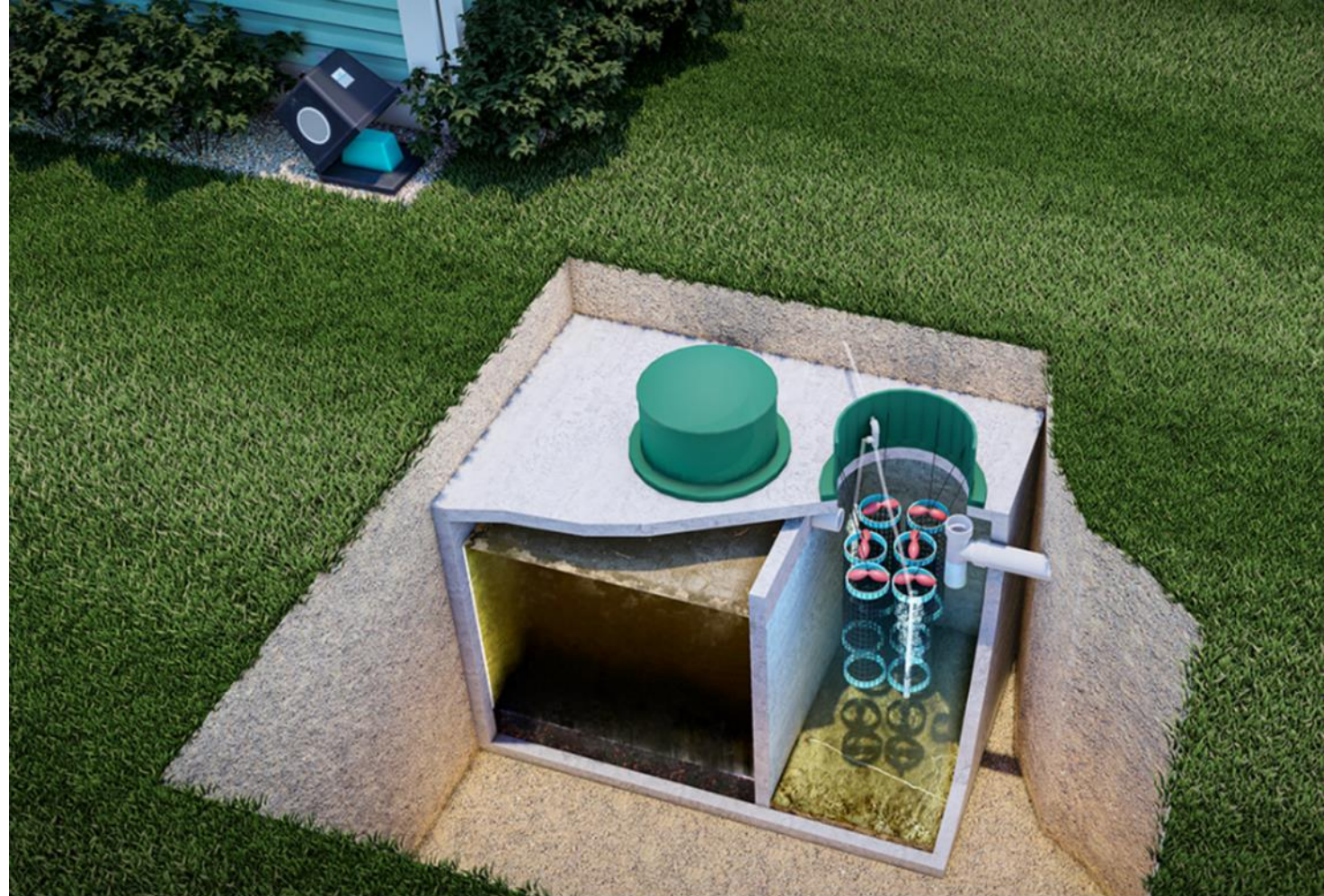
- Now through end of 2027
- QAPP—Now through February 2026
- **Participant Recruitment—December 2025-February 2026**
- Permitting and Contracting—Now through May 2026
- Pump-out, Inspection, Installation—March-June 2026
- Monitoring— field sample collection and lab analysis of samples—
July 2026 through June 2027
- Data Analysis—July 2026 through July 2027
- Final Report—September 2027

