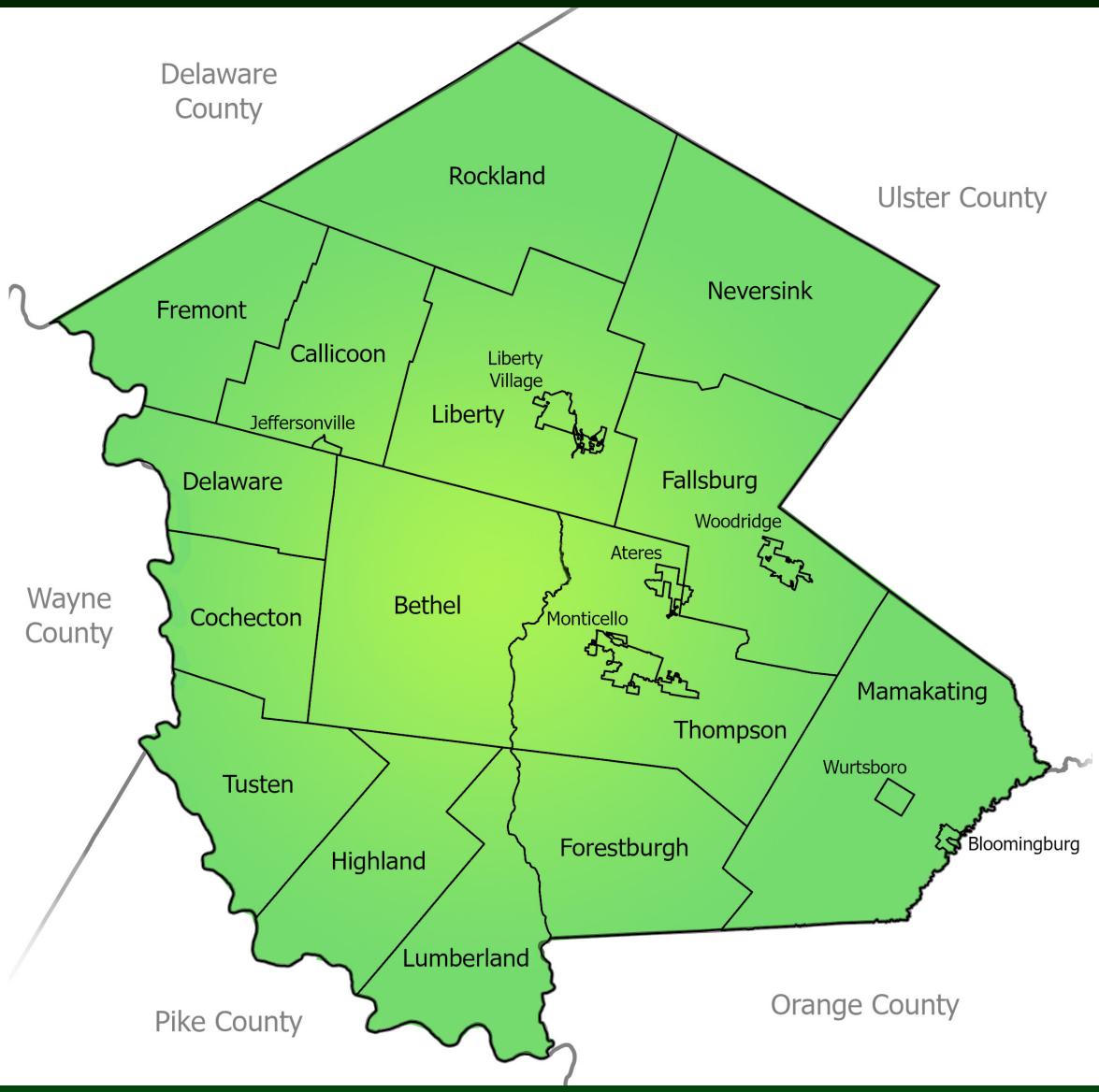
Sullivan County Assessment of Potable & Wastewater Infrastructure

VOLUME I

Sullivan County



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May 2026

Volumes I and II are part of a larger report.
The full Sullivan County Assessment of Potable and Wastewater Infrastructure Report may be requested from the Sullivan County Division of Planning, Community Development and Environmental Management

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Executive Summary

Water supply and wastewater management are essential services that, in Sullivan County, are provided by a variety of different arrangements. In support of its efforts to aid municipalities in the County in the collection and centralization of data regarding water and sewer systems, the County undertook this Countywide Assessment of Potable and Wastewater Infrastructure, or CAPWI. The CAPWI report is organized in two volumes: Volume 1 is the Countywide Report and Volume 2 provides Community Profiles for each of the County's twenty-two municipalities.

To develop this report, an extensive data collection exercise was conducted. This involved interviews with municipal officials, representatives, water and sewer operators, and engineers and was structured by a checklist of information needed to support the assessment, such as mapping and inventory information; service areas; plans, engineering reports, and record drawings; system operating conditions; regulatory compliance history; recent and planned capital investment; and budgets and financing. In addition, public datasets, including GIS-based environmental data, regulatory activities, and municipal websites, were reviewed.

While the assessment is oriented toward municipal centralized water supply and wastewater management, information was developed, as available primarily through public datasets and regulatory filings, about privately owned water and sewer infrastructure regulated in a manner similar to municipal infrastructure. Sullivan County is home to numerous privately owned seasonal water and sewer systems in various conditions. Privately owned infrastructure includes water and sewer systems servicing mobile home parks, residential communities, camps, industrial sites and the like.

The initial data collection effort occurred between January and October 2025. As part of this effort, a gap analysis was conducted to identify missing information and to determine the implications of these information gaps. In general, records, mapping, and inventory information maintained by the County's municipalities were found to be highly varied in terms of quality, comprehensiveness, coverage, and format. While some municipalities have extensive digital and GIS-based data about their systems, others rely on paper-based historical maps or local knowledge. In terms of the CAPWI, this widely disparate availability of data shaped the substance of both the municipal and County-level evaluations; supporting efforts to inventory and standardize record-keeping is among the key recommendations of this report.

Volume 2 of this report presents, for each of the County's twenty-two municipalities, the results of the data collection effort, in the form of a series of Community Profiles. In

addition, for each municipality, an evaluation of water supply and wastewater management infrastructure was performed, structured around challenges and opportunities identified by the project team. Given the importance of and domain-specific nature of the terminology involved, a glossary of terms was developed and is included with both Volume 1 and Volume 2. Across the County's municipalities, the majority (15 of 22) provide municipal water supply and the majority (15 of 22) provide municipal sewer service; four municipalities provide neither water nor sewer service. However, with the exception of several villages, the extent of the service areas within which water and sewer services are provided are limited to portions of their respective jurisdictions; outside of these areas, privately-owned decentralized systems or on-site facilities are in use.

The information base presented in Volume 2, in turn, was analyzed for common themes. Reflecting water and sewer conditions in the County, challenges and opportunities across three broad areas are summarized: System Investment, Administration, and Regulatory Dictates, System Operating Conditions, and Infrastructure Change, Planning, and Related Considerations. Not surprisingly, given the prevalence of on-site facilities even in municipalities providing centralized water and sewer, challenges and opportunities associated with these on-site facilities appeared frequently, though given the site-specific nature of these facilities, detailed assessment is beyond the scope of this report. Among the opportunities most frequently identified are those relating to intermunicipal partnerships, system interconnections, available capacity, private decentralized systems, and presence of growth and development pressure. Conversely, challenges most frequently identified include the number and cost of known needed capital improvements, small user bases over which to spread fixed costs, available capacity, age of infrastructure (life-cycle issues), and growth and development pressures and associated need for planning for growth. Specifically with respect to sewer systems, regulatory compliance and presence of inflow and infiltration (I&I) are also frequent challenges for the County's municipalities. This evaluation was further refined and extended and preliminary recommendations developed, oriented toward County-wide implications and potential County supporting activities.

Finally, the report presents fourteen high-priority recommendations. A key aspect of this effort is that the County does not own or operate any centralized water or sewer systems; the high-priority recommendations are, therefore, structured around enhancing coordination among municipalities and providing strategic and realistic support to municipalities. Each recommendation is presented with pertinent background information, identification of sponsors/implementation leads, implementation considerations, action plans, and funding options.

The recommendations are programmatic as well as technical. With its position and resources, the County can develop programs aimed at grants of technical assistance addressing shared needs; developing capacity at the county department and staff level to serve as a resource to various constituencies as well as provide an interface with regulatory bodies; and facilitate a County-level dialog by sponsoring a water and sewer communities consortium. Helping decision-makers, both elected leaders and appointed land use board members, make informed decisions with respect to provision of water and sewer service by offering training is another area of recommended program development. On the technical side, inventorying, mapping, and GIS hosting of system data represents an area of broad need within which economies of scale can be gained. Procurement support, support for shared services activities, and development of model codes, policies, and regulations are additional recommendations.

Ultimately, the information developed as part of the CAPWI will have multiple purposes, including but not limited to acting as a springboard to planning on both a Countywide and local level, a decision tool for prioritization of focus and investment where needed most, a catalyst for seeking grants and low-cost financing to support much-needed capital investment, and as an aid to foster economic investment at appropriate scale and in locations where it is best suited to bring value to the local community and the wider region without externalities associated with sprawl, such as increased cost of infrastructure, more impervious surface, and landscape fragmentation.

Introduction

Sullivan County has identified the need to provide assistance to its municipalities regarding the collection and centralization of data regarding water and sewer systems. The information collected will have multiple purposes, including but not limited to acting as a springboard to planning on both a Countywide and local level, a decision tool for prioritization of focus and investment where needed most, a catalyst for seeking grants and low-cost financing to support much-needed capital investment, and as an aid to foster economic investment at appropriate scale and in locations where it is best suited to bring value to the local community and the wider region without externalities associated with sprawl.

To meet this need, Sullivan County Planning has engaged with Delaware Engineering, DPC, to prepare this "Sullivan County Assessment of Potable and Wastewater Infrastructure," or CAPWI. The efforts include extensive data collection for water and sewer infrastructure in each municipality in the County, as well as engineering and planning analysis of the data collected, and the development of this county-level report, as well as Community Profiles that document the data and analysis, and provide recommendations.

This Volume 1 report provides a brief discussion of the methodology used to acquire the data and conduct the analysis on a community-by-community basis, as well as county-level observations and recommendations. Each recommendation is detailed, and an associated action plan is provided in order to aid implementation. Attached to this report as Volume 2 are the Community Profiles that provide data specific to each municipality, along with an analysis of challenges and opportunities.

Sullivan County Overview

Sullivan County possesses a unique blend of rural charm and environmental sensitivity, amongst an ever-growing residential and tourist population. The 996.24 square miles of Sullivan County are renowned for their rich natural resources, including pristine rivers, lakes, and reservoirs that are vital for local ecosystems, communities, and downstream beneficiaries.

The County is comprised of portions of the Catskill Mountains, Delaware River Valley, and Shawangunk Mountains. It encompasses the Beaverkill/Willowemoc Riparian Corridor, Ten Mile River, Mongaup River, and the Neversink, Rondout, Toronto, and Swinging Bridge Reservoirs. The southern 12.6% of the Catskill Park is within the county boundary, accounting for 13.7% of the County. 90.4% of the County is within the Delaware River Watershed Management Area, accounting for 6.6% of its total watershed area. The northeastern 7% of the County sits within New York City's West-of-Hudson Watershed Management Area, accounting for 4.4% of the watershed area.

Centralized water supply and wastewater management infrastructure is generally located within and surrounding the villages and seasonal communities throughout the County. Infrastructure issues range from contamination due to agricultural practices, source and capacity limitations, capital funding for improvements and extensions, and seasonal stress from peak demands on water and sewer treatment systems. The deterioration or lack of water and wastewater infrastructure can be both a burden and a restriction to economic, residential, and employment growth, especially within distressed communities. The availability of water and wastewater capacity, and the cost of the services, are vital to the quality of life in the more densely developed areas of Sullivan County.

Centralized vs. Decentralized Water and Sewer Systems

Centralized – These systems, typically but not exclusively municipally owned, are characterized by extensive distribution and conveyance networks serving large areas. Water supply and wastewater management are provided at typically larger-scale facilities. These systems are highly regulated.

Decentralized – These systems tend to be characterized by smaller numbers of connections and with water supply and wastewater treatment works provided closer to the users or source of demand. This term includes on-site water supply wells and septic systems serving single users but also encompasses systems serving multiple connections that are regulated similar to centralized systems.

Demographics and Housing

Future water and sewer infrastructure upgrades and expansion directly correlate with the housing needs of Sullivan County. According to the County's Comprehensive Housing

Strategy from September 2022, among the challenges faced by the local municipalities are issues of maintaining and expanding infrastructure needed to support private housing investments. The Comprehensive Housing Strategy recommends that infrastructure concerns be addressed before housing investment.

While the County population has grown at a rate slower than NYS, growth in seven of the 22 municipalities exceeds the NYS rate.

While half of the County's municipalities lost population, the 2010-2020 growth rate of 1.4% was created by growth in the other half, led by the Village of Bloomingburg, whose population increased by 612 (145%), the Town of Fallsburg (10.3%), and Town of Thompson (8.1%).

The development pattern within Sullivan County is generally high growth to the east-southeast and low growth to the west-northwest. As presented in Table 1, between 2010 and 2020, the Town of Fallsburg had both the largest increase in number (1,322) and percentage (10%) of people for a town. The Town of Delaware had the second largest decrease in number (-467) and percentage (-17%) of people, while the largest decrease in the number of people was 485 in the Town of Rockland. Of the seven (7) villages, Bloomingburg has the largest percentage increase at 146% as well as the largest increase in the number of people at 612, due to the doubling in size of the village boundary and new construction. The Village of Wurtsboro lost the largest number of people at 122, while Woodridge lost the highest percentage of people at 11.8%.

