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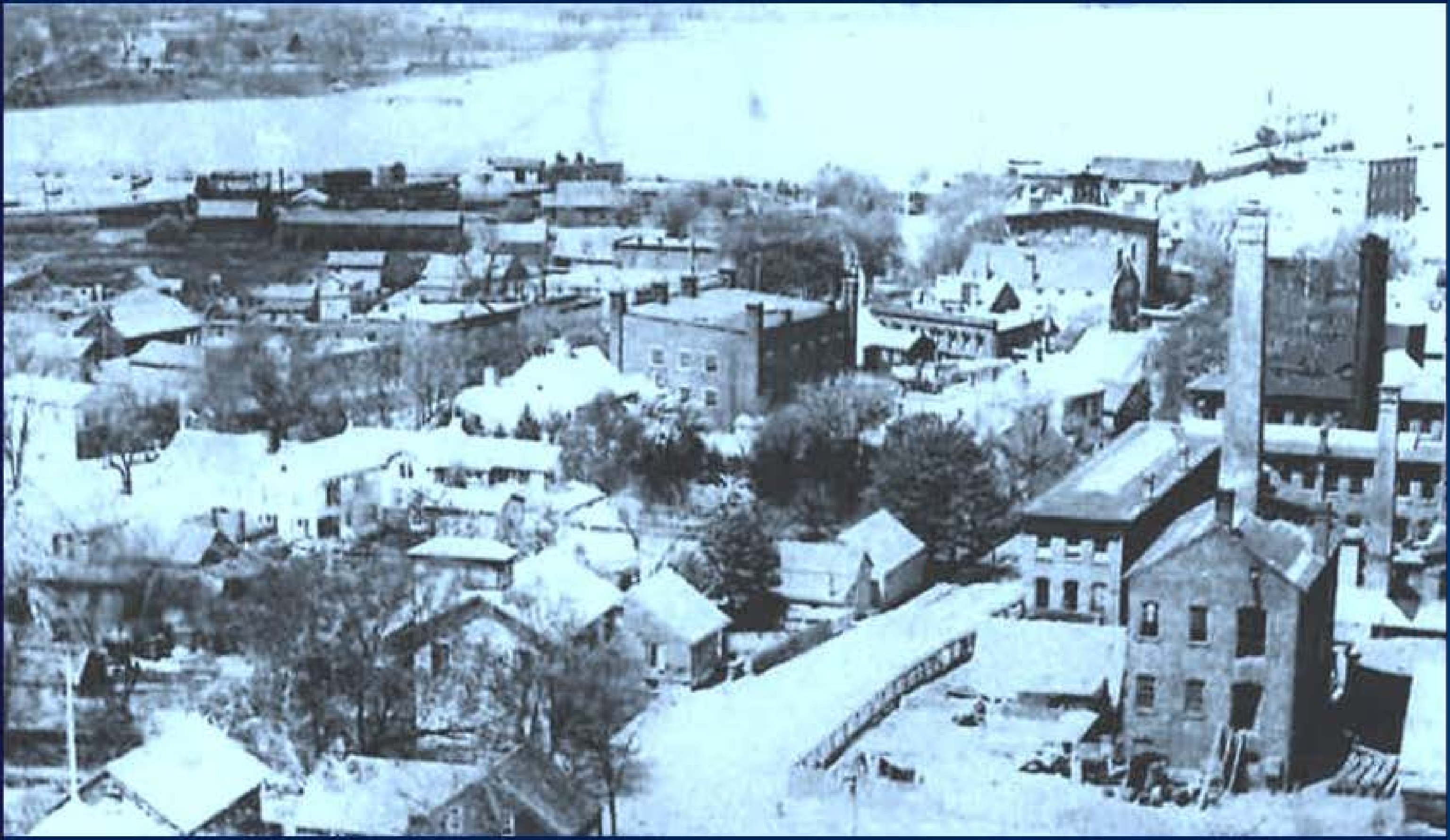
Sewer Master Plan

Prepared for:

Village of Sag Harbor



Prepared by:

Cameron Engineering

January 2022

VILLAGE OF SAG HARBOR
SEWER MASTER PLAN

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

(Appendices are found at the end of the document)

1. Overview

The Village of Sag Harbor commissioned the development of this Sewer Master Plan (the "Plan") to determine how to best manage wastewater generated within its borders to protect the local recevieing waters. The Plan provides guidance to the Village on the management of wastewater generated by its residents and its downtown commercial district. Presently approximately 13% of the parcels within the Village are sewered, with the balance of the parcels using on-site wastewater treatment systems (OWTS). The Village's boundaries lie in both the Town of Southampton and the Town of East Hampton. There are 1,219 parcels representing approximately 55% within the Town of Southampton and 919 parcels representing approximately 45% within the Town of East Hampton. The Village recognizes that the health of the Village's vibrancy and economy is tied directly to the quality of the local surface waters including the inland embayments and the harbor area. The Plan identifies management measures to protect these waterbodies from the impacts of nitrogen loading from OWTS. The Village has received two grants each of $72,400 from the Town of East Hampton and Town of Southampton towards the Plan's total cost of $145,800. The grants were awarded approximately 12 months apart resulting in the Master Plan (Plan) being initiated with one grant in place and a reconfiguring of the Plan work efforts to maximize the initial grant funding while the second grant was pursued and eventually obtained. Upon receipt of the second grant, the Village authorized the completion of the Plan.

The Village's Wastewater Treatment Plant (WWTP) is a critical asset and plays a significant role in determining where and when the Village should consider extending sewers or creating alternative treatment capacity. The WWTP has an estimated 90,000 gallons per day (gpd) of available excess capacity. The Master Plan (Plan) uses this benchmark as a cap for connecting new flows to the WWTP. As noted in this Plan, once this benchmark is reached, there would be no further connections unless the WWTP has been expanded or application(s) of new treatment technologies within the existing WWTP footprint have been identified that will provide additional treatment capacity.

2. Goals and Objectives

The Sewer Committee and Cameron Engineering held a virtual kickoff meeting on July 24, 2020 to review the scope of the Plan as detailed in Cameron Engineering's proposal accepted by the Village. For the kickoff meeting, Cameron Engineering prepared a "Checklist of Scope Items" that identified a total of forty-four (44) items to be addressed in the Plan. Due to the initial available funding constraints, it was necessary to identify those elements of the Plan that were deemed the most important and would provide a basis for the Village to make important decisions on wastewater management.

The most critical items and tasks as identified by the Village's Sewer Committee are:

- Determine available capacity of Wastewater Treatment Plant
- Evaluate potential buildout within existing Sewer Service Areas
- Identify potential sewersheds boundaries
- Develop a matrix for ranking of potential sewersheds
- Identify the cost of nitrogen reduction

While the excess capacity of treatment capacity at the Village's WWTP is a key factor, the excess capacity is not of a sufficient volume to contemplate sewering of the entire Village. The Plan addresses alternatives to connecting parcels to the WWTP, including both decentralized wastewater treatment systems and individual Innovative & Alternative (I/A) treatment systems.

3. Available Capacity at Wastewater Treatment Plant (WWTP)

3.1. Available Capacity

The Village's Wastewater Treatment Plant (WWTP) has a stated design capacity of 250,000 gallons per day (gpd). Per NYSDEC requirements, a Facility Plan would be required once the flow at the WWTP reaches 95% of design capacity that would be equal to an average daily flow 237,500 gpd. Peak days for flow in prior high summer seasons have been in the range of 140,000 to 150,000 gpd. Due to the COVID-19 pandemic, peak flows in 2020 were lower than prior years so the data for 2020 will not be used for peak flow analysis. For the purposes of this Master Plan, an available capacity of 90,000 gpd could be allocated before a Facility Plan would need to be prepared. Using the Suffolk County Department of Health Services factor of 300 gpd for a Single-Family Residence (SFR), this available or excess capacity is equivalent to approximately 300 single family homes.

Table 3-1. Maximum Average Daily Flows

Year	Max. Average Daily Flows (MGD) [1]
2017	0.137
2018	0.149
2019	0.138
2020	*0.121*
2021	*0.127*

The discussion of the WWTP capacity presumes that the operability of the Village's wastewater treatment plant may become more challenging once the flow level increases and approaches the facility's design capacity. Presently at the reduced flow levels, the WWTP often has two and at times three tanks offline during the off-season low flow period. This provides the operations staff with flexibility to divert flow to an empty tank to allow to perform scheduled maintenance work on; piping, valves, aeration headers and air diffusers. Having an empty tank or two also provides the flexibility to operations staff to take a tank offline for unscheduled maintenance or an emergency event(s). This operational flexibility is significantly reduced once peak

[1] 2020 & 2021 Flows will not be used in analysis due to COVID-19 pandemic which resulted in non-typical flows that were less than the previous years' maximum daily flows.

flows increase and more or all of the process tanks are on line 100% of the time. This consideration is further discussed in Section 9, WWTP Evaluation.

3.2. Build-Out and Service Areas

The Village has seven (7) Sewer Service Areas that service the downtown commercial areas of the Village. It is necessary to determine if there is potential of additional infill or buildout of existing parcels within the sewer service areas. This exercise was performed in 2014 as part of the sewer expansion studies funded by the Suffolk County Department of Public Works. The maximum daily flows referenced in the 2014 report were in the range 150,000 to 170,000 gpd, which is higher than the current (140,000 to 150,000 gpd). There were two pending developments at the time with proposed wastewater flows of 35,100 gpd. These projects, Bulova Watchcase and West Water Street, have been developed and occupied, therefore this flow is accounted for within the current operating flow. At that time, there was also approximately 24,000 gpd of additional sewage was projected to be generated from potential infill within the Sewer Service Area in accordance with zoning and codes in place at that time.

Cameron Engineering conducted a field reconnaissance of the existing Sewer Service Areas in August 2020 to determine if there were any significant changes from the existing conditions observed in 2014. The field work did not note any major changes in land uses identified in the 2014 study.

Although the extent of infill and mulitple change of uses throughout the commercial area of the Village was not quantified for this plan, it is noted that flow from the two large developments, has not increased the maximum operating flow as projected. The use of low flow, modern plumbing fixtures and water consumption appliances in new construction could contribute to the operating flow not increasing concurrently with Suffolk County wastewater generation rates. A similar occurrence was noticed in the Village of Port Jefferson study conducted by Cameron Engineering.

3.2.1. Existing Sewer Service Area

The Village has a somewhat unique designation of properties that is different from other municipalities for its sewerage system. All properties inside the Village of Sag Harbor are within its "sewerage system". Only those properties that are within one of the "sewer "service areas," have the ability and are required to connect to the wastewater treatment plant (WWTP). Presently, only ~13% of the Village parcels are connected to the sewer system. The remaining parcels in the sewerage system are considered to be in the "non-service areas," which are serviced by privately owned and maintained on-site wastewater treatment systems (OWTS). These are typically cesspools, septic tank based systems as well as a small but growing number of Innovative Alternative septic system designs. The Village does not have a 'sewer district.'

3.2.2. Field Survey

On August 21, 2020, Cameron Engineering completed a comprehensive field survey of the Village's existing sewer service area. The objective of the field survey was to confirm existing land uses at each parcel within the sewer service area and update GIS data and the corresponding land use map accordingly.

3.2.3. Existing Land Use and Zoning

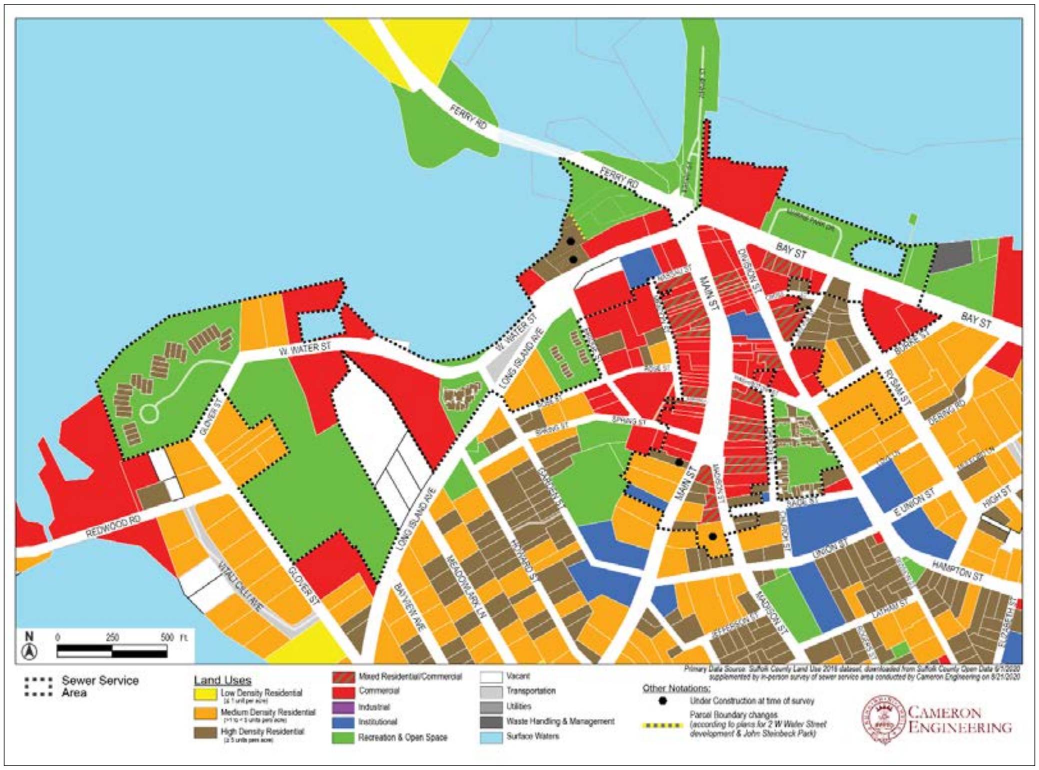
Land Use

The surveyed sewer service area contains a total of 295 parcels[2], based on the Suffolk County Land Use dataset[3]. This dataset includes overlapping tax parcels in multi-floor condominium buildings at five residential sites (144 parcels in total) and one commercial site (5 parcels). The land use of each parcel was verified or updated based upon observable conditions.

[2] Note: One building containing Residential condo parcels at 2 W Water St (15 parcels in total) has been demolished and is currently under construction and being replaced by 3 condo units (likely 4 parcels).

[3] Parcel dataset downloaded from https://gis3.suffolkcountyny.gov/gisviewer/

Figure 3-1. Land Uses within Sewer Service Area



Within the sewer service areas, residential use accounts for 59% of the total parcels (19% of the total parcel land area). This includes Low-, Medium- and High-Density residential uses, but not mixed-use buildings where apartments are located above ground floor commercial uses. 10.2% of the parcels (6.9% of parcel land area) in the sewer service areas contain “Mixed Residential/Commercial” buildings (ground floor commercial; upper floor residential). Mixed Residential/Commercial uses are located primarily along Main Street.

Table 3-2. Land Uses within the Sewer Service Area

Land Use	Parcel Count	Percent	Acreage	Percent
Residential (Low-, Med.- & High-Density)	174	59.0%	11.09	19.1%
Mixed Residential/Commercial	30	10.2%	4.02	6.9%
Commercial	70	23.7%	19.13	32.9%
Institutional	3	1.0%	1.30	2.2%
Recreation & Open Space	14	4.7%	21.99	37.8%
Vacant	1	0.3%	0.27	0.5%
Transportation	3	1.0%	0.34	0.6%
Total	**295**	*100%*	**58.13**	*100%*

Commercial Use, *including* the mixed-use category[4] accounts for approximately 34% of the total parcels (approximately 40% of parcel land area). Commercial Use without the mixed-use category accounts for 23.7% of the total parcels (nearly 33% of parcel land area). Recreation and Open Space (which includes private residential condo grounds)[5] comprised approximately for 4.7% of total parcels, or approximately 38% of parcel land area. One percent of parcels in the survey area are classified Institutional (2.2% of the parcel land area). This category includes public facilities such as the Sag Harbor Municipal Building, Police Station, and the Post Office.

Zoning

The majority of the land area within the Village is zoned R20 Residential, which allows for single-family detached housing (as-of-right) and two-family conversions (by special permit). Within the sewer service area, 25% of the parcels are zoned R20, accounting for 25% of the parcel land area.

Village Business (VB), which is a commercial district for retail uses and restaurants as well as public facilities, comprises approximately 52% of the total parcels, 26% of the parcel land area. Parcels zoned Office District (OD) allow for banks and professional offices and account for nearly 9% of parcels (7.3% of the parcel land area) in the sewer service area. The Resort Motel (RM) district provides for transient travelers and accounts for 6% of the parcels (9.2 % of parcel land area) within the sewer service area.

The Waterfront District (WF) was created to preserve public access to the shoreline, and accounts for 12.9% of the land area within the sewer service area. The Parks and Conservation (PC) district is reserved for recreational areas, beach areas, open spaces, nature preserves and historic sites, and accounts for 20% of the land within the sewer service area.

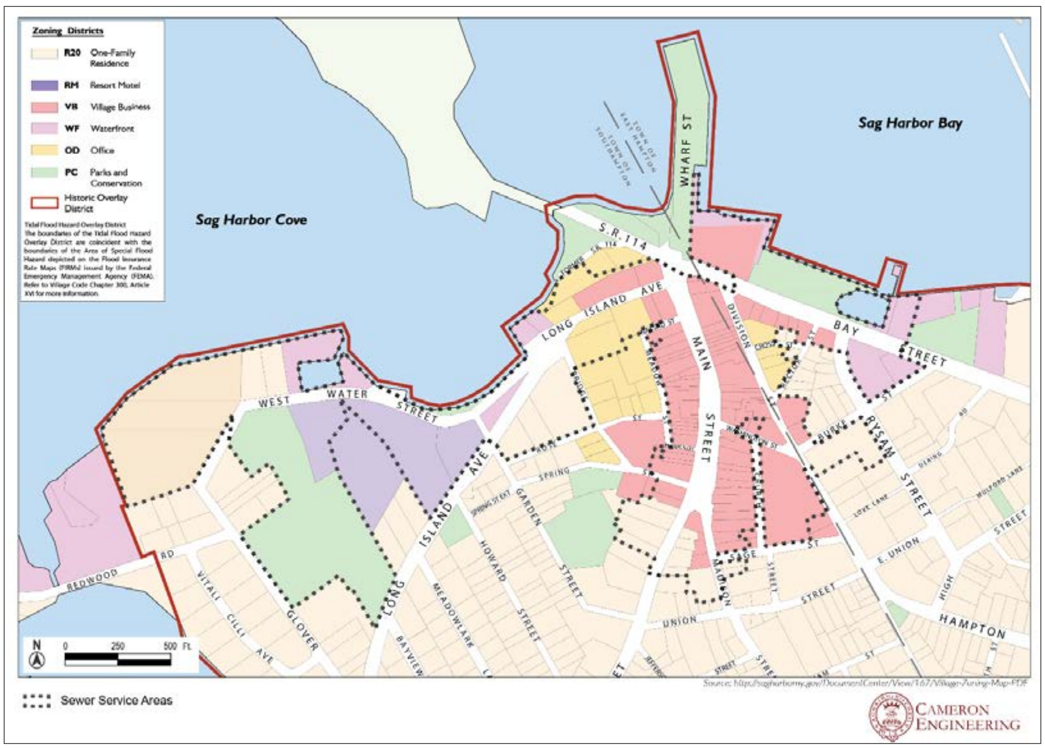
[4] The Suffolk County Land Use dataset considers these mixed-use buildings "Commercial Use", following the general rule of assigning the most intense use to a parcel where multiple uses are found.

[5] According to the Dataset, provided by the Suffolk County Department of Economic Development & Planning, Division of Planning & Environment: "Dedicated common areas in a residential condominium development are classified as Recreation and Open Space, because these areas mostly serve as passive or active recreation and open space and are not available for development"

Table 3-3. Zoning within the Sewer Service Area

Zoning District	Parcel Count	Percent	Acreage	Percent
Residence (R20)	81	27.5%	14.80	25.5%
Resort Motel (RM)	18	6.1%	5.42	9.3%
Village Business (VB)	155	52.5%	14.98	25.8%
Waterfront (WF)	12	4.1%	7.02	12.1%
Office District (OD)	26	8.8%	4.26	7.3%
Parks & Conservation (PC)	3	1.0%	11.64	20.0%
Total	**295**	*100%*	**58.13**	*100%*

Figure 3-2. Zoning within the Sewer Service Area



3.2.4. Future Flow allocation within Existing Sewer Service Area

As confirmed by the August 2020 field survey, there are minimal vacancies throughout the Village with a high level of activity in the downtown and waterfront area. This pattern of growth and activity indicated that there are few areas of potential future development. As stated above, the survey did not note any major changes in land uses identified in the 2014 study. As the Village Code contain provisions for minimum parking spaces for new buildings and expansion of existing buildings, significant buildout within existing sewer service areas is not anticipated. However it is prudent to allocate an amount of sewer capacity for the infill of existing service areas. An allocation of 25,000 gallons per day is appropriate for near term (1-5 years) planning purposes.

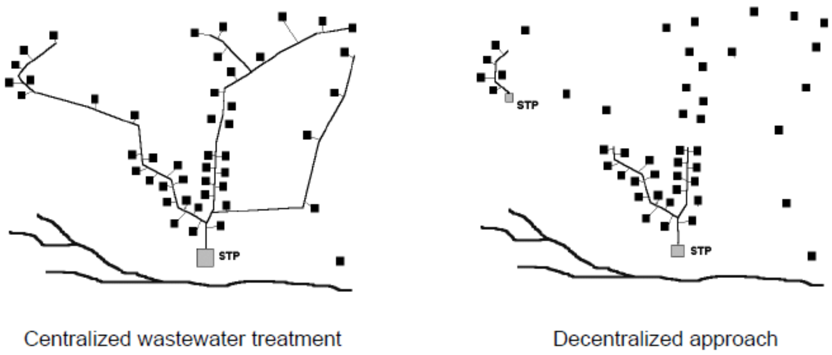
4. Potential Sewersheds

As the available capacity at the WWTP is limited to approximately 90,000 gpd, it is necessary to determine what areas of the Village have the greatest need for improved wastewater treatment. This initial excess capacity must take into account the potential buildout flow within existing sewered areas as noted in prior section. As stated above, an allocation of 25,000 gallons per day for the existing sewer service areas is appropriate for near term (1-5 years) planning purposes. Using this value, there would be approximately 65,000 gallons per day of remaining capacity at the Village's WWTP for connections that are outside of the current sewer service areas. As the Plan is a guidance document it should be revisited every few years to determine if the anticipated or projected conditions were realized and if not, what adjustments or revisions to the Plan need to be made to account for the conditions present at the time of the Plan's review.

The Plan is focused on maximizing environmental benefits and not to promote additional growth within the Village. The Plan identifies where wastewater may not be achieving the maximum reduction of pollutants with existing OWTS and identifies which of the Village's waterways it is the reciepient of this sewage discharge. To this goal, it was necessary to establish sewershed boundaries within the Village that were then evaluated for increased management of wastewater within the respective sewershed. This increased management of wastewater may include:

- Centralized: Connecting parcel(s) to the existing Sag Harbor WWTP sewer system
- Decentralized: Clustered wastewater treatment systems (2 or more systems)
- Innovative and Alternative (I/A) On-site Wastewater Treatment Systems

Figure 4-1. Centralized wastewater vs. decentralized wastewater treatment systems



Source (US EPA, 2003)

The US Environmental Protection Agency (US EPA) Office of Water has published numerous guidance manuals for onsite wastewater treatment systems (OWTS) and clustered (decentralized) wastewater treatment systems. For at least 20 years, the US

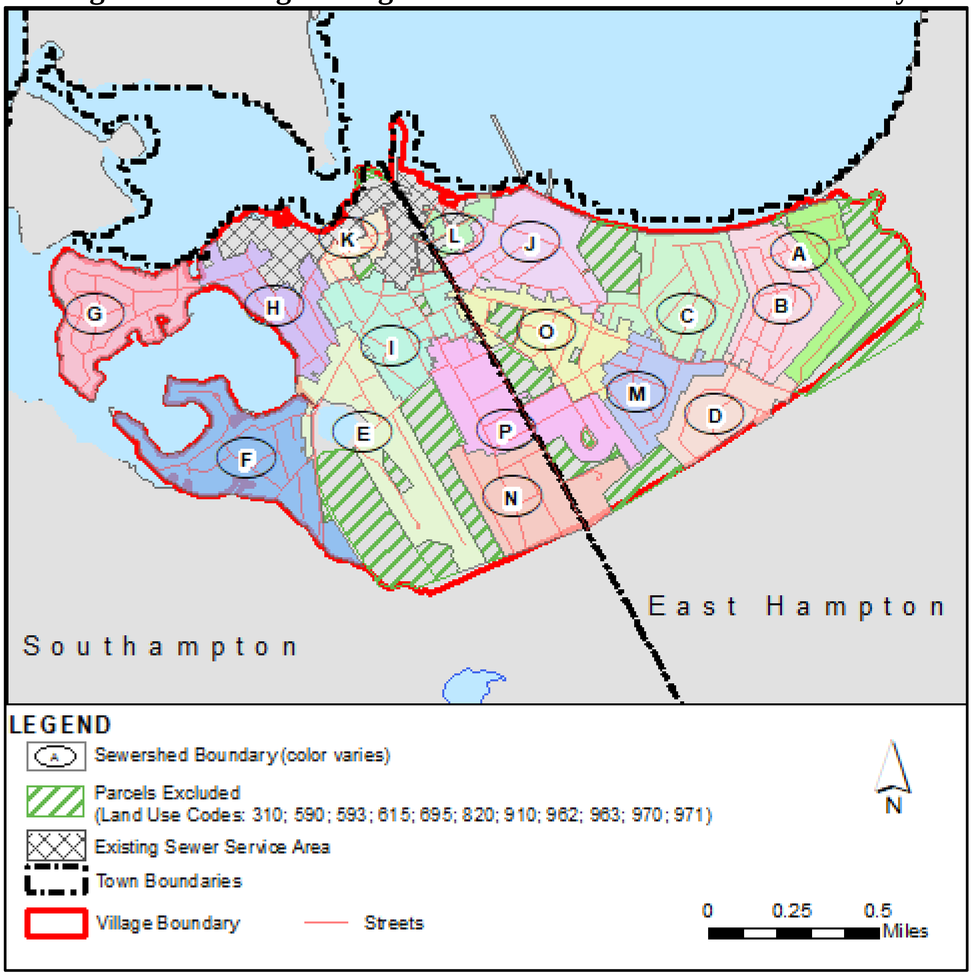
EPA has promoted the value of decentralized wastewater treatment systems, particularly for rural and suburban communities. Cluster or decentralized systems are defined as those that serve two or more dwellings or buildings, but less than an entire community (Figure 4-1).

As the typical engineering design for both the Centralized and Decentralized management approach requires combining either wastewater or wastewater systems from multiple properties, the potential sewershed boundaries encompass streets when possible to reflect the installation of sewer infrastructure. Also taken into consideration to identify the potential sewershed boundaries were the following factors:

- Physical boundaries/characteristics
- Groundwater flow direction to receiving waterbodies
- Depth to groundwater
- Topography (elevation)
- Travel time to receiving waters
- Soil characteristics

Using these criteria, Cameron Engineering has identified a total of sixteen (16) potential sewersheds within the Village's boundaries. Figure 4-2 displays the potential sewershed boundaries used in this analysis. The following sections describe the criteria used.

Figure 4-2. Village of Sag Harbor Potential Sewershed Boundary



Designating the specific boundaries of the potential sewersheds also takes into consideration property lines, streets, and in certain circumstances, soil type and elevation were elements used to decipher boundaries of the sewersheds. These characteristics grouped parcels together to help determine which areas of the Village would have the largest beneficial impact on the Village's receiving waters should an alternative to the current on-site wastewater systems be implemented.

4.1. Physical Characteristics

Physical characteristics such as property lines and streets, guided the sewershed boundaries as they play an important role in both centralized and decentralized sewering. Streets provide locations for utilities as they are typically not privately owned and guarantee access for construction and maintenance vehicles and personnel.

Public Open Space (Parks, Cemeteries, Playing Fields, Utilities, Otter Pond) as well as Public Schools were removed from subwatersheds. Public Open Space has virtually zero wastewater contribution and therefore their inclusion would skew the wastewater nitrogen per acre scoring. The Public Schools are assessed separately (Section 6.5.1).

4.2. Groundwater Flow and Water Bodies

Although located on the southern portion of Long Island, the groundwater flow trends are similar to those on the north shore of Long Island. This is due to the Village's location on the north shore of the of the South Fork. Since there are high topographic elevations in the middle of the Fork, groundwater flow is split in a north-south divide along this ridge. The Sag Harbor area groundwater flows north to Sag Harbor Cove and Sag Harbor Bay, which are part of the Peconic Estuary (Figure 4-3). Travel time is under two years for the majority of the Village. Areas in the central part of the Village that have a slight increase in elevation, have an increased travel time, with a very small portion in the 25-50 year travel time range. Consequently, upgrading existing OWTS within the Village should show a more rapid improvement on water quality as compared to interior Long Island where groundwater travel times could typically be greater than 50 years. There would be a positive effect (less nitrogen) on the quality of the groundwater discharging to surrounding waters including; the Inner Cove (Upper Sag Harbor Cove & Morris Cove), Sag Harbor Cove, Sag Harbor Bay and also the water quality in the receiving waters of the Peconic Estuary.

The Village of Sag Harbor has a long shoreline along Sag Harbor Cove and Sag Harbor Bay as well as numerous water bodies within the Village (Figure 4-4). Although portions of the waterfront are bulkheaded, sections of natural shoreline and tidal wetlands remain. Sag Harbor Cove and Upper Sag Harbor Cove are semi-enclosed bays surrounded by residential land uses, many of which are in low-lying areas. Since they are semi-enclosed, the tidal flushing rate is fraction of that of Sag Harbor Bay (Bay). Therefore, groundwater flowing to the waterbodies with the lower flushing rates are greater impacted by OWTS discharge as compared to the Bay. Within the Village, groundwater flow is generally divided along the Town of East Hampton and Town of Southampton boundary, also coinciding with Division Street. Generally, parcels located in East Hampton flow to Sag Harbor Bay, while parcels located in Southampton flow towards Sag Harbor Cove.

Figure 4-3. Sag Harbor-Groundwater Contributing Areas

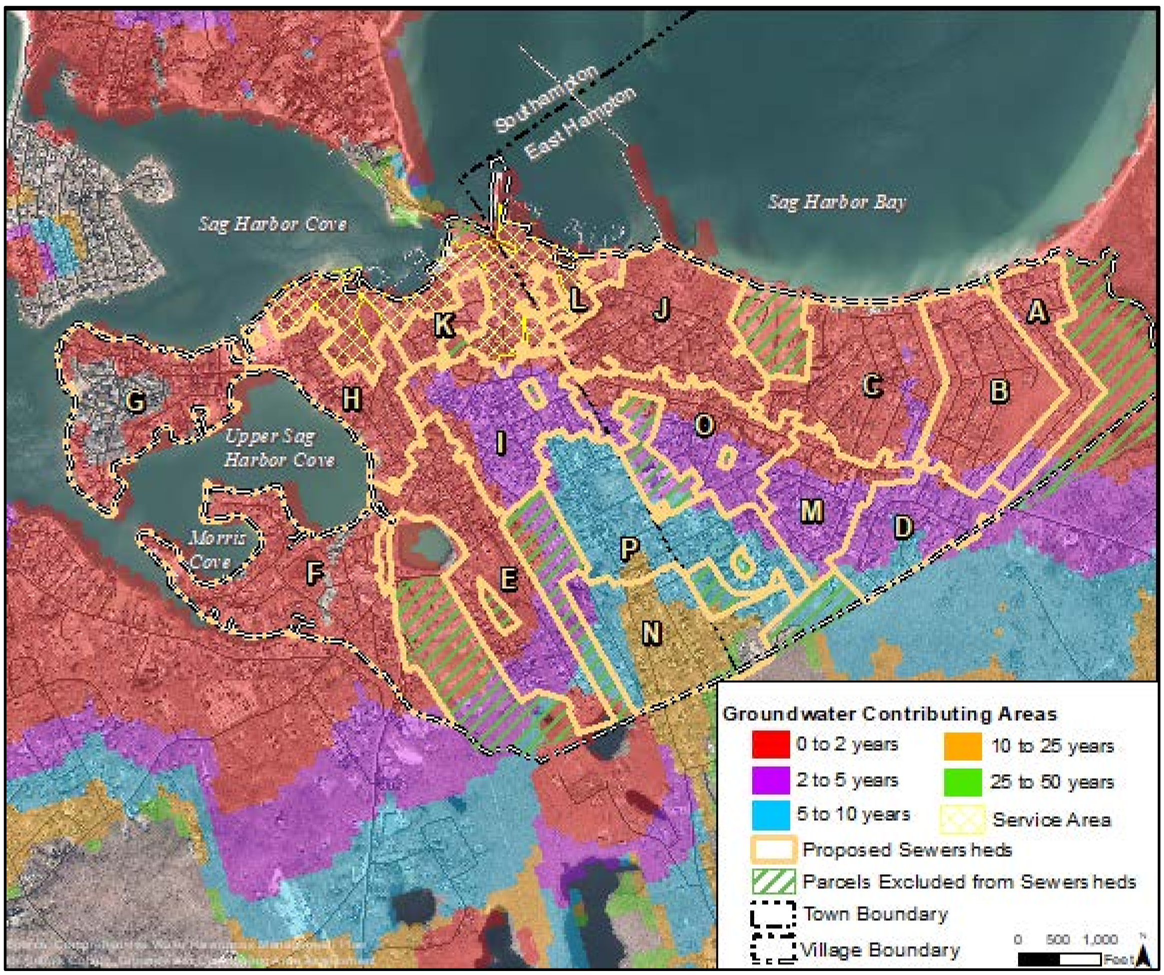
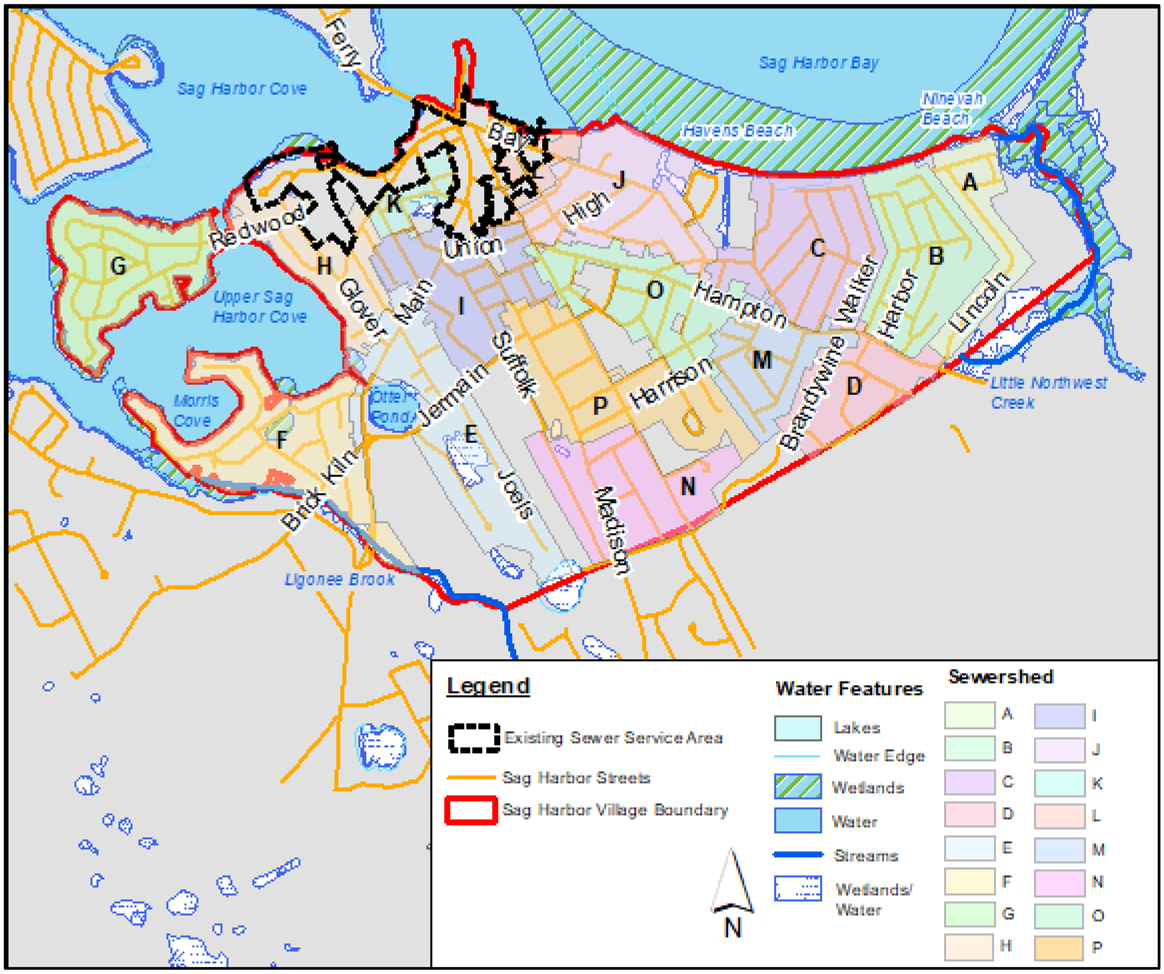


Figure 4-4. Sag Harbor -Area Water Bodies



4.3. Topography and Depth to Groundwater

Much of the Village of Sag Harbor (Figure 4-5) is at low elevations (0-60 feet). Elevations below 10 feet are typically problematic for onsite wastewater treatment systems (OWTS). The County requires a minimum of two feet of separation between the bottom of the OWTS (typically the leaching pool) and groundwater. Typical installation of OWTS places them at an elevation at least 8-10 feet below grade. Many of the OWTS are located in areas of 0-10-foot elevation may therefore not meet County requirements. The County requires this separation between groundwater and OWTS to facilitate a degree of mechanical and biological treatment of the effluent by the soil and the bacteria that reside there. Insufficient separation means no additional treatment and direct connection to groundwater by the OWTS discharge.

Groundwater can be relatively high near the coast particularly in areas with elevations of under 10 feet. The U.S. Geologic Survey (USGS) has created an interactive map indicating the depth to groundwater below surface for Long Island[6]. A snapshot of this map is shown in Figure 4-6. This map appears consistent when comparing to the topography elevations (less than 10 ft) in Figure 4-7. Those OWTS that do not meet these County requirements may be contributing higher nitrogen loads to groundwater than systems located at higher elevations. With lack of a soil barrier between the OWTS discharge and the groundwater, the nitrogen may be in the form of ammonia, this would impart a greater oxygen demand on the receiving waters than a nitrified discharge. Additionally, there is the potential to introduce coliform bacteria into the groundwater if there is minimal or no separation from the bottom of leaching pool or cesspool to the groundwater interface. Overflows of failed OWTS can lead to coliforms being introduced into stormwater systems as well during rain events.

[6] USGS Long Island Depth to Water Viewer https://ny.water.usgs.gov/maps/li-dtw/

Figure 4-5. Sag Harbor - Area Elevations

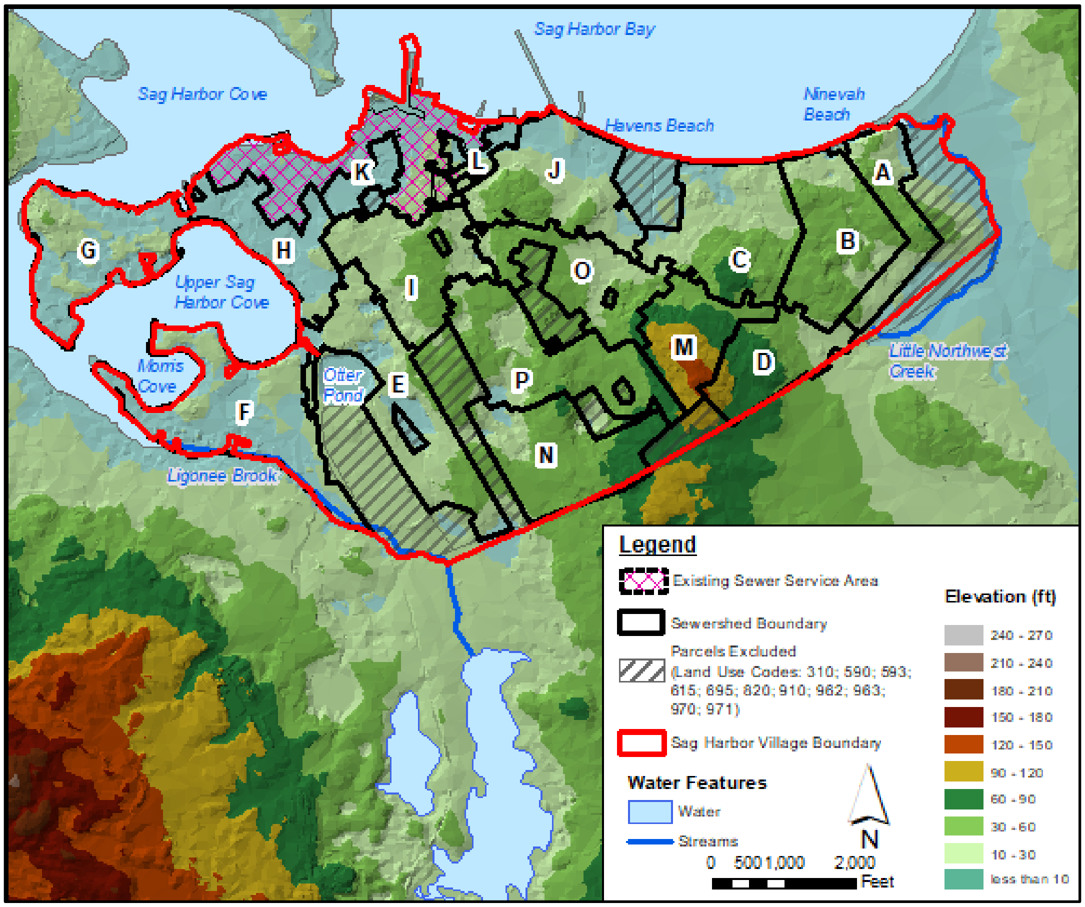
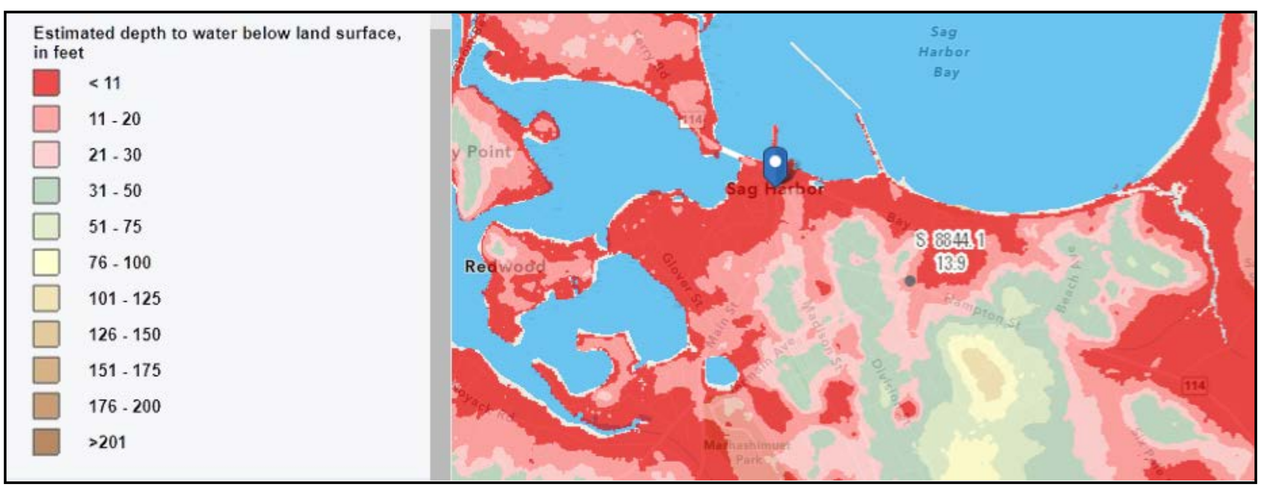


Figure 4-6. Sag Harbor - Area Depth to Groundwater (Source: USGS https://ny.water.usgs.gov/maps/li-dtw/)

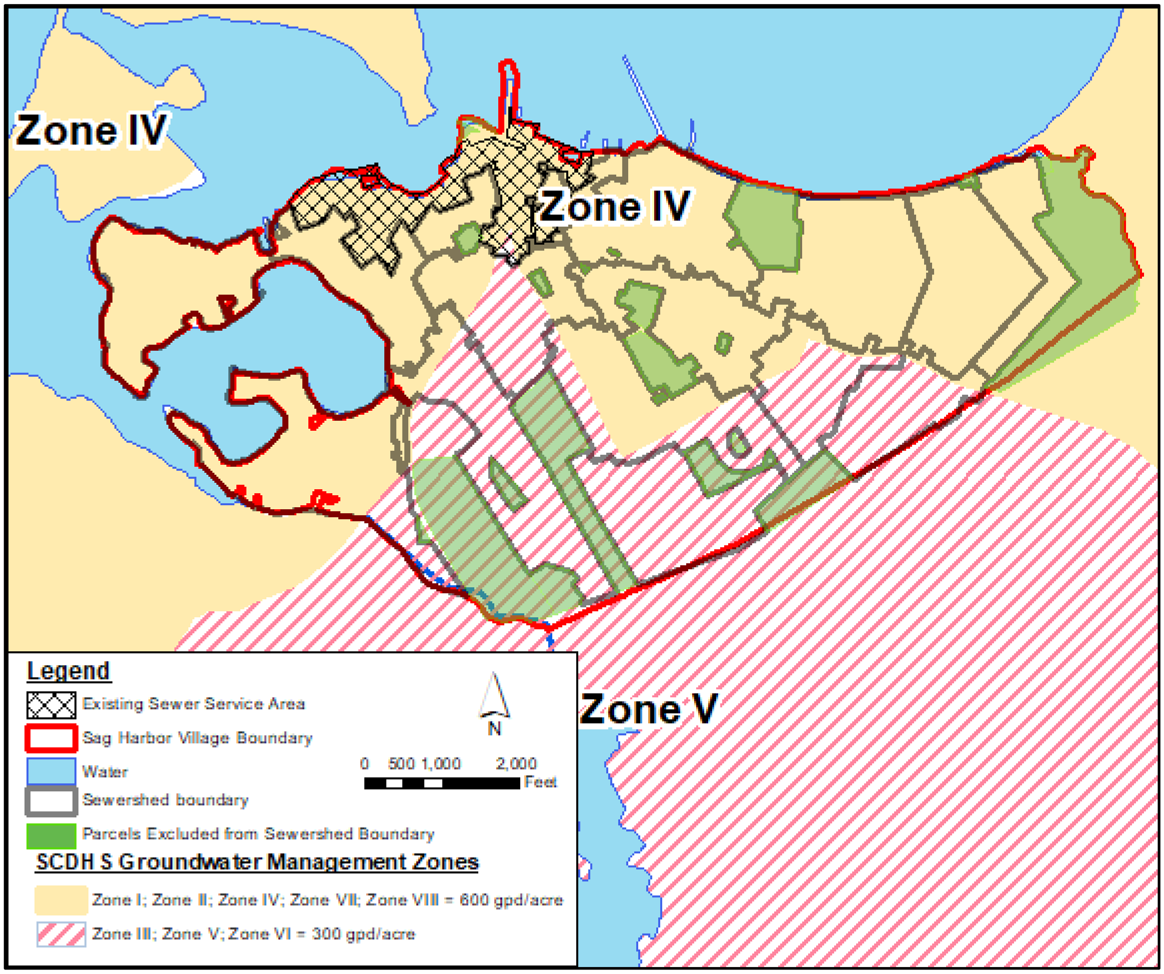


Failing onsite systems can contribute excess nitrogen and pathogens to surface waters and can be a human health concern. As failing or failed systems may have the most deleterious impact on water quality and even human health, they should be prioritized for getting upgraded treatment or replacement as compared to their upgradient neighbors.

According to the US EPA, “onsite wastewater systems (septic tanks, cesspools) that are poorly installed, improperly located, or are in close proximity to waterbodies are potential sources of human pathogens to surface water and groundwater (US EPA, 2001). Researchers demonstrated higher levels of indicator bacteria in coastal waters with increasing urban density, during dry and wet conditions (Duda & Cromartie, 1982). The authors found that OWTS densities exceeding one system per seven acres resulted in bacterial levels sufficient to cause shellfish closures. Suffolk County OWTS densities are not as conservative as this study. Within the Village of Sag Harbor, SCDHS has two designated Groundwater Management Zones. Zone IV has an allowable density of 600 gpd/acre, which is equivalent to 2 Single Family Residences per acre. Zone V has an allowable density of 300 gpd/acre, which is equivalent to 1 Single Family Residence per acre.

These rates apply to properties that are not connected to the existing sewer service areas. Pathogens from OWTS can reach surface waters via stormwater runoff from failing or failed OWTS or via groundwater from the leaching pool effluent that is introduced into the groundwater due to insufficient separation from bottom of leaching pool soil. OWTS located in areas with high groundwater elevation could be a source of coliform introduction into the Village’s local waterways

Figure 4-7. Sag Harbor Area – Groundwater Management Zones



An estimation of the quantity of pathogens contributed by OWTS to surface water via groundwater movement depends upon on a number of factors including soil type, depth to the water table, temperature, season, and the survival rate of pathogens. Effluent from OWTS must first travel through the soil medium before reaching the water table. In 1988, researchers studied the effect of loading rate and water table depth on the absorption of OWTS contaminants (Cogger, Hajjar, Moe, & Sobsey, 1988). They found that depth to water table was the primary factor in removal of contaminants while the loading rate was a secondary factor. A 1974 paper (Bouwer, Lance, & Riggs, 1974) suggested that majority of fecal coliforms were removed in the two feet of soil between the bottom soil elevation of the OWTS and the water table.

4.4. Soils

The soil types within the Village of Sag Harbor that are indicators of a high-water table include:

- Type Bd: Berryland
- Type Mu: Muck
- Type Tm: Tidal Marsh

These types are classified as ‘Very Poorly Drained’. These areas are also indicative of precluding the option to replace existing or failed OWTS with I/A systems. These soil characteristics are not favorable for additional reduction of both nitrogen and coliform bacteria.

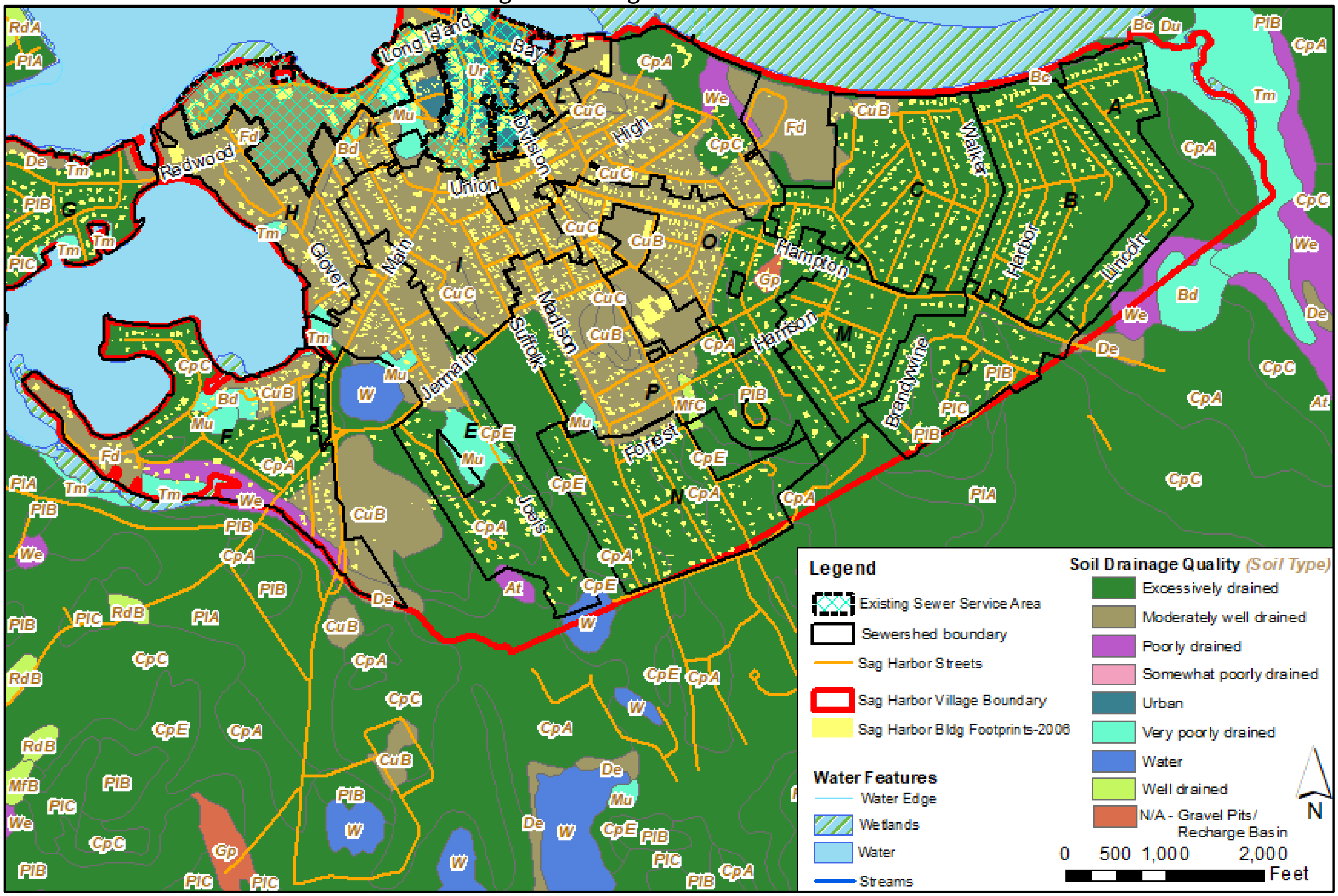
In the 2006 study (Karathanasis, Mueller, Boone, & Thompson, 2006) quantified the removal efficiencies for various soil types in their study area. They found that, through two feet of soil beneath the bottom elevation of the OWTS, pathogen removal efficiencies varied from approximately 64 percent to almost complete removal, depending upon the soil type. They determined, however, that fecal coliform removal was generally poor in all soil groups in their study, through coarse-textured soils (e.g., those with high sand content, like those present here on Long Island) performed worse than fine-textured (i.e., clayey) soils. In addition, they concluded that increasing soil depth might be ineffective for treatment of OWTS effluents, particularly in coarse-textured soils. High groundwater elevations and permeable sandy substrates are both located in the Village of Sag Harbor.

The soil types within the Village of Sag Harbor that are indicators of excessively drained soils include:

- Type Bc: Beaches
- Type CpA: Carver
- Type PlB: Plymouth

Well draining soils are often favored for placement of leaching pools due to rapid drainage characteristics yet these types of soils provide minimal treatment of the effluent from the OWTS.

Figure 4-8. Sag Harbor Area – Soils



5. Sewershed Prioritization

5.1. Matrix Category Scoring

A matrix was developed to prioritize the potential sewersheds for future wastewater treatment upgrades. It is important to note that the scoring of the potential sewersheds reflects primarily the environmental impact of a particular sewershed on the overall quality of the Village's coastal waters. Below is a list of the categories of each characteristic used for scoring and the scales used to attach a value. Each category or factor will be given a value of 1, 2, or 3 and is weighted for its potential impact on the Village's water bodies. A low score would relate to a lesser impact than a higher score that would have a greater adverse impact.

- ❖ OWTS Effluent (Groundwater) Direction→weighted 25%
  Prioritizes the waterbodies with the least amount of flushing
  - Inner Harbor →3
  - Inner and Outer Harbor →2
  - Outer Harbor →1
- ❖ Density of Nitrogen from Wastewater (lbs/day/acre)→weighted 40%
  Prioritizes subwatersheds with more dense development
  - Greater than 0.6 lbs/day/acre →3
  - Between 0.3 and 0.6 lbs/day/acre →2
  - Below 0.3 lbs/day/acre →1
- ❖ Depth to Groundwater (G/W): Arithmetic Average of High and Low (ft)→weighted 15%
  Prioritizes high groundwater subwatersheds
  - Less than 10 ft →3
  - Between 10 and 30 ft →2
  - Greater than 30 ft →1

- Percent of Non-Vacant Parcels in 0-2 years G/W Contributing Area→weighted 10%

  Prioritizes the potential subwatersheds with the higher percentage of parcels in this area

  - Greater than 67% →3
  - Between 33% and 67% →2
  - Less than 33% →1

- Number of Buildings (2006) in or within 10ft of Very Poorly Drained Soils→weighted 10%

  Very Poorly Drained Soils include types such as Muck, Berryland and Tidal Marsh. Based on age of OWTS, if installed prior to 1980, alternative soil may not have been installed around OWTS, as is required in current installations. Prioritizing those potential sewersheds with buildings on or within 10 ft of these soil types.

  - Greater than 9 buildings →3
  - 1 through 9 buildings →2
  - Zero buildings →1

5.2. Matrix Results

The following Figures are the results of the matrix based on the catergories described in the prior section. Sewersheds with the higher score, indicate a higher priortiy for upgrading or replacing the OWTS within the respective sewershed boundary. Individual Scoresheets for the potential sewersheds are located in Appendix A.

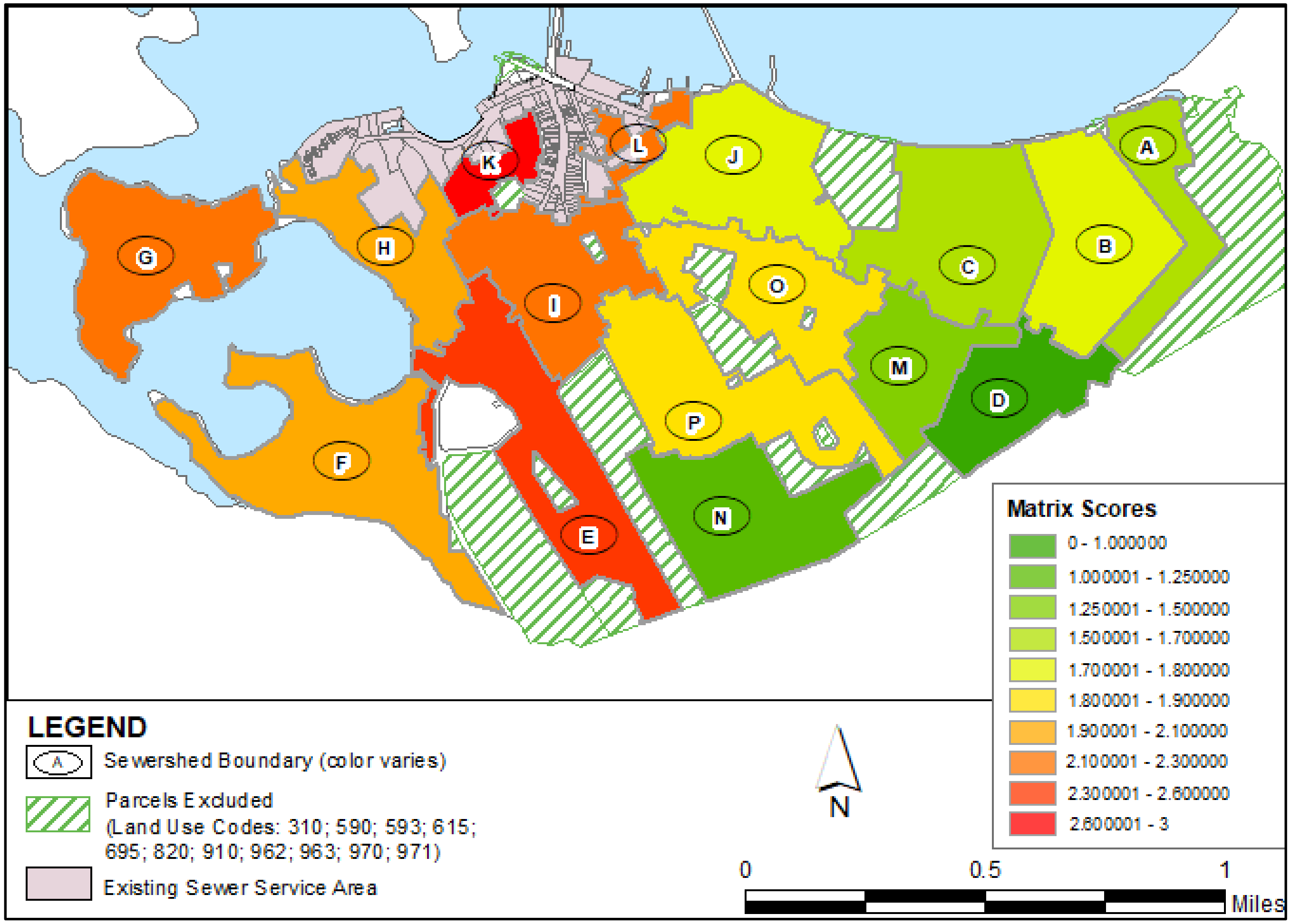
Figure 5-1. Sag Harbor Sewershed Matrix (sorted by Alphabetically)

	Sewershed Characteristics	OWTS Effluent (G/W) Direction		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcel Area in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	25%	*(unweighted)*	40%	*(unweighted)*	15%	*(unweighted)*	10%	*(unweighted)*	10%	100%
Sewershed Area	A	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	2	**0.2**	**1.7**
	B	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	C	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	1	**0.1**	**1.6**
	D	*1*	**0.25**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1**
	E	*3*	**0.75**	*2*	**0.8**	2	**0.3**	3	**0.3**	2	**0.2**	**2.35**
	F	*3*	**0.75**	*1*	**0.4**	2	**0.3**	3	**0.3**	3	**0.3**	**2.05**
	G	*3*	**0.75**	*2*	**0.8**	2	**0.3**	2	**0.2**	2	**0.2**	**2.25**
	H	*3*	**0.75**	*1*	**0.4**	3	**0.45**	3	**0.3**	2	**0.2**	**2.1**
	I	*2*	**0.5**	*3*	**1.2**	2	**0.3**	2	**0.2**	1	**0.1**	**2.3**
	J	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	K	*3*	**0.75**	*3*	**1.2**	3	**0.45**	3	**0.3**	3	**0.3**	**3**
	L	*1*	**0.25**	*3*	**1.2**	3	**0.45**	3	**0.3**	1	**0.1**	**2.3**
	M	*1*	**0.25**	*2*	**0.8**	1	**0.15**	1	**0.1**	1	**0.1**	**1.4**
	N	*2*	**0.5**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1.25**
	O	*1*	**0.25**	*3*	**1.2**	1	**0.15**	2	**0.2**	1	**0.1**	**1.9**
	P	*2*	**0.5**	*2*	**0.8**	2	**0.3**	1	**0.1**	2	**0.2**	**1.9**
Scales	3	Inner		0.6	- +	0	- 10	67%	- +	9	- +	
	2	Inner & Outer		0.3	- 0.6	10	- 30	33%	- 67%	0	- 9	
	1	Outer		0	- 0.3	30	- +	0%	- 33%		- 0	

Figure 5-2. Sag Harbor Sewershed Matrix (sorted by sewershed scores)

	Sewershed Characteristics	OWTS Effluent (G/W) Direction		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcel Area in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	**25%**	*(unweighted)*	**40%**	*(unweighted)*	**15%**	*(unweighted)*	**10%**	*(unweighted)*	**10%**	**100%**
Sewershed Area	K	*3*	**0.75**	*3*	**1.2**	3	**0.45**	3	**0.3**	3	**0.3**	**3**
	E	*3*	**0.75**	*2*	**0.8**	2	**0.3**	3	**0.3**	2	**0.2**	**2.35**
	L	*1*	**0.25**	*3*	**1.2**	3	**0.45**	3	**0.3**	1	**0.1**	**2.3**
	I	*2*	**0.5**	*3*	**1.2**	2	**0.3**	2	**0.2**	1	**0.1**	**2.3**
	G	*3*	**0.75**	*2*	**0.8**	2	**0.3**	2	**0.2**	2	**0.2**	**2.25**
	H	*3*	**0.75**	*1*	**0.4**	3	**0.45**	3	**0.3**	2	**0.2**	**2.1**
	F	*3*	**0.75**	*1*	**0.4**	2	**0.3**	3	**0.3**	3	**0.3**	**2.05**
	O	*1*	**0.25**	*3*	**1.2**	1	**0.15**	2	**0.2**	1	**0.1**	**1.9**
	P	*2*	**0.5**	*2*	**0.8**	2	**0.3**	1	**0.1**	2	**0.2**	**1.9**
	B	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	J	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	A	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	2	**0.2**	**1.7**
	C	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	1	**0.1**	**1.6**
	M	*1*	**0.25**	*2*	**0.8**	1	**0.15**	1	**0.1**	1	**0.1**	**1.4**
	N	*2*	**0.5**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1.25**
	D	*1*	**0.25**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1**
Scales	**3**	Inner		**0.6**	- +	**0**	- 10	**67%**	- +	**9**	- +	
	2	Inner & Outer		**0.3**	- 0.6	**10**	- 30	**33%**	- 67%	**0**	- 9	
	1	Outer		**0**	- 0.3	**30**	- +	**0%**	- 33%		- 0	

Figure 5-3. Sag Harbor Sewershed Map with Matrix Scores



5.3. Critical Subsewersheds

With there being an estimated maximum of 90,000 gallons of available capacity at the Village's WWTP, the goal is to use that capacity in the most cost-efficient manner while addressing the critical sewersheds.

Identifying these critical sewersheds allows the Village to see tangible results in water quality improvement within a short period of time (< 2 years) after installation of the new infrastructure allowing connection to the existing WWTP or a new communal treatment system.

Table 5-1. Estimated Wastewater Flow from Unsewered Areas in the Village (by Subsewershed)

Sewershed ID	Score Total	Estimated Wastewater Generation (gpd)
K	3	12,346
E	2.35	42,023
L	2.3	9,812
I	2.3	68,218
G	2.25	38,100
H	2.1	26,856
F	2.05	38,538
O	1.9	48,865
P	1.9	51,075
B	1.75	34,800
J	1.75	41,940
A	1.7	20,400
C	1.6	45,288
M	1.4	23,100
N	1.25	28,500
D	1	18,900
Total (gpd):		548,761

Sewersheds K and L are both located in proximity to the existing sewer service areas and share common factors of smaller parcel size (increased building/wastewater density), high groundwater and short travel time (<2 years) to the surface waters. Sewershed I ranks higher in Density of Nitrogen (related to parcel sizes), which is weighted more heavily than the other categories. This factor is taken into account when determining sewersheds to be connected to either a central or decentralized collection system. For example, if a sewershed ranked higher in other categories but had larger parcel sizes, new infrastructure such as collection systems may not be favored due to the capital cost required to collect a smaller amount of wastewater. This is further discussed in cost considerations. Sewershed E is located on the southwest portion of the Village (contiguous with Otter Pond). It is prioritized based on OWTS Effluent Direction (flowing towards the Inner Harbor) and a high percentage of parcels located in the 0-2 yr. range of groundwater contribution meeting the shore. Unlike sewersheds K, L and I, sewershed E is not located adjacent to an existing sewer service area and will be further evaluated in the decentralized analysis.

6. Village-Wide Wastewater Collection and Treatment Strategies

The vast majority (87%) of parcels within the Village are unsewered and rely on on-site wastewater treatment systems (OWTS) such as cesspools and septic tanks. Overview of total parcels and loading from unsewered parcels is provided in Table 6-1.

Table 6-1. Estimated Wastewater Flow from Unsewered Areas in the Village

Estimated Wastewater Generation Rate from Unsewered Residential Parcels (gpd)	526,500
Estimated Wastewater Generation Rate from Unsewered Non-Residential Parcels (public schools excluded) (gpd)	22,261
Estimated Wastewater Generation Rate from Unsewered Public Schools (gpd)	8,712
Total (gpd):	**557,473**

6.1. Collection- Gravity Sewers

Gravity sewers are the most widely used method of collecting and transporting wastewater to treatment facilities. Gravity sewers are also the most common method of sewage collection throughout Suffolk County (please note that only 25% of Suffolk County is sewered) and is the form of sewage collection in its existing Sewer Service Areas. Village employees are familiar with the installation, operation, and maintenance associated with gravity systems and their appurtenances. A gravity collection system may be the more viable alternative in a developing or expanding a business/commercial district because it offers greater design flexibility as wastewater flow increases with future development. Design of gravity sewers is governed by Ten States' Standards as well as by good engineering practice.

6.1.1. Components and Installation

The design of a gravity collection system typically involves the following components: manholes, sewer mains, house connections and pump stations.

A minimum slope is required to convey the wastewater at a minimum flushing velocity of two feet per second to minimize solids deposition. Pump stations may be required if the change in topography is less than the minimum slope. In the application of extending sewers in the Village, the sewer main extensions into adjacent sewersheds would maintain the flushing velocity and connect to existing mains or manholes. Gravity mains in more remote sewersheds may possibly require a pump station and force main to transfer the wastewater from the sewershed to the nearest point in the existing gravity collection system.

If house waste line connections to existing septic tanks are in the rear yard (typically older homes), property owners would have to redirect internal plumbing and create a new house connection through the front yard. This is a typical construction practice in Suffolk County and does not usually require the property owner to install new mechanical equipment or to incur costs for electrical work, as would be necessary for certain alternative sewer systems such as Low Pressure Systems (LPS) discussed in next section. Property owners with certain types of basement plumbing (i.e., bathrooms, showers, utility sinks) may not be able to connect to the gravity collection system without a sewage ejector pump (depending upon the final elevations of the gravity system). More recently developed parcels within the Village would be expected to have septic systems in the front yard and would only require an extension of the house connection to the new gravity system in the street.

Once connected to the sewer main, the existing on-site septic system would require abandonment. If abandoned and cleaned properly, the existing sanitary leaching pools may be able to be re-used as on-site stormwater storage once/if Town (Southampton or East Hampton) have been granted. The SCDHS has stated through personal communications that the County's approval would not be required for re-purposing of the properly abandoned sanitary leaching pools.

The property owner typically incurs the cost for house connections, abandonment and any internal plumbing modifications necessary to connect to the sewer system located in the right of way. Municipalities sometimes offer financing or other incentives to qualified property owners to connect to the sewer service areas. Grants may become available in the future to cover homeowner costs. This has recently (2021) occurred in areas of Suffolk County (Mastic and North Babylon) where homeowner costs for connection were covered. In this Master Plan, the costs for septic system removal, abandonment and the installation of a new house connection was not included in the project's total estimated capital cost. The Village can decide at a later date to add these costs to the overall sewering cost as it may decide to amortized such costs through a bond or through a grant should one be obtained from local, State or Federal agencies.

6.1.2. Operation and Maintenance

The majority of the components of the gravity system are passive. Sewer mains convey the wastewater and manholes are installed for changes in direction or connections with other sewer mains, typically in road intersections. House connections are typically gravity unless the elevation of basement plumbing is lower than the elevation of the sewer main in the street. As discussed above, a sewage ejector pump may need to be installed by the property owner whose waste line is below the elevation of the gravity main. In this case, the owner would be responsible for the maintenance and electrical power required for the pump. The owner would also need to make provisions for electrical power interruption (*e.g.,* battery back-up or emergency generator).

Pump stations are typically installed at low points in the collection system and designed to keep sewer mains at an elevation that allows for ease of maintenance. Pump stations require electrical power, emergency generator and typically a small structure to house control panels.

Sewer mains and manholes require routine inspections and cleaning. Once installed, the operators will assess the mains and determine how often cleaning is required. Pump stations require daily inspections from a qualified operator. The Village may choose to install a SCADA system, which transmits pump status to a central location or to designated personnel via internet, cell phone or dedicated handheld device. This offers flexibility to allow the operator to monitor the station operation, prioritize pump station inspections and to respond to emergency or other alarm causing events in a timely manner.

Presently, the Village only has one pump station and that is located on the grounds of the WWTP. Should gravity sewers be considered for more remote areas of the Village then it is most probable that a pumping station(s) would be required to transfer the wastewater to the WWTP or alternate site (i.e. decentralized treatment system) for treatment and disposal.

Advantage to gravity sewers is there are no moving parts and familiarity of Village staff with the gravity collection system. Disadvantages would be the high capital cost if construction occurs in areas of high groundwater and the increased possibility of both groundwater infiltration and inflow from illegally connected storm drainage systems contributing unwanted excess flow.

6.2. Collection - Low Pressure Sewer Systems

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 here on Long Island, LPS collection systems are used in the Village of Patchogue Sewer District and have been designed for use in Oakdale, Sayville, Mastic and portions of West Babylon. The common factor at these locations being high groundwater. The relatively flat topography and high groundwater conditions present in these south shore communities has made the LPS technology a good choice for sewage collection. Individual homes or lots requiring a connection to a nearby gravity sewer could employ a LPS to lift the sewage to a connection point where it would flow by gravity to the treatment location. LPS would have applicability for use in the Village of Sag Harbor, especially in the Sewershed K area where groundwater levels are very high.

6.2.1. Components and 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 collected sewage into the force main. A brief description of each follows:

(1) Piping – typically High-Density Polyethylene (HDPE) or Polyvinyl Chloride (PVC) ranging from 1” to 4” inches in diameter.

(2) Isolation Valves – for section maintenance and repair without shutting the entire collection system down.

(3) Cleanouts - every 500-600 feet, at changes in pipe size, direction and junctions to allow for high pressure cleaning and clearing of blockages.

(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 station is located on 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.

6.2.2. Operation 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 some storage of flow and minimization of pumping cycles. Due 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 rags.

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 (2-3ft/sec) is required at least several times per day to flush the pipeline and prevent deposits of material including grease that would cause problems. Hydrogen sulfide and odors can be released in locations (ie. manholes) where an LPS system discharges into a larger gravity sewer.

Operations and maintenance are best left to qualified and trained operators or contract service providers. 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. In the event of a prolonged power outage, an LPS system is out of service and may need to be pumped or a portable generator supplied to power the system. This is a major disadvantage of the LPS system.

In some locations, the O&M of the LPS pumping unit is the responsibility of the homeowner and in other locations, the local utility retains responsibility for the pumping unit. The Village would need to make a determination on the LPS pumping unit maintenance. Should the Village decide to take on the O&M of the LPS pumping units, the units should be located outside of the building foundation to allow for access by Village personnel without the need to enter the homeowners' premises. Preliminarily, the Village is intending on the homeowner retaining responsibility for the individual LPS pump station located on the homeowner's parcel.

One major advantage to LPS collection system installation is that it is lower in capital cost and can work in areas of varying topography while moving wastewater long distances in small diameter and shallow depth force mains. The major disadvantage is there are individual pumping units for each parcel and loss of power (ie. storm events) results in loss of sewage disposal services. Under municipally-owned LPS pumping units, there is a significant increase in overall level of maintenance hours performed by municipal staff relating to emergency calls such as stoppages and equipment failure as well scheduled maintenance activities. For the Village of Sag Harbor, as previously noted, the homeowners would retain reponsibilty for the LPS operation and maintenance (following manufacturer's guidelines for proper and efficient operations).

6.3. Collection- Small Diameter Gravity Sewers

Small diameter gravity sewers include the conversion of septic tanks to interceptor tanks and providing small diameter collection mains from the converted interceptor tanks to a treatment plant or pump station. The interceptor tanks offers pretreatment of the raw wastewater by removing settleable solids from the waste stream. A check valve and effluent filter are equipped on the existing septic tank to ensure no solids are discharged and to prevent backflow of wastewater. This provides for the design of collector mains to exclude the transport of solids, thereby reducing the diameter and required slope of the collection mains. In theory, this allows the sewer to follow the existing topography (i.e., high and low points) as no minimum velocity is necessary to maintain solids from settling, which also reduces the slope of the sewer and maximum burial depth. Following the existing topography also reduces the number of manholes and alignment changes, which can results in substantial cost savings. In addition, there is no construction upstream of the septic tanks. The overall construction/capital cost would be limited to providing small diameter sewers to convey wastewater to a pump station or treatment at the WWTP or I/A system. Since there are no mechanical or electrical components to a small diameter gravity sewer, operations and maintenance costs are relatively insignificant.

The disadvantages of a small diameter gravity sewer include its limited use in the United States (i.e., it is believed that there are no small diameter gravity sewer systems in use on Long Island). In addition, pump-out of septic tanks would be a required maintenance item the Village would monitor and hauling of sludge to a permitted facility (i.e., Riverhead or Bergen Point). Commercial properties, such as laundromats and restaurants, would be required to maintain pretreatment (lint screens and grease traps) as small diameter gravity sewers could easily clog. Small diameter gravity sewers will also require more frequent cleaning than traditional sewers. Due to the time in the septic tank, odors and corrosive gases could present a challenge in the mains- typically at the discharge point (either manhole or pump station). Design of odor control biofilters or increasing the oxygen content into the transported wastewater would resolve these challenges.

Based on the above, small diameter gravity sewers could be an option for conveying residential sewage from sewersheds not in the downtown area to either the existing collection system for treatment at the WWTP or a decentralized (neighborhood) I/A system. Transferring the pretreated wastewater to a decentralized I/A system such as a constructed wetland, would achieve an effluent total nitrogen concentration of 19 mg/l or less as discussed in the next section.

6.4. Innovative & Alternative Systems

In the last few years, the use of Innovative & Alternative (I/A) treatment systems have become available and have demonstrated ability to reduce total Nitrogen concentration to 19 mg/l or less. These I/A treatment systems are small scale wastewater treatment plants. To date (January 2022), there are over 1,500 installed I/A systems in Suffolk County. Per recent changes to the Village Sewer Code, an I/A must be used in several conditions including as per the Village’s recent update of the Sewer Code.
Situations requiring the use of an I/A treatment system include the following:

- All new residential construction
- Any significant upgrade of existing OWTS is required
- 25% increase of floor area of a building
- Any new OWTS upgrade required by Harbor Committee pursuant to Village Code 285

- All non-residential properties that require site plan review pursuant to Village Code 300-14.3.

To date the I/A installations within the Village are as follows:

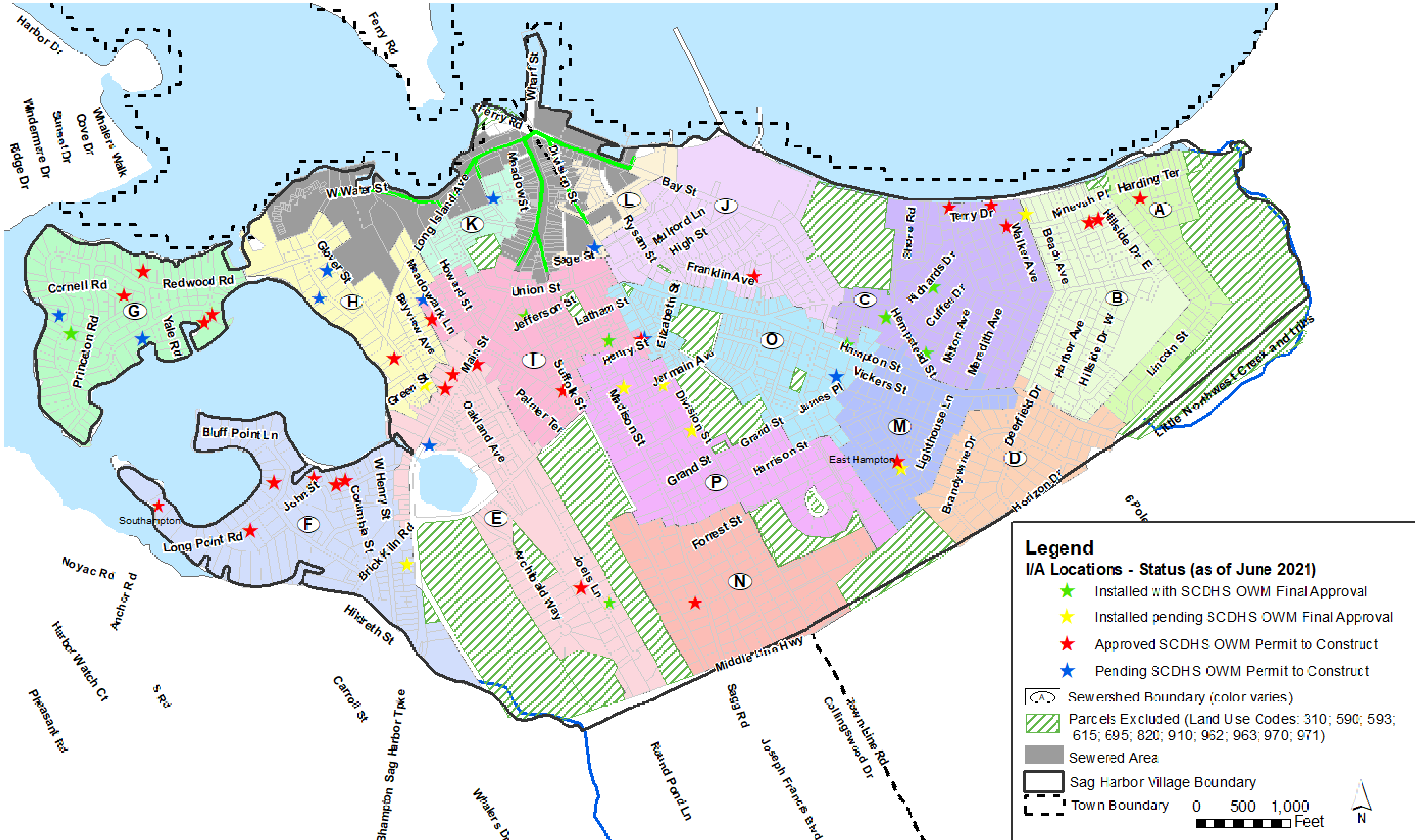
- 15 I/A treatment systems installed since 2018
- 28 I/A treatment systems approved by SCDHS Office of Wastewater Management (OWM) with a permit to construct
- 10 I/A treatment systems pending SCDHS OWM permit to construct

Figure 6-1 shows the locations of these I/A systems and the sewershed boundaries.

Presently, the cost of a new residential I/A system is on the order of $25,000-$30,000 for the purchase, engineering, permitting and installation. Up to this date (January 2022) residential I/A systems have been largely subsidized by grants of approximately $20,000 by Town and County programs. The balance of $10,000 after the application of the grants is financed by homeowner.

Future refurbishments of OWTS within the Village will likely require the use of an I/A treatment systems and the permitted use of traditional OWTS will decrease significantly over the coming years. I/A offers significantly improved treatment over existing OWTS that discharge a concentration between 55-65 mg/l of nitrogen. It should be noted that use of I/A in high groundwater situations may present installation challenges requiring the use of anti-buoyancy construction. Separation distances between the I/A effluent leaching structure(s) and groundwater must meet the County's minimum two (2) foot separation distance.

Figure 6-1. Sag Harbor I/A Locations within Village



6.5. Decentralized Treatment Systems (Neighborhood)

Decentralized wastewater treatment systems are facilities designed to accept and treat wastewater from multiple residences or businesses. The benefit of decentralized systems is that it is more cost effective to manage the sewage flow at one location than to have multiple on-site or I/A treatment systems treating the same volume of flow. Flows can vary but would typically be less than 30,000 gallons per day (gpd) on the upper level to serve approximately 100 homes but could be sized as small as 4,500-6,000 gpd to serve 15-20 homes. Generally, there is an economy of scale having the treatment at one location and treatment processes are less susceptible to an upset at the higher flow rates. These sytems in Suffolk County are typically single lot, high flow complexes, such as condominiums, hotels and/or industrial/commercial complexes. A proposed decentralized system within the Village could be incorporated in current Village Code, as every parcel is already included in the “sewerage system”. A decentralized system would be creating new “service area(s)”.

Currently, in Suffolk County decentralized treatment systems that accept flow from multiple properties would need to follow the requirements for a community seweage treatment plant. Some of these requirements include setback and discharge requirements that typically lend to complex and expensive systems (capital and O&M costs). There is presently not a mechanism to join multiple properties to an I/A system and meet I/A requirements (acreage, setbacks and discharge).

Once a mechanism for multiple properties is established with Suffolk County Department of Health Services, the Village may want to pursue a decentralized system on the west side of the Village (including Sewersheds E, F and H) as they are not located in proximity to existing sewer infrastructure for treatment at the WWTP. Enhanced wastewater treatment in this area, would greatly benefit the environment due the existing high groundwater conditions and groundwater flowing towards the inland coves that have less flushing as compared to the Bay.

Typically the significant challenge of decentralized systems is siting the treatment system. Due to the price of land on Long Island and more specifically, within the Village of Sag Harbor, finding a suitable site at a reasonable cost may prove to be difficult. This would warrant the investigation of availability of open sites within the Village that are owned by; the Village, other governmental agencies, non-governmental organizations, and non-profits (i.e., Peconic Land Trust).

Once a suitable site(s) is identified, a schematic layout can be performed that would yield a theoretical volume of flow that could be accommodated at the site. If the site has good attributes; size, location, buffers, etc. it could be further evaluated for hosting a decentralized system. Two recent decentralized scale treatment systems recently completed (November 2021) in Suffolk County cost in the range of $1.5M to $3M with each having the capacity of 30,000 gpd. The cost differential is due to type of technology (one mechanical and one passive) and the reuse of an existing pretreatment system for the lower cost project. Both projects were hosted by the owner of the land, therefore there was no cost for land acquisition.

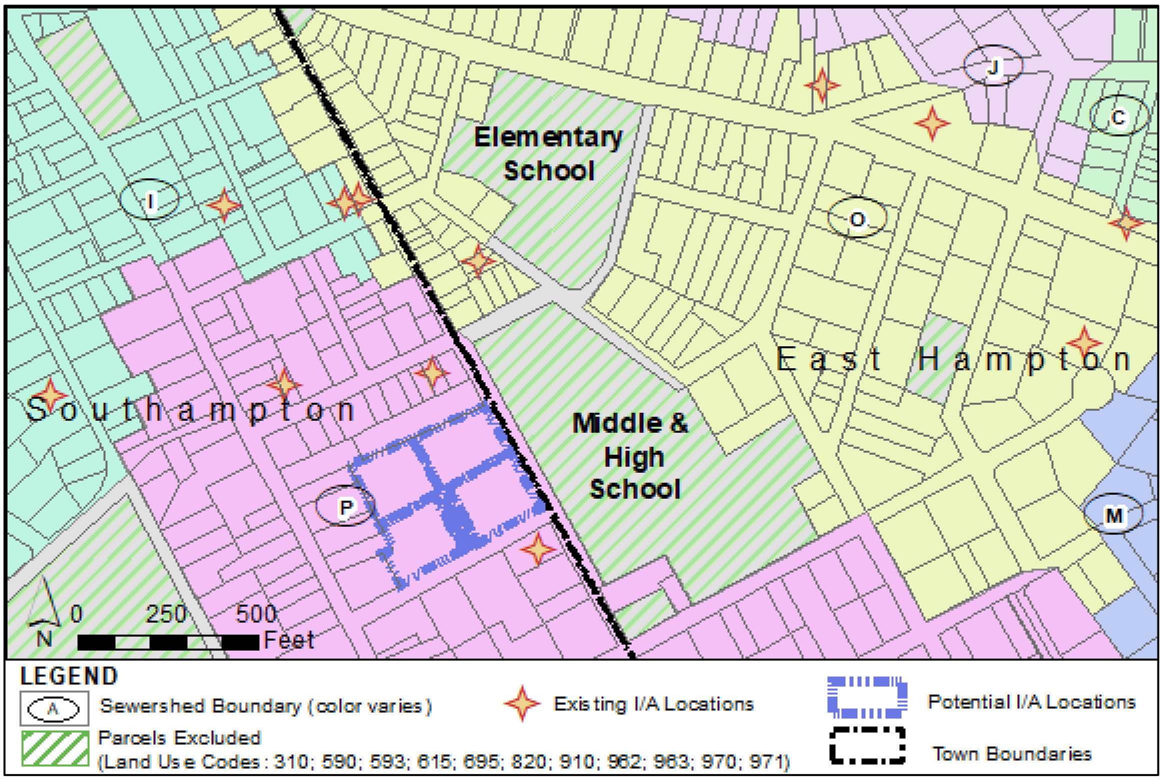
Presently, there are two vacant areas within the Village that may have the ability to host a decentralized treatment system: Four (4) vacant parcels in the vicinity of the public schools and Cilli Farm. A passive I/A system (i.e. constructed wetland) could be constructed on vacant properties. Parcels would access the I/A site may be able to use their existing wastewater infrastructure: sanitary pipes, grease traps and septic tanks (if they pass an inspection) for pretreatment of the wastewater. Either low pressure sewers (LPS) or small diameter gravity sewers with a pump station could serve as the collection and transfer system to these decentralized systems.

6.5.1. Public Schools

Public schools are regulated by the NYSDEC and are not required to comply with Suffolk County Sanitary Code Article 6 Standards and Requirements (including maximum density- flow per acre). As stated in the Suffolk County Subwatershed Wastewater Plan (SC SWP), students typically live within the proximity to the public school they attend and therefore nitrogen produced may be accounted for within the same subwatershed or in this case, subwatersheds within the Village. SCDHS reviews sewage disposal system plans for SCDHS conformance and construction for public schools within the County, as an agent for the NYSDEC.

Schools typically have site constraints and considerable utility infrastructure on the property (playing fields, parking lots etc…). Upgrading an existing OWTS to an I/A, would require setbacks and restrict student access to a portion of the school's property. Off-site locations for these systems could be introduced. There are currently 4 vacant parcels on the west side of Division Street across from the Middle and High School's property.

Figure 6-2. Public School Location and Vicinity



Preliminary wastewater gerneration rates for the both of the school properties are summarized below:

Table 6-2. Estimated Wastewater Flow from Public Schools

Use	Est. Capita (students + 20% employees)	Wastewater Generation Rate	Hydraulic Design Flow (gpd)
Elementary School	490	7.5 gpd/capita	3,675
Middle and High School	672	7.5 gpd/capita	5,040
Totals:	*1,162*		*8,715*

As stated earlier, there is limited SCDHS guidance/requirements regarding combining flow from multiple parcels for a single I/A system. Coordination between NYSDEC and SCDHS requirements would determine whether the I/A system could be housed on each individual school property or a combined system location on the vacant parcels across the street. A project of this stature could be incorporated into school curriculum and create invaluable learning opportunities for the local schools as well as vistiors to the area.

Additional Considerations

Pump Station and Force Main

One or both of the schools could connect to the existing sewer collection system by installing a pump station and force main to discharge at the nearest existing sanitary manhole. This would involve the construction of pump station and force main piping installed in the Village or State right of way (ROW). Ancillary collection system piping between school building may also need to be installed. With expansion of sewer service areas being considered (see Section 7), the distance to a service area may be reduced upon completion of an expansion project. As the school populations are seasonal in nature, the capacity requirement for the school year (September – June) coincides with the traditional low flow period at the WWTP. The low flow periods for the schools (June-August) coincides with the high flow period at the WWTP. Therefore the capacity for the schools and the peak summer flow periods typically seen at the Village's WWTP complement each other, therefore not creating capacity issues.

Gravity Sewers

The topography of the Village at the locations of the schools favors use of gravity sewers, which could be installed in the roadway from the school parcels to the nearest manhole in the closest existing or expanded sewer service area. The major difference between the gravity sewer option and the above option that includes a pump station and a force main, is that in accordance with Village Sewer Code, properties that are located along/adjacent to the new gravity sewer line from the school(s) would be required to connect to the new sewer system. The total flow from these parcels located adjacent to the new gravity sewer line would have to be determined then an allocation made from the existing excess capacity at the wastewater treatment plant. The flows from these parcels could be significant and could therefore impact connection of other critical areas that may have a greater need.

6.5.2. Cilli Farm

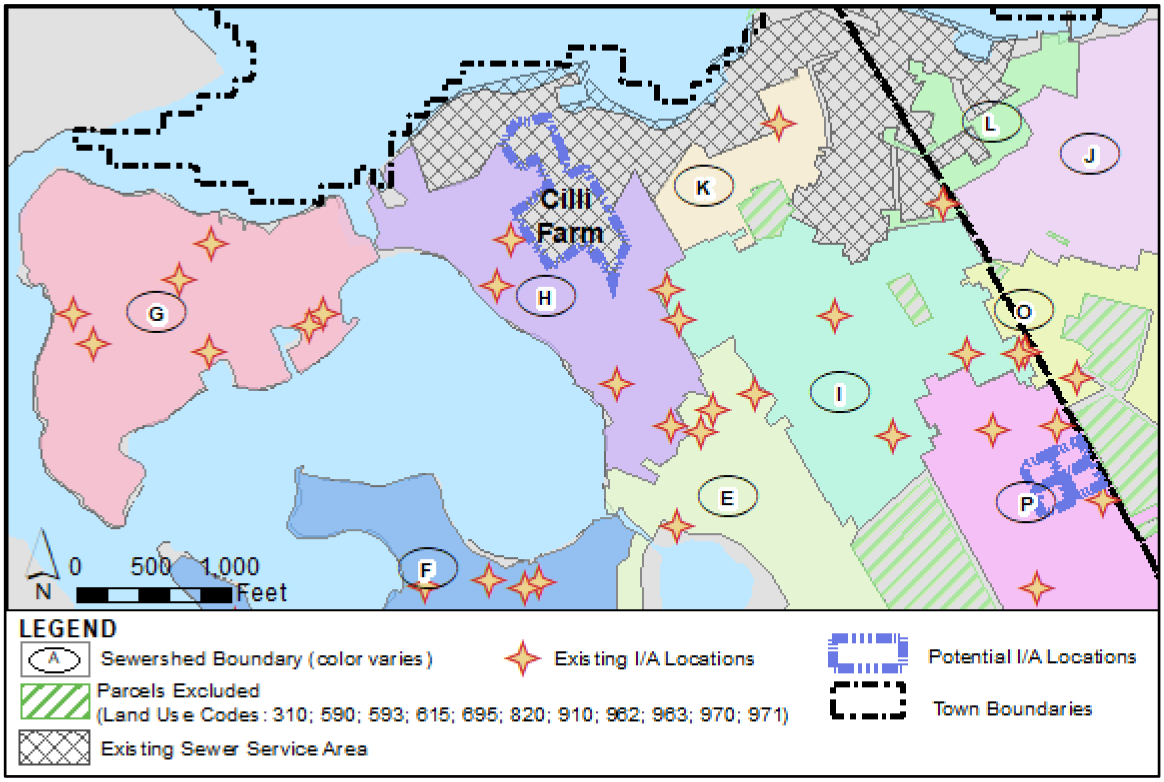
The former Cilli farm property is a municipally-owned, 8.98 acres parcel located in the northwest portion of the Village. According to Village Code, the location of the Farm is considered within the sewer service area, although it does not produce any wastewater at this time.

The parcel is bounded by West Water Street, extending south to Long Island Avenue and west to Glover Street. According to the Sag Harbor Historical Society, it was once used as a dairy farm where up to 65 cows would graze. It also produced a portion of the cow's feed (hay and corn). The parcel is currently listed as vacant.

The Farm's location on the west side of the Village could accommodate a decentralized I/A system. The depth to groundwater varies across the large parcel from north to south, with the highest groundwater estimated as the southern part of the parcel. This would dictate the placement and type of the I/A system and the effluent leaching structures. In areas of high groundwater, underground tanks would require preventative measures for tanks "floating" including the anchoring to concrete pads underneath the tank to overcome buoyancy uplift forces. There are also separation requirements between the bottom of I/A systems and effluent leaching structures and highest recorded groundwater elevation. The leaching system may need to use shallow galley drainfields which typically require more land (surface) area than typical deep leaching fields.

As stated above, the Cilli Farm parcel could be considered once the SCDHS has developed a mechanism for multiple properties to use a single property for a decentralized system to enhance the treatment of existing wastewater in that sewershed.

Figure 6-3. Cilli Farm Location and Vicinity



6.6. Village-Wide Management Plan

With the bulk of the Village being unsewered, it means that the bulk of the nitrogen loading (Pounds per Day) discharging to the Village's water bodies is generated from OWTS systems. The portion of the Village that is sewered (Sewer Service Areas) represents approximately 13% of the parcels and approximately 20% of the wastewater flow. The existing sewer service areas of the Village are located in the downtown and waterfront business areas. This is the heart of the Village's economy and having these area sewered allows for the wet uses that accommodate both the Village's residents as well as the tourist visiting the Village. Without the sewers, the economy of the Village would be severely impacted. However, it is well established that the Village's waterways are a very significant portion of the Village's economy as well. Marinas and associated businesses generate dollars that work their way back into the Village's local economy. Protection of the waterways is a primary focus of this Master Plan. As all of the Village's residents benefit either directly or indirectly from both a vibrant downtown and clean waters, it is only reasonable that every parcel owner within the Village's boundaries (Sewerage System) contribute to protecting the Village's waters. As noted earlier in this document, the bulk (87%) of the parcels within the Village are not connected to sewers and are using onsite wastewater treatment systems (OWTS) that provide very little reduction of pollutants.

How the Village's residents participate can vary from something as straight forward "tax" as has been used in other municipal programs such as the Maryland "flush tax". The tax money can be used not only in financing or funding of the WWTP needs but for a more expanded range of uses such as; inventorying existing OWTS, providing funds for purchasing and maintaining I/A systems (if grants not available), pumping and inspection of older OWTS, connecting parcels to existing sewer service areas, installation of low pressure pumping units, public education program amongst other sewage related needs. Cameron Engineering has prepared a draft conceptual plan for a Village-wide wastewater management program to assist in the discussion of such a program. We believe that a wastewater management program that has all of the Village residents involved will be highly successful in providing a sustainable source of funding for wastewater related issues. The draft management plan is provided in Appendix B.

7. Cost Considerations

Cost is always an important factor as improvements relating to sewer infrastructure often come with high price tags. The work typically requires heavy equipment, skilled labor and due to the work being below grade unknowns associated with existing utilities, groundwater conditions and soil conditions. Sewage collection can be accomplished using traditional gravity piping, low pressure piping and vacuum piping systems. As vacuum sewage collection systems require a relatively flat terrain for optimum performance, they will not be considered for the cost analysis. Gravity systems are most commonly used and is the method of sewage conveyance that the Village currently has in place. Low pressure sewers (LPS) are gaining popularity here on Long Island. There are being used in widely in the Village of Patchogue connecting out of district parcels to the Village's gravity sewage collection system. LPS are currently being designed for use in Oakdale, Sayville, Mastic and portions of West Babylon. The attractiveness of the LPS is its use in high groundwater conditions and lower capital costs.

7.1. Gravity Sewers- Collection

For purposes of further identifying which critical sewersheds should be considered for sewering, a unit cost of $1,450 per linear foot of gravity pipe installed. The cost for sewer pipe installation has increased significantly over the past couple of years due to supply chain issues, cost of petroleum based materials (PVC pipe) and skilled labor shortages. The cost estimate was developed based on 3,800 feet of gravity sewer installation in Sewershed L. This cost per foot could vary if the quantity of piping is considerably shorter or longer. Cost per foot includes construction in high-groundwater conditions that would require dewatering as the targeted areas for sewers are located in these conditions and asphalt pavement restoration.

The Village would bring service laterals to the property lines of each parcel that the new gravity sewer line passes in front of. It would be the responsibility of the individual parcel owner(s) to hire a plumber or contractor licensed in both Suffolk County and the Village to connect the parcel's sanitary waste line to the new gravity sewer service connection.

The Village Sewer Code requires that parcel owners to connect to gravity sewers should it become available within a time period specified by the Village Board.

7.2. Low Pressure Sewers- Collection

For purposes assessing sewersheds, a unit cost of $500 per linear foot for installation of low-pressure sewer pipe to be installed in the roadway, has been developed. This cost estimate is based on information from recent LPS projects that were bid and awarded by Suffolk County. The unit cost includes collection system pipe installation within the roadway and asphalt restoration.

Similarly, to the gravity cost per linear foot, this cost allocates the responsibility of the parcel owners to purchase a low-pressure grinder pump assembly to be used to connect the parcel to the low-pressure force main service connection at the property line. Homeowners will be required to hire a plumber or contractor licensed in Suffolk County and the Village to connect the parcel's sanitary waste line to the low-pressure sewer service connection.

The Village Sewer Code may require that parcel owners connect to the low-pressure sewers should the LPS force main become available. The time period required for connection would be specified by the Village Board.

7.3. Abandonment of OWTS

Under any sewer extension alternative, gravity or LPS, parcels that will be connected to either a gravity sewer or low-pressure sewer force main will be required to properly abandon their on-site sewage disposal system in accordance with SCDHS provisions. This typically requires that the cesspool or septic tank be emptied, cleaned and filled with clean sand. In some instances, the cleaned cesspool may be used for receipt and disposal of site drainage (i.e. roof rain water). SCDHS has indicated that the reuse of the existing cesspool for drainage would be subject to Town approval.

7.4. Cost per Nitrogen Removal

It is beneficial to determine what the actual cost is to remove a pound of nitrogen for collection system options and treatment at the Village's WWTP. Total cost of removing a pound of nitrogen would include both the capital cost (debt service) for the infrastructure and the annual Operations & Maintenance (O&M) cost. These two costs added together divided by the amount (pounds) of nitrogen removed would provide an estimate of cost for removing nitrogen for the two options. The capital cost (debt service) of the WWTP's original constsructed has been retired. The Village may have outstanding bonds due to other improvements and upgrades made over the years since the facility has been on line. This Plan identifies projects that should be undertaken within the treatment plant and out in the collection system that will be needed to be financed and therefore a debt service component will be borne by the Village.

7.4.1. WWTP Annual Operation and Maintenance

Table 7-1 below provides budget information for years 2017 through 2021 (May 31, 2021) and the total amount of sewage received and treated. It also provides projected values discussed below. Using a value of 45 mg/L for influent Nitrogen concentration, the estimated cost per pound of nitrogen removed ranging from a low of $75.11 to a high of $84.51. This range varies with the total amount of flow received at the Facility. The last two years (2020-2021) saw a decline in overall flow received due to the Covid-19 pandemic and its impact on the restaurant and tourism activity in the Village. The Facility's highest annual volume treated was just over 28 Million Gallons (MG) in budget year 2018-2019. The 28 MGY represents only 32% of the total potential yearly capacity of the Facility which is 86.7 MGY based on receiving an average of 237,500 gpd which is equal to 95% of design capacity. With a consistent annual budget, this analysis displays the cost savings on handling additional flow (i.e., the year with the highest flow was the lowest cost per pound of total nitrogen removed).

Projecting an increase in the daily average flow to 125,000 gpd, as a result of connecting approximately 50,000 gpd of flow to the 2018-2019 flow over the next 5-10 years, the yearly total flow would increase to approximately 45.63 MGY. This represents 53% of total plant capacity. O&M costs would increase in the areas of power consumption, chemicals and sludge disposal, there would not be a need to increase staffing levels. Conservatively for this analysis, an additional $240,000 (2021 dollars), representing an increase of 30% to the 2018-2019 budget to reflect the increase in cost for these items. Using the same current efficiency rates at the WWTP for reducing nitrogen at the new higher flow rate, the cost for removing a pound of nitrogen decreases to approximately $64.44 per pound.

Table 7-1. WWTP Budget Information (2017-2021)

Budget Year (June 1 - May 31)	2017-2018	2018-2019	2019-2020	2020-2021	at 0.125 MGD
Annual WWTP Budget (O&M)	$ 682,852	$ 661,785	$ 660,522	$ 708,475	$ 900,000
Estimated Annual Flow (MGY)	27.33	28.07	23.02	25.13	45.63
Est. Average Daily Flow (MGD)	0.075	0.077	0.063	0.069	0.125
Est. Inf TN lbs per year (based on 45 mg/L)	10,257	10,535	8,639	9,431	17,125
Est. Eff TN lbs per year	1,618	1,724	823	698	3,159
Est. TN lbs removed per year	8,639	8,811	7,816	8,733	13,966
Est. Cost per lb TN removed (O&M)	***$ 79.04***	***$ 75.11***	***$ 84.51***	***$ 81.13***	***$ 64.44***

7.4.2. Capital Construction Project- Collection System Piping Installation

A preliminary collection system piping layout was designed to determine which areas of Sewersheds, I, K, and L (the highest scoring subwatersheds adjacent to the existing collection system) would be able to connect through either gravity or require low pressure sewers. The preliminary layout and construction budget are in the figures below.

Figure 7-1. Collection System Schematic (Sewersheds I, K, and L

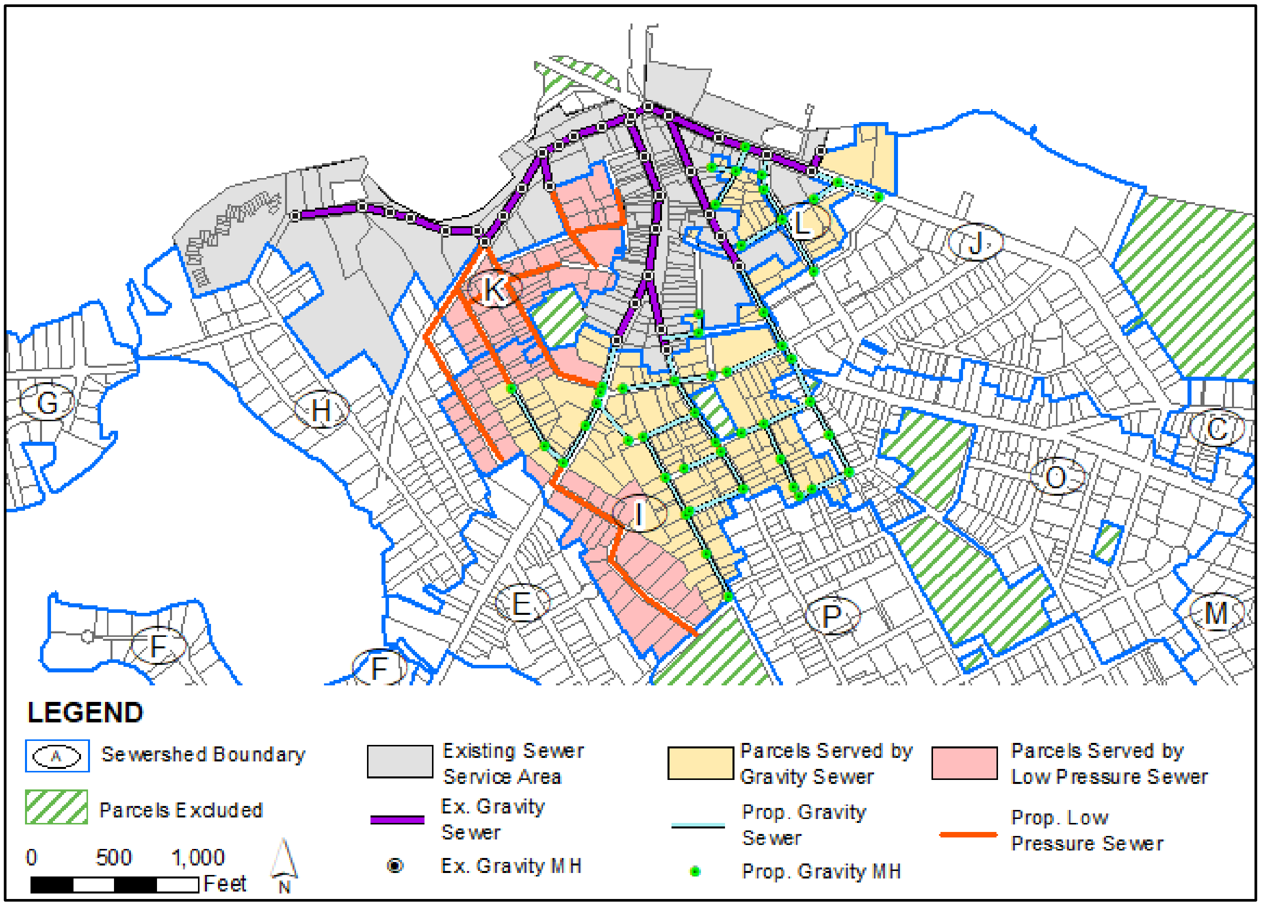


Table 7-2. Collection System Cost per Pound of Nitrogen (Sewersheds I, K, and L)

	SubwaterShed ID	I	K	L
Gravity Collection Pipe	Gravity Pipe Length (ft)	7,800		3,140
	HC pipe length (20'/parcel)	2,700		660
	Total Length of Pipe (ft)=	10,500		3,800
	Est. Cost of Gravity Pipe Installation and Restoration ($1,450/ft)	$ 15,225,000		$ 5,510,000
	Annual Debt Service (20 yr@ 4%APY)	$ 1,120,282		$ 405,435
	# Parcels Served by Grav	135		33
	Flow Served by Grav (gpd)	52,098		9,812
	Estimated lbs N per day (based on 65 mg/L)	28		5
	Estimated lbs N removed by WWTP per day	25.2		4.7
	Estimated lbs N removed annually	9,198		1,732
	Annual Debt Service Cost per lb N	$ 122		$ 234
	Annual O&M Cost per lb N removed	$ 64		$ 64
	Annual Cost per lb N removed	$ 186		$ 298
LPS Collection Pipe*	LPS Length (ft)	3,427	3,344	
	HC pipe length (20'/parcel)	960	880	
	Total Length of Pipe (ft)=	4,387	4,224	
	Est. Cost of LPS Pipe Installation and Restoration ($500/ft)	$ 2,193,500	$ 2,112,000	
	Annual Debt Service (20 yr@ 4%APY)	$ 161,402	$ 155,405	
	# Parcels Served by LPS	48	44	
	Flow Served by LPS (gpd)	16,120	12,346	
	Estimated lbs N per day (based on 65 mg/L)	9	7	
	Estimated lbs N removed by WWTP per day	7.8	6.0	
	Estimated lbs N removed annually	2,846	2,180	
	Annual Debt Service Cost per lb N	$ 57	$ 71	
	Annual O&M Cost per lb N removed	$ 64	$ 64	
	Annual Cost per lb N removed	$ 121	$ 135	

*Requires individual pump stations to pump to LPS pipe and individual O&M costs to be incurred by parcel owner as compared to gravity sewer.

7.4.3. Individual Construction Project- I/A System

As noted in an above section, the typical standard residential I/A system designed and installed is on the order of $25,000-$30,000. Non-standard installations resulting from special conditions at a site reportedly (per communication with certified installer) can exceed the standard cost. To date (2021), homeowners have been receiving subsidies totalling $20,000 in form of $10,000 grants from both the Town and County. While the grants will decrease the debt that the homeowner will be responsible for, for the purposes of determining a cost per pound of nitrogen removed, the annual cost for debt service for $30,000 at 4% for 20 years (APY) of $2,207 will be applied. The annual loan cost for a $10,000 at 4% for 20 years (APY) will also be used for those property owners who receive the $20,000 grant ($736 per year).

The O&M of I/A systems is projected at $500 per year to cover two (2) service visits by licensed technicians, plus $10/month for electrical usage ($120/year) and sludge removal of 500 gallons per year at $0.25/gallon or $125 per year. Total annual O&M is therefore $500 without any costs set aside for potential charges for replacement parts or emergency service calls.

As noted in Table 7-3 the cost for removing a pound of nitrogen ranges for single family residence (SFR) is estimated at $64.36 and $29.39 using the flow rate of 300 gpd for a single-family residence, without and with grants, respectively. Once the loan for the original purchase and installation is retired, the yearly costs would decrease to approximately $11.89 per pound of nitrogen removed (2021 dollars).

Table 7-3. Individual I/A System Cost per Pound of Nitrogen

	$30,000 Debt Service	$10,000 Debt Service ($20,000 rec'd in grants)
Est. Annual Debt Service	$ 2,207	$ 736
Est. Annual O&M	$ 500	$ 500
Est. Total Annual Cost	$ 2,707	$ 1,236
Est. Average Daily Flow (gpd)	300	300
Est. lbs N per year (based on 65 mg/L)	59.43	59.43
Est. lbs N removed annually (based on effluent of 19 mg/L)	42.06	42.06
Annual Debt Service Cost per lb N removed	$ 52.47	$ 17.50
Annual O&M Cost per lb N	$ 11.89	$ 11.89
Annual Cost per lb N removed	***$ 64.36***	***$ 29.39***

7.4.4. Construction Project- Collection System with Decentralized I/A System

Treatment systems to handle multiple homes could be sized at various capacities, using 300 gpd for single family residence, a 15,000 gpd capacity communal system could receive and treat wastewater from up to 50 homes. Based on information from a recent Cameron Engineering project involving two (2) communal sized (30,000 gpd capacity) treatment systems, the capital cost for the two different systems ranged from a low of approximately $42/gallon per design gallon (constructed treatment wetland) to a high of approximately $100/gallon per design gallon for a more mechanical system having a higher level of removal efficiency. There are significant differences in space allocations between these two treatment systems.

7.5. Comparison of Costs

Overall, the I/A costs for nitrogen removal are less than that of the WWTP. Significant differences exist between treatment of sewage at the WWTP and that of an individual I/A system that need be pointed out. The Village's treatment plant's effluent regularly achieves total nitrogen concentrations well below 10 mg/L and typically is at 5 mg/L concentration or less for total nitrogen. The residential I/A system is expected to achieve a concentration of 19 mg/L or roughly

380% that of the treatment plant's effluent. It is acknowledged that some I/A units can achieve concentrations below 19 mg/L with one or two systems apparently achieving between 10-12 mg/L on a consistent basis or roughly 200% greater than the WWTP's effluent Nitrogen concentration. After installation, the I/A systems are monitored and maintained by the certified installer(s) for a period of three (3) years. Homeowners will be required to have a service contract in place with a certified and licensed entity to perform the O&M on the I/A once the initial 3 year warranty period expires.

The Village's wastewater treatment plant is monitored 24/7 with operational testing performed daily with permit testing done once or twice weekly depending on the parameter. WWTP staff are skilled professionals with certifications achieved through specialized training classes and State certification testing procedures. Presently I/A treatment systems are required to be visited only two times per year by technicians. Performance testing is based on one or two grab samples over the course of the year. Should the I/A experience a mechanical problem, unless noted by the homeowner and corrected by a qualified technician, the sewage bypasses the treatment section of the I/A and flows to the leaching pools in an untreated state. Household cleaning products containing bleach and antibacterial compounds can adversely impact the biological community of the I/A for several weeks or more until the biological community's health is restored. Owners of I/A treatment systems should be advised on the use of non-toxic household cleaning products. The homeowner is the point person for ensuring that the I/A system is properly operated and maintained.

The I/A is a good and may in some cases, be the only choice for improving water quality if a connection to a sewage treatment plant or communal treatment system is not available or the parcel has a failing or failed OWTS. With the limited available capacity at the WWTP, I/As will play an important role in providing improved wastewater treatment within the Village.

8. Existing Sewage Collection System Evaluation

The sewage collection system or sewer system is a vital component of the Village's water quality protection infrastructure. The sewage collection system receives the sewage from businesses and homes and delivers it via a network of piping of various diameters and material types (ductile iron, cast iron, cement and PVC) and manholes to the wastewater treatment plant (WWTP). The sewer system was installed in the late 1970s and consists of a total of approximately 5000 linear feet of pipe. The sewer system was designed for gravity flow of sewage all the way to the site of the WWTP where there is a pump station to lift the sewage up and into the WWTP for treatment.

The sewer system piping was cleaned and subjected to closed circuit television (CCTV) in 2018-2019 and findings indicated that sewer system is in good overall condition. One item of note is that due to cleaning activities over the years, the cementitious lining on the ductile iron pipe has been degraded and in some cases is now missing on some segments of piping. Without the lining in place, the pipe surface is roughened adding to the increase in friction promoting some components of sewage to settle and collect as noted by both solids and grease deposits in several sections of pipe. Additionally, the uncovered iron pipe is subject to corrosion from exposure to the corrosive material present in the sewage and sewer gases such as hydrogen sulfide. It is recommended that the Village develop a sewer pipe lining program that would systematically line the entire sewage collection piping over a 2-5 year period. The lining using cured in place liners made of PVC and/or resin impregnated woven materials would restore the original design coefficient of friction, provide for protection of the piping interior and reduce infiltration of groundwater flow into the piping network. Every 300 gallons of infiltration eliminated in the lining process would allow for an additional single-family residence or apartment to connect to the sewage collection system. Liners have a design life of a minimum of 50 years.

9. Village WWTP Evaluation

The Village's WWTP is the key piece of infrastructure for protecting the Village's waters and vibrant economy. Without the WWTP the Village would lack the ability to host the number of restaurants and entertainment venues that serve both its residents and tourists. The WWTP was constructed in 1980 at the same time that the sewer system was being installed. The bulk of the facility is now 40 years old however there have been a few upgrades including new equalization tanks and repurposing of the original aeration tanks into Sequence Batch Reactors (2002). A fifth SBR reactor was added as a result of anticipated increase of flow from the redevelopment of the Bulova Watch site and the subsequent increase of flow based on new residents accessing the downtown area. These upgrades have increased the design capacity of the WWTP to 250,000 gallons per day.

This section of the Master Plan will focus on important features of the facility that need to be maintained and upgraded in the short term (1-5 years) as well as intermediate term (6-10 years) and long term (>10 years) considerations. Planning improvements will also require a financial analysis as to how best to finance the improvements.

9.1. Short Term Improvements (1-5 years)

9.1.1. Process Control Panel Upgrade

The control panel that operates and controls the various functions of the SBR treatment system is considered the "brain" of the WWTP's treatment system and most specifically the nitrification and denitrification processes. The control panel functions include the automation of the aeration blowers, timing of various treatment cycles (fill, react, settle, waste and decant) and allows for operator interface for adjustment of the various settings of the nitrification-denitrification process. In 2020 there was a failure of the panel that required an emergency repair. Loss of the control panel interface precluded the operations staff from adjusting the process and from monitoring the process from the office control room. An inspection of the panel by the technology vendor in late 2019 indicated that while some portions of the control panel were still in very good condition it was appropriate to consider the upgrading of the panel to incorporate a new Programmable Logic Control and related hardware. The failure of a portion of the control panel in 2020 has demonstrated the criticality of the unit. The Village received a proposal for the control panel upgrade and executed a contract to have the new panel provided and installed. The upgraded panel will be installed in first quarter of 2022. Cost of this item is approximately $75,500. The WWTP SCADA system will be required to be upgraded for compatibility with the new control panel. Estimated cost for this item is $35,000. Total for panel upgrade is therefore $110,500.

9.1.2. Instrumentation and Controls

The upgraded control panel can accept inputs from sensors that can provide feedback to the control panel resulting in automated process adjustments. Presently, there are Dissolved Oxygen (DO) probes that send signals back to the control panel for adjustment of the blower speed. Operators can interface and set the desired DO levels that the control panel will maintain by raising or lowering the blower speed that results in the raising or lowering of the DO concentrations. The Village has replaced some DO meters, for short term planning purposes an upgrade of the DO sensors and systems and connection to the upgraded control panel. Cost is estimated at $37,500 (2021 dollars).

New sensors and controls allow for a more biological based control strategy. These include monitoring of ammonia levels and suspended solids levels with the control panel automatically making the adjustments in the process control without the need for operator interface. In larger more complex treatment facilities having multiples of tanks, this is can be an invaluable tool. At the Village's treatment facility, process tankage is limited to 3-4 units maximum online at any one time and the operators are very familiar with the trending of the process. It is noted that the NYSDEC is proposing to modify the SPDES Permit some time in 2022-2023. Our understanding is that an effluent limitation for Ammonia will be added. There are two new Ammonia limits (concentrations) being proposed, a summer limit of of 1.2 mg/l and a winter limit of 3.7 mg/l. While the WWTP has an excellent compliance record for total nitrogen discharged, the proposed Ammonia limits may prove to be a challenge to meet on a consistent basis. Should the proposed Ammonia limitations become enacted as permit condition, the Ammonia control via feedback sensors option describe above may be necessary. The upgraded control panel noted above can accept these new sensors and process control logic. Sensor packages for Ammonia monitoring and control is approximately $50,000 (2021 dollars) not including any required ancillary work such as installation of conduits and wire. It would be appropriate to add an additional $50,000 to cover cost of new conduits and installation of same.

It has been discussed with the Superintendent of Public Works that the automated sludge wasting process optional project (suspended solids sensor package) will not be required in the near term (2-5 years).

9.1.3. Primary Treatment

The WWTP utilizes a rotating wire screen to remove materials pumped up from the main pump station prior to the sewage entering the equalization tanks (EQ). The material is sized reduced material contained within the raw sewage that has passed through the communitor in the wet well of the pump station. The material can include rags, plastics, oversized organic material, and chunks of grease dislodged from collection piping and the like. Suspended solids contained within the raw sewage will pass through the screen openings and enter the process via the EQ tanks. Plant operators note that settleable solids (a component of suspended solids) concentrations can vary on a daily basis as identified in the Imhoff Cone laboratory test. These heavy and dense solids can settle to the bottom of the EQ tanks as well as the SBR tanks during the settle phase of the process. It is advised to consider installation a form of primary settling after the influent screen and upstream of the EQ tanks to capture these solids thereby reducing their impact on downstream processes. A primary treatment system would likely be on the order of $500K-$750K depending on the type of enclosure/structure required to support the system. A separate engineering evaluation would be required to determine the details and costs of a primary process system.

9.2. Intermediate Term Improvements (6-10 years)

9.2.1. Additional Tank for SBR Decant (Intermediate EQ Tank)

Presently there is one tank for SBR Decant (Intermediate EQ tank). This tank receives flow from the decant arms in the SBR during the decant cycle. This tank allows for the rapid receipt of decant that is basically final effluent from the last cycle of the SBR treatment reactor. The decant flows from this tank at a lower velocity to the disinfection (UV treatment) process located downstream of the tank. Operationally, having only the one post SBR EQ tank limits the decanting of SBR cells to one at a time. Should the flow increase to the treatment plant that requires that four (4) or possibly five (5) SBR cells to be on line with more than 1 decant ocurring simultaneously, the need for a second Decant/EQ Tank will be required. This will involve the construction of a new tank that would be of equal size and capacity of the existing tank. Preliminary estimated cost would be on the order of $750K-$1M depending on the type of supporting foundation (piles or spread footing) required.

9.2.2. Effluent Polishing Filter

The WWTP produces a very high quality effluent on a consistent basis without the benefit of an effluent polishing filter (effluent screening system). An effluent polishing filter would allow for further capture and removal of suspended solids and thereby reduce the concentration and loading of suspended solids being discharged to marine waters. Further cleaning of the existing effluent could also lead to examination of reuse of the effluent. There are a number of types of effluent polishing filters including cloth disk, membrane and multi-media. There are pluses and minuses associated with each type. Due to the lack of existing space in existing buildings, a new structure would be required to house the filter. This would add to the overall cost of effluent polishing. A rough estimate of a new effluent polishing system housed in a structure would be on the order of $800K-$1.0M.

9.2.3. Effluent Disinfection

The WWTP changed from disinfecting the effluent using liquid sodium hypochlorite (bleach) to using the ultraviolet light (UV) disinfection process. This changeover occurred when the facility's SPDES permit was modified to include an effluent limit for Total Residual Chlorine (TRC) of 0.5 mg/L. The UV system utilizes lamps emitting light at a set frequency (ultraviolet) that disrupts the cell walls of the pathogenic organisms rendering them inactive. For monitoring of the disinfection process, total coliform and fecal coliform are used as the surrogate organisms to indicate the likely presence of pathogens in the treated effluent. UV is favored over chlorine based disinfection processes as there are no byproducts that can pose harm to the marine environment. The particular unit the facility uses is the Trojan Model 3000. There are 2 modules with each module having the ability to treat 250,000 gpd of effluent. These units are installed in each of the original chlorine contact tank cells. A disadvantage of the existing system is that the quartz sleeves that protect the UV lamps must be cleaned manually. This requires the extraction of the unit from the contact tank(s) and manually wiping down the quartz sleeve to remove any deposits such as particulates, slime, algae, etc. The cleaning process is time consuming but is regularly scheduled weekly basis to maintain high levels of "kills" of the indicator organism (total and fecal coliform) for pathogens. Plant personnel use calcium hypochlorite tablets (disks) in limited amounts to assist in reducing the presence of slime, molds and algae. The plant staff regularly monitor effluent TRC concentrations to ensure compliance with the effluent limitation of <0.5 mg/L. Plant staff are considering the ceasation of the hypochlorite disks to lessen the impact of the effluent on the receiving waters.

Presently, the Village has a good inventory of spare lamps, sleeves and miscellaneous spare parts to keep the existing unit functioning in the near term. For the long term, consideration of designing and installing an automatic UV disinfection system is warranted. Preliminary investigations indicate the need to construct a new channel that would be sized to accommodate the longer units. A budgetary estimate of a new automated UV disinfection system would be on the order of $600K -$750K in 2021 dollars.

9.2.4. Staffing

Presently there is a total staff of four (4) individuals assigned to the operations and maintenance of the Village's WWTP. In addition to the staff that report to the facility on a daily basis, the Superintendent of Public Works who is a certified wastewater treatment plant operator provides daily supervision of the staff and can also direct other Village resources and outside contractors to assist in the maintenance of the sewage collection system and treatment facility. Due to the seasonality of flow into the facility, the staff typically dedicates more time during the off-season months to conduct more labor maintenance activities such tank cleanings, diffuser replacements, rotation of equipment, etc. Should there be a modest increase in plant flow, the existing staff should be sufficient to handle without any additional employees. If the flow to the WWTP increased to levels approaching a daily average in excess of 200,000 gpd and or additional treatment systems were brought online that would require more extensive operations and maintenance, it would be recommended that an additional qualified person be added to the staff.

9.3. Hardening of Critical Systems

While there is a discussion in the next section on whether the treatment facility should be relocated in the future, it is safe to say that for the near term (next 10 years) that the facility will remain at its current location. The previous sections spoke to improvements in the treatment processes to meet a possible increase in flow and process technologies to better automate the treatment system. It is appropriate to speak to the issue of climate change and sea level change. It is undeniable that the sea level is rising and the frequency and severity of storms is increasing. The WWTP site is only a few feet above the elevation of normal high tide in the harbor. As the tidal elevation and storm severity increases, it is expected that the harbor waters could breach the top of the bulkhead and flow on to the facility site. During extreme storm events, the direction, velocity and duration of the wind in combination with elevation of the high tide cycle could combine to create a surge event. It is not unlikely that under these scenarios that surges would occur where several feet or more could be expected to wash on to the site of the WWTP. This surge condition is what occurred on the South Shore of Long Island during Superstorm

Sandy in October of 2012 where up to 6-8 feet or more of bay water surged on to properties including several wastewater treatment facilities and dozens of sewage pumping stations located in low lying areas causing significant damages. *Hardening Action (minor): purchase deployable barriers that can be set up in short notice around the perimeter of the building.*

Fortunately, the bulk of the process tankage at the Village's treatment plant including equalization tanks, SBR tanks, decant/EQ tank and sludge holding tanks are above grade structures with high elevation walls. These structures are not considered to be vulnerable to sea level rise or extreme tidal storm surges. However, there a number of critical components of the WWTP that would be susceptible to seawater overtopping the bulkhead and flowing on to the site. These critical areas include:

9.3.1. Influent Pump Station

This is the main pump station for the WWTP. All sewage entering the Village's sewer system from the Sewer Service Areas flows by gravity to the Influent Pump Station. Here the sewage is lifted up into the Screening unit and then into the Equalization Tanks. All sewage once screened and deposited into the Equalization Tanks is then directed into the SBR tanks for treatment. The Influent Pump Station is a subgrade unit located approximately 25 feet below the surface grade. The station features a "wet side" that has a size reduction device and a "dry side" that houses the influent pumps and controls. The station has a 3 foot concrete collar around the access hatches that serve to prevent rainwater and stormwater from entering the station. Should a significant storm surge enter the site, seawater could enter the station and knock the size reduction device and raw sewage pumps out of service. The Village recently purchased a mobile diesel powered pump that serves as a emergency backup should the influent pumps be taken out of service unexpectedly. This pump could be deployed once the surge waters recede from the site.

Hardening Action (major): evaluate converting the existing influent pumps from dry pit duty pumps to either dry pit submersible pumps or straight submersible pumps. These types of pumps are designed and manufactured to operate in a submerged condition.

9.3.2. Effluent UV Disinfection System

The UV disinfection system located in the former chlorine contact tanks that have exterior concrete walls approximately 18" above grade. This provides a level of protection from breaching of seawater for minor storm events. Under a larger storm surge event it is likely the UV control modules would be compromised if submerged or swamped by wave action.

Hardening Action (minor): raise control modules from current location on top of concrete chamber wall to as high a location as practical. A modest 12-18" in elevation would provide additional protection while moving the control modules to an elevation of 2 feet above the 500 year flood level would provide maximum protection. This may require a small platform and a few steps to access the control modules.

9.3.3. Main Control Building

The main control building is located on grade. Within the building are located the main process control panel, the process blowers (SBR and Sludge Tanks), main electrical panel and the emergency power standby generator. It is conceivable that a storm surge of 2-3 feet above the top of the bulkhead in height could enter the building and cause damage.

Hardening Action (major): change out all doors with special flood proof units, examine all penetrations on exterior walls to determine if their requirement can be raised to a higher elevation followed by the sealing of the lower penetration. Evaluate raising aeration blowers, control panels and other key equipment to a higher elevation by installing equipment pads or steel structures. Achieving the necessary elevation may require the raising of the roof in the area of the critical equipment.

<u>Cost considerations:</u> A separate engineering evaluation would be required to determine specific needs and associated costs.

9.4. Long Term Considerations (>10 years)

The Village's WWTP like many treatment facilities that discharge to surface waters, is located directly adjacent to the Village's harbor, just on the inside (south side) of the bulkhead of the marina. The outfall pipe that discharges effluent from the facility's last treatment process (UV disinfection) terminates at the north face of the bulkhead. While the current location of the treatment plant selected over 40 years ago is technically sound and appropriate, there are long term considerations that need to be evaluated including the current location of the facility and the outfall pipe.

9.4.1. Relocation of Treatment Plant

Relocating the treatment facility likely would take a minimum of 5-7 years to accomplish under the most optimistic time frame if the task was started today. For this reason we are placing this item in the long term (>10 year) category. Should the Village place a priority on this relocation, the task would be moved into the Intermediate (6-10 year) category. Tasks to be completed for a such an endeavor include but not limited to:

- *Evaluation of suitable alternative sites*
- *Field work such as surveys, borings, and environmental testing for selected site(s)*
- *SEQRA process, including Draft Environmental Impact Statement*
- *Public meetings and hearings*
- *Preliminary engineering and permitting*
- *Detailed design documents*
- *Permitting – NYSDEC, SCDHS, ACOE, NYSDOS, NYSOHP*
- *Financing - NYSEFC*
- *Preparation of Contract Documents and Approvals*
- *Bid Phase and Award of Contracts*
- *Construction of new wastewater treatment facility*
- *Construction/Upgrade of Pumping Station and Force Main to new site*
- *Decommission and demolition of existing WWTP*

Should the WWTP relocation be a primary goal of the Village, it would be appropriate to initiate the first step of evaluating potential sites as that task will be less defined as to time required than the technical, SEQRA and construction time frames.

Site considerations: locations suitable for hosting a wastewater treatment plant should exhibit these characteristics:

- *Elevation above the 500-year storm elevation plus an additional 2-4 feet of elevation to account for future sea level rise and global warming*
- *If such elevation is not available, the treatment plant structures on the selected site will need to either be elevated to required elevation or the facility would need to be located inside a berm or wall constructed to the necessary elevation*
- *Sufficient buffer area from nearest receptors including single family homes, schools, houses of worship, and health care facilities*
- *Determination of type of discharge, surface water (as existing facility) or groundwater discharge (would favor a more inland site)*
- *Distance from existing sewage collection system should be considered as collected sewage at current treatment plant location would need to be conveyed to the new site via a new pump station and force main. At a distance of 8,000 feet (roughly 1.5 miles) from the current pump station location, a force main route could be constructed to the furthest Village boundary*

<u>Cost considerations</u>: a new state of the art wastewater treatment plant featuring nutrient reduction, advanced process controls, odor control, effluent polishing, UV disinfection and effluent reuse would be expected to cost in the range of $125 to $150 per design gallon (2021 dollars). Using the current design flow capacity of 250,000 gpd, a replacement facility would be in the range of $31.3M to $37.5M in 2021 dollars. Should there be additional scope such as; increase in design capacity, specialty architecture, difficult site conditions, exterior protection wall/berm and or more stringent SPDES effluent limitations to meet, this cost could increase accordingly. Upgraded pump station ($5M) and force main to the new WWTP location are additional costs. As described above, a placeholder of 8,000 feet will be used for the force main route to the Village boundary ($4.8M). The cost of the new treatment plant relocation would be on the order of $50-$57M (2021) including soft costs.

9.4.2. Relocate Outfall Pipe

The current location of the outfall pipe is in the southeast corner of the harbor adjacent to the sailing club property. Due to the harbor having a protective breakwater that runs in a northwest/southeast direction, it serves as a restriction to both wind and wave action. Having the breakwater is a positive in protecting the marina, for the vessels using the harbor and the harbor's shoreline from erosion. On the negative side of the breakwater, the treated effluent discharged by the WWTP does not enjoy the benefits of natural wind and wave action to assist in the distribution and mixing of the effluent into the water column to the same degree that an outfall located on the seaward side of the breakwater would benefit from. This fact is reflected in the NYSDEC's recent decision to propose implementing new effluent limitations for Ammonia. These proposed changes to the SPDES permit may require upgrading process control measures as previously discussed in Section 9.1.2. Relocating the outfall to a location on the other side of the harbor breakwater is technically feasible. It would require the construction of a new effluent pump station and a horizontally directionally drilled (HDD) force main that would terminate on the seaward side of breakwater at a selected location that would allow for good mixing of the effluent with the marine waters.

<u>Cost considerations</u>: a new effluent pump station designed to meet current standards as well as the hardening measures to meet the future challenges of climate change and sea level rise would have an estimated cost on the order of $400K (2021 dollars). An HDD force main of approximately 1,500 linear feet (shortest feasible distance) would cost on the order of $1,000-$1,500 per linear foot equivalent for an estimated cost of $1.5-2.25M. These costs are schematic and do not account for design and permitting costs nor any investigations that could be required by regulatory agencies that to identify and confirm the location of the new outfall. Total cost range is $1.9-2.65M not including soft costs.

9.5. Infrastructure Financing

The cost of the short term and long term improvements are substantial and may require the Village to pursue financing alternatives. There are a number of options that can offer opportunities for funding. These include:

- Grants -There are a number of avenues for seeking grant funds. The Village has been successful on obtaining grants from local government programs including the Town of East Hampton and Town of Southampton through their Community Preservation Fund (CPF) programs. The CPF program that is funded in part by real estate transactions occurring within Suffolk County and sales tax revenue should remain a viable source of environmentally based grants. These grants can provide financial assistance to the Village for the planning and design of sewer infrastructure as well as for the infrastructure improvements.

  The Village can pursue construction grants from these programs once the construction documents have been finalized, approved and all permitting has been completed.

  The NYSDEC has several grant programs that relate to water quality improvement and sewer infrastructure that may be appropriate for the Village to submit applications. These programs include Water Infrastructure Improvement Grants (WIIA) Program and Intermunicipal Water Infrastructure Grants (IMG) Program.
- Low interest Financing – New York State Environmental Facilities Corporation through its State Revolving Fund (SRF) offers low interest long term financing of wastewater collection and treatment project to eligible municipalities.
- Muncipal Bond Issuance – The Village can pursue financing of the sewer infrastructure using traditional measures that are available to municipalities such as the issuance of General Obligation Bonds. There are legal firms specializing in municipal bond offerings that can provide guidance to the Village on this specific financing option.

Table 9-1. Short Term, Intermediate, and Long Term Capital Improvments

Term	Area	Item	# Units	Cost/Unit	Total Cost
Short Term (1-5 years)	Collection System	Pipe Lining	5,000	$ 80	$ 400,000
		Subtotal			$ 400,000
		Contingency	20%		$ 100,000
		Design/Permit/CA&CM	20%		$ 100,000
		TOTAL			***$ 600,000***
	WWTP	Control Panel	1	$ 75,500	$ 75,500
		SCADA system upgrade	1	$ 35,000	$ 35,000
		DO system upgrade	1	$ 37,500	$ 37,500
		Ammonia monitoring sensors (inc. electrical etc..)	1	$ 100,000	$ 100,000
		Primary Treatment system*	1	$ 625,000	$ 625,000
		DO Probes (replace all units)	5	$ 5,000	$ 25,000
		Hardening (minor)			
		Deployable barriers, etc…	1	$ 50,000	$ 50,000
		UV (raising of unit)	1	$ 20,000	$ 20,000
		Subtotal			$ 968,000
		Contingency	20%		$ 193,600
		Design/Permit/CA&CM	20%		$ 193,600
		TOTAL			***$ 1,355,200***
Intermeidate Term (6-10 years	WWTP	Additional Decant Tank*	1	$ 875,000	$ 875,000
		Effluent Polishing Filter*	1	$ 900,000	$ 900,000
		New UV Disinfection System*	1	$ 675,000	$ 675,000
		Hardening (major)			
		Main Control Bldg	1	$ 250,000	$ 250,000
		Influent PS Retrofit (convert to submersible)	1	$ 250,000	$ 250,000
		Subtotal			$ 2,450,000
		Contingency	20%		$ 490,000
		Design/Permit/CA&CM	25%		$ 735,000
		TOTAL			***$ 3,675,000***
Long Term (11-20 years)	WWTP Outfall	Relocate Outfall			
		Effluent Pump Station	1	$ 400,000	$ 400,000
		HDD Force Main to new outfall location*	1,500	$ 1,250	$ 1,875,000
		Subtotal			$ 2,275,000
		Contingency	20%		$ 455,000
		Design/Permit/CA&CM	25%		$ 682,500
		TOTAL			***$ 3,412,500***
	WWTP	Relcoate WWTP			
		New WWTP Facility*	250,000	$ 137	$ 34,250,000
		Force Main to new WWTP	8,000	$ 600	$ 4,800,000
		New Pump Station to new WWTP	1	$ 5,000,000	$ 5,000,000
		Subtotal			$ 44,050,000
		Contingency	20%		$ 8,810,000
		Design/Permit/CA&CM	20%		$ 8,810,000
		TOTAL			***$ 61,670,000***

*Mid-points of estimates in text used.

10. Summary of Next Steps

1. Complete design of sewer expansion areas (Sewershed K and L).
2. Prepare Map & Plan for the sewering of Sewersheds K and L.
3. Conduct public outreach and informational meetings on Sewer Master Plan and proposed expansions of sewer service areas.
4. Notify NYSEC and SCDHS on intentions to expand sewer service areas.
5. Identify and procure financing to install new sewers in Sewersheds K and L.
6. Continue to determine the best course of action for improving wastewater management in the remaining sewersheds having highest priority.
    a. Continue the discussion of options for connecting highly ranked sewersheds to WWTP (either the entire sewershed or portions that would deliver the greatest impact).
        i. With gravity pipes and pump stations
        ii. With low-pressure sewers
    b. Continue to update available capacity at the WWTP
    c. Discuss options for decentralized treatment areas
        i. Treat wastewater with County approved I/A system(s)
        ii. Treat/transfer wastewater with/at communal sized treatment units
        iii. Consideration of connecting Elementary and/or High School to either the WWTP or I/A system
7. Sewage Collection System Improvements
    a. Prepare contract documents for the procurement of a qualified contractor to perform repairs to the sewer system.
    b. Lining of the entire collection system should be considered.
    c. Investigate grant opportunities for sewer lining.
8. Wastewater Treatment Plant
    a. Design and install storm hardening measures for Main Control Building.
    b. Prepare Engineering Design Report for short term improvements described in Section 9.
    c. Commence investigations of alternative sites for WWTP relocation.

APPENDIX A

Sewershed Checklist

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**A**				
Total Parcel Acreage	**29.10**				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	~~Havens Beach~~	**Ninevah Beach**	
Town located in	**East Hampton**	~~Southampton~~			
Zoning Classifications	**R20**				
No. Single Family Residences	**68**				
No. of Multi-Family	**0**				
No. of Commercial Properties	**0**				
No. Buildable Vacant Residential Properties	**2**				
Estimated Existing Residential Sewage[1]	**20,400**	Gallons Per Day			
Estimated Residential Nitrogen[2]	**11.084**	Pounds per Day			
Estimated Commercial Sewage[3]	**0**	Gallons Per Day			
Estimated Commercial Nitrogen[4]	**0.0000**	Pounds per Day			
Estimated Nitrogen Quantity per Acre	**0.381**	Pounds per Day per Acre			
Distance to Nearest SSA	**5,700**	Linear Feet			
Min Depth to Groundwater	**4**	Feet			
Max Depth to Groundwater	**58**	Feet			
Arithmetic Average	**31**	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	**0-2**	Years	61	22.37083	
	2-5	Years			
	~~5-10~~	Years			
	~~10-25~~	Years			
	~~25-50~~	Years			
	total non-vacant etc... parcels		69	26.37661	

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3 - based on existing uses and SCDHS wastewater flow generation rates
4 - uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	B				
Total Parcel Acreage	50.63				
Receiving Water		~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
		~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in		**East Hampton**	~~Southampton~~		
Zoning Classifications	R20				
No. Single Family Residences	116				
No. of Multi-Family	0				
No. of Commercial Properties	0				
No. Buildable Vacant Residential Properties	1				
Estimated Existing Residential Sewage[1]	34,800	Gallons Per Day			
Estimated Residential Nitrogen[2]	18.908	Pounds per Day			
Estimated Commercial Sewage[3]	0	Gallons Per Day			
Estimated Commercial Nitrogen[4]	0.0000	Pounds per Day			
Estimated Nitrogen Quantity per Acre	0.373	Pounds per Day per Acre			
Distance to Nearest SSA	5,000	Linear Feet			
Min Depth to Groundwater	5	Feet			
Max Depth to Groundwater	51	Feet			
Arithmetic Average	28	Feet			

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	106	31.62411
	2-5	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		116	34.45111

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3 - based on existing uses and SCDHS wastewater flow generation rates
4 - uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**C**			
Total Parcel Acreage	**58.13**			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~		
Zoning Classifications		**R20**		

No. Single Family Residences	**150**	
No. of Multi-Family	**0**	
No. of Commercial Properties	**2**	
No. Buildable Vacant Residential Properties	**3**	
Estimated Existing Residential Sewage[1]	**45,000**	Gallons Per Day
Estimated Residential Nitrogen[2]	**24.45**	Pounds per Day
Estimated Commercial Sewage[3]	**288**	Gallons Per Day
Estimated Commercial Nitrogen[4]	**0.1081**	Pounds per Day
Estimatedl Nitrogen Quantity per Acre	**0.422**	Pounds per Day per Acre
Distance to Nearest SSA	**3,000**	Linear Feet
Min Depth to Groundwater	**2**	Feet
Max Depth to Groundwater	**68**	Feet
Arithmetic Average	**35**	Feet

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	136	46.19964
	2-5	Years		
	~~**5-10**~~	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc… parcels		152	50.65264

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**D**			
Total Parcel Acreage	**34.61**			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~		
Zoning Classifications	**R20**			

No. Single Family Residences	**63**			
No. of Multi-Family (as SFE)	**0**			
No. of Commercial Properties	**0**			
No. Buildable Vacant Residential Properties	**1**			
Estimated Existing Residential Sewage[1]	**18,900**	Gallons Per Day		
Estimated Existing Residential Nitrogen[2]	**10.269**	Pounds per Day		
Estimated Commercial Sewage[3]	**0**	Gallons Per Day		
Estimated Commercial Nitrogen[4]	**0.0000**	Pounds per Day		
Estimated Nitrogen Quantity per Acre	**0.297**	Pounds per Day per Acre		
Distance to Nearest SSA	**4,800**	Linear Feet		
Min Depth to Groundwater	**4**	Feet		
Max Depth to Groundwater	**101**	Feet		
Arithmetic Average	**52.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	~~0-2~~	Years	0	0
	2-5	Years		
	5-10	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc… parcels		63	31.74949

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**E**			
Total Parcel Acreage	**65.41**			
Receiving Water	**Otter Pond**	**Morris Cove**	**Upper Sag Harbor**	~~Ligonee Brook~~
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	**Southampton**		

Zoning Classifications	**R20**	
No. Single Family Residences	**110**	
No. of Multi-Family (in SFE)	**25**	
No. of Commercial Properties	**4**	
No. Buildable Vacant Residential Properties	**1**	
Estimated Existing Residential Sewage[1]	**40,500**	Gallons Per Day
Estimated Existing Residential Nitrogen[2]	**22.005**	Pounds per Day
Estimated Commercial Sewage[3]	**1,523**	Gallons Per Day
Estimated Commercial Nitrogen[4]	**0.5714**	Pounds per Day
Estimated Nitrogen Quantity per Acre	**0.345**	Pounds per Day per Acre
Distance to Nearest SSA	**1,040**	Linear Feet
Min Depth to Groundwater	**2**	Feet
Max Depth to Groundwater	**34**	Feet
Arithmetic Average	**18**	Feet

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	103	44.05121
	2-5	Years		
	5-10	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc... parcels		127	57.23965

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**F**			
Total Parcel Acreage	**76.48**			
Receiving Water	~~Otter Pond~~	**Morris Cove**	**Upper Sag Harbor**	**Ligonee Brook**
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	**Southampton**		

Zoning Classifications	**R20**			
No. Single Family Residences	**110**			
No. of Multi-Family (as SFE)	**18**			
No. of Commercial Properties	**1**			
No. Buildable Vacant Residential Properties	**4**			
Estimated Existing Residential Sewage[1]	**38,400**	Gallons Per Day		
Estimated Existing Residential Nitrogen[2]	**20.864**	Pounds per Day		
Estimated Commercial Sewage[3]	**138**	Gallons Per Day		
Estimated Commercial Nitrogen[4]	**0.0518**	Pounds per Day		
Estimated Nitrogen Quantity per Acre	**0.273**	Pounds per Day per Acre		
Distance to Nearest SSA	**2,440**	Linear Feet		
Min Depth to Groundwater	**2**	Feet		
Max Depth to Groundwater	**27**	Feet		
Arithmetic Average	**14.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	114	65.5847
	2-5	Years		
	~~**5-10**~~	Years		
	~~**10-25**~~	Years		
	~~**25-50**~~	Years		
	total non-vacant etc... parcels		122	69.96035

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**G**					
Total Parcel Acreage	**53.26**					
Receiving Water	~~Otter Pond~~	**Morris Cove**		**Upper Sag Harbor**	~~Ligonee Brook~~	
	Sag Harbor Cove	~~Sag Harbor Bay~~		~~Havens Beach~~	~~Ninevah Beach~~	
Town located in	~~East Hampton~~	**Southampton**				
Zoning Classifications		**R20, WF**				
No. Single Family Residences		**121**				
No. of Multi-Family (as SFE)		**4**				
No. of Commercial Properties		**1**				
No. Buildable Vacant Residential Properties		**2**				
Estimated Residential Sewage[1]		**37,500**	Gallons Per Day			
Estimated Residential Nitrogen[2]		**20.375**	Pounds per Day			
Estimated Commercial Sewage[3]		**600**	Gallons Per Day			
Estimated Commercial Nitrogen[4]		**0.2252**	Pounds per Day			
Estimated Nitrogen Quantity per Acre		**0.387**	Pounds per Day per Acre			
Distance to Nearest SSA		**1,325**	Linear Feet			
Min Depth to Groundwater		**4**	Feet			
Max Depth to Groundwater		**35**	Feet			
Arithmetic Average		**19.5**	Feet			
				No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water		**0-2**	Years	76	34.48715	
		~~**2-5**~~	Years			
		~~**5-10**~~	Years			
		~~**10-25**~~	Years			
		~~**25-50**~~	Years			
		total non-vacant etc… parcels		124	51.47366	

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	H			
Total Parcel Acreage	35.41			
Receiving Water	~~Otter Pond~~	Morris Cove	Upper Sag Harbor	~~Ligonee Brook~~
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	Southampton		
Zoning Classifications	R20, WF			

No. Single Family Residences	75			
No. of Multi-Family (as SFE)	12			
No. of Commercial Properties	2			
No. Buildable Vacant Residential Properties	1			
Estimated Residential Sewage[1]	26,100	Gallons Per Day		
Estimated Residential Nitrogen[2]	9.454	Pounds per Day		
Estimated Commercial Sewage[3]	756	Gallons Per Day		
Estimated Commercial Nitrogen[4]	0.2837	Pounds per Day		
Estimatedl Nitrogen Quantity per Acre	0.275	Pounds per Day per Acre		
Distance to Nearest SSA	Borders	Linear Feet		
Min Depth to Groundwater	5	Feet		
Max Depth to Groundwater	14	Feet		
Arithmetic Average	9.5	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	0-2	Years	80	30.45545
	~~2-5~~	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		83	32.08145

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	I			
Total Parcel Acreage	48.05			
Receiving Water	Otter Pond	Morris Cove	Upper Sag Harbor	~~Ligonee Brook~~
	Sag Harbor Cove	Sag Harbor Bay	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	~~East Hampton~~	Southampton		

Zoning Classifications	R20			
No. Single Family Residences	147			
No. of Multi-Family (as SFE)	57			
No. of Commercial Properties*	5	*(2 chruches, library,2 museums)		
No. Buildable Vacant Residential Properties	0			
Estimated Residential Sewage[1]	61,200	Gallons Per Day		
Estimated Residential Nitrogen[2]	33.252	Pounds per Day		
Estimated Commercial Sewage[3]	7,018	Gallons Per Day		
Estimated Commercial Nitrogen[4]	2.6339	Pounds per Day		
Estimated Nitrogen Quantity per Acre	0.747	Pounds per Day per Acre		
Distance to Nearest SSA	Borders	Linear Feet		
Min Depth to Groundwater	5	Feet		
Max Depth to Groundwater	41	Feet		
Arithmetic Average	23	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	0-2	Years	48	16.44486
	2-5	Years		
	5-10	Years		
	10-25	Years		
	25-50	Years		
	total non-vacant etc... parcels		179	47.67442

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	J				
Total Parcel Acreage	55.36				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	~~Havens Beach~~	~~Ninevah Beach~~	
Town located in	**East Hampton**	~~Southampton~~			
Zoning Classifications		**R20**			
No. Single Family Residences		115			
No. of Multi-Family(as sfe)		2			
No. of Commercial Properties		5			
No. Buildable Vacant Residential Properties		1			
Estimated Residential Sewage[1]		35,100	Gallons Per Day		
Estimated Residential Nitrogen[2]		19.071	Pounds per Day		
Estimated Commercial Sewage[3]		6,840	Gallons Per Day		
Estimated Commercial Nitrogen[4]		2.5671	Pounds per Day		
Estimated Nitrogen Quantity per Acre		0.391	Pounds per Day per Acre		
Distance to Nearest SSA		230	Linear Feet		
Min Depth to Groundwater		0	Feet		
Max Depth to Groundwater		44	Feet		
Arithmetic Average		22	Feet		

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	120	53.99243
	~~2-5~~	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		120	53.99243

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	K				
Total Parcel Acreage	10.62				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~	
	Sag Harbor Cove	~~Sag Harbor Bay~~	~~Havens Beach~~	~~Ninevah Beach~~	
Town located in	~~East Hampton~~	Southampton			

Zoning Classifications	R20, VB, OD			
No. Single Family Residences	27			
No. of Multi-Family (as SFE)	4			
No. of Commercial Properties*	8		* inc. apt complex of 5 apts	
No. Buildable Vacant Residential Properties	1			
Estimated Residential Sewage[1]	10,800	Gallons Per Day		
Estimated Residential Nitrogen[2]	5.904	Pounds per Day		
Estimated Commercial Sewage[3]	1,546	Gallons Per Day		
Estimated Commercial Nitrogen[4]	0.5802	Pounds per Day		
Estimated Nitrogen Quantity per Acre	0.611	Pounds per Day per Acre		
Distance to Nearest SSA	borders	Linear Feet		
Min Depth to Groundwater	0	Feet		
Max Depth to Groundwater	8	Feet		
Arithmetic Average	4	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	0-2	Years	37	7.59792
	2-5	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc… parcels		44	7.59792

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	L			
Total Parcel Acreage	8.27			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	~~Havens Beach~~	~~Ninevah Beach~~
Town located in	**East Hampton**	**Southampton**		

Zoning Classifications	**R20, VB, WF**	
No. Single Family Residences	**25**	
No. of Multi-Family (as SFE)	**3**	
No. of Commercial Properties	**5**	
No. Buildable Vacant Residential Properties	**0**	
Estimated Residential Sewage[1]	**8,400**	Gallons Per Day
Estimated Residential Nitrogen[2]	**4.564**	Pounds per Day
Estimated Commercial Sewage[3]	**1,412**	Gallons Per Day
Estimated Commercial Nitrogen[4]	**0.5299**	Pounds per Day
Estimated Nitrogen per Acre	**0.616**	Pounds per Day per Acre
Distance to Nearest SSA	**borders**	Linear Feet
Min Depth to Groundwater	**4**	Feet
Min Depth to Groundwater	**14**	Feet
Arithmetic Average	**9**	Feet

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	31	6.83197
	~~2-5~~	Years		
	~~5-10~~	Years		
	~~10-25~~	Years		
	~~25-50~~	Years		
	total non-vacant etc... parcels		31	6.83197

Notes:

1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**M**			
Total Parcel Acreage	**31.76**			
Receiving Water	~~Otter Pond~~	~~Morris Cove~~	~~Upper Sag Harbor~~	~~Ligonee Brook~~
	~~Sag Harbor Cove~~	**Sag Harbor Bay**	**Havens Beach**	~~Ninevah Beach~~
Town located in	**East Hampton**	~~Southampton~~		

Zoning Classifications	**R20**			
No. Single Family Residences	**77**			
No. of Multi-Family	**0**			
No. of Commercial Properties	**0**			
No. Buildable Vacant Residential Properties	**0**			
Estimated Residential Sewage[1]	**23,100**	Gallons Per Day		
Estimated Residential Nitrogen[2]	**12.551**	Pounds per Day		
Estimated Commercial Sewage[3]	**0**	Gallons Per Day		
Estimated Commercial Nitrogen[4]	**0**	Pounds per Day		
Estimated Nitrogen Quantity per Acre	**0.395**	Pounds per Day per Acre		
Distance to Nearest SSA	**borders**	Linear Feet		
Min Depth to Groundwater	**28**	Feet		
Min Depth to Groundwater	**123**	Feet		
Arithmetic Average	**75.5**	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	**0-2**	Years	19	8.9185
	2-5	Years		
	5-10	Years		
	10-25	Years		
	~~25-50~~	Years		
	total non-vacant etc… parcels		77	29.39968

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	**N**			
Total Parcel Acreage	**55.39**			
Receiving Water	**Otter Pond**	**Morris Cove**	**Upper Sag Harbor**	**Ligonee Brook**
	Sag Harbor Cove	**Sag Harbor Bay**	**Havens Beach**	**Ninevah Beach**
Town located in	**East Hampton**	**Southampton**		
Zoning Classifications	**R20**			

No. Single Family Residences	**93**	
No. of Multi-Family (as SFE)	**2**	
No. of Commercial Properties	**0**	
No. Buildable Vacant Residential Properties	**0**	
Estimated Residential Sewage[1]	**28,500**	Gallons Per Day
Estimated Residential Nitrogen[2]	**15.485**	Pounds per Day
Estimated Commercial Sewage[3]	**0**	Gallons Per Day
Estimated Commercial Nitrogen[4]	**0**	Pounds per Day
Estimated Nitrogen Quantity per Acre	**0.280**	Pounds per Day per Acre
Distance to Nearest SSA	**3,000**	Linear Feet
Min Depth to Groundwater	**6**	Feet
Min Depth to Groundwater	**80**	Feet
Arithmetic Average	**43**	Feet

			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	~~0-2~~	Years	0	0
	2-5	Years		
	5-10	Years		
	10-25	Years		
	25-50	Years		
total non-vacant etc… parcels			94	51.07493

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	O				
Total Parcel Acreage	41.58				
Receiving Water	~~Otter Pond~~	~~Morris Cove~~		~~Upper Sag Harbor~~	~~Ligonee Brook~~
	Sag Harbor Cove	Sag Harbor Bay		Havens Beach	~~Ninevah Beach~~
Town located in	East Hampton	Southampton			
Zoning Classifications	R20				
No. Single Family Residences	147				
No. of Multi-Family (as SFE)	11				
No. of Commercial Properties	5				
No. Buildable Vacant Residential Properties	1				
Estimated Residential Sewage[1]	47,400	Gallons Per Day			
Estimated Residential Nitrogen[2]	25.754	Pounds per Day			
Estimated Commercial Sewage[3]	1,465	Gallons Per Day			
Estimated Commercial Nitrogen[4]	0.550	Pounds per Day			
Estimated Nitrogen Quantity per Acre	0.633	Pounds per Day per Acre			
Distance to Nearest SSA	500	Linear Feet			
Min Depth to Groundwater	5	Feet			
Min Depth to Groundwater	76	Feet			
Arithmetic Average	40.5	Feet			
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)	
Travel Time to Surface Water	0-2	Years	77	19.3475	
	2-5	Years			
	5-10	Years			
	10-25	Years			
	25-50	Years			
	total non-vacant etc… parcels		160	40.58671	

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

Village of Sag Harbor
Sewershed Checklist

Sewershed ID	P			
Total Parcel Acreage	61.76			
Receiving Water	Otter Pond	Morris Cove	Upper Sag Harbor	Ligonee Brook
	Sag Harbor Cove	Sag Harbor Bay	Havens Beach	Ninevah Beach
Town located in	East Hampton	Southampton		

Zoning Classifications	R20			
No. Single Family Residences	142			
No. of Multi-Family (as SFE)	26			
No. of Commercial Properties	2			
No. Buildable Vacant Residential Properties	8			
Estimated Residential Sewage[1]	50,400	Gallons Per Day		
Estimated Residential Nitrogen[2]	27.384	Pounds per Day		
Estimated Commercial Sewage[3]	675	Gallons Per Day		
Estimated Commercial Nitrogen[4]	0.253	Pounds per Day		
Estimated Nitrogen Quantity per Acre	0.447	Pounds per Day per Acre		
Distance to Nearest SSA	1,500	Linear Feet		
Min Depth to Groundwater	8	Feet		
Min Depth to Groundwater	44	Feet		
Arithmetic Average	26	Feet		
			No. of Parcels (ex. Vacant, roads, cemetaries, parks, conserv lands, pkg)	Parcel Area (Acres)
Travel Time to Surface Water	0-2	Years	0	0
	2-5	Years		
	5-10	Years		
	10-25	Years		
	25-50	Years		
	total non-vacant etc... parcels		156	53.93328

Notes:
1 - uses 300 gpd for SFE
2 - SFE with N of 65 mg/L = 0.163 #/N/day
3- based on existing uses and SCDHS wastewater flow generation rates
4-uses 45 mg/L (typical influent TN conc at the Sag Harbor wastewater treatment facility)

	Sewershed Characteristics	OWTS Effluent (G/W) Direction		Density of Nitrogen (lbs/day/acre)		High Groundwater: Arith. Avg Depth to GW (ft)		Percent of Non-Vacant Parcel Area in 0-2 yr G/W Contributing Area		No. of Bldgs (2006) in or within 10 ft of Very Poor Drained Soils		Totals:
	Weighting	*(unweighted)*	**25%**	*(unweighted)*	**40%**	*(unweighted)*	**15%**	*(unweighted)*	**10%**	*(unweighted)*	**10%**	**100%**
Sewershed Area	A	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	2	**0.2**	**1.7**
	B	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	C	*1*	**0.25**	*2*	**0.8**	1	**0.15**	3	**0.3**	1	**0.1**	**1.6**
	D	*1*	**0.25**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1**
	E	*3*	**0.75**	*2*	**0.8**	2	**0.3**	3	**0.3**	2	**0.2**	**2.35**
	F	*3*	**0.75**	*1*	**0.4**	2	**0.3**	3	**0.3**	3	**0.3**	**2.05**
	G	*3*	**0.75**	*2*	**0.8**	2	**0.3**	2	**0.2**	2	**0.2**	**2.25**
	H	*3*	**0.75**	*1*	**0.4**	3	**0.45**	3	**0.3**	2	**0.2**	**2.1**
	I	*2*	**0.5**	*3*	**1.2**	2	**0.3**	2	**0.2**	1	**0.1**	**2.3**
	J	*1*	**0.25**	*2*	**0.8**	2	**0.3**	3	**0.3**	1	**0.1**	**1.75**
	K	*3*	**0.75**	*3*	**1.2**	3	**0.45**	3	**0.3**	3	**0.3**	**3**
	L	*1*	**0.25**	*3*	**1.2**	3	**0.45**	3	**0.3**	1	**0.1**	**2.3**
	M	*1*	**0.25**	*2*	**0.8**	1	**0.15**	1	**0.1**	1	**0.1**	**1.4**
	N	*2*	**0.5**	*1*	**0.4**	1	**0.15**	1	**0.1**	1	**0.1**	**1.25**
	O	*1*	**0.25**	*3*	**1.2**	1	**0.15**	2	**0.2**	1	**0.1**	**1.9**
	P	*2*	**0.5**	*2*	**0.8**	2	**0.3**	1	**0.1**	2	**0.2**	**1.9**
Scales	**3**	Inner		**0.6** - +		**0** - 10		**67%** - +		**9** - +		
	2	Inner & Outer		**0.3** - 0.6		**10** - 30		**33%** - 67%		**0** - 9		
	1	Outer		**0** - 0.3		**30** - +		**0%** - 33%		- 0		

APPENDIX B

Draft Concept for
Village Wastewater Management Plan

VILLAGE OF SAG HARBOR

VILLAGE-WIDE WASTEWATER MANAGEMENT PLAN

For

PROTECTION OF VILLAGE WATERS

Concept Document

Prepared For

VILLAGE OF SAG HARBOR SEWER COMMITTEE

Prepared By

Cameron Engineering & Associates, LLP

January 2022

Cameron Engineering, & Associates, LLP

TABLE OF CONTENTS

TABLE OF TABLES

1. Overview

On-site wastewater treatment systems (OWTS) are largely responsible for nitrogen pollution to groundwater and surface waters. This is the case in Suffolk County with only 25% of its population served by sewers and the balance (75%) relying on OWTS. This is also the case in the Village of Sag Harbor as only 13% of the parcels in the Village are connected to the Village's Wastewater Treatment Plant (WWTP) with the balance of the Village's property owners relying on OWTS. The Village's WWTP is the cornerstone of the Village's management efforts to protect its local surface waters and maintain a vibrant downtown commercial center that is the economic engine of the Village.

All properties inside the Village of Sag Harbor boundaries are within its "Sewerage System". Only those properties that are within the seven (7) "Sewer Service Areas," have the ability and are required to connect to the sewer system that transport collected wastewater down to Village's wastewater treatment plant (WWTP) for processing. Presently, only 295 Village parcels out of a total of 2,210 are connected to the sewer service areas. The remaining parcels in the "sewerage system" are considered to be in the "non-service areas," which are serviced by privately owned on-site wastewater treatment systems. The Village does not have a 'sewer district' that is common in other parts of the County.

Sewering all the parcels within the Village of Sag Harbor is impractical, costly, and may not be necessary. The Sewer Master Plan recommends measures to prioritize areas and conditions for identifying specific areas that require either sewering or upgrading of existing OWTS. Recommendations in the Master Plan may lead to sewering of specific areas to maximize available treatment capacity.

A key component of the Sewer Master Plan is to identify to how best manage the on-site wastewater treatment systems (OWTS) that are used by the majority of the Village's residents. As previously noted, the entire Village is designated a Sewerage System with a total of seven (7) Sewer Service Areas (SSA) that are connected to the WWTP. The Village's wastewater collection system repair and maintenance and the Village's Wastewater Treatment Plan (WWTP) Operation and Maintenance (O&M) costs are paid for solely by those property owners that are connected to the sewer system and are located within an SSA. Better protection of groundwater and surface waters of the Village would be possible if all property owners contributed to the costs of maintaining and upgrading the Village's wastewater infrastructure as well as the improving and upgrading OWTS owned by the Village's residents. By establishing a steady revenue stream, needed repairs to the existing sewer system and treatment plant will fortify the front line of defense for protection of the Village's surface waters. The additional revenue stream will allow for the Village to focus on how best to fund improvements to the unsewered areas of the Village as well as assisting its residents in the proper operations and maintenance of their OWTS.

The protection of the Village's ground and surface waters is critical to the vitality and economy of the Village. This concept document examines the potential benefits of a Village-wide wastewater management program that includes all property owners; sewered and unsewered, participating in an equitable wastewater management program that could help improve and protect the quality of the Village's ground and surface waters. As of the Village's property owners benefit either directly or indirectly from clean waters, it is fair and reasonable to expect all residents (property owners) to participate in improving and managing the wastewater generated within its boundaries.

2. Wastewater *Management Benefits All*

Quality wastewater treatment can be in the form of both sewering and the use of Innovative/Alternative (I/A) systems by the residents and businesses located in the Village. The Village's WWTP removes 90 percent of the nitrogen from wastewater it receives and treats from the sewer service areas serving the Village's downtown area thereby helping to protect the quality of groundwater and surface water. Nitrogen from onsite wastewater treatment systems (OWTS) located in most areas of the Village, is believed to be primary contributor to the impaired water quality of the Village's inner harbor and outlying beach areas. Impairment of the Village's water bodies by excess Nitrogen has been confirmed by SUNY Stony Brook Center for Clean Water Technology, Dr. Christopher Gobler's report entitled *"Assessment of Water Quality in Marine Waters Surrounding Sag Harbor Village, 2018-2019"* and is well documented in Suffolk County's most recent study "*Subwatershed Management Plan (July 2020)"* that evaluated all surface water impairments in Suffolk County.

The Village's sewers make it possible to preserve the viability of Village's downtown and waterfront area with its mixed residential, business, retail, and commercial uses. Redevelopment of existing connected properties are made possible by the Village's sewers and treatment plant. The Village's vibrant downtown draws people and tourists from outside the Village to partake in the dining, commercial, recreational, and cultural offerings of the Village thereby contributing to the overall economy of the Village. This is only possible by the presence of the Village's sewer system and wastewater treatment plant.

3. Designate Critical Areas (Sewersheds)

Designate Critical Areas for Expanding Sewers, New Sewers or for Onsite System Upgrades

The environmental impacts of OWTS are clear – they remove only 35 percent of wastewater nitrogen, whereas the Village's WWTP removes 90 percent or more of the incoming nitrogen. Because sewering is expensive and the entire Village cannot be connected due to limited excess capacity, 'Critical Areas' must be given priority by the Village. 'Critical Areas' are: 1) dense unsewered areas where groundwater flows to impaired waters; 2) low lying areas where high groundwater may preclude the proper operation of OWTS; 3) near-shore properties whose OWTS contributes pathogens directly to surface waters; and 4) unsewered areas that drain to 'ecologically sensitive' waterbodies. These critical areas have been identified by their respective and specific sewershed in the Sewer Master Plan.

The Village has delineated unsewered groundwater contributing areas (sewersheds) that discharge to impaired waterbodies. Sewersheds with the highest residential densities (small lot sizes that exceed the density requirements regulated by SCDHS) would be priority candidates. Low-lying properties (depth to groundwater 10 feet or less) likely have OWTS in non-compliance with SCDHS regulations. These OWTS may not function properly and most likely contribute high pathogen and nitrogen loading to the Village's local waters. Low-lying properties that do not meet SCDHS standards should be required to 1) install holding tanks in place of OWTS that would be regularly pumped out or 2) install an 'Innovative & Alternative (I&A) system' that provides substantially greater nitrogen and pathogen removal or 3) connect to either a communal scale or the Village's sewer system. The same requirements should apply to properties with OWTS within 100 feet of surface water to reduce pathogen transmission to surface waters. The Village has revised its Sewer Code that identifies the conditions that when present, require the parcel owner to upgrade the existing conventional OWTS to an I/A treatment system. To date, there are almost two (2) dozen I/A treatment systems either installed or approved for installation at various locations within the Village.

The Master Plan discusses the consideration when practical, of the use of these advanced treatment systems on a communal scale rather than individual residential units. Site selection process for communal scale treatment systems would need to be undertaken to identify potential sites having suitable characteristics such as size, buffer, depth to groundwater, proximity to wastewater generators, zoning, and parcel ownership.

4. Inventory, Inspect, Upgrade, and Maintain Onsite Wastewater Systems

4.1. Strengthen Requirements for Onsite Wastewater Treatment Systems

Under a Village-wide management plan, Village code would require an inspection of OWTS installations by qualified personnel or firms for new home and commercial constructions as well as building additions that require a Building Department permit. Village Building Code (Section 92) provides detail on when an Innovative & Alternative wastewater treatment system is required. Examples include the substantial upgrade of the existing OWTS that would cost more than 50% of the current system. Other conditions triggering the requirement of an I&A treatment system be installed include:

- All new construction permits
- Substantial upgrade of existing OWTS
- Increase of more than 25% of floor area
- Required by the Village's Harbor Committee
- Non-residential properties

The Village's Building Department Code also provides extensive information on the requirements pertaining to the participation and approval of the Suffolk County Department of Health Services that must be obtained prior to the issuance of the Village's Building Department permit.

Another consideration is to require that all OWTS systems should be required to conform to SCDHS requirements prior to ownership transfer. Such a program would assure buyers of old, new and substantially remodeled homes that the OWTS conforms to current SCDHS requirements.

4.2. Establish an Onsite Wastewater Treatment System Inspection Program

It is believed that many of the older homes located within the Village have cesspools rather than the more effective septic systems required by SCDHS after 1972. The newer septic tank systems still have very limited removal efficiencies but are superior to the earlier vintage cesspools. Other properties may have undersized OWTS systems and still others may have either failed or failing systems because they have not regularly pumped the solids out of the system or have leaching pools with clogged soils. In a Village-wide management plan, all OWTS would be inspected to ensure that they are functioning as well as possible and are not endangering public health or creating environmental impairment. Inspecting all the estimated more than 1,900 OWTS in the Village is a large task. Consequently, inspections would begin in areas located by GIS analysis inside 'Critical Areas' identified in the Master Plan, followed by the inspection of OWTS systems of older homes. A septic system inspection should also be part of all property transfers within the Village. If Village does not have sufficient resources to conduct the inspections, it could consider contracting with one or more private firms to inventory and inspect all high priority OWTS. The Village's Superintendent of Public Works would monitor the private service and inspect those OWTS recommended by the private firm for significant upgrades, replacement with an I/A or an emergency connection to the sewer system if technically feasible. The inspection program would be paid for by a Village-wide wastewater management fee (see below). The Village Sewer Code would be updated to require inspection of OWTS installations as part of the Building Department's inspection program for all properties, except those constructed within five (5) years of the code change. The inspection would determine whether all the elements of the installation conform to SCDHS requirements. A copy of the SCDHS inspection report could be used for properties constructed within five years of the code change. Subsequent inspections would be conducted for all properties with a frequency dependent on water usage with a maximum time frame of five years between inspections.

4.3. Require Onsite Wastewater Treatment System Pump-Outs

The Village, under a Village-wide Wastewater Management Plan, would institute a requirement for regular OWTS pump-outs with a frequency based on water consumption or on the number of bedrooms for residential properties, bathrooms for commercial office and dry retail properties, and seats for bars and restaurants should they be served by an OWTS. Additional maintenance requirements such as grease trap maintenance and leaching pool replacement should be based on the results of regular inspections. Alternatively, inspectors/Village could determine pump-out frequency based on guidelines and specific property conditions. Pump-outs and other maintenance should be provided at no cost to the property owner, as the costs would be covered by a Village-wide wastewater or sewage management fee. Contracts should be negotiated between the Village and licensed private septage carters for pump-outs and transport to regional wastewater treatment plants (i.e., Riverhead or Bergen Point) for proper disposal. The Village could initiate a pump-out requirement with a start date that allows for the identification and securing of capacity at existing or new septage receiving facilities if necessary. An RFP would be issued to secure a contract between the Village and licensed private septage haulers for proper disposal of the solids. The Village could establish a septage manifest tracking system and require carters to submit completed forms to the Village's Department of Public Works.

Pump-outs and inspections would be covered by fees collected from the program.

4.4. Consider Advanced Onsite Wastewater Treatment Systems

The Village has added language to its Building Department Code on the requirements and thresholds triggering the need to install an Innovative/Alternative wastewater treatment system. These new County approved I/A treatment systems have the ability to reduce the total nitrogen concentration to 19 mg/L or less. The Village should engage the SCDHS in a discussion of the Village's plan to promote/require the use of advanced I/A wastewater systems for use in Critical Areas and areas of the Village that are not likely to be connected to the WWTP at any time in the future. The County's I/A program has allowed for more than one-thousand (1,000) of these systems to be installed County-wide on residential parcels. For the majority of these installations, grants were made available by the County and in some cases the local Towns to the homeowners that offset the installation cost by 50-90% of the total cost. Many of these initial installations were for replacement of block cesspools and failed septic tank and leach fields.

The results of the Village's OWTS inspection program may identify those parcels that are served by cesspools. Those OWTS systems comprised of cesspools should be on the top of list for replacement with an I/A if connection to the Village's WWTP is not practical. Use of these I/A systems for *single residential properties* could be confined to these special locations. As noted above, the County is providing grants to replaced failed OWTS systems. Consideration of the use of community-scale treatment plants that could serve several dozen or more homes. In those applications, the systems would need to meet or exceed existing SCDHS effluent limitations requiring a total nitrogen concentration of not greater than 10 mg/L. The Village would need to identify locations for siting of communal sized treatment systems.

5. Establish a Single Village-Wide Wastewater Management District

The Village could establish a single wastewater management district that includes all properties that generate wastewater, whether it is connected to the Village's wastewater collection system or has an OWTS. As the Village "sewerage system" comprises the entire boundaries of the Village already, formation of the "wastewater management district" should be feasible. Single-family property owners with OWTS contribute 5 times more nitrogen on a concentration basis to the environment than residents and businesses that are connected to WWTP. Much of this nitrogen works its way into the Village's local waterways contributing to the degradation and eutrophication of these critical resources. The Village could include all properties in a single wastewater management district so that all owners contribute to the protection of groundwater and local surface waters. All property owners in the single wastewater management district would contribute through an equitable formula-based fee. There are several potential options for having Village residents participate financially. These are discussed in greater detail in Section 6.

A Village-wide wastewater management district would facilitate good planning by designating areas that are appropriate for sewering and those that are not. This effort was initiated in the Sewer Master Plan by establishing sewersheds and ranking them based on environment factors. At this time, the sewersheds having the greatest potential impact on the Village's waters have been identified. The Village's downtown comprised on predominantly commercially zoned parcels is already sewered to a great part. There is additional capacity at the WWTP and how and to whom that capacity is allocated will be important as noted in the Master Plan. Those areas include densely populated areas adjacent to surface waters, properties inside the contributing area of impaired waterbodies, and low-lying areas where high groundwater precludes proper operation of OWTS. The Village should direct future sewer infrastructure improvements when funding is available, to those sewersheds deemed the most critical.

5.1. Evaluate the Condition and Performance of the Village's Wastewater Treatment Plant

The Village's WWTP is now 40 plus years in age. The importance of the Village's WWTP to the protection of the local waters cannot be understated. The WWTP has been well operated and maintained and has an excellent history of performance. As with any wastewater treatment facility, the treatment systems and equipment operate on a 24-hour 7-day per week basis. While the concrete structures have an extended service life in excess of 50 years, the processing equipment has an expected service life in the range of 10-15 years or so depending on the level of duty. Well-maintained equipment and systems can last up to 20 years. The Village must budget reserve funds on an annual basis to replace and upgrade these treatment equipment and components on an as-needed basis. The WWTP's continued high level of performance is critical to the protection of the Village's economic viability as well as its waterways. As all the Village's property owners benefit from the WWTP it is only fair and equitable that all Village residents participate in the funding of the WWTP's capital improvements and annual operations and maintenance O&M costs. The Village-wide "wastewater management district" would provide the mechanism to fund the upgrades and O&M costs of the WWTP.

5.2. Contract with Private Firms to Provide WWTP Services

Management of the Village's WWTP is conducted by Village employees. As Village staff retire and leave the Village's payroll, it will be necessary to hire replacements having the requisite skill sets and certifications. Currently staffing level and supervisory oversight is very good, this situation can change with the loss of one or two individuals. Recruitment of qualified replacement personnel can be a challenge as the Village has to work within the State Civil Service System (Civil Service). Civil Service may have a limited pool of candidates and due to the Village's location on the East End, candidates may not accept the position(s). Should the Village run into a long-term staffing shortage, it may have to consider the option of contracting out the WWTP O&M to a qualified a private firm (contract operator) with the expertise and experience needed to run the facility according to NYSDEC regulations. It is not likely that contract operations would be more cost efficient over the current Village operation as such firms are "for profit" entities. The Village can issue a Request for Proposals (RFP) for the operation and maintenance of the Village's WWTP to ascertain what the interest and cost for private operation would be so as to have that information available. Under a typical contract operations scenario, the Village would retain financial responsibility for capital improvements and facility upgrades.

5.3. Contract with Private Firms to Provide OWTS Services

With a Village-wide wastewater management district, the Village could issue an RFP for a Village-wide OWTS inspection and inventory program to be conducted over several years beginning with designated high-priority locations and with Village oversight. Contracts could be issued with several licensed and insured septage haulers to provide OWTS pump-out services. Village program oversight would be required through a manifest system and periodic inspections.

6. Establish an Equitable Fee Structure for the Village-Wide District

6.1. All Should Contribute Equitably to the Cost of Wastewater Management

As sound wastewater management provides both environmental and economic value to all Village property owners, all should contribute to the program cost. Although all property owners generate wastewater, not all contribute to its management, and those that do, do so inequitably. Presently only those parcels (295) connected to the Village's WWTP are paying for the upkeep and operations of the Village's sewer system and treatment facility. The balance of the properties in the Village (1,915), however, are unsewered and rely on onsite wastewater treatment systems (OWTS). Properties with OWTS contribute four to five times more nitrogen (in concentration) to ground and surface waters than those parcels that are connected to the WWTP.

Wastewater treatment fees to residents and business owners, however, vary widely from zero (OWTS owners) to several hundred or thousands of dollars per year for connected commercial properties. Property owners with onsite wastewater systems pay for pump-outs, repairs, and system replacement on an as-needed basis. These costs are typically only incurred should a problem arise such as a backup in the waste plumbing line or for a poorly functioning system, frequently required system pump-outs. Property owners connected to the Village's wastewater treatment plant pay sewer fees depending on use and water consumption records.

As noted earlier, the cost of sewering the entire Village is too great to be considered a viable option. The costs of maintaining and operating the WWTP being borne solely by the connected parcels is not equitable in that the entire Village benefits from the sewer system and WWTP. It could be argued that the connected parcels enjoy the benefits of sewers by having uses that exceed the SCDHS density requirements such as bars, restaurants, condominiums, etc. and by having sewers they benefit economically. The Village will have an opportunity to distribute the costs of wastewater management equitably to all property owners by creating a sewerage management district that incorporates all properties. As previously noted, the Village's "sewerage system" includes all the parcels located within the Village's boundaries.

6.2. Fee Components for Properties Connected to WWTP

The Village establishes a line-item budget on an annual basis to cover all expenses incurred relating to the sewer system and the WWTP. Some of these expenses include:

- Administration
- Salary and benefits
- Utilities; electric, water, diesel fuel, gas for vehicles
- Sludge hauling and disposal
- Treatment chemicals
- Building and Grounds Maintenance
- Insurances
- Regulatory permits and fees
- Materials and Supplies
- Contracted repairs
- Engineering fees
- Education and Training
- Facility Upgrades

Additionally, a repair-reserve fund is maintained to allow for scheduled or emergency repair work. The parcels connected to the sewer system are responsible for meeting the needs of the annual budget. Presently the Village fee structure that includes three (3) components: 1) a base portion based on Single Family Equivalent; 2) a unit surcharge based on type and size of establishment; 3) a usage-base portion based on SCWA water consumption records. The Village adjusts the rates of these components to meet the projected budget needs of the WWTP. Under a Village-wide wastewater management plan, the Village could incorporate other fee components such as Assessed Valuation to account for the program management, debt service and other services whose cost is not assigned. Assessed Valuation introduces a fairness component and ability to pay consideration.

6.3. Fee Components for Properties with OWTS (conceptual)

Property owners with OWTS would pay a wastewater management fee that could have four components: 1) Base fee, 2) Usage fee, and 3) Fee based on Assessed Value. The fourth component would be based on proximity to groundwater and surface water. The base fee for property owners with OWTS would be higher than the base fee for those connected to WWTP to cover the cost of Village-wide OWTS program administration and inspections and pump-outs. The usage portion of the fee would be based on Single Family Equivalent (300 gpd). Village could consider a sliding scale based on volume of water consumed with larger uses paying a higher fee to reflect increased discharge from the OWTS system.

Those parcels located in Critical Areas as identified in the Master Plan where there is high groundwater and or where the parcel is in proximity to surface waters (i.e., <2-year travel time). These parcels would pay an additional fee to reflect the greater impact to surface waters.

Fees paid by unsewered property owners would cover program administration, first and periodic inspections of systems. As the Village wide program develops, the services could be expanded to include pump-outs of excess solids from the OWTS on a scheduled basis. Portions of fees could also be used to offset/support the cost of sewer system repairs, existing plant operations and maintenance and upgrades to the WWTP to meet regulatory requirements.

6.4. Provide Financial Assistance to Property Owners for OWTS Upgrades

The Village could establish a system to provide some form of financing assistance to economically distressed property owners that are required to upgrade or replace their OWTS. While there is both a County and Town (East Hampton & Southampton) grant program for I/A systems, it is not known how long these grants will be available. A portion of the fees paid into a new Village-wide wastewater management program could be set aside to provide low-interest loans that could be repaid through property tax bills. Alternatively, funding might be supplemented or provided by the State Clean Water Revolving Loan Fund or grants from Suffolk County, Town of East Hampton, Town of Southampton, or other sources. It is recognized that this level of funding may not be available until the program is well established and revenues are available to support these services.

7. Establish the Legal Structure for a Village-Wide Wastewater Management District

The concept of the establishment of a single sewer district for all of Suffolk County has been put forth several times in the last few years. The concept is to have every parcel owner participate in the protection of the County's ground and surface waters. There are an estimated 360,000 parcels that are served by OWTS systems. As the County is only 25% sewered, 75% of the wastewater generated by its residents is treated by OWTS. The goal of a County-wide wastewater management program is to have everyone pay something towards the proper management of wastewater. It has been established that the excess nitrogen from OWTS is the major contributor (>65%) of nitrogen to the County's ground and surface waters and the associated harmful impacts including algae blooms, fish kills, shellfish toxicity and oxygen depletion. The Village has experienced these impacts on its waterways albeit to less intensity than some of the other water bodies within the County.

As the Village Sewer Code has all properties within its legal boundaries included it is "Sewerage System", the mechanism for developing a "Village-wide Wastewater Management District" or similar name should be within existing Village legal authority. A legal determination on the creation of a Village-wide wastewater management district would have to be obtained.

8. Recommendations Summary

The table on the following pages summarizes all the recommendations of this concept document.

Table 8-1. Summary of Recommendations

Form Village-wide sewerage management district	Establish a single 'wastewater management district' including all properties in the Village, either connected to the WWTP and those with OWTS. Contract with qualified and experienced firms to provide inspections and maintenance service for OWTS. Costs of all contracted services to be borne by the Village and paid for through an equitable formula-based Village-wide water quality fee (see below).
Designate Critical Residential Areas	Designate 'Critical Areas' inside of which special wastewater management regulations would apply. These should include subwatersheds or sewersheds where groundwater discharges to impaired waterbodies, dense single-family neighborhoods near the shoreline, and low-lying areas where the depth to groundwater is less than 10 feet and travel time less than 2 years.
Use SCDHS permit data to build Village OWTS inventory in GIS	Village Code should be updated to require that property owners submit a completed inspection report from SCDHS of the OWTS installation for new construction as part of the Building Department's OWTS inventory and inspection program. The Village should digitize the data from the SCDHS permit forms to create a GIS-based inventory of existing residential and commercial OWTS to monitor maintenance and upgrades.
Conduct remote OWTS assessment	Conduct initial Village-wide OWTS assessment with a scan of color infrared satellite images to identify possible failing or failed systems. Field inspect systems thus identified first as they may be contributing disproportionally to water quality deterioration.
Prioritize OWTS for Inspections	Conduct an initial prioritization of all OWTS through a GIS data analysis based on age and location of structure. Properties with SCDHS permits for OWTS installations within five years of the inventory would be exempted by submitted a copy of the permit to the Village. Parcels with I/A systems would also be exempt.
Require inspections for all properties with OWTS except those newly constructed or those with I/A system	The Village would contract with a private firm to inventory and inspect all high-priority OWTS. Inspectors should be state certified or licensed or supervised by a Professional Engineer. The Village would have its own inspector on staff to check on the private service and inspect properties recommended for significant upgrades. Subsequent inspections should be conducted every five years or sooner at the discretion of the inspector/Village. Properties found to have OWTS that do not conform to SCDHS requirements or are otherwise deficient would be reported to the Village for maintenance, replacement, or upgrading with a required follow-up inspection.
Require SCDHS permit submission for building additions and inspection for replacement OWTS	The Village requires that the property owner submit a Building Department permit when performing work on its building or residence. The Village currently has established criteria that sets requirements for replacing OWTS with I/As that is connected to the Building Department permit. Homeowner and business owners must provide any applications to the SCDHS that indicate that an I/A or sewer connection is required. SCDHS approval would be required prior to installation of the approved I/A system.
Require OWTS inspections for property transfers	Require inspections of all properties changing ownership unless they had been inspected within five years of the contract of sale date. Properties found to have deficient OWTS or OWTS that do not meet SCDHS requirements would be reported to the Village for maintenance, replacement, or upgrading with a follow-up inspection by the Village prior to transfer of ownership.

Table 8-2. Summary of Recommendations (cont'd)

Require regular OWTS pump-outs	Require regular OWTS pump-outs with a frequency based on water consumption or on the number of bedrooms for residential properties, bathrooms for commercial office and dry retail properties, and seats for bars and restaurants. Provide financial assistance for pump-outs and other maintenance as part of a town-wide wastewater management fee. Establish a septage manifest tracking system managed by the Village.
Evaluate advanced treatment systems	Engage SCDHS in a discussion of the value of advanced I/A systems for isolated locations in 'Critical Residential Areas' and for community-scale wastewater treatment systems to serve up to 100 properties.
Impose Village-wide water quality fee	Consider small annual 'Water Quality Protection Fee' similar to Maryland's 'Flush Tax' as a mechanism to establish a Village-wide wastewater management program and initiate the prerequisite studies and inventories of OWTS.
Establish Village-wide water quality fee for properties connected to WWTP	Develop Village-wide wastewater fee with four components: 1) base portion for program administration (the 'Water Quality Protection Fee'); 2) usage-based portion, 3) portion based on ability to pay, and 4) portion based on WWTP condition and performance. Base portion would be flat fee for administration. Usage portion, based on water consumption, would encourage conservation and would reduce WWTP capacity requirements. The third component based on property assessed value would account for property owners' ability to pay and the size and type of their land use. The fourth component would help equalize costs of maintaining and upgrading the Village's WWTP.
Add future WWTP debt service to user fee	Incorporate debt service into the wastewater management fee for those property owners currently paying their sewer fee. This fee would be in place for major upgrades and would be discontinued when the debt is retired.
Establish Village-wide wastewater fee for properties with OWTS	Property owners with OWTS would pay a wastewater management fee with three of the same four components as the fee paid by property owners connected to the WWTP: 1) a base fee; 2) a usage fee to encourage water conservation; and 3) a fee based on assessed value. The base fee for property owners with OWTS may be higher than the fee for those connected to the WWTP to cover the cost of Village-wide OWTS inspections and pump-outs and to contribute to wastewater treatment. A fourth component of the fee would be based on proximity to surface waters and groundwater.
Contract out OWTS inspection & inventory	Contract out Village-wide OWTS initial inspection and inventory program to begin with high-priority locations. Incorporate results into Village or County GIS. Would require the program to be in place and a revenue stream established.
Involve all appropriate Village Departments	Assign responsibility for the Village-wide wastewater management program to appropriate Village departments including: Planning, Department of Public Works, Village Attorney and Sewer Committee.
Provide assistance to qualified property owners	Provide financial assistance to economically distressed property owners who are required to upgrade or replace their OWTS if no grant funds are available. Provide low-interest loans from wastewater management program repaid through property tax bills. Alternatively, provide funding through the State Clean Water Revolving Loan Fund loan or other sources such as Suffolk County Water Quality Protection and Restoration program funded through the ¼ cent sales tax program.

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