Process for Participant Selection

- Neighborhood Information Meeting (12/16/25)
- Applications target due date: January 31, 2026*
- Review applications and interview applicants for eligibility based on site attributes and resident activities
- Choose up to 60 sites for pump-out and inspection
- Participants sign Participant Agreement and Liability Waiver
- Inspect and review condition of tanks and drainfields
 - Confirm seasonal high-water elevation and soil percolation capacity
- Choose 40 sites for participation and assign to treatment categories
 - Note that 8 homes will be assigned to control (no treatment system)
- Submit and finalize tank maintenance and operating permits from DOH
- Install BioMaze systems in tanks and monitoring wells in drainfield
- Monitor tanks bi-weekly and wells monthly for 12 months
- Conclude study and report results

Modifications to participating sites

- Expose tank access points
- Access risers added to tanks
- Aerator pump installed with exterior 120V electric access
- BioMaze® system installed
- Monitoring well in drainfield installed (next slide)
- Biweekly sample collection onsite by Stetson staff and students



Rendering of RioVation® BioMaze® BM2624 Installed in a Two Compartment Septic Tank

Participant Tasks

- Sign Participant Agreement and Liability Waiver
- Provide clear access to tank
- Provide exterior 120V electricity for aerator pump
- Maintain weekly water use journal (number of people in the house, additional visitors, # loads of laundry, etc.) and provide monthly water bill
- Minimize use of harsh cleaning chemicals that could impact health of tank contents
- No additions of OTC tank treatments or disinfectants (see list of Dos and Don'ts)

BioMaze Trial Participant Evaluation Sheet		
Pre-Inspection	Yes/No	Details
Site attributes		
Groundwater elevation 18-24" below drainfield		Depth:
Tank and drainfield are safely accessible (no fences or outdoor pets)		
No long-term or short-term rentals		
Close proximity to accessible power supply		Distance between tank and outlet:
Tank attributes		
Existing tank not an ENR-ATU		Details:
Permit for existing tank is recorded		
Single compartment (need 8)		
Two-compartment (need 32)		
Tank capacity		Gallons:
Participant attributes		
Live onsite yearround		
Full-time household size (2-4 people)		#:
No plans to move for the following 18 months		
Willing to sign participant agreement and liability waiver		
Willing to keep usage log		
Post-Inspection		
Inspection shows no cracks or other failures		

Sampling strategies

- Biweekly tank sample grabs by FT Stetson staff and student assistants
- Monthly monitoring well grabs
- Standard protocols approved by DEP
- Samples analyzed by a certified lab

Lab Analytes

Total N
Total Kjeldahl N
Nitrate
Nitrite
Ammonia
Total Suspended Solids
Fecal coliform
Alkalinity
CBOD

Field Measurements

pH
Temperature
Sludge thickness
Sludge color
Sludge odor



Communication between IWER Team and participants

- Provide regular updates, answer questions, and address concerns about process
- Address significant changes to household water use
- Address tank or drainfield performance issues
- Notify of intent to move or other significant changes in home use



Application Form

Florida DEP Innovative Technology Grant (INV54) - Participant Application Form



Florida DEP Innovative Technology Grant (INV54) - Participant Application Form

Prospective study participants can request inclusion in the study by providing correct information through this form.

* Required

1. Full name *

2. Phone number *

3. Email address *

4. Address (Street number and name, City, State, Zip Code) *

5. Are you the homeowner or legal representative? *

Yes

No

6. If you are not the homeowner, please provide the name of the homeowner and their contact information. Enter "N/A" if not applicable. *

7. Do you have a permitted septic tank system on this property? (Permits are issued through the Florida Department of Health) *

Yes

No

8. Please describe what you know about the septic tank system on this property (i.e., installation date or approximate age of the installed system, number of compartments, recent maintenance or upgrades). *

9. How many people live full-time at this address? Please let us know how many adults and how many children (age 17 and under). *



Questions?

