Development of a Roadmap to Reclaim Our Water

February 2020

In response to the growing water quality crisis facing our county, the Suffolk County Department of Health Services has developed an unprecedented solution to address nitrogen pollution through the development of a countywide wastewater upgrade strategy. A Reclaim Our Water initiative, the strategy is documented in the Suffolk County Subwatersheds Wastewater Plan (SWP), which was developed in partnership with the Long Island Nitrogen Action Plan and in collaboration with numerous project partners, stakeholders, and technical experts. The SWP is the product of years of intensive research, documentation, modeling, and evaluation of all of Suffolk County's water resources and provides a parcel-specific roadmap on how to address the nitrogen crisis through wastewater upgrades and other nitrogen pollution mitigation strategies. The plan seeks to arrest and reverse the existing trend of degrading water quality over a 10 year period.

The Problem

Approximately 380,000 wastewater disposal systems in Suffolk County are releasing nitrogen into our groundwater at concentrations 100 times greater than our coastal ecosystems can handle naturally. In addition, the nitrogen concentration of the shallow groundwater that feeds our sensitive surface water resources has been increasing at a rate of approximately 1-2% per year over the past 30+ years (**Figure 1**). As a result of this nitrogen loading and other contributing factors such as global warming, our surface waters and coastal ecosystems have suffered severe impacts.

The sources of nitrogen in Suffolk County have been studied and well documented for decades going back to the 1978 208 Study. For most waterbodies, the primary sources of nitrogen include onsite wastewater disposal systems, atmospheric deposition (e.g., "rain water" and other atmospheric sources), and fertilizer. In the past 10 years, five studies ([Gobler et al., 2016], [Vaudrey et al., 2016], [Lloyd, 2014], [Kinney & Valiela, 2011], and [Lloyd, et al., 2016]) have evaluated nitrogen sources at various geographic locations throughout the county using watershed models. The SWP findings corroborated these studies and it is estimated that approximately 64 percent of nitrogen that reaches our groundwater system comes from untreated wastewater, that is, water that we flush everyday into our cesspools or septic systems (**Figure 2**).

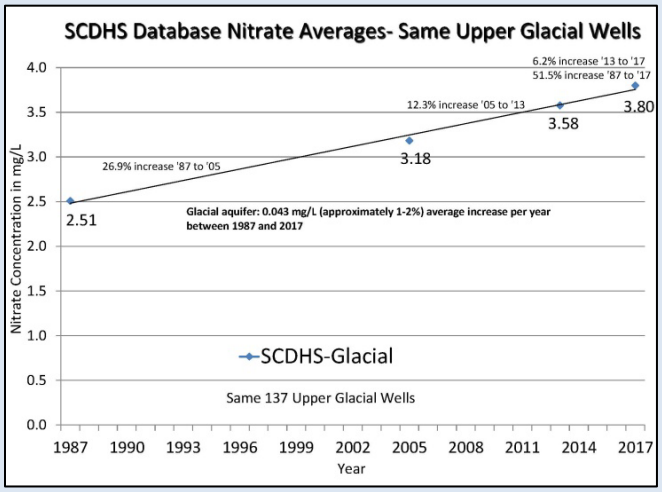


Figure 1 – 30-Year Nitrate Concentration Trends In Groundwater, Same Supply Wells

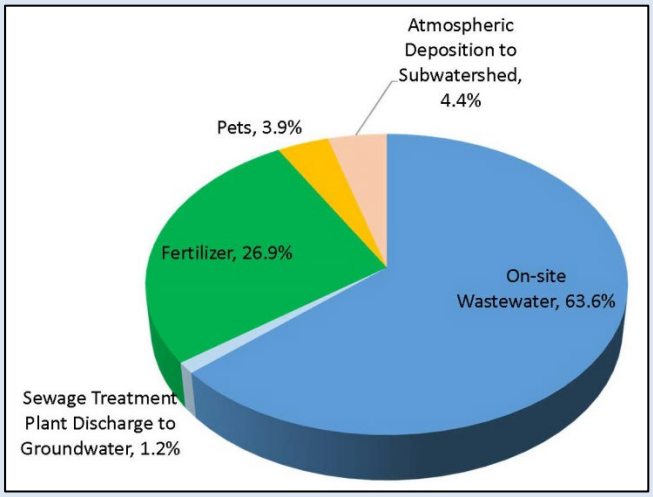


Figure 2 - Sources of Nitrogen Loads to Groundwater

The SWP model also corroborated the findings of previous studies and found that on-site wastewater is the number one contributor of nitrogen to most subwatersheds throughout Suffolk County. As an example, a comparison of nitrogen sources to Great South Bay from a previous study and the SWP (for the eastern bay) is provided below (**Figures 3 and 4**).