Table 1: Population Change 2010-2020 (US Decennial Census)

	2010	2020	# Change	% Change
New York State	19,420,354	20,201,249	780,895	4.0%
Sullivan County	77,551	78,624	1,073	1.4%
Villages				
Ateres	0	400	400	----
Bloomingburg	420	1,032	612	145.7%
Jeffersonville	359	368	9	2.5%
Liberty	4,392	4,700	308	7.0%
Monticello	6,726	7,173	447	6.6%
Woodridge	847	747	-100	-11.8%
Wurtsboro	1,246	1,124	-122	-9.8%
Towns				
Bethel	4,255	3,959	-296	-7.0%
Callicoon	3,057	2,989	-68	-2.2%
Cochecton	1,372	1,448	76	5.5%
Delaware	2,670	2,203	-467	-17.5%
Fallsburg	12,870	14,192	1,322	10.3%

	2010	2020	# Change	% Change
Forestburgh	819	808	-11	-1.3%
Fremont	1,381	1,161	-220	-15.9%
Highland	2,530	2,196	-334	-13.2%
Liberty	9,885	10,159	274	2.8%
Lumberland	2,468	2,243	-225	-9.1%
Mamakating	12,085	12,655	570	4.7%
Neversink	3,557	3,366	-191	-5.4%
Rockland	1,381	1,161	-220	-15.9%
Thompson	15,308	16,550	1,242	8.1%
Tusten	1,515	1,405	-110	-7.3%

Housing Unit Summary

Sullivan County possesses a wide variety of housing types due to its unique second-home history and its contemporary appeal for seasonal and permanent residence. This mix of housing types and tenures contributes greatly to the inconsistency and variety of water and sewer systems. Understanding the County's housing trends is paramount to predicting future demands and alleviating potential issues.

Table 2 provides the housing unit trend from 2019 to 2024 according to the US Census ACS 1-year estimates. The data includes total units, occupied units, vacant units, median value, median mortgage, median taxes, and median rent.

An important trend is conversion of seasonal housing units into full-time occupied units while overall unit numbers in the County remain relatively flat. This trend involves all dwelling unit types, from detached single family to multifamily units.

The most prevalent trend is the pronounced increase in occupied housing units over this time period without growth in the total number of units. This means that the vast majority of the units now classified as occupied were most likely formerly vacant units: 93.4% of the decline in vacant housing units offset the increase in occupied units. The remaining 398 formerly vacant units were removed from the total number of units through their demolition or conversion to a different type of use. The current growth trend in the County, driven by permanent residents, also causes changes in the nature and location of demands placed on water and sewer infrastructure.

Table 2: Change in Housing Units by Type (2019-2024)

Data Type	2019	2020	2021	2022	2023	2024	Total Δ
Housing Units	51,276	50,966	49,564	49,956	50,492	50,878	-0.8%
Occupied Units	28,960	28,762	32,529	32,758	30,971	34,452	19.0%
Vacant Units	22,316	22,204	17,035	17,198	19,521	16,426	-26.4%

Figure 1 provides the change in the ratio of occupied units to vacant units in Sullivan County for each year from 2019 to 2024. The impact of COVID-19 is undeniable, as this table shows a10% swing towards occupied housing between 2020 and 2021. Occupied housing increased from 58% to 69% of total housing units between 2019 and 2024, while vacant housing decreased from 42% to 31%.

Figure 1: Ratio of Occupied to Vacant Housing Units

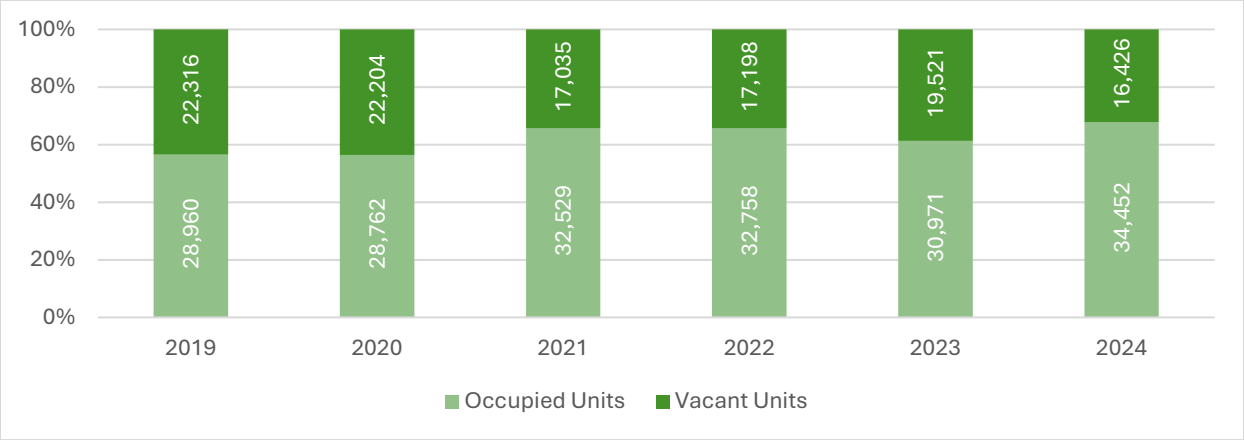
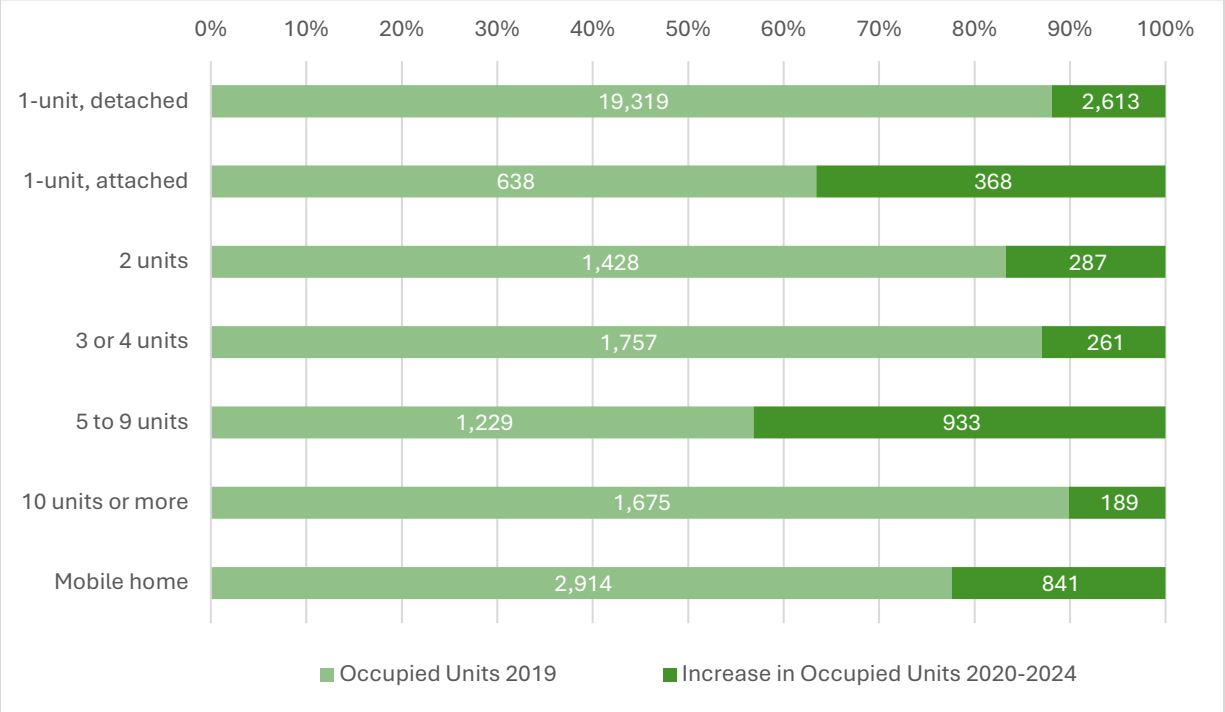


Figure 2 provides the total makeup by occupied unit type from 2019 to 2024. Detached one-unit homes increased by 2,613 units, accounting for nearly 48% of all newly-occupied housing structures. The largest percentage growth was in occupied housing units within five to nine-unit structures, with a 76% increase. The smallest increase in the number of occupied units, by both percent and number, occurred in structures of ten or greater units. The reality displayed by this figure shows that growth in occupancy occurred in all types of residential structures throughout Sullivan County, including single-family homes, rowhouses, multifamily housing, and mobile homes. An overall reduction of detached one, two, three, and four-unit homes occurred county-wide. This reduction occurred exclusively within the number of vacant units in each category.

Figure 2: Increase by Occupied Unit Type between 2019 and 2024



Households Summary

Similar to trends across NYS, the County has experienced growth in the number of households and smaller household sizes while population growth is more modest, in part, driving the need for additional housing units.

Tracking household trends is important for utility management as it enables more accurate planning for new and upgraded infrastructure needs, improves resource sustainability, and provides for higher operational efficiency. Household formation also drives the need for new housing units. The number and types of households throughout the County can vary widely from year to year due to the nuances in definitions, the shifting of population between household types, and the conversion of housing types. While each category demonstrates considerable variability, the overall household numbers have shown a general upward trend over the last five years, increasing 20% between 2020 and 2024.

Table 3 presents a total household increase of 5,492 from 2019 to 2024. In that same span, the County saw a family household increase of 5,274 and a non-family household

increase[1] of 218. The average household size decreased about 12% during this time period, which reflects the trend throughout the state and country.

Table 3: Selected Household Metrics (2019-2024)

Household Metric	2019	2020	2021	2022	2023	2024
Total HHs	28,960	28,762	32,529	32,758	30,971	34,452
Family HHs	16,914	17,925	18,310	19,612	19,355	22,188
Non-Family HHs	12,046	10,837	14,219	13,146	11,616	12,264
Average HH Size	2.48	2.49	2.30	2.29	2.45	2.17

While there has been a general increase in households, the household numbers reveal great variation from year to year. After zero growth in household numbers in the year 2020, there was a dramatic spike in 2021 for all households due to a 30% increase in non-family households. This was followed by an 8% and an 11% decrease in 2022 and 2023, respectively, and then by a 5% increase in 2024.

Water Resources Management

Effective resource management is critical in Sullivan County to ensure the sustainability of water resources, especially as land development, agricultural practices, and climate change create challenges. Local land use control alongside regional and state agencies such as the Delaware River Basin Commission (DRBC) and NYSDEC play a significant role in water resource management. Key strategies include watershed protection, pollution prevention, and sustainable land-use planning. Protecting watersheds is critical to maintaining water quality and involves preserving forested areas, regulating development near water bodies, and implementing buffer zones to filter runoff.

Agriculture, a significant part of the county's economy, often presents challenges for water management. Runoff from farms, carrying nutrients and sediments, can lead to water quality issues such as algal blooms and oxygen sag in waterbodies. Programs like the Upper Delaware River Stream Corridor Management Program promote best practices for farmers, including cover cropping, riparian buffer planting, and nutrient management plans to mitigate these effects.

Stormwater management is another critical aspect of water conservation in Sullivan County. Development increases impervious surface cover, which translates to increased

[1] Family households are defined as those that include at least one person related to the householder by birth, marriage or adoption. A nonfamily household consists of a householder living alone (a one-person household) or where the householder shares the home only with people to whom he/she is not related (e.g., a roommate).

pollutant transport (e.g., pesticides, fertilizers, oils/greases, pet waste, sediments, etc.) to receiving waters, as runoff is not absorbed into the ground. A decrease in the infiltration capacity of a watershed can affect the hydrologic cycle by reducing groundwater recharge. In addition, increased rainfall intensity due to climate change has resulted in higher stormwater volumes, leading to erosion, flooding, and water quality degradation. Best practices to mitigate these concerns include green infrastructure solutions, such as rain gardens, permeable pavements, and constructed wetlands, to reduce stormwater runoff and improve infiltration. These approaches not only mitigate flooding but also recharge aquifers and maintain stream flows during dry periods.

Education and community engagement are integral to effective water management. Local organizations such as the Catskill Center and Sullivan County Soil & Water Conservation District conduct outreach programs to raise awareness regarding water conservation and pollution prevention. These efforts empower residents to adopt water-saving practices and advocate for sustainable policies. Despite these proactive measures, water management in Sullivan County faces ongoing challenges.

In the context of an increasing year-round population and, in higher-growth areas, more development, management of the County's water resources, including for water supply and wastewater management, while critical, will require different strategies.

Effective wastewater management is critical for maintaining the ecological health of the County's human and natural environment. Sullivan County faces several wastewater-related challenges due to its geography, aging infrastructure, and increased development. Much of the county is rural, with many properties relying on individual septic systems for wastewater treatment. Where centralized wastewater systems exist, the high costs of constructing, operating, and maintaining the infrastructure are challenging for local governments, property owners, and residents.

Wastewater management in Sullivan County is a complex but critical issue that impacts public health, environmental sustainability, and regional water resources. Collaboration among local, regional, state, and federal partners offers hope for sustainable solutions. By investing in infrastructure, promoting education, and exploring innovative technologies, the community can safeguard its water quality and preserve its natural beauty for future generations.

The seasonal tourist influx has exacerbated the wastewater management challenges. With the rise of vacation rentals, resorts, and seasonal residents, wastewater systems often experience stress during peak months.

Methodology and Dataset

This section provides an overview of the work undertaken to prepare this CAPWI.

Data Acquisition

The first step in conducting the work was the creation and distribution of a data checklist to each municipality to facilitate gathering the information that is relevant to assessing water and sewer systems. The data gathering included:

- Copies of any existing reports or engineering plans;
- Mapping information;
- Regulatory compliance history, including agency inspection reports;
- Raw water taking and treatment data as well as meter data for consumption for at least three years;
- Monthly operating reports and/or discharge monitoring report data for at least three years;
- Regulatory inspection reports;
- Engineering reports;
- Notices of violation, regulatory orders, and corrective actions for violations; and
- Financial data, including budget to actual expense and revenue, the status of any capital reserves, annual maintenance budgeting, and the status of any planned or existing debt issuance.

A representative of Delaware Engineering met with representatives of each municipality to review the data request and obtain documentation. In addition, these meetings included informal interviews with local elected leaders, administrators, and operations personnel regarding water and sewer infrastructure in their community. These observations are recorded in the data set provided in Volume 2.

In addition to this intensive direct data gathering, all publicly available GIS coverages for the community relevant to the assessment of water and wastewater systems were obtained, including but not limited to: environmental and land data; real property data for land use; and any other relevant coverages. This information was used to begin building a base map.

With respect to privately owned water and sewer infrastructure, data was obtained for water and sewer systems that are of a scale and nature where evaluation and assessment are meaningful in the context of environmental preservation, land development activities, and/or where there are opportunities for consolidation with municipal systems either functionally or administratively.

Important to the data gathering phase of the work is a gap analysis to determine where data is missing, how it may be obtained, and if it cannot be obtained in the context of the project, its criticality to the assessment, and any assumptions that will need to be made in the absence of objective data. The gap analysis is further detailed below.

A data catalogue listing the data collected, and its source (including metadata), as well as the gap analysis and recommendations regarding the quality, nature, and quantity of data available for analysis, was prepared. The data catalogue is summarized for each municipality in Volume 2.

Evaluation and Analysis

This phase of the work included identifying commonalities for water and sewer systems. In terms of commonalities, all systems are reviewed for aging infrastructure, regulatory compliance, and likely future regulatory requirements, demands on the systems from a historical, current, and future perspective, and the resilience and sustainability of a system in the context of needed improvements to provide a high level of service for the system's users.

A basic evaluation was completed for the permitted capacity and service areas for each system, including quantitative data regarding existing demands for service. Descriptions of municipalities' existing infrastructure are provided in the Community Profiles, together with maps of each municipality showing infrastructure.

For water systems, the analysis phase of the work involved an evaluation of source water capacity and quality, treatment effectiveness and needs, storage volume and function, and distribution system quality. For sewer systems, both the collection system as well as treatment facilities are a focus. The result of the analysis phase of the work is generally detailed outlines that provide overviews of systems, conditions, and needs, as reflected in the Community Profiles.

The County has emphasized GIS and mapping in the scope of the Countywide Assessment. The value of accurate GIS mapping and data cannot be understated, and the County's goal to collect detailed information for all water and sewer systems is laudable and will be welcomed by the communities and regulatory agencies alike.

In the context of the goals and objectives of Sullivan County for this study, depending on the data available, GIS coverages for all water and sewer service areas, with underlying pipe networks to the extent such information is available and verifiable, with overlays of existing land use from real property data and environmental layers, have been created. On

a countywide basis, this will be a major step towards the ultimate goal of having very detailed, centralized mapping of all systems.

Recommendations

Recommendations are a vital aspect of an infrastructure evaluation. Using the infrastructure evaluation, including the challenges and opportunities identified in each Community Profile, a series of recommendations oriented toward the types of assistance, programs, and policies appropriate to the level of the County and its role is developed. The recommendations provide priority with justification and structure to the evaluations and are the foundation of the decision tool that the CAPWI is intended to be.

It is important to note that Sullivan County does not provide centralized water supply or wastewater management services. While lacking a direct role in the ownership, operation, and administration in the provision of these essential services to County residents and businesses, the County is uniquely positioned to address shared needs and create efficiencies across these shared needs, as well as develop programs and support policymaking aimed at addressing these needs as well as promoting coordination and best practices.

Many planning efforts of this nature end with recommendations, which are often inadequate to result in action. To that end, this effort includes detailed implementation plans for each of the priority actions recommended. Importantly, the implementation plans include a review of likely financing, including grants and low-cost funding for the recommended activities, together with steps, likely responsible parties, and realistic timelines for action.

The fourteen identified recommendations are structured, from a usability standpoint, to be standalone documents and contain fundamental information needed to support decision making and implementation, including the purpose and description of the recommended action; implementation lead and partners; timeframes; discussion of implementation considerations; and an action plan, as well as funding and related resources.

Summary of Dataset and Gap Analysis

A gap analysis was developed to set an information baseline for each municipality. This dataset was an instrument intended to provide the county-wide landscape for utility data. General data categories were developed for the gap analysis compilation for both the water and wastewater systems.

For water and wastewater systems, the gap analysis included the items listed in Table 4.

Table 4. Water and Wastewater systems gap analysis parameters (items with asterisk are permit or other legal requirements)

Level I	Basic understanding of the scope of the municipal water or sewer service, including its geographic extent, relative number of users, amounts of water supplied, and indication of conformance to water quality standards
Service	**Item**	**Purpose**
	**Annual Budget**	*Essential to understanding financial aspects of system operations; Coupled to user rates, necessary to understand how costs of system operation are distributed among users*
	**Annual Water Quality Reports***	*Self-reported information about population served, number of connections, water produced, water sold, and water quality standards performance and corrective actions taken; Available to and intended for public audience*
	**Service Area Mapping/ Information**	*Fundamental information to understand extent of users served infrastructure and, in combination with other data, characteristics of the user population; Where provided as part of special district proceedings, documents operation of a water or wastewater system formed under NYS Town Law**
	**Water Withdrawal Permits***	*System operating parameters reported to NYSDEC annually; Provides overview of system components, such as number of sources, type, and yield*
	**SPDES Permits***	*Provides fundamental information about water quality a WWTP must be able to meet prior to discharging to surface waters, such as maximum contaminant levels, including influent able to be received at plant; Contains other conditions that may affect collection and conveyance system operation; Contains schedule of compliance of items required to be completed, such as engineering plans or other activities*
Level II	More precise understanding of system extent, components, and financial status to include location and type of infrastructure and ability to fund capital projects
Service	**Item**	**Purpose**
	**Capital Reserve**	*Provides information about planned capital projects, funding targets, and funding availability;*

	**Debt Status**	*Necessary in order to understand ability of municipality to issue debt to undertake future projects; Provides indication of overall cost of service provision and user rates*
	**Digital Mapping**	*Basic inventory information about what infrastructure is where in space but beyond that can contain relatively more or less detailed information and still be extremely useful; Less technical than Engineering Drawings; Springboard to more sophisticated inventory, mapping, and asset management strategies*
	**Engineering Drawings**	*Detailed technical drawings showing precise location and type of improvements; Can be design or "as-built" drawings, which show improvements as installed; Very useful to inform addressing many different needs, such as potential modifications, age/condition of components, life-cycle status, system modeling, etc.*
	**Wastewater Treatment Facility Data**	*Includes operational records, inspections, and other documentation related to system design and operational condition; Includes information provided in other items, such as required SPDES reporting, * as well as information provided verbally to the project team*
Level III	Detailed understanding of system operating parameters, such as production from water sources and factors contributing to conformance to water quality standards, as well as basis of design of system components and alternative designs evaluated; more precise understanding of cost to provide service	
Service	**Item**	**Purpose**
	**Compliance History***	*Includes incident reports, notices of non-compliance, orders on consent, inspection reports, and other actions related to SPDES permit compliance; Provides key information about regulatory requirements and whether they are met*
	**Discharge Monitoring Reports***	*Required to be sent periodically by SPDES permittees and involves reporting measurements of discharges for regulated contaminants; Useful to understand permit compliance; Documents flows through a WWTP; Reported data must have been analyzed by a NYS-certified lab*
	**Engineering Reports**	*Document system conditions, needs, and improvements; Provides basis of design of improvements; Serves as historical record where projects have been completed*
	**Monthly Water Reports**	*Necessary in order to calculate cost of water produced and unaccounted for (water loss); Allows plant-by-plant (source-by-source) decomposition of water production data; Documentation of sampling results and conformance to water quality standards*

Level IV		Comprehensive, precise understanding of all system components and their operational characteristics and factors contributing to regulatory compliance and cost to provide service
Service	**Item**	**Purpose**
	**Meter Reports**	*Very useful to analyze consumption characteristics of groups of water users and address system-level water loss*
	**Monthly Operation Reports**	*Provides raw data showing daily volume of sewage treated and other characteristics of both influent received and effluent discharged*
	**Water Treatment Data**	*In concert with other water quality information, can aid in understanding of relationship between system configuration, operational practices, and water delivered to customers; Helpful to understand cost of consumables (e.g., chlorine); Documents treatment processes in use*

The results of the water system gap analysis collectively provide the data and availability trends for the County. Withdrawal permits and service area mapping/ information were able to be acquired for all 15 water systems. 14 systems provided engineering drawings; 13 systems provided an engineering report; 12 systems provided treatment data; 10 systems provided meter reports, monthly reports, and annual quality reports; nine provided annual budgets, capital reserves, debt status, and digital mapping.

The results of the wastewater system gap analysis collectively provide the data and availability trends for the County. Engineering reports, SPDES permits, engineering drawings, service area mapping/information, treatment facility data, and compliance history were able to be acquired for all 26 wastewater systems. 22 systems provided inspection reports and discharge monitoring reports; 20 systems provided monthly operation reports; 18 systems provided an annual budget and debt status; 17 systems provided digital mapping; and 16 systems provided their capital reserve.

For both water and sewer systems in the County, it should be noted that not all municipalities provided all items for each portion of their systems, and not all information the project team obtained was equivalent in its forms and content. For example, with respect to sewer systems, the majority of digital mapping reviewed did not contain detailed conveyance system information, such as pipe types, slopes, and manhole invert elevations. Similarly, detailed line-item budget information to establish costs to provide service was not uniformly available.

Therefore, the level of analysis achieved as part of this effort was between Level II and Level III, i.e., using the analysis level types set forth in this section, depending on the system. This means that **the project team was, for all municipalities, consistently evaluating**

fundamental aspects of the systems reviewed, such as service areas, extent of infrastructure, system throughput and size, capital projects, and financial status. However, the information available did not permit consistent precise evaluation and analysis of system status and specific capital or operational needs.

For example, this report does not assess available capacity, both of individual system elements, like water wells, pump/booster stations, and WWTPs, as well as the networks of pipes and other conveyances, or the factors that might contribute to these observed conditions. As well, information was not consistently available for a comprehensive set of Countywide capital project recommendations; however, broad categories of capital projects, such as those aimed at I&I mitigation, were able to be identified.

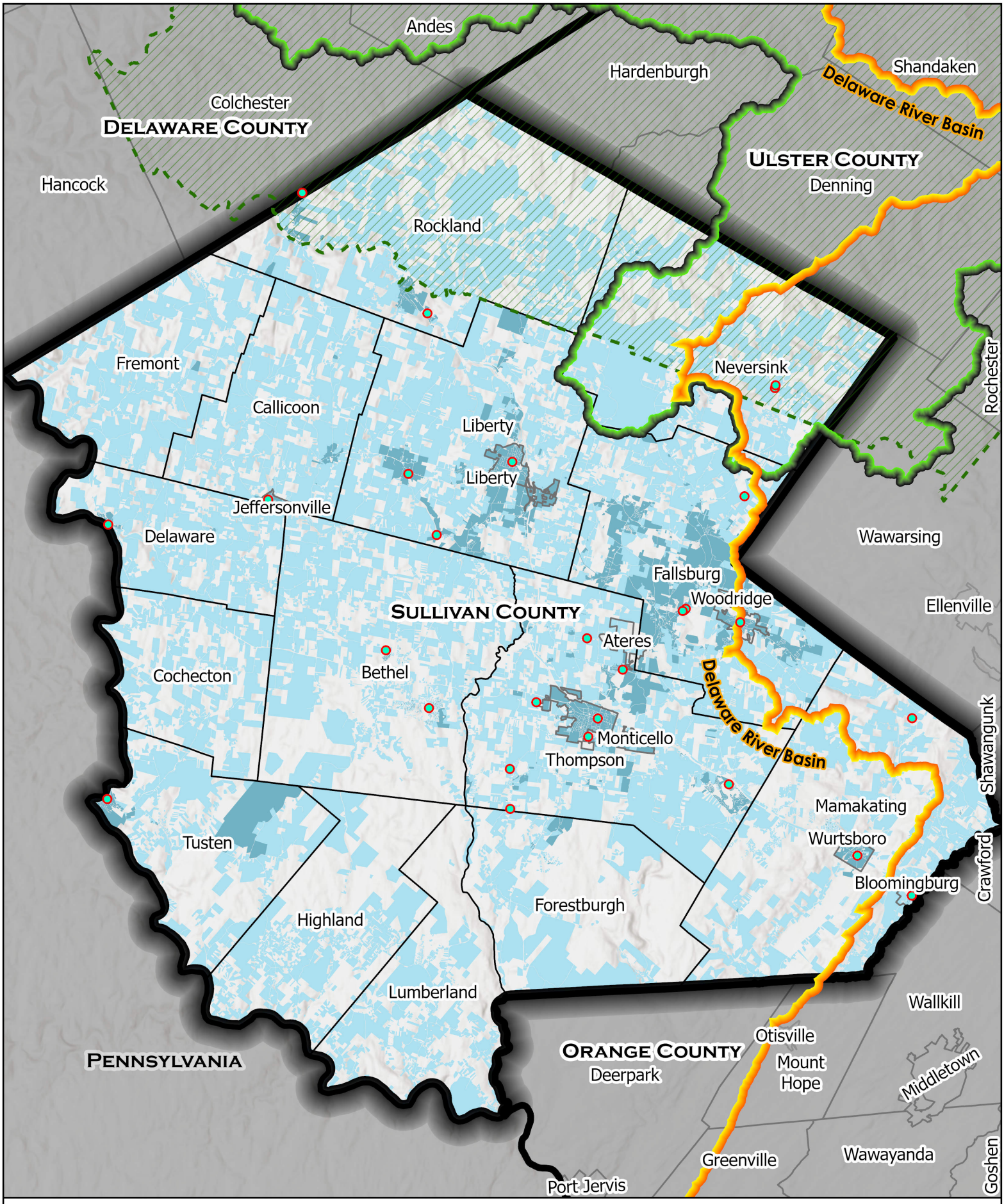
Evaluation Results and Discussion

Mapping of key information related to the provision of centralized water supply and sewer services was also undertaken and has been included on the following pages. The maps are intended to provide data at a macro scale to depict the overall conditions from a demographic, land use, land cover, and environmental perspective. The data utilized show general locations and trends and should not be taken as absolute, as the presented scale is too large for the accurate display of small-scale boundaries.

Existing water and sewer systems in the County were inventoried and identified, including publicly-owned and significant privately-owned systems, which are

Table 5. Summary of Municipal Water Supply & Sewer Service

Sullivan County Communities	Municipal Water Supply	Municipal Sewer Service
Village of Ateres		
Village of Bloomingburg		
Village of Jeffersonville		
Village of Liberty		
Village of Monticello		
Village of Woodridge		
Village of Wurtsboro		
Town of Bethel		
Town of Callicoon		
Town of Cochecton		
Town of Delaware		
Town of Fallsburg		
Town of Forestburgh		
Town of Fremont		
Town of Highland		
Town of Liberty		
Town of Lumberland		
Town of Mamakating		
Town of Neversink		
Town of Rockland		
Town of Thompson		
Town of Tusten		



Water Withdrawals by Parcel

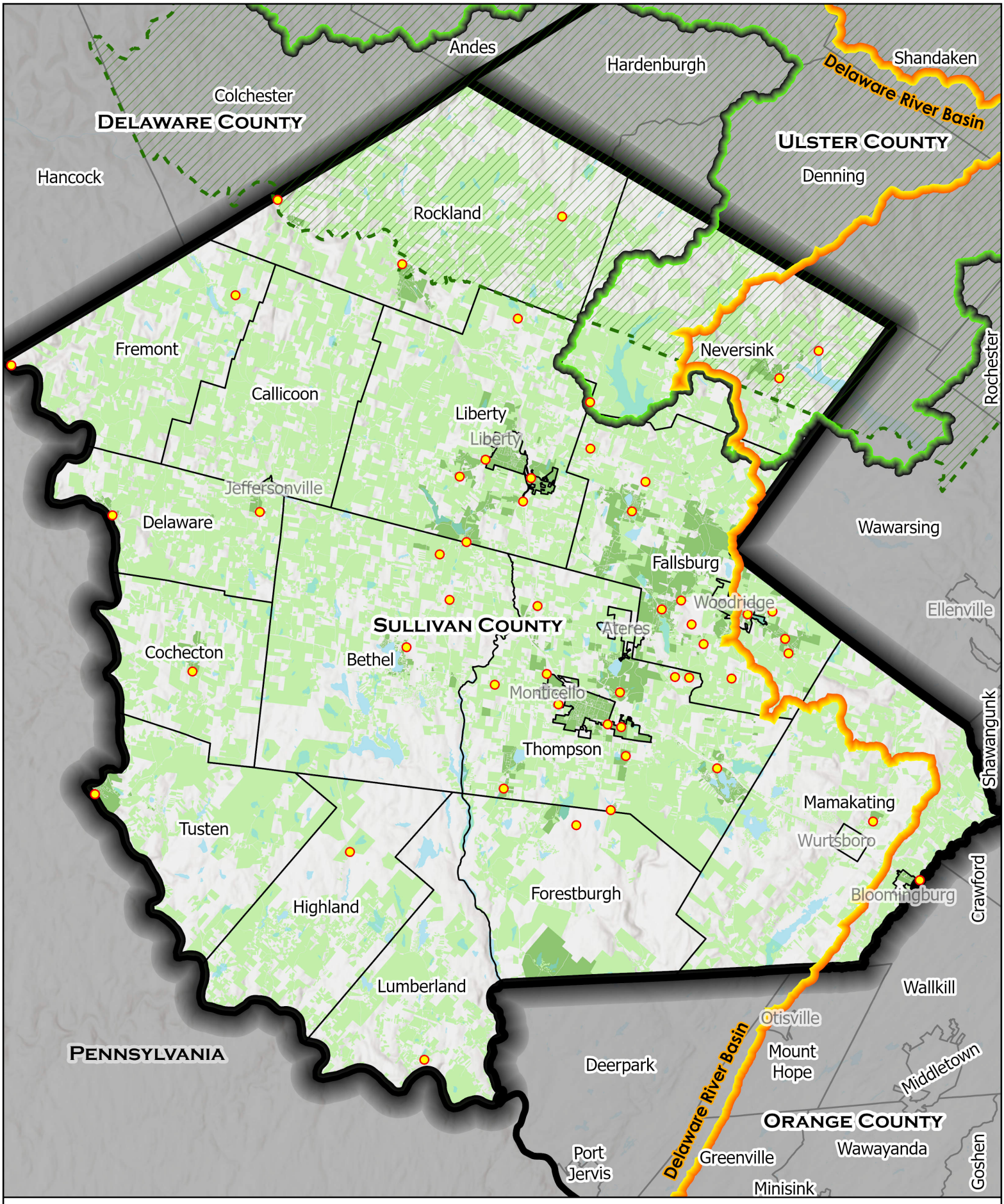
Sullivan County, New York

0 2.5 5 10 Miles

N

- Withdrawal Permit
- Catskill Park
- NYC Watershed
- Delaware River Basin
- Public Water Areas
- Private Water Areas

Prepared by: Delaware Engineering, DPC
Date: December 2025
Source: Sullivan County, NYSDEC



Wastewater Discharge by Parcel

Sullivan County, New York

SPDES Permits
Catskill Park
NYC Watershed
Delaware River Basin
Public Sewer Areas
Private Sewer Areas

0 2.5 5 10 Miles

N

Prepared by: Delaware Engineering, DPC
Date: October 2024
Source: Sullivan County, NYSDEC

those that, while privately held and generally incorporated (if multiple connections) or operated by large individual users (e.g., a restaurant or resort), are, for regulatory purposes, treated the same as municipal owned (e.g., Part 5 and SPDES).

As Table 5 shows, the majority of communities in the County provide centralized water and sewer service via infrastructure owned by the municipality. The service areas of these systems are shown in Figure 3 and Figure 4 for water and sewer, respectively. As these figures show, particularly in the County's towns, not all areas within a given community are provided with these services by the municipality. Additionally, the water map provides the distribution of water withdrawal permits, while the wastewater map provides the distribution of State Pollutant Discharge Elimination System (SPDES) permits.

The majority of water supply and wastewater management needs outside of the water and sewer districts are met by private individual wells and septic systems. However, there are many privately owned decentralized water and sewer systems in the County. This is most clearly depicted on the wastewater collection districts map (Figure 4), which shows SPDES permits distributed throughout the County, though concentrated in the center eastern portion.

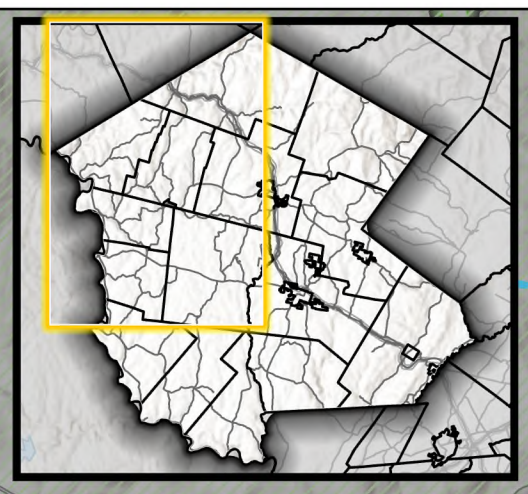
County Land Use Patterns

Understanding the extent of residential and commercial development, along with the intensity of development, provides the viewer with a perspective on the totality of the human impact occurring throughout Sullivan County.

The **County Land Use maps** demonstrate a 2025 snapshot for all parcels as recorded via the municipal assessors and provided through the County's parcel database shapefile (Figure 5, Figure 6, Figure 7, and Figure 8). The vast majority of parcels, as well as the majority of the land area, are classified as residential in use. The second most prevalent land use classification by number of parcels is vacant land, while the second largest by land area is wild, forested, or conservation lands/parks. Additionally, agriculture, commercial, recreation/entertainment, community service, industrial, and public service use parcels have also been classified to depict those areas of concentration as well as the wide dispersal of certain types of uses throughout the County.

The **County Land Cover maps** (Figure 9, Figure 10, Figure 11, and Figure 12), following the Land Use maps, are based on the use of land, categorized by development intensity and vegetation type, as per the National Land Cover Database. Rather than depicting an entire parcel with a singular use, as limited to within the assessment, the land cover data shows the reality on the ground. This dataset provides a different picture of land use throughout

- Agriculture
- Residential
- Vacant
- Commercial
- Recreation/Entertainment
- Community Services
- Industrial
- Public services
- Wild, forested, conservation lands/parks
- NYC Watershed
- Catskill Park
- Water Body
- Delaware River Basin



TOWN OF COLCHESTER, DELAWARE COUNTY
TOWN OF ROCKLAND
TOWN OF HANCOCK, DELAWARE COUNTY
TOWN OF FREMONT
TOWN OF CALLICOON
TOWN OF LIBERTY
TOWN OF DELAWARE
TOWN OF BETHEL
TOWN OF COCHECTON
TOWN OF TUSTEN
TOWN OF THOMPSON
VILLAGE OF JEFFERSONVILLE
NEW YORK
PENNSYLVANIA

Beaver Kill Ponds
Beaver Kill Pond
Catskill State Park Pond
Catskill State Park Ponds
Lake Nimrod
North Branch Basket Pond
Cranberry Ponds
Lake Muskoday
Cooks Brook Pond
Lake Florence
Tennanah Lake
Holp Pond
Mud Pond
Shandelee Lake
Olympus Lake
Petrillo Lake
Anawanda Lake
Sand Pond
Lenape Lake
Matawa Lake
Denman Lake
Vogel Pond
Reichman Pond
Stump Pond
Benton Brook
Revonah Lake
Melbern Lake
Hust Pond
Lenape Lakes
Delaware River
Lake Jefferson
Briscoe Lake
Fieldston Lake
Lake Barnabee
Swan Lake
Birch Ridge Pond
Horseshoe Lake
Pauls Pond
Frasers Brook Pond
Hunter Lake
Silver Lake
Filippinis Pond
Birch Ridge Ponds
Horseshoe Lakes
Lynchs Pond
Creamery Brook Pond
Amber Lake
Angel Mill Brook
Chestnut Ridge Pond
Resnicks Ponds
Lake Superior
Little Black Lake
Black Lake
Hemp Meadow Brook Pond
White Lake Brook
Indian Field Pond
Lake Nianque
Toronto Lake
Toronto Reservoir
Crystal Lake
Wildcat Lake
Swinging Bridge Reservoir
Trout Pond
Wells Pond

Figure 5: Land Use - Northwest

Sullivan County, New York

0 3 6 9 12 Miles

N

* This portion of the County is entirely outside the NYC Watershed and entirely within the DRBC boundary.

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

Figure 6: Land Use - Northeast

Sullivan County, New York

Agriculture
Residential
Vacant
Commercial
Recreation/Entertainment
Community Services
Industrial
Public services
Wild, forested, conservation lands/parks
Delaware River Basin
NYC Watershed
Catskill Park
Water Body

Town of Hardenburgh, Ulster County
Town of Rockland
Town of Denning, Ulster County
Town of Neversink
Town of Liberty
Town of Fallsburg
Town of Wawarsing, Ulster County
Town of Bethel
Town of Thompson
Town of Mamakating
Village of Liberty
Village of Woodridge
Village of Ateres
Village of Monticello
Delaware River Basin
NYC Watershed

Beaver Kill Ponds
Catskill State Park Ponds
Hunter Pond
North Pond
Lake Nimrod
Lily Pond
Cranberry Pond
Olympus Lake
Little Beaver Kill
Neversink Pond
Wynkoop Brook Pond
Neversink Reservoir
Trout Brook Pond
Kees Lake
Benton Brook
Revonah Lake
Melbern Lake
Sunset Lake
Grossingers Lake
Hanofee Lake
Lake Ophello
Loch Sheldrake
Sheldrake Stream
Morningside Lake
Lake Barnabee
Fieldston Lake
Swan Lake
Horseshoe Lakes
Pauls Pond
Shaddock Pond
Alta Lake
Conklin Pond
Frasers Brook Pond
Crescent Lake
Anawana Lake
Pleasure Lake
Creamery Brook Pond
Gurneys Pond
Baileys Lake
Strolowitz Lake
Kiamesha Lake
Stackhouse Pond
Sheldrake Stream Pond
Mullers Pond
Neversink Lakes Pond
Sackett Lake
Sackett Lakes
Swinging Bridge Reservoir
Wildwood Lake
Neversink River
Davies Lake
Lake Louise Marie
Treasure Lake
Bowers Pond
Beaver Lake
South Brook Pond
Wanaksink Pond
Rondout Reservoir
Red Brook Pond
Ulster Heights Lake
West Branch Beer Kill Pond
Windsor Lake
Cranberry Lake
Silver Lake
Braden Brook
Katz Pond
East Pond
Sandburg Creek

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

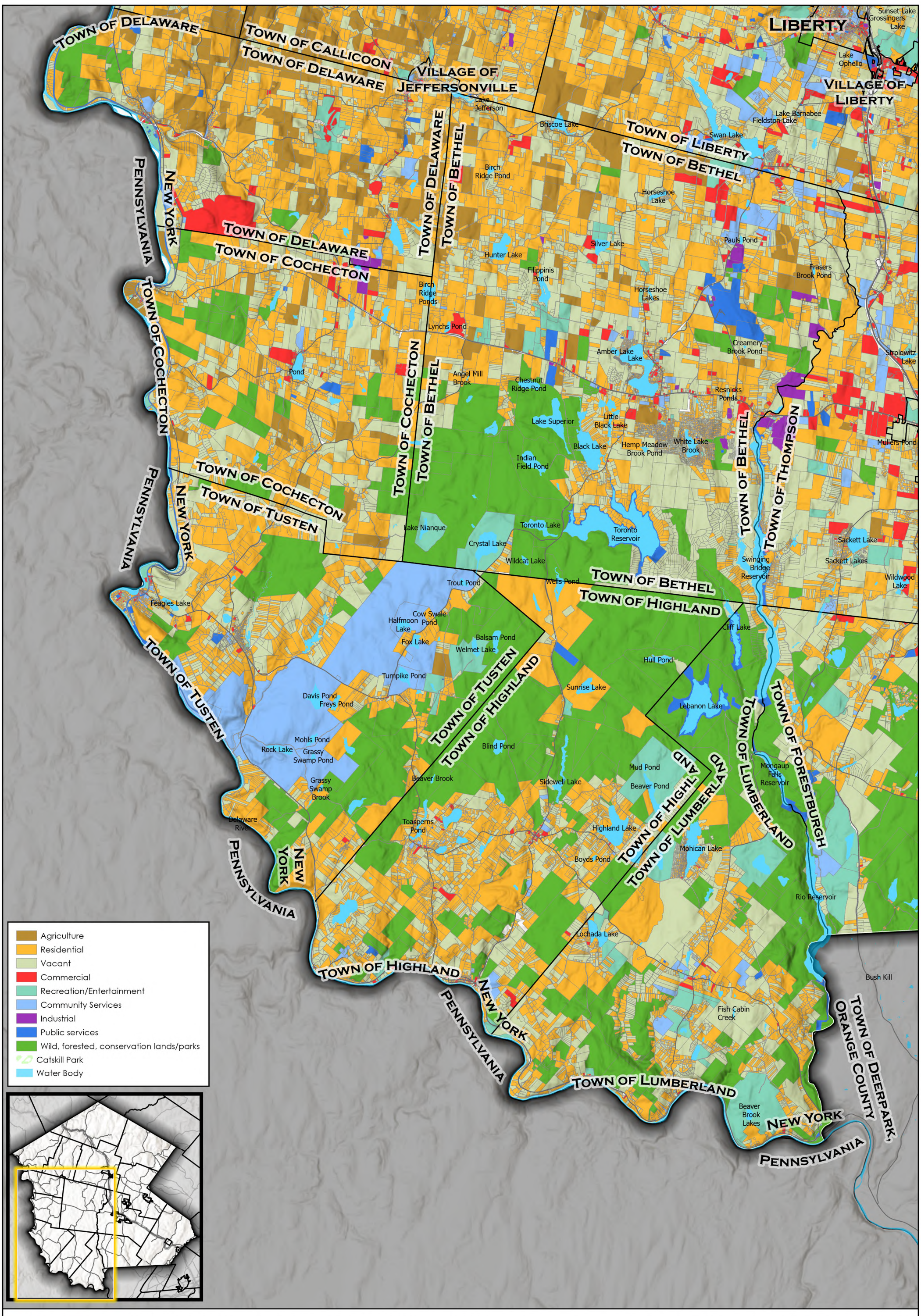


Figure 7: Land Use - Southwest

Sullivan County, New York

* This portion of the County is entirely outside the NYC Watershed and entirely within the DRBC boundary.

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

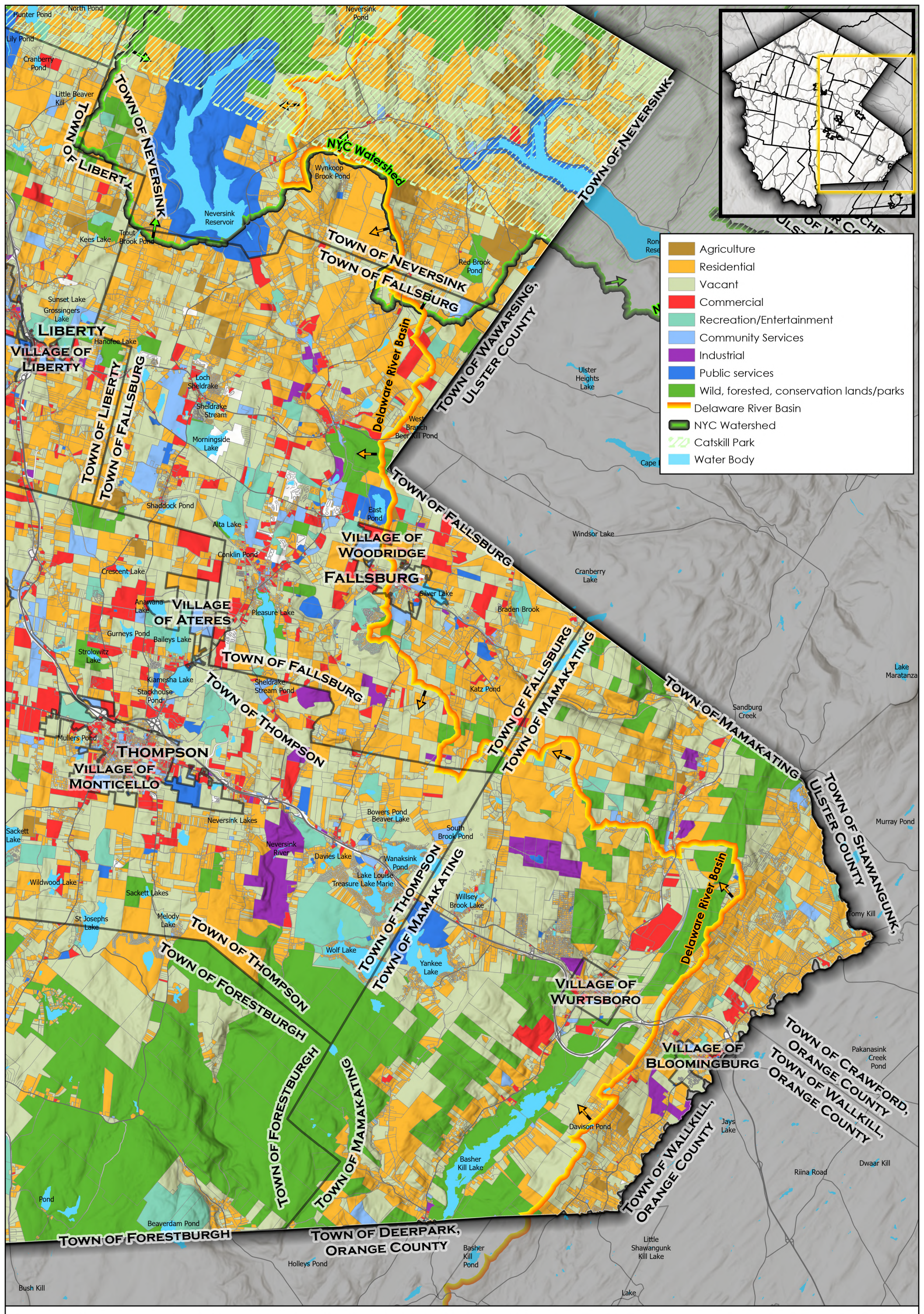


Figure 8: Land Use - Southeast

Sullivan County, New York

Prepared by: Delaware Engineering, DPC
Date: April, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

Figure 9: Land Cover - Northwest

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land (Rock/Sand/Clay)
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands

TOWN OF HARDENBURGH, ULSTER COUNTY
TOWN OF ROCKLAND
TOWN OF HARDENBURGH, ULSTER COUNTY
TOWN OF DENNING, ULSTER COUNTY
TOWN OF DENNING, ULSTER COUNTY
TOWN OF NEVERSINK
TOWN OF ROCKLAND
TOWN OF LIBERTY
TOWN OF ROCKLAND
TOWN OF NEVERSINK
TOWN OF LIBERTY
TOWN OF NEVERSINK
TOWN OF NEVERSINK
TOWN OF FALLSBURG
TOWN OF WAWARSING, ULSTER COUNTY
LIBERTY
VILLAGE OF LIBERTY
TOWN OF LIBERTY
TOWN OF FALLSBURG
TOWN OF FALLSBURG
VILLAGE OF WOODRIDGE
TOWN OF BETHEL
TOWN OF THOMPSON
VILLAGE OF ATERES
THOMPSON
VILLAGE OF MONTICELLO
TOWN OF FALLSBURG
TOWN OF THOMPSON
TOWN OF FALLSBURG
TOWN OF MAMAKATING
TOWN OF MAMAKATING

Beaver Kill Ponds
Catskill State Park Ponds
Hunter Pond
North Pond
Lake Nimrod
Lily Pond
Cranberry Pond
Olympus Lake
Little Beaver Kill
Benton Brook
Revonah Lake
Melbern Lake
Kees Lake
Trout Brook Pond
Neversink Reservoir
Wynkoop Brook Pond
Neversink Pond
Rondout Reservoir
Red Brook Pond
Sunset Lake
Grossingers Lake
Hanofed Lake
Lake Ophello
Loch Sheldrake
Sheldrake Stream
Morningside Lake
Lake Barnabee
Fieldston Lake
Swan Lake
Horseshoe Lakes
Pauls Pond
Shaddock Pond
Alta Lake
East Pond
Conklin Pond
Ulster Heights Lake
West Branch Beer Kill Pond
Windsor Lake
Cranberry Lake
Silver Lake
Braden Brook
Frasers Brook Pond
Crescent Lake
Anahana Lake
Pleasure Lake
Creamery Brook Pond
Gurneys Pond
Baileys Lake
Strobowitz Lake
Kiamesha Lake
Stackhouse Pond
Sheldrake Stream Pond
Katz Pond
Sandburg Creek
Mullers Pond
Neversink Lakes
Pond
Bowers Pond
Beaver Lake
South Brook Pond
Sackett Lake
Sackett Lakes
Swinging Bridge Reservoir
Neversink River
Davies Lake
Wanaksink Pond
Lake Louise
Treasure Lake Marie
Wildwood Lake

Figure 10: Land Cover - Northeast

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

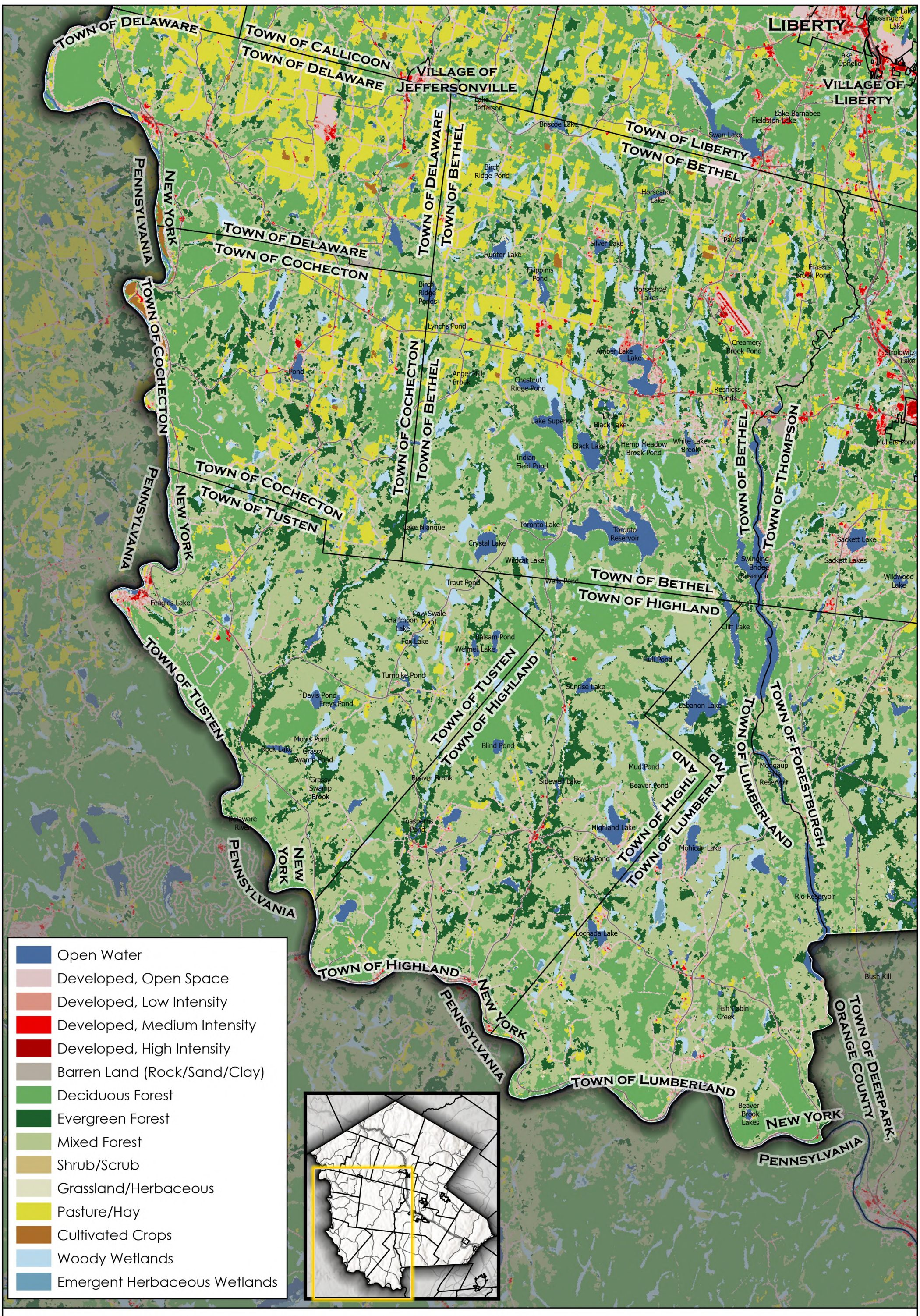


Figure 11: Land Cover - Southwest

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

Figure 12: Land Cover - Southeast

Sullivan County, New York

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

the County, with the vast majority classified as forested land, followed by lands covered in pasture or hay, and then by developed areas of various intensities.

Clear patterns emerge when the County is viewed by land cover. The highly forested areas are found within the northern Towns of Rockland and Neversink, and within the southern Towns of Tusten, Highland, Lumberland, Forestburgh, and Mamakating. Agricultural lands dominate the western Towns of Fremont, Delaware, and Cochecton, and the central Towns of Callicoon, Bethel, and the southwest portion of Liberty. The developed lands of varying degrees are clustered in the central and eastern Towns of Liberty, Thompson, and Fallsburg, including their respective villages.

Understanding the extent of residential and commercial development, along with the intensity of development, provides the viewer with a perspective on the totality of the human impact occurring throughout Sullivan County. For water and wastewater systems, it shows where significant areas of development are concentrated external to a public utility district or village, along with the density of development in certain areas of the County and the lack of development in other areas of the County.

Soil Suitability

Understanding the geographic distribution of the population and suitable soils provides a valuable perspective on the need for resource allocation and potential impacts from past development, and those locations to which future development should be directed.

The Soil Suitability for Septic maps on the following pages (Figure 13, Figure 14, Figure 15, and Figure 16) provide a comparison of the locations of addresses for homes and businesses alongside those soils most suitable for septic systems. The maps depict those areas classified by the Natural Resource Conservation Service (NRCS) according to soil survey information and properties of those soils for particular uses – in this case, septic systems with absorption fields.

Soil properties and qualities affecting use for wastewater disposal include: ability of water to move through saturated soils, depth to a seasonal high water table, depth to bedrock, depth to dense material, and susceptibility to flooding. Stones and boulders and a shallow depth to bedrock or dense material interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. In addition, the hazards of erosion and sedimentation increase as slope increases. Ratings are as follows:

- **"Not limited"** indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected.

Not Limited Soil
Somewhat Limited Soil
Very Limited Soil
Water Body
Address Point
NYC Watershed
Catskill Park
Delaware River Basin

TOWN OF HANCOCK, DELAWARE COUNTY
TOWN OF COLCHESTER, DELAWARE COUNTY
TOWN OF COLCHESTER, DELAWARE COUNTY
TOWN OF ROCKLAND
Beaver Kill Ponds
Beaver Kill Pond
Catskill State Park Pond
Catskill State Park Ponds
Lake Nimrod
Lake Muskoday
Cranberry Ponds
Cooks Brook Pond
Lake Florence
Tennanah Lake
Holp Pond
Mud Pond
TOWN OF ROCKLAND
TOWN OF CALLICOON
TOWN OF ROCKLAND
Shandelee Lake
Olympus Lake
TOWN OF LIBERTY
TOWN OF FREMONT
Petrillo Lake
Anawanda Lake
Sand Pond
Lenape Lake
Matawa Lake
Denman Lake
Vogel Pond
TOWN OF FREMONT
TOWN OF CALLICOON
Benton Brook
Stump Pond
Reichman Pond
Revonah Lake
Melbern Lake
NEW YORK
PENNSYLVANIA
Hust Pond
TOWN OF CALLICOON
TOWN OF LIBERTY
Lenape Lakes
TOWN OF DELAWARE
TOWN OF CALLICOON
TOWN OF DELAWARE
VILLAGE OF JEFFERSONVILLE
Delaware River
Lake Jefferson
Fieldston Lake
Lake Barnabee
Briscoe Lake
Swan Lake
TOWN OF LIBERTY
TOWN OF BETHEL
PENNSYLVANIA
NEW YORK
TOWN OF DELAWARE
TOWN OF BETHEL
Birch Ridge Pond
Horseshoe Lake
TOWN OF DELAWARE
TOWN OF COCHECTON
Pauls Pond
Silver Lake
Hunter Lake
Frasers Brook Pond
Filippinis Pond
Birch Ridge Ponds
Horseshoe Lakes
TOWN OF COCHECTON
PENNSYLVANIA
Lynchs Pond
Creamery Brook Pond
Amber Lake
Pond
Angel Mill Brook
Chestnut Ridge Pond
Lake
Resnicks Ponds
TOWN OF COCHECTON
TOWN OF BETHEL
TOWN OF BETHEL
TOWN OF THOMPSON
Lake Superior
Little Black Lake
Black Lake
Hemp Meadow Brook Pond
White Lake Brook
Indian Field Pond
NEW YORK
TOWN OF COCHECTON
TOWN OF TUSTEN
Lake Nianque
Toronto Lake
Toronto Reservoir
Crystal Lake
Wildcat Lake
Swinging Bridge Reservoir
Trout Pond
Wells Pond

Figure 13: Soil Suitability for Septic - Northwest

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

Figure 14: Soil Suitability for Septic - Northeast

Sullivan County, New York

Not Limited Soil
Somewhat Limited Soil
Very Limited Soil
Water Body
Address Point
NYC Watershed
Catskill Park
Delaware River Basin

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

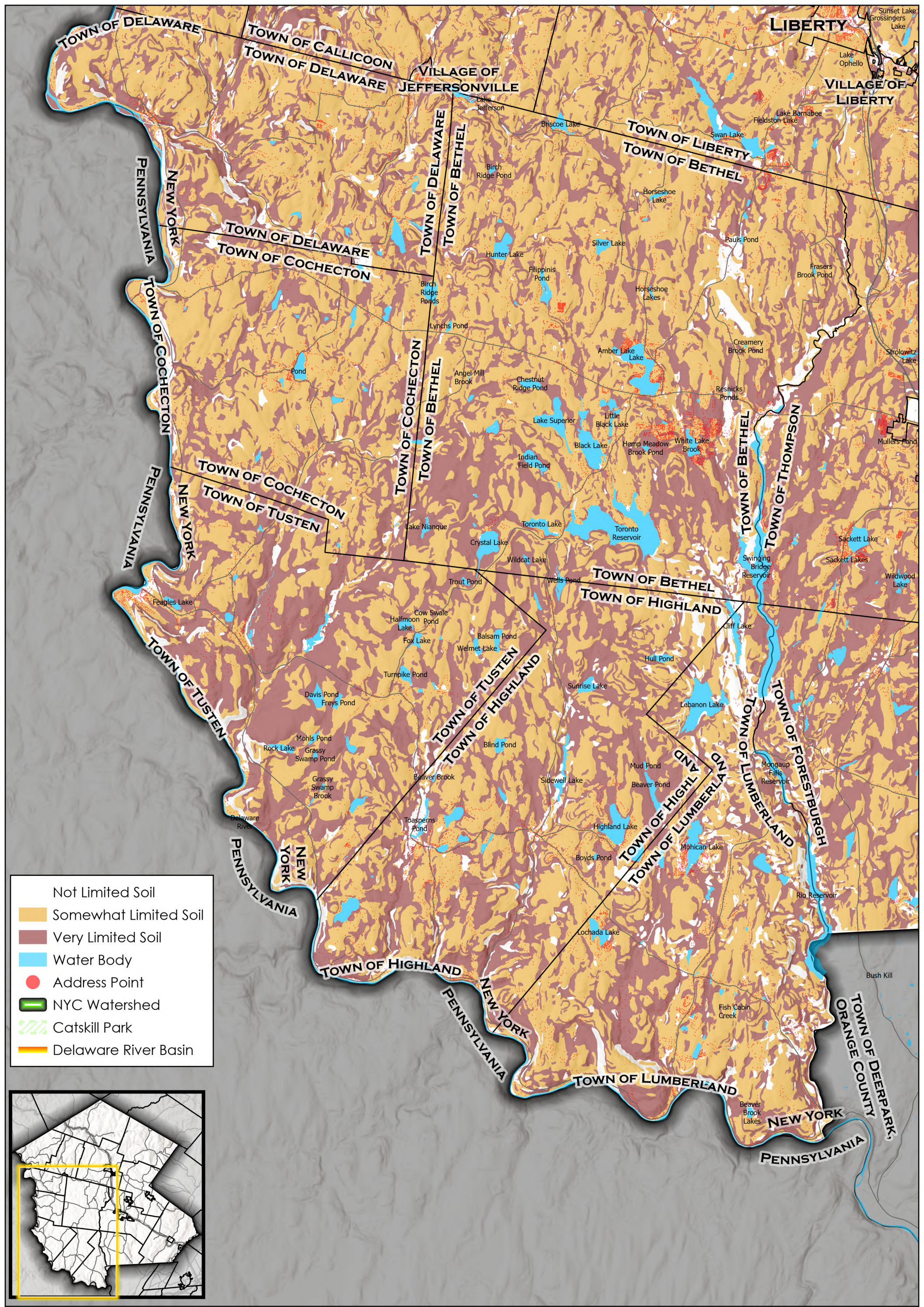


Figure 15: Soil Suitability for Septic - Southwest

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: January, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

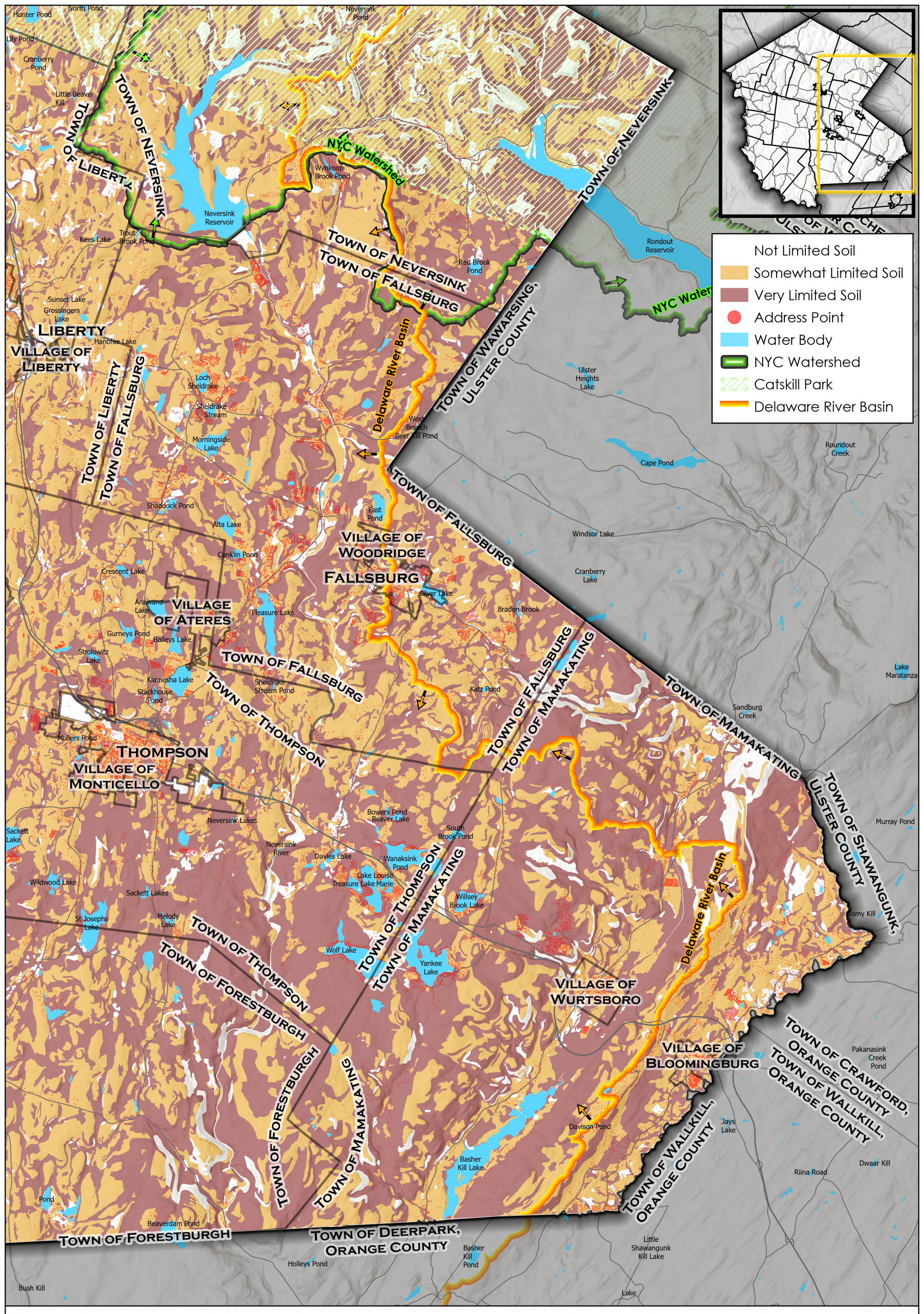


Figure 16: Soil Suitability for Septic - Southeast

Sullivan County, New York

0 3 6 9 12 Miles

N

Prepared by: Delaware Engineering, DPC
Date: April, 2026
Sources: New York State Office of Information Technology Services, Sullivan County, NYSDEC

- **"Somewhat limited"** indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.
- **"Very limited"** indicates that the soil has one or more features that are unfavorable for septic absorption field use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

It is important to note that site specific evaluations are necessary and that construction of compliant septic absorption fields even in soils classed as "very limited" is possible. On the following maps, only those areas classed as "not limited" and "somewhat limited" are shown; all other areas are "very limited." And as the maps show, while there are areas favorable for septics; however, the majority (70%) of soils across the County - are "very limited" and present challenges for these facilities.

Hydrology

Watersheds, wetlands and surface waters (streams and other waterbodies) together form regional hydrography. Understanding regional hydrography is essential for water supply and wastewater management and planning because it directly influences availability, quality, and environmental conditions. Knowing the location of watershed boundaries helps identify where surface water and groundwater recharge occurs and what land areas impact the water entering the system.

As the watershed mapping in this section shows, certain watersheds in the County have high concentrations of water intakes and sewer outfalls, while others have very few. With this reality, intermunicipal and regional coordination and planning are paramount to achieving a water-secure and sustainable future.

Watersheds are delineated by USGS using a nationwide system (National Watershed Boundary Dataset) based on surface hydrologic features. Watersheds are nested with smaller watersheds grouping to form larger ones. USGS has created a hydrologic unit code (HUC) consisting of 2 additional digits for each level in the hydrologic unit system that is used to identify any hydrologic area.

The watershed boundaries mapped in this report are at the HUC 10 level, which is one level above the smallest level of delineation in the National Watershed Boundary Dataset and provides sufficient detail for watershed planning, including water supply and wastewater

management. There are eleven HUC 10 watersheds with areas in Sullivan County, including:

- Beaverkill Watershed
- Upper Delaware River Watershed
- Middle Delaware River Watershed
- Lower Delaware River Watershed
- Willowemoc Creek Watershed
- Neversink River Watershed
- Upper Roundout Creek Watershed
- Mongaup River Watershed
- Basher Kill Watershed
- Shawangunk Kill
- Halfway Brook – Delaware River Watershed

In addition to the HUC 10s depicted in the hydrologic mapping, there are two additional watersheds shown: the Delaware River Basin and the New York City (NYC) Watershed.

The Delaware River Basin (DRB) encompasses all watershed areas that contribute to the Delaware River. The basin is 13,539 square miles in four states, plus the 782 square-mile Delaware Bay. New York's portion of the basin is approximately 17.69% and is entirely in the HUC 6 "Upper Delaware" watershed (watersheds increase in size as the HUC value reduces.) This boundary is important, as certain activities occurring here are subject to oversight by a regional body, the Delaware River Basin Commission (DRBC), formed by interstate compact commission to oversee managing the river system without regard to political boundaries. DRBC programs and regulations include management of water quality protection; water supply allocation, water conservation initiatives and watershed planning; regulatory review (permitting); flow and drought management; flood loss reduction; and recreation. It is crucial to water supply and wastewater management to understand where the DRBC is or is not applicable in Sullivan County.

The NYC watershed refers to all areas that contribute to NYC drinking water supply, the source of which is mainly surface waters. These areas are found both east and west of the Hudson River; a portion of Sullivan County drains to watersheds comprising NYC's Catskill-Delaware system. The NYC Department of Environmental Protection (NYCDEP) oversees a program of regulations and other programs aimed at protection of this water supply designed to avoid the need to install filtration equipment. In contrast to DRBC, which regulates both water quality and quantity, the NYCDEP's programs and regulations in the

NYC Watershed are aimed mainly at water quality and, therefore, at the effects of pollutants, such as from wastewater treatment facilities and stormwater runoff.

Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year. Wetlands have the capacity to improve water quality by acting as a natural filter removing nutrients, sediments and other harmful pollutants from water. The amount and location of wetlands can influence how much they affect water quality, and wetlands also are generally unsuitable for use for many types of development, including residential and commercial construction as well as use for septic systems.

Stream class is also included in the hydrologic mapping, assigned by the New York State's Department of Environmental Conservation (NYSDEC). All waters of the state are provided with a class and standard designation based on existing or expected best usage, which also determines the protection status of a particular water or waterway segment. These classes and best usage, as described in regulation, are listed below:

- AA, A – Drinking source
- B – Swimming and other recreation, not suitable for drinking
- C – Fisheries, non-contact activities
- D – Fishing

The Watershed Discharge Area maps (Figure 17, Figure 18, Figure 19, and Figure 20) show the watersheds associated with the streams and rivers within Sullivan County in relation to wastewater treatment facilities operating under a SPDES permit. Understanding where a municipal system lies along the greater watershed system provides valuable insights into the potential for cumulative impact, along with which systems and municipalities would most benefit from cooperative management efforts (i.e., the upstream systems can impact the downstream systems). Moreover, water classifications are used in determining effluent limits assigned to SPDES permits, and these limits, in turn, influence the design and operation of WWTPs.

Throughout much of the County, the most intense development falls within either the headwaters or the center of the water flows, rather than the downstream section of each watershed. Just a handful of small public systems are located downstream, including the Hamlets of Callicoon, Narrowsburg, and Long Eddy. These maps also show that certain watersheds have high concentrations of water intakes and sewer outfalls within the County, while others have very few. With this reality, intermunicipal and regional coordination and planning are paramount to achieving a water-secure and sustainable future.

Challenges and Opportunities

This section summarizes and synthesizes identified challenges and opportunities across the municipalities of Sullivan County. The Volume 2 reports contain an evaluation of the water supply and wastewater management landscape in each of the County's twenty-two municipalities.

Observations from Evaluation of Infrastructure Conditions Across Municipalities

The **Volume 2** evaluations, which are presented as challenges and opportunities in each of the twenty-two municipal reports, were reviewed for common themes in an effort to understand shared concerns, issues, and needs across the County. The observed opportunities and challenges for each municipality were then categorized and, within each category, further summarized across municipalities. These challenges and opportunities were identified both specifically by local officials, system operators, and other representatives interviewed as part of the CAPWI effort, as well as derived from analysis of the data developed for the water and sewer infrastructure situation in each municipality.

This section presents the results of this exercise, beginning with a description of the set of categories that emerged and followed with a detailed presentation of the observed challenges and opportunities within those categories, and then proceeding with summary charts showing the prevalence of those categories of challenges and opportunities across municipalities.

Observation Categories

Challenges and opportunities fell across a number of different thematic categories, which are summarized broadly by three areas in this section. In some of these categories, both challenges and opportunities were identified, while other categories may trend in one direction and be viewed more as a challenge as opposed to an opportunity.

System Investment, Administration, and Regulatory Dictates

The first area relates to governance and applicable laws and regulations. Categories of challenges and opportunities include:

- Cost of Capital Improvements – Magnitude or amount of capital (i.e., as opposed to O&M) investment needed or thought to be needed for service delivery to continue to be provided, consistent with applicable requirements
- Known Needed Capital Improvements – Major, long-term investments in tangible and intangible assets supporting water and sewer service, which have been

identified, to varying degrees of detail, as requirements for continuation of service by the system owner

- Small User Base – Relatively fewer numbers of service connections or other revenue-generating consumers, given typical fixed costs, capital investments, or construction costs of centralized water and sewer systems
- Finance, Administration, and O&M – Relating to the fundamental governance and material activities needed to provide the service
- Grant and Financing Assistance – Role of and considerations relating to obtaining outside sources of funding assistance in system management
- Regulatory Compliance – Adhering to legal requirements imposed or implemented by higher levels of government in the design, construction, and operation of water and sewer systems
- EBPS Rank – Position of regulated WWTP on NYSDEC list of SPDES permittees for required permit renewal activities [2]

System Operating Conditions

The second area involves water and sewer infrastructure operations, including aspects of the individual system elements, such as source water or collection and conveyance system, and other related considerations. Categories of challenges and opportunities in this area include:

- Available Capacity – Quantity of water supply or wastewater treatment the system is capable of providing
- Hydraulic Constraints – Characteristics of water distribution and sewer collection and conveyance systems creating conditions under which the ability to move finished water or sewage is limited
- Industrial Users – Users, typically commercial enterprises, discharging to a sanitary sewer system of non-domestic sewage flows
- Inflow and Infiltration (I&I) – Introduction into sanitary sewer collection and conveyance systems of stormwater and groundwater that creates hydraulic issues and uses permitted capacity
- Lifecycle Issues – Assets at or approaching the end of the period in which the assets may be reasonably expected to be useful, given such considerations as the physical

[2] Under this system, SPDES permit holders are assigned a score and rank that then determines the order in which NYSDEC staff carry out a full technical review to determine whether a permit needs modification. These scores are added together, and a rank is assigned. The higher the EBPS Permit Priority Score, the higher the priority that permit has for full technical review and modification initiated by NYSDEC.

environment of use; the prevailing characteristics of design, construction, and use; the associated maintenance needs; the level of operator experience, etc.

- Search for Additional Sources of Supply – Addition to an existing water system of raw water from a groundwater aquifer or watercourse from which water is taken either periodically or continuously for municipal purposes
- Seasonality of Demand – Significant differences over a given period (i.e., annually) in the quantity of water supply or wastewater management services needed by users
- Significant Users – Those water supply and wastewater disposal connections that, whether supporting commercial, institutional, or other users, place disproportionate demands for service and, typically, also disproportionately generate revenue for system owners
- Water Loss – Finished water in a water supply system that is unaccounted for by a water system operator, whether by meter or other documented/known fate
- Water Source Challenges – Conditions within a source of water supply, upstream of application of any treatment process, requiring, for various reasons, whether aesthetic, regulatory, or operational, some form of remediation
- Vulnerability of Existing Facilities – Natural and human-made risks that threaten interruptions of access to water supply and wastewater management services

Infrastructure Change, Planning, and Related Considerations

This third and final area relates to the dynamics of and managing change in water and sewer infrastructure in municipalities. Categories of challenges and opportunities include:

- Benefits of Creating Centralized System – Positive aspects of and possibilities attached to providing centralized water and/or sewer service, especially to areas served by existing on-site facilities
- Proliferation of On-Site, Decentralized Facilities – Water and sewer systems serving individual properties or users
- Growth and Development Pressures – Increases in investment interest, including housing development and business activity, drive demand for water and sewer infrastructure
- Interconnections Among Service Provider Systems – Physical interfaces between non-connected, separate centralized water supply and sanitary sewer systems
- Intermunicipal Partnerships – The relationships created between two or more municipalities for a variety of purposes, including interconnections, as well as supporting legal, financial, and operational frameworks

- Municipal Development/Acquisition of Centralized System – Process by which a municipality itself provides water and sewer service, whether by construction of new facilities or assuming ownership of existing facilities
- Planning for Growth and Development – Future-oriented activities undertaken to guide and coordinate the process of addressing increased demand for water and sewer service
- System-Level Analyses – Hydraulic modeling, condition assessments, and similar analyses aimed at describing and assessing operational parameters, such as pipe capacity, pressure zones, flow/throughput, etc., across entire water and sewer systems, and interaction among system elements
- Privately Owned Decentralized Systems – Water supply and wastewater management systems generally serving many users, owned and operated by a non-governmental entity, but regulated similarly to municipal systems under applicable state and federal law

Summary Table and Charts

This section presents an overview of the specific challenges and opportunities identified within the above categories. Figure 21 and Figure 22, below, show the number of instances of specific opportunities within the various categories. Figure 23 and Figure 24 depict the same with respect to identified challenges. Finally, Table 6 presents a more detailed summary of these items.

With regard to both challenges and opportunities, of note is that on-site, decentralized facilities appear frequently for both water and sewer. This is due to the fact that many residents and businesses in the County rely on these facilities, and for a number of communities, specific challenges have been identified (e.g., areas with failing septic systems). With respect to opportunities, these facilities are, across many portions of the County where settlement density and numbers of users are low, likely to remain the primary means of providing water supply and wastewater management in a financially sustainable way.

As Figure *21* shows, intermunicipal partnerships and system interconnections were frequently identified as opportunities in order to meet water supply needs. Privately owned decentralized systems were also frequently identified as opportunities for the same reasons – their ability to supply developments – but opportunities exist also with respect to setting up frameworks at the municipal level for sustainable operations long term, such as creating water districts coterminous with their service areas. Finally, growth and development pressure were also frequently identified.

Figure 21. Percent of water supply opportunities within identified categories of (n = 55)

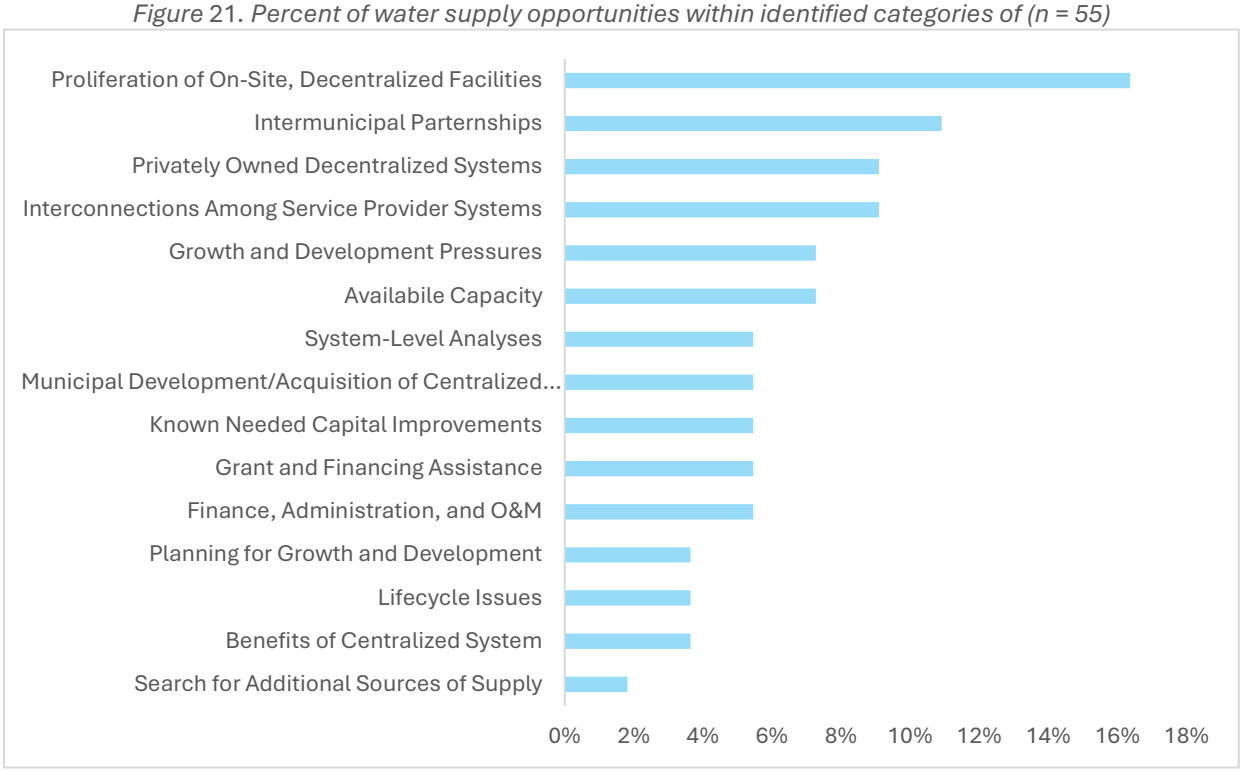


Figure 22. Percent of wastewater management opportunities within identified categories (n = 37)

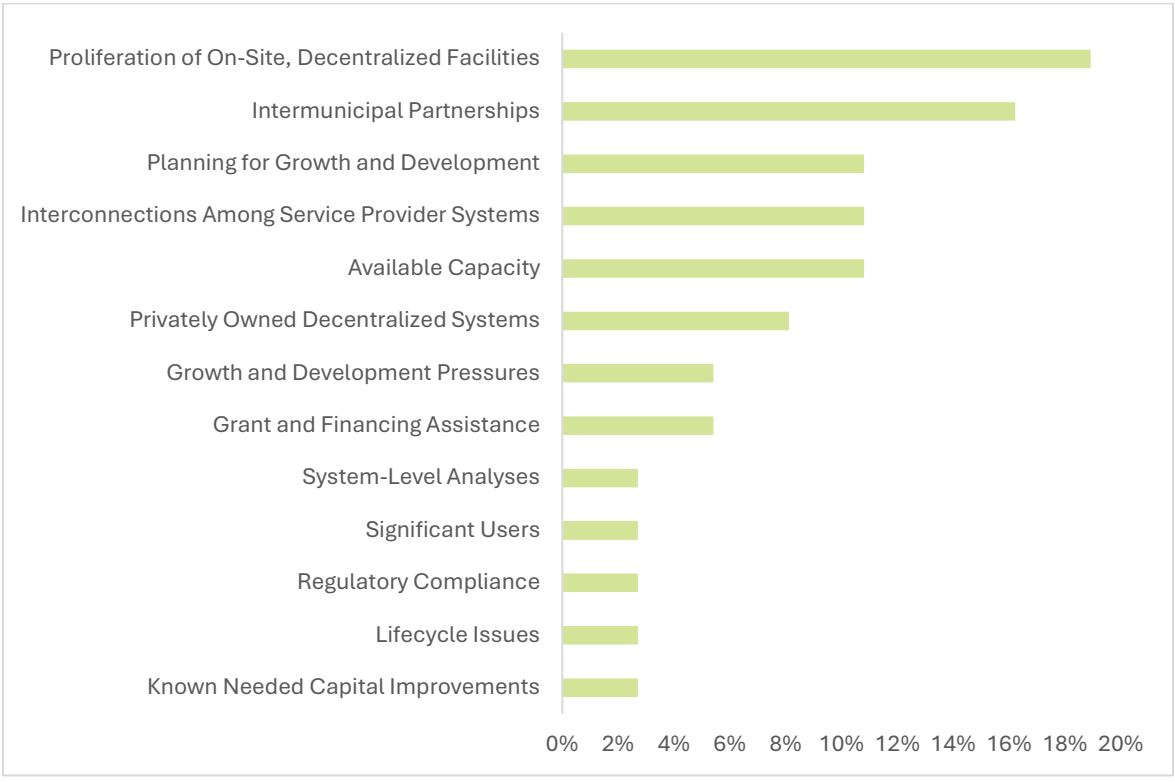


Figure 22 shows a similar pattern with respect to intermunicipal collaboration for the provision of sewer service. Planning for growth and development, and available capacity in certain municipal systems (e.g., due to loss of a significant user) were also identified as opportunities.

With respect to water supply challenges, Figure 23 shows that, for many municipalities, the known needed capital investment in their systems represents a key challenge. Other challenges relate to growth pressures, including whether sufficient capacity is available to meet needs, as well as the challenges associated with smaller user bases over which to spread fixed costs. With respect to wastewater management challenges, growth and development, regulatory compliance, cost of capital improvements, I&I, and lifecycle issues, all were identified as being associated with specific challenges (Figure *24*).

Figure 23. Number of water supply challenges within identified categories (n = 98)



Figure 24. Percent of wastewater challenges within identified categories (n = 100)

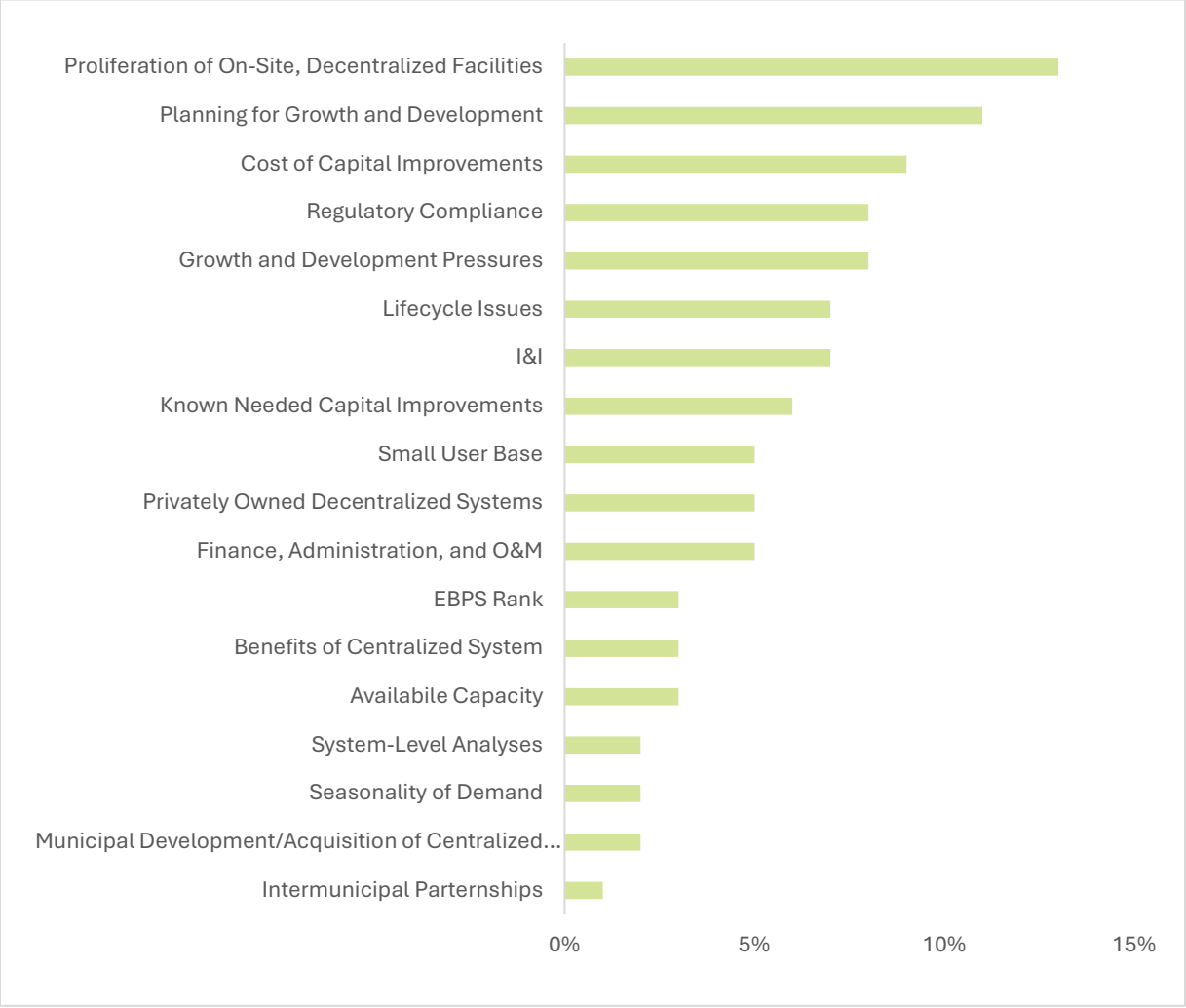


Table 6. Volume 2 reports summary of specific challenges and opportunities by category

Observation Category	Summary of Challenge(s) Evaluation	Summary of Opportunity(ies) Evaluation
Cost of Capital Improvements	• System requires, or is thought to require, relatively substantial investment, whether based on detailed analysis or not, in order to remain in service • Cost of capital investment may exceed the ability of users to pay without assistance • Financing of known needed projects in a sustainable fashion is not in place	
Known Needed Capital Improvements	• Capital needs have been identified, but projects are not detailed, estimated, or budgeted • Generalized understanding of needs due to system age (life-cycle), but not further specified • Community resources are limited and strained by addressing known needs and projects• Past permit requirements and equipment combine to make needed upgrades more costly	• Implementing projects, such as replacement of water mains prone to failure, provides multiple benefits, from staff time and vendor/contractor costs reduction to water savings • Identification of projects needed in advance provides leverage for seeking and securing financial assistance
Small User Base	• Difficult capital and O&M funding environment, as fixed costs of service provision are spread over a smaller user base	
Finance, Administration, and O&M	• Capital projects can require commitment of significant local resources, such as staff time, to implement, from customer service to municipal boards, grant administration, project management, and oversight, etc. • Administration of service is complicated by the involvement of other entities responsible for service provision • Difficulty maintaining necessary staffing levels, such as those of qualified system operators • Evolving needs, such as due to flushing of inappropriate materials, can overwhelm legacy components not designed to address them • Water loss due to aging equipment, such as water meters • Need to optimize the performance of system components	• Community maintains reserves facilitating known needed capital project implementation • Potential sources of funding support for needed investment, such as grants or as part of the land development process, appear to be available
Grant and Financing Assistance	• Grant funding carries requirements of the funding entity that must be met	• Known needed projects have secured, or are anticipated to secure, financial assistance • Financial assistance can be the only means by which a capital project is financially feasible and sustainable
Regulatory Compliance	• Regulatory dictates can increase capital and O&M costs • Compliance schedules in permits must be adhered to • Multiple overlapping jurisdictions are present in some portions of the County • Permit exceedances can create reactionary conditions, which increase cost and reduce space to integrate needed improvements into the overall program of service provision	• Compliance needs provide leverage for additional sources of funding, as well as to implement projects aimed at facilities modernization and efficiency enhancements • Monitoring regulatory changes and impending requirements affords the opportunity to proactively plan for needed capital improvements

Observation Category	Summary of Challenge(s) Evaluation	Summary of Opportunity(ies) Evaluation
EBPS Rank	• NYSDEC information indicates SPDES permit is likely to undergo a full technical review • Projects in flight or planned may not have intended operational outcomes (e.g., influent capacity) or may require modification to meet expected permit standards	
Available Capacity	• Identified concerns about the ability of the system to meet future demands • Known sourcewater production or redundancy issues	• System presently has, or may have, spare capacity to meet increased demands • Identified projects have the potential to increase system capacity
Hydraulic Constraints	• Conditions in the water distribution system itself mean that the available water supply will not meet the needs of the Community • Uncertainty about specific operating conditions in the water distribution system to support decision-making	
Industrial Users	• Impacts to WWTP or conveyance system operations due to unusual or unusually concentrated constituents in flow	
Inflow and Infiltration (I&I)	• Available capacity limitations attributable directly to I&I • Process or equipment concerns during weather events and conditions causing I&I • SPDES permit issues	• Addressing I&I may increase available capacity within a collection and conveyance system and at WWTPs
Lifecycle Issues	• Often can lead to system-wide issues and substantial infrastructure projects necessary in a compressed timeframe • Can exacerbate other issues, such as I&I and water loss • Investments required far in excess of normal O&M costs and can burden ratepayers or make financially infeasible • Where not addressed, a reactive approach to repeated failures or issues increases overall system and service provision costs	• Investments to address aging infrastructure provide multiple benefits and can increase efficiencies in service delivery
Search for Additional Sources of Supply	• Need for redundancy in water supply by regulation can create conditions under which the search is more exigent	• Openness to partnerships with entities with existing or potential sources of water supply, such as land developers, can aid in the search for added capacity
Seasonality of Demand	• Infrastructure must be able to accommodate peak flows, which in some municipalities can be three times or more than non-peak season flows • Wastewater treatment processes must be designed to treat substantially varying quantities of inflow • Available capacity is limited	

Observation Category	Summary of Challenge(s) Evaluation	Summary of Opportunity(ies) Evaluation
Significant Users	• Loss of a user historically contributing to infrastructure requirements and funding can create radically different financial and operational conditions • The needs of these users can be challenging to accommodate	• Potential for increased available capacity
Water Loss	• Certain systems experience high rates of water that is produced, at the supplier's expense, by a water system, but is unable to be billed • Aging water meters that may no longer read accurately	
Water Source Challenges	• Elevated levels of substances, such as DBPs, are present in sourcewater requiring treatment or other countermeasures	
Vulnerability of Existing Facilities	• Legacy infrastructure situated within contemporary areas of special flood hazard but without contemporary mitigative measures or designs	
Benefits of Creating Centralized System		• Existing areas lacking centralized sewer service are situated in proximity to sensitive water resources, making sewer service a key to resource protection • Provision of centralized water supply service is one solution to addressing larger-scale issues with on-site decentralized facilities affecting many properties • Often, the only solution is where higher-density development is planned or anticipated
Proliferation of Decentralized Facilities	• Variety of site-specific, localized challenges with centralized service being a potential solution • Known areas of failing on-site decentralized facilities • Reliance on these facilities may frustrate other community goals, such as environmental quality or redevelopment • Designed to legacy regulatory and technical standards, making replacement in kind challenging	• Ability to meet user demands in a more financially sustainable way, given the right conditions
Growth and Development Pressures	• Community is experiencing anticipated, planned, or approved development involving municipal facilities • Added residential and commercial users require a portion of the limited available system capacity • Infrastructure installed to support private development should be constructed to municipal standards prior to being offered for dedication • New, privately owