Fire Island Wastewater Management Plan

Issued By:

Citizens Campaign for the Environment

In Association with:

Cameron Engineering

an IMEG company

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Kismet
Fair Harbor
Dunewood
Lonelyville
Atlantique
Robbins Rest
Summer Club
Corneille Estates
Seaview
Ocean Bay Park
Point O' Woods
Cherry Grove
Fire Island Pines
Water Island
Davis Park

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1. EXECUTIVE SUMMARY

1.1 BACKGROUND

Fire Island is a barrier island approximately 10 square miles in surface area and is a part of the Fire Island National Seashore (FINS). It is bordered on the north by the Great South Bay and on the south by the Atlantic Ocean. There are seventeen (17) communities located on Fire Island with approximately 4,000 homes. Fire Island attracts upwards of 2 million visitors each year, primarily during the summer months. The island population includes a diverse mix of seasonal homeowners, year-round residents, short-term renters, and day trippers visiting FINS, the developed communities or the ocean beaches. There is one wastewater treatment plant located in the Incorporated Village of Ocean Beach. This treatment facility has a capacity of 0.5 Million Gallons per Day (MGD). The balance of the homes and businesses on Fire Island use onsite wastewater treatment systems (OWTS) comprised of cesspools, septic tanks, leaching pools and Innovative Alternative (I/A) systems. Due to the high groundwater, their effectiveness in removing pollutants is marginal.

In June 2018, a coalition of local, state, and federal agencies, nonprofit organizations and Fire Island stakeholders was formed with the mission to develop wastewater management strategies for Fire Island. Citizens Campaign for the Environment (CCE) received a Suffolk County grant and engaged the services of Cameron Engineering, an IMEG Company to assist in researching and confirming the existing conditions in each community and identifying viable options for treating wastewater on a community and Island wide basis.

This Wastewater Management Plan also provides the guidance for the future planning and implementation including:

- The physical environmental settings.
- Population demographics and sewage flow generation.
- Wastewater sewage pollutant loadings.
- Potential wastewater treatment options.

- Expansion alternatives of the Village of Ocean Beach Wastewater Treatment Facility (WWTF).
- Innovative and Alternative (I/A) technologies and other new technologies.
- Pump out/maintenance access of I/A systems.
- Recommended code changes to facilitate installation of I/A systems.
- Marine based alternatives such as barging or pumping wastewater to the mainland wastewater treatment facilities.
- The National Park Service (NPS) restrictions that impact potential land for wastewater treatment.
- Suffolk County, Town of Islip and Brookhaven codes and limitations, and recommended changes to accommodate the unique conditions of Fire Island.
- Wastewater Management Plans for each of the 17 communities.
- An Action Plan summarizing the potential short-term and long-term solutions for Fire Island, and an implementation Road Map.

Figure 1-1 shows the location and expansiveness of Fire Island.

Figure 1-1 - Fire Island Map

Public Health and Safety

Groundwater and surface water pollution is of concern because of its impact on coastal ecosystems (Great South Bay), the human health risks associated with sewage entering the ground surface, as well as the threats posed to recreational activities.

The Fire Island cesspools and septic systems may contribute pollutants and Contaminants of Emerging Concern (CECs) to surface-water bodies due to shallow groundwater and short travel distance of poorly treated effluent to the Great South Bay. Pathogens can also potentially enter the ground or surface waters. There is significant public health concern associated with possible ingestion of these pathogens, including bacteria, viruses and protozoans.

Sea Level Rise/Climate Change

The USGS and USACE expect sea level rise in the New York City metropolitan area to increase approximately 30 inches by the year 2050. Fire Island residents report a rise in groundwater elevations of 1 – 2 feet over the last 20 years, and increased flooding during rain events and storm tides, particularly on the bayside areas of the communities. When considering the feasibility of I/A's systems, the rising groundwater will impact their constructability and effectiveness, and failures may result in an increased potential for public health risks.

1.2 WASTEWATER FLOWS

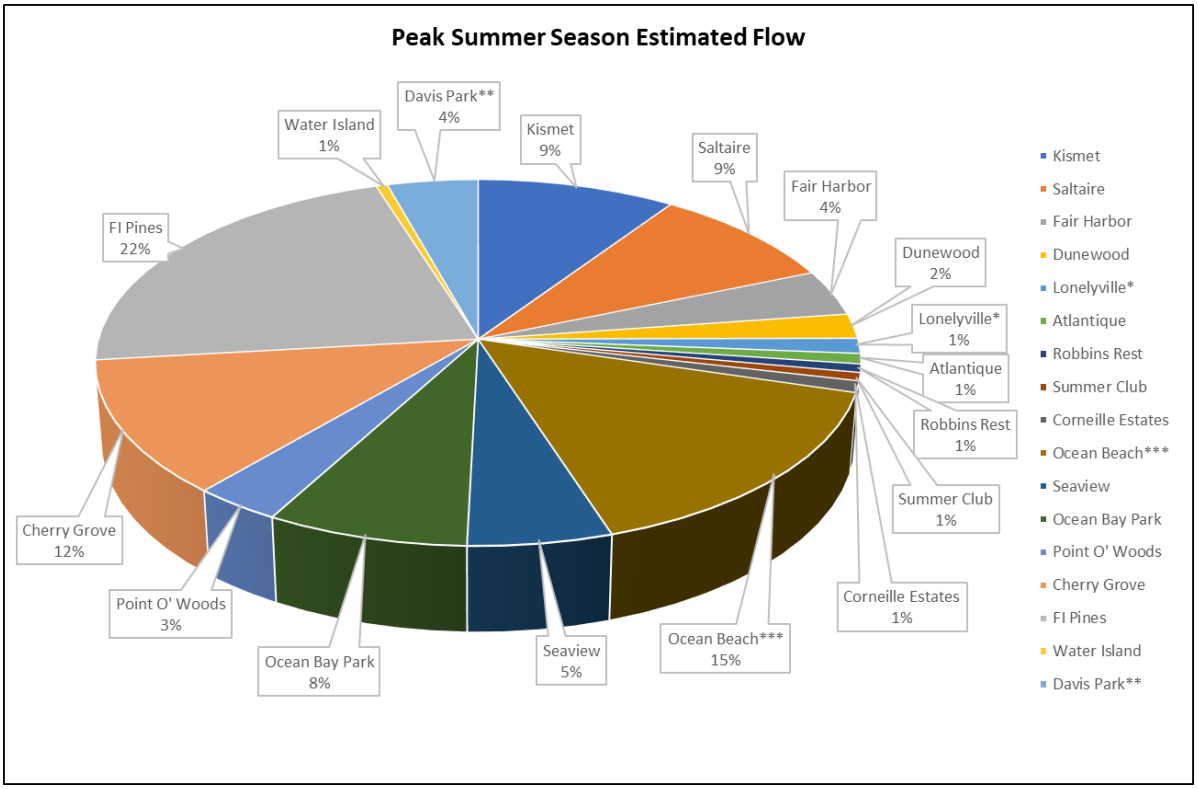
Wastewater flows for the 17 communities were estimated to determine the potential for wastewater treatment improvements, both individually and/or collaboratively with neighboring communities.

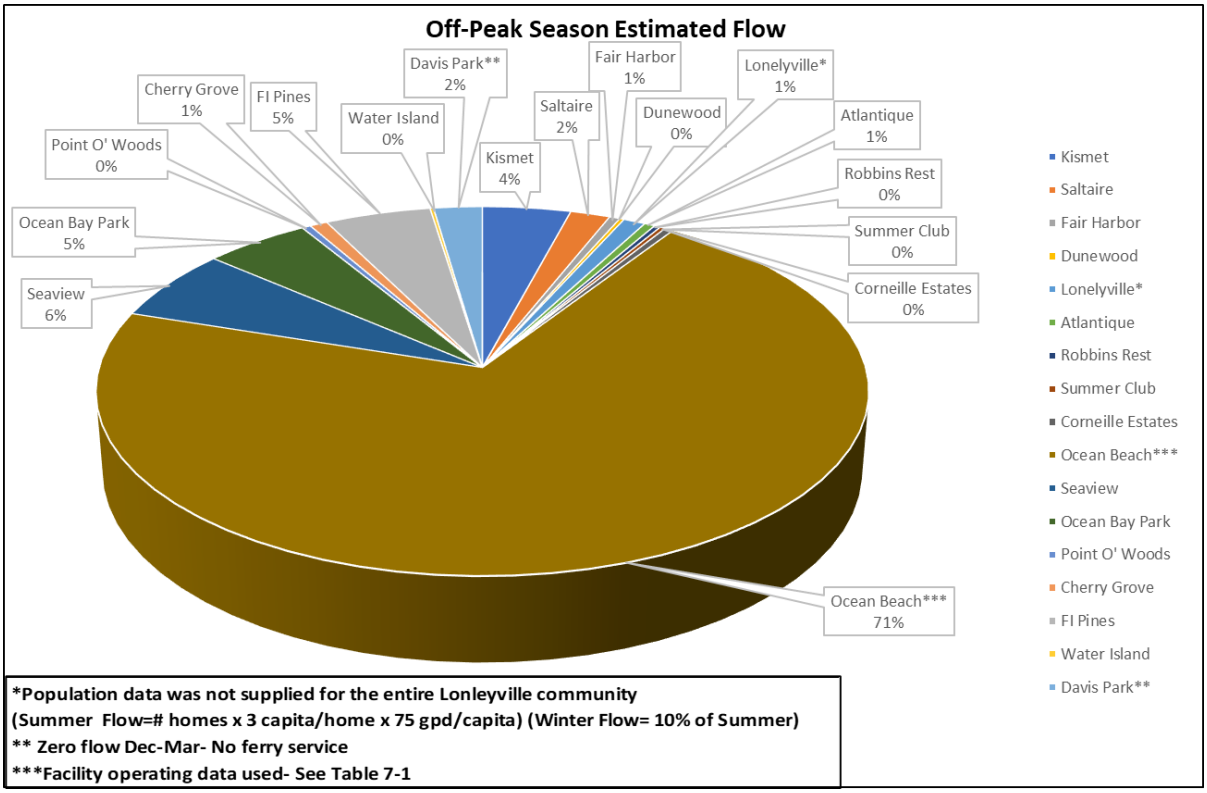
A wastewater survey distributed to each community established background information on the wastewater treatment practices, access/logistics and plans for future residential development. Individual meetings with the communities confirmed the sentiment that including expansion of business/commercial districts is not warranted in the future projections.

It was determined that each community has their unique characteristics and distinct culture which translates to significantly different levels of occupancy (seasonal vs. year-round) and therefore variable amounts of wastewater generation. During peak summer seasons, some communities swell with overnight visitors (6+ overnighters per residential unit), while other communities remain consistent (2-3 overnighters per residential unit). Some communities experience a large influx of day trippers, while others are primarily communities of local residents and guests. Population data was utilized to more accurately represent each community as compared to parcel data. A population-based approach accounted for the seasonal differences across the island.

Season	Estimated Wastewater Flow (GPD)
Off-Peak Season (8 months)	143,545 - 179,575
Peak Summer Season (4 months)	881,530 - 1,385,550

The contribution by each community is shown on Figure 1-2.





***Population data was not supplied for the entire Lonleyville community**
(Summer Flow=# homes x 3 capita/home x 75 gpd/capita) (Winter Flow= 10% of Summer)
**** Zero flow Dec-Mar- No ferry service**
*****Facility operating data used- See Table 7-1**

Figure 1-2 - Estimated Wastewater Flow Projections

1.3 INNOVATIVE/ALTERNATIVE TREATMENT SYSTEMS (I/A)

A septic system or OWTS receiving less than 1,000 gallons per day (gpd), is regulated by the NYSDOH and SCDHS.

Suffolk County has declared nitrogen as a major causal factor for the Great South Bay (GSB) adverse water quality issues. To address this problem, Suffolk County is testing advanced septic systems that are designed to removal nitrogen to a concentration of 19 mg/l or less. Those advanced onsite wastewater systems are called Innovative/Alternative On-site Wastewater Treatment Systems, or I/A systems for short.

A Suffolk County Grant Assistance Program provides funding to homeowners. Homeowners may apply and receive up to $20,000 of grant funding for an I/A system. In some cases, additional grant monies ($1,000) can be procured based on income or with the proposed use of Pressurized Shallow Drain Field. Additional grant money may be available from New York State.

Suffolk County recognizes that there is not a one-size-fits-all solution for wastewater management, and in particular, for communities on Fire Island. As such, Suffolk County has commissioned studies to elucidate challenges of I/As on Fire Island.

The Specific challenges were identified as follows:

1. Small parcel size (average 0.2 acres) results in the need for waivers on setback requirement. SCDHS standards allow reduced setbacks for replacements of an existing OWTS with an approved I/A system if it meets the requirements to the greatest extent possible. This is referred to as the “Best Fit” condition.
2. High groundwater and small parcel size limit the effectiveness of drain fields.
3. Limited number of contractors for the installation and maintenance of these systems. Specifically, the number of Fire Island resident contractors approved by the Suffolk County to install I/A systems qualifying for the Grant Assistance programs is very limited.

4. Pump out/maintenance access including logistics in transporting equipment, supplies and service vehicles because there are no paved or concrete roads dedicated solely to vehicular traffic in many communities, with only boardwalks, narrow streets or sand roadways that limit access for commercial vehicles.
5. All vehicles accessing Fire Island are required to have one of the very limited number of permits issued by the Fire Island National Sea Shore (FINS).

Recommended Code Changes

I/A systems are feasible options for a lot size of approximately 6,000 square feet. Some lots under 6,000 square feet can also utilize I/A systems under the current best fit policy. Previous study by P.W. Grosser Consulting and CDM Smith's Davis Park Study have identified a list of administrative and code changes relating to separation distances to accommodate the installation of I/A systems and leaching fields beneath raised houses or decking, between pilings, and reduce current setback or separation distance requirements. The recommended changes to reduce the existing separation distances are as follow:

Table 1-1 – Recommended Changes to Reduce the Existing Separation Distances

Minimum Horizontal Separation Distance From	Recommendation Fire Island System	Existing Fire Island System
Building on Piles	1 ft*	10 ft
Porches, Decks, Overhangs, Cantilevers, etc.	1 ft*	5 ft
Retaining Walls	5 ft	10 ft
Property Lines	5 ft	5 ft
*Separation distances of 1 foot would apply to pilings under or adjacent to the house, deck, porch, etc.		

P.W. Grosser Consulting also examined existing Fire Island system percolation rate and recommended a higher percolation rate be allowed for I/A systems which in effect would reduce the size of the leaching area.

Other recommendations as outlined in the Davis Park Study are as follows:

1. Assignment of one set of design standards rather than having to work with multiple standards required by SCDHS, SCDPW, and Towns.
2. Assignment of a single lead agency to streamline the approval process.
3. Creation of a stable/recurring revenue source and a central entity responsible for operation and maintenance of the units.

SCDHS has indicated that they had been working with the New York State Department of Health Services on possible waivers to certain setback requirements that are specific to Fire Island. As of December 6, 2023, SCDHS published a draft guidance document outlining its best-fit policy for the siting of Onsite Sewage Disposal System on Fire Island. Under the existing standards, Onsite Sewage Disposal System on Fire Island can be approved as Best-Fit by SCDHS per sections 5-104(3) of the Residential Standards, XI(2)(a) of the Commercial Standards, VIII of the Replacement/Retrofit Standard, or Section 760-614(F) of Article 6 without the need for a variance or waiver. SCDHS best-fit policy may allow reduced setbacks and hydraulic sizing for some types of Onsite Sewage Disposal System installations without the need to obtain a variance or waiver from the Department's Board of Review. Best-Fit also allows for some of the Suffolk County Subwatershed Wastewater Plan's Fire Island recommendations to be utilized when installing Onsite Sewage Disposal Systems.

1.4 OCEAN BEACH WASTEWATER TREATMENT PLANT

The Village of Ocean Beach (Village) Wastewater Treatment Facility (WWTF) is permitted by the NYDEC to receive, treat and discharge 500,000 gallons per day (gpd). The WWTF treats wastewater from the entire Village.

The Village has expressed a desire to offer the excess capacity that currently exists to parcels located outside the Village's sewer district. Receiving NYSDEC approval to connect out of district parcels will be dependent on the mitigation of the extraneous Infiltration and Inflow (I/I) flow that is currently underway and the WWTF's limited nitrogen removal capabilities.

Sewer District Expansion Areas

The best candidates to take advantage of the WWTF excess capacity are Seaview and Ocean Bay Park located to the east, and Summer Club, and the communities of Corneille Estates, Robbins Rest and Atlantique to the west of Ocean Beach.

Figure 1-3 shows the five (5) communities that could connect to the Ocean Beach WWTF

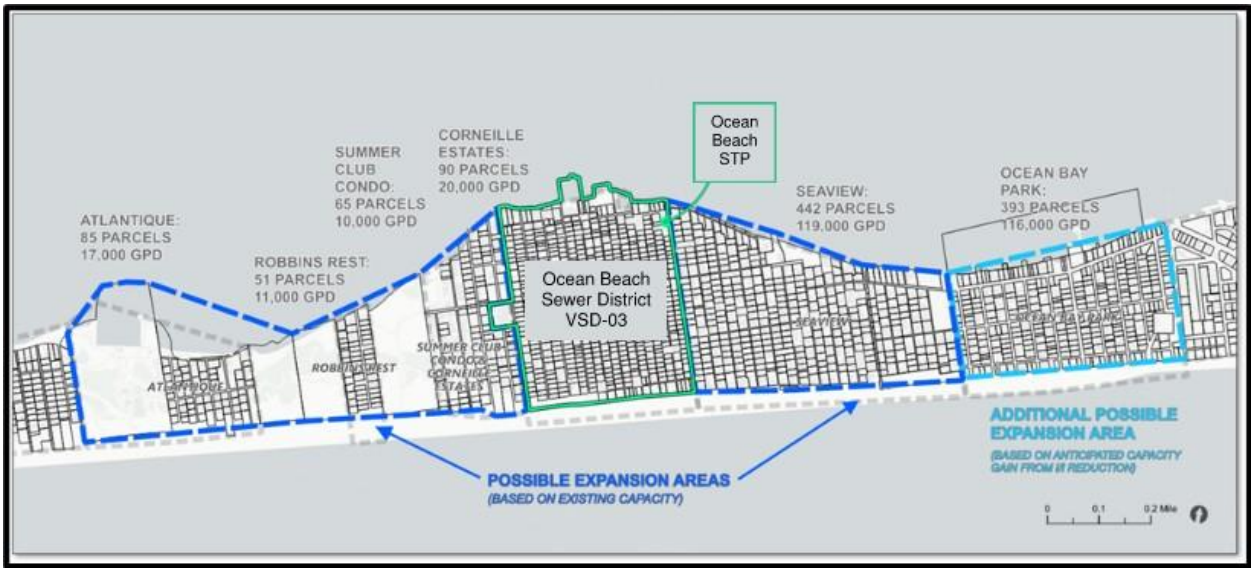


Figure 1-3 – Ocean Beach WWTF Expansion Areas

Converting the WWTF to Pump Station / Pump to Mainland

An alternative to utilizing the Village's WWTF as a regional wastewater treatment facility is to convert the WWTF to a regional pump station with a force main to convey the wastewater under the GSB to the County's SCSD No. 3 sewage collection system on the mainland. Under this option, transferred wastewater would flow to the County's Bergen Point WWTF in Babylon for treatment. This option is one of the long-term regional solutions identified in this report.

An approximately 3.5-mile-long force main from the WWTF would be installed under the bay bottom via directional drilling to minimize environmental disruption and would land at Heckscher State Park in Great River.

1.5 WASTEWATER TREATMENT/COLLECTION ALTERNATIVES

The following wastewater treatment alternatives were identified:

- Innovative Alternative Treatment Systems (I/A)
- Low Pressure Sewer Collection System
- Ocean Beach WWTF Expansion

- Marine Based Alternatives
    - Collection/Transfer to Ocean Beach WWTF by Barge
    - Collection/Barging Wastewater to Mainland WWTF
    - Central Pump Station/Force Main Under GSB to Mainland
- Communal/Cluster Treatment Systems
- Use of FINS Property for Treatment Plant Sites
- Innovative Technologies
    - Mobile Restrooms/Urine Diversion
    - Composting Toilets
    - Incineration Toilets

Innovative Alternative Treatment Systems (I/A)

The applicability of I/A systems in each community was evaluated to determine the approximate number and associated costs of systems that could be installed based on the following conditions:

- Limitations due to distance/logistics from freight docks and roads.
- A 6,000-sf minimum lot size was used when determining if a property could fit an I/A system. This does not take existing woodland coverage or habitat loss and erosion control into account.
- I/A cost estimated at $75,000 per installation represents the total cost including engineering ($15,000) and construction ($60,000). Costs may be offset with available grant opportunities.
- The Ocean Beach community is served by a WWTF.

Table 1-2 summarizes the percentage of community applicability of I/A's and the estimated costs.

Table 1-2 – Innovative Alternative Treatment System Community Summary

Community (listed from west to east)	Total Parcels	No. of Developed Parcels (see note 5)	No. of Dev. parcels greater than 6,000 sf (see note 2)	% of Community's I/A Applicability	Est. I/A Cost for applicable parcels only (see note 3)
Kismet	306	242	137	57%	$10,275,000
Saltaire	603	412	256	62%	$19,200,000
Fair Harbor	487	394	140	36%	$10,500,000
Dunewood	114	100	61	61%	$4,575,000
Lonelyville	123	92	60	65%	$4,500,000
Atlantique	84	55	31	56%	$2,325,000
Robbins Rest	53	38	15	39%	$1,125,000
Summer Club	67	45	45	100%	$3,375,000
Corneille Estates	89	69	48	70%	$3,600,000
Seaview	437	376	301	80%	$22,575,000
Ocean Bay Park	394	312	100	32%	$7,500,000
Point of Woods	297	152	104	68%	$7,800,000
Cherry Grove	310	280	93	33%	$6,975,000
Fire Island Pines	646	575	501	87%	$37,575,000
Water Island	75	45	23	51%	$1,725,000
Davis Park	303	278	170	61%	$12,750,000
Totals	**4,388**	**3,465**	**2,085**	**60%**	**$156,375,000**

Notes:

1. Communities may encounter limitations due to distance/logistics from freight terminals/roads.
2. 6,000 sf was used as a minimum lot size when determining if a property could typically fit an I/A system with minimal lot issues. Parcel information was sourced from the County's tax map database. This represents an overview of each community. Individual parcel characteristics such as lot coverage, double lots, etc. would have to be reviewed on an individual basis.
3. I/A cost estimated at $75,000 per installation represents the total cost including engineering ($15,000) and construction ($60,000). Costs may be off set with available grant opportunities.
4. Ocean Beah community is served by WWTP and is not included.
5. Includes parcels that are currently developed. Land uses removed from this total include but are not limited to; vacant, wetlands, land underwater, parks, athletic fields, roads, flood control, etc.

Low Pressure Collection and Conveyance Systems

There are several sewage collection system alternatives. They include a traditional gravity system as well as innovative or 'alternative systems' such as low pressure and vacuum-assisted sewers or a combination of systems.

Groundwater elevation is an important consideration when evaluating the most efficient type of collection system. The high groundwater condition increases the capital costs of gravity sewers as the installation will require dewatering of the soil during construction. The Low-Pressure Sewer (LPS) was determined to offer the most cost-effective approach based on the physical conditions in the study area.

Marine Based Alternatives

Because Fire Island is a barrier island, access requires the use of permitted four-wheel drive vehicles (year-round residents and licensed contractors and service providers), and to a much greater degree, the use of marine transportation. The ferry terminals located in Bay Shore, Sayville and Patchogue would likely provide for the bulk of the transportation to and from the 17 communities for options involving a marine based operational component. A study would have to done for the Fire Island communities with ferry terminals to determine their capacity to accommodate the barges.

Marine based alternatives could play either a supporting role or a major role in managing the wastewater. Specific alternates investigated include:

- Collection/Transfer to Ocean Beach WWTF by Barge
- Collection/Barging Wastewater to Mainland County-owned WWTF
- Central Pump Station/Force Main Under GSB to Mainland to County sewage collection system

1.6 WASTEWATER MANAGEMENT PLAN

The goal of this Wastewater Management Plan is to identify effective and sustainable wastewater treatment alternatives. The main challenge is finding the best solutions for each of the respective communities as they each have their own unique characteristics. Factors that influence the efficacy of treatment technologies include development density, depth to groundwater, vicinity to the ocean or bay, elevation, seasonality of use, as well as characteristics of each community. Sea-level rise must be considered when analyzing the long-term sustainability and functionality of potential systems. A commitment to collaborative stewardship and partnerships between the local municipalities, communities, and various stakeholders will be necessary for success.

I/A systems, marine based options, or community treatment systems on municipal or FINS owned property each have advantages and disadvantages associated with their applicability as a short- or long-term solution. The public health and water quality benefits are also critical.

The reasons for considering transferring the wastewater (marine based solution) include high groundwater conditions, insufficient parcel size and the economy of scale in managing wastewater on a community level, as opposed to on an individual basis. The public health and water quality benefits are higher because of the advanced treatment at the mainland and discharge of the highly treated effluent to the Atlantic Ocean versus continued discharge into the GSB. When considering Sea Level Rise (SLR) and Climate Change, I/A Systems in high groundwater areas on the Island may only be applicable in the near term (5-10 years) and begin to look less sustainable as one looks out another decade or two. SLR will result in higher tides and increases in groundwater elevations. Treatment units installed below grade (I/A's) will experience greater forces of buoyancy and separation distances between the discharge depth of leaching fields and the surface of groundwater will decrease, resulting in a reduction in treatment and in some cases, the possible hydraulic failure of the treatment system. Homes on the north side of Fire Island will see more dramatic changes than parcels located on the southern portion of the Island. The impact of Climate Change, such as more intensive storms with

increased wind, higher tides, storm surge and precipitation, will likely add to the challenge of maintaining effective operations. With SLR and Climate Change here to stay, it is appropriate to consider longer term options, such as transferring wastewater to the mainland.

An example is the City of Long Beach, NY. In partnership with Nassau County, is converting their WWTF to a pump station with a force main to traverse underneath Reynolds Channel to the County's South Shore Water Reclamation Facility in East Rockaway for treatment. The barrier island in Long Beach is susceptible to the same environmental factors as Fire Island. Conversion of the City's WWTF to pump station was determined to be the best alternative to provide continued and long-term wastewater treatment at a larger regional facility located on the mainland, while reducing the potential of destruction of the treatment facility from the next major storm event.

Fire Island will be susceptible to similar conditions with tidal storm surges coming through the barrier island inlets. A pump station could be constructed with hardening measures to sustain tidal surges and high winds. It would be appropriate to consider two (2) pump stations and force mains to the mainland. One would be located south of the site of the Ocean Beach WWTF and one on the island's east end in the vicinity of Davis Park or Cherry Grove. Force main piping from both pump stations would traverse underneath the Great South Bay. These alternatives offer longer term solutions over the next 50-75 years.

Implementation of long-term solutions has associated jurisdictional challenges and complexities:

- Requires County, Towns and communities to work together on a very complex project.
- Require creation of a new sewer district.
- Requires Federal, State, County, Town and local community approvals.

East End Collaborations

Due to the existing wastewater infrastructure in Ocean Beach and proximity of 13 of the 17 communities to each other in the western portion of Fire Island, it is pragmatic to promote collaboration of the four (4) communities on the eastern end. This includes the communities of Cherry Grove, Fire Island Pines, Water Island and Davis Park, which are all located within the Town of Brookhaven. They have an estimated peak summer wastewater flow of just over 0.5 MGD. A wastewater management plan may include a collection system, pump station/force main under GSB to Village of Patchogue.

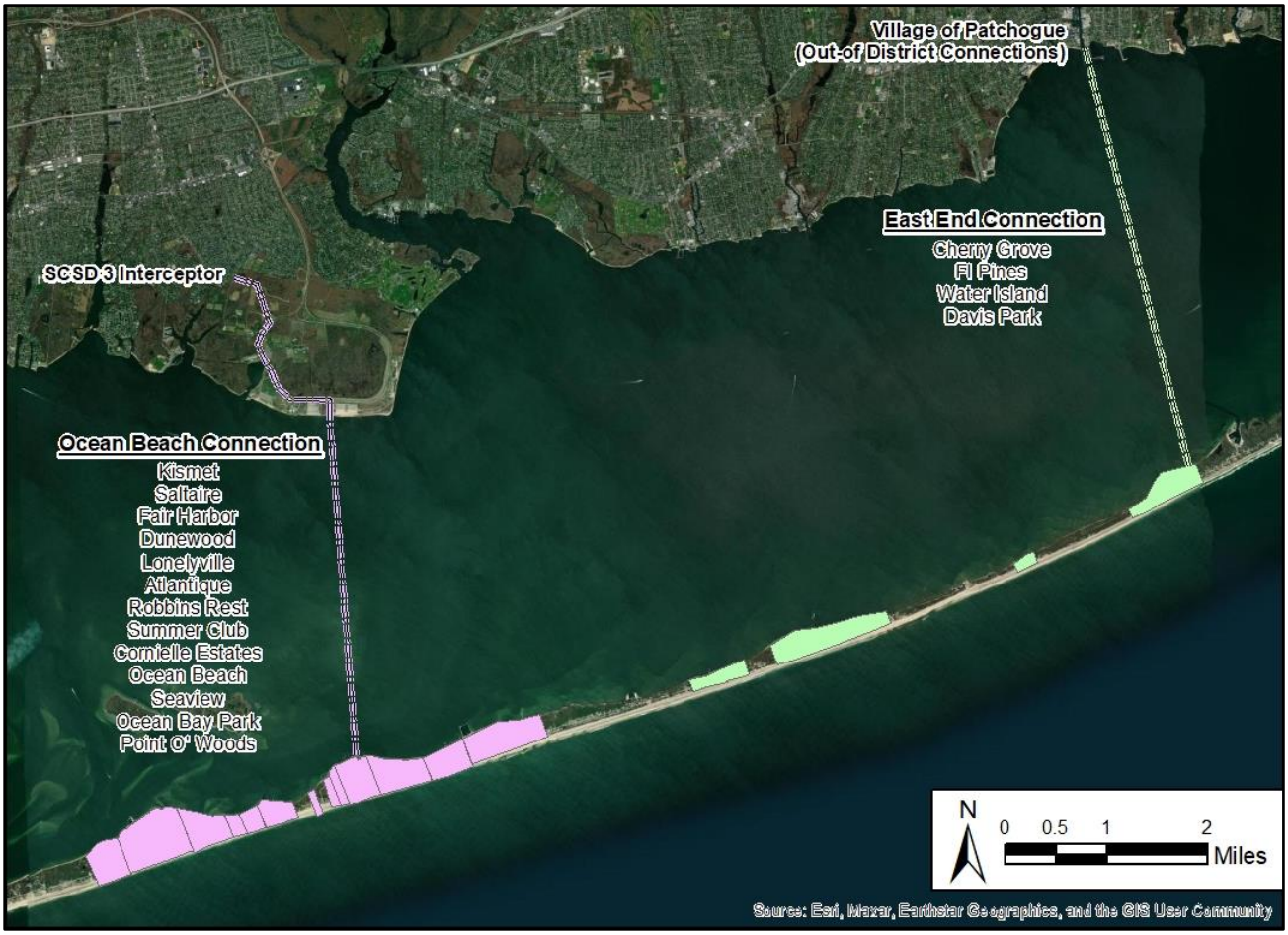


Figure 1-4 – Central Pump Station/Force Main Under GSB to Mainland

Tables 1-3 & 1-4 below present the short/long term alternatives and the advantages and disadvantages of each based on the impacts of SLR and climate change that Fire Island should take into consideration in developing a wastewater management plan going forward.

Table 1-3– Fire Island Wastewater Management Alternatives

Community	I/A Systems		Ocean Beach Sewer District Expansion		Marine Based Alternatives				Innovative Alternative Technologies		Use of FINS Property for Central Treatment Systems Sites
	% of Community Applicable	Estimated Capital Costs	WWTF Upgrades	Collection/ Transfer Infrastructure	Infrastructure for Barging to Mainland Treatment Facility (See note 3)	Central Pump Station / Force Main Under GSB to Mainland Treatment			Incineration Toilets	Mobile Restroom Units / Urine Diversion	
						Potential Communities Served	Estimated Capital Costs				
							Dual Crossing	Single Crossing			
Kismet	57%	$10,275,000	-	-	$10,670,000	See note 1	$204M	$271M	$4,000/ea. Consider for smaller / less dense communities / non rental properties	$60,000/ea. Consider for Ferry Terminals/ Commercial Areas	<u>Community WWTF</u> 20,000 – 50,000 gpd $10M 51,000 – 100,000 gpd $25M 101,000 – 300,000 gpd $75M 500,000 gpd $200M <u>Island Wide WWTF</u> $400M (see note 4)
Saltaire	62%	$19,200,000	-	-	$17,774,000						
Fair Harbor	36%	$10,500,000	-	-	$12,822,000						
Dunewood	61%	$4,575,000	-	-	$4,241,000						
Lonelyville	65%	$4,500,000	-	-	$3,446,000						
Atlantique	56%	$2,325,000	See note 2	2,668,000	$2,893,000						
Robbins Rest	39%	$1,125,000		1,596,000	$1,821,000						
Summer Club	100%	$3,375,000		1,985,000	$2,210,000						
Corneille Estates	70%	$3,600,000		2,805,000	$3,030,000						
Ocean Beach	-	-		-	-						
Seaview	80%	$22,575,000		13,686,000	$14,361,000						
Ocean Bay Park	32%	$7,500,000		10,541,000	$11,666,000						
Point O'Woods	68%	$7,800,000	-	-	$8,305,000						
Cherry Grove	33%	$6,975,000	-	-	$11,834,000	See note 1	$198M				
FI Pines	87%	$37,575,000	-	-	$25,629,000						
Water Island	51%	$1,725,000	-	-	$2,445,000						
Davis Park	61%	$12,750,000	-	-	$10,911,000						
TOTAL	**60%**	**156,375,000**	**-**	**$33,281,000**	**$144,058,000**		$402M	$271M			

Notes:

1. *Cost includes LPS and transfer system infrastructure to a central pump station for each community.*
2. *Further study NYSDEC/upgrade requirements for out of district connections.*
3. *Cost includes LPS/Storage Tank System Infrastructure to transfer to barge for all communities.*
4. *Costs include LPS and transfer system infrastructure to regional WWTF to serve Fire Island located on FINS parkland property.*

Table 1-4 – Short/Long Term Alternatives

I. Short Term	Estimated Capital Costs	Comments
I/A Systems	• Individual: $75,000 each • Cluster: $120,000 – 200,000(1500gpd)	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for communities with larger commercial areas with sufficient land available.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets for smaller/less dense communities. • Mobile restrooms for Ferry terminals/commercial areas and pump out/barge to mainland for treatment.
II. Long Term	**Estimated Capital Costs**	**Comments**
Ocean Beach Sewer District Expansion	• Treatment Plant Upgrades • Collection/Transfer System Infrastructure $33M	• Further study NYSDEC permit/upgrade requirements for out of district connections. • Feasible for neighboring communities to Ocean Beach. • Investigate Suffolk County takeover of WWTF/establish new sewer district.
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $144M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $7,500 for 8-hour shift.
Central Pump Station/Force Main Under GSB to Mainland Treatment	<u>Dual Crossing</u> • Ocean Beach Crossing $204M • East end Crossing $198M <u>Single Crossing (all communities)</u> • Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. This is in addition to the capital costs. • Capital costs include community LPS infrastructure.
FINS Property Treatment Plant Sites	<u>Community WWTF</u> • 20,000 – 50,000 gpd: $10M • 51,000 – 100,000 gpd: $25M • 101,000 – 300,000 gpd: $75M • 500,000 gpd: $200M <u>Island Wide WWTF</u> $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • On-Island WWTF is still vulnerable to sea level rise and climate change.

Table 1-5 – Short/Long Term Advantages and Disadvantages

III. Short Term	Advantages	Disadvantages
I/A Systems	• Approved Technology. • Grants available. • Property owner installed. • No district formation required. • Applicable for new construction and renovation projects. • Treats to < 19 mg/L Total Nitrogen. • Public Health Improvement: Moderate.	• Feasible for 6,000 sf or greater lot size. • May not fit on smaller parcels without variances. • High cost to property owner due to contractor logistics and construction limitations. • Requires pump-out vehicles to access properties for maintenance. Communities have limited access. • Susceptible to sea level rise/climate change as a long-term solution. • Multiple systems(cluster)require legal agreements and County approval. Limited space available. • High groundwater increases construction cost. Leaching systems require importing fill. • Requires Maintenance Contract. • Environmental/habitat impacts: Tree/land clearing.
Incineration Toilets	• Property owner installed. • No water required. • Removes 100% nitrogen. • Moderate cost. • Public Health Improvement: High.	• Not applicable for homes with short-term rentals with above average occupancy. • Limited to remote /less dense communities. • Toilet liner required for each use. • Toilet emissions requires a buffer to neighboring property is recommended. • Pilot study recommended. • Limited to four flushes per hour per toilet.
Mobile Restroom / Urine Diversion	• Minimal infrastructure required. • Removes 100% of water/nitrogen. • Low-flow fixtures reduces water use. • Applicable for Ferry terminals/commercial areas. • Moderate cost. • Potential Re-Use opportunities (fertilizer). • Public Health Improvement: High.	• Barge access required for pump out/disposal. Communities have limited access. • Communities have limited space available. • Barge scheduling & disposal fees. • Public use requires maintenance/security. • Reuse requires regulatory approval. Island location may not be cost effective.

IV. Long Term	Advantages	Disadvantages
Ocean Beach Sewer District Expansion	• Utilizes existing infrastructure. • Applicable to neighboring communities. • Increase service area improves treatment efficiency and distribute costs over larger tax base. • District expansion requires County to take over ownership/operation. • May be an interim solution if central pump station/ force main under GSB is selected as prime solution. • Removes 30% Nitrogen. • Public Health Improvement: High	• Must adhere to NYSDEC permit/upgrade requirements for out of district connections. • NYSDEC may require treatment plant upgrade to include biological nitrogen removal (BNR). May not be feasible due to limited space. • Discharge to Great South Bay. • High cost: Communities need LPS infrastructure to connect. • Treatment plant O&M costs. • Environmental /habitat impacts: Tree/land clearing
Infrastructure for Barging to Mainland Treatment Facility	• Advanced treatment: nitrogen removal. • Discharge to the Atlantic Ocean via Bergen Point STP outfall discharge. • Removes 100% Nitrogen to Great South Bay. • No treatment plant O&M cost. • Not susceptible to climate change/sea level rise. • Public Health Improvement: High	• Feasible for communities with Ferry access and capacity at freight docks. • Barge operation, wastewater transfer & disposal costs. • High cost: Communities need LPS infrastructure transferring wastewater to storage tank. • Communities have limited land available to accommodate storage and barge operations. • Requires creation of community sewer districts. • Environmental /habitat impacts: Tree/land clearing
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Advanced treatment: nitrogen removal. • Discharge to Atlantic Ocean via Bergen Point STP outfall discharge. • Removes 100% Nitrogen to Great South Bay. • Larger service area increases tax base. • No treatment plant O&M cost. • Less susceptible to climate change/sea level rise. • Public Health Improvement: High	• High cost: Communities need LPS infrastructure transferring wastewater to central pump station/ force main under GSB to mainland treatment. • Vacant space needed to accommodate pump stations. • Out of district connection subjected to Suffolk County connection fee and pro-rata user fees based on flow. • Requires creation of Island-wide sewer district. • Environmental/habitat impacts: Tree/land clearing

Community Wastewater Management Plans

Each of the 17 communities on Fire Island are unique with different challenges for developing an effective and sustainable wastewater management plan. A survey questionnaire was distributed to each community and workshops held with community leaders to collaborate on the potential wastewater treatment alternatives.

Appendix A presents individual community wastewater plans that summarize the action plan elements for guidance on the next steps on a community and Island-wide basis. An east end community plan for Cherry Grove, Fire Island Pines, Water Island and Davis Park is provided.

Road Map and Action Plan Summary

Table 1-6 presents a summary of the action plan elements that are recommended for the planning and implementation of a Fire Island wastewater management plan road map.

This provides direction and guidance on the next steps to advance a successful wastewater management program for Fire Island.

Table 1-6 – Wastewater Management Road Map and Action Plan

Item Description	Action Plan
Innovation/Alternative (I/A) Systems	• Highest potential acceptance with installation viable in several communities. • Susceptible to sea level rise/climate change not considered a long-term solution. • Pump out/maintenance access is critical issue that requires further study. • NYSDOH/SCDHS waiver/variances required. Needs further discussion/review when draft standards are published. • Further study recommended to establish Island wide maintenance/service program and logistics for companies interested in serving the Island. • Environmental/Habitat impacts from land and tree clearing requires further investigation.
Innovative Technologies	• Further research recommended on applicability and interest of incineration toilets in smaller/less dense communities. • Evaluate mobile restrooms at ferry docks/commercial areas and pump outs/disposal logistics. • Small scale testing/pilot study is recommended.
Ocean Beach Sewer District Expansion	• Further study recommended on WWTF NYSDEC permit/upgrade requirements for sewer district expansion. • Initiate meetings with Suffolk County on takeover of WWTF to determine interest. • Highest potential for neighboring communities to Ocean Beach. Discuss interest/and obtain letters of commitment. • Potential interim solution if central pump station/force main under GSB is ultimate solution.
Marine Based Alternatives and use of FINS property.	• Should be further vetted and engineering study conducted on the most feasible alternative. • Further investigation is recommended with Ferry companies for logistics and access. • Requires community commitment and land for hosting storage tanks. • Initiate meetings with regulatory agencies to determine permitting requirements. • Further discussion with FINS is recommended on approval process to utilize park land for treatment plant sites and sewer infrastructure.
Potential Project Implementation	• Research grant funding opportunities. • Develop communication and outreach plan to engage stake holders/communities' interest and acceptance.

2. INTRODUCTION

2.1 Background

Fire Island is a 32-mile-long barrier island located off the south shore of Suffolk County, with a land area of approximately 10 square miles and contained within the Fire Island National Seashore (FINS). Fire Island is approximately 80 percent public or undeveloped land. There are seventeen (17) residential communities, with an estimated 4,000 homes and a year-round population of approximately 300. Fire Island attracts upwards of 2 million visitors each year, primarily during the summer months. Approximately 25% of the visitors arrive through one of the Fire Island National Seashore sites managed by the National Park Service (NPS). The remainder of visitors generally visit one of the 17 communities, municipally owned beaches and or marina facilities. The island population includes a diverse mix of seasonal homeowners, year-round residents, short-term renters and day trippers. There is one wastewater treatment plant located in Ocean Beach that has a design capacity of 0.5 Million Gallons per Day (MGD) that has recently been upgraded and hardened post Superstorm Sandy. This facility handles the wastewater for the 575 parcels connected within the Village. The bulk of the wastewater received and treated at this facility is generated by residents and visitors. The balance of the homes and businesses on Fire Island use onsite wastewater treatment systems (OWTS) comprised of cesspools and septic tanks (pre-1972) to treat wastewater from the parcels. Due to the high groundwater levels on the majority of FI, the effectiveness of the OWTS is marginal due to limited separation from the point of the effluent discharge to the surface of the groundwater. Based on information contained in the County's Subwatershed Management Plan (SWP), FI is contributing approximately 6% of the total nitrogen in the Great South Bay - eastern portion and Shinnecock Bay areas.

In June 2018 a Coalition of local, state, and federal agencies, nonprofit organizations and Fire Island stakeholders was formed to develop wastewater management strategies for Fire Island. Citizen Campaign for the Environment (CCE) received a

Suffolk County grant and engaged the services of Cameron Engineering, an IMEG Company to assist in researching and confirming the existing conditions in each community and identifying viable options for treating wastewater on a community and Island wide basis.

This Wastewater Management Plan also provides guidance for the future planning and implementation of wastewater treatment measures including:

- An overview of the physical environmental settings on Fire Island relative to groundwater, sea level rise and climate change.
- Population demographics in identifying concentrations of people and sewage flow generation.
- Wastewater sewage pollutant loadings.
- Potential wastewater treatment options.
- Expansion alternatives of the Village of Ocean Beach Wastewater Treatment Facility (WWTF).
- Innovative and Alternative (I/A) technologies and other new technologies.
- Recommended code changes to facilitate installation of I/A systems.
- Marine based alternatives such as barging or pumping wastewater to the mainland wastewater treatment facilities.
- The National Park Service (NPS) restrictions that impact potential use of land for wastewater treatment.
- Suffolk County, Town of Islip and Brookhaven codes, limitations and recommended changes to accommodate the unique conditions of Fire Island.
- Screening of the potential treatment options and associated capital costs.
- Wastewater Management Plans for each of the 17 communities.
- An Action Plan summarizing the potential short-term and long-term solutions for Fire Island, and an implementation Road Map.

Figure 2-1 shows the location and expansiveness of Fire Island.

Figure 2-1 – Fire Island Map

2.2 Description of Communities/Wastewater Management Practices

Most communities on Fire Island are unincorporated hamlets within the Town of Islip and Brookhaven (with a section of public parkland located within the Town of Babylon). Ocean Beach and Saltaire are both Incorporated Villages. Infrastructure and wastewater management/treatment vary from community to community.

Kismet (Town of Islip)

Kismet is the westernmost residential community on Fire Island. Due to its location, it is perhaps the most accessible Fire Island community. Visitors can walk to Kismet from Robert Moses State Park in about 30 minutes or from the Fire Island Lighthouse in about 15 minutes.

There are approximately 225 homes and condominiums within the community, with one public bathroom. Most homes utilize traditional septic tanks/leaching pools. Kismet is home to the largest year-round population on Fire Island. As a result, in the wake of Superstorm Sandy, many of these homeowners have rebuilt their homes with more resilient materials and design concepts. Based on wastewater survey results, there is only one (1) I/A wastewater treatment system presently installed. The small lot sizes make it difficult to meet SCDHS Standards for siting onsite treatment systems. There is limited space for cluster or centralized treatment systems unless adjacent FINS property is made available.

Kismet has two restaurants, a general store, a pizzeria, shops and a 50-slip commercial marina. Bulkhead condo also has 20 slips.

Kismet is accessed from the west by foot, or by public ferry (from Bay Shore), water taxi or private vessel.

Village of Saltaire (Town of Islip)

Saltaire is primarily a residential community and one of two incorporated villages on Fire Island. It is located at one of the widest points of the barrier island.

There are approximately 400 homes, making it Fire Island's second largest residential community. The year-round population is estimated between 30-45 residents. Saltaire has one commercial establishment, a general market/liquor store. Most homes utilize

traditional septic tanks/leaching pools. Saltaire reports approximately eight (8) I/A systems have been installed. There is limited space for cluster or centralized treatment. Access to Saltaire is provided by public ferry (from Bay Shore), water taxi or private vessel.

Fair Harbor (Town of Islip)

Fair Harbor is a residential community with one restaurant (Fair Harbor) and a public restroom.

Fair Harbor comprises 360 homes and has few year-round residents but with approximately 500-day trippers, swells to 1,200 during the peak season. Most homes utilize traditional septic tanks/leaching pools. Fair Harbor reports approximately 1 or 2 I/A systems have been installed. There is limited space for cluster or centralized treatment. There is one (1) public bathroom owned by the TOI, and the new fire house has bathroom facilities for public use during their hours of operation.

Access to Fair Harbor is provided through public ferry (from Bay Shore), water taxi or private vessel. Central Walk runs through the middle of the community, with a few other cement walkways. The rest of the community has 5' wide wooden walkways. Central Walk provides access for emergency vehicles, dumpster removals, etc. The majority of the residents use bicycles and golf carts as their mode of transportation.

Dunewood (Town of Islip)

Dunewood is a residential community with approximately 100 homes and has no commercial area. Dunewood has one public restroom (TOI) and does not see a large summertime population boom. Most homes utilize traditional septic tanks/leaching pools. Dunewood reports approximately 3 or 4 I/A systems have been installed to date. There is limited space for cluster or centralized treatment facilities.

Dunewood is accessed via public ferry (from Bay Shore), water taxi or private vessel (though Dunewood does not have public marina/docking facilities). Cars, golf carts and bicycles can access properties as there are some concrete sidewalks, with one wooden walkway. The majority of the concrete walks have access for EMS/Fire vehicles.

Lonelyville (Town of Islip)

Lonelyville has approximately 80 homes, one public restroom and no commercial or public facilities within the community. There are few year-round residents and summer visitors. Most homes utilize traditional septic tanks/leaching pools. Lonelyville reports only one (1) I/A system has been installed. There is limited space for cluster or centralized treatment systems. The community consists of two (2) HOAs, Lonelyville Property Owners Association (West Side) and Taxpayers Association of Lonelyville (East Side). The Lonelyville Property Owners Association has 25 seasonal residences and 1 year-round resident.

Taxpayers Association of Lonelyville does not have direct public ferry service (Dunewood is the closest public ferry terminal) and most residents rely on the nearby communities of Fair Harbor (to the west) and Ocean Beach (to the east) for commercial goods and services. Wood decking, designed and intended for use by pedestrians, provides access to properties, and the only vehicles with access to these are bicycles and golf carts.

Atlantique (Town of Islip)

Atlantique is one of the smaller residential communities on Fire Island. There are approximately 50 homes within the community, with no private commercial uses. Atlantique is located at one of the narrowest points of Fire Island. The narrow strip of land is vulnerable to flooding and surging bay water during storms, as it was one of the Fire Island communities most impacted by Superstorm Sandy

The community is located directly adjacent to Atlantique Beach, which is operated as a Town of Islip recreational facility. This Town facility extends from the 159-boat slip Atlantique Marina on the bay (north side) to the public ocean beach (south side). The Marina includes a full-service snack shack and numerous public amenities. The TOI facility is not included in population and wastewater estimates. However, the closeness of ferry access and land availability makes the TOI marina a positive attribute to the community.

Most homes utilize traditional septic tanks/leaching pools. Atlantique reports no known I/A system installations to date. There is limited space for cluster or centralized treatment systems.

It is accessible by public ferry (from Bay Shore), water taxi or private vessel, as the full-service Atlantique Marina attracts many boaters throughout the summer season.

Robbins Rest (Town of Islip)

Robbins Rest has approximately 37 residential homes with no commercial or public facilities and is not accessible by public ferry or water taxi. The community is bounded by FINS park areas on both sides. Most homes utilize traditional septic tanks/leaching pools. Robbins Rest reports no known I/A systems installed at this time. While the area is small (in comparison with other FI communities) and has non-developed FINS property on either side, a community cluster system may be a consideration for wastewater treatment. Access to Robbins Rest is limited, with no direct ferry service. The community has concrete roads/walkways.

Summer Club (Town of Islip)

Summer Club is a condominium community located just west of Ocean Beach and Corneille Estates. There are 45 homes located along West (Schooner) Walk and East (Sloop) Walk, with no commercial or visitor services. Most homes utilize traditional septic tanks/leaching pools. Summer Club reports approximately eight (8) I/A systems have been installed to date. There is limited space for cluster or centralized treatment.

Access to Summer Club is limited, with no direct ferry service. Those arriving by ferry access Summer Club via Ocean Beach and the Midway Walk. The community has concrete roads/walkways.

Corneille Estates (Town of Islip)

Corneille Estates is a residential community and is home to the only public school on Fire Island, the Woodhull School. There are approximately 69 homes within the community, with no commercial uses. Public facilities are limited to the Woodhull School's fields, ball courts and public library. Wastewater generated from the Woodhull school is conveyed and treated at Ocean Beach's WWTP. The properties within the

community are larger than many other Fire Island communities and therefore more suitable for I/A's. Most homes utilize traditional septic tanks/leaching pools. Corneille Estates reports no known I/A systems to have been installed to date.

Access to Corneille Estates is limited, with no direct ferry line, water taxi service or marina within the community. Residents and visitors frequently rely on neighboring Ocean Beach for their transportation services as well as Ocean Beach's restaurants, shops and facilities for entertainment and purchasing goods.

Village of Ocean Beach (Town of Islip)

Ocean Beach is one of two incorporated villages on Fire Island and consists of the downtown area, with commercial and recreational bayfront. Main Street is the center of this commercial district, with restaurants, hotels, bars and shops located in close proximity to the Ferry Terminal and bayfront.

Considered Fire Island's largest community, there are approximately 600 homes in Ocean Beach, with an increasing presence of year-round residents (Census/Visitor ship numbers to be updated). Ocean Beach owns and operates a WWTP with a design capacity of 0.5 MGD.

Ocean Beach is accessed by public ferry (from Bay Shore), water taxi or private vessel.

Seaview (Town of Islip & Town of Brookhaven)

Seaview is a residential community located just east of Ocean Beach. The community has approximately 368 homes (approximately 290 homes are located in the Town of Islip and approximately 70 in the Town of Brookhaven), with limited commercial operations along the bayfront. Commercial uses include a nursery, market and liquor store. Most homes utilize traditional septic tanks/leaching pools. Seaview reports approximately 15 I/A systems have been installed and project 20% of the homes to have I/A's in the next 10 years. The western side of the community has interest in connecting to the Ocean Beach WWTP.

Seaview is easily accessible by public ferry (from Bay Shore), water taxi or private vessel and has paved roadways.

Ocean Bay Park (Town of Brookhaven)

Ocean Bay Park has approximately 300 homes within the community with an active commercial bayfront. The commercial area includes public restrooms, waterfront restaurants, bars, a marina, two hotels, markets and shops. Most homes utilize traditional septic/leaching pools onsite wastewater treatment and disposal systems.

Access to Ocean Bay Park is available via public ferry (from Bay Shore), water taxi or private vessel. The roadways throughout the community are made from various materials (concrete, asphalt, gravel and wood decking, compacted dirt) with most properties accessible by vehicles.

Point O' Woods (Town of Brookhaven)

Point O' Woods (POW) has approximately 130 homes and is a unique community as it retains common land ownership under the Point O' Woods Association, with homeowners maintaining a long-term lease on their homes. The community has a ferry terminal, general store, member-only eating club, a tennis /community center and church that are not generally open to the public except on limited occasions. Just to the east of POW lies the Sunken Forest.

Most homes utilize traditional septic tanks/leaching pools. POW reports two I/A systems in the application process and three planned for installation in 2023.

The homeowner's association makes cluster and central treatment systems easier to implement. A previous preliminary study commissioned by the Point O' Woods Association identified individual or cluster systems as a potential feasible wastewater treatment alternative that would require variances from the current regulations.

Access to POW is available via water taxi or private ferry. The community has concrete and wood decking for roads/walkways that are accessible by some emergency vehicles, and sand roads for commercial vehicles.

Cherry Grove (Town of Brookhaven)

Cherry Grove (The Grove) is nestled between the Sailor's Haven Visitor Center and Sunken Forest to the west of the National Seashore and Fire Island Pines to the east.

There are approximately 270 homes with a commercial district featuring restaurants, theaters, hotels and shops. There are approximately 20 year-round residents, growing to over 2,000 seasonal residents during the summer months. Most homes utilize traditional septic tanks/leaching pool. Approximately ten (10) I/A systems have been installed. There is limited space for cluster or centralized treatment unless adjacent FINS property is made available.

Access to Cherry Grove is limited to private boats with private marina access, ferry service (from Sayville) or private water taxi. There are no established roads, only wood decking throughout the community.

Fire Island Pines (Town of Brookhaven)

Fire Island Pines has approximately 600 homes and 100 condominium units. The year-round resident's number is estimated at 120 and the summer population often expands upwards of 4,000.

The Pines Harbor area has commercial establishments, which include restaurants, markets and shops. Most homes utilize traditional septic tanks/leaching pools. Approximately fifteen (15) I/A systems have been installed. There is limited space for cluster or centralized treatment unless adjacent FINS property is made available.

Fire Island Pines is accessed by public ferry (from Sayville), water taxi or private vessel (limited transient slips are available at the Pines Marina). The accessways/roads in the community are made of wood decking and compacted dirt.

Water Island (Town of Brookhaven)

Water Island is one of the Island's most secluded residential communities, surrounded by FINS, natural dunes, and open space on each side. Water Island has approximately 50 homes and one year-round resident. There are no commercial or public facilities. Water Island has no restaurants or hotels. There are one or two I/A systems within the community.

Access is provided through limited ferry service from Sayville, water taxi or private vessel. Wagons are used throughout the community.

Davis Park (Town of Brookhaven)

Davis Park has approximately 270 homes, with few year-round residents. During peak season, this increases to over 2,000 visitors. Davis Park commercial area includes the Harbor Store and Snack bar, Casino Café and CasBar. Public restrooms are also available.

Davis Park is located adjacent to the FINS Otis Pike Wilderness Area. The community includes the smaller residential communities of Davis Park, Leja Beach (to the west) and Ocean Ridge (to the east), which are together commonly referred to simply as Davis Park.

Access to Davis Park is provided through ferry service (from Patchogue), water taxi or private vessel. There is no ferry service from December through March. The accessways/roadways are mainly wood decking and sand. The Town of Brookhaven operates one of the largest marinas on Fire Island at Davis Park, with approximately 250 slips for boats.

Figure 2-2 shows the Fire Island National Seashore, Communities, and Ferry Lines.

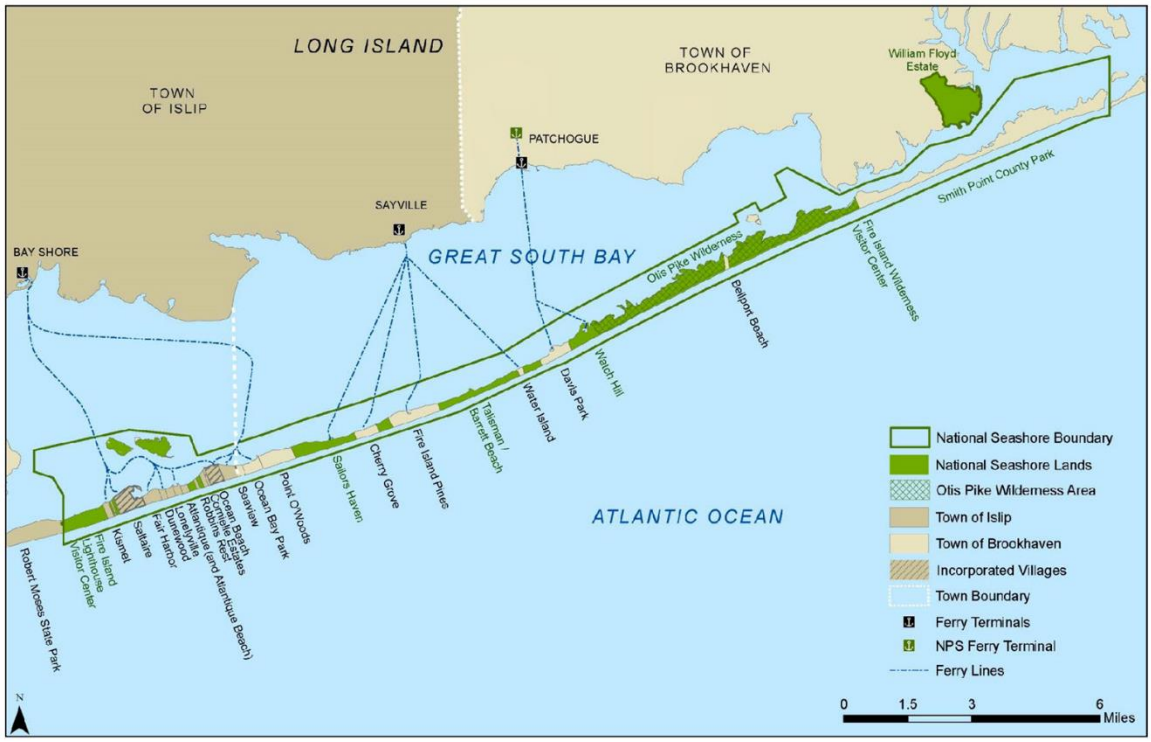


Figure 2-2 – Fire Island Seashore, Communities and Ferry Lines

2.3 Groundwater and Hydrology

Fire Island is a barrier island that consists of highly permeable deposits of clay, silt, sand, and gravel that sit atop the sloping bedrock of the continental shelf. The sand and gravel deposits immediately below the surface are collectively known as the upper glacial aquifer. Older, deeper deposits make up the Magothy aquifer which is hydraulically separated from the upper aquifer by lower permeability sediment and saline groundwater. While shallow groundwater from the upper glacial aquifer was historically used as a domestic source of drinking water on Fire Island, this supply has largely been abandoned. Most drinking water of Fire Island is now pumped from the deeper Magothy aquifer.

The groundwater immediately under the surface of Fire Island is a freshwater lens that is surrounded on all sides by saltwater: the Atlantic to the south, Great South Bay, Moriches Bay and other embayment's to the north, and saline groundwater underneath. The depth to groundwater varies for Fire Island at a given location, and its location along the cross section of the island. According to USGS 2013 data, elevations vary from 1 to 3 feet on the northern bay side to 9 to 12 feet on the south side (Atlantic) where protective dunes are located.

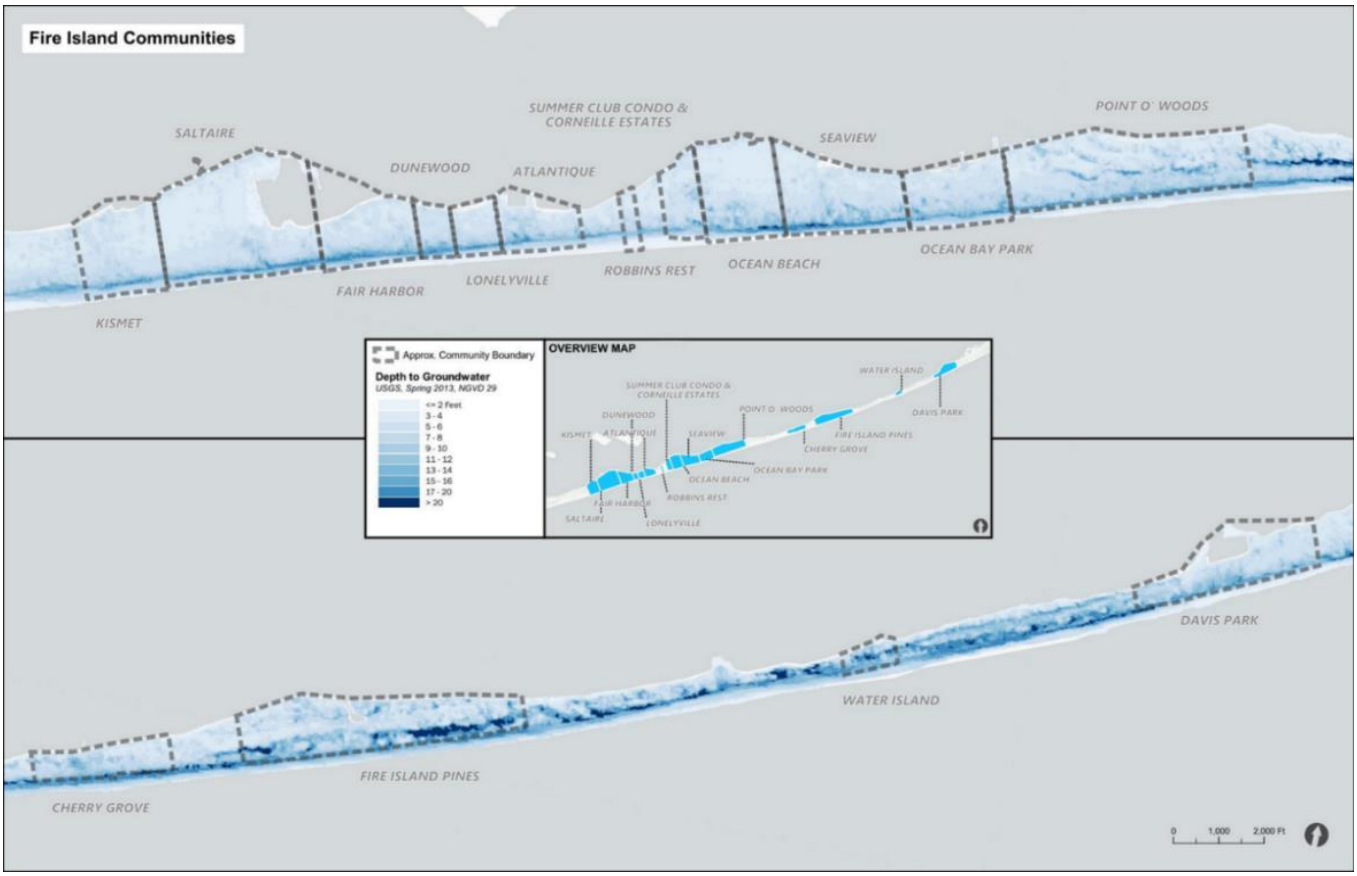


Figure 2-3 – Depth to Groundwater

2.4 Public Health and safety

Groundwater and surface water pollution is of concern because of its impact on coastal ecosystems, and the potential human health risks associated with recreational activities. The cesspools and septic systems used on Fire Island may contribute pollutants and Contaminants of Emerging Concern (CECs) to surface-water bodies due to shallow groundwater and short travel distance to the Great South Bay.

The highest public health risk is associated with ingestion when pathogens, including bacteria, viruses and protozoans, that reach groundwater or surface waters.

OWTS can be significant sources of CEC's pharmaceuticals, personal care and domestic use products, and endocrine active compounds, leaching into surrounding water.

2.5 Sea Level Rise/Climate Change

The USGS and ACOE expect sea level rise to increase approximately 30 inches by the year 2050. Fire Island residents report increases in groundwater elevations of 1 – 2 feet over the last 20 years, increasing in flooding during rain events and storm tides particularly on the bayside communities. When considering I/A's systems, the rising groundwater will impact their effectiveness and failures will result in an increase in public health risks.

2.6 Parcel Land Use

As shown below, the land use along Fire Island is not as diverse as other communities within Suffolk County. Each parcel in the figure is color-coded based on land use from Suffolk County's database (typically used for tax purposes). The parcels that have a yellow designation indicate a residence with the ability of year-round/full-time occupancy, while purple designations indicate seasonal occupancy. Moving west to east, the year-round residences decrease while the seasonal residences increase. The Summer Club community is comprised of condominiums and coded orange.

There are very few commercial uses (designated with red), mostly concentrated near bayside (north shore), and near the ferry terminals. The majority of the commercial uses are located in Ocean Beach. Commercial uses have higher water usage/wastewater generation rates. If they are located in Ocean Beach, this wastewater is treated at their WWTF. The parks or conservation areas (coded green), indicate former residences that were impacted by the ocean and bought by the government.

The land use codes deciphering year-round and seasonal residences are not necessarily accurate depiction of Fire Island's true population. In some cases, a year-round designation was given based on type of construction (ex. adequate insulation or installed heating elements), rather than use. This discrepancy is discussed further in Section 4.2, which describes different methodologies for determining wastewater flow estimates.

The land use information in Figure 2-4 regarding parcel use (residential vs. commercial) and distribution, was used in determining locations of commercial areas and also indicates developed parcels that are not within the designated 17 communities in this study.

Figure 2-4 – Parcel Land Use Map

3. WASTEWATER TREATMENT REGULATIONS/GUIDELINES

3.1 New York State Department of Health

The New York State Department of Health (NYSDOH) has jurisdiction under Public Health Law Section 201(1)(I) to regulate the design of residential onsite wastewater treatment systems (OWTS) and to promote effective maintenance of those systems to ensure public health is protected.

Specifically, residential OWTS design standards are established under Appendix 75-A as the minimum statewide standards under Title 10 of the Official Compilation of Codes, Rules and Regulations of the State of New York (10NYCRR). Appendix 75-A, in accordance with New York State Education Law, the design of OWTS requires either a professional engineer or a registered architect licensed to practice in New York State by the New York State Education Department. The components of a typical OWTS include septic tank, distribution piping, and absorption/leaching area.

3.1.1 Appendix 75-A

Appendix 75-A is titled "Wastewater Treatment Standards – Residential Onsite Systems" and is dated February 3, 2010. Appendix 75-A applies to OWTS serving residential properties and receiving sewage without the admixture of industrial wastes or other wastes, as defined in Environmental Conservation Law, Section 17-0701, in quantities of less than 1,000 gallons per day (gpd).

Local health departments may establish more stringent standards and if such standards have been established, the more stringent standard shall apply. However, a local health department may not adopt standards less stringent than the State standard unless a General Waiver has been issued by the State Commissioner of Health or his designated representative as provided in Part 75 of this Title, or the local health department is otherwise legally authorized to adopt such standards. In addition, when individual sewage systems overlay a drinking water aquifer, local health departments may establish population density limits and minimum lot sizes for residential development with on-site sewage treatment systems.

In addition to Appendix 75-A, NYSDOH produced a handbook titled “Residential Onsite Wastewater Treatment Systems, Design Handbook” which serves to provide information and guidance to help uniformly implement for the design of OWTS.

NYSDOH understands that certain situations would require deviation from design standards, as such, it offers an option for the local jurisdiction to issue a specific waiver for an individual situation because a hardship or other circumstance makes it impractical to comply with Appendix 75-A.

A specific waiver is not required where a general waiver has been issued to a county health department to address a specific design standard deviation. Multiple general waivers regarding various requirements also have historically been issued to local health departments and the New York City Department of Environmental Protection (NYCDEP) to address unique local area needs and conditions.

Suffolk County Department of Health Services (SCDHS) has been delegated authority to implement Appendix 75-A on behalf of the NYSDOH. General waivers, specifically for Suffolk County that are in effect, are summarized in Table 3-1 below.

Table 3-1 – NYSDOH Appendix 75-A General Waivers for Suffolk County

Suffolk County – General Waivers		
1981	Soil test modifications and seepage pit design criteria.	75-A.4(d) & 75-A.8(h)(2)(i)
1982	Seepage pit design criteria.	75-A.8(h)(2)(ii) & 75-A.8(h)(3)
1993	Modified separation requirement between septic tank and dwelling slab.	75-A.4(b)
	Modified separation requirement between absorption facilities and property lines.	75-A.4(b)
	Allow absorption facilities 60 to 150 feet from individual wells with added protective measures for wells.	75-A.4(b)
	Allow multiple septic tank outlets under specific conditions.	75-A.8(h)(4)(ii)
	Modified vertical separation requirement between seepage pits and high ground water.	75-A.8(h)(2)(ii) & 75-A.8(h)(3)
	Modified separation requirement between adjacent seepage pits.	75-A.8(h)(3)(vi)

Since many parcels on Fire Island are too small to be able to meet current setback requirements for the installation of innovative/alternative onsite wastewater treatment systems, a reduction in setback requirements, if found to be acceptable, could be sought by SCDHS as a general waiver from NYSDOH for all Fire Island communities. A typical OWTS in Suffolk County includes a septic tank, distribution piping, and leaching area, as shown in Figure 3-1.

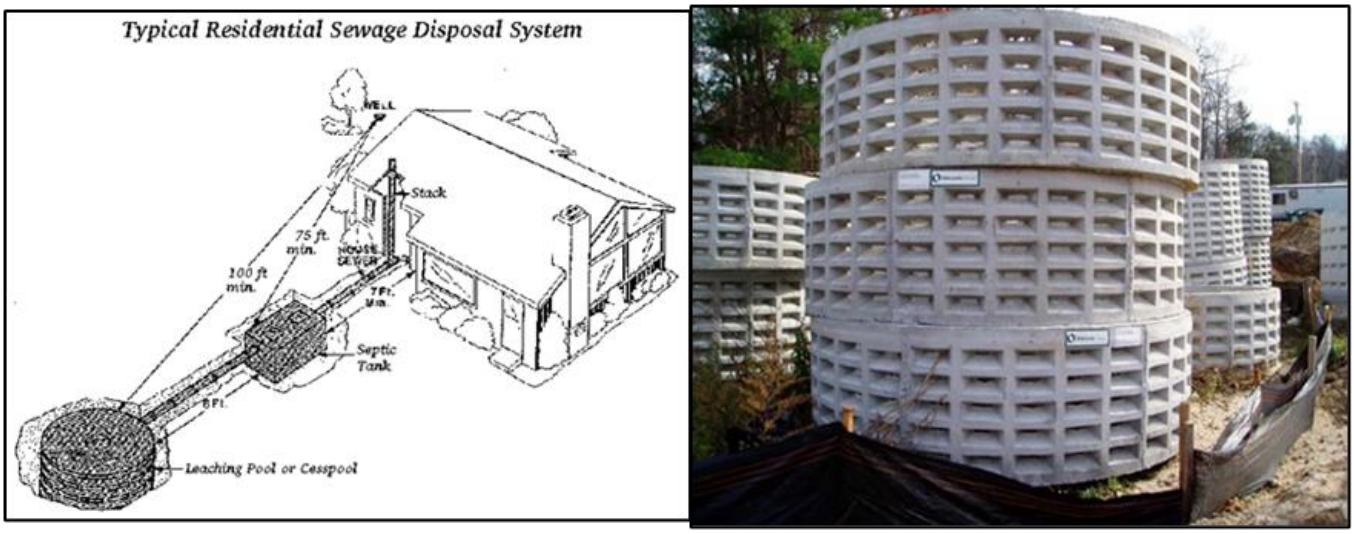


Figure 3-1 - Typical On-Site Wastewater Treatment System (Left) & Precast Leaching Rings (Right) (Source: Suffolk County Subwatershed Wastewater Plan, 2015)

3.2 Suffolk County Department of Health

The Suffolk County Department of Health (SCDHS) regulates pollution and wastewater discharge in accordance with its own local codes such as Article 6 of the Suffolk County Sanitary Code, and residential septic systems are regulated on behalf of NYSDOH.

Various water quality related issues within Suffolk County have been increasing over the past decades, including higher nitrogen concentration in the groundwater, and excessive nitrogen in the local waterbodies that have been identified to have caused various water quality related issues including the following:

- harmful algal blooms
- beach closures
- decrease in shellfish and finfish stocks
- decrease in commercial fishing economies

- decrease in property values
- decrease in dissolved oxygen concentrations
- decrease in biodiversity due to hypoxic events
- higher elevation of storm surge
- increase in erosion due to lack of vegetation that anchors the shoreline

In response to these mounting water quality concerns, Suffolk County released the Suffolk County Comprehensive Water Resources Management Plan (Comp Plan) in 2015 that outlined various water related issues as well as recommendations. One of the recommendations of the Comp Plan was to address nitrogen pollution from on-site wastewater treatment systems. Subsequent to the release of the Comp Plan, the attention to nitrogen pollution received another boost from the State of New York and it became a New York State priority in 2015 with New York State appropriating $5 million to develop the locally focused Long Island Nitrogen Action Plan (LINAP). Suffolk County is one of many important local partners of LINAP in promoting actions to reduce nitrogen loading into the local water bodies.

With the formation of LINAP, Suffolk County examined previous studies of nitrogen pollution into major tributaries in Suffolk County and realized that those studies were limited in scope and that an integrated watershed-based evaluation that delineates all the County's subwatersheds was never performed. As such, based on common assumptions with established boundary conditions, Suffolk County initiated the preparation of the Subwatershed Wastewater Plan (SWP) and finalized the SWP in July 2020. The SWP provided a Countywide wastewater management road map outlining implementation action to reduce nitrogen loading from wastewater sources to mitigate nitrogen related ecosystem degradation for the entire county. Details of the SWP in relation to required nitrogen reduction action from residential septic systems are discussed in following sections.

3.3 Suffolk County Subwatershed Wastewater Plan

The Suffolk County Subwatershed Wastewater Plan (SWP) is a comprehensive look at the state of nitrogen pollution in Suffolk County. The plan modeled nitrogen loads from various wastewater sources such as on-site wastewater treatment systems, wastewater treatment plants, fertilizer and atmospheric deposition at the parcel level to the groundwater. With the results from data analyses, cost analyses and state-of-the-art modeling, nitrogen loadings and reduction goals were developed for each of the 190 subwatersheds, or water bodies. Suffolk County Subwatershed Wastewater Plan (SWP) identified on-site wastewater treatment systems (OWTS) as the major contributor of excess nitrogen to its local water bodies at 63.6%. Fertilizer as the second largest contributor of nitrogen at 26.9%, followed by atmospheric deposition at 4.4%, pets at 3.9%, and groundwater discharge from sewage treatment plants at 1.2%.

Because wastewater from OWTS is the largest load of nitrogen into the groundwater, with subsequent groundwater underflow into surface water, the SWP's recommendations, among others such as sewer extension, is to target the approximately 360,000 residential on-site wastewater treatment systems (OWTS), i.e., septic or cesspools, and 11,798 commercial on-site treatment systems for nitrogen reduction.

The SWP also looked at all the subwatersheds and ranked them based on nitrogen load, ecological endpoints, nitrogen load goals, residence time, surface water quality data, and ecological sensitivity to predicted nitrogen loads. Priority rankings ranged from 1 to 4 with 1 being the highest priority for nitrogen reduction actions. The 190-surface water subwatersheds were then grouped together into wastewater management areas based on similar rankings, nitrogen load reduction goals, and respective estuary management programs.

Based on a three-year investigation, USGS published a scientific report in 2009, "Analysis of the Shallow Groundwater Flow System at Fire Island National Seashore, Suffolk County, New York", which concluded that 82% of the total nitrogen load from Fire Island enters the back bay areas including the Great South Bay. As designated by the Suffolk County Subwatershed Wastewater Plan (SWP), Great South Bay is within Wastewater

Management Area 18 – Great South Bay Restoration Area 1. According to the SWP, this Wastewater Management Area includes 22 individual water bodies located within and connected to the unsewered sections of Great South Bay. Water quality in this area is poor with documented frequent occurrences of harmful algal blooms, low dissolved oxygen in the water column, and poor water clarity with elevated levels of chlorophyll-a. Wastewater Management Area 18 is ranked as Priority 1 with a reduction goal of 93 percent total nitrogen. This reduction goal represents the highest overall regional load reduction in Suffolk County.

Based on the SWP, Suffolk County prioritized the extension of sewers and replacement of OWTS with Innovative/Alternative (I/A) on-site wastewater treatment systems that are designed to remove higher levels of nitrogen than conventional OWTS. In short, for homeowners, as of the date of this report, any new residential construction or major residential renovation would trigger the requirement for an I/A treatment system. Major renovation is when the costs of reconstruction are 50% or greater than the market value of the structure, or a new bedroom is added and if there is an increase in overall square footage or building footprint.

The currently approved I/A systems by Suffolk County for Provisional use include the SeptiTech STAAR, Orenco AX, Norweco Hydro-Kinetic, and Norweco Singulair. The currently approved manufacturers by Suffolk County for General Use are Hydro-Action and FujiClean. Details on the I/A program and related grants program are discussed in Chapter 4.

3.4 Town of Brookhaven/Islip (Land Use Alternatives)

The Town of Islip does not require a building permit for septic or I/A treatment systems per se and defers to SCDHS approval of onsite wastewater treatment systems. The Town of Brookhaven does not require a building permit and defers to SCDHS approval; however, the Town code requires an I/A system for residential parcels located in the Nitrogen Protection Zone. Nitrogen Protection Zone (NPZ) is defined by the Town as zones that encompasses an area within 500 feet of surface waters such as the Atlantic Ocean, Long Island Sound, the Great South Bay, the Forge River, the Carmans River, and other rivers,

lakes, streams, ponds, ditches, or canals. Residential properties within 500 feet of surface waters tend also to lie within flood zones or coastal erosion hazard areas and are subject to flooding and/or collapse if located on a bluff or dune that may result in nitrogen and pathogens discharges from sanitary systems affecting surface waters to a greater degree than properties located further inland of surface waters. The requirement for an I/A system is solely on new dwelling or structure, or construction that fully replaces demolished existing structures, or residential properties, commencing January 1, 2017.

3.5 Description of Other Similar Communities

Similar to Fire Island, many coastal communities located on the eastern seaboard have similar topography, geology and groundwater setting, as well as concerns relating to wastewater management in the present and future due to climate change. Below are discussions on three (3) communities with similar settings as Fire Island and how each deal with their wastewater management.

3.5.1 Provincetown, Massachusetts

Located at the tip of Cape Cod, Provincetown is a small coastal resort town in New England with a year-round population of approximately 3,664 based on the 2020 United States Census. The population during the summer months swells to as high as 60,000 as Provincetown is a popular vacation destination given its amenities such as picturesque beaches, harbor, lively art scene, and a vibrant LGBT+ community.

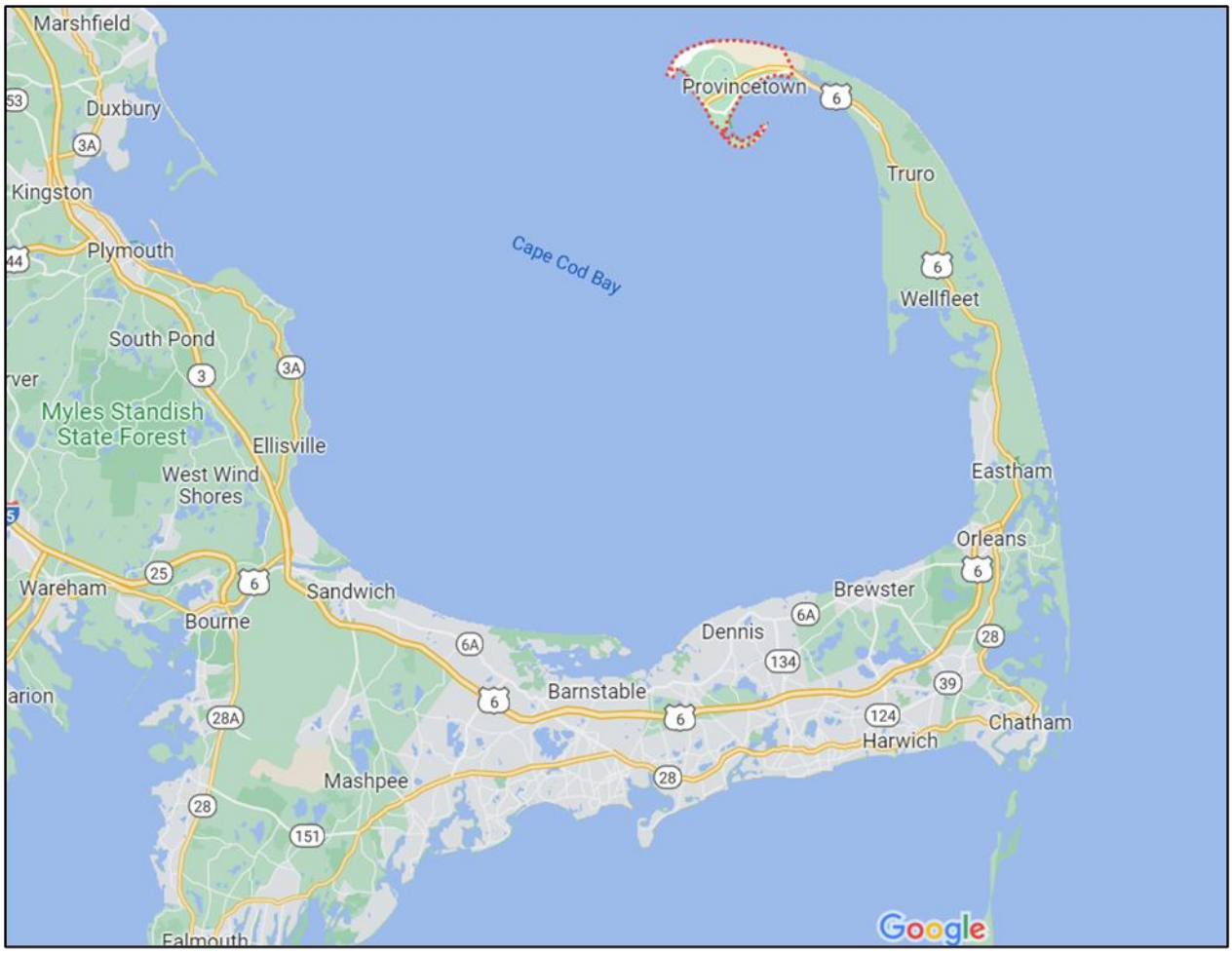


Figure 3-2 - Provincetown, Massachusetts

With similar issues of a high groundwater table, as well as septic systems and cesspools being the largest source of nitrogen discharged into the local waters, Provincetown has proposed a plan in 2022 to modernize its existing vacuum sewer system to meet new connection requests, promote public health, protect its environment, support housing & economic development, and provide coastal resiliency. The plan is to upgrade the town's existing vacuum sewer system by; increasing both treatment and disposal capacity, reduce vulnerability to sea level rise, and to reduce onsite pollution to ensure reliability and extend sewer service to all properties in Provincetown. The treatment plant capacity would be expanded from 750,000 gpd to 1.125 MGD. The sewer system currently serves a little over half of the 2,135 properties. The plan, when fully implemented by 2030, will enable Provincetown to be the first town on Cape Cod to be 100% served by a wastewater collection system.

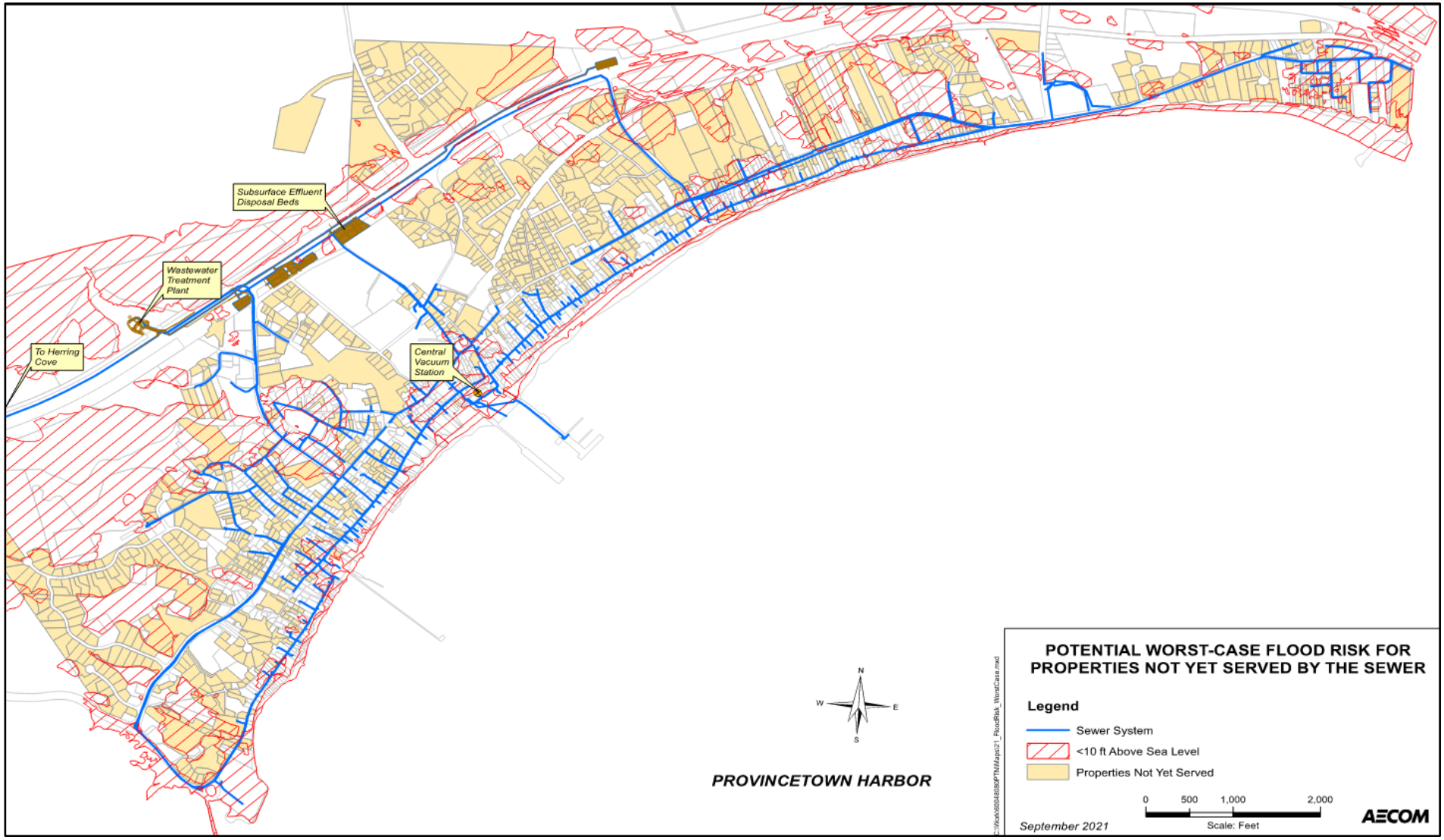


Figure 3-3 - Provincetown Sewer System (Source: Town of Provincetown, Public Forum October 12, 2022, Sewer Expansion & Modernization Project, Slide Presentation)

3.5.2 Long Key, Florida

A chain of islands, including the island of Long Key, located on the southern tip of the Florida Peninsula, is collectively called the Florida Keys (Keys), which extends southwest for approximately 130 miles into the Florida Strait.

Long Key is located near the middle of the Florida Keys between Fiesta Key to the northeast and Conch Key to the southwest and is approximately five miles long, and about 1.6 mile wide at the widest part including the wetland area of Long Key State Park. Long Key is home to the small island City of Layton with a population of 210 based on 2020 Decennial Census. Like most other keys, Long Key is a tourist destination in the summer. Given the issues with high groundwater table, excess nutrients, pathogens, and other pollutants loading from septic and cesspools into the nearshore sensitive waters, the State of Florida mandated the provision of central wastewater service throughout the Keys in 1999. The Florida Keys Aqueduct Authority (FKAA) is the responsible agency for providing centralized wastewater services to seven regions of the Keys. The Layton/Long Key Wastewater District is one of the seven keys being managed by FKAA. After the 1999 mandate, the Norman Anderson Water Quality Improvement Facility was constructed and came online in 2006 to serve the Layton/Long Key Wastewater District. The City of Layton and the Long Key State Park are currently being served with a planned sewer expansion to extend services to both the east and west end of Long Key.

Figure 3-4 - Long Key, Long Key State Park and the City of Layton

A combination of gravity and low-pressure sewer systems was chosen as the method to collect and convey the wastewater to the Norman Anderson Water Quality Improvement Facility which is located within the Long Key State Park boundaries and is approximately 1,700 feet southwest of the City of Layton. As of the date of this report, only the City of Layton and the Long Key State Park are connected to the wastewater treatment plant. FKAA is currently working to expand the collection system to include properties on both the east and west end of the Key. Upon completion of the expansion, a total of 35,000 gpd of wastewater will be collected and treated to remove 95% of the nutrient load prior to discharge into an injection well.

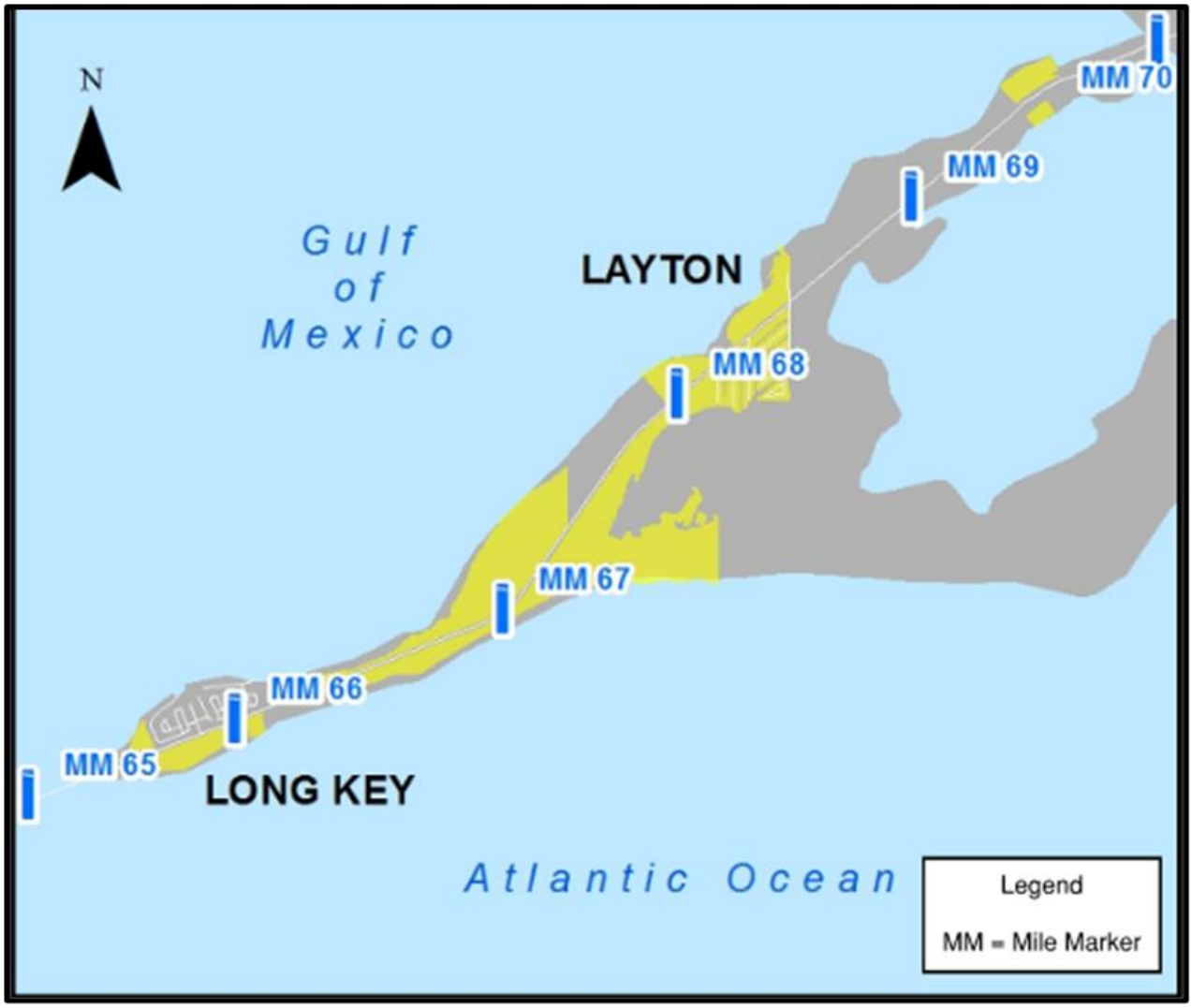


Figure 3-5 - Layton/Long Key Wastewater District (Source: Florida Keys Aqueduct Authority)

FKAA also provides highly treated and disinfected wastewater as reclaimed water at two regions (Duck Key and Big Coppitt Key) to help reduce potable water use, extend the life of the drinking water supply, and provide a source of water for irrigation during drought conditions and postpone the need for funding of future potable water infrastructure. Reclaimed water must meet strict guidelines set forth by the Florida Department of Environmental Protection, for uses such as irrigation, vehicle washing and aesthetic fountains. It is also allowed for use on edible crops so long as the food is peeled, skinned, cooked, or thermally processed before human consumption. Drip irrigation is the recommended method of watering food crops.

3.5.3 Nags Head, North Carolina

The Town of Nags Head (Nags Head) is located in the northern region of the Outer Banks in the State of North Carolina. It is considered the heart of vacationing in the northern region of the Outer Banks. Based on 2022 census, the Town of Nags Head has a population of 3,168 but can rise to over 40,000 during the peak summer season. It is a busy vacation spot given its beaches, the nearby Jockey's Ridge with its tallest active sand dunes in the eastern seaboard, Nags Head Woods, and Cape Hatteras National Seashore. About 85% of the parcels in Nags Head rely on septic systems. Because Nags Head's economy is greatly dependent on water recreation tourism, the preservation of good water quality in the local water bodies is important. The Town recognized that in order to protect its water resources, appropriate management of septic systems is critical, as such, it created a Septic Health Initiative in 1999 to provide free septic system inspections, septic pump out water utility bill credits, low interest loans for repairs and replacement, as well as water quality testing.

Subsequent to the 1999 initiative, the Town commissioned a study which looked at septic system characteristics together with water quality sampling data and resulted in the creation of the Decentralized Wastewater Management Plan (DWMP). The DWMP outlined for the Town a path to continue to improve wastewater management as it relates to septic systems. The DWMP is considered a dynamic and evolving resource by the Town of Nags Head and was updated in 2019 and again in early 2022.

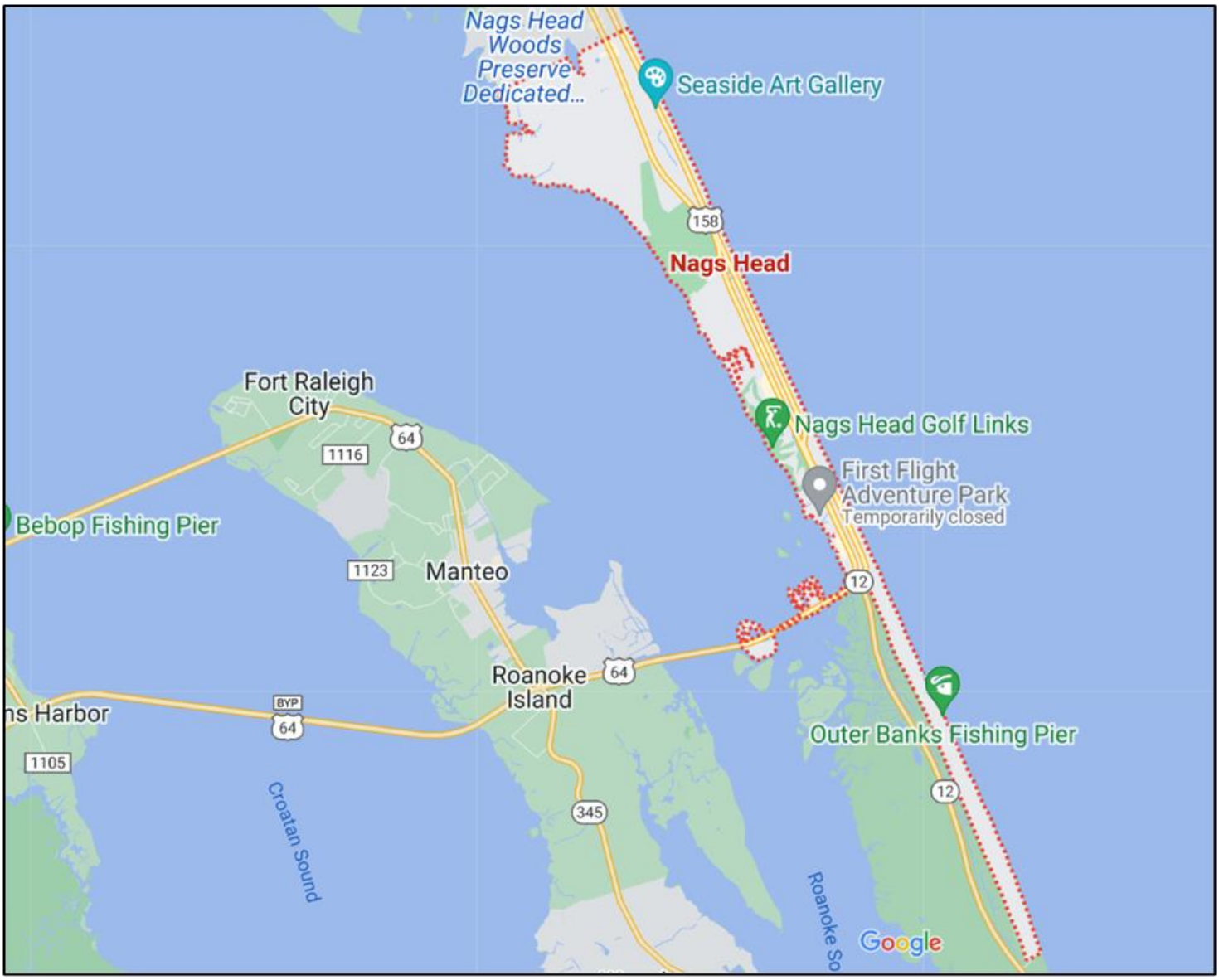


Figure 3-6 - Nags Head, Outer Banks, North Carolina (Source: Microsoft Bing Map)

The 2022 updated DWMP recommended expansion of the Septic Health Initiative as cited above and the development of a Long-Range Septic System Viability Master Plan to address septic system installation, repair, or replacement, based on relative risk to the environment and future conditions relating to climate change. As it is currently outlined in the updated DWMP, depending on individual sites and area setting such as soil texture, depth of suitable soil to restrictive layer, proximity to environmental sensitive areas, proximity to poor surface water quality, etc., the following summarizes the options for new or replacement of a septic system:

1. Residential Septic System with Low-Pressure Pipe (LPP) with mounded dispersal fields.
2. Onsite Advanced Treatment Unit with conventional, and drip LPP dispersal.
3. Onsite Advanced Treatment Unit with additional treatment to meet 2U Standards at grade dispersal with shallow drip (highest level treatment so effluent can be reused for surface irrigation or toilet flushing).
4. Community Collection System Sewer with non-discharge treatment system.
5. Community Collection Sewer with Reuse Quality Non-Discharge 2U Treatment System.

Note that 2U refers to the North Carolina code on reclaimed water. It is codified under Title 15A North Carolina Administrative Code Environment and Natural Resources, Chapter 2 – Environmental Management, Subchapter 02U – Reclaimed Water.

4. PROJECTED WASTEWATER FLOWS

Projecting wastewater flows for the 17 communities on Fire Island will assist in determining wastewater treatment improvements and recommendations, both individually and/or collaboratively with neighboring communities.

The lack of available centralized wastewater treatment in unsewered areas of Suffolk County's mainland is typically a hindrance to the development of these areas. Meeting SCDHS on-site wastewater standards without higher level treatment does not allow for higher density development, new walkable downtown areas, the need of additional services etc... (i.e., medical, healthcare, restaurants). All of which have a need to increase with increased

populations. Projecting wastewater flows in these areas consider the additional future development through discussions with planning departments and local legislators. Wastewater solutions would be two-fold, including both existing and future (build-out) solutions. However, there are a few mainland communities that experience such a degree of OWTS failures due to high groundwater, at these locations, centralized collection and treatment appear to be the necessary solution to improve public health, groundwater and downstream waterbodies. Additional development is not a high priority in these areas. In some cases, an increased development resulting from sewering may be considered an undesired effect.

The wastewater survey distributed to Fire Island included a small section of *new commercial uses* to gauge the sentiment of expanding services and increasing the commercial aspect of FI. The survey specifically inquired about "wet" uses that have higher water/wastewater rates, such as restaurants/bars, care services (salons/spas) and medical needs. Ocean Beach, which has a WWTP, was exception of these results, welcomes new dry retail. The remaining 16 communities agree that additional commercial uses would not be part of Fire Islands' future. A few communities detailed that there is "no room", "residential only" or simply that new uses are typically on a parcel that had a previous business on it. Individual meetings with the communities confirmed the sentiment that expanding business/commercial districts, or a need of additional services is not warranted in the future projections of Fire Island.

Since there will be no future build-out projections used for Fire Island's wastewater flowrate estimates, the report includes and compares estimated wastewater flows based on *land-use parcel data* provided by Suffolk County as well as *population data* provided by individual communities. The goal of these estimates is to determine the range (average to maximum value) of wastewater quantities on a daily basis (gallons per day). These values are used to size conveyance and treatment options and determine associate costs to each option.

4.1 Day trippers

In this report, a ***day tripper*** will be defined as a visitor who does not stay overnight. This is in contrast to an ***overnighter***, which would not distinguish between a resident, guest, renter etc., they would simply be on Fire-Island overnight.

Similar to the water records discussion in Section 4.4, information from ferries may give a snapshot of the number of day trippers, however this data would need to be evaluated on a daily basis. Errors in this data may also arise from day trippers departing the ferry and walking to other communities, therefore adding a day tripper to the departure community only. Day trippers from private vessels (both by water and car), would not be included in this total.

Due to these reasons, the wastewater survey results of day tripper information will be used for this estimation. This information will have an impact on recommendations regarding potential public restrooms, and a visual of the day tripper vs. overnighter ratio of each community. It will also be used in determining wastewater flow by population; however, the impact will be minimal only assigning 7.5 gpd/day for each day tripper. The survey results are shown in the table below. Assuming the peak day for each community is the same, the maximum number of day trippers would be 12,900 people.

Table 4-1 – Survey Results

Community	Estimated Maximum No. of Day Trippers
Kismet	2,500
Saltaire	2,000
Fair Harbor	500
Dunewood	50
Lonelyville	n/a
Atlantique	n/a
Robbins Rest	160
Summer Club	n/a
Cornielle Estates	60
Ocean Beach	1,000
Seaview	n/a
Ocean Bay Park	2,000
Point O' Woods	n/a
Cherry Grove	2,000
FI Pines	120
Water Island	10
Davis Park	2,500

4.2 Land Use-Based Wastewater Flow Estimates

Using Suffolk County's 2021 parcel data, land-use information was extracted for each parcel for the 17 communities (over 5,000 parcel records). These records were categorized as assigned wastewater flow values based on SCHDS standards.

For residential parcels, the land use codes describe a detailed use (ex. single family, two-family, three family, seasonal). Seasonal residences were assigned the same value as year-round single-family residences. Through conversations at the community meetings, it was highlighted that the seasonal data provided from SC does not translate directly to occupancy nor is it up-to date. It also brought to attention that the installation of newer mini-split air conditioners has the option of heat, which may trigger the parcel's land-use to be changed from seasonal to year-round, even though other factors (such as insulation) were not installed. Therefore, subtracting the parcels coded "seasonal" is not as accurate as first thought when determining summer versus winter flowrates. In the summary table at the end of this section only summer (peak) flows are estimated.

The land-use coding for commercial parcels is not as well-defined as residences. When a given code needed additional details to assign a flow (ex. number of rooms in an inn or boarding house), internet searches were conducted, or Google Street view was used to decipher a land-use. Building footprints were used to estimate the number of seats for restaurants. The wastewater flow estimates for commercial uses, impacted some communities more than others, however, were still only a small percentage of the communities' overall flow, given the overwhelming majority of the land uses are residential. There is one school located on Fire Island, which although located in Corneille Estates, is connected to the Ocean Beach WWTP. Therefore, flow from the school was not individually calculated as it is captured in the operating flow of the WWTP.

The use of low-flow, modern plumbing fixtures and water consumption appliances in renovations and new construction contribute to the discrepancies of Suffolk County wastewater generation rates versus actual flows. This occurrence was noticed in the Village of Port Jefferson sewer feasibility study conducted by Cameron Engineering for the Suffolk County Department of Public Works. As discussed in Section 4.4, Fire Island residents also employ graywater practices (outdoor showers, clothes washing), which would also

contribute to the County's generation rates being considered conservative. For these reasons, SC wastewater generation rates will be used as the upper value of the estimate's range, and 60% of the SC values will be used as the lower value.

Table 4-2 – Estimated Wastewater Flow Based on Land Use (GPD)

Community	Peak Summer Season
Kismet	54,600 - 91,000
Saltaire	73,200 - 122,000
Fair Harbor	71,400 - 119,000
Dunewood	18,000 - 30,000
Lonelyville	16,800 - 28,000
Atlantique	10,200 - 17,000
Robbins Rest	6,600 - 11,000
Summer Club Condo	6,000 - 10,000
Corneille Estates	13,200 - 22,000
Ocean Beach	129,000 - 215,000
Seaview	71,400 - 119,000
Ocean Bay Park	69,600 - 116,000
Point O' Woods	29,400 - 49,000
Cherry Grove	69,000 - 115,000
Fire Island Pines	129,600 - 216,000
Water Island	12,000 - 20,000
Davis Park	58,200 - 97,000
Total	**838,200 - 1,397,000**
Less Ocean Beach (currently sewered and treated at WWTF)	*709,200 - 1,182,000*

4.3 Population (capita)-Based Wastewater Flow Estimates

After meeting with the communities, it was determined that each community has their own personality which translates to occupancy and therefore wastewater generation. During peak summer seasons, some communities swell with overnighters (6+ overnighters per residential unit), while others remain consistent (2-3 overnighters per residential unit). Some communities are overwhelmed with day trippers, while others remain more private to residents only. For example, a residence in Cherry Grove or Fire Island Pines would see different occupancy rates as compared to Water Island or Fair Harbor. Along the same lines, day trippers in Davis Park greatly exceed those to the Seaview community. Using

population data, may more accurately represent each community as compared to parcel data. The single-family residence flow rate is 300 gpd. A water use rate per capita is 75 gpd, for an overnighter. Therefore, using the 300 gpd rate translates to 4 capita per residence. In those communities with over 6 capita per residence, flow would be underestimated and those that peak at 2 capita/residence would be overestimated using only parcel data.

Using a population-based approach also can account for the seasonal differences across the island. The table below assigns 75 gpd for each overnighter, using the maximum summer population from the community surveys. It also adds 7.5 gpd for each day tripper, using the peak number of day trippers provided from the community surveys.

Population data from the survey was not used for two (2) communities in the table and figures below. The population from Lonelyville was estimated based on 3 capita per home, as the survey information was incomplete. This value was also determined after analyzing water usage data (Section 4.4.1). Since Ocean Beach measures wastewater flow at the WWTF, flow data submitted to the state was used. The WWTF is further discussed in Section 7.

Table 4-3 – Estimated Wastewater Flow Based on Population (GPD)

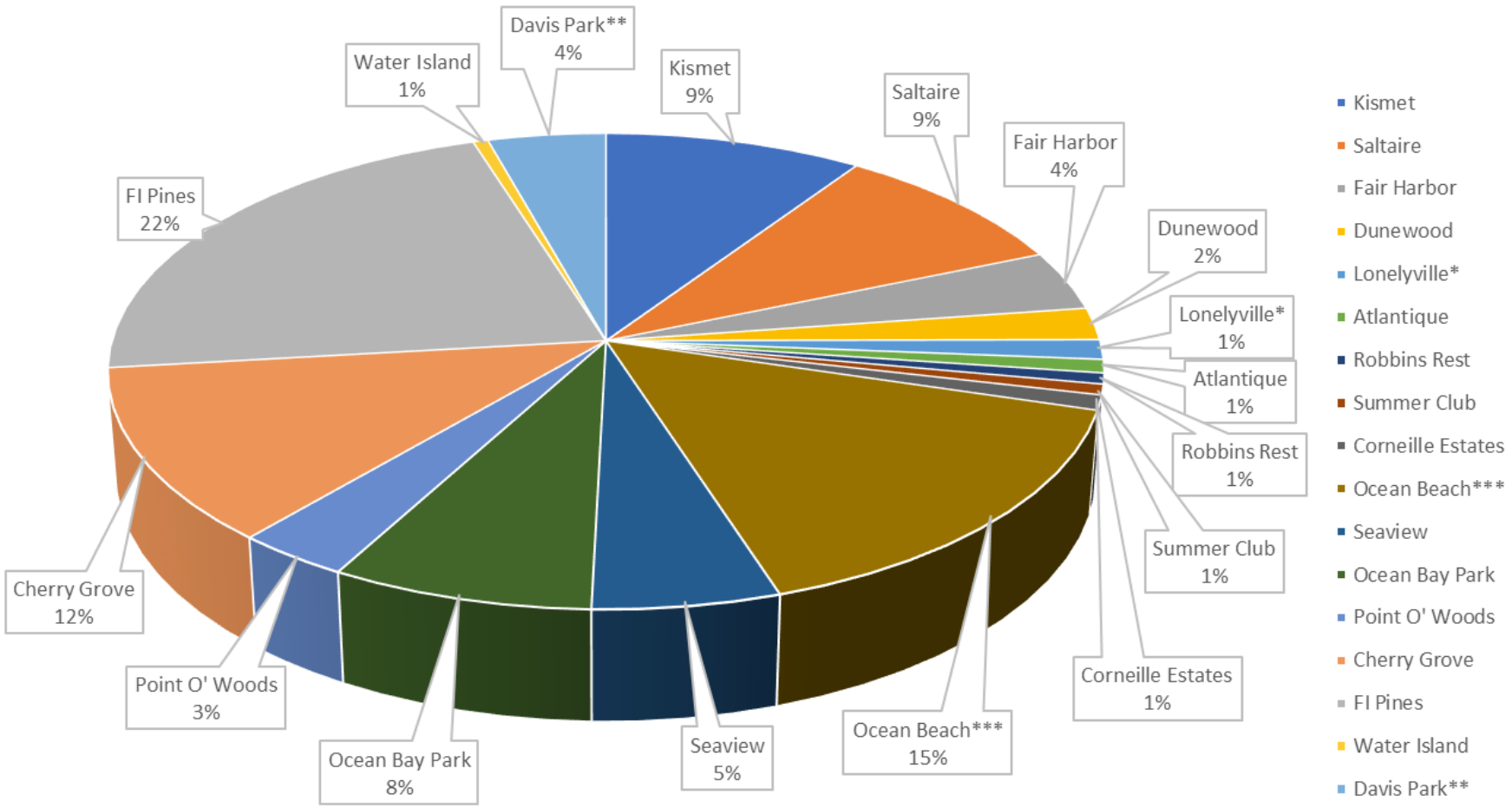
Community	Off-Peak Season (8 months)	Peak Summer Season (4 Months)
Kismet	4,500 - 7,500	78,750 - 131,250
Saltaire	2,025 - 3,375	76,500 - 127,500
Fair Harbor	540 - 900	33,750 - 56,250
Dunewood	225 - 375	18,225 - 30,375
Lonelyville*	1,125 - 1,875	11,070 - 18,450
Atlantique	540 - 900	7,560 - 12,600
Robbins Rest	315 - 525	6,120 - 10,200
Summer Club	270 - 450	5,940 - 9,900
Corneille Estates	450 - 750	8,370 - 13,950
Ocean Beach***	112,000 - 127,000	178,000 - 213,000
Seaview	6,750 - 11,250	45,000 - 75,000
Ocean Bay Park	5,400 - 9,000	63,000 - 105,000
Point O' Woods	450 - 750	27,360 - 45,600
Cherry Grove	900 - 1,500	99,000 - 165,000
FI Pines	5,400 - 9,000	182,340 - 303,900
Water Island	180 - 300	4,545 - 7,575
Davis Park**	2,475 - 4,125	36,000 - 60,000
Total	**143,545 - 179,575**	**881,530 - 1,385,550**
Less Ocean Beach (currently sewered and treated at WWTF)	***31,545 - 52,575***	***703,530 - 1,172,550***

***Population data was not supplied for the entire Lonelyville community (Summer Flow=# homes x 3 capita/home x 75 gpd/capita) (Winter Flow= 10% of Summer)**

**** Zero flow December to March No ferry service**

*****Facility operating data used (see Table 7-1)**

Figure 4-1 Peak Summer Season Estimated Flow



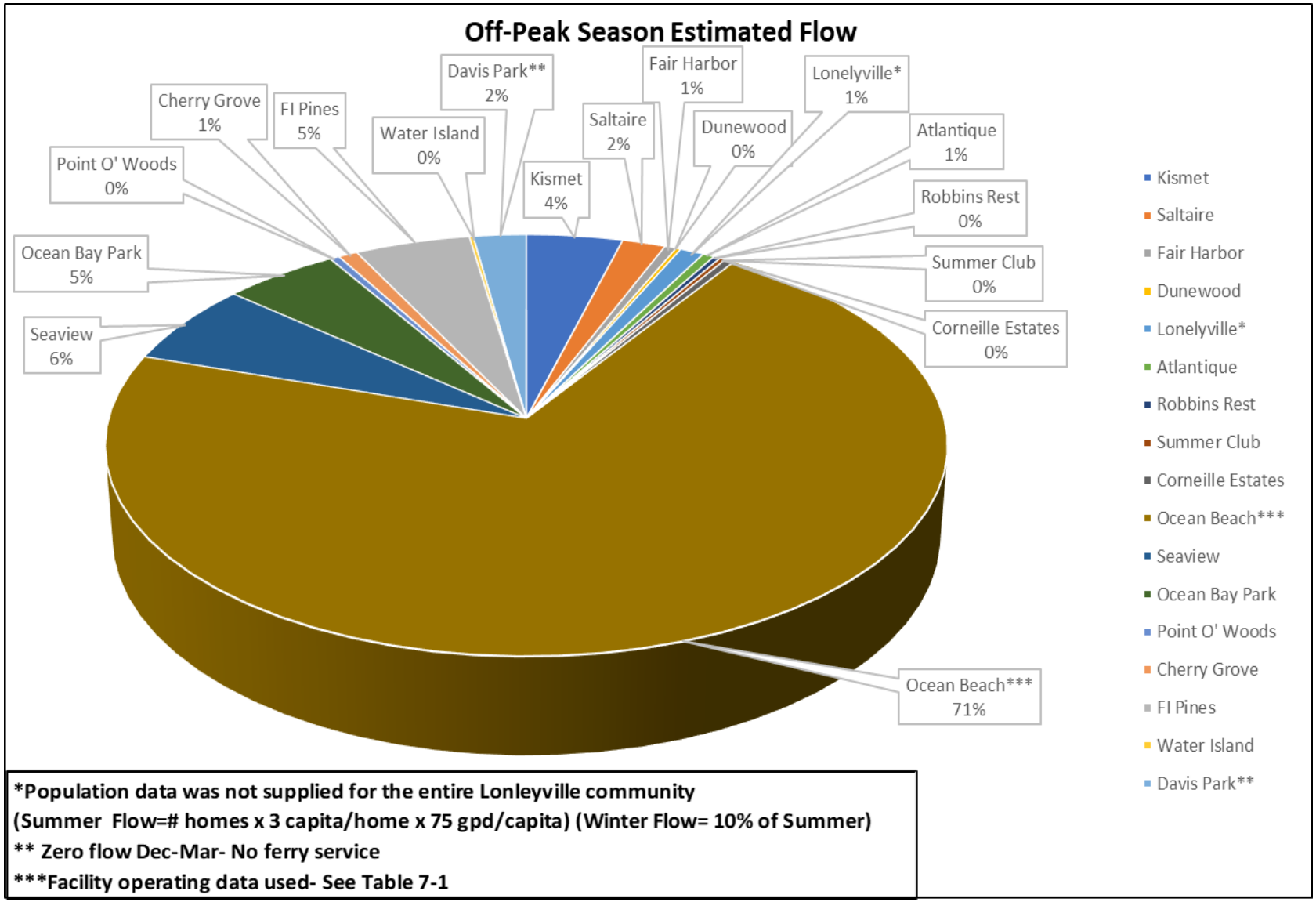


Figure 4-1 - Estimated Wastewater Flow Projections

4.4 Water Use Records

Fire Island communities are served by Suffolk County Water Authority, the Village of Saltaire as well as private wells. In certain circumstances using water meter records is a helpful tool in sizing wastewater treatment options. Fire Island has a few unique characteristics that would preclude relying solely on water records. To effectively use the records for the entire Island, some factors would have to be the same for each community for this island wide. Water records received from SCWA are typically released per quarter (3 months) or depending on how the parcel is billed, on a monthly basis. Due to the population of Fire Island changing on a daily basis (seasonal, weather, weekends etc.) using composite or aggregate data of three months of water usage and determining the average and maximum days, requires many assumptions.

In addition, unless separately metered, water used for irrigation or marina purposes or (that does not become wastewater) would be part of the records. This irrigation/marina value would have to be estimated and removed from the records. Discussions with communities also indicated water used in outdoor showers and in some cases, clothes washing machine (referred to as graywater) is not piped to the wastewater treatment system. The value of this graywater would also have to be estimated and removed from the records. While irrigation/marina and graywater may only be factors in a few communities, the task would take away some reliability and value of using the water records.

If daily records are available, using water records in future studies of individual communities may prove to be helpful as a comparison to the values and methods of this Island wide study.

4.4.1 Suffolk County Water Authority

While the population and parcel-based wastewater estimates are typical for this level of study, upon request SCWA consumption data was received for 11 of the 17 communities with usage per parcel for 3 years. This was approximately 4-meter readings per parcel per year. It was determined that the summer readings for 2022 would be analyzed, based on non-typical water use during the COVID pandemic (2020

and 2021). The following two charts summarize the findings and estimations that were made. The water usage rate (gpd) was determined by dividing the consumption data by the number of days between meter readings. The quarterly data received assumes a linear distribution; each day of the week has the same rate (no deciphering between weekend/weekday usage rates), and inconsistencies explained above (i.e., landscaping irrigation, gray water etc..) were not removed. A capita (person) per meter rate was also developed using a conservative standard of 75 gpd/capita. This estimation was done to see if a community may notice a corresponding element within their typical summer season occupancy. For example, FI Pines was estimated at 7.4 capita/meter, while Lonelyville was 3.0 capita/meter.

Table 4-4 – Estimated Wastewater Flow Based on SCWA Water Usage

	No. of Dev. Parcels	No. of Water Meters (SCWA provided info)	Percent Water Meter per Dev. Parcels	Usage Rate (GPD) SCWA Metered water data per # of days between meter readings	Usage Rate (GPD) per Meter	Capita per Meter (using 75 gpd/ capita)
Kismet	242	217	90%	69,370	320	4.3
Lonelyville	92	93	101%	20,845	224	3.0
Atlantique	55	31	56%	6,896	222	3.0
Robbins Rest	38	28	74%	7,153	255	3.4
Summer Club	45	38	84%	17,855	470	6.3
Cornielle Estates	69	49	71%	12,802	261	3.5
Ocean Bay Park	312	280	90%	101,761	363	4.8
Point of Woods	152	132	87%	59,066	447	6.0
Cherry Grove	280	273	98%	98,884	362	4.8
FI Pines	575	552	96%	304,789	552	7.4
Davis Park	278	267	96%	54,139	203	2.7
Totals	***2,138***	***1,960***		***753,560***		

This chart compares this high level of water usage data analysis with the wastewater flow estimates based on both population and parcel-based information. As the totals show, the water usage data and the wastewater flow estimates are for relatively close planning purposes. Once the community's decision-making process proceeds to a design phase, the wastewater flow could be vetted further. For example, one

community may have more landscape irrigation than another. Another example that is demonstrated with this analysis, is how the population of FI Pines exceeds typical parcel-based usage, which is reflected in the high SCWA Usage rate. Overall, completing this analysis for 11 of the 17 communities confirmed the methodology that is included in this report.

	SCWA Usage Data (GPD) (Pro-rated for complete number of developed parcels)	**Estimates Wastewater Flow (GPD) pop.-based**	**Estimated Wastewater Flow (GPD) parcel-based**
Kismet	77,440	78,750 - 131,250	54,600 - 91,000
Lonelyville	20,608	11,070 - 18,450	16,800 - 28,000
Atlantique	12,210	7,560 - 12,600	10,200 - 17,000
Robbins Rest	9,690	6,120 - 10,200	6,600 - 11,000
Summer Club	21,150	5,940 - 9,900	6,000 - 10,000
Cornielle Estates	18,009	8,370 - 13,950	13,200 - 22,000
Ocean Bay Park	113,256	63,000 - 105,000	69,600 - 116,000
Point of Woods	67,944	27,360 - 45,600	29,400 - 49,000
Cherry Grove	101,360	99,000 - 165,000	69,000 - 115,000
FI Pines	317,400	182,340 - 303,900	129,600 - 216,000
Davis Park	56,434	36,000 - 60,000	58,200 - 97,000
Totals	***815,501***	***525,510 - 875,850***	***463,200 - 772,000***

5. INNOVATIVE/ALTERNATIVE TREATMENT SYSTEMS (I/A)

5.1 I/A

Septic systems, or on-site wastewater treatment systems (OWTS) receiving less than 1,000 gallons per day (gpd), is regulated by the New York State Department of Health via the local health department. Because of high groundwater table and logistical reasons, a built-on-site septic system called the Fire Island system (FI System) has been widely used on Fire Island for single-family residence. The FI System is designed to be built on-site with concrete masonry blocks for the sidewalls with cover from precast

slabs and consists of a two-chamber structure. The first chamber serves as the septic tank and the second chamber serves as the leaching structure. Similar to a conventional septic system, the first chamber of the FI System acts as a septic tank and provides separation of floatable matter (e.g., scum, oils and grease) and settleable solids from the wastewater. The second chamber, which is the leaching structure, discharged the effluent into the surrounding soil for additional treatment by the soil via mechanism of adsorption, absorption, and bacterial action. A minimum separation distance of 2 feet from groundwater rather than the standard 3 feet is acceptable because of the high groundwater table on Fire Island. A mound septic system could be installed as well for parcels with less than 2 feet of groundwater separation distance from the invert of the leaching structure to the groundwater table. The Fire Island System, as well as conventional septic systems and cesspools, function as designed but they do not remove nitrogen.

Because of water quality issues caused by eutrophication (excess nitrogen form anthropogenic activities) in our water bodies, Suffolk County has declared nitrogen as a major causal factor for the water quality issues in the county such as harmful algae blooms, beach closures, fish kills, and wetland loss. According to numerous studies as well as Suffolk County's Subwatershed Wastewater Plan, much of the nitrogen loading is coming from our onsite wastewater treatment systems, namely, septic systems and cesspools on the Long Island side of the Great South Bay. To address this problem, Suffolk County has been testing advanced septic systems that are designed to remove nitrogen to a concentration of 19 mg/l or less. Those advanced septic systems being evaluated by Suffolk County include systems that have already been nationally certified for nitrogen removal (i.e., National Sanitation Foundation - NSF/ANSI 245), as well as testing innovative technologies and designs such as the Nitrogen Removing Biofilter brought forth by the Center for Clean Water Technology (Stony Brook University). Those advanced nitrogen removing onsite wastewater systems are called Innovative/Alternative On-site Wastewater Treatment System, or I/A system for short.

Unlike conventional septic systems, which are passive systems (no oxygen is being actively introduced to the wastewater for aerobic treatment), I/A systems are basically miniaturized wastewater treatment plant with active aeration (nitrification) along with an anoxic stage or chamber to provide nitrogen removal.

Suffolk County's I/A testing program is quite comprehensive with each manufacturer's system first required to meet stringent criteria before being approved by SCDHS for use. Depending on length of time since testing and laboratory results from effluent samples, those systems are categorized by the County as either "Experimental," "Piloting," "Provisional," or a "General Use" system, permitted for installation as an onsite wastewater treatment system in accordance with the "Standards for Approval of Plans and Construction for Sewage Disposal Systems for Single-Family Residences" (Standards). For all practical purposes, only I/A systems that are currently on the "Provisional" or the "General Use" category should be selected by FI homeowners for use as those systems have been proven to provide a consistent treatment to meet the 19 mg/l of total nitrogen limit, and there are no limitations on how many units may be installed in the County. Current approved manufacturers by Suffolk County for Provisional use are the SeptiTech STAAR, Orenco AX, Norweco Hydro-Kinetic, and Norweco Singulair. The currently approved manufacturers by Suffolk County for General Use are Hydro-Action and FujiClean.

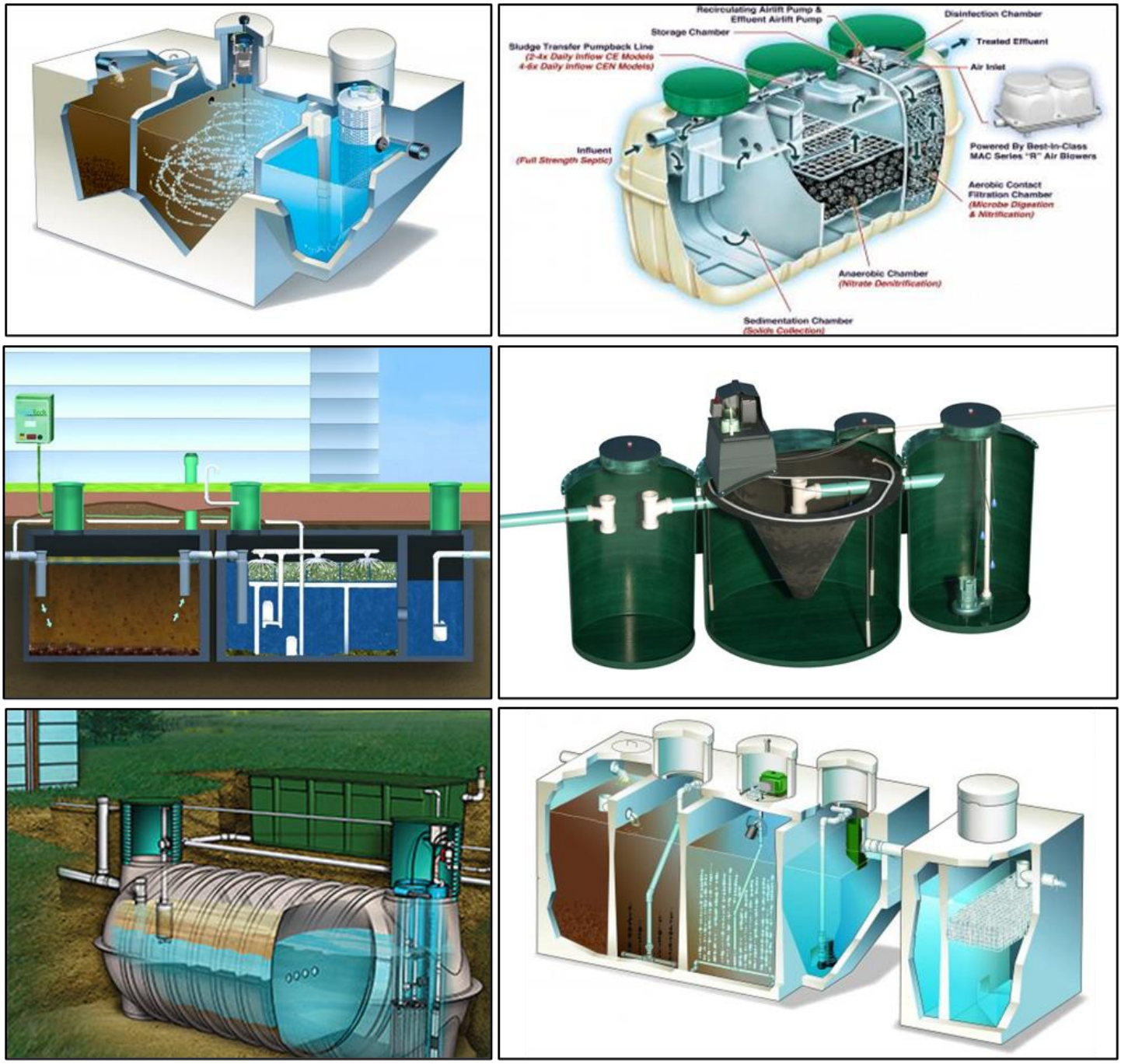


Figure 5-1 - I/A Systems - Left to Right, Top to Bottom - Norweco Singulair TNT, Fuji Clean CEN Series

An Operation and Maintenance (O&M) contract must be entered into as part of the I/A system installation. The typical cost estimate for Fire Island is about $2,000 for a three-year contract, or about $670 per year. This cost is covered within the grant amount if a

homeowner is awarded the SIP funding. Note that O&M contract typically include only inspection for items such as the control panel, recirculation pump, air pump, and checking of the various equipment such as and sludge/scum depth, air pressure, floats, and alarm with adjustment (if necessary), visual check of the effluent quality, and clean the laterals if leaching system is a Pressurized Shallowed Drain field. The O&M contract typically does not cover any out-of-warranty parts and labor, sludge pumping or emergency calls.

5.1.1 Maintenance Requirements

For illustrative purposes, a summary of typical maintenance requirements and frequency are outlined in the table below for the Fuji Clean I/A system. Due to logistical reasons, I/A pump out operation is definitely the most challenging aspect of I/A maintenance on Fire Island. This is discussed in detail in Section 6.5.

Table 5-1 - Maintenance Items and Frequency.

Requirement	Frequency
Maintenance Service Visit Items to be checked: 1. Odor 2. Bugs 3. vibration 4. noise 5. Clarity 6. Foreign objects 7. Blower Operation (blower, alarm, filter & diaphragms) 8. Effluent quality (clarity, odor, and pH) 9. High water float switch 10. Inflow pipe 11. Scum Transfer 12. Recirculation control valve 13. Aeration Balance control valve 14. Effluent Airlift Valve/pipe 13. Backwash/sludge transfer 14. Recirculation Air-Lift Pump 15. Sludge level	Once every 6 months
Pump Out For a CEN5 model, typical pump out volume is approximately 450 gallons.	Once every 1 to 2 years, or as required based on scum and sludge depth.

5.1.2 Cost Estimates

Suffolk County has published cost estimates on their reclaimourwater.info website for I/A equipment and installation costs, as well as cost estimates associated with repair and replacement, operation, and maintenance, and electrical. Note that those cost estimates will vary based on the chosen I/A technology and site constraints. The current equipment and installation costs as of the date of this report, for single family home with up to four (4) bedrooms, as published based on twenty-one vendors doing business on the mainland of Long Island, ranged from a low of $15,725 to a high of $38,000. Note that the cost estimates do not include cost associated with private mark out and survey, engineering, permit fee, potential need for retaining walls or sand/fill import for a mound system, potential need for fill export, need for RCA as a sub-base, sales tax, irrigation system repair, and landscaping.

The following table provide a summary of cost estimate based on the number of bedrooms and three leaching structures scenarios associated with the I/A installation. Scenario 1 is I/A system with the reuse of existing leaching structure, Scenario 2 is I/A system with new gravity leaching structure, and Scenario 3 is I/A system with a pressurized shallow drainfield. Details regarding each of these leaching alternatives is described in further detail in Section 9.

Table 5-2 - I/A Installation Cost Estimates.

No. of Bedrooms	SCENARIO 1 Reuse Existing Leaching Structure		SCENARIO 2 New Gravity Leaching Structure		SCENARIO 3 Pressurized Shallow Drainfield	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
1 to 4	$15,175	$36,000	$19,038	$38,225	$21,900	$44,035
5	$15,725	$38,000	$21,500	$42,000	$23,878	$46,325
6	$17,275	$44,000	$22,625	$44,000	$23,900	$48,420

Cost for an I/A system on Fire Island is expected to be approximately double the cost estimates shown above due to factors such as logistical cost relating to transportation, additional time needed for skilled labor to travel to and from the work site, additional time to install using smaller equipment in order to fit the narrow paths and walkways, as well as cost associated with dewatering the soil due to high groundwater table.

5.2 Summary Of Grant Program

Suffolk County understood at the inception of their Reclaim Our Water initiative that to address the nitrogen issue is that the cost for an I/A system would be cost prohibitive and assistance on funding must be provided to homeowners, otherwise, the septic replacement program with I/A system would be dead-on-arrival. With financial assistance from New York State, Suffolk County was able to launch the Residential Innovative and Alternative Onsite Wastewater Treatment System Grant Assistance Program (also known as “The Septic Improvement Program” or SIP for short) to provide the necessary funding opportunity to homeowners to help with costs of the I/A system, design and installation costs. Interested homeowners must apply for the grant via an application process. Applications are prioritized based on Suffolk County’s Priority Areas and with preferential consideration given to existing system failure and in environmental sensitive areas.

Suffolk County designed their Priority Areas to account for locations that have a higher parcel density and shorter groundwater underflow travel time to the nearest surface water body. Thus, areas that have a higher parcel density with a commensurate higher nitrogen loading and are within the 0–2-year baseflow travel time for groundwater to surface waters is classified as Priority Area 1, and areas with 2–25-year baseflow travel time for groundwater to surface waters classified as Priority Area 2.

SIP grant funding is awarded based on priorities and on the availability of funding. Once entire annual funding is encumbered for the year, any qualified unfunded applications would roll over for next year’s consideration.

Homeowners may apply and receive up to $30,000 of grant funding for an I/A system. The amount of the $30,000 funding is broken out for each category shown below:

- $10,000 – SIP grant from Suffolk County

  $10,000 – SSRP (Septic System Replacement Program) grant from New York State, pass through to Suffolk County. New York State will provide grant of 50% of the I/A system cost up to $10,000 (does not cover: sales tax, pumping or decommissioning, interior plumbing changes, landscaping, permit fee, fines and penalties, engineering fee associated with construction observation and administrative work conducted by the engineer, or operation & maintenance costs)
- $5,000 incentive for Low to Moderate Income households
- $5,000 incentive for Pressurized Shallow Drain Fields / Nitrogen Polishing Units

The State of New York has allocated $75 million for septic systems replacements for the entire state in 2017 and an additional $20 million in 2022 strictly for Suffolk County to ensure sufficient state funding is available to sustain its SIP program. In addition, Suffolk County is currently working on finding a recurring sustainable funding mechanism for the SIP program, until this is in place, the amount of funding would vary from year to year.

A detailed I/A onsite wastewater treatment system (I/A OWTS) grant application eligibility, conditions and process information is provided below as of the date of this report; however, please refer to Suffolk County's Reclaim Our Water website for up-to-date information.

1. Eligibility/Conditions
   - Applicants must apply for and be issued a grant prior to installation of the I/A OWTS.
   - The existing residence must be served by a septic system or cesspool and not connected to a sewer system or located within a proposed sewer district.
   - New construction on a vacant lot is not eligible.

- Must have Property Deed recorded with the Suffolk County Clerk.
- The Property cannot have tax liens or be in foreclosure. Must be current on payment of property tax.
- Applicants must use an installer from the County's list in order to be eligible for grant funding. Installer is paid County SIP and NYS SSRP grant funds directly by Suffolk County on the homeowner's behalf.
- Grant Awardees must permit the Suffolk County Department of Health Services the right to enter onto the property to perform any site assessments related to the processing of applications.

2. Required documents.
   - Grant Application (www.ReclaimOurWater.info).
   - Copy of Homeowner's Insurance Policy.
   - Copy of most recent property tax bill.
   - Copy of Certificate of Occupancy or Zoning Compliance for the dwelling.
   - If applying for the additional $5,000 Low to Moderate Incentive, you must provide the first two pages of property owner(s)' latest year's tax return along with signature page (Form 1040, 1040A or 1040EZ). Please be sure to redact your social security number.
   - If applicable: proof of sanitary system failure (photo, service receipts, etc.).
   - If property is owned by Trust, LLC, or Corporation, additional documentation is required.
   - Copy of Property Deed.
3. Ranking and Scoring Process.
   - Completed applications are scored and ranked by the County as outlined in SIP rules and regulations.
   - Top ranked applications (based on documented failure and priority area) will be issued grants in the order in which completed applications are received.

- Grant Awardees will be sent a Grant Acceptance packet which contains the Grant Certificate, County SIP Grant Agreements, NYS SSRP Grant Contracts, Assignment of Payments and W-9(s).

4. Grant Agreement
   - Homeowner evaluates options and decides to move forward. Grant Agreement must be signed and returned to SCDHS within 30 days from receipt of Grant Acceptance packet.
   - Copy of fully executed contracts will be returned to the homeowner.
5. Contract with Installer/Design Professional
   - Homeowner contracts with Design Professional at their own expense.
   - Design Professional completes a permit application and submits to Suffolk County's Office of Waste Management (OWM).
   - The Design Professional will also identify any required Town, Village, or State permits that may be required.
   - SCDHS OWM Permit to Construct is issued.
6. County Contract Process
   - Homeowner selects installer from County-approved vendor list and submits price quote based on approvable Wastewater Management Permit site plans.
   - Homeowner submits signed Assignment of Payments (AOPs).
   - Receive Grant Eligibility Memo from SCDHS based on submitted price quote.
   - Homeowner may contact CDCLI Funding Corporation (http://www.cdcli.org/septic- replacement-loan-program-suffolk-county-residents/) or other financial institution for loan pre-approval. It is expected that third party financial institutions will require a copy of the Grant Certificate to begin the pre-approval process.

7. I/A Install and Final Approval
    - I/A OWTS Installation can begin after OK to Proceed is given to Approved Installer.
    - SCDHS inspectors will visit the site and inspect to ensure the installation is in accordance with County and Manufacturer Standards.
    - System start-up witnessed by SCDHS. As-built plans submitted to SCDHS by the Design Professional.
    - Vendor submits Certification Forms.
    - Submit an O&M Agreement from maintenance provider.
    - The homeowner submits I/A OWTS Registration form.
8. Grant Payment
    - Vendors must submit payment vouchers and invoices to SCDHS.
    - Once Inspector Certification letter is issued, County SIP and NYS SSRP grant payments will be issued by Suffolk County on behalf of the homeowner to the Vendor identified in the Assignment of Payment forms.
    - Grant Award may be subject to federal and/or state taxes. Grant Awardee should consult his/her own tax, legal and accounting advisor(s) regarding tax implications.

5.3 Summary Of Building Code Requirements – Town of Islip & Town of Brookhaven

As mentioned earlier in this report, the Town of Islip does not require a building permit and defers to SCDHS approval. The Town of Brookhaven does not require a building permit and defers to SCDHS approval; however, the Town code requires an I/A system for residential parcels located in the Nitrogen Protection Zone. Nitrogen Protection Zone (NPZ) is defined by the Town as zones that encompasses an area within 500 feet of surface waters such as the Atlantic Ocean, Long Island Sound, the Great South Bay, the Forge River, the Carmans River, and other rivers, lakes, streams, ponds, ditches, or canals. Residential properties within 500 feet of surface waters tend also to lie within

flood zones or coastal erosion hazard areas and are subject to flooding and/or collapse if on a bluff or dune that may result in nitrogen and pathogens from sanitary systems affecting surface waters to a greater degree than properties located further from surface waters. The requirement for an I/A system is solely on a new dwelling or structure, or construction that fully replaces a demolished existing structure of residential properties, beginning January 1, 2017.

Regarding permitting for an I/A system in the Village of Saltaire (Saltaire), besides a SCDHS permit requirement, Saltaire requires a building permit within a larger part of an application, or if done independently, an applicant can submit a sanitary permit application. All setback requirements are based on SCDHS requirements.

Parcel owners need to be cognizant of their community's restriction on construction periods. That is, most communities on Fire Island have restrictions as to when construction can take place, with some variations on the dates, most communities prohibit construction between the start of Memorial Day through Labor Day weekend, except for emergency situations.

5.4 Code Limitations to Install I/A

Suffolk County's Subwatershed Wastewater Plan, finalized in July 2020, outlined the necessary actions for reducing nitrogen loading to surface water bodies via sewer extension and upgrade of septic systems/cesspools with I/A systems. The plan identified Priority Areas to fund I/A installation. Fire Island is classified as Priority 1 area for Septic Improvement Program, i.e., septic system replacement with I/A system.

At the inception of the Subwatershed Wastewater Plan, Suffolk County recognized that there is not a one-size-fits-all solution pertaining to wastewater management methods for the different areas of Suffolk County, and in particular, communities on Fire Island. As such, Suffolk County had commissioned a study called the Fire Island - Davis Park Pilot Area Evaluation (Davis Park Study) to elucidate challenges for implementation of Innovative/Alternative On-site Wastewater Treatment System (I/A) on Fire Island. Davis Park is located on Fire Island east of our study area. It is similar in geographical, topographical, and geophysical characteristics to the communities within our study area

on Fire Island, so any challenges identified by the Davis Park Study therein are applicable to the other communities on Fire Island as well. The pilot study area, included Davis Park and Ocean Ridge, includes 281 residential, 5 commercial, 8 recreation and open space, 1 transportation, and 5 vacant properties. The average parcel size of the 286 residential and commercial properties is 0.20 acres. The purpose and methodology of the Davis Park Study were as follows:

1. Establish environmental setting for Fire Island.
2. Define logistical challenges with installing and maintaining I/A OWTS.
3. Provide recommendations for I/A OWTS technologies.
4. Evaluate the cost and benefits of four (4) leaching options:
    a. Use existing Fire Island septic system (block leaching structure)
    b. Gravelless trench
    c. Geotextile sand filters
    d. Pressurized Shallow Drain Fields
5. Evaluate seasonal performance of I/A OWTS.
6. Provide initial cost estimates for I/A OWTS.
7. Identify data gaps and provide recommendations for further study.

The Davis Park Study was completed on June 7, 2019, with the latest revision dated June 29, 2019. Based on this study, specific challenges to the installation and servicing of I/A systems were identified as follows:

1. Small parcel size (average 0.2 acres) and size limitations resulted in the need to seek waiver for setback requirement from SCDHS. However, on a case-by-case basis, Suffolk County's Standards allow reduced setbacks without the need for a waiver or variance for homeowners that apply for replacements of an existing OWTS with an approved I/A system so long as the installation plan meets the requirements of the Standards to the greatest extent possible. This is referred to as the "Best Fit" conditions. See table below for summary of setback requirements:

Table 5-3 – Setback Requirements

Minimum Horizontal Separation Distances from:	Setback Distance for I/A, feet	Setback Distance for Leaching System, feet
Building with Cellar or Basement	10	10
Building on Slab	5	10
Porches, Deck, House overhangs, Cantilevers, etc.	5	5
Underground Utilities	5	5
Leaching pools, Gallery, Trench	8	8
Septic Tank, Pump Station, or Manhole	5	8
Property Lines	5	5

Source: Standards for Approval of Plans and Construction for Sewage Disposal Systems for Single-Family Residences, April 19, 2022.

2. "Best Fit" conditions is to achieve setbacks to the greatest extent possible.
3. High groundwater table (2 to 16 feet below grade) – increase in capital cost (need for ballast to prevent tank floatation) and installation cost (dewatering system cost).
4. Geographically isolated – estimated installation cost ranged from $40,000 to $61,000 per system, not including other costs that may be required such as retaining walls, surveys, dewatering, permitting, and engineering fees.
    a. Increase in logistical cost, namely shipping/transportation cost.
    b. Increase in labor cost due to additional travel time.
    c. Increase in operation and maintenance costs.
5. Limited access – beach, boardwalks, narrow sidewalks.
6. Seasonal use – start up at the beginning of the season.

P.W. Grosser Consulting (PWGC) also conducted a feasibility study with respect to implementing the I/A systems and alternative leaching systems and recommended code changes relating to the existing SCDHS's separation distances to accommodate the installation of I/A systems and leaching fields beneath raised houses or decking, between pilings, and reduce current setback or separation distance requirements. The recommended changes to reduce the existing separation distances are as follow:

Table 5-4 –Recommended Changes to Reduce the Existing Separation Distances

Minimum Horizontal Separation Distance From	Recommendation Fire Island System	Existing Fire Island System
Building on Piles	1 ft*	10 ft
Porches, Decks, Overhangs, Cantilevers, etc.	1 ft*	5 ft
Retaining Walls	5 ft	10 ft
Property Lines	5 ft	5 ft
*Separation distances of 1 foot would apply to pilings under or adjacent to the house, deck, porch, etc.		

PWGC also examined existing Fire Island system percolation rate and recommended a higher percolation rate be allowed for I/A systems which in effect would reduce the overall size of the leaching area.

5.5 Recommendations

Cameron Engineering identified similar challenges and agreed with the conclusion and the recommendations from the Davis Park Study as well as PW Grosser's recommendations. I/A systems are feasible options for Fire Island for lot size of around 6,000 square feet. Some lots under 6,000 square feet can also utilize I/A systems under the current best fit policy; however, the smaller lots would not likely be able to install an I/A system unless exemptions are granted. The 6,000-sf lot size estimate does not take existing woodland coverage or habitat loss and erosion control into account. Recommendations are as follows:

1. Fiberglass I/A systems (FujiClean and HydroAction), with deadmen for anchoring, are recommended due to their significantly lighter weight to ease transportation challenge. As an example, the Fuji Clean CEN5 has a small footprint of 34 square feet, meets 4-bedroom treatment requirement, weighs only 400 lbs. and requires no onsite assembly.
2. Pressurized Shallow Drain Fields and geotextile sand filters – the use of both meet SCDHS setback requirements on Davis Park's average size lot and are suitable for high groundwater areas. Pressurized drain fields do require power as opposed to geotextile sand filters which do not require power to function.

3. Pump outs - use of scavenger waste plant or holding tanks is feasible provided municipal space is available.
4. Pump Trucks - The use of regular sized pump out trucks is a challenge given the narrow roads and streets built with varying material of construction. Specialized pump trucks would need to be developed to provide access to parcels that may only be accessible via wooden boardwalks or narrow sand roads.
5. Regulatory agencies should consider revision of codes to accommodate the installation of I/A systems and leaching fields beneath raised houses or decking, between pilings, and reduce current setback or separation distance requirements.
6. Assignment of one set of design standards rather than having to work with standards from Suffolk County Department of Health Service and/or Suffolk County Department of Public Works, with a single lead agency to streamline approval process for both I/A and clustered I/A systems.
7. Creation of a Countywide Wastewater Management District that would administer and manage the County's Subwatershed Wastewater Plan (replacement of 360,000 OWTS with I/A systems and O&M contract), serve as financial administrator for the grant program, create sustainability funding stream to make I/A systems affordable.

SCDHS has indicated that they had been working with the New York State Department of Health Services on possible waivers to certain setback requirements that are specific to Fire Island. As of December 6, 2023, SCDHS has published a draft guidance document outlining its best-fit policy for the siting of Onsite Sewage Disposal System on Fire Island. Under the existing standards, Onsite Sewage Disposal System on Fire Island can be approved as Best-Fit by SCDHS per sections 5-104(3) of the Residential Standards, XI(2)(a) of the Commercial Standards, VIII of the Replacement/Retrofit Standard, or Section 760-614(F) of Article 6 without the need for a variance or waiver. SCDHS best-fit policy may allow reduced setbacks and hydraulic sizing for some types

of Onsite Sewage Disposal System installations without the need to obtain a variance or waiver from the Department's Board of Review. Best-Fit also allows for some of the Suffolk County Subwatershed Wastewater Plan's Fire Island recommendations to be utilized when installing Onsite Sewage Disposal Systems.

In summary, the draft guidance document discussed the types of proposals or projects that would qualify or not qualify for best-fit installations.

Best-Fit is Not Permitted

- Not permitted for proposals to construct a new single-family residence or commercial project on a vacant tax parcel. A proposal to install an Onsite Sewage Disposal System must conform to the Residential and Commercial Standards (e.g., setbacks, hydraulic sizing, etc.). Applicants proposing to install an Onsite Sewage Disposal System that does not comply with these standards may request a variance or waiver from the SCDHS's Board or Review.
- Not permitted for commercial projects when proposing to replace or retrofit an Onsite Sewage Disposal System or cesspool due to a change of use, building addition, or new/replacement structure that does not meet the requirements of the Commercial Standards. For proposals not complying with the Commercial Standards, applicants may request a variance or waiver from the SCDHS's Board or Review.
- Not permitted when there is adequate area to install a system complying with Department standards but the applicant desires to locate the system in a location causing reduced setbacks or reduced hydraulic sizing (i.e., self-created hardship) then the proposal will not be considered Best-Fit by the Department. However, the applicant may request a variance or waiver from the SCDHS standards from the SCDHS's Board of Review.
- Not permitted for residential projects when the proposals do not comply with the Residential Standards due to a self-created hardship. In this case, the applicant may request a variance or waiver from the Residential Standards from the SCDHS's Board of Review.

- Not permitted when an onsite or neighboring drinking water well exists, then the setbacks to the proposed Onsite Sewage Disposal System should be no less than the setbacks to the existing Onsite Sewage Disposal System or cesspool being retrofitted or replaced. If this cannot be accomplished, then the applicant will be required to request a variance or waiver for the reduced separation distances from the drinking water well(s) to the proposed Onsite Sewage Disposal System from the SCDHS's Board of Review.

Best-Fit is Permitted

- Permitted for an existing Onsite Sewage Disposal System or cesspool being replaced or retrofitted with either an I/A OWTS or conventional system where no change of use or new construction is proposed (including additions, structure relocation, reconstruction) may be installed as Best- Fit with reduced setbacks to property lines or structures (e.g., dwelling, decks, swimming pools, etc.) or reduced hydraulic sizing, provided the reductions are not due to a self-created hardship. Reduced setbacks from the sanitary systems to the following may be permitted provided they do not impact operation, installation and maintenance:
    - Property Lines
    - Retaining walls
    - Underground utilities/tanks
    - Drainage structures
    - Decks or buildings
    - I/A Tanks may be located under elevated deck or house on piles if there is no other available land area provided and there is adequate separation to piles, headers, girders, joists, footings, or deck posts as well as adequate accessibility for the installation, and maintenance of the I/A OWTS tank, with the I/A OWTS being vented in accordance with SCDHS Standards. The applicant's design professional must submit a signed and sealed letter/report justifying the above and including:

i. Certifying the proposal will not structurally impact the existing dwelling, deck or Onsite Sewage Disposal System.
ii. Certifying the proposal will provide adequate access for the installation, operation, and maintenance and include specific design drawings such a site layout depicting pile, footing, or deck post locations with respect to the I/A OWTS tank placement and/or cross-sections or layout plans of the deck, dwelling, and I/A OWTS depicting access.
iii. Stating the means and methods of installation.

- Permitted for proposals to modify an existing single-family residence (including additions which would not impact the placement of the Onsite Sewage Disposal System, elevating an existing dwelling, construction of a replacement structure/residence in generally the same footprint as the residence to be removed, relocation of a dwelling for erosion mitigation measures or coastal protection such as dune construction, relocation of a dwelling to increase separation to surface waters, or change of use of a portion of the residence) may receive Best-Fit for the installation of an Onsite Sewage Disposal System when the existing system to be replaced or retrofitted consists of a cesspool or conventional system with an I/A OWTS (refer to Article 6 Section 760-614(F)).

Note that proposed projects will be evaluated on a case-by-case basis by SCDHS to determine if the proposed Onsite Sewage Disposal System may be approved as Best-Fit.

For a detailed discussion of what is permitted and not permitted Please refer to Appendix which is a draft guidance document titled SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES, GENERAL GUIDANCE MEMORANDUM #XX, FIRE ISLAND ONSITE SEWAGE DISPOSAL SYSTEM.

6. LOGISTICS

As noted previously, Fire Island is a 32-mile barrier island off the south shore of Suffolk County, with a land area of approximately 10 square miles and contained within the Fire Island National Seashore (FINS). Access to Fire Island is limited to private vessels, public ferries, dedicated ferries, water taxis (mostly travel between the 17 communities) and permitted four-wheel drive vehicles with permits issued only to year-round residences, utilities companies, and limited number of tradespeople. Some smaller communities do not have direct ferry access. Freight ferry is the only way to transport equipment and material but there are a limited number of freight docks and landing facilities. Any solid waste generated is carted off the island by freight barges or permitted four-wheel drive trucks.

Besides the logistical challenges of getting to Fire Island, travelling in or intra-community has its own challenges. The major access road that traverses most of the communities which starts at the Fire Island lighthouse (Burma Road) east of Robert Moses State Park and traverses east running through community to community with the road made up of a patchwork of sand tracks, cement walks, wooden boardwalks and paths. Given that access and arterial roads and walkways in each community are different in size, shape, type of construction and of varying weight bearing capacity, as well as restriction on type of vehicle or equipment allowed by each community, along with restricted construction window, this complicates the entire logistical process of getting to and from Fire Island. This is particularly challenging for those that are not residents, frequent visitors or contractors that regularly work on Fire Island. Detailed information on access to and from FI as well as on FI are discussed in more details below.

6.1 Access Challenges for Each Community

Public ferries to Fire Island are seasonal and run regularly from May to October. To move equipment and material, a freight ferry is necessary and would need to be arranged ahead of time during the off season. Those services are limited outside of that time frame. The availability of passenger ferries, freight ferries, and landing facilities, along with construction windows, are summarized in Table 6-1 on the next page.

6.2 Roads and Pathways Conditions for Navigation Through Each Community

Although access roads and boardwalks to each community are different in some ways, there is similarity between the communities in that the main access road is generally sufficiently wide for commercial trucks, but the arterial roads or walkways/boardwalks coming off of the main road are usually smaller in width and depending on the type of construction, usually provides for lower weight bearing capacity. Tables 6-1 through 6-3 on the following pages summarize the makeup of various main and arterial roads for each community, and the largest acceptable size trucks on the main road, based on information obtained from Community Surveys.

Table 6-1 – Transportation Information

Communities	Transportation		Freight Dock and Landing Facilities	
	Fire Island Passenger Ferry	Water Taxi	Freight Dock	Landing Facility for Barges
Kismet	Bay Shore Terminal	Bay Shore Terminal	y	N
Saltaire	Bay Shore Terminal	Bay Shore Terminal	Y	N
Fair Harbor	Bay Shore Terminal	Bay Shore Terminal	Y	N
Dunewood	Bay Shore Terminal	Bay Shore Terminal	Y	N
Lonelyville	Bay Shore Terminal to Dunewood	Bay Shore Terminal to Dunewood	Y	N
Atlantique	Bay Shore Terminal	Bay Shore Terminal	Y	N
Robbins Rest	N	N	N	N
Summer Club	N	N	N	N
Cornielle Estate	N	N	N	N
Ocean Beach	Bay Shore Terminal	Bay Shore Terminal	Y	Possible*
Seaview	Bay Shore Terminal	Bay Shore Terminal	Y	N
Ocean Bay Park	Bay Shore Terminal	Bay Shore Terminal	Y	N
Point O' Woods	Private Ferry	Private Ferry	Y	N
Cherry Grove	Sayville Terminal	Sayville Terminal	Y	N
FI Pines	Sayville Terminal	Sayville Terminal	Y	N
Water Island	Sayville Terminal	N	N	N
Davis Park	Patchogue Terminal	Patchogue Terminal	Y	N

*The Village of Ocean Beach owns a Freight dock that could accommodate barges.

Table 6-2 – Access Information for Each Community

	Roads and Walkways						
	NO Interior Roads	Asphalt	Concrete	Gravel	Wood Decking	Compacted Dirt	Other
Atlantique					W		Sand, Wood boardwalks, 1 cement walk
Cherry Grove	X						No roads
Corneille			C		W		
Davis Park					W		Sand
Dunewood			C - walks		W		One wooden walkway - sections of South Walk
Fair Harbor					W - 5ft no cars		
FI Pines					W	CD	Sand Road- short concrete walks
Kismet			C	Gr		CD	
Lonelyville			C (west)		W (east)		
Ocean Beach			C				
Ocean Bay Park		A	C	Gr	W	CD	
Point O' Woods			C		W		Truck Roads are sand
Robbins Rest			C				Sand
Saltaire					W		
Seaview							Paved
Summer Club			C				
Water Island	X				W		

Table 6-3 – Vehicle Information for Each Community

	Modes of Transportation							Largest Vehicle				
	Bicycles	Golf Carts	Mopeds	Cars/ Vehicles	ATV	Water Vehicles	Other	Car/ SUV/ Van	ATV	Tanker Truck	Golf Cart	Other
Atlantique	B	G		C				C				
Cherry Grove		G										
Corneille	B	G							ATV			
Davis Park				C			Contractors use small carts				G	
Dunewood	B	G		C		W				TT -EMS/ Fire Tanker		
Fair Harbor	B	G									G	
FI Pines	B	G		C			walks are 4' wide-- cars and trucks on FI Blvd only				G	
Kismet	B	G	M	C		W	Small Trucks					Trucks
Lonelyville	B	G									G	
Ocean Beach	B	G		C		W		SUV				
Ocean Bay Park	B	G		C				SUV				
Point O' Woods	B	G		C	A	W	Emergency Response Vehicles			TT- 1000 gpm fire truck		
Robbins Rest	B	G				W	Off Season Cars	SUV		TT		
Saltaire	B	G		C		W				TT		F550 MAX
Seaview	B	G		C							G	
Summer Club	B	G	M	C	A	W				T (wheelbase max. 6')		
Water Island							Wagons					Wagon

6.3 Truck Access from Beach/National Seashore Beach Permit

FINS considers water borne transportation to be the first and foremost method to access Fire Island. Driving to and from Fire Island is restricted. Vehicles must have a permit issued by the superintendent of FINS to drive onto and off Fire Island. Vehicles can access Fire Island east from Smith Point County Park (prior to the Old Inlet breach caused by Superstorm Sandy in 2012) and west from Robert Moses State Park. Because of the breach, vehicles that need to access Fire Island must now access from the west at the east end of Robert Moses State Park. To broadly summarize the eligibility requirements for a driving permit, only the following categories of applicants can apply and receive a driving permit that is good for a period one year:

1 Year-round resident – limited to a total of 145 permits.
2 Part-time residence grandfathered before 1978 – total of 100 permits.
3 Utilities permit and essential services – propane, refuse removal, fuel, business (total of 30 permits)
4 Construction business – 80 permits
5 Municipal permits – 5 permits per village or community
6 Recreational – Fishermen - restriction on number of trips per year

Vehicles must be four-wheel drive with gross weight of less than or equal to 10,000 lbs. and must drive only on designated route.

Driving rules and regulations are currently being reviewed by the National Parks Service and any changes would require local support and buy in.

6.4 Ferry Transportation

Given the fact that passenger and freight ferry service is limited during the shoulder and off-season, many of the visitors and contractors, even some residents, do need to engage in additional planning to travel on or off Fire Island. This is especially true for contractors who are new to working on Fire Island where additional logistical planning is necessary to move personnel, equipment, and materials to Fire Island. The cost estimates for passenger and freight ferry relating to contractors are discussed in more detail in Chapter 8.

One particular community has commented that it would like to see more ferry services during the shoulder and off-season along with more driving permits for service personnel.

6.5 I/A Pump Out Maintenance

I/A system works as a miniature biological wastewater treatment plant which generates sludge within its aerobic and anoxic chambers. The generated sludge will accumulate over time and must be periodically removed to ensure optimal function. Depending on size of the system and wastewater loading to the I/A system, pump out frequency can range between once a year to once every three years. The service provider under the required service contract would perform routine equipment check and maintenance once every six months that for the most part, would include recirculation pump and aeration pump, control panel, alarms, air diffusers, floats, visual effluent check, along with routine maintenance such as replacing filters, cleaning pumps or distribution laterals if the leaching system is a Pressurized Shallow Drain Field. Scum and sludge accumulation level would be checked as well on each service visit and the service provider would provide pump out recommendations per the manufacturer's operations and maintenance manual. Note that the service contract typically does not cover emergency calls, alarms call, pump outs, and repair of equipment due to misuse.

For most I/A systems, the pump out procedure requires all electrical components to be turned off. Depending on the brand and model of the I/A system, a typical pump out for a four (4) bedroom home would involve the removal approximately 500 gallons of liquid scum and sludge.

Given the access issue discussed in this report, regular sized pump out trucks would not be able to access some of the distance parcels from the main access road due to tree canopies, road/boardwalk width and weight limit. Town of Brookhaven has weight limitation on its public wooden walk and prohibit any vehicle or conveyance of any kind having a gross weight of more than 1,800 lbs. Given that a 500-gallon sludge pump out equates to approximately 4,173 lbs. of net weight, any specialized vehicles such as a modified golf cart or ATV is severely limited in the amount it can haul either with a

holding tank or a trailer mounted tank. For example, a typical golf cart weights between 800 to 1,100 lbs., and if we assume the golf cart is retrofitted for sludge pumping only with passenger seats and other accessories removed, then it could have a tare weight at the lower end of that range which is 800 lbs. This means the cart would have an available cargo capacity of 1,000 lbs. (1,800 lbs. weight limit – golf cart weight of 800 lbs.). Subtracting the weight of the driver would result in further reduction of the cargo capacity to an average of 820 lbs. (1,000 lbs. cargo capacity – average adult weight of 180 lbs.), or an available 98 gallons of available capacity for sludge hauling, or a total of at least 5 trips to effectuate a complete pump out of an I/A system.

The best alternative to perform pump outs would be to utilize septic pump out truck with multiple section of hoses to extend the reach to parcels located far away from the main access roads. Another workable alternative would be to utilize portable pumps and hoses to convey the sludge to a parked pump out truck on the main access road. Technically, this method is capable of pumping sludge a long distance from any parcels to a parked septic truck.

7. OCEAN BEACH WASTEWATER TREATMENT FACILITY

7.1 Background

The Village of Ocean Beach (Village) owns and operates the Ocean Beach Wastewater Treatment Facility (Facility) that is located on the northeast corner of Bay Walk and Surf View Walk, Ocean Beach, with treated effluent discharged to the Great South Bay. The Facility, built in 1917, is currently permitted by the New York State Department of Environmental Conservation (DEC) at 500,000 gallons per day (gpd) of sanitary wastewater and treats wastewater from the entire Village. Figure 7-1 shows the sewer district boundary of the Village of Ocean Beach.

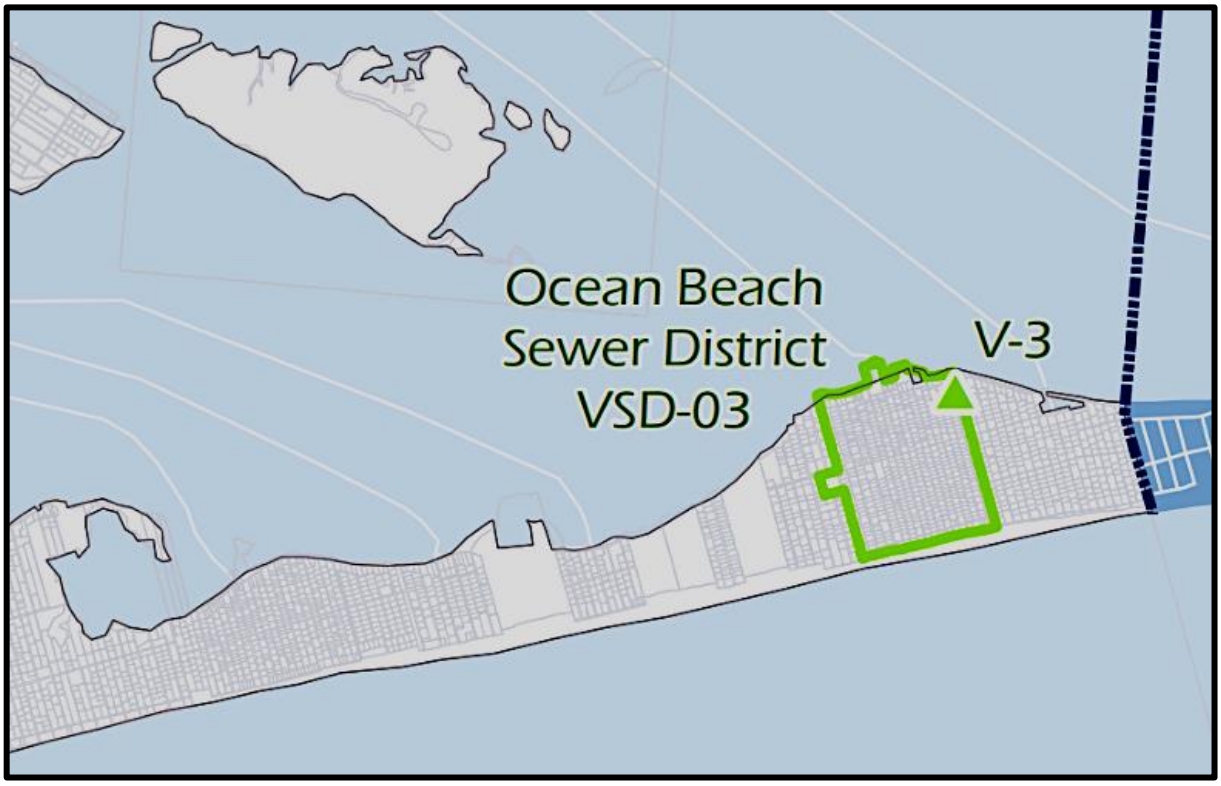


Figure 7-1 - Ocean Beach Sewer District Boundary

The Facility was damaged by Superstorm Sandy in 2012 and the damaged treatment process equipment and electrical equipment were subsequently repaired/replaced to meet FEMA standards with installation of flood doors and elevation of electrical systems.

The existing treatment facility consists of the following influent to effluent unit processes; screening, influent pumping, rapid mix and flocculation with chemical addition, sedimentation tanks, multimedia filters, GAC (granular activated carbon) filters, disinfection, followed by dechlorination with treated effluent discharged to the Great South Bay. The facility does not currently have biological nitrogen removal. The Facility is currently discharging on average a total nitrogen concentration of 1.42 mg/l, 1.14 mg/l, 1.3 mg/l and 0.77 mg/l for calendar years 2019, 2020, 2021 and 2022, respectively. Compared to the current limit-of technology of 3 mg/l of total nitrogen, those reported concentrations are extremely low and are likely due to low influent loading because of a significant amount of infiltration and inflow (I/I) into the sewage

collection system. The South Shore Estuary reserve currently does not have a nitrogen limit for wastewater treatment facilities from either a local watershed management plan, a Nine-Element plan per DEC, or a total maximum daily load. However, due to recurring reported water quality issues such as harmful algae blooms, the need to mitigate excess nitrogen to surface water bodies as cited within the South Shore Estuary Comprehensive Management Plan, Suffolk County's Reclaim Our Water initiative, and the New York State's Long Island Nitrogen Action Plan, the treatment plant would likely need to be upgraded to tertiary treatment with biological nitrogen removal before any out-of-district sewer connections could be considered or approved by the regulatory agencies such as the DEC or United States Environmental Protection Agency (USEPA). Interviews and discussions with the Clerk/Treasurer of the Village of Ocean Beach indicated that the plant capacity is currently underutilized and there is excess capacity for considering out-of-district connections. This statement appeared accurate and is corroborated by information based on the number of residents and the monthly average wastewater data recorded during the winter and summer seasons.

The Village is a summer vacation destination. There are currently an estimated +/- 150 year-round residents but that number increases to an average of 5,000 during the peak summertime season. Average summertime day-trippers are about 1,000 per day based on wastewater survey result. Because of the difference in the number of residents and visitors from off-peak to summertime season, there is a seasonal monthly flow difference of about 100,000 gpd received at the Facility. As shown on the table below for the past three calendar years (2019 to 2021), there was a distinct difference in flow between the pre-COVID pandemic and during the pandemic. For calendar year 2021, which was a pandemic year, the summertime monthly maximum flow and average for the four-month peak-season period (June through September) was reported as 184,500 and 177,525 gpd, respectively. For the pre-COVID pandemic year of 2019, the summertime maximum monthly flow and average for the four-month peak-season period was reported as 235,700 and 212,975 gpd, respectively.

Table 7-1 – Ocean Beach WWTF Reported Flows

Year	Off-Season, gpd	Peak-Season (June to September)	
		Monthly Average, gpd	Maximum Reported Monthly Average, gpd
2019	126,720	212,975	235,700
2020	112,313	167,325	178,900
2021	113,050	177,525	184,500

The sanitary collection system that collects sewage consists of vitrified clay pipes, except for various short sections of PVC pipes that were used in repairing sewer breaks under emergency situations. Because of settlement, misalignment of piping sections, as well as cracks and gaps developed in the piping due to age, coupled with a high groundwater table and low topographic elevation on the northern portion of the Village, the WWTF currently experiences an estimated 100,000 gpd of infiltration and inflow (I/I). Infiltration occurs due to various portions of the collection system that are either totally or partially submerged in groundwater. Where the groundwater table hydraulic head is higher than the hydraulic head of the wastewater in the collection system, groundwater will seep into sewer pipes through holes, cracks, joint failures, and faulty connections. Sections of collection piping may be subjected to fluctuations in the groundwater elevation as a result of tidal influence.

Figure 7-2 below depicts the topographical elevation for Village of Ocean Beach and shows the lowest elevation along the northern portion of the Village along. This area, along Bay Walk, is where stormwater would collect after a wet weather event and flood. Any flood water collected in this low-lying area would inflow into the collection system via non-watertight sanitary manholes.

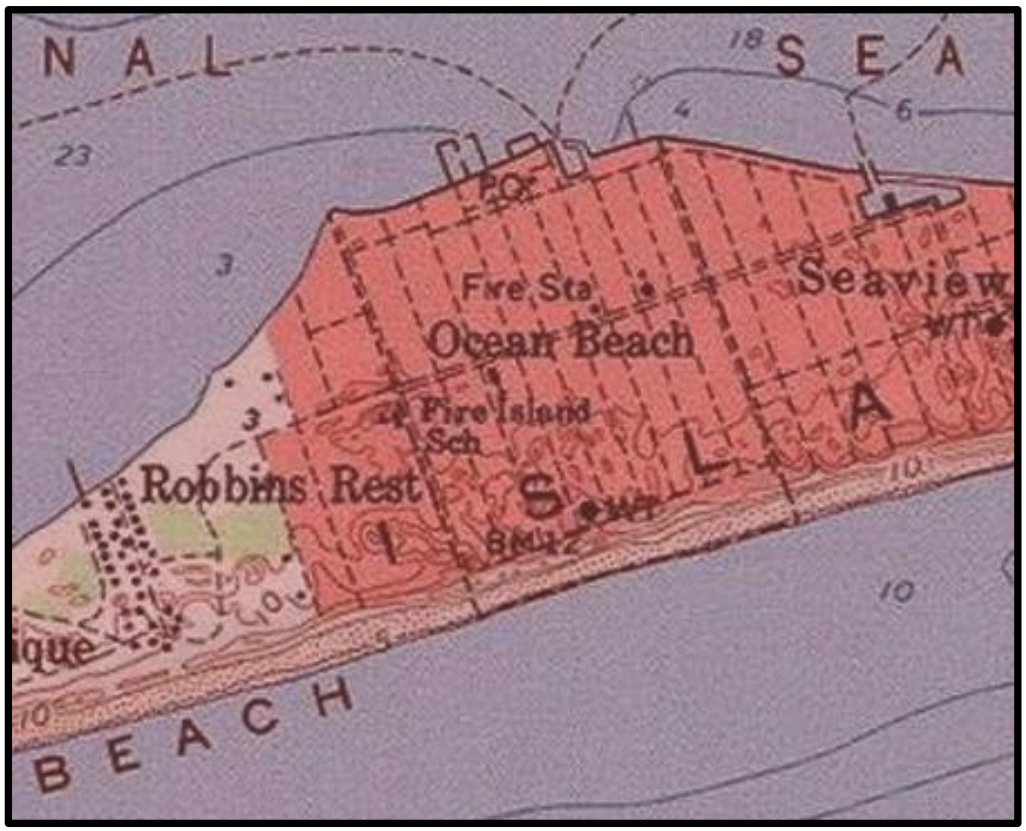


Figure 7-2 - Topographical Elevation for Village of Ocean Beach

The Village is currently in the process of implementing a remedial plan to address the I/I problem in two phases; Phase I (IA & IB) of the I/I remedial action has been bid and awarded at $12.5 Million to implement sanitary and stormwater improvement in the low-lying areas along Bay Walk from Cottage/Dehnhoff to Surf View Walk. Modular wetland units, series of interconnected sediment basins and storm sewer conveyance to a pump station are currently under construction to alleviate inflow into the sanitary collection system. Phase IC has not yet been bid but the cost is anticipated to be well over $3 Million. As part of the Phase I ground opening trench work, a new sewage pipe would be laid to accommodate future sewer connections from outside the Village.

Phase II work will involve the replacement of sewer pipes. Except for the 12” diameter PVC pipe along Bay View Walk between Surf View Walk and Dehnhoff Walk, all sewer pipes within the Village, which totals approximately 20,000 feet of vitrified clay pipe, will be replaced with low-pressure sewer at an estimated cost of over $20 Million.

It is anticipated by the Village that the two-phase approach with current actual (Phase IA and IB) and estimated cost (Phase IC and Phase II) totaling over $35.5 MM would virtually eliminate the existing 100,000 gpd of I/I.

7.2 Wastewater Treatment Facility Capacity

Since daily flow records were unavailable, monthly average flow rates were used for this analysis. In accordance with New York State Department of Environmental Conservation (NYSDEC) requirements, a Facility Plan will be required for flow management once the annual average flow reaches 95% of its design capacity. Based on this requirement and the 2019 maximum summertime flow rate information, the Village has a 240,000 gpd of excess capacity (500,000 permitted flow x 0.95 allowable percent of permitted flow = 475,000 gpd; 475,000 gpd – 235,700 gpd maximum reported peak season average monthly flow = 239,300 gpd, then round up resulted in 240,000 gpd).

Upon completion of the I/I reduction work, the WWTF would realize approximately another 100,000 gpd. Therefore, after I/I reduction, the total available capacity would be 340,000 gpd (240,000 gpd of excess capacity + 100,000 gpd from I/I reduction work), could be connected.

The Village has expressed a desire to offer the excess capacity to connect parcels located outside the sewer district; however, the ability to gain permission to connect out of district parcels will require NYSDEC approval and be dependent on the mitigation of the I/I flow (Phase 1 and Phase 2) and the nitrogen reduction.

7.3 Sewer District Expansion Areas

A major cost factor on any new parcel connection is distance from the existing sanitary collection system, as such, communities that are contiguous and closest to the Village, if so desired, are the best candidates to take advantage of the excess capacity; this means Seaview and Ocean Bay Park to the east of the Village, with Summer Club Condo/Corneille Estate, Robbins Nest and Atlantique to the West of the Village would be the preferred communities to be connected once capacity is available.

Again, upon completion of the I/I reduction work, total probably available capacity for the Plant could be 340,000 gpd (240,000 gpd of excess + 100,000 gpd from I/I reduction).

As shown in Table 7-2 and Table 7-3 below, for the five communities mentioned above, the total number of parcels is 1,124 parcels, with total maximum peak summer season wastewater flow projected as 226,560 gpd based on population (295,000 gpd based on land use). According to parcel land uses, as described in Section 2.6, then the total maximum peak summer flow would be 295,000 gpd. In either scenario, the excess capacity available at the WWTF could connect all the parcels within the five communities via low-pressure sewer if they so desire.

Table 7-2 – Total Parcels

Number of Parcels in Each of the Five Communities			
West of Ocean Beach	No. of Parcels	East of Ocean Beach	No. of Parcels
Summer Club/Corneille Estates	156	Seaview	437
Robbins Rest	53	Ocean Bay Park (Post I/I)	394
Atlantique	84		
Subtotal (Parcels) =	293	Subtotal (Parcels) =	831
Total No. of Parcels = 1,124			

Table 7-3 – Total Projected Wastewater Flow

Peak Summer Season Wastewater Flow from Each of the Five Communities					
West of Ocean Beach	Based on Population, gpd	Based on Land Use of Parcels, gpd	East of Ocean Beach	Based on Population, gpd	Based on Land Use of Parcels, gpd
Summer Club/ Cornielle Estates	23,850	32,000	Seaview	75,000	119,000
Robbins Rest	10,200	11,000	Ocean Bay Park (Post I/I)	105,000	116,000
Atlantique	12,600	17,000			
Subtotal =	46,650	60,000	Subtotal =	180,000	235,000
Total Projected Wastewater Flow, Based on Population = 226,560 gpd					
Total Projected Wastewater Flow, Based on Land Use of Parcels. = 295,000 gpd					

Graphically, this is shown on Figure 7-3 which shows the five (5) communities that could connect to the WWTF.

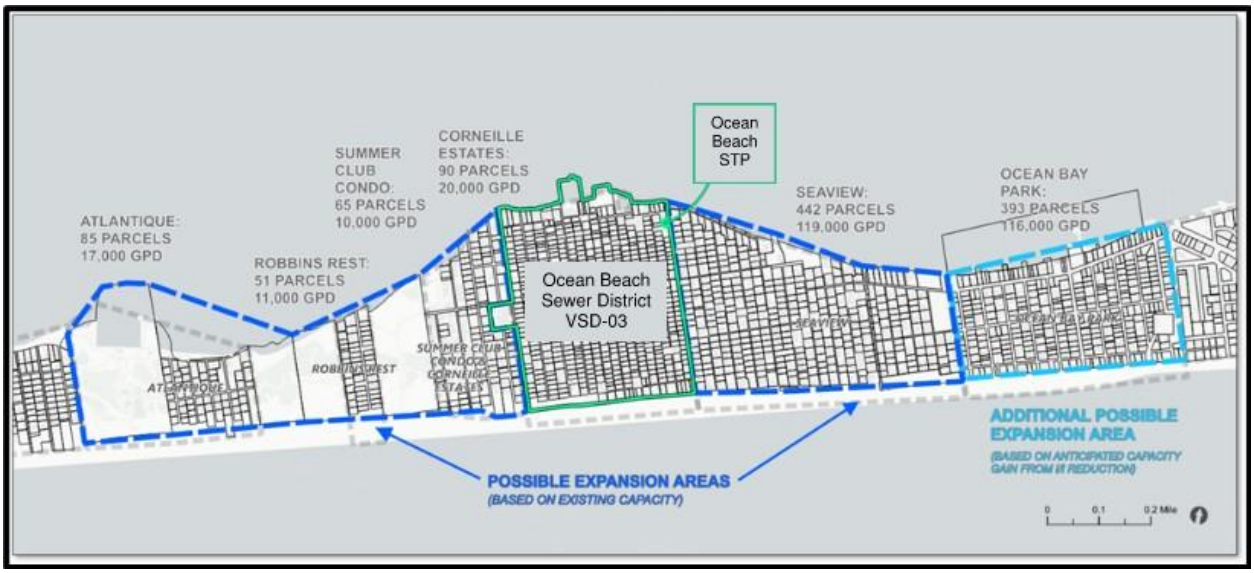


Figure 7-3 - Ocean Beach WWTP Possible Expansion Areas

7.4 Conversion to Pump Station/Pump to Mainland

The alternative to convert the existing WWTF to a pump station with force main to convey the collected wastewater under the Great South Bay to Suffolk County Sewer District No. 3 (aka Bergen Point) exists. This option is one of the long-term solutions for the management of wastewater on Fire Island given the predicted climate change scenario with sea level rise, higher groundwater table, more intense and frequent wet weather events, storm surges, and coastal erosion.

The WWTF is currently serving the Village of Ocean Beach and post I/I reduction has additional capacity to connect approximately 340,000 gpd. Any additional connections to the treatment plant beyond the current capacity would not be possible as there is insufficient space to expand the WWTF. However, if the WWTF is converted to a pump station with a force main to the mainland for treatment of the wastewater would at a regional treatment facility (Bergen Point WWTP), all parcels within the communities from the western boundary of Kismet to eastern boundary of Point of Woods could be connected.

The approximately 3.5-mile force main from the WWTF would be installed under the bay bottom via directional drilling, to minimize environmental disruption, and land at Heckscher State Park in Great River. A large diameter Suffolk County sewer interceptor exists at Timber Point Road approximately 2 miles north of Heckscher State Park that would be suitable to accept the sewage flow. This interceptor would carry the Ocean Beach wastewater by gravity flow westward to the County's Bergen Point WWTP for treatment and effluent discharge to the Atlantic Ocean.

7.5 SCDPW Ownership, Operation & Maintenance

The Suffolk County Department of Public Works (SCDPW) has many responsibilities which include the construction, maintains and operations of county properties, as well as the designs, construction and maintenance of county roads, sewerage systems, buildings, and other facilities, such as waterways, bridges, docks, and marinas.

Regarding sewerage systems, SCDPW owns and operates approximately twenty (20) Publicly Owned Treatment Works, including Bergen Point Wastewater Treatment Plant which is the largest treatment plant in Suffolk County with a permitted flow of 40.5 MGD. SCDPW has extensive operational and maintenance expertise to handle all aspects of sewage treatment plant and their respective sanitary collection system. The County also has a number of other Sewer Districts that it owns and operates. These Sewer Districts have their own sewage collection systems with complementary treatment plants many of which are tertiary treatment (nitrogen reduction) that are operated and maintained by SCDPW staff.

The Village of Ocean Beach is a small village with limited resources. It has expressed the desire for the SCDPW to take ownership and operate the WWTF. The Village should commence discussions with the County as to the concept of the Village's sewer infrastructure being transferred to County ownership and operation. Under County ownership, the ability to pursue grant opportunities should increase potential to attract Federal and State monies. Expansion of the Southwest Sewer District No.3 would allow the Village's and possibly additional communities on Fire Island to be received and treated at the County's Bergen Point facility as discussed in Section 7.4.

8. FIRE ISLAND CONTRACTORS/CERTIFICATION REQUIREMENTS

8.1 Contractors

The installation and servicing of septic and I/A systems in Suffolk County requires contractors to obtain a Liquid Waste License (LWL) issued by Suffolk County Department of Labor, License and Consumer Affairs. A licensee must have proper endorsement(s) for the type of work desired such as installation (endorsement 10) or service and maintenance (endorsement 11). Application for an LWL requires 5 years of working experience in that field and service type for the proper endorsement. The license and endorsement must be renewed every two years. Given such a rigorous experience requirement, Suffolk County may be looking into the possibility of starting up an apprenticeship training program under the local Boards of Cooperative Educational Services (BOCES) network. Section 8.5 lists each endorsement.

As of the date of this report, there are currently 139 licensed and endorsed I/A system installers and 52 service providers by Suffolk County. However, the number of contractors is much smaller depending on the chosen I/A system since manufacturers require certification or training for their specific system.

The number of contractors that perform I/A system installation and services on Fire Island is currently limited to a handful given the logistical challenge of working on Fire Island. These challenges are discussed below.

8.2 Maintenance Service / Pump Outs For I/A Systems

An I/A treatment system requires semi-annual or annual maintenance service call and periodic removal of sludge from the system to ensure optimal function. Sludge must be removed from the I/A system at least once every two to three years. Service provider will measure sludge accumulation on each I/A system service visit and provide the homeowner the guidance to help arrange for a septic tank pumping company to provide this service when necessary. Although the normal usage would require a pump out about once every two to three years, the frequency of pump out can vary depending on wastewater strength, volume of flow treated and how water is used and disposed of by the occupants.

System pump outs will be a challenge and the degree of challenge will vary depending on parcel location. There are a limited number of contractors currently available to service I/A systems on Fire Island due to its remote location and associated logistical issues. Given that the I/A systems on Fire Island are recent installations, those systems have not been in operation for two years yet. However, the challenge with pumping out a treatment system on Fire Island is access. Pump out trucks must access Fire Island via freight ferry to freight docks that are already at capacity in at least a few communities. The second biggest challenge is how to access parcels that are not situated next to a main road. Many parcels in all 17 communities have board walks as access roads that could not accommodate regular septic pump trucks given the narrow width and limited weight bearing capacity. Board walks within the Town of Brookhaven have weight limit, as such, a smaller pump out truck or a specially designed pump out vehicle or a tow behind pump out tank will be required. Section 6.5 outlines specific challenges and recommendations regarding this maintenance.

8.3 Ferry Operations Logistics and Transportation Costs

The majority of the 17 communities have restrictions on when construction can take place and the permitted time frame is typically only during off-season which is for the most part before Memorial Day and after Labor Day unless it is an emergency. Passenger ferry operations are limited in the off-season, so coordination of work requires advanced planning by the contractor. A freight ferry would need to be coordinated as well to ensure products are delivered and transported to the work site with appropriate workers to receive the material at the ferry terminal.

Approximate transportation costs are given below for a typical 2 day I/A system installation project for freight, barge, and passenger transport:

- Freight Transport
    - $1,500 per trip - tool trailer, equipment, I/A tank, and appurtenances
- Barge Transport
    - $1,800 to $2,500 - tool trailer, equipment, I/A tank, and appurtenances
- Water Taxi

- $185 to $250 per trip – depends on the season. Additional passengers will incur extra fare.

- Passenger Ferry
  - $12 to $25 per vehicle per day - Parking at ferry terminal
  - $25 - round trip fare - passenger ferry
  - $260 - 40 round trip worker ticket book
  - $442- 40 round trip adult ticket book

8.4 How To Reduce Minimum Certification Requirements to Be an Installer

Suffolk County currently has about 360,000 septic/cesspool systems that would eventually require replacement with I/A treatment systems. Application for a Liquid Waste License requires five (5) years of working experience, incurred within the past ten (10) years, in that general field and service type for the proper endorsement. The license and endorsement must be renewed every two years.

To replace all 360,000 septic/cesspool systems it will take decades to replace the 360,000 septic/cesspool systems given the current number of installers.

Suffolk County should consider the need to reduce the minimum licensing requirement to ensure sufficient installers and servicers are available to meet demand once the Septic Replacement Program advances to the next phase beyond the current requirement for an I/A system on new or expanded single-family residence or projects that are considered major reconstruction.

Suffolk County should also consider reducing the required minimum 5-year experience by allowing educational/formal training to offset a minimum of two years of work experience. Education requirement relating to the basic physical, mechanical, and biological function of the entire waste treatment system along operation and maintenance, servicing, regulations, and basic mathematics with a passing test result could be eligible for reduction in the experience years. Several education entities could be suitable to provide the necessary classes such as the New England Onsite Wastewater Training Program, New York Onsite Wastewater Treatment Training Network, Inc. (OTN), and New York Rural Water Association.

8.5 Application & Approval Process Improvement

Contractors who wish to perform I/A installations or servicing must apply with the proper experience documentation and other documents as required based on endorsement being sought, and a fee of $200 to Suffolk County Department of Labor, License and Consumer Affairs and receive a Liquid Waste License, with proper endorsement to be duly licensed for said work.

The current licensing requires a minimum of five years' work experience and is valid for 2 years. There are 11 endorsements available ranging from pumping, grease trap operation and maintenance to I/A related services. Details of each endorsement is outlined in Suffolk County's Article VII but in summary, available endorsements for I/A systems are as follow:

- Endorsement 1 - Septic tank pumping, cleaning, and maintenance
- Endorsement 2 - Grease trap/interceptor cleaning and maintenance
- Endorsement 3 - Yellow grease/fryer oil collection
- Endorsement 4 - Temporary restroom facilities
- Endorsement 5 - Waste line cleaning and inspection
- Endorsement 6 - Bulk liquid waste transportation
- Endorsement 7 - Vactor (pump/vacuum) services
- Endorsement 8 - Conventional septic system maintenance inspector
- Endorsement 9 - Conventional septic system installation
- Endorsement 10 - I/A system installation
- Endorsement 11 - I/A system service

Note that continuing education is required for endorsement renewal and requires a minimum of eight (8) training contact hours for endorsements 1 through 8 and twelve (12) training contact hours for endorsements 9 through 11.

As mentioned earlier, to reduce the requirements to obtain a Liquid Waste License to install or service I/A systems, education/formal training should be considered as part of the requirement and be allowed to reduce the experience time necessary to apply for an I/A installation and or service provider license and associated endorsements. Aside from possible educational classes, Suffolk County should also investigate the possibility of an apprenticeship training program under the local Boards of Cooperative Educational Services (BOCES) network.

9. I/A ALTERNATIVE DRAINAGE SYSTEMS

9.1 Alternate Leaching System

An on-site wastewater treatment system generally consists of three main components, the septic tank or the I/A tankage (treatment system), the distribution pipe and the leaching system. By itself an I/A tankage unit could easily fit the majority of parcels on Fire Island. However, the leaching system requires additional space and given the high groundwater table, it is problematic to fit traditional leaching pools and still meet the groundwater separation distance of 2 feet. Alternative drainage or leaching systems were examined by both P.W. Grosser Consultants Inc. (PWGC) and CDM Smith. PWGC had engaged with SCDHS in 2020 regarding how best to fit leaching systems for I/A effluent discharge on Fire Island. PWGC examined the current Fire Island leaching system and several existing SCDHS approved low-profile leaching systems and concluded that those systems would not meet all existing setback requirements without a variance. Those approved systems can be found in Appendix C of the NYS Department of Health Residential Onsite Wastewater Treatment Systems Design Handbook as well as in Suffolk County's Design Standards.

The sizing of leaching systems is based on design flow and site soil percolation rate. The allowable application rates are given in the standards, for example, for sites with a percolation rate of 5 minutes or less per inch, the application rate for a trench system is 1.2 gallons per day per square foot.

Three low-profile leaching systems were examined:

1. Geotextile sand filter - Eljen,

2. Infiltrator – Chamber and ATL, and
3. Geomatrix – Geomat

PWGC discussed four variances, or options, with justification that could allow those low-profile leaching systems to be installed with an I/A treatment system.

1. Allow higher wastewater loading rate to the leaching system than what is currently permitted.
2. Allow the use of Pressurized Shallow Drainfields (PSDs) at 55% reduction in the current required leaching area.
3. Allow the use of the existing leaching system with reduced height.
4. Allow the installation of the I/A and leaching system between piles under raised houses, decks and boardwalks/walkways.

In short, the justification offered for the first two options above is based on wastewater loading rates to the leaching systems, calculated based on bottom area only. PWGC calculations showed that the current Fire Island System leaching system, based on bottom area only, is allowed a higher loading rate than the alternative low-profile options, that is, the Fire Island system is allowed a loading rate that ranges from 2.75 gpd/sq.ft. to 3.25 gpd/sq.ft. versus the allowable loading rate for the low-profile systems of 1.2 gpd/sq.ft. In addition, I/A systems produce a high-quality clean effluent with very low solids concentrations; thus, the alternative leaching system should be allowed a higher loading rate. Wastewater treatment plant effluent discharge is permitted at 5 gpd/sq. ft hydraulic loading rate, so an alternative leaching system such as drain fields could be considered for a 2.5 gpd/sq. ft. hydraulic loading rate. A higher loading rate would translate to a smaller required leaching system footprint to satisfy a given wastewater flow. This may allow for the fitment of alternative leaching systems within smaller sized parcels.

The third option is to allow the use of the existing leaching portion of the Fire Island System without any additional requirement. Should the entire Fire Island System be required for leaching (i.e., septic portion and leaching portion), the height of the system should be allowed to be reduced since the leaching system is now larger in footprint.

This would allow the retaining wall to be lowered in height commensurately with a reduction in cost.

The last option is self-explanatory. It was recognized that the bearing capacity of the piles would be reduced by the installation of an I/A and/or the leaching system and acknowledged that those piles would need to be driven deeper to compensate for the loss in structural support.

The existing and draft best fit approval is currently only approved for projects with an existing sanitary system, provided no change in number of bedrooms beyond previously approved, or major modification are proposed. PWGC felt that the best fit approach should be expanded beyond what is currently allowed.

9.2 Alternate Leaching System – SCDHS Davis Park Study

At the inception of the Suffolk County's Septic Replacement Program, Suffolk County Department of Health recognized that Fire Island would present a challenge for its program due to its unique settings such as high groundwater table, small parcel size plus site limitations, geographically separated from the mainland, access limitations, and seasonal use instead of year-round occupancy. Because of this concern, SCDHS completed a study to examine the possible issues in the use of I/A treatment systems with different types of leaching systems, based on a typical sized lot in Davis Park, as well as to provide recommendations for permitting I/A systems. The results presented therein showed that the current approved disposal systems do not meet existing SCDHS setback requirements.

The existing leaching system, along with three low-profile leaching systems that are in the SCDHS Design Standards to accommodate high groundwater table or other geological limitations, were examined based on existing leaching capacity and setback requirements in the study:

1. Existing leaching system,
2. Open bottom trenches,
3. Geotextile sand filters, and
4. Pressurized Shallow Drainfields (PSDs)

Those low-profile systems also allow for elimination or reduction of retaining wall that may be required to achieve the minimum of 2' separation from the invert of disposal system to seasonal high groundwater table.

The study concluded that although none of the low-profile disposal systems examined above met all of the SCDHS setback requirements, the geotextile sand filters and PSDs met more setback requirements than the open bottom trench system but were unable to meet the 5-foot setback from the foundation of the house, property line, utilities, porches and decks. Thus, unless setback requirements are relaxed, the typical parcel on Davis Park would not be able to meet SCDHS requirements. This conclusion can be extended to the other 16 communities since they may have similar parcel sizes, and the high groundwater condition.

9.3 System Sizing Requirements – Based on Number of Bedrooms or Occupancy

The existing septic tank sizing requirements is codified in Suffolk County's Standards for Approval of Plans and Construction for Sewage Disposal Systems for Single-Family Residences (Residential Standards), April 19, 2022, and is based on the number of bedrooms in a dwelling.

Table 9-1 -Minimum Septic / I/A Capacity and Design Flow

Number of Bedrooms	Minimum Septic Tank Capacity, gallons	Minimum I/A System Capacity, gallons per day	Design Flow, gallons per day
0, 1, 2, or 3	1,000	400	330
4	1,250	440	440
5	1,500	550	550
6	1,750	660	660
7	2,000	770	770

Garbage grinder is strongly discouraged for conventional septic system and is not permitted for I/A systems. The daily flow rate in gallons for a single-family resident is 110 gallons per bedroom in accordance with the Residential Standards. Studies have shown that the current wastewater flow per capita ranges from 50 to 75 gallons per capita per day.

If occupancy is used to calculate the daily wastewater flow rate, for a typical rental home with an average of 6 people (2 per bedroom), this would translate into a daily flow rate range of 300) and 450 gpd (6 people x 50 gpd, and 6 people x 75 gpd = 300 gpd and 450 gpd respectively), which is within the design flow rate given in the table above.

9.4 System Footprint Options / Separation Distance / Best Fit

At the time of this report, I/A system footprints vary among the manufacturers. Square footage required ranged from 33 square feet for the Fuji Clean CEN5 system to 55 square feet of the Hydro-Action AN Series. Both of those systems require no onsite assembly. Any smaller, lighter weight I/A system should be considered first for any new or replacement applications given the logistical challenges for Fire Island. The smaller footprint of the above two systems could be installed at the majority of the parcels on Fire Island, however, as discussed above, the effluent leaching systems would not be able to meet SCDHS setback requirements without a variance or a relaxation of said requirements.

The use of I/A systems to replace existing septic systems works under the current best fit policy provided the dwelling does not, now or in the future, undergo major modification or the addition of bedroom(s). Should major modification or the addition of bedroom be undertaken, a full application to SCDHS with a variance request will be required to allow for the reduction in setbacks granted under the best fit approval.

10. FIRE ISLAND NATIONAL SEA SHORE (FINS)

The Fire Island National Sea Shore (FINS) was established by Congress on September 11, 1964, following a mostly grass-roots preservation efforts supported by local citizens, local government as well as the Fire Island Coalition which represented the 17 communities within the boundaries of FINS on Fire Island. FINS encompasses a 26-mile section of the approximately 30-mile-long barrier island. The mission of the National Park Service (NPS) is “dedicated to conserving unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.” This is accomplished through a workforce of approximately

27,000 employees permanent and seasonal employees, and partnerships with nonprofit organizations, state and local governments, and private industries.

Given NPS's mission is for the preservation of natural resources and the protection of land, there are restrictions on how the land is to be used within FINS. Any given land for easement by FINS to a local municipality for uses other than what is charged must be well justified.

A meeting with FINS held on August 30, 2022, resulted in a better understanding of the criteria in which the taking of parkland may be possible. However, applying to the NPS to take parkland must be the last resort after all other available options are considered, evaluated and exhausted. Also, any proposed use on parkland must have an environmental assessment prepared and the proposed action shown to be the lowest impact solution possible to satisfy the National Environmental Policy Act (NEPA).

FINS cited the Anacostia River Tunnel Project in Washington D.C. as an example of possible taking of land by local municipality for purposes other than as parkland. The Anacostia River Tunnel project was necessary to reduce approximately 93% of combined sewer overflows that contribute to water quality impairment of the Potomac River, which is a tributary to the Chesapeake Bay. The Anacostia River Tunnel Project was implemented as outlined with the 2005 Federal Consent Decree entered into by DC Water, the District of Columbia, the US Environmental Protection Agency, and the US Department of Justice. As portions of the project needed to be constructed on lands administered by the NPS, an environmental assessment was prepared to document compliance with the National Environmental Policy Act (NEPA) before NPS could issue a construction permit for the project. During rain events, the existing combined sewer system would flow to the tunnel and be diverted to an advanced treatment plant with treated effluent discharged to the Potomac River.

The Anacostia Tunnel Project cited above established a very high bar for the taking of national parkland for uses other than parkland. As mentioned above, all options, including the purchase of existing parcels for use in siting treatment plant(s), pump stations and force mains, and storage tanks, would need to be considered and exhausted before approaching NPS for possible use of parkland.

11. WASTEWATER TREATMENT/COLLECTION ALTERNATIVES

The following wastewater treatment alternatives were identified for Fire Island.

- Innovative Alternative Treatment Systems (I/A)
- Low Pressure Sewer Collection System
- Ocean Beach WWTP Expansion
- Marine Based Alternatives
    - Collection/Transfer to Ocean Beach WWTP by Barge
    - Collection/Barging Wastewater to Mainland WWTP
    - Central Pump Station/Force Main Under GSB to Mainland
- Communal/Cluster Treatment Systems
- Use of FINS Property for Treatment Plant Sites
- Innovative Technologies
    - Mobile Restrooms/Urine Diversion
    - Compost Toilets
    - Incineration Toilets

11.1 Innovative Alternative Treatment Systems (I/A)

Section 5 and 6 present a summary of the Suffolk County I/A program, applicability to Fire Island, and environmental and logistical challenges with installing and maintaining I/A's.

Each community will encounter limitations due to the following:

- Depth to groundwater/soil characteristics
- Lot sizes
- Distance/logistics from freight terminals/roads
- Contractor availability
- Access for maintenance /pump-outs

Based on previous studies and research, the applicability of I/A systems in each community was evaluated to determine the approximate number of systems and associated costs that could be installed based on the following:

- Limitations due to distance/logistics from freight terminal/roads.

- A 6,000 sf was used as a minimum lot size when determining if a property could fit an I/A system. Parcel information from the County's tax map database.
- I/A costs estimated at $75,000 per installation – represents the total cost including engineering ($15,000) and construction ($60,000). Costs may be offset with available grant opportunities.
- The Ocean Beach community is served by a WWTP and is not included.

Table 11-1 summarizes the percentage of community applicability and the estimated I/A costs.

Table 11-1 – Innovative Alternative Treatment System Community Summary

Community (listed from west to east)	Total Parcels	No. of Developed Parcels (see note 5)	No. of Dev. parcels greater than 6,000 sf (see note 2)	% of Community's I/A Applicability	Est. I/A Cost for applicable parcels only (see note 3)
Kismet	306	242	137	57%	$10,275,000
Saltaire	603	412	256	62%	$19,200,000
Fair Harbor	487	394	140	36%	$10,500,000
Dunewood	114	100	61	61%	$4,575,000
Lonelyville	123	92	60	65%	$4,500,000
Atlantique	84	55	31	56%	$2,325,000
Robbins Rest	53	38	15	39%	$1,125,000
Summer Club	67	45	45	100%	$3,375,000
Cornielle Estates	89	69	48	70%	$3,600,000
Seaview	437	376	301	80%	$22,575,000
Ocean Bay Park	394	312	100	32%	$7,500,000
Point of Woods	297	152	104	68%	$7,800,000
Grove	310	280	93	33%	$6,975,000
Pines	646	575	501	87%	$37,575,000
Water Island	75	45	23	51%	$1,725,000
Davis Park	303	278	170	61%	$12,750,000
Totals	**4,388**	**3,465**	**2,085**	**60%**	**$156,375,000**

Notes: 1. Communities may encounter limitations due to distance/logistics from freight terminals/roads.

2. 6,000 sf was used as a minimum lot size when determining if a property could typically fit an I/a system with minimal lot issues. Parcel information was sourced from the County's tax map database. This represents an overview of each community. Individual parcel characteristics such as lot coverage, double lots, etc., would have to be reviewed on an individual basis.
3. I/A cost estimated at $75,000 per installation represents the total cost including engineering ($15,000) and construction ($60,000). Costs may be off set with available grant opportunities.
4. Ocean Beach community is serviced by WWTP and is not included.
5. Includes parcels that are currently developed. Land Uses removed from this total include but are not limited to vacant, wetlands, land underwater, parks, athletic fields, roads, flood control, etc.

11.2 Low Pressure Collection and Conveyance Systems

There are a number of collection system alternatives. They include a traditional gravity system as well as innovative or 'alternative systems' such as low pressure and vacuum-assisted sewers or a combination of systems.

Groundwater elevation is an important consideration when evaluating the most efficient type of collection system. The Fire Island groundwater elevations vary from 1 to 3 ft below grade and the high groundwater condition increases the capital costs of gravity sewers as installation will require dewatering during construction.

The three (3) different types of collection systems were considered:

- Alternative I: Gravity Sewers
- Alternative II: Vacuum Sewers
- Alternative III: Low Pressure Sewers

Alternative I (Gravity Sewers) was determined not to be a viable alternative due to the high groundwater. Alternative II (Vacuum Sewers) was also determined not to be a viable alternative due to the relatively high operation and maintenance costs, limited space for vacuum central stations and reported issues with vacuum systems operating in high groundwater conditions associated with these systems. Low Pressure Sewers was determined to offer the most cost-effective approach based on the physical conditions in the study area and is described below. (Alternative III).

11.2.1 Low Pressure Sewer System

Overview

Low-pressure sewer (LPS) collection systems got their start in the late 1960's, and with the advent of the Federal Construction Grants Program, became more popular with more than 600 installations by the end of the 1990's. The popularity of these systems increased when traditional gravity sewers were found to be impractical due to cost or physical conditions (high groundwater, rock, elevation, etc.). Parcels having poor soils and shallow recharge that were unsuitable for traditional on-site treatment and disposal systems could employ LPS to transfer wastewater to decentralized community treatment systems located off site at a more amenable location. Locally,

LPS collection systems are being utilized in the Patchogue Sewer District and the Carlls River Sewer Extension (Babylon). LPS collection systems are also being constructed in the Town of Babylon Mastic/Shirley communities (Forge River Sewer Project). Nassau County has LPS in Atlantic Beach servicing 36 (thirty-six) connections and several individual homes throughout the North Shore. The topography and high groundwater present in these south shore communities make LPS collection systems a good choice for sewage collection and transfer.

11.2.2 Components/Installation

LPS collection system components include small diameter plastic pipe, cleanouts, isolation valves, air release valves, various types of pipe fittings and appurtenances. Additionally, a receiving pit, positive displacement pump, and controls are required to transfer the sewage into the force main. A brief description of each follow:

1. Piping – typically High-Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC) ranging from 1¼" to 8" in diameter.
2. Isolation Valves – for section maintenance and repair without shutting entire system down.
3. Cleanouts - every 500-600 feet, at changes in pipe size, direction and junctions to allow for high pressure cleaning.
4. Air release valves – located on system high points, manual or automatic operation.
5. Pipe fittings – tees, saddles, and isolation and check valves needed to make connections.
6. Appurtenances – valve boxes (plastic, cast iron, concrete), vaults, pressure monitoring station and flow meters.
7. Pump station – consists of a receiving pit (vault), positive displacement (progressive cavity) grinder pump(s) - single or duplex, floats, and pump control panel. Typically, the below grade station is located within the front yards near the road with electrical supply from the residence or business being served.

Some stations come as a pre-packaged unit (*e.g.*, E-One). Pumps are typically designed in the 10-gpm capacity range.

11.2.3 Operations and Maintenance

The LPS system accepts sewage on a continuous basis in a receiving pit and discharges intermittently (based on incoming flow) into the force main. Receiving pits are designed to allow for modest level of storage of flow and minimization of pumping cycles. Due to the size of the pumps and force mains, users are strongly urged to limit the types of material discharged in their respective plumbing systems including large solids, plastics, stringy material and non-biodegradable wipes and rags. All of which should not be discharged into any sanitary system.

An LPS system can be designed for both individual and multiple lot servicing. Piping networks resemble water distribution systems in that sections can be isolated for maintenance and repair. Peak flow velocity (2-3 feet/sec) is required at least several times per day to flush the pipeline and prevent deposits of material including grease.

Operations and maintenance are best left to qualified and trained operators or contract service providers. In the event of a prolonged power outage, an LPS system can be powered by a portable generator. Typical O&M items include electrical problems (supply and floats in receiving pit), malfunction of grinder pumps due to obstructions (rags, wipes, sanitary napkins, plastics, kitty litter and the like), and pump vault infiltration (illegal connections, roots, poor site grading, grease, etc.). Typical emergencies include receiving pit overflows from electrical outages, main line ruptures, and pump failures.

The LPS pumping unit requires maintenance. Should a municipality (or a created “District”) decide to take on the responsibility for the O&M of the LPS pumping units, the units should be located outside of the building foundation to allow for access by District personnel without the need to enter the homeowners’ premises. The homeowner would be retaining responsibility for the individual LPS pump station located on the homeowner’s parcel.

11.2.4 Abandonment of Septic Systems

The properties that will be connected will be required to properly abandon their on-site sewage disposal system in accordance with Suffolk County provisions. This typically requires that the cesspool or septic tank be emptied, cleaned, and filled with clean sand.

Table 11-2 presents a summary of the estimated costs for an LPS collection system for each community based on the approximate number of homes and length of roads/distances to a central collection point on the bay side of each community.

Table 11-2 – Summary of the estimated costs for an LPS collection system

Fire Island Wastewater Management Plan Low Pressure Sewers/Collection System Community Summary

Community	Peak Summer Flow (gpd)	Estimated No. of Homes	Estimated Length of Roads (ft.)	LPS and Collection System Estimated Costs
Kismet	91,000	265	3,361	$ 9,319,750
Saltaire	122,000	400	11,380	$ 16,423,750
Fair Harbor	119,000	360	4,841	$ 12,146,625
Dunewood	30,000	99	1,764	$ 3,790,875
Lonelyville	28,000	82	1,462	$ 3,220,750
Atlantique	17,000	50	2,279	$ 2,667,125
Robbins Rest	11,000	37	352	$ 1,595,125
Summer Club	10,000	45	818	$ 1,984,875
Cornielle Estates	22,000	69	1,285	$ 2,805,000
Ocean Beach	215,000	See note 2	See note 2	See note 2
Seaview	119,000	368	7,622	$ 13,685,750
Ocean Bay Park	116,000	300	4,858	$ 10,540,500
Point O' Woods	49,000	152	7,552	$ 7,854,500
Cherry Grove	115,000	270	4,505	$ 10,258,125
FI Pines	216,000	600	10,543	$ 22,703,625
Water Island	20,000	50	1,086	$ 2,219,750
Davis Park	97,000	270	5,444	$ 10,235,250
Totals	**1,397,000**	**3,417**	**69,152**	**$ 131,451,375**

Notes:

1. Total estimated flow based on peak summer populations
2. Ocean Beach has existing sewer collection system

11.3 Ocean Beach WWTF Expansion

As discussed in Section 7.0 the Ocean Beach WWTF has excess capacity to connect parcels located outside the sewer district.

A major cost factor for any new parcel connection is distance from parcel to the nearest existing sanitary collection system, as such, communities that are contiguous and closest to the Village. Seaview and Ocean Bay Park to the east of the Village, with Summer Club Condo/Corneille Estate, Robbins Nest and Atlantique to the West of the Village would be the preferred communities due to their proximity to the Village.

Table 11-3 below shows the cost estimates for each of the adjacent communities.

Table 11-3 – Cost Estimate

Ocean Beach WWTF Expansion	
Communities	**Cost Estimate**
Atlantique	$2.7M
Robbins Rest	$1.6
Summer Club	$2.0
Corneille Estates	$2.8
Seaview	$13.7
Ocean Bay Park	$10.5
Total =	$33.3M

The cost estimates do not include connection costs and fees that would be charged by the Village of Ocean Beach. Based on common practices in the industry, the connection cost could be as high as $20,000 per parcel but would likely be lower when an entire hamlet, with many parcels, are to be connected at the same time. This cost includes abandonment of the existing system (inspections, removal and disposal of residuals) and connection fees based on land use.

11.4 Marine Based Alternatives

Overview

As previously noted in this report, Fire Island (FI) is a barrier island, access to FI requires the use of permitted four-wheel drive vehicles (year-round residents and licensed tradespeople) and to a much greater degree, the use of marine transportation options. The existing ferries located in Bayshore, Sayville and Patchogue would likely provide

for the bulk of the transportation and commerce activities to and from FI's 17 communities for options involving a marine based operational component. These options would include the use of public ferries, dedicated ferries, commercial/freight ferries and self-propelled vessels, water taxis and privately owned and operated watercraft transporting people, goods, and freight to the Island. Residual wastes generated by year-round residents and tourists include solid waste (municipal solid waste, bulky and white goods, and recyclables) and liquid wastes (wastewater sludge and septic wastes). These residuals can be removed most efficiently via a commercial ferry. Specific to wastewater treatment activities, commercial ferries are currently involved in the removal of residual sludge (biosolids) from the Ocean Beach Wastewater Treatment Facility (OBWWTF) a minimum of twice a year as per personal correspondence with the operations staff of Fire Island Ferries of Bay Shore. Commercial ferries also provide transportation of equipment, material, and supplies to the barrier island necessary for the installation of Innovative & Alternative (I/A) treatment systems and appurtenances. Tradesman and technicians from the mainland travel to and from worksites on the FI using the public ferries and water taxis. FI does have a small nucleus of year-round tradesman that provide services to residents of the local communities. It would be expected that as more sewer related infrastructure is installed on FI that additional technicians and service providers that are located on FI, would obtain the necessary licenses and approvals to provide such services.

For this study, it was necessary to identify marine based alternatives that could play either a supporting role or a major role in managing the wastewater generated on Fire Island. Specific alternates investigated for this study include:

- Collection/Transfer to Ocean Beach WWTF by Barge
- Collection/Barging Wastewater to Mainland WWTP
- Central Pump Station/Force Main Under GSB to Mainland

The collection/transfer to the Ocean Beach WWTF by barge is similar to transport to the Mainland WWTP option and was determined to be not cost effective with limited public health and water quality benefits and therefore was removed from further consideration.

The following sections provide details on these marine based alternatives.

11.4.1 Wastewater Storage & Transfer

As a part of a wide range of wastewater management strategies it is necessary to anticipate that installations of I/A and communal based treatment systems may not be technically or physically possible to site. Limitations such as parcel size (residential), depth to groundwater, set back and code requirements, available land (communal) and constructability issues may preclude the use of individual or communal treatment systems. For these situations and on a case by case or community by community basis, wastewater storage and transfer may be considered a viable option.

11.4.2 Land Based Storage

For this option, it would require the siting of a storage tank(s) that would hold a predetermined volume of raw sewage. For purposes of this study, it would be prudent to provide storage for several days of storage with an upper limit of say seven (7) days to account for inclement weather (wind, storms, mechanical issues, etc.) that would preclude or delay a transfer operation. If providing 7 days of storage is cost prohibitive, a minimum of three (3) days of storage to cover the Friday-Sunday period should be provided. The storage tank(s) would receive raw sewage from LPS pumping system(s) located at residential and/or commercial properties. LPS systems can transfer raw sewage considerable distances and can handle many dozens of connections. The force main(s) would terminate at the storage tank(s). The storage tank(s) would need to be sited in relative proximity to the shoreline to allow for transfer out of the storage tank(s) to a barge or self-propelled vessel that could accept the transferred sewage. The barge or vessel would require a mooring or docking location. The docking location could be at existing freight terminals or at a new to be determined location. The barge or vessel would be designed to accept a set volume of wastewater prior to completion of the transfer operation. Volume would be dependent on the capacity of the vessel and the draft of the vessel when fully loaded. The water depth in receiving areas would need to be considered. The mooring/docking site would need to accommodate the

fully loaded vessel at various tidal conditions. Upon completion of the transfer operation, the transfer line to the barge/vessel would be flushed with water to eliminate any wastewater remaining in the transfer line. Storage tank(s) would be fitted with vacuum/pressure relief valves and odor control systems to properly treat any storage tank exhaust.

A significant challenge associated with this alternative is finding and securing a suitable site to host the storage tank(s). As noted above, the tank(s) should be located in relative proximity to the shoreline/ferry terminal although that is not mandatory. The site would need to have sufficient buffer from residential dwellings and proper setbacks from other habited structures. The tank(s) and associated appurtenances would need to be designed with hardening features to withstand tidal and storm surges, climate change effects such as increased sea level rise and more frequent and extreme storm events.

Once loaded, barges and or self-propelled vessels would transport the wastewater to a transfer location on the mainland. The transfer location should be in proximity to the Bergen Point WWTP for offloading of the wastewater for transport and disposal. See following section.

11.4.3 Wastewater Transport on Barges or Vessels to Mainland WWTP

Commercial ferries and or self-propelled vessels could be utilized for the transfer of raw wastewater that is loaded on the vessel via a transfer system. The transfer system could be land based at or near the storage tank(s) described above or on the vessel itself. Flat deck ferries currently have the ability to carry storage tanks (Frac Tanks) on board as well as tanker trucks that can drive on and off the flat deck commercial ferry. Commercial ferries and self-propelled barges according to a local ferry operator (Fire Island Ferries) could comfortably carry 80 to 90-ton loads. This load would equate to approximately 20,000 gallons of liquid waste. Assuming a transfer rate of 300 gpm, a transfer operation could require 1.5-2.0 hours to account for connecting, transferring and flushing the transfer piping between the storage tank and transport vessel.

Wastewater loads would be returned to the mainland at designated offload points. These could include existing ferry locations in Bayshore, Sayville and Patchogue as well as new to be developed offload points that in appropriate and suitable commercial waterfront locations that could support such an operation. These operations could include the transferring of the sewage from a storage tank (Frac Tank) to a receiving station or tanker truck(s) driving off the barge to travel to designated disposal location such as the Bergen Point Sewage Treatment Plant (Plant) located in West Babylon. Consideration for the analysis of a marine offloading station at the Bergen Point STP is warranted. Such a station could take advantage of the treatment processes located at the County's wastewater treatment facility. Components of the offloading platform/docking station would include docking platform, pipeline into Plant property, connection to existing tankage or manhole connected to the Plant drain system. The Scavenger Waste Receiving Facility (SWRF) is located on the southeastern portion of the property. Offloading to the SWRF may be a logical location to consider for receiving wastewater from a marine based operation. Depth of water in the area of unloading platform/station would need to be sufficient for accommodating a fully loaded barge and if not, dredging of a mooring site may be required.

11.4.4 Barge Mooring and Staging Areas

The above marine-based alternatives discussed the use of specially designed barges or self-propelled vessels travelling to designated slips or platforms to conduct a number of possible activities including:

- Receiving raw sewage from a holding tank via pipeline
- Receiving raw sewage from portable restroom storage tanks
- Receiving raw sewage from a pumping station via a force main
- Receiving and treating sewage directly from a storage tank or pumping station and discharging treated effluent at the mooring site

- Receiving sludge (i.e., Ocean Beach) from land-based treatment systems and transporting to mainland either in tanker vehicles, Frac Tank or vessel with a built-in holding tank.

A listing of existing docking facilities is provided in Table 6-1. The table provides location, type of facility, location and existing usage. Of these facilities, those facilities showing commercial access may be candidates for consideration for modification to participate in raw sewage transfer operations involving transfer of containerized sewage (i.e., tanker or small moveable container) and possibly transfer of sewage via a pipeline from a storage tank. The majority of the existing sites would likely not be suitable for long term mooring of a barge or vessel for receiving raw wastewater over several days or for on-vessel processing of raw sewage with the discharge of treated effluent into the bay. If one or more of the marine-based options becomes both technically and financially viable, it is reasonable that new special use mooring sites could be permitted and constructed that would not impact the use of existing terminals that transport visitors and supplies to the communities.

11.4.5 Costs

Marine operations are by far more costly than providing similar services on the mainland. The operation of the vessels requires minimum staffing of qualified personnel. Operational expenses for marine vessels include salaries, fuel, supplies and expendables. Overhead costs include liability and environmental insurance, dockage fees, debt service on equipment, administrative personnel salaries, union dues and labor benefits such as health care. Costs would also include the cost of the equipment and systems specific to each of the marine options discussed above.

In addition to daily operational fees, disposal of liquid waste would be subject to dump fees at the receiving treatment facility. For Sewer District No.3, the current (2022) tipping fee for liquid wastes is $84 per 1000 gallons ($0.084/gallon). Transportation of the wastewater to the receiving facility would be an additional cost. That would be estimated on the order of $300-$500 per trip for a tanker truck to the County's Bergen Point WWTP.

Should marine based options be determined to be a strategic component of wastewater treatment for Fire Island, it is reasonable to consider procuring marine based services through a Request For Proposal (RFP) format. This process is subject to New York State Municipal Law 120-W and is often used for procuring waste services such as solid waste collection and disposal. Liquid wastewater would be considered solid waste. Procurement for 10-15-20 years of services would allow for bidders to develop both operational and financial plans that would be necessary for them to procure the needed vessel(s), undertake capital improvements for barge/mooring structures, storage tanks, etc. and secure the revenue stream for payment of the associated debt through a long-term service agreement.

With both climate change and sea level rise becoming a reality, the marine based options described above may become more attractive at a future date. This may allow for proper planning and consideration of suitable sites that could host some of the components required such as mooring locations, new docks/wharfs, storage tanks and offloading sites on the mainland. It is reasonable to consider that environmental review, acquisition, permitting and development of a site(s) for marine based options would take a minimum of 3-5 years to complete and possibly longer.

11.4.6 Centralized Collection/Pump Station and Force Main to Mainland

This option has merit and should be considered a long-term alternative. In previous sections, the use of low-pressure systems (LPS) has been discussed as an option for receiving and transporting wastewater to other treatment locations such as the Ocean Beach WWTF or a communal sized treatment system located at a municipally or on a federally owned (FINS) parcel. The reasons for transferring the wastewater could include high groundwater conditions, insufficient parcel size, economy of scale and strength in managing wastewater on a community level as opposed to on an individual basis. When we factor in Sea Level Rise (SLR) and Climate Change as discussed in Section 2.5, some of the alternatives and options applicable in the near term (0-10 years) begin to look more tenuous. As one looks out into the future another decade or two, SLR will result in higher tides reaching higher elevations on FI as well as

increasing local groundwater elevations. Treatment units installed below grade will experience greater forces of buoyancy and separation distances between leaching fields discharge depth and the surface of groundwater will decrease resulting in a reduction in treatment and in some cases the hydraulic failure of the system. Parcels on the north side of Fire Island will see more dramatic changes than parcels located on the southern portion of the Island. When Climate Change is added in, more intensive storms with increased wind and precipitation will add to the challenge of maintaining operations of subsurface and in some cases, surface treatment systems if any are developed in the near term (0-10 years). With SLR and Climate Change here to stay, it is appropriate to consider longer term options including transferring wastewater to the mainland.

A very current example of this option is the City of Long Beach, NY. The City of Long Beach in partnership with Nassau County are in the initial stages of the conversion of the City's WWTP to a pump station with a force main to traverse underneath Reynolds Channel to transfer the City's wastewater to the County's South Shore Water Reclamation Facility in East Rockaway. This project was borne out of Superstorm Sandy that devastated both the City's WWTP and the County's treatment facility formerly known as the Bay Park Sewage Treatment Plant (STP). The County's treatment plant was rebuilt and hardened to prevent damage from future storm events. The hardening design features include a levee that totally encloses the rebuilt plant to keep out storm surges at projected future SLR elevations. The City of Long Beach will no longer have to worry about treating wastewater on a barrier island that may be susceptible to future storm events. The project is expected to go into construction in 2024 at an estimated cost of $129M with the bulk of the funding coming from FEMA in the form of a grant.

Fire Island will be susceptible to the same or similar conditions to those of the City of Long Beach with tidal storm surges coming through the barrier island inlets (Fire Island, Moriches and Shinnecock) with heavy surf and surging tides on the ocean side of the Island. Strong winds out of the north, northeast and northwest typically present

during a low-pressure event will batter the northern side of the Island with punishing waves and wind. Similar to the City of Long Beach, a pump station could be designed and constructed with hardening measures to sustain a 500-year storm event plus tidal surge and high winds. The pump station should be located to a position a southerly location to avoid the brunt of storm surge and damaging waves coming off the bay. It would be appropriate to consider two (2) pump stations and force mains to the mainland. One to be located south of the existing site of the Ocean Beach WWTF and one that would be located in the East End (Davis Park). The hypothetical Ocean Beach Pump Station service area would extend from Kismet on the western border to Point of Woods on the eastern border. The hypothetical East End Pump Station service area would extend from Cherry Grove on the western border to Davis Park on the eastern border. Force main piping from both pump stations would traverse underneath the Great South Bay. The Ocean Beach force main would be approximately 3.3 miles underwater. The Ocean Beach force main would continue to Heckscher State Park in Great River via directionally drilled piping (approximately on land for an additional 2 miles). The County has suitably sized sewer interceptor pipes in the area of Timber Point Road that would have the capacity to accept flow from this conceptual pump station. The East End force main could become an out-of-district connection to the Village of Patchogue's collection system and treated at their facility. Despite the Village of Patchogue's existing capacity (0.8 MGD), an expansion of their facility to treat the East End connection may be a viable solution.

Both the Ocean Beach and East End pump stations would accept sewage flow at its wet wells via small diameter low pressure sewer piping from the communities that would be within the sewer service areas. Pump stations would require alternate power sources (e.g., standby generator) with sufficient supply for a minimum of 3-5 days of station operations. It is noted that parcels served by LPS units would not have sewer service unless the parcel had its own standby power supply.

Table 11-4 summarizes the costs for a dual and single crossing under the GSB. Figure 11-1 shows potential crossing locations and communities served.

Table 11-4 - Costs for a Dual and Single Crossing Under The GSB

Central Pump Station/Force Main Under Great South Bay to Mainland Treatment

Alternative	Central Pump Station Location	Crossing Distance (ft)	Central Pump Station/Force Main Under GSB	Community LPS/ Collection Systems	Total Estimated Costs	Potential Communities to Be Served (see note 4)
Dual Crossing	Ocean Beach (see note 1)	18,000	$118M	$86M	$204M	Kismet, Saltaire, Fair Harbor, Dunewood, Lonelyville, Atlantique, Robbins Rest, Summer Club, Corneille Estates, Ocean Beach, Seaview, Ocean Bay Park, Point O' Woods (Total Estimated Flow – 0.85 MGD)
	East End (see note 2)	22,000	$145M	$53M	$198M	FI Pines, Cherry Grove, Water Island, Davis Park (Total Estimated Flow – 0.54 MGD)
Single Crossing	Ocean Beach (see note 1)	18,000	$118M	$153M	$271M	Serves all communities

Note:

1. *Crossing point to Heckscher State Park to 36" Sewer District No. 3 Interceptor at Woodland Drive.*
2. *Crossing point to Village of Patchogue (Existing small diameter LPS force mains in vicinity of dock).*
3. *Includes cost to collect and transfer wastewater to Central Pump Station location within each community.*
4. *Total Estimated Flow based on peak summer populations.*

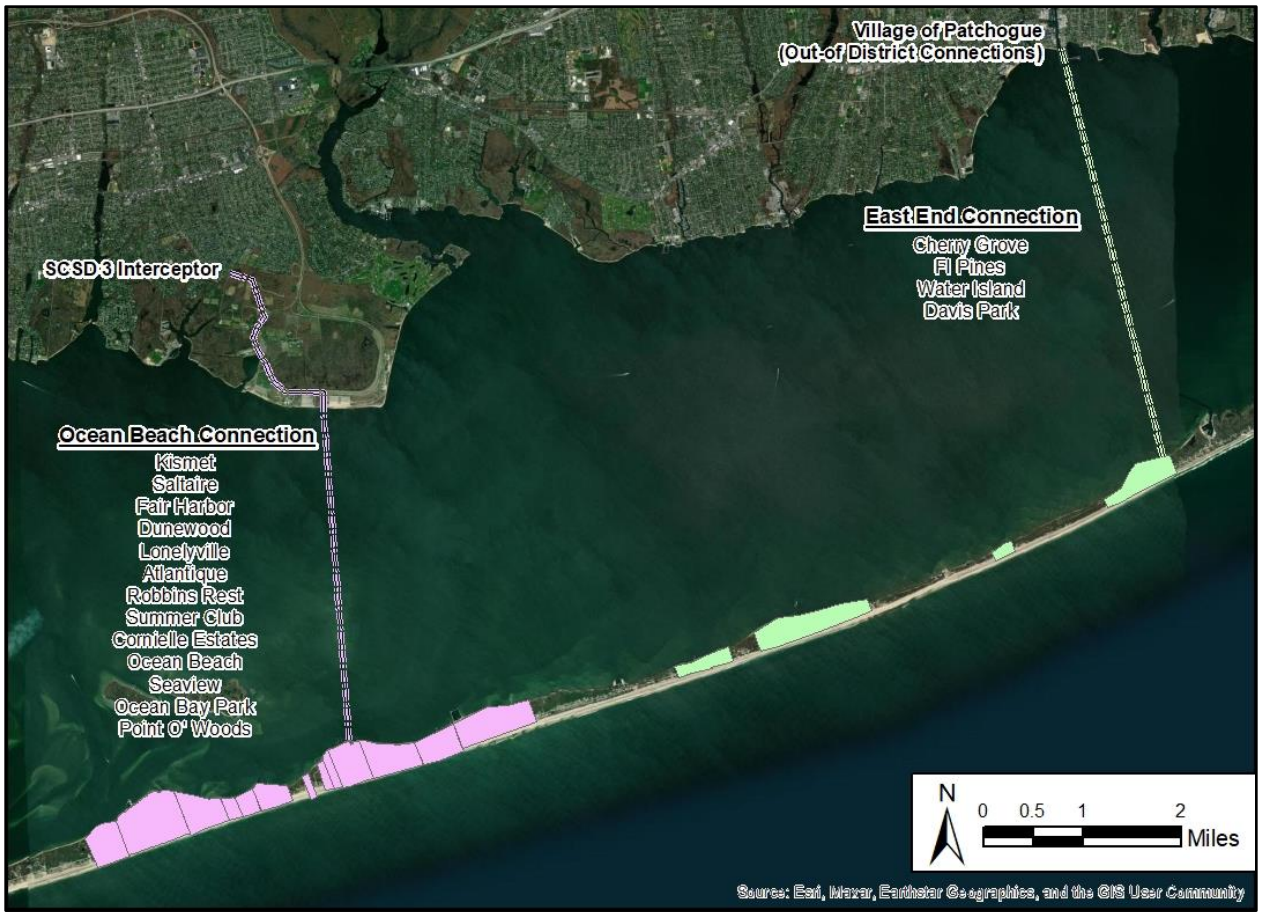


Figure 11-1 – Central Pump Station/Force Main Under GSB to Mainland Treatment (Single/Dual Crossings)

11.4.7 Composting Toilets

Composting toilet systems are currently allowed under State regulations. It is a dry-type toilet that treats human waste via composting in-situ via biological process and does not require a septic tank and leach field. The typical compost process relies on mesophiles compost process, which are biological organisms that suited to moderate temperature, and commonly takes months to years to accomplished, as such, application is generally at recreation areas such as parks; off-grid building such as remote cottages, ecotourism resorts, and hunting cabins; and rural areas where centralized wastewater treatment is not available or where environmental setting render installation of a septic tank and leach field difficult. Unlike flush toilets, composting toilet systems do require more involvement by the user and maintenance

is critical to proper odorless operation. Typical output volume from these systems is about 10 to 30% of input.

Component of a compost toilet system consists of a typical commode type toilet and a collection/composting compartment. The composting chamber can be designed as a split system located above or below grade (in basement). The composting chamber is generally consisting of four main components, storage/composting chamber, ventilation unit to remove noxious odors such as ammonia, nitrous oxide, methane, hydrogen sulfide, and other volatile organic compounds, a leachate collection to remove the excess moisture to ensure the composting process does not become anerobic which interfere with decomposition, and an accessway for extracting the compost. Some compost toilet system design includes a urine diversion system to ensure the material in the compost chamber is not over saturated and to eliminate the ammonia in the urine that could inhibit biological activity and slow down the composting process.

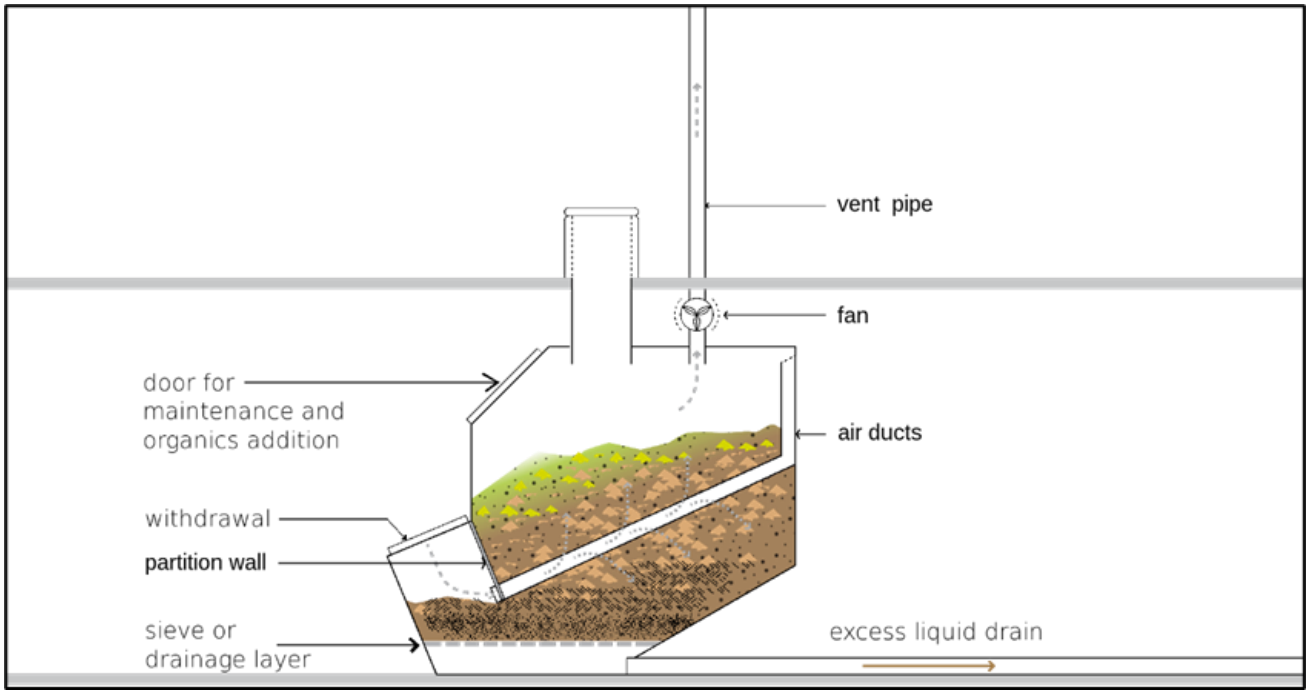


Figure 11-2 - Schematic of a Compost Toilet System

There are two basic compost toilet system process designs, slow or active. Slow composting toilet system relies only on the natural environment without active introduction of oxygen, venting and heat. The composting chamber is a separate structure from the toilet. This type of system takes longer to complete its composting process and would not provide a pathogen free end-product.

Active composting toilet systems would have fans and mixers to provide aeration, a heating element to ensure optimum composting temperatures are maintained, as well as a system to add moisture to the compost chamber if necessary. An active system allows for faster completion of the composting cycle in months rather than years.

The OGO brand compositing toilet is designed to be used in niche settings such as tiny homes, RVs, remote cottages, boats, etc. It has urine separation storage and a built-in solids bin at the bottom of the toilet. The urine storage container typically requires emptying after about 25 to 30 uses. The solids bin would need to be emptied at about the same frequency and since the contents are not fully composted the solids will need to be disposed of properly or be added to a separate compost pile to continue the composting process. Given the smaller size of the composting chamber, this type of toilet is best for infrequent, remote, or occasional use applications as mentioned above.

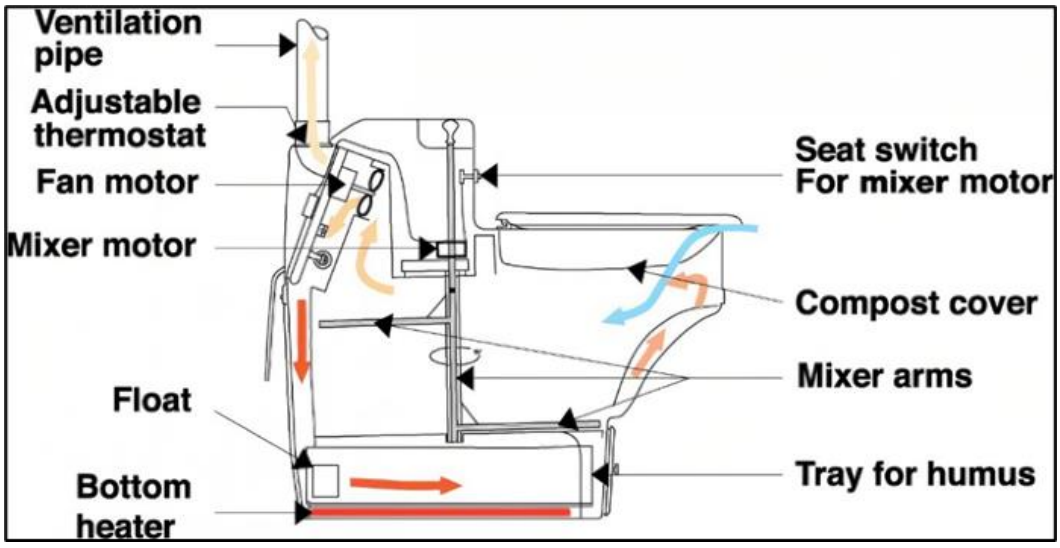


Figure 11-3 - Schematic of a Typical Compost Toilet with built-In Storage Bin

Composting toilet systems require additives such as saw dust, coconut coir or peat moss as bulking agent to allow for air pockets to ensure aerobic decomposition. The additive also provides a better carbon to nitrogen ratio to reduce potential odor during the composting process. The finished compost product can be used, in certain states such as Oregon, for soil amendment in domestic gardens. Other states such as Rhode Island and Vermont require burial of the material. It is not clear at this point if Suffolk County Department of Health Services would allow the end-product to be used in non-food chain agricultural or horticultural applications.

The average price for a composting toilet such as the OGO model costs a little over $1,000. A composting toilet system with a large compost chamber located in the basement or exterior structure could be more than $20,000. A composting toilet is far from the flush it and forget it system that most folks are accustomed to. And as mentioned, both the slow and active compost toilet has its niche so the designer would need to consider the setting and their owners' commitment to its hands-on maintenance, whether or not it is a permittable practice and the final disposal options for the end-product.

11.4.8 Urine Separation

Many studies completed to date have confirmed that total nitrogen from anthropogenic urine contains approximately 80% of the total nitrogen in sewage, this is because nitrogen is mainly contained within the urea in human urine. Given this high percentage of nitrogen in urine, it would make sense that if urine is collected separately from the other black water components of wastewater that it would provide a great opportunity to remove a large percentage of nitrogen from either entering our environment via septic systems, cesspools or entering our wastewater treatment plant where a large amount of energy is required to nitrify and denitrify the urine. As four out of five toilet flushes are related to urine, urine separation could potentially reduce the volume of potable water used for toilets by approximately 80%.

Aside from being rich in nitrogen content, urine also contains many nutrients that plants need which makes it ideal to use as fertilizer around homes or on a nearby farm

should local regulations allow. The use of urine as fertilizer is not a novel idea in the developing world or rural communities around the globe. In fact, it is quite common in certain parts of the world such as rural farming communities in China. As an example, in rural China, many of the villages collect urine with community collection pits located within each village for use as crop fertilizer. Urine separation and urine reuse is a relatively new concept in America and this idea is currently being promoted.

One of the pioneering organizations in dealing with urine reuse is The Rich Earth Institute (REI) based in Vermont. REI views urine as "liquid gold." It is the first in the nation to have a facility located in Vermont to conduct urine processing and handling technologies as well as running field trials to gather data on its efficacy and safety.

Part of REI mission is to educate the public as to proper usage, safety practices and acceptance by the regulators, farmers, and the general public. Research is being conducted by REI to ensure the public's safety as well as confirming efficacy of urine as fertilizer.

Research conducted under the auspice of the Rich Earth Institute (REI) confirmed that grasses grown with pure urine did not suffer noticeable growth issues versus using diluted urine so long as the application rate is appropriate.

In addition, research conducted from 2014 to 2020 on 20 different pharmaceuticals and 2 metabolites by the REI showed promising preliminary results in that many of those pharmaceuticals are broken down by microbes in the soil. And that although there are some constituents that are detectable in crop tissues, the levels are miniscule and are detected in the parts per billion range. As an example, REI study on acetaminophen (active ingredients of Tylenol and other non-steroidal anti-inflammatory drugs) showed that to ingest the equivalent of a single dose of acetaminophen, a person would need to eat a pound of urine-fertilized lettuce every day for 2,000 years. However, should additional treatment be desired, filtration with charcoal would remove many of the residual pharmaceuticals.

Urine separation can be accomplished using low or high tech depending on local scale and local health department's requirements, if any. A simple container with a tight-

fitting lid is all that is required to collect the urine for reuse. The high-tech approach requires separate infrastructure to allow the separate conveyance of urine from the other form of black water. Urine would be collected via separate collection piping and storage tank system. This is usually accomplished using either waterless urinals or toilets with a urine collection bowl built-in that is plumbed to a urine collection/storage tank. However, logistical challenges exist for large scale urine reuse. Storage capacity and transportation could be challenging depending on volume generated versus reuse demand. REI is developing reverse osmosis method to concentrate urine and pointed out that freezing, evaporation as well as vapor compression distillation have all been shown to work in concentrating urine.

Given the above discussion, a large-scale urine separation requiring separate plumbing and storage tank is best done for new development as cost would be lower vs retrofitting an existing building. It is also more cost-effective to implement urine separation retrofit at commercial establishments than at residents. The use of portable restrooms discussed earlier in this document noted that restrooms could be fitted out with only urinals to focus on urine diversion alternative. To ensure proper pathogen management, pasteurization is required and used by REI for distribution of urine to farmers.

Urine separation and collection is a straightforward endeavor but urine reuse by homeowners and farmers as fertilizer is unclear at this point in the State of New York. At a minimum, the New York State Department of Health and the New York State Department of Environmental Conservation would have jurisdiction on urine reuse as it applies to fertilization.

11.4.9 Incineration Toilets

Incinerator toilets are self-contained commode-style dry toilet whereby the contents from each use are burned in-situ instead of flushed to a decentralized wastewater treatment system such as a septic system, or to a centralized wastewater treatment plant. A source of power such as electrical or propane is needed to power the incinerator that is built-into the toilet.

Incinerator toilet generally consists of a commode-style toilet with lid and button to "flush" or drop the contents from the bowl into the lower incinerator chamber. A built-in blower wheel is provided and works in concert with an exhaust stack to provide proper venting of combustible gases to the outside. Water is not required to flush after each use, but all the three brands discussed below require the use of its proprietary bowl liner bag that must be placed into the toilet for each use. After each use, the incineration cycle starts and generally takes about an hour to complete the cycle which reduces the contents to about 1 teaspoon of ash. Depending on brand and model, some will allow continued use up to 60 uses before the start of the incineration cycle, others will start the incineration cycle after each use but allow concurrent use of up to 4 times per hour.

Typical use location for incinerator toilets includes single family homes in areas with water scarcity, boats, rural area where centralized wastewater treatment is not available or septic system is not practical due to soil and site characteristics such as high groundwater or shallow soils, steep slope, hunting cabins, mobile homes, and RVs.

There are several manufacturers of incinerator toilets, and the most popular ones include EcoJohn, Cinderella and Incinolet. All the aforementioned manufacturers require the use of a toilet bowl liner per each use.

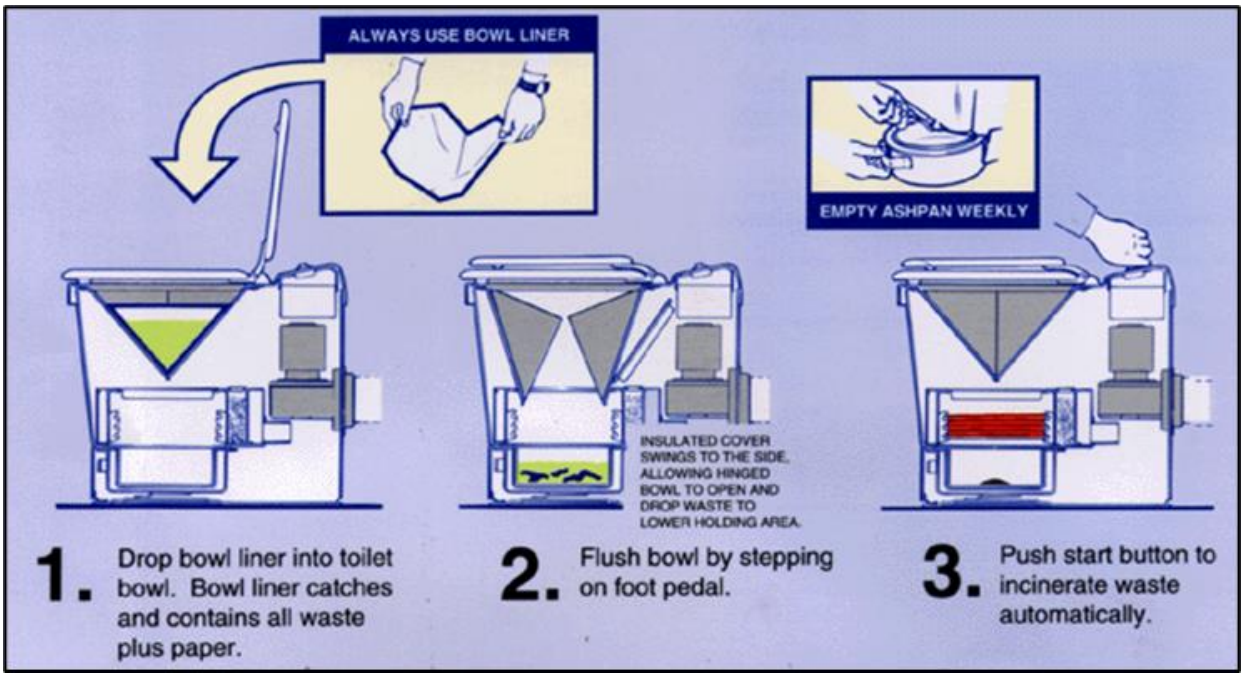


Figure 11-4 – Incinerator Toilet – Typical Operation (Source: Incinolet)

The EcoJohn manufactures a line of incinerator toilets called TinyJohn that is sized for five people and TinyJohn XL for 6 to 12 people. Its model requires a liner for each use to maintenance cleanliness of the toilet bowl and to ensure contents is dropped into the incinerator chamber. It is sized for approximately 30 flushes or uses a day and consumes a 5-gallon size BBQ propane tank per 150 uses. The EcoJohn 120V AC model cost approximately $3,600, not including accessories kit such as vent system, installation and permits.

EcoJohn also manufactures mobile bathrooms equipped with a single incinerator toilet called WorkJohn; those are similar to a porta potty but are outfitted with an incinerator toilet instead of a traditional holding tank. SepticJohn, a large size system for a single-family home which can process up to 300 gallons per day of wastewater water is available as well in its lineup. It is a standalone unit with a waste storage tank (or septic tank) that collects wastewater from standard low flush toilets and fixtures from the building and pumped to an exterior SepticJohn incinerator.

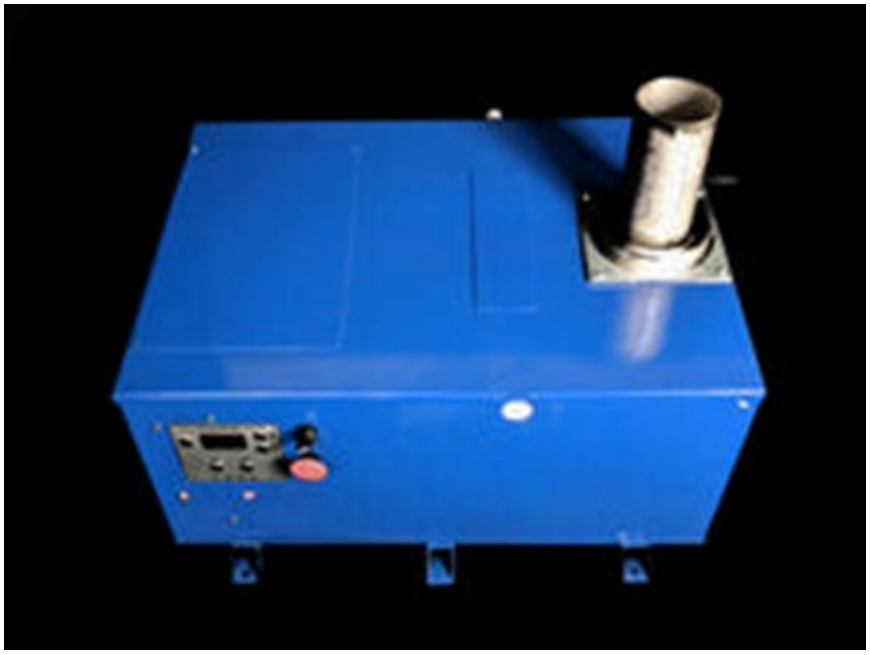


Figure 11-5 – SeptiJohn Incinerator

For a household of 2, the SepticJohn model WC5 system costs about $15,000 and the incinerator unit dimension is about 2.25' high by 2' wide by 3' deep. For a household of 8 people, model WC64 system costs about $25,000 and the incinerator unit is about 2.25' high by 3.75' wide by 5.3' deep. All costs presented do not include accessories, installation and permitting. SepticJohn is only available in natural gas/propane or diesel power version. Average operating costs given for the WC5 and WC64, using propane, are $3.49/day and $19.01/day respectively.

Another manufacturer of incinerator toilets is Cinderella. Its model starts at about $4,000 without the installation, permitting, and installation kit. It requires 220v installation with capacity per incinerator toilet limited to 4 visits per hour. Ash removal is typical of other units with frequency of once a week for a family of 4.

Incinolet, another manufacturer of incinerator toilets, allow some customization to its project such as stainless or white shell, 120 volts or 240 volts, lid color and with or without U.S. Coast Guard Certification. Its model price ranged from about $2,300 to $2,500. Its 120 volts/2000 watts model is designed to serve the needs of 4 people, with the 240 volt/3500 watts model having the capacity to serve 6 people.

One of the issues designers would need to consider with the property owner is power outages, during such time, the incinerator toilets will not be functional and there may be odor if the outage was during an incineration cycle. Another issue to consider is that maintenance and repairs would be required like other appliances. As all incinerator toilet contents are burned, any possibility of resource recovery such as urine reuse and solid waste composting would no longer be available.

Incinerator toilet is another wastewater treatment and management option. Like the other wastewater management options presented in this report, environmental settings such as geology, groundwater depth, lot size, land use category, occupancy frequency, frequency of use, regulations, and other factors would help the designer in selecting the option as to how best to collect and treat the wastewater, including disposal.

11.4.10 Mobile Restroom Units

The portable or mobile restrooms can come in several customized options. These can include basic units having several stalls with basic finishes starting in the $50,000 range to high-end units having more upscale finishes and materials. These could increase the cost over the basic unit by $25,000 or more. The portable units could be delivered to the designated locations prior to peak summer season. The portable units would need to be connected to a larger holding tank(s) to allow for storage of wastewater until transferred over to a self-propelled barge for transport to the mainland for disposal. It would be appropriate to have a placeholder of $100,000 to cover the cost of a holding tank and its design, permitting and installation. Transfer and disposal costs are estimated at:

- One self-propelled barge 8-hour shift $5000
- 20,000 gallons disposal fee at $0.084/gal $1680
- Cost per gallon for portable restroom $0.33/gallon (2022)

The cost of the portable restroom is not included in the above figure. It may be possible to explore leasing units for a 6-month period (May-October). Units if owned, would

need to be transported back to the mainland for the off season and properly stored. This would be an additional expense.

There would be additional costs associated with the day-to-day operation and maintenance of the portable restrooms. These costs would include electrical power, expendables such as paper towels, soap, disinfectants, other cleaning supplies and the labor to clean and disinfect the restroom several times each day.

12. WASTEWATER MANAGEMENT PLAN ROAD MAP

12.1 Multiple Solutions

The goal of this Wastewater Management Plan is to identify effective and sustainable wastewater treatment alternatives. The main challenge is finding the best solutions for each of the respective communities as they each have their own unique characteristics. Factors that influence the efficacy of treatment technologies include development density, depth to groundwater, vicinity to the ocean or bay, elevation, seasonality of use, as well as characteristics of each community. Sea-level rise must be considered when analyzing the long-term sustainability and functionality of potential systems. A commitment to collaborative stewardship and partnerships between the local municipalities, communities, and various stakeholders will be necessary for success.

I/A systems, marine based options, or community treatment systems on municipal or FINS owned property each have advantages and disadvantages, and their applicability as a short and or long-term solution. The public health and water quality benefits are also important to consider.

The reasons for transferring the wastewater (marine based solution) include high groundwater conditions, insufficient parcel size and the economy of scale in managing wastewater on a community level as opposed to on an individual basis. The public health and water quality benefits are higher because of the advanced treatment at the mainland units and treated discharges to the Atlantic Ocean versus the Great South Bay. When considering Sea Level Rise (SLR) and Climate Change, I/A systems in the higher groundwater areas on the Island may only be applicable in the near term (5-10 years) and begin to look more tenuous as one looks out another decade or two. SLR

will result in higher tides reaching elevations and an increase in groundwater elevations. Treatment unit installed below grade (I/A's) will experience greater forces of buoyancy and separation distances between leaching fields discharge depth and the surface of groundwater will decrease resulting in a reduction in treatment and in some cases the hydraulic failure of the system. Parcels on the north side of Fire Island will see more dramatic changes than parcels located on the southern portion of the Island. When Climate Change is added in, more intensive storms with increased wind and precipitation will add to the challenge of maintaining operations of subsurface and in some cases, surface treatment systems if any are developed in the near term (5-10 years). With SLR and Climate Change here to stay, it is appropriate to consider longer term options such as transferring wastewater to the mainland.

As discussed previously, the City of Long Beach, in partnership with Nassau County, is converting the City's WWTP to a pump station with a force main to traverse underneath Reynolds Channel to the County's South Shore Water Reclamation Facility in East Rockaway. This project was borne out of Superstorm Sandy that devastated both the City's WWTP and the County's treatment facility formerly known as the Bay Park Sewage Treatment Plant (STP). The County's treatment plant was rebuilt and hardened to prevent damage from future storm events. The hardening design features include a levee that totally encloses the rebuilt plant to keep out storm surges at projected future SLR elevations. The City will no longer have to worry about treating wastewater on a barrier island that may be susceptible to future storm events. The project is expected to go into construction in 2024 with an estimated cost of $129M with the bulk of the funding coming from FEMA in the form of a grant.

Fire Island will be susceptible to the same or similar conditions to those of the City of Long Beach with tidal storm surges coming through the barrier island inlets (Fire Island, Moriches and Shinnecock) with heavy surf and surging tides on the ocean side of the Island. Strong winds out of the north, northeast and northwest typically present during a low-pressure event will batter the northern side of the Island with punishing waves and wind. Similar to the City of Long Beach, a pump station could be designed and constructed with hardening measures to sustain a 500-year storm event plus tidal surge

and high winds. It would be appropriate to consider two (2) pump stations and force mains to the mainland. One to be located south of the existing site of the Ocean Beach STP and one that would be located on the east end in the vicinity of Davis Park. Force main piping from both pump stations would traverse underneath the Great South Bay to either Heckscher State Park in Great River (Ocean Beach force main) or the Village of Patchogue (East End force main) via directionally drilled piping. This offers a longer terms solution for the next 50-75 years until pipeline rehabilitation would be required.

Implementation of the long-term solutions has jurisdictional challenges and complexities:

- Requires County, Towns, and communities to work together on a very complex project.
- Require creation of a new sewer district.
- Requires Federal, State, County, Town, and local community approvals.

13. PROJECT COSTS & FINANCING

13.1 Project Costs

Costs associated with sewer infrastructure improvements on the scale described in this management plan are substantial in nature. The costs of purchasing and installing an I/A was described in detail in Section 5.1.2. The existing grant programs for I/As was also detailed. This section will focus on the financing of larger scale sewer works.

There are several categories of costs that will figure into the overall cost of larger scale infrastructure projects such as sewage collection systems, pump stations, force mains, storage tanks and treatment plant upgrades. These categories include both soft costs and hard costs. Soft costs can include planning, engineering design, administrative, legal & financial, design services during construction and construction management (daily oversight and inspection). Hard costs are those costs associated with the actual construction and installation of the infrastructure. A brief discussion on each category of cost is warranted.

13.2 Soft Costs

13.2.1 Planning

Major infrastructure projects often start with a planning phase. In this phase the need is identified as well as other related items including cost. This wastewater management plan has established the scale of the improvements albeit schematic in nature. Some of the alternatives described can be implemented on a community basis or are more appropriate for implementation on a wider basis such as several communities joining together or even an Island-wide project where the majority of communities participate.

13.2.2 Engineering Design

Planning identifies the needs on a broad basis. Engineering design identifies and details the specific solutions for the size of the work, the location of the work and the cost of the work. The Fire Island Association through this plan has allowed for the identification of the scale of the wastewater improvements required to be constructed to serve one or more of the communities. The next step is the detailed design of the improvements. Detailed design includes the gathering of supporting information such as topographic survey, location of existing utilities, soil borings and geotechnical report of the specific areas that will receive the new infrastructure. Following these initial tasks, an Engineering Report would be developed that will identify the need, location, scale and cost of the improvements. Engineering reports in addition to establishing the basis of design and need for the improvements, are necessary for securing low interest financing from State agencies such the Environmental Facilities Corporation (EFC).

Following the development of the respective engineering reports for the selected improvements, the detailed design is prepared. This includes the preparation of detailed drawings for example the routing and depth of the new piping. Design of pumping stations, and treatment systems (i.e., Ocean Beach STP). These drawings incorporate the topographic survey and existing utility locations. The drawings are prepared by experienced designers that use the Ten State Standards as guidance for

the proper sizing and sloping of the new sewage collection piping and water transmission lines. Accompanying the design drawings are the technical specifications that provide the necessary information as the materials and methods for installing the new infrastructure. These drawings and specifications become part of the Contract Documents that establish contract provisions as to how the work will be performed, contractual requirements (bonds and insurance), project scope, project schedule, staffing, special testing, and acceptance of the new works. The Contract Documents are used in the procurement (bidding process) of a qualified contractor(s) for the construction of the new infrastructure works.

13.2.3 Administrative and Legal

The Owner (Suffolk County or Village of Ocean Beach or other entity) of the respective project with need to administer project components such as financing agreements and the environmental review (SEQRA) of the project. For example, if it is a County project, it would involve the participation of County staff including the Department of Public Works (DPW) on the technical matters and the County Council of Environmental Quality (CEQ) for conducting the SEQRA process for the project. The Owner's consultants would be required to participate in the Planning, Design and Financing phases of the project. Additionally, the Owner may require assistance in the procurement of grants and applying for low interest long term financing (EFC). Legal support will be required in the drafting of financial agreements, issuance of bond resolutions (if required), review of environmental impact (SEQRA) of the project, and the review and execution of Contract Documents with the selected contractor(s).

For those alternatives that feature pumping of sewage from the Island to the mainland, it will be necessary to either enter into an agreement with the County to entertain an out of district connection or the County could consider creating an extension to the existing Southwest Sewer District (SWSD) No.3. Under either scenario, legal contracts and agreements will need to be developed and executed. These alternatives would also have costs associated with connecting to the County's system. Currently an out of district connection is $30 per design gallon. An example is if the

volume of sewage to be transferred to the mainland is estimated at 300,000 gallons per day, the connection fee would be $9M. This fee is to compensate the County and existing sewer district users for debt service either previously paid or currently being paid by sewer users to maintain and upgrade the SWSD No.3 sewer infrastructure including the sewage collection system and the Bergen Point Sewage Treatment Plant.

In addition to the sewer connection fee, sewer users that discharge into the SWSD No.3 sewer system would pay yearly O&M fees for their sewage to be treated at the Bergen Point STP. The fee is based on flow and is prorated in accordance with the total flow received and treated at the Bergen Point STP. Presently, total fees for SWSD No.3 are typically in the range of $600-$750 dollars per year for a single-family residence. Commercial properties would be multiples of the single-family fees. Should consideration of these alternatives be advanced, a detailed cost analysis would be performed in the Map & Plan document that is developed to ascertain the cost for reasonableness and would confirm whether what charges are to be levied by the County for sewer connection fees and yearly O&M charges.

13.2.4 Construction Administration

Construction Administration, also known as “Design Services During Construction” (DSDC), is the responsibility of the design engineer(s) and includes many services conducted during the construction period. These tasks include, review of submittals and schedules, review of shop drawings, assisting Contractor(s) in review and interpretation of contract drawings and specifications, resolution of unforeseen field matters, review of change order requests, review of payment requisitions, attendance at construction meetings, communications with the Owner, assistance on grant reporting and other financial reporting requirements.

The Design Engineer is responsible for certifying that the construction was performed in accordance with the approved contract documents.

13.2.5 Construction Management

The Owner would be required to ensure that the infrastructure is constructed in accordance with approved Contract Documents (Plans & Specifications). This task requires the assigning of a full time Resident Engineer, Office Engineer and Field Inspectors to oversee the construction of improvements. These individuals would be onsite everyday while the work is being conducted. The Construction Management team is supported by the design engineer(s) through the DSDC task detailed above. Soft costs can typically total between 20-25% of a major infrastructure project(s) such as some of the alternatives discussed in this plan. Costs associated with the actual construction of the improvements is considered a project “hard cost”.

13.3 Hard Costs

The bulk (75-80%) of hard costs for a large sewer infrastructure project is the actual construction. The infrastructure costs will be determined by solicitation of bids following the NYS General Municipal Law Section 103. Bid packages will be issued using public notice and advertisement. Qualified bidders will be encouraged to submit cost proposals (bids) following the instructions contained within the Contract Documents. Construction costs include the Materials and Labor to provide the infrastructure in accordance with approved Contract Documents. Examples of Materials include, piping, manholes, fittings, select backfill, sheeting, trench support systems, connectors, excavators, backhoes, pumps, generators, trucks and the like. Examples of Labor includes skilled labor of various disciplines: equipment operators, laborers, truck drivers, flagmen, foremen, superintendents, office manager, and administrative staff. Alternatives having a marine component would involve other specialized trades and specialized equipment such as barges, workboats, jacking equipment and the like.

13.4 Minority, Women and Veteran Owned Business Enterprises

As state and federal monies (grants & loans) may be used for financing a portion of the infrastructure work, there will be provisions for encouraging the participation of Women Owned Businesses (WBE), Minority Owned Businesses (MBE), Service Owned Small Businesses (SOSB) and Service Disabled Veterans Owned Businesses (SDVOB). These contract provisions establish goals for each of the categories and best efforts would need to be made by all involved parties to reach these goals. The goals can range from 25%-35% of the total project cost. The Contract Documents will identify these specific provisions.

13.5 Funding Options

13.5.1 Municipal Bonds

Projects of the scale noted in the Plan would require significant amount of capital to fund both the soft and hard costs detailed in prior sections. As previously stated, these costs are typically funded out of loan proceeds from General Obligation (GO) Bonds. GO Bonds is the most common method used by municipalities to provide funds for water and sewer infrastructure as well as other types of infrastructure such as roads, drainage, bridges, etc. GO Bonds are often both exempt from Federal and State taxes. The principal and interest due are paid back from revenues coming into the Owner (i.e., Suffolk County).

13.5.2 Water & Sewer Utilities Bond

Another type of bond is the Water & Sewer Utilities Bond that is issued specifically for the funding of water and sewer infrastructure projects. The Water & Sewer Bond's principal and interest is paid from the revenues from payment of water bills. These types of bonds are considered riskier than GO Bonds as the bonds are not backed by the municipality but only by the revenue collected from customers paying their water bills. This is not likely a viable alternative for financing sewer projects on Fire Island.

13.5.3 NYSEFC State Revolving Fund Loan Program

The New York State Environmental Facilities Corporation (EFC) is a publicly funded agency in the State of New York whose primary purpose is to provide financing (loans and grants) for water and wastewater infrastructure projects. The specific program is the State Revolving Fund (SRF) that with the use of Federal subsidies can offer both low cost and interest free loans for wastewater projects through its Clean Water State Revolving Fund (CWSRF). These programs often provide working capital for initial stages (short term loan) of the project that eventually converts into a 30-year long term low interest subsidized loan upon construction completion. The CWSRF program has funded hundreds of millions of dollars of water and wastewater infrastructure programs over the past few decades. To participate in the EFC's SRF program, the Owner would be required to enter the program through Intended Use Plan (IUP). This will require an application and documentation supporting the application. This Plan would be a useful document, however engineering reports for selected wastewater projects prepared in accordance with EFC guidelines would need to be developed to support participation in the EFC low interest loan programs. There is great anticipation that the recently approved State Environmental Bond Act may be providing substantial funding for large scale sewer projects.

13.5.4 Grant Programs

There are grant programs that the Owner may be able to participate in for obtaining monies for sewer projects identified in this Plan. These grant programs categories include planning, design, construction, and construction management. Other programs are associated with water quality improvements. There are often specific requirements for each program that includes matching funds from the applicant.

The EFC does have a program entitled Engineering Planning Grant for eligible communities, which pays up to $100,000 for development of engineering planning documents such as engineering reports.

13.6 Wastewater Management Alternative Summary

Table 13-1 summarizes the Fire Island Wastewater Management Alternatives.

Table 13-2 & 13-3 presents the short/long term alternatives and the advantages and disadvantage of each based on the impacts of SLR and climate change that Fire Island should take into consideration in developing a wastewater management plan going forward.

Table 13-1 – Fire Island Wastewater Management Alternatives

Community	I/A Systems		Ocean Beach Sewer District Expansion		Marine Based Alternatives				Innovative Alternative Technologies		Use of FINS Property for Central Treatment Systems Sites
	% of Community Applicable	Estimated Capital Costs	WWTP Upgrades	Collection/ Transfer Infrastructure	Infrastructure for Barging to Mainland Treatment Facility (See note 3)	Central Pump Station / Force Main Under GSB to Mainland Treatment			Incineration Toilets	Mobile Restroom Units / Urine Diversion	
						Potential Communities Served	Estimated Capital Costs				
Kismet	57%	$10,275,000	-	-	$10,670,000	See note 1	Dual Crossing	Single Crossing	$4,000/ea. Consider for smaller / less dense communities / non rental properties	$60,000/ea. Consider for Ferry Terminals/ Commercial Areas	<u>Community WWTP</u> 20,000 – 50,000 gpd $10M 51,000 – 100,000 gpd $25M 101,000 – 300,000 gpd $75M 500,000 gpd- $200M <u>Island Wide WWTP</u> $400M (see note 4)
Saltaire	62%	$19,200,000	-	-	$17,774,000		$204M	$271M			
Fair Harbor	36%	$10,500,000	-	-	$12,822,000						
Dunewood	61%	$4,575,000	-	-	$4,241,000						
Lonelyville	65%	$4,500,000	-	-	$3,446,000						
Atlantique	56%	$2,325,000	See note 2	2,668,000	$2,893,000						
Robbins Rest	39%	$1,125,000		1,596,000	$1,821,000						
Summer Club	100%	$3,375,000		1,985,000	$2,210,000						
Corneille Estates	70%	$3,600,000		2,805,000	$3,030,000						
Ocean Beach	-	-		-	-						
Seaview	80%	$22,575,000		13,686,000	$14,361,000						
Ocean Bay Park	32%	$7,500,000		10,541,000	$11,666,000						
Point O' Woods	68%	$7,800,000	-	-	$8,305,000						
Cherry Grove	33%	$6,975,000	-	-	$11,834,000	See note 1	$198M				
FI Pines	87%	$37,575,000	-	-	$25,629,000						
Water Island	51%	$1,725,000	-	-	$2,445,000						
Davis Park	61%	$12,750,000	-	-	$10,911,000						
TOTAL	**60%**	**156,375,000**	**-**	**$33,281,000**	**$144,058,000**		$402M	$271M			

Notes:

1.Cost includes LPS and transfer system infrastructure to a central pump station for each community.
2.Further study NYSDEC/upgrade requirements for out of district connections.
3.Cost includes LPS/Storage Tank System Infrastructure to transfer to barge for all communities.
4.Costs include LPS and transfer system infrastructure to regional WWTF to serve Fire Island located on FINS parkland property.

Table 13-2 – Short/Long Term Alternatives

V. Short Term	Estimated Capital Costs	Comments
I/A Systems	• Individual: $75,000 each • Cluster: $120,000 – 200,000(1500gpd)	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for communities with larger commercial areas with sufficient land available.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets for smaller/less dense communities. • Mobile restrooms for Ferry terminals/commercial areas and pump out/barge to mainland for treatment.
VI. Long Term	**Estimated Capital Costs**	**Comments**
Ocean Beach Sewer District Expansion	• Treatment Plant Upgrades • Collection/Transfer System Infrastructure $33M	• Further study NYSDEC permit/upgrade requirements for out of district connections. • Feasible for neighboring communities to Ocean Beach. • Investigate Suffolk County takeover of WWTP/establish new sewer district.
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $144M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs estimated at $85/1,000 gallons. • Barge operations costs estimated at $7,500 for 8-hour shift.
Central Pump Station/Force Main Under GSB to Mainland Treatment	<u>Dual Crossing</u> • Ocean Beach Crossing $204M • East End Crossing $198M <u>Single Crossing (all communities)</u> • Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. This is in addition to the capital costs. • Capital costs include community LPS infrastructure.
FINS Property Treatment Plant Sites	<u>Community WWTP</u> • 20,000 – 50,000 gpd: $10M • 51,000 – 100,000 gpd: $25M • 101,000 – 300,000 gpd: $75M • 500,000 gpd: $200M <u>Island Wide WWTP</u> $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • On-Island WWTP is still vulnerable to sea level rise and climate change.

Table 13-3 – Short/Long Term Advantages and Disadvantages

VII. Short Term	Advantages	Disadvantages
I/A Systems	• Approved Technology. • Grants available. • Property owner installed. • No district formation required. • Applicable for new construction and renovation projects. • Treats to < 19 mg/L Total Nitrogen. • Public Health Improvement: Moderate.	• Feasible for 6,000 sf or greater lot size. • May not fit on smaller parcels without variances. • High cost to property owner due to contractor logistics and construction limitations. • Requires pump-out vehicles to access properties for maintenance. Communities have limited access. • Susceptible to sea level rise/climate change as a long-term solution. • Multiple systems(cluster)require legal agreements and County approval. Limited space available. • High groundwater increases construction cost. Leaching systems require importing fill. I/A in several communities may not be feasible. • Requires Maintenance Contract. • Environmental/habitat impacts: Tree/land clearing.
Incineration Toilets	• Property owner installed. • No water required. • Removes 100% nitrogen. • Moderate cost. • Public Health Improvement: High	• Not applicable for homes with short-term rentals with above average occupancy. • Limited to remote /less dense communities • Toilet liner required for each use. • Toilet emissions requires a buffer to neighboring property is recommended. • Pilot study recommended. • Limited to four flushes per hour per toilet.
Mobile Restroom / Urine Diversion	• Minimal infrastructure required. • Removes 100% of water/nitrogen. • Low-flow fixtures reduces water use. • Applicable for Ferry terminals/commercial areas • Moderate cost. • Potential Re-Use opportunities (fertilizer). • Public Health Improvement: High.	• Barge access required for pump out/disposal. Communities have limited access. • Communities have limited space available. • Barge scheduling & disposal fees. • Public use requires maintenance/security. • Reuse requires regulatory approval. Island location may not be cost effective.

VIII. Long Term	Advantages	Disadvantages
Ocean Beach Sewer District Expansion	• Utilizes existing infrastructure. • Applicable to neighboring communities. • Increase service area improves treatment efficiency and distribute costs over larger tax base. • District expansion requires County to take over ownership/operation. • Maybe an interim solution if central pump station/force main under GSB is selected as prime solution. • Removes 30% Nitrogen. • Public Health Improvement: High	• Must adhere to NYSDEC permit/upgrade requirements for out of district connections. • NYSDEC may require treatment plant upgrade to include biological nitrogen removal (BNR). May not be feasible due to limited space. • Discharge to Great South Bay. • High cost: Communities need LPS infrastructure to connect. • Treatment plant O&M costs. • Environmental /habitat impacts: Tree/land clearing
Infrastructure for Barging to Mainland Treatment Facility	• Advanced treatment: nitrogen removal. • Discharge to the Atlantic Ocean via Bergen Point STP outfall discharge. • Removes 100% Nitrogen to Great South Bay. • No treatment plant O&M cost. • Not susceptible to climate change/sea level rise. • Public Health Improvement: High	• Feasible for communities with Ferry access and capacity at freight docks. • Barge operation, wastewater transfer and disposal costs. • High cost: Communities need LPS infrastructure transferring wastewater to storage tank. • Communities have limited land available to accommodate storage and barge operations. • Requires creation of community sewer districts. • Environmental /habitat impacts: Tree/land clearing
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Advanced treatment: nitrogen removal. • Discharge to Atlantic Ocean via Bergen Point STP outfall discharge. • Removes 100% Nitrogen to Great South Bay. • Larger service area increases tax base. • No treatment plant O&M cost. • Less susceptible to climate change/sea level rise. • Public Health Improvement: High	• High cost: Communities need LPS infrastructure transferring wastewater to central pump station/ force main under GSB to mainland treatment. • Vacant space is needed to accommodate pump stations. • Out of district connection subjected to Suffolk County connection fee and pro-rates user fees based on flow. • Requires creation of Island-wide sewer district. • Environmental /habitat impacts: Tree/land clearing
FINS Property Treatment Plant Sites	• Advanced treatment: nitrogen removal. • Discharge to Atlantic Ocean. • Remove 100% Nitrogen to Great South Bay. • Park land near or adjacent to most communities. • Public Health Improvement: High	• FINS approval will be difficult. • Treatment plant location susceptible to sea level rise/climate change: storm hardening required. • High cost: New WWTP construction & communities need LPS infrastructure transferring wastewater to treatment plant sites. • Requires creation of Island wide sewer district. • Environmental /habitat impacts: Tree/land clearing

13.7 Community Wastewater Management Plans

Each of the 17 communities on Fire Island are unique with different challenges for developing an effective and sustainable wastewater management plan. A survey questionnaire was distributed to each community and workshops held with community leaders to collaborate on the potential wastewater treatment alternatives.

Appendix A presents individual community wastewater plans that summarize the action plan elements for guidance on the next steps on a community and island wide basis.

The data presented in each community's Appendix A summary card is a compilation of derived information from sources including Suffolk County, USGS, USDA, the book "An Inside Look at Fire Island", Fire Island Association, community surveys and meetings.

13.8 Road Map and Action Plan Summary

Table 13-4 presents a summary of the action plan elements that are recommended for the planning and implementation of a Fire Island wastewater management plan road map.

This provides direction and guidance on the next steps to advance a successful wastewater management program for Fire Island.

Table 13-4 – Wastewater Management Road Map and Action Plan

Item Description	Action Plan
Innovation/Alternative (I/A) Systems	• Highest potential acceptance with installation in several communities. • Susceptible to sea level rise/climate change not considered a long-term solution. • Pump out/maintenance access is critical issue that requires further study • NYSDOH/SCDHS waiver/variances required. Needs further discussion/review when draft standards are published. • Further study recommended to establish Island wide maintenance/service program and logistics for companies interested in serving the Island. • Environmental/Habitat impacts from land and tree clearing requires further investigation.
Innovative Technologies	• Further research recommended on applicability and interest of incineration toilets in smaller/less dense communities. • Evaluate mobile restrooms at ferry docks/commercial areas and pump outs/disposal logistics. • Small scale testing/pilot study is recommended.
Ocean Beach Sewer District Expansion	• Further study recommended on WWTF NYSDEC permit/upgrade requirements for sewer district expansion. • Initiate meetings with Suffolk County on takeover of WWTF to determine interest. • Highest potential for neighboring communities to Ocean Beach. Discuss interest/and obtain letters of commitment. • Potential interim solution if central pump station/force main under GSB is ultimate solution.
Marine Based Alternatives and use of FINS property.	• Should be further vetted and engineering study conducted on the most feasible alternative. • Further investigation is recommended with Ferry companies for logistics and access. • Requires community commitment and land for storage tank. • Initiate meetings with regulatory agencies to determine permitting requirements. • Further discussion with FINS is recommended on approval process to utilize park land for treatment plant sites and sewer infrastructure.
Potential Project Implementation	• Research grant funding opportunities. • Develop communication and outreach plan to engage stake holders/communities' interest and acceptance.

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APPENDIX A

Community Wastewater Management Plans

COMMUNITY SUMMARY

Community	Kismet (Town of Islip)
Est. Winter Population	50 - 100
Est. Summer Population	500 - 1,500
Peak No. of Daytrippers	2,500

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
306	242	225	Two condo complexes: 40 units

Description

- Westernmost residential community
- Most accessible: Walk from Robert Moses Park
- Largest year-round population
- Two restaurants, general store, pizzeria, shops
- Marina holds 50 Slips, Bulkhead Condo holds 20 slips
- Public Playground
- Public Bathroom at Old Firehouse
- Average lot size 40' x 80' (3,200 sf)
- Camelot Estates consists of 20 units
- Hotel consists of 10 efficiency units
- One I/A system installed

Access

- Ferry (Bay Shore), water taxi, private vessel, by foot
- Truck access from beach

Estimated Projected Wastewater Flow (Based on Population)

- Winter 4,500 - 7,500 gpd
- Summer 78,750 - 131,250 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Conc/Gravel/Comp Dirt
- Navigation thru community: Up to Small Trucks
- Dock to accommodate barge: No

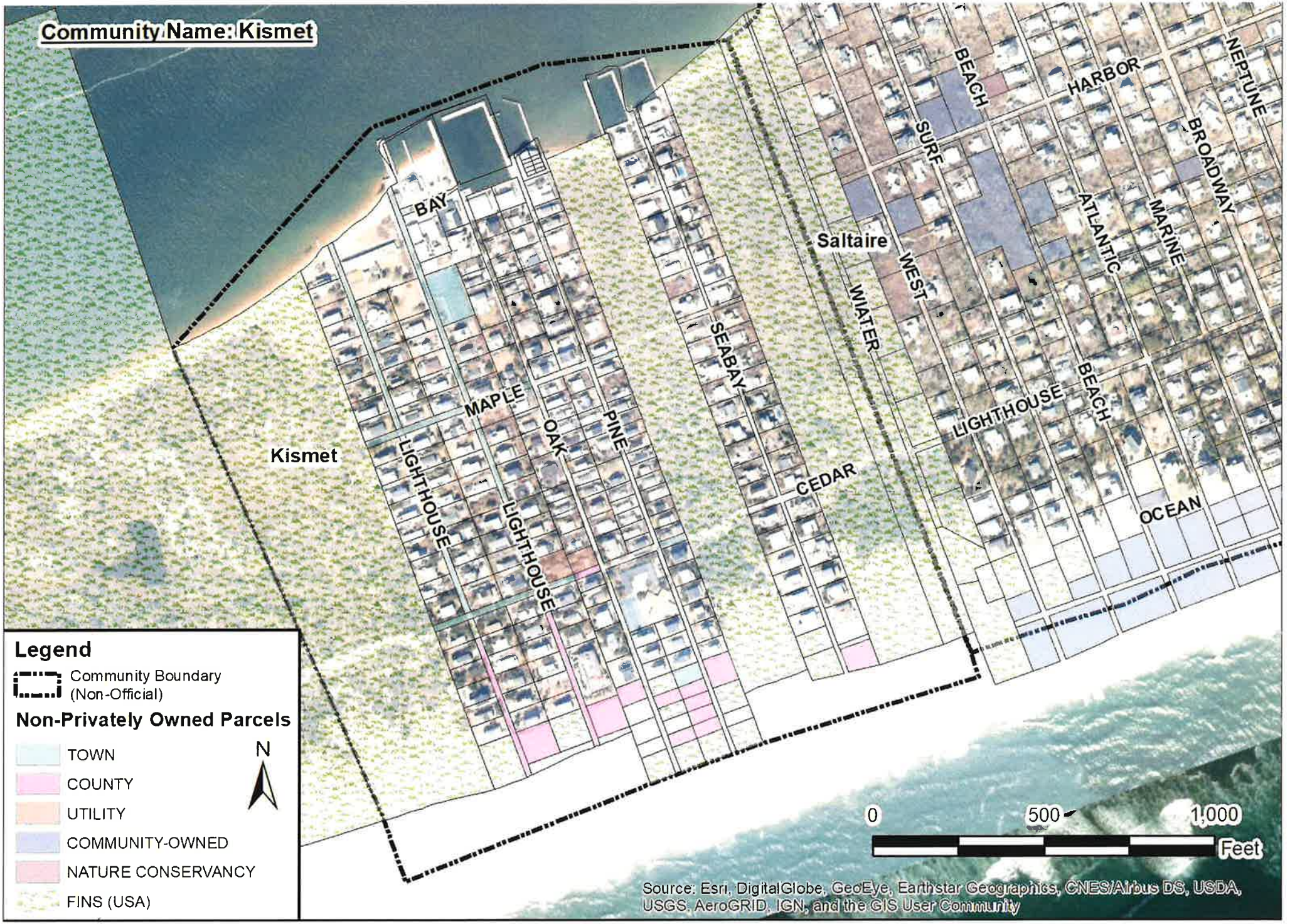
Geology

Depth to Groundwater:	USGS	4-8 feet, 12-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Kismet's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 137 • % of Parcels applicability: 57% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for the larger commercial areas. Limited land available. • SCDHS is Responsible Management Entity (RME) • Habitat loss with required clearing for drain fields. • Good access for required maintenance.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $10.67M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 -2500 per trip • Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • LPS require no trees or shrubs within 10' of perimeter. • Limited space available for storage tank/barge require further study on feasibility.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: Coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Kismet est. WW flow : 131,250 gpd $75M • Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • National Park property to east and west. • Northern Half of FINS property has soil designation (TM) Tidal Marsh
Miscellaneous	• Investigate use of NYS Park property to the west. • Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Kismet
BAY
MAPLE
OAK
PINE
SEABAY
CEDAR
LIGHTHOUSE
LIGHTHOUSE
LIGHTHOUSE
Kismet
Saltaire
WATER
WEST
SURF
BEACH
HARBOR
NEPTUNE
BROADWAY
ATLANTIC
MARINE
LIGHTHOUSE
BEACH
OCEAN
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Saltaire (Town of Islip)
Est. Winter Population	30 - 45
Est. Summer Population	1500
Peak No. of Daytrippers/Guests	2,000

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	Approximate No. of Homes	Notes
603	412	400	Data provided by Village (03/11/2024) below[1]

Description

- Incorporated Village, One of the widest points on FI
- Approx. (8) I/A systems installed (2 to 3 new units installed per year due to new construction or renovation).
- One general store, yacht club
- Extensive facilities and services: day camp, playground, ballfield, bay swimming lanes, library, post office, Village Doctor's Office, lifeguards, Public Safety officers and Volunteer Fire Co.
- Existing cesspools (some older cesspools are not working as efficiently as designed due to rising groundwater elevation)

Estimated Projected Wastewater Flow (Based on Population)

- Winter 2,025 - 3,375 gpd
- Summer 76,500 - 127,500 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Wood decking
- Navigation thru community: Cars/golf carts/bicycles
- Largest Vehicle: Tank Truck/F550 Max.

Access

- Ferry (Bay Shore), water taxi, private vessel

Geology

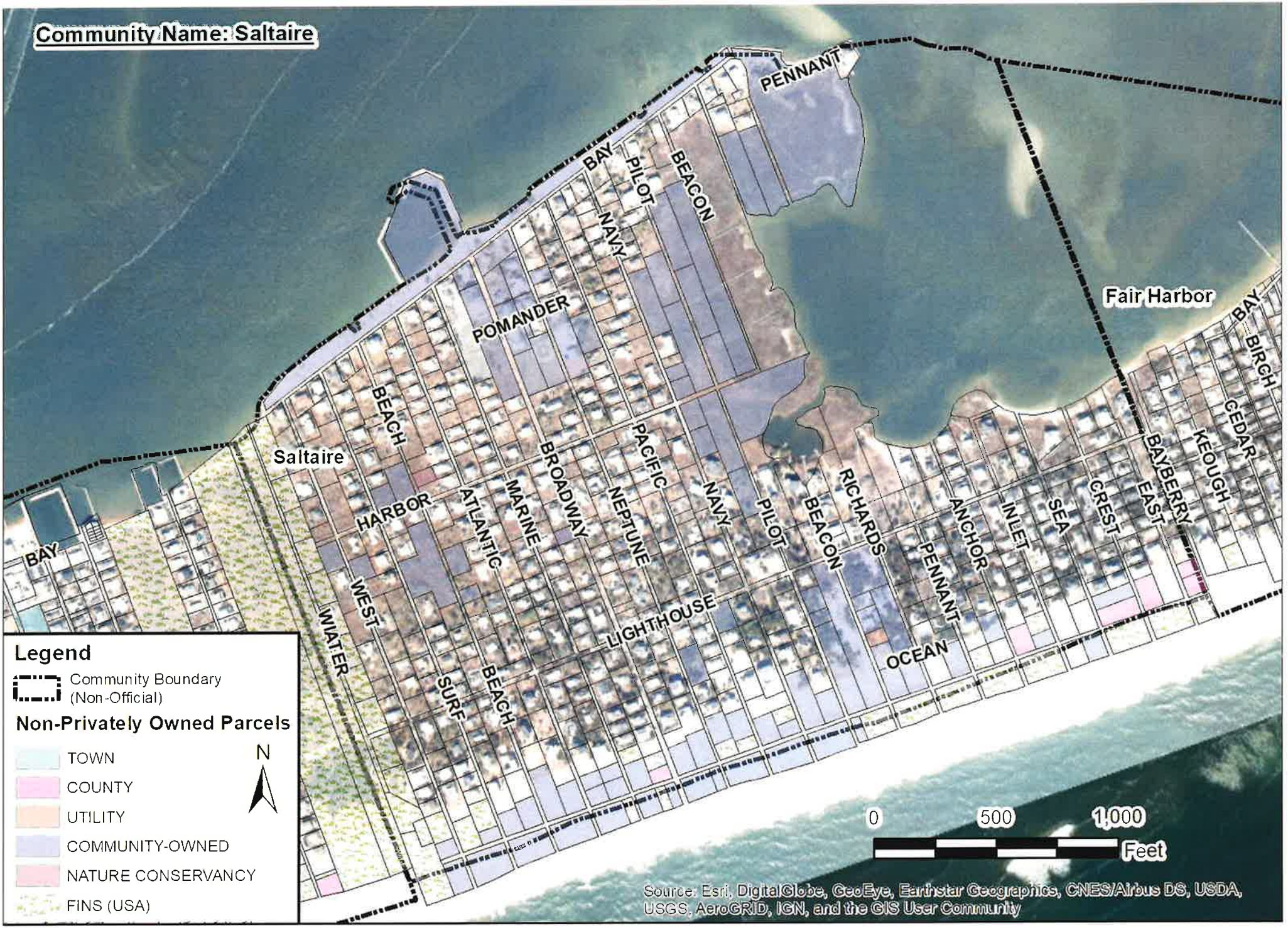
Depth to Groundwater:	USGS	3-5 feet, 5-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

[1] Approximate Parcel Count: 596
Approximate No. of Developed Parcels with a Sanitary System: 417
Approximate No. of Homes with a Residential Sanitary System: 408

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Saltaire's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 256 • % of Parcels applicability: 62% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for the larger commercial areas. Limited land available. • SCDHS is the Responsible Management Entity (RME) • Waterfront properties Clam Pond/Navy Walk; has Soil Classification: TM: Tidal Marsh • Good access for required maintenance on Lighthouse Rd only. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $17.774M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 – 2500 per trip. • Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • Limited space available for storage tank/barge require further study on feasibility. • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate./agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Saltaire Est. WW flow :127,500 gpd $75M • Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • National Park property to west. • Northern Half of FINS property has soil classification TM:Tidal Marsh
Miscellaneous	• Investigate use of NYS Park property to the west. • Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Saltaire
PENNANT
BAY
PILOT
BEACON
NAVY
POMANDER
Fair Harbor
BAY
BIRCH
CEDAR
KEOUGH
BAYBERRY
EAST
CREST
SEA
INLET
ANCHOR
PENNANT
RICHARDS
BEACON
PILOT
NAVY
PACIFIC
NEPTUNE
BROADWAY
MARINE
ATLANTIC
HARBOR
BEACH
Saltaire
BAY
WEST
WATER
SURF
BEACH
LIGHTHOUSE
OCEAN
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Fair Harbor (Town of Islip)
Est. Winter Population	12
Est. Summer Population	700
Peak No. of Daytrippers	500

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
487	394	360	Typical Properties750 sf (2 beds each)

Description

- Mainly seasonal residences (deep water lines available to winterize-but not many have connected)
- General store, ice cream, pizza take-out, liquor, food, 1 restaurant
- Fire/EMS Dept–serves Dunewood & Lonelyville
- Fire Dept- operates public restroom 9am-5pm
- TOI public restroom on Elm/Central
- Restaurant reported in need of wastewater management solution
- Stormwater flooding-downtown & Central/Cranberry & Birch
- 13 walkways

Access:

- Ferry (Bay Shore), water taxi, private vessel

Estimated Projected Wastewater Flow (Based on Population)

- Winter 540 - 900 gpd
- Summer 33,750 - 56,250 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Owned by FI Ferries
- Freight Dock: Owned by FI Ferries
- Accessway/Road materials: 5' wooddecking
  Cement walks: Central/Bayberry/Broadway/Oak
- Navigation thru community: Bicycles/Golf Carts
- Largest Vehicle: Golf Carts

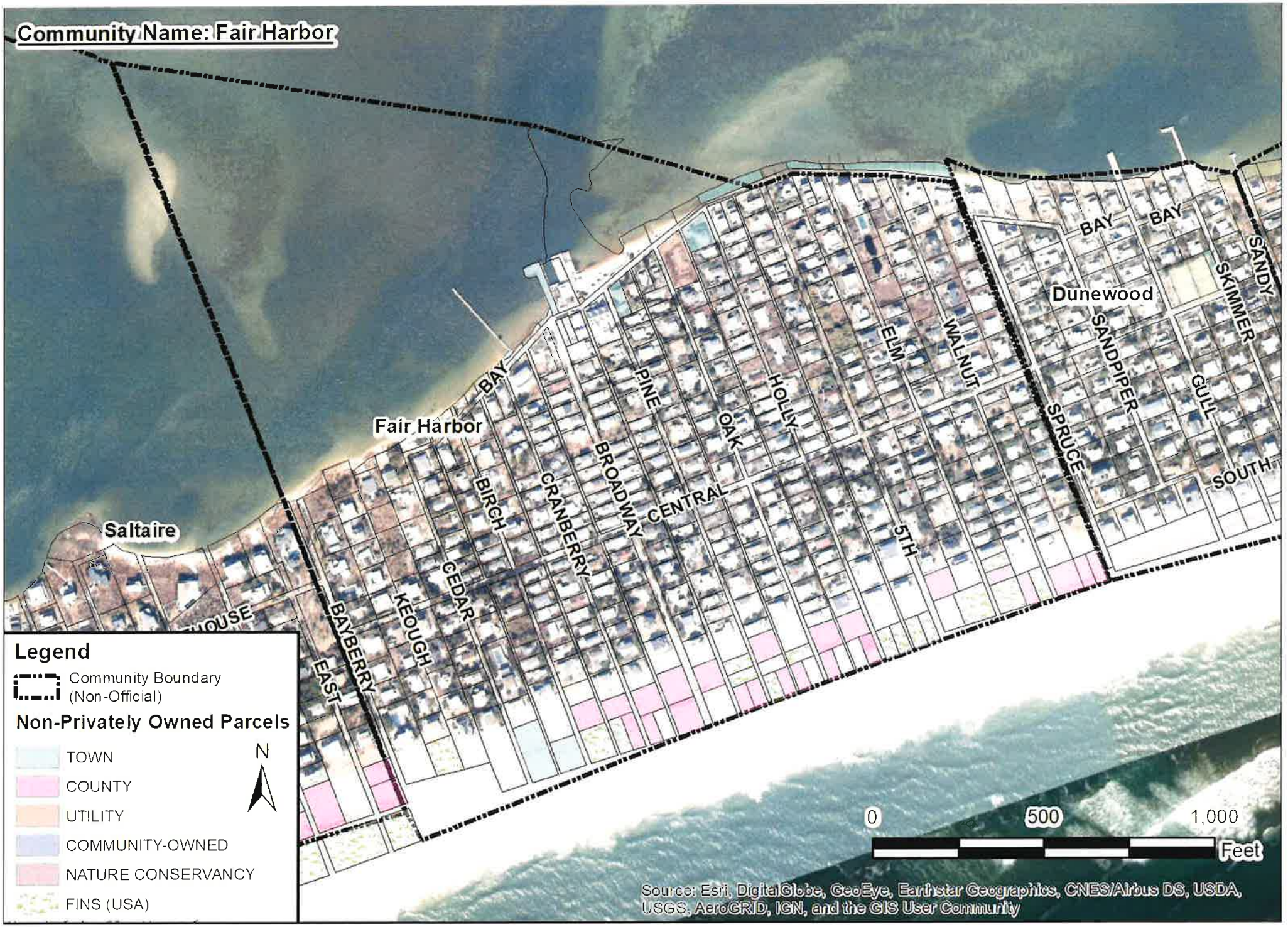
Geology:

Depth to Groundwater:	USGS	4-8 feet, 10-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Fair Harbor's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 140 • % of Parcels applicability: 36% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Limited land available. • SCDHS is the Responsible Management Entity (RME). • Limited to no access for required maintenance (Central Ave only) • Special design for flood prone areas. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $12.822M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 -2500 per trip. • Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • Limited space available for storage tank/barge require further study on feasibility. • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • No neighboring FINS property • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Fair Harbor
Fair Harbor
Saltaire
Dunewood
BAY
BAY
SANDY
SKIMMER
SANDPIPER
GULL
SOUTH
SPRUCE
WALNUT
ELM
HOLLY
OAK
PINE
BROADWAY
CENTRAL
CRANBERRY
BIRCH
CEDAR
KEOUGH
BAYBERRY
EAST
5TH
HOUSE
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Dunewood (Town of Islip)
Est. Winter Population	5
Est. Summer Population	350 - 400
Peak No. of Daytrippers	50

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
114	100	99	One Homeowner Association

Description

- Private tennis courts and yacht club
- Popular for sailing, swimming, and tennis programs
- Prohibits group-share rentals
- TOI public restroom
- 1 private dock-Dunewood owned
- 2 full-time residences (south side of central walk on sandpiper)
- Prohibits group-share rentals

Estimated Projected Wastewater Flow (Based on Population)

- Winter 225 - 375 gpd
- Summer 18,225 - 30,375 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Pedestrian/Conc Sidewalks
- Navigation thru community: Cars/Golf Carts/Bicycles
- Largest Vehicle: Tanker Truck/EMS/Fire

Access

- Ferry (Bay Shore)
- No public marina/docking facilities
- No landing facility that would accommodate barge

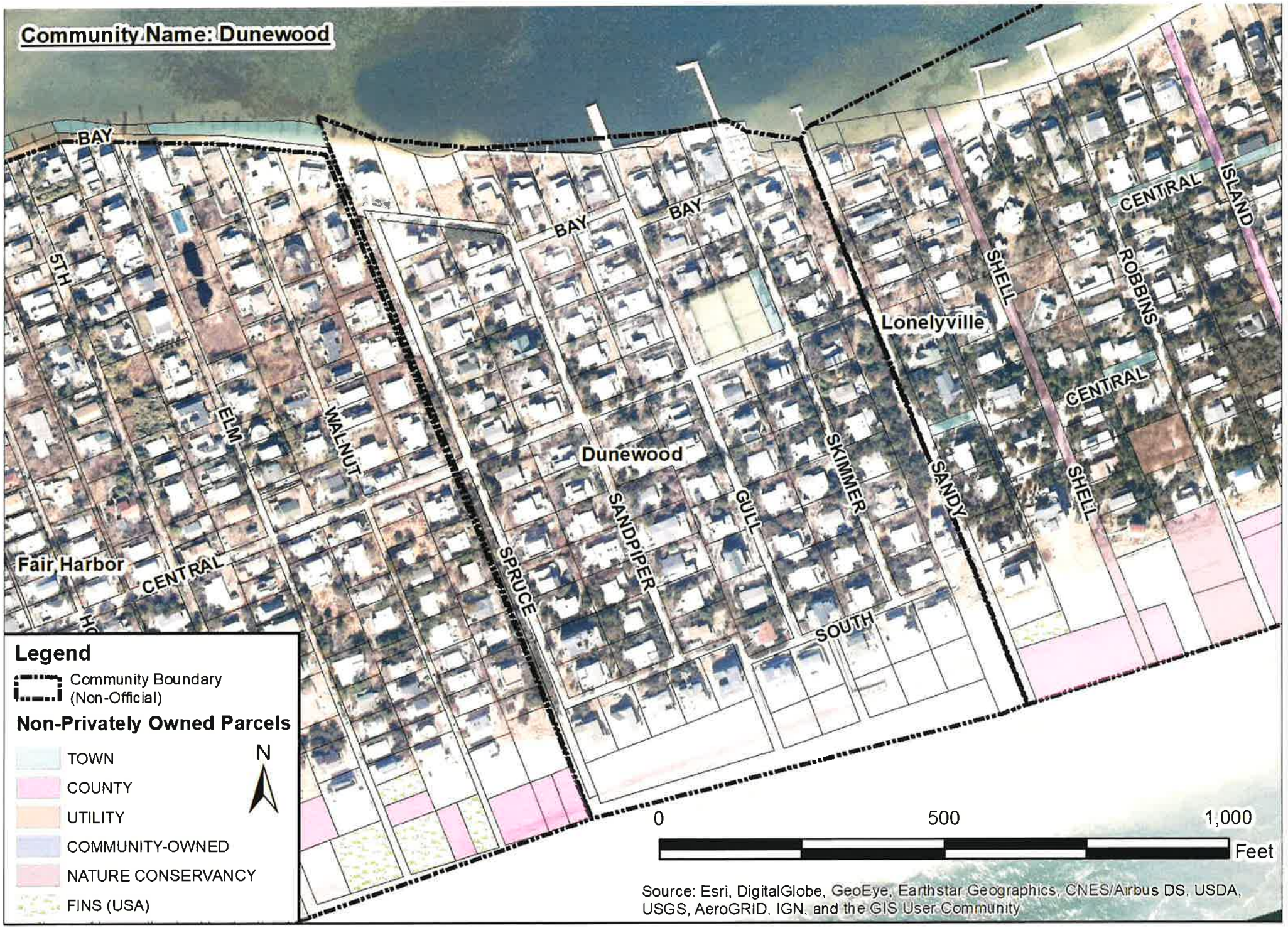
Geology

Depth to Groundwater:	USGS	4-8 feet, 10-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Dunewood's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 61 • % of Parcels applicability: 61% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as coll. sys.). Limited land available. • SCDHS is the Responsible Management Entity (RME). • Concrete pedestrian sidewalks could provide access for req'd maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $4.241M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 – 2500 per trip. • Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • Limited space available for storage tank/barge require further study on feasibility. • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • No neighboring FINS property • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Dunewood
BAY
5TH
ELM
WALNUT
SPRUCE
SANDPIPER
GULL
SKIMMER
SANDY
SHELL
ROBBINS
ISLAND
CENTRAL
SOUTH
Dunewood
Lonelyville
Fair Harbor
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Lonelyville (Town of Islip)
Est. Winter Population	25
Est. Summer Population	246
Peak No. of Daytrippers	n/a

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
123	92	82	Two (2) Homeowners Association

Description

- No commercial or public facilities
- Small residential community throughout year
- HOA: Lonelyville Property Owner Assoc. (West side)
  Winter population:10
  Summer population: 150
- HOA: Taxpayers Assoc. of Lonelyville (East side)

Estimated Projected Wastewater Flow (Based on Population)

- Winter 1,125 - 1,875 gpd
- Summer 11,070 - 18,450 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: N/A
- Freight Dock: N/A
- Accessway/Road materials:Wood decking(designed for pedestrians)
- Navigation thru community: Bicycle/Golf Cart

Access

- Private boat,Closest ferry is Dunewood
- No landing facility that would accommodate barge

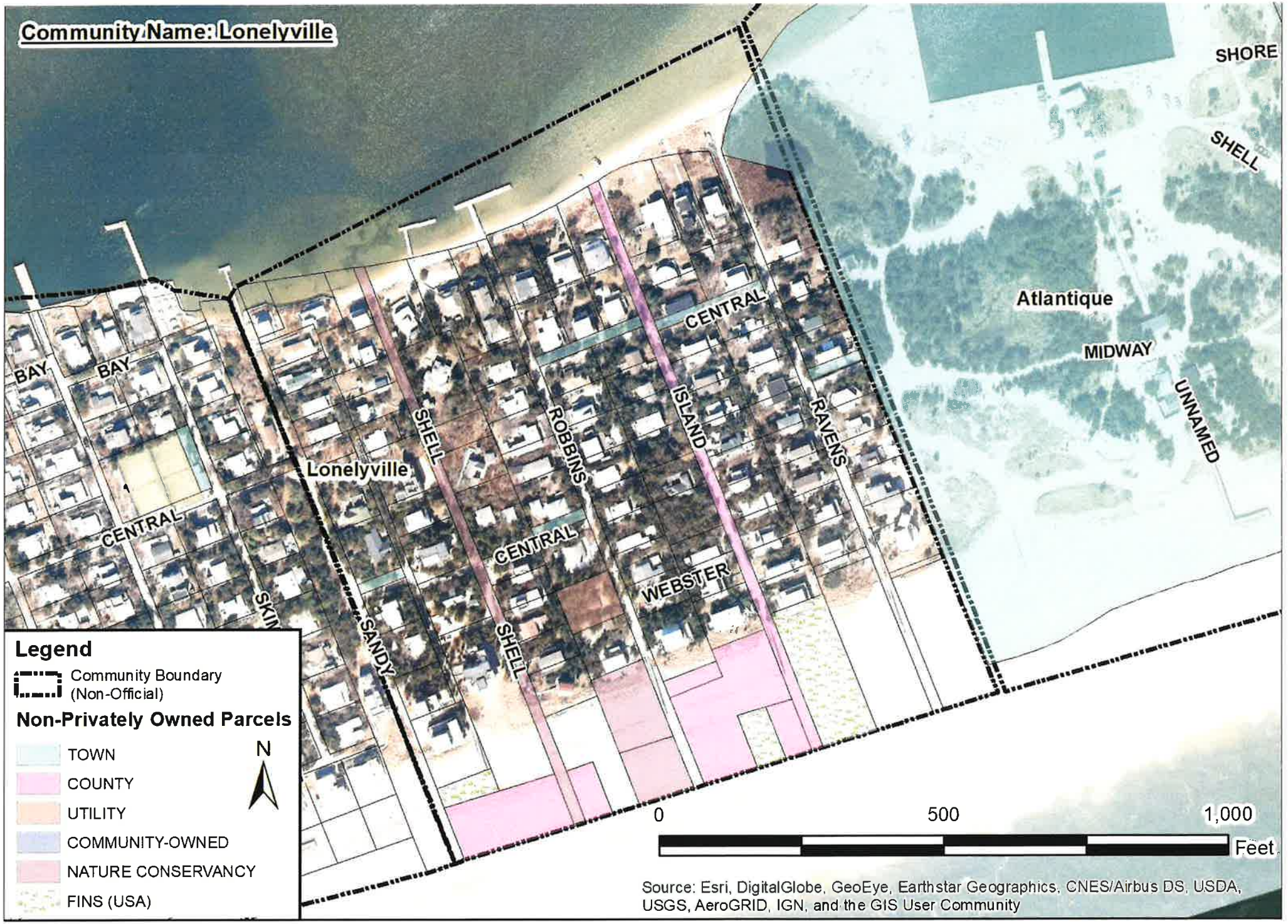
Geology

Depth to Groundwater:	USGS	4-6 feet, 8-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Lonelyville's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 60 • % of Parcels applicability: 65% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). • Limited land available. • SCDHS is the Responsible Management Entity (RME). • Habitat loss with required clearing for drain fields. • Limited to no access for required maintenance
Innovative Technologies	• Incineration Toilets: $4,000 each	• Incineration toilets may be applicable because of low density community.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• Communities LPS Infrastructure • Storage Tank Systems for Barge Transfer $3.446M	• Most feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 – 2500 per trip. • Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • Limited space available for storage tank/barge require further study on feasibility. • LPS require no trees or shrubs within 10' of perimeter. • No existing landing facility for barge access/transfer. • TOI-owned Atlantique is adjacent
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS/TOI Property Treatment Plant Sites	• Lonelyville Est. WW flow: 18,450 gpd $10M • Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS or TOI is recommended on approval process to utilize park land. • TOI neighboring property to the east. • No neighboring FINS property • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies. • Investigate use of TOI property to the east	


Community Name: Lonelyville
SHORE
SHELL
Atlantique
MIDWAY
UNNAMED
CENTRAL
BAY
BAY
SHELL
ROBBINS
ISLAND
RAVENS
Lonelyville
CENTRAL
CENTRAL
WEBSTER
SANDY
SHELL
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Atlantique (Town of Islip)
Est. Winter Population	12
Est. Summer Population	168
Peak No. of Daytrippers	n/a

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
84	55	50	

Description

- No commercial facilities
- One of narrowest points on FI
- Vulnerable during storms
- Adjacent to Town of Islip owned recreational facility: 159 slip marina, full-service snack shack and public amenities (hot showers, playgrounds, marine electrical, free pump-out station)
- Sand paths, wooden boardwalks, 1 cement walkway
- Some residents have medical permits for golf carts.

Access

- Seasonal Ferry (Bay Shore), water taxi, private vessel

Estimated Projected Wastewater Flow (Based on Population)

- Winter 540 - 900 gpd
- Summer 7,560 - 12,600 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Sand paths,Wood decking
- Navigation thru community: Golf Carts on some walks (Trucks only on Burma Rd, northern half of Seabreeze Walk, southern half of Pirates Walk, northern half of EastEnd Walk)

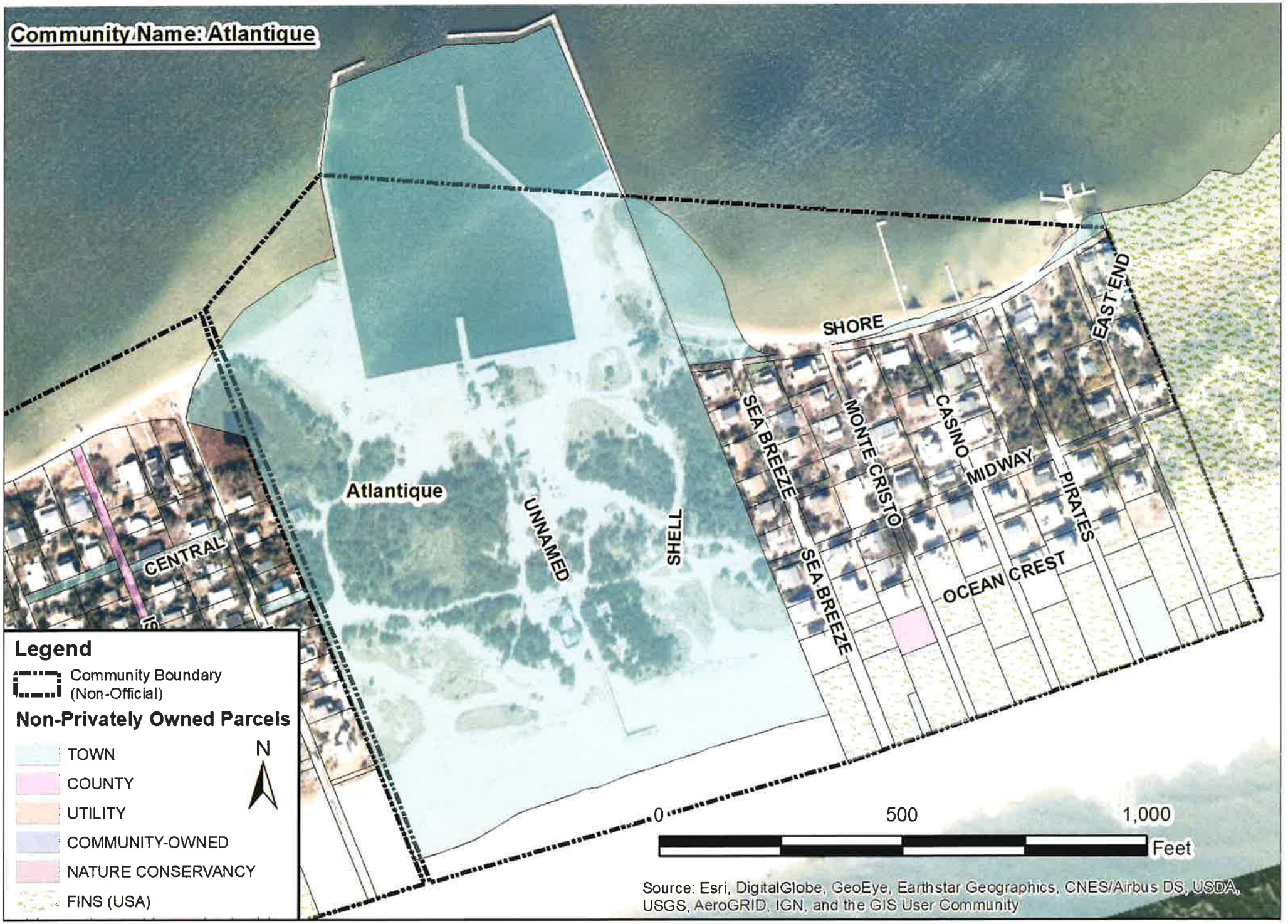
Geology

Depth to Groundwater:	USGS	4-8 feet, 8-12 feet on southern edge, close to 2 feet on northern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Atlantique's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 31 • % of Parcels applicability: 56% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Limited land available. • SCDHS is the Responsible Management Entity (RME) • Limited to no access for required maintenance. • Habitat loss with required clearing for drain fields
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal. • Mobile Restroom for TOI to investigate
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility or connection to Ocean Beach	Communities LPS Infrastructure • LPS plus Storage Tank Systems for Barge Transfer $2.893M • Connection to Ocean Beach District- LPS cost with connection to Robbins Rest $2.668M	• Barge option feasible for communities with Ferry access/freight docks. • Disposal costs are estimated at $85/1,000 gallons. • Barge operations costs estimated at $1800 – 2500 per trip. • Barge Cost for only for sewer infrastructure to collect and transfer wastewater from each property to central storage tank near marina. • Limited space available for storage tank/barge require further study on feasibility. • LPS require no trees or shrubs within 10' of perimeter. • TOI-owned Atlantique parcel is adjacent. • FINS parcel is adjacent
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M • Atlantique's Est. WW flow: 12,600 gpd $10M	• Further discussion with FINS or TOI is recommended on approval process to utilize park land. • TOI neighboring property to the west. • FINS neighboring property to the east. • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies. • Investigate use of neighboring TOI/FINS properties	


Community Name: Atlantique
Atlantique
SHORE
EAST END
SEA BREEZE
MONTE CRISTO
CASINO
MIDWAY
PIRATES
OCEAN CREST
SEA BREEZE
UNNAMED
SHELL
CENTRAL
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Robbins Rest (Town of Islip)
Est. Winter Population	7
Est. Summer Population	120
Peak No. of Daytrippers	160

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
53	38	37	

Description

- No commercial or public facilities
- Bounded by National Seashore (FINS)
- High water table-some sidewalks have been raised by 8", those that did not are flooded.

Estimated Projected Wastewater Flow (Based on Population)

- Winter 315 - 525 gpd
- Summer 6,120 - 10,200 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: No
- Freight Dock: No
- Access way/Road materials: Concrete, Sand paths
- Navigation thru community: Bicylces, Golf Carts, Cars
- Largest Vehicle: Tank Truck/SUV

Access:

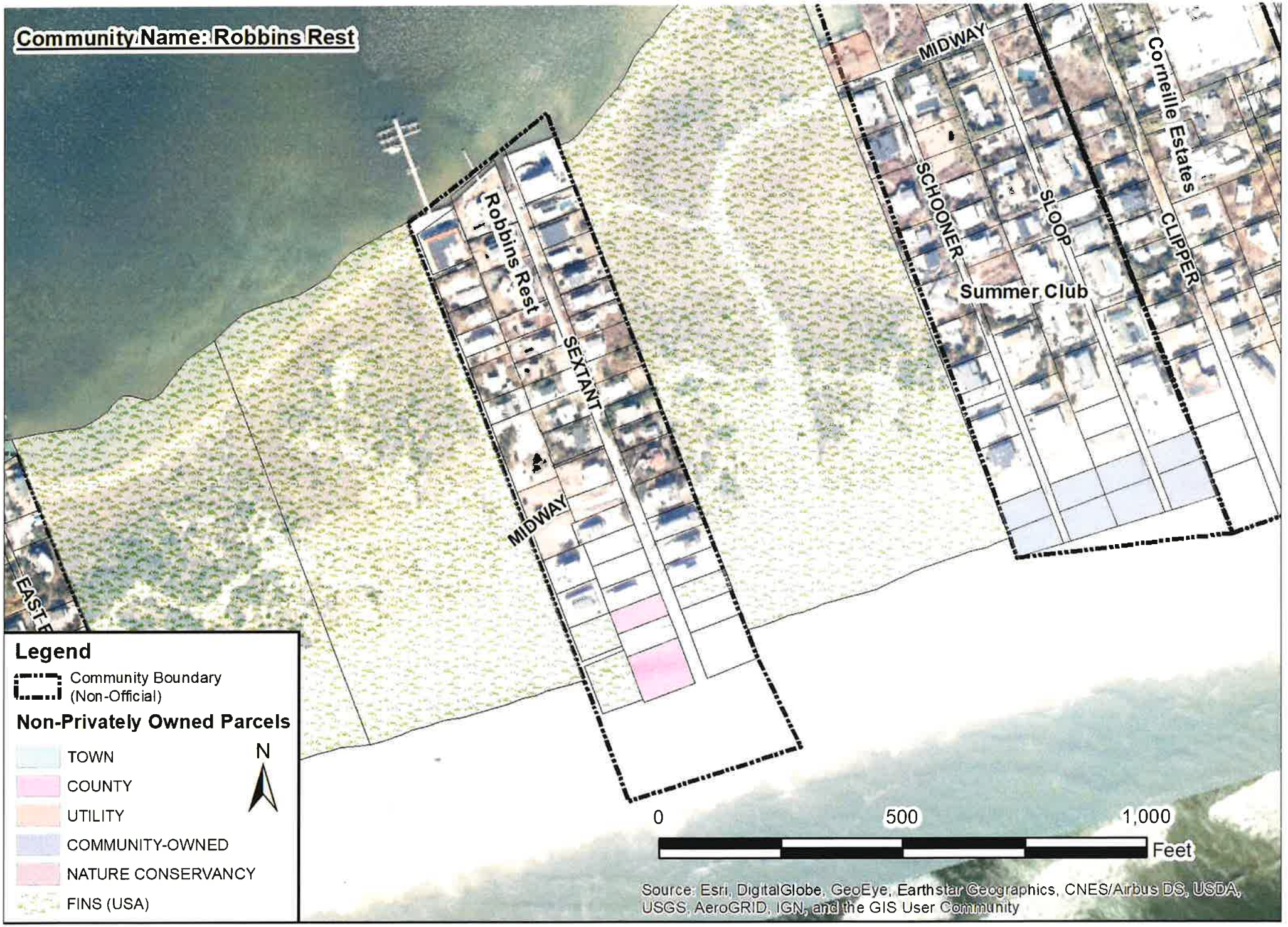
- Private boat
- No landing facility that would accommodate barge

Geology:

Depth to Groundwater:	USGS	4-8 feet, 8-12 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Robbins Rest's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 15 • % of Parcels applicability: 39% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as coll. sys.). Vacant parcels within community available. • SCDHS the Responsible Management Entity (RME) • Limited to no access for required maintenance. • Habitat loss with required clearing for drain fields
Innovative Technologies	• Incineration Toilets: $4,000 each	• Incineration toilets may not be applicable because of high density community.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Connection to Ocean Beach	• Connection to Ocean Beach District- LPS cost with connection to Summer Club $1.596M	• Connection to Ocean Beach collection system. • Limited space available for storage tank/barge require further study on feasibility. • No existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter. • FINS parcel is adjacent on both sides.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M • Robbins Rest Est. WW flow: 10,200 gpd $10M	• Further discussion with FINS is recommended on approval process to utilize park land. • FINS neighboring property to the east and west • Large Project: coordinate/agreement & legal requirements w/ other communities. • Tidal marsh soil only on north side of FINS.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies. • Investigate use of neighboring FINS properties	


Community Name: Robbins Rest
MIDWAY
Corneille Estates
SCHOONER
SLOOP
CLIPPER
Summer Club
Robbins Rest
SEXTANT
MIDWAY
EAST
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Summer Club (Town of Islip)
Est. Winter Population	6
Est. Summer Population	132
Peak No. of Daytripers	n/a

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
67	45	45	Condominium Community

Description

- No commercial or visitor services
- Club house on bayfront includes tennis courts, bay beach, and boating facilities for Summer Club condominium members

Estimated Projected Wastewater Flow (Based on Population)

- Winter 270 - 450 gpd
- Summer 5,940 - 9,900 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: No
- Freight Dock: No
- Accessway/Road materials: Concrete
- Largest Vehicle: Small tanker trucks
- Navigation thru community: Cars,golf carts,bicycles, mopeds, ATV's

Access:

- Private boat
- Closest ferry is Ocean Beach

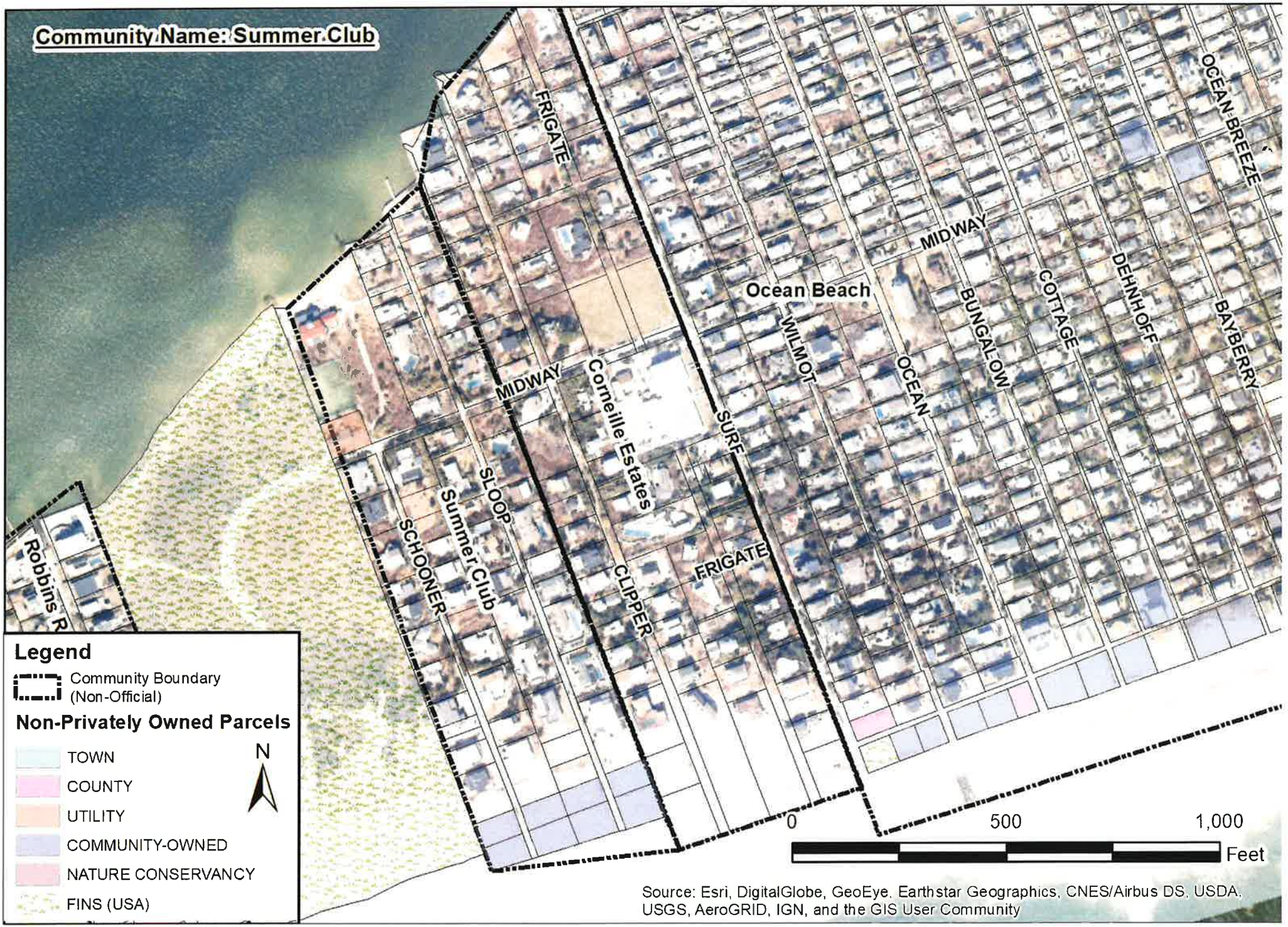
Geology:

Depth to Groundwater:	USGS	2-6 feet, 8-12 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Summer Club's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 45 • % of Parcels applicability: 100% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as coll. sys.). Limited land available. • SCDHS is the Responsible Management Entity (RME) • Access available for required maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each	• Incineration toilets may not be applicable because of high density community.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Connection to Ocean Beach	• Connection to Ocean Beach District- LPS cost with direct connection to Corneille Estates $1.985M	• Connection to Ocean Beach collection system. • Limited space available for storage tank/barge require further study on feasibility. • No existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter. • FINS parcel is adjacent west
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M • Summer Club Est. WW flow: 9,900 gpd $10M	• Further discussion with FINS is recommended on approval process to utilize park land. • FINS neighboring property to the west. • Large Project: coordinate/agreement & legal requirements w/ other communities. • Tidal marsh on north side of FINS property,
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies. • Investigate use of neighboring FINS property	


Community Name: Summer Club
FRIGATE
MIDWAY
Corneille Estates
SURF
WILMOT
Ocean Beach
MIDWAY
OCEAN
BUNGALOW
COTTAGE
DEHNHOFF
BAYBERRY
OCEAN BREEZE
SCHOONER
SLOOP
Summer Club
CLIPPER
FRIGATE
Robbins R
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Corneille Estates (Town of Islip)
Est. Winter Population	10
Est. Summer Population	180
Peak No. of Daytrippers	60

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
89	69	69	Public School: Woodhull

Description

- Public school: Woodhull School
- No commercial facilities
- Public facilities,school fields, ball courts & library
- Existing cesspools are failing
- One permitted I/A in 2022

Estimated Projected Wastewater Flow (Based on Population)

- Winter 450 - 750 gpd
- Summer 8,370 - 13,950 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: No
- Freight Dock: No
- Accessway/Road materials: Concrete/6' Wide wood decking
- Navigation thru community: Bicylces/Golf Carts
- Largest Vehicle: ATV

Access:

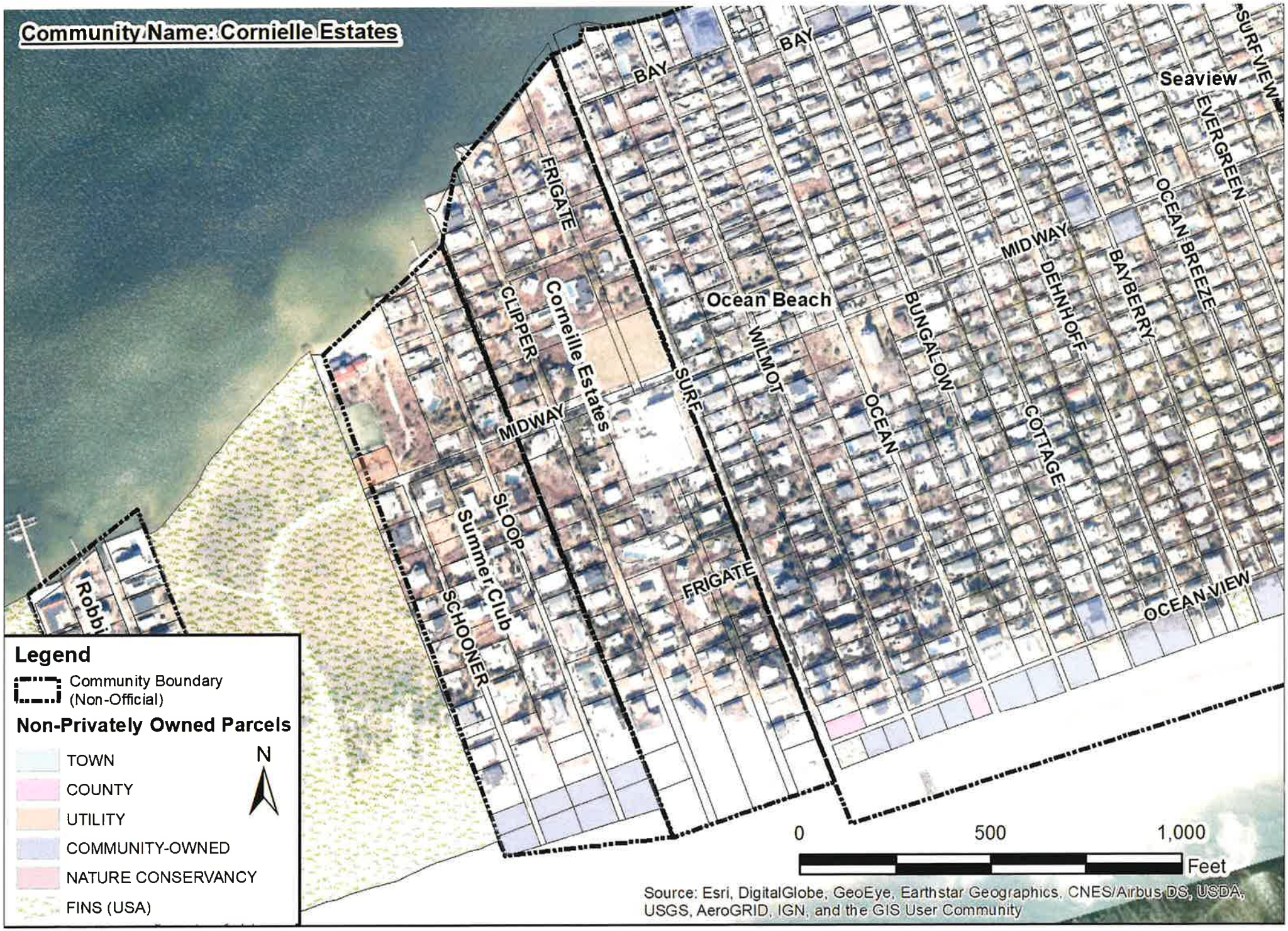
- No landing facility that would accommodate barge
- Closest ferry is Ocean Beach

Geology:

Depth to Groundwater:	USGS	2-4 feet, 8-10 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Corneille Estates' Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 48 • % of Parcels applicability: 70% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Limited land available. • SCDHS is the Responsible Management Entity (RME) • Limited to no access available for required maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each	• Incineration toilets may not be applicable because of high density community.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Connection to Ocean Beach	• Connection to Ocean Beach District- LPS cost with direct connection to Ocean Beach $2.80M	• Connection to Ocean Beach collection system. • Limited space available for storage tank/barge require further study on feasibility. • No existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Cornielle Estates
BAY
BAY
Seaview
SURFVIEW
EVERGREEN
OCEAN BREEZE
BAYBERRY
MIDWAY
DEHNHOFF
COTTAGE
OCEAN
BUNGALOW
WILMOT
Ocean Beach
FRIGATE
Cornielle Estates
CLIPPER
MIDWAY
SLOOP
Summer Club
SCHOONER
SURF
FRIGATE
OCEAN VIEW
Robbi
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Ocean Beach (Town of Islip)
Est. Winter Population	157
Est. Summer Population	5,000
Peak No. of Daytrippers	1,000

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
653	607	600	Wastewater Treatment Plant

Description

- Incorporated Village
- Largest downtown area:restaurants/bars/shops
- Most extensive public services: police force, ferry terminal bldg & community events.
- Tennis &, basketball courts, ball field & playground
- Wastewater Treatment Plant and Collection System

Estimated Projected Wastewater Flow (Based on Population)

- Winter 112,000 - 127,000 gpd
- Summer 178,000 - 213,000 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Concrete
- Navigation thru community: Bicylces/Golf Carts/Cars
- Largest Vehicle: Car/SUV/Van

Access:

- Ferry (Bay Shore), water taxi, private vessel

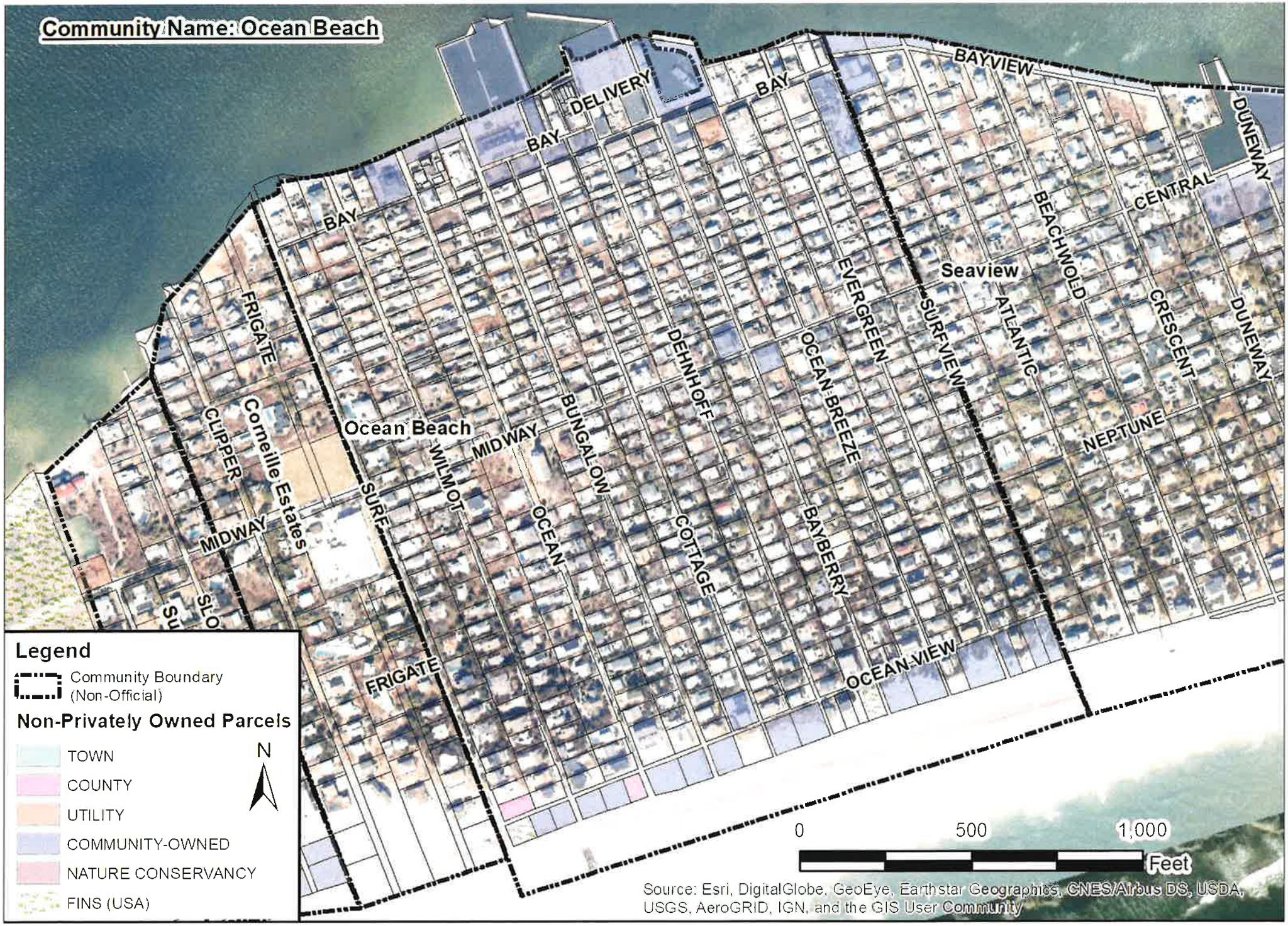
Geology:

Depth to Groundwater:	USGS	4 ft. north of Midway, 4-10 feet south of Midway, 10-20 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

Ocean Beach's Short and Long Term Alternatives

Short Term	Considerations/Estimated Costs	Comments
Phase I Inflow/Infiltration (I/I) Remedial Plan	• Implement stormwater I/I remedial action $2.7M	• Plan will alleviate flooding / minimize inflow into sanitary sewers.
Phase II Sewer Replacement Plan	• Replace sewer pipes/LPS $8.6M	• Plan will increase capacity of WWTF by reducing I/I
Sewer District ownership to Suffolk County or Town of Islip	• Investigate new ownership of collection system & WWTF	• Future considerations to extend WWTF use to adjacent communities (i.e. beyond Village boundaries), a Town or County owned Sewer District may be considered.
Long Term	**Considerations/Estimated Costs**	**Comments**
Infrastructure for Additional Connection to Ocean Beach Sewer District	• Investigate alternatives for conveyance of wastewater from communities (i.e. extend LPS collection system straight to WWTF or discharge wastewater at the existing sewer district's boundary)	• LPS piping installed is small and shallow as compared to gravity piping. • Existing roads in Ocean Beach are concrete and would require repair if LPS is extended to WWTF. • Large Project: coordinate/agreement & legal requirements w/ other communities.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Convert WWTF to pump station for transfer to mainland • Ocean Beach crossing $204M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure. • Large Project: coordinate/agreement & legal requirements w/ other communities. • Removes 100% Nitrogen to GSB.


Community Name: Ocean Beach
BAY
DELIVERY
BAY
BAY
BAYVIEW
DUNEWAY
CENTRAL
BEACHWOLD
Seaview
EVERGREEN
SURFVIEW
ATLANTIC
CRESCENT
DUNEWAY
FRIGATE
CLIPPER
Corneille Estates
Ocean Beach
MIDWAY
WILMOT
BUNGALOW
DEHNHOFF
OCEAN BREEZE
NEPTUNE
MIDWAY
SURF
OCEAN
COTTAGE
BAYBERRY
FRIGATE
OCEAN VIEW
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Seaview (Town of Islip & Brookhaven)
Est. Winter Population	150
Est. Summer Population	1000
Peak No. of Daytrippers	Minimal

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
437	376	368	

Description

- Borders the Town's of Islip & Brookhaven
- Nursery, market, and liquor store
- Community facilities include playground, wading pool, tennis courts, basketball courts, and ball fields
- 60 Slip Marina
- Western portion- smaller lots
- Flooding and groundwater concerns
- Approximately 15 I/A systems

Estimated Projected Wastewater Flow (Based on Population)

- Winter 6,750 - 11,250 gpd
- Summer 45,000 - 75,000 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: No
- Accessway/Road materials: Paved
- Navigation thru community: Golf Carts/Bicycles/Cars
- Largest Vehicle: Golf Cart

Access:

- Ferry (Bay Shore), water taxi, private vessel

Geology:

Depth to Groundwater:	USGS	4-8 ft north of Neptune Walk/Thompson Ave, 6-12 ft north of Ocean View, 16-20 ft on Ocean View
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Seaview's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf:301 • % of Parcels applicability: 80% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as coll. sys.). Limited land available. • SCDHS is the Responsible Management Entity (RME) • Access available for required maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Connection to Ocean Beach or Barging to Mainland Treatment Facility	• Connection to Ocean Beach District- LPS cost with direct connection to Ocean Beach $13.686M • LPS plus Storage Tank Systems for Barge Transfer $14.361M	• Connection to Ocean Beach collection system. • Limited space available for storage tank/barge require further study on feasibility. • Existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure(no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Seaview
BAY
BAYVIEW
BEACHWOLD
DUNEWAY
DUNEWAY
CRESCENT
CENTRAL
ATLANTIC
SURFVIEW
EVERGREEN
BAYBERRY
OCEAN BREEZE
DEHNHOFF
MIDWAY
Seaview
NEPTUNE
EVERGREEN
FAIRWAY
GALE
HOMESITE
IVY
JUNIPER
KELP
LAUREL
BAY VIEW
MIDWAY
THOMPSON
MIDWAY
SUPERIOR
Ocean Bay Park
OCEAN VIEW
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Ocean Bay Park (Town of Brookhaven)
Est. Winter Population	120
Est. Summer Population	1200
Peak No. of Daytrippers	2000

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
394	312	300	

Description

- Active commercial area: restaurants, bars, hotels, markets, and shops
- Public amenities including police department and volunteer fire/EMS department
- Small cottages being replaced by larger homes
- Flooding and high groundwater concerns
- Approximately 4 I/A Systems

Estimated Projected Wastewater Flow (Based on Population)

- Winter 5,400 - 9,000 gpd
- Summer 63,000 - 105,000 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Asphalt, concrete, gravel, wood decking, compacted dirt
- Navigation thru community: Bicycles, golf carts, cars/SUVs

Access:

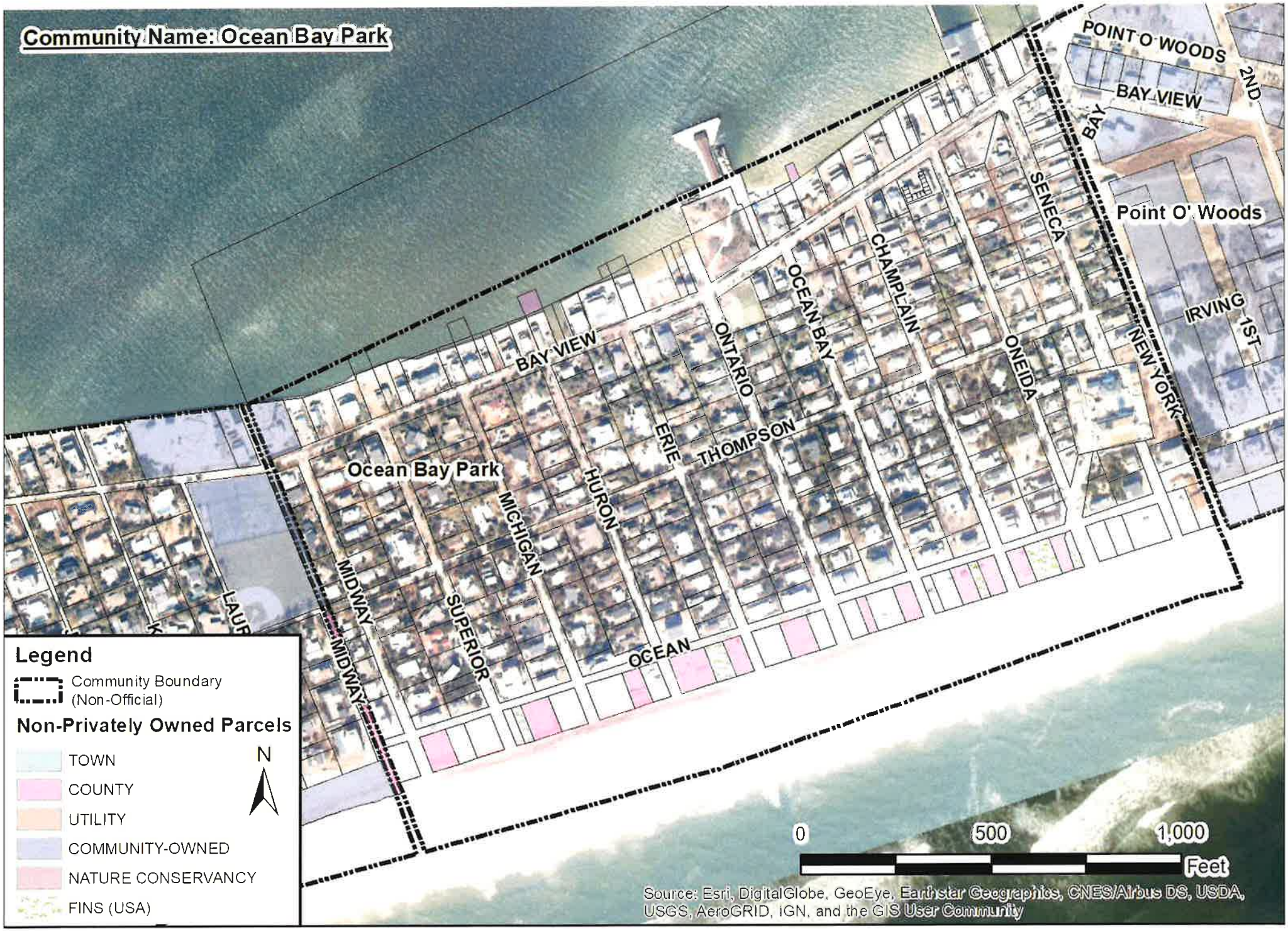
- Ferry (Bay Shore), water taxi, private vessel

Geology:

Depth to Groundwater:	USGS	4-10 feet, 12-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Ocean Bay Park's Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf:100 • % of Parcels applicability: 32% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Limited land available. • SCDHS is the Responsible Management Entity (RME). • Access available for required maintenance. • Habitat loss with required clearing for drain fields
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Connection to Ocean Beach or Barging to Mainland Treatment Facility	• Connection to Ocean Beach District- LPS cost with direct connection to Ocean Beach $10.541M • LPS plus Storage Tank Systems for Barge Transfer $11.666M	• Connection to Ocean Beach collection system. • Limited space available for storage tank/barge require further study on feasibility. • Existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • Large Project: coordinate/agreement & legal requirements w/ other communities.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Ocean Bay Park
POINT O WOODS
2ND
BAY VIEW
BAY
SENECA
Point O' Woods
CHAMPLAIN
OCEAN BAY
ONTARIO
ONEIDA
NEW YORK
IRVING
1ST
BAY VIEW
ERIE
THOMPSON
Ocean Bay Park
HURON
MICHIGAN
MIDWAY
SUPERIOR
MIDWAY
OCEAN
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Point O' Woods (Town of Brookhaven)
Est. Winter Population	10
Est. Summer Population	608

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
297	152	-	Common land ownership under Point O'Wood Assoc.

Description

- Member only general store and eating club
- Seasonal Dormitories (Approximately 50)
- No hotel, motel or condos
- Tennis/Community Center ("Casino")
- Recently raised bulkhead on bay side
- Area may be available for cluster systems & leaching fields
- Two I/A systems installed

Estimated Projected Wastewater Flow (Based on Population)

- Winter 450 - 750 gpd
- Summer 27,360 - 45,600 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: No
- Accessway/Road materials: Concrete, wood decking, sand
- Navigation thru community: Bicycles,cars,golf carts,ATV
- Largest Vehicle: 1,000 gpm fire truck

Access:

- Private Ferry

Geology:

Depth to Groundwater:	USGS	4-16 feet
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Point of Woods' Short and Long Term Alternatives

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf:104 • % of Parcels applicability: 68% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Land available. • SCDHS is the Responsible Management Entity (RME) • Limited access available for required maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• LPS plus Storage Tank Systems for Barge Transfer $8.305M	• Limited space available for storage tank/barge require further study on feasibility. • Existing freight dock available for barge option • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M	• This is an out of district sewer connection subject to initial connection fee of $30/gallon and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• Point of Woods est. Wastewater flow: 45,600 gpd $25M • Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • National Park property to east.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies.	


Community Name: Point O' Woods
Point O' Woods
BAY
BAY VIEW
PARK
UNNAMED
UNNAMED
UNNAMED
CENTER
9TH
10TH
MIDLAND
RIDGE
NEW YORK
OCEAN
6TH
CENTER
CHURCH
2ND
IRVING
1ST
3RD
BAY VIEW
CHAMPLAIN
ONEIDA
SENECA
BAY
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Cherry Grove (Town of Brookhaven)
Est. Winter Population	20
Est. Summer Population	2000
Peak No. of Daytrippers	2000

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
310	280	270	

Description

- Bounded by natural seashore (FINS)
- Commercial area includes community theater house, restaurants, market, bars, hotels, and shops
- Volunteer fire/EMS department and walk-in health clinic
- Existing cesspools are failing
- Approximately 10 I/A systems installed

Estimated Projected Wastewater Flow (Based on Population)

- Winter 900 - 1,500 gpd
- Summer 99,000 - 165,000 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: None
- Navigation thru community: Golf carts

Access:

- Ferry (Sayville), private vessel

Geology:

Depth to Groundwater:	USGS	4-12 feet, 12-24 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)


Community Name: Cherry Grove
Cherry Grove
BAYVIEW
BAYVIEW
BEACH
SURF
HOLLY
OCEAN
MAIN
DOCTORS
DURMEA
GREENE
GERARD
BAYVIEW
AEON
MARYLAND
SUMNER
IVY
LEWIS
WEST
EAST
SEA
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

COMMUNITY SUMMARY

Community	Fire Island Pines (Town of Brookhaven)
Est. Winter Population	120
Est. Summer Population	4040
Peak No. of Daytrippers	120

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
646	575	600	100 co-ops

Description

- Bounded by natural seashore (FINS)
- Commercial areas: restaurants, market, bars, hotels, offices and shops
- Walks are 4' wide (cars & trucks on FI Blvd only)
- Homes getting larger
- Stormwater system needs improvement
- Vacant parcels purchased for wastewater disposal by businesses
- Approximately 15 I/A systems installed

Estimated Projected Wastewater Flow (Based on Population)

- Winter 5,400 - 9,000 gpd
- Summer 182,340 - 303,900 gpd

Transportation Logistics/Construction Access

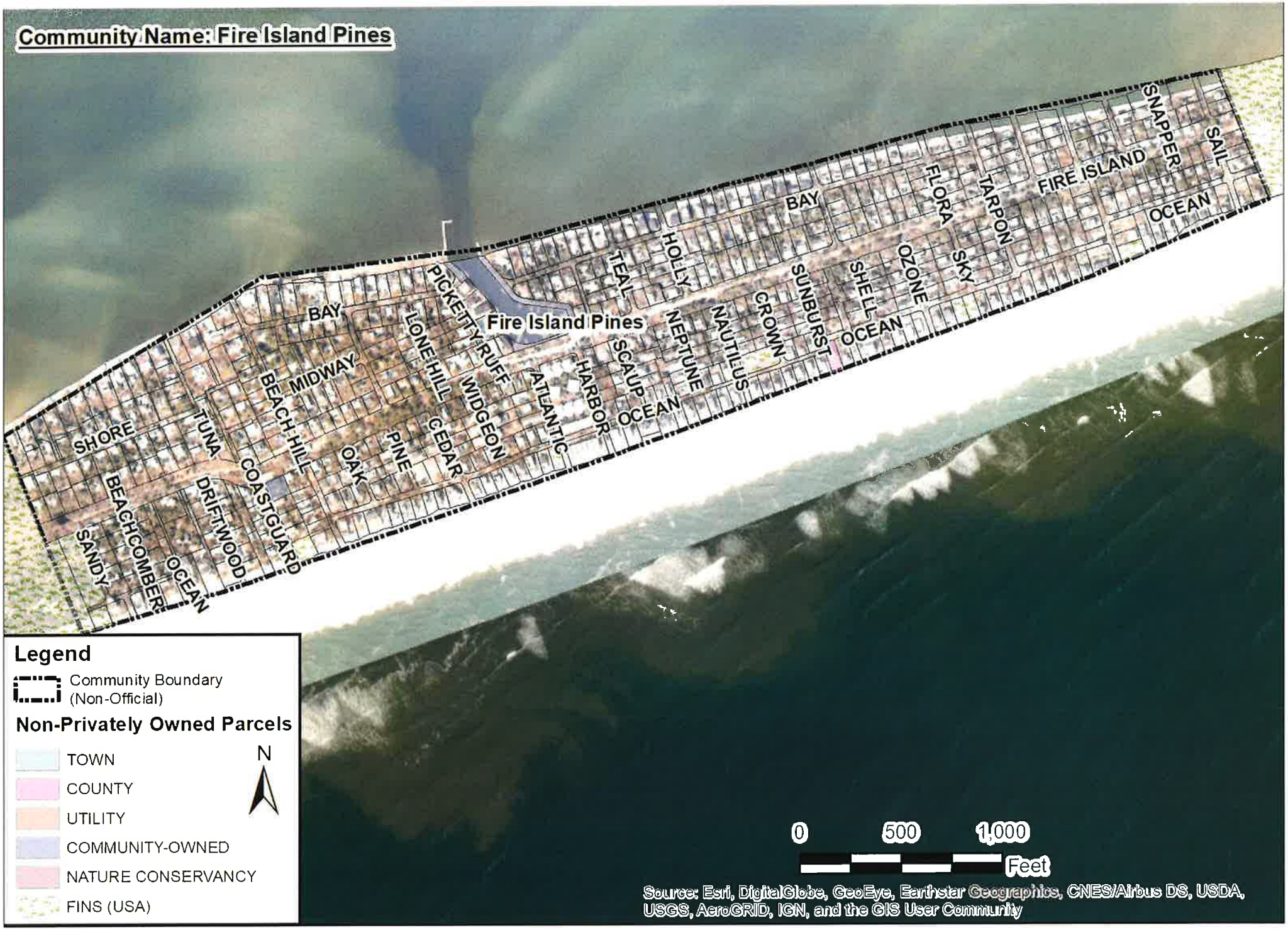
- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Sand Road,4'conc.walks
- Navigation thru community: Bicycles,Golf Carts,Cars
- Largest Vehicle to access majority: Golf Carts

Access:

- Ferry (Sayville), water taxi, private vessel

Geology:

Depth to Groundwater:	USGS	4-8 ft north of Fire Island Blvd,8-12 ft on south of Fire Island Blvd,12-30 ft SE end
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)


Community Name: Fire Island Pines
Fire Island Pines
BAY
OCEAN
FIRE ISLAND
SNAPPER
SAIL
FLORA
TARPON
TEAL
HOLLY
OZONE
SKY
SHELL
SUNBURST
CROWN
NAUTILUS
NEPTUNE
SCAUP
HARBOR
ATLANTIC
PICKETT
RUFF
WIDGEON
LONE HILL
MIDWAY
BEACH HILL
SHORE
TUNA
COASTGUARD
OAK
PINE
CEDAR
DRIFTWOOD
BEACHCOMBER
SANDY
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

COMMUNITY SUMMARY

Community	Water Island (Town of Brookhaven)
Est. Winter Population	0 - 4
Est. Summer Population	100
Peak No. of Daytrippers	10

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
75	45	50	

Description

- Surrounded by natural seashore (FINS)
- No commercial or public facilities beyond seasonal ferry dock
- Public water only for firefighting
- No business district

Estimated Projected Wastewater Flow (Based on Population)

- Winter 180 - 300 gpd
- Summer 4,545 - 7,575 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: No
- Accessway/Road materials: Wooddecking
- Navigation thru community: Wagons

Access:

- Ferry (Sayville), water taxi, private vessel

Geology:

Depth to Groundwater:	USGS	4-20 feet
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)


Community Name: Water Island
BAY
Water Island
ATLANTIC
WEST
FIRE ISLAND BEACH
CHARACH
STEELS
CALDWELLS
EAST
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

COMMUNITY SUMMARY

Community	Davis Park (Town of Brookhaven)	
Est. Winter Population	55	(0-December thru March)
Est. Summer Population	450 -	550
Peak No. of Daytrippers		2500

Parcel Count (Suffolk County)	No. of Developed Parcels (Suffolk County)	No. of Homes	Notes
303	278	270	No-year round residents (up to 8 months/yr)

Description

- Surrounded by natural seashore
- Commercial area includes market, restaurant and bar
- Full range of public amenities and facilities, volunteer fire department and healthcare services
- 250 slip marina
- Public Bathrooms with showers, sinks & toilets
- Lifeguard facility and firehouse restaurants
- Areas may be restricted due to piping plovers & other species
- West side (Davis Park) 150 homes
- East side (Ocean Ridge) 120 homes
- Approximately 5-10 I/A systems installed

Access:

- Ferry (Patchogue) Davis Park Ferry Co.

Geology:

Depth to Groundwater:	USGS	4-12 feet, 12-16 feet on southern edge
Soil Classification:	USDA	Highly permeable/silt, sand & gravel
Potential Sea Rise:	USACE	30 inches (2050)

Estimated Projected Wastewater Flow (Based on Population)

- Winter 2,475 - 4,125 gpd
- Summer 36,000 - 60,000 gpd

Transportation Logistics/Construction Access

- Ferry Accessible: Yes
- Freight Dock: Yes
- Accessway/Road materials: Wood decking, sand paths
- Navigation thru community: Cars, bicycles, ATVS


Community Name: Davis Park
Davis Park
WINDWARD
WINDWARD
LEEWARD
LEEWARD
DRIFTWOOD
SPINDRIFT
SEAFOAM
SANDPIPER
WHALE BONE
WHALE BONE
TRUSTEES
EAST
WEST
DONELLA
SEAJAY
BEACH PLUM
PEPPERIDGE
DUNE
1ST
2ND
3RD
4TH
5TH
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
500
1,000
Feet
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

FIRE ISLAND WASTEWATER MANAGEMENT PLAN

East End's Short and Long Term Alternatives

Cherry Grove, Fire Island Pines, Water Island and Davis Park

Short Term	Estimated Costs	Comments
I/A Systems	• No. of parcels greater than 6,000sf: 787 • % of Parcels applicability: 67% • Individual: $75,000 each • Cluster: $120,000 – 200,000	• Feasible for 6,000 sf or greater lot sizes. • Best fit exceptions for existing parcels. • Susceptible to sea level rise/climate change as a long-term solution. • Cluster treatment systems may be considered for group of residents (LPS as collection system). Land available. • SCDHS is the Responsible Management Entity (RME) • Limited to no access available for required maintenance. • Habitat loss with required clearing for drain fields.
Innovative Technologies	• Incineration Toilets: $4,000 each • Mobile Restroom / Urine Diversion: $60,000 each	• Incineration toilets may not be applicable because of high density community. • Mobile restrooms for Ferry terminal/commercial areas and pump out/barge to mainland for treatment. • Ferry access for waste removal.
Long Term	**Estimated Costs**	**Comments**
Infrastructure for Barging to Mainland Treatment Facility	• LPS plus Storage Tank Systems for Barge Transfer $50.82M	• Limited space available for storage tank/barge require further study on feasibility. • Existing freight dock at Davis Park available for barge option • LPS require no trees or shrubs within 10' of perimeter.
Central Pump Station/Force Main Under GSB to Mainland Treatment	• Island-wide Ocean Beach Crossing $271M • East End Patchogue Crossing: $198M	• This is an out of district sewer connection subject to initial connection fees and pro-rated user fees based on flow. • Costs include community LPS infrastructure (no trees or shrubs within 10'). • Large Project: coordinate/agreement & legal requirements w/ other communities.
FINS Property Treatment Plant Sites	• East End Est. Wastewater flow: 536,475 gpd $200 M • Island Wide Central WWTP: 1.5 MGD $400M	• Further discussion with FINS is recommended on approval process to utilize park land. • National Park property in between communities • Town of Brookhaven property in center of Davis Park.
Miscellaneous	• Evaluate Community/Island wide maintenance service program for interested companies. • Investigate use of neighboring FINS property.	


Fire Island: East End Communities
Davis Park
Water Island
Fire Island Pines
Cherry Grove
Legend
Community Boundary (Non-Official)
Non-Privately Owned Parcels
TOWN
COUNTY
UTILITY
COMMUNITY-OWNED
NATURE CONSERVANCY
FINS (USA)
N
0
0.5
1
2
Miles
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

APPENDIX B

Draft Suffolk County Department of Health Services

General Guidance Memorandum #XX

Fire Island Onsite Sewage Disposal Systems

COUNTY OF SUFFOLK

STEVEN BELLONE
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

GREGSON H. PIGOTT, MD, MPH,
Commissioner

DRAFT – September 18, 2023

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES GENERAL GUIDANCE MEMORANDUM #XX FIRE ISLAND ONSITE SEWAGE DISPOSAL SYSTEMS

AUTHORITY

The Suffolk County Department of Health Services ("SCDHS," the "Department") reviews and approves proposals for the installation of individual sewerage systems and subsurface sewage disposal systems (Onsite Sewage Disposal System) in accordance with the Suffolk County Sanitary Code Article 6 (Article 6).

The installation of an Onsite Sewage Disposal System must comply with the SCDHS "*Standards for Approval of Plans and Construction for Sewage Disposal Systems for Single-Family Residences*" (Residential Standards), *"Standards for Approval of Plans and Construction for Sewage Disposal Systems for Other Than Single-Family Residences"* (Commercial Standards), or "*Standards for Procedures for the Replacement and Retrofits of Existing Sewage Disposal Systems for Single-Family Residences and Other Than Single Family Residences*" (Replacement/Retrofit Standards), as well as Article 6.

PURPOSE

The primary means of wastewater treatment for the Fire Island National Seashore (FINS) is the use of Onsite Sewage Disposal Systems. The Suffolk County Subwatersheds Wastewater Plan (July 2019) included a Pilot Evaluation of innovative and alternative onsite wastewater treatment system (I/A OWTS) installations for Fire Island with recommendations.

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Because of the isolated location and challenging site conditions associated with residential and commercial properties located on the FINS (e.g., extremely small lots, high groundwater, limited transportation infrastructure), this document has been prepared to provide guidance with examples to SCDHS staff in the Office of Wastewater Management, design professionals and installers holding an active liquid waste license pursuant to the Suffolk County Code Chapter 563, Article VII (Septic Industry Businesses) through the Suffolk County Department of Labor, Licensing and Consumer Affairs regarding when a proposal to install an Onsite Sewage Disposal System on FINS can be approved as Best-Fit per sections 5-104(3) of the Residential Standards, XI(2)(a) of the Commercial Standards, VIII of the Replacement/Retrofit Standard or Section 760-614(F) of Article 6 without the need for a variance or waiver from SCDHS. Best-Fit may allow reduced setbacks and hydraulic sizing for some types of Onsite Sewage Disposal System installations without the need to obtain a variance or waiver from the Department's Board of Review. Best-Fit also allows for some of the SWP Fire Island recommendations to be utilized when installing Onsite Sewage Disposal Systems.

Applicants proposing to install an Onsite Sewage Disposal System that does not comply with the Best-Fit requirements of the Residential Standards, Commercial Standards, Replacement /Retrofit Standards or Article 6 may request a variance or waiver from the Department's Board or Review for any deviation from the requirements. Applicants seeking a variance or waiver must demonstrate that the proposal will be in general harmony and intent of the Suffolk County Sanitary Code to protect groundwater, drinking water supplies, surface water or other natural resources, and public health, safety and welfare. See Article 6 Section 760-612(A) regarding variance or waiver requests.

Article 6, the Residential Standards and the Commercial Standards only allow Best-Fit when installing an I/A OWTS (Refer to Section 5-104(3) of the Residential Standards or Section XI(2)(a) of the Commercial Standards). The Replacement/Retrofit Standards allow Best-Fit installation of conventional system or I/A OWTS for proposals complying with Section II of the Replacement/Retrofit Standard. Existing sanitary systems without a septic tank and/or an I/A OWTS preceding the leaching structure (e.g., cesspool) shall be prohibited at the time of the retrofit or replacement of an existing cesspool(s), and a septic tank or I/A OWTS must be installed preceding the leaching structure (e.g., cesspool) at the time of retrofit or replacement per Article 6.

GUIDANCE

A. Types of Projects Qualifying and Not Qualifying for Best-Fit Installations

1. Proposals to install a new Onsite Sewage Disposal System as part of the construction of a new single-family residence or other than new-single-family residence (commercial project) on a vacant tax parcel

Best-Fit is not permitted for proposals to construct a new single-family residence or commercial project on a vacant tax parcel. A proposal to install an Onsite Sewage Disposal System must conform to the Residential and Commercial Standards (e.g., setbacks, hydraulic sizing, etc.). Applicants proposing to install an Onsite Sewage Disposal System that does not comply with these standards may request a variance or waiver from the Department's Board or Review.

2. **Proposals solely to replace or retrofit an existing Onsite Sewage Disposal System or cesspool**

   An existing Onsite Sewage Disposal System or cesspool being replaced or retrofitted with either an I/A OWTS or conventional system where no change of use or new construction is proposed (including additions, structure relocation, reconstruction) may be installed as Best-Fit with reduced setbacks to property lines or structures (e.g., dwelling, decks, swimming pools, etc.) or reduced hydraulic sizing, provided the reductions are not due to a self-created hardship. When there is adequate area to install a system complying with Department standards but the applicant desires to locate the system in a location causing reduced setbacks or reduced hydraulic sizing (i.e., self-created hardship) then the proposal will not be considered Best-Fit by the Department. However, the applicant may request a variance or waiver from the SCDHS standards from the Department's Board of Review.

   When an onsite or neighboring drinking water well exists, then the setbacks to the proposed Onsite Sewage Disposal System should be no less than the setbacks to the existing Onsite Sewage Disposal System or cesspool being retrofitted or replaced. If this cannot be accomplished, then the applicant will be required to request a variance or waiver for the reduced separation distances from the drinking water well(s) to the proposed Onsite Sewage Disposal System from the Department's Board of Review.

3. **Proposals to retrofit or replace an existing Onsite Sewage Disposal System or cesspool as part of change of use, addition, or construction of a replacement structure**

   Proposals to modify an existing single-family residence (including additions which would not impact the placement of the Onsite Sewage Disposal System, elevating an existing dwelling, construction of a replacement structure/residence in generally the same footprint as the residence to be removed, relocation of a dwelling for erosion mitigation measures or coastal protection such as dune construction, relocation of a dwelling to increase separation to surface waters, or change of use of a portion of the residence) may receive Best-Fit for the installation of an Onsite Sewage Disposal System when the existing system to be replaced or retrofitted consists of a cesspool or conventional system with an I/A OWTS (refer to Article 6 Section 760-614(F)). Best-Fit is not permitted for residential projects when the proposals does not complying with the Residential Standards due to a self-created hardship. In this case, the applicant may request a variance or waiver from the Residential Standards from the Department's Board of Review.

   Best-Fit is not permitted for commercial projects when proposing to replace or retrofit an Onsite Sewage Disposal System or cesspool due to a change of use, building addition, or new/replacement structure that does not meet the requirements of the Commercial Standards. For proposals not complying with the Commercial Standards, applicants may request a variance or waiver from the Department's Board or Review.

B. Examples of Best-Fit Installation Allowances

The below examples are theoretical only and each application/proposal will be evaluated on a case-by-case basis by the Department to determine if the proposed Onsite Sewage Disposal System may be approved as Best-Fit. Note if Department staff determine the reductions proposed are due to a self-created hardship then the applicant may request a variance or waiver from SCDHS Standards through the Department's Board of Review for the proposed reductions.

1. Reduced Hydraulic Sizing

Reduced hydraulic sizing of an Onsite Sewage Disposal System may be permitted when there is no proposed increase in sanitary or kitchen/grey water design flow due to increased bedrooms, a change of use, building addition, proposed detached buildings, or replacement of an existing building (which is located outside the general footprint of the existing building to be removed).

For reduced hydraulic sizing, the applicant's design professional shall maximize the hydraulic design of the Onsite Sewage Disposal System to the greatest extend possible. This may include proposing septic tanks, grease traps, I/A OWTS units or leaching structures that maximize the hydraulic size of the system. The design professional should attempt to design the Onsite Sewage Disposal System so it is sized hydraulically equivalent to or increases the hydraulic size as compared to the existing system being replaced or retrofitted.

2. Reduced Setbacks

a. *The Onsite Sewage Disposal System to property lines* may be permitted provided there is adequate separation from the property line to the system for the installation and maintenance of the system without damaging/impacting a neighboring property, surface waters, wetlands, or right-of-way. The applicant's design professional shall provide a report outlining the means and methods of installation and maintenance of the system to prevent impacts to the neighboring, surface waters, wetlands, or right-of-way.

b. *The Onsite Sewage Disposal System to a retaining wall* may be constructed less than 10 feet apart, for walls retaining sewage, provided the retaining wall is constructed of waterproof concrete (or equivalent as approved by the Department). The reduced separation distance from the Onsite Sewage Disposal system to the retaining wall should provide adequate clearance to not affect the functionality of the system and allow for installation and maintenance of the system. The applicant's design professional shall provide a signed and sealed letter verifying that the setback from the Onsite Sewage Disposal System to the retaining wall is adequate as not to affect the performance, installation and maintenance of the system.

c. *The Onsite Sewage Disposal System to decks or buildings* may be less than those required by SCDHS Standards provided the proposed separation is maximized and does not structurally impact the building(s), deck(s) or Onsite Sewage Disposal System and provides sufficient clearance for installation, operation and maintenance

of the system. The Department may allow an I/A OWTS tank to be installed beneath an existing dwelling on piles or deck provided there is no available land area for the I/A OWTS and there is adequate separation to piles, headers, girders, joists, footings, or deck posts as well as adequate accessibility for the installation, and maintenance of the I/A OWTS tank, with the I/A OWTS being vented in accordance with SCDHS Standards. The applicant's design professional must submit a signed and sealed letter/report justifying the above and including:

1. Certifying the proposal will not structurally impact the existing dwelling, deck or Onsite Sewage Disposal System.
2. Certifying the proposal will provide adequate access for the installation, operation, and maintenance and include specific design drawings such a site layout depicting pile, footing, or deck post locations with respect to the I/A OWTS tank placement and/or cross-sections or layout plans of the deck, dwelling, and I/A OWTS depicting access.
3. Stating the means and methods of installation.

d. *The Onsite Sewage Disposal System to underground utilities/tanks* (gas or electric lines and underground fuel storage tanks) should be installed to maximize the horizontal separation distance between them and allow for installation and maintenance of the system or utility lines/storage tanks without impacts to either of them. Mark-out tape should also be installed for underground utilities and sanitary lines.

e. *The Onsite Sewage Disposal System to drainage structures* (leaching and non-leaching drainage structures) shall be maximized and should be installed not to interfere with the installation, functioning, and maintenance of either the sewage disposal system or drainage system. The applicant's design professional shall provide a signed and sealed letter verifying that the reduced setback from the Onsite Sewage Disposal System to drainage structures is adequate to not affect the performance of either system and not affect the installation and maintenance of the systems.

f. *The Onsite Sewage Disposal system to swimming pools*

1. The separation distance from an Onsite Sewage Disposal System to an existing inground or semi-inground swimming pool shall be maximized but must not closer than 10 feet to the swimming pool or equivalent distance to the existing swimming pool as compared to the Onsite Sewage Disposal System to be replaced or retrofitted.
2. The separation distance from an Onsite Sewage Disposal system to an existing elevated swimming pool or swimming pool at grade shall be placed with adequate clearance for installation and maintenance of the Onsite Sewage Disposal System and swimming pool as determined by the applicant's design professional and must not be closer than 5 feet.
3. For either case above (1 or 2), the applicant's design professional shall submit a signed and sealed letter stating:

a. There will not be any structural impacts to either the existing swimming pool or replaced or retrofitted Onsite Sewage Disposal system during installation and operation.
b. The provided separation distance between the existing swimming pool and Onsite Sewage Disposal System will not affect the installation, operation or maintenance of the swimming pool or Onsite Sewage Disposal System.
c. Stating the means and methods of installation.

4. Setbacks from an Onsite Sewage Disposal system to a new swimming pool must comply with the SCDHS Standards. For proposals not complying with these standards, the applicant may request a variance or waiver from the Department's Board of Review.

g. *Pressurized shallow drainfields (PSD) to trees and woody shrubs* may have a separation of less than 10 feet provided a root barrier is installed between the PSD and the trees/shrubs. The root barrier must be installed with adequate separation to the PSD to allow for proper functioning of the PSD and installation and maintenance of the PSD. The applicants design professional shall provide a sign and sealed letter stating the type of root barrier to be installed and verify that the setback from the PSD to the PSD is adequate to not affect the performance of the PSD and not affect the installation or maintenance of the PSD.

h. *The Onsite Sewage Disposal System to water lines* may have a horizontal separation reduced to less than 10 feet provided the water line is sleeved and is no closer than 5 feet to the Onsite Sanitary System. A water line shall not cross a leaching structure or any tank associated with the Onsite Sewage Disposal System (e.g., septic tank, I/A OWTS, manhole, pump basin, etc.). A water line may cross a sewer line provided the crossing complies with standards.

i. *The Onsite Sewage Disposal System to onsite and neighboring drinking water wells* has a separation distances from the Onsite Sewage Disposal System to water supply wells that either complies with Department standards or is no less than the existing separation distances.

EFFECTIVE

This document is for guidance purposes only and should apply to most cases, but it is not a standard and is not meant to substitute for the discretion of the reviewer. Additionally, it should be noted that the information contained in this guideline may be amended in the future. In all instances, the requirements of the SCSC shall govern.

Issued by: Craig Knepper, P.E., Chief
Office of Wastewater Management

Date: XXXXXXXX