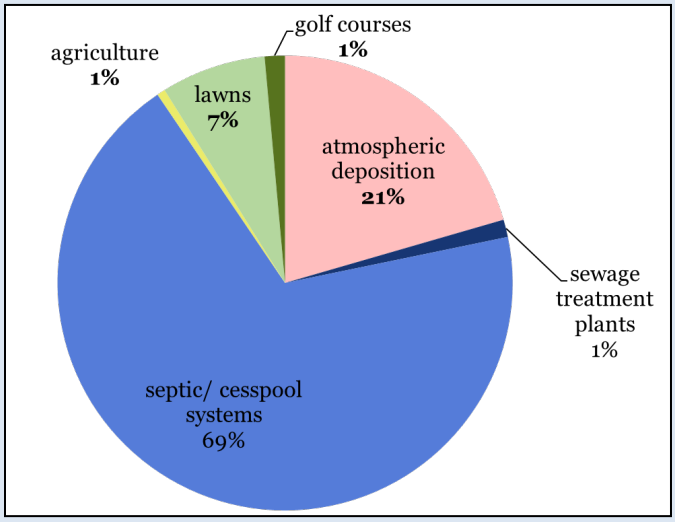


Figure 3 – Estimated Nitrogen Sources to Great South Bay (Kinney and Valiela, 2011)

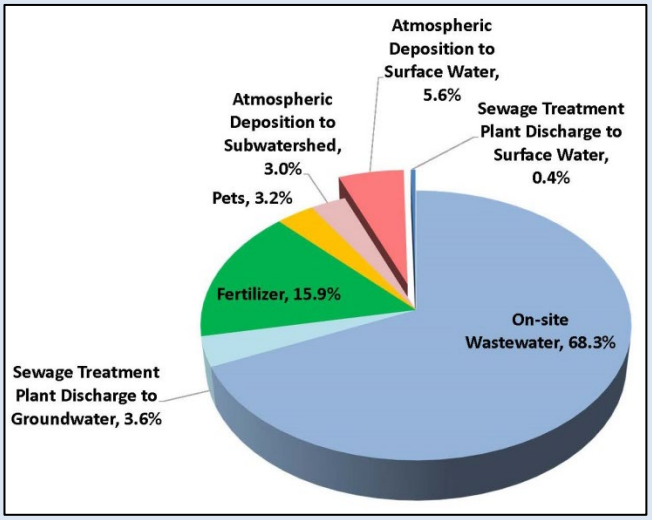


Figure 4 - Estimated Nitrogen Sources to Unsewered Sections of Great South Bay (eastern) from the SWP

What is a cesspool or conventional septic system?

Seventy-four percent of Suffolk County residents and businesses use cesspools or conventional septic systems to dispose of their household and commercial wastewater on-site. Septic systems consist of a septic tank designed to remove solids followed by a leaching pool to release the septic tank effluent into the groundwater system (**Figure 5**). For many homes and businesses, wastewater is disposed directly into the groundwater system through a leaching pool or cesspool only. The problem is that wastewater contains significantly elevated levels of nitrogen and other contaminants, and conventional septic systems and cesspools are not designed to remove these contaminants.

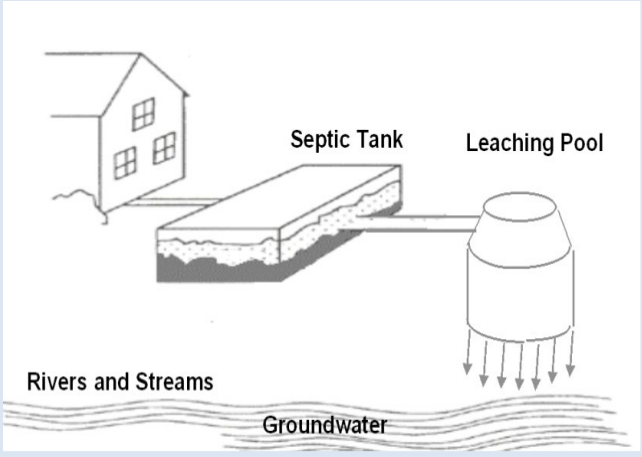
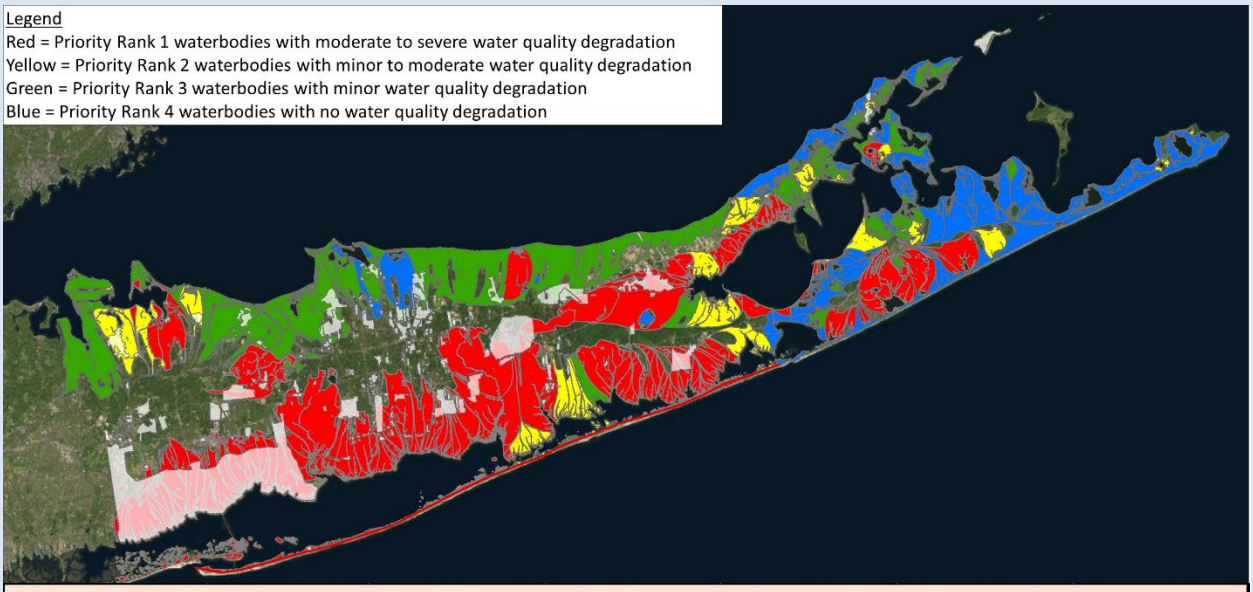


Figure 5 - Conventional Sanitary Systems

Why is it a problem?

Untreated nitrogen and other contaminants that are released to groundwater eventually reach one of two possible destinations: 1) a surface water body such as a lake, stream, bay, estuary, or the ocean; or 2) a water supply well (such as irrigation well or drinking water supply well). Several existing regional studies have documented the link between nitrogen loads, in water nitrogen concentration, and water quality degradation (e.g., [Hauxwell, Cebrian & Valiela, 2003], [Heisler et al., 2008], [Davis et al., 2009], [Hattenrath et al., 2010], [Latimer & Charpentier, 2010], [Latimer & Rego, 2010], [Gobler & Sunda, 2012], [Harke & Gobler, 2013], [Benson et al., 2013], [Davidson et al., 2014], [Wallace et al., 2014], [Gobler et al., 2016], [Lefcheck et al., 2017], [Luk et al., 2019]). Using the first of its kind county-wide water quality database, the SWP corroborated these findings and found that ***waterbodies with higher nitrogen concentrations and nitrogen load rates were associated with poorer water quality in Suffolk County*** **(Figure 6).**



Average Water Quality Values for Marine Waterbodies by SWP Priority Rank

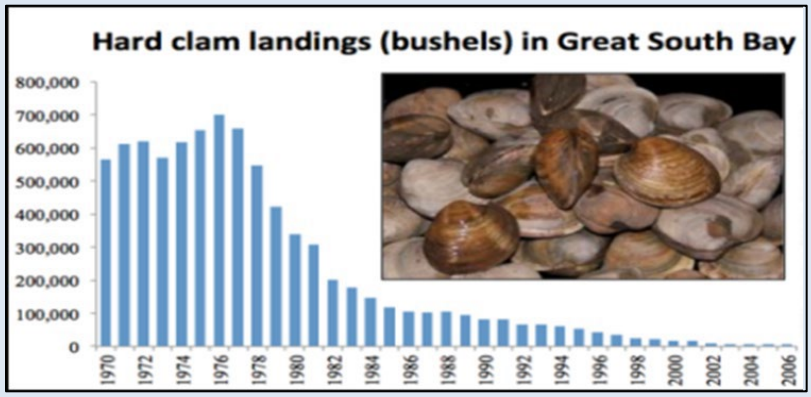
Subwatershed Priority Rank	Predicted Nitrogen Load (#/volume/yr)	Total Nitrogen in-water Concentration 90th percentile of last 10 years (mg/L)	Dissolved Oxygen 10th percentile for last ten years (mg/L)	HABs - Environmental and Human Health # of blooms in last 10 years	Chl-a 90th percentile for last 10 years (ug/L)	Clarity average secchi depth for last 10 years (ft)
Priority Rank 1	0.070	1.36	4.60	5	29.1	4.1
Priority Rank 2	0.030	0.80	6.11	3	21.8	5.5
Priority Rank 3	0.013	0.74	5.81	1	9.4	6.1
Priority Rank 4	0.008	0.39	6.52	0	6.1	7.4

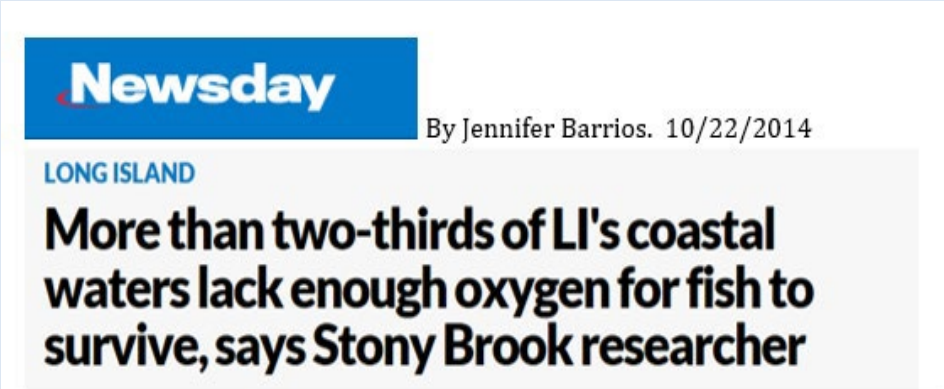
Figure 6 – SWP Subwatershed Priority Rankings and Average Water Quality by Priority Rank

As shown in the comparative analysis above, waterbodies in Suffolk County with higher nitrogen concentrations correspond to a significant increase in the number of harmful algal blooms (HABs), decrease in dissolved oxygen, significant increase in chlorophyll-a, and significant decrease in water clarity. In addition to being aesthetically alarming, increased chlorophyll-a and HABs disrupt the ecosystem by preventing light from reaching the bottom of our estuaries. Similar to terrestrial plants, light is essential for the growth and health of the local aquatic vegetation that provides habitat for finfish and shellfish and which helps to prevent erosion and reduce wave energy during coastal storms. Some HABs can also produce toxins that are harmful to human and pet health resulting in the closure of thousands of acres of shellfish harvest areas and resulting in recurring beach closures. Finally, the HAB commonly referred to as "brown tide" inhibits the growth of young shellfish which, in some locations, is preventing the restoration of hard clam populations following the significant decline of hard clam populations which occurred in the 1970' and 1980's (**Figure 7**).

In the past 10 years alone, Suffolk County has experienced over 230 harmful algal blooms.

Figure 7 - Reduction in Hard Clam Landings in Great South Bay




Newsday By Jennifer Barrios. 10/22/2014

LONG ISLAND

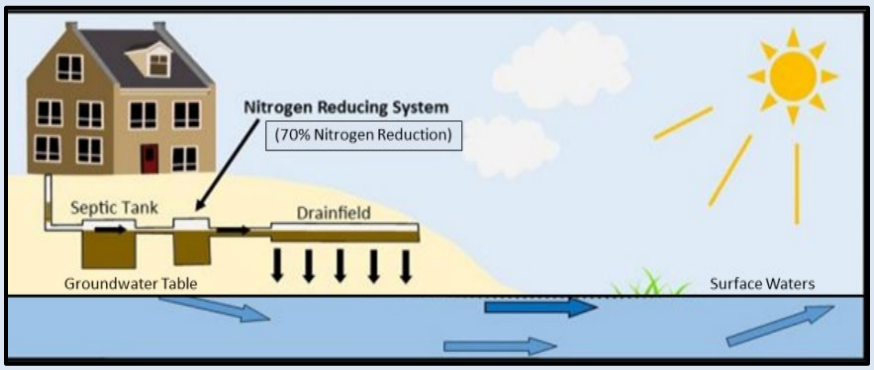
More than two-thirds of LI's coastal waters lack enough oxygen for fish to survive, says Stony Brook researcher

What's the Solution?

The good news is that if we act now, the increasing nitrogen trend observed in the shallow groundwater that is feeding our bays and estuaries can be reversed in as short as 5-10 years. Through the leadership of County Executive Steve Bellone, Suffolk County has been establishing the foundation for implementation of a countywide wastewater upgrade program. The Subwatersheds Wastewater Plan demonstrates that significant improvements to water quality are possible if Suffolk County embarks on the countywide wastewater upgrade strategy to replace the estimated 380,000 cesspools and conventional septic systems with technologies that remove nitrogen. At the forefront of the strategy is the use of Innovate/Alternative Onsite Wastewater Treatment Systems (I/A OWTS), which have been demonstrated through rigorous testing by Suffolk County and other jurisdictions to remove greater than 70 percent of the nitrogen in our wastewater (**Figure 8**).

Article 19 of the Suffolk County Sanitary Code sets forth rigorous approval requirements for individual I/A OWTS technologies. All I/A OWTS technologies must meet a stringent effluent concentration of 19 mg/l (i.e., approximately 70 percent nitrogen removal) before they can be approved for use in Suffolk County. As of August 2019, the cumulative average effluent concentration of all provisionally approved I/A OWTS in Suffolk County is 17.5 mg/l.

Figure 8 - Schematic of I/A OWTS



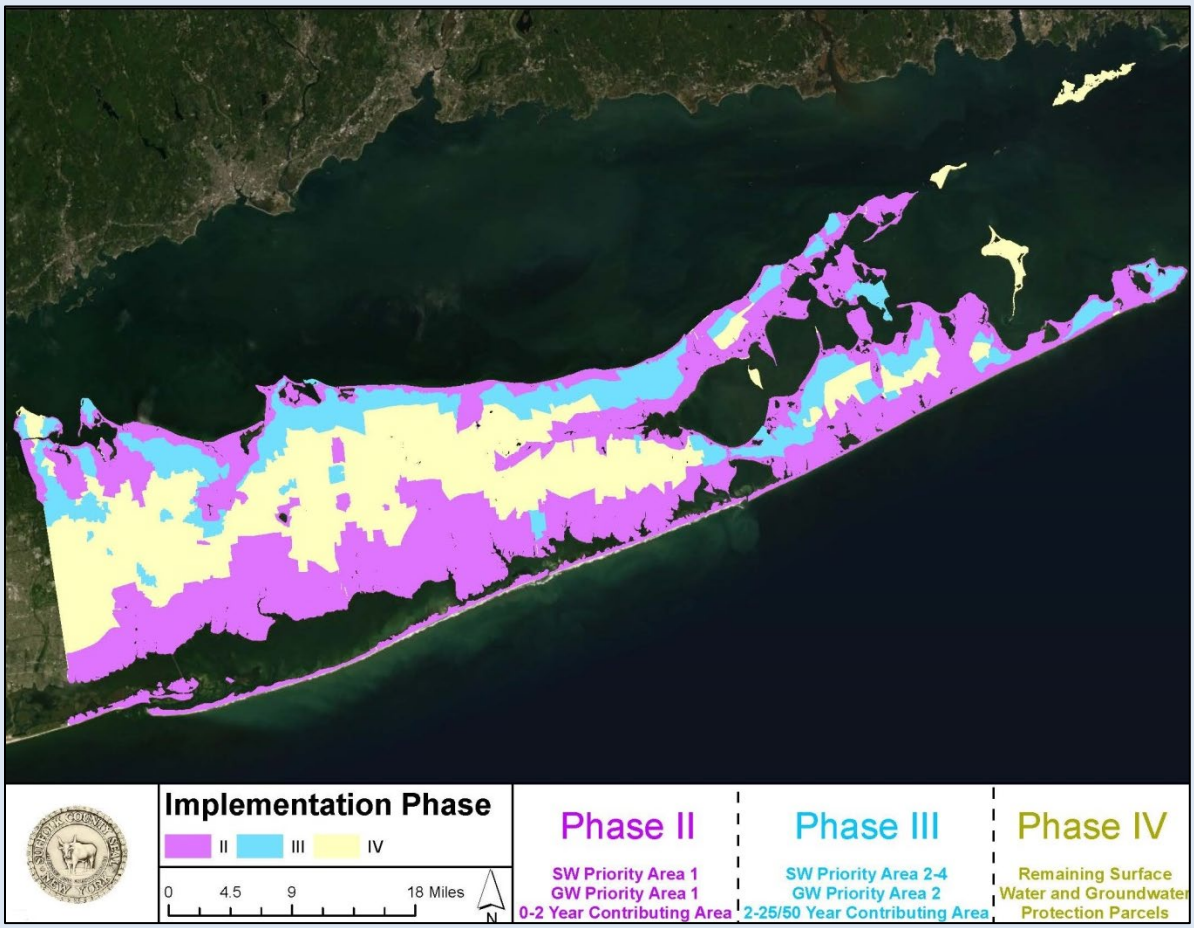
Local sewer expansion, where wastewater is sent to a central sewage treatment plant for treatment and disposal, will also serve a critical role of the overall strategy, particularly in locations that are especially vulnerable to high nitrogen loads such as the Great South Bay.

How will the plan be implemented?

The **recommended strategy**** set forth in the SWP includes a **phased approach** which will upgrade all conventional on-site wastewater systems and cesspools within the most sensitive and vulnerable areas of Suffolk County within 30 years of program onset. The upgrade implementation phases are depicted on **Figure 9**.

*****Note that recommended upgrade program provided in the SWP will not be advanced unless a stable, recurring revenue source is established that makes the cost of wastewater upgrades affordable to the homeowners of Suffolk County. Furthermore, the recommendations provided in the SWP are not binding and present strategies for consideration by policymakers. Each policy recommendation will require separate review and approval by the Suffolk County Legislature and Suffolk County Board of Health.***

Figure 9 - Wastewater Plan Implementation Phases



A description of the recommended program phases is provided below (**Table 1**). The first phase (Phase I) will be a ramp-up of the program, with the top priority to establish a stable and recurring revenue source. Other priorities will be to: prohibit the use of wastewater disposal systems that don't remove nitrogen; build the industry; continue to implement

voluntary programs; and advance approved sewer projects. Homeowners can currently apply to participate in the voluntary Septic Improvement Program (SIP).

Table 1 - Wastewater Plan Implementation Phases

Program Phase	Program Phase Objectives	Timeline
I Program Ramp Up 9,000 WWT Upgrades (5,000 retrofit; 4,000 new construction)	- Continue voluntary upgrade incentive programs - I/A OWTS required for all new construction - Implement SCCRI sewer connections plus connect any unconnected homeowners to SWSD -Ramp up RME and Industry Capacity -Establish Countywide Wastewater Management District -Establish Stable Recurring Revenue Source	5 Years (2019-2023)
II Upgrades in Near Shore and Highest Priority Areas 207,000 WWT Upgrades (177,000 retrofit; 30,000 new construction)	-Continue Program Ramp Up (RME and Industry Capacity) -Address all highest priority areas including: *Upgrades in all near shore 0-2 year contributing areas. *Upgrades in surface water priority area rank 1. * Upgrades in groundwater/drinking priority area rank 1.	30 Years (2024-2053)
III Upgrades in All Other Priority Areas 299,000 WWT Upgrades (253,000 retrofit; 46,000 new construction)	-Upgrades in all remaining priority areas. *Remaining parcels in surface water priority area ranks 2,3 and 4. *Groundwater/drinking water priority area rank 2	15 Years (2054-2068)

The highest priority areas to be addressed in Phase II, and the first areas to require upgrades, include the watersheds of the most impaired or vulnerable waterbodies. These waterbodies were identified based on many factors, including current and predicted water quality and nitrogen inputs.

The highest priority areas also include the entire 0-2-year groundwater contributing area to surface waters which will result in the most cost-effective approve to remove nitrogen from surface waters. Therefore, within two years of full implementation, it is anticipated that we will begin to reduce trends of increasing degradation in surface waters, and will arrest and reverse the trends within 10 years of full scale implementation with a recurring revenue source.

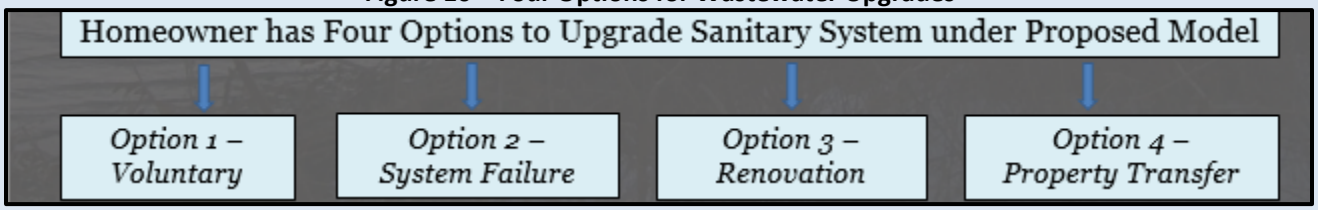
What's the Cost to the Homeowner?

Because the cost of connecting to a sewer system or replacing a cesspool or septic system would otherwise create a significant financial burden, a fundamental recommendation included in the SWP is the identification and establishment of an alternative source of funding to make the process affordable for homeowners. ***Implementation of the Subwatersheds Wastewater Plan will not move forward unless a revenue stream is established that results in minimal out-of-pocket expense to homeowners.*** Based on a review of practices used successfully in other states, the upgrade model utilized in the SWP includes four options (**Figure 10**) for homeowners to upgrade their sanitary system if they fall within a priority area, resulting in:

- ✓ Minimal out-of-pocket expense for installation;
- ✓ Upgrades can be completed voluntarily, at system failure, at property transfer, or upon major building addition.
- ✓ NO out-of-pocket maintenance cost for 3 years if the homeowner elects to upgrade voluntarily or at system failure. ~$250-$300/year thereafter**
- ✓ An annual electric cost of ~$11/month (assuming $0.22/kwh based upon current market conditions)
- ✓ Additional incentives may also be provided for those with limited financial means.

** It is expected the annual O&M cost will decrease as the program matures due to increased market growth

Figure 10 – Four Options for Wastewater Upgrades



What It Means to You

Nitrogen pollution threatens our great way of life in Suffolk County. Some of the benefits anticipated from implementation of a countywide wastewater upgrade program include:

- Protection of the health of you and your family through a reduction in harmful algal blooms, elimination of toxins in shellfish, reduction in direct exposure risk to pathogens, and reduction of toxins in our sole source drinking water aquifer.

- Increase in property values due to higher market demand caused by cleaner recreational waters.

- Increase in economic prosperity through enhanced tourism, creation of new jobs, and the reestablishment of Suffolk County as a leader in shell fishing industry.

- Increased protection against storm surges (coastal resiliency) through the protection of the submerged aquatic vegetation and wetlands plants that anchor our shores

The public is invited to review the entire Subwatersheds Wastewater Plan and related State Environmental Quality Review (SEQRA) documentation (Generic Environmental Impact Statement (GEIS), etc.), as well as obtain additional information, at the Reclaim Our Water SWP website (www.reclaimourwater.info/TheSubwatershedsWastewaterPlan.aspx). There, you will find the full list of recommendations of the wastewater strategy, including sewers, wastewater disposal at commercial sites and other mitigation strategies.

The public comment period for the draft GEIS was extended from 30 days to 60 days, and comments were accepted from August 16, 2019 through October 16, 2019. Public hearings were completed on September 5 and 6, 2019 and the presentation and posters from the hearings can be downloaded on the website. A final GEIS responding to public comments was completed in February 2020.

What You Can Do

- Take advantage of the existing County, Town, and State grant programs to install nitrogen-reducing wastewater systems at your property. You can visit www.ReclaimOurWater.info to find out more!

- Tell your friends and co-workers about Suffolk County's roadmap to clean and healthy water and ecosystems. Knowledge is power!

- Support the establishment of a stable and recurring funding source that will be required to solve the water quality crisis.

Contact the Project Manager if you have further questions:

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Reclaim Our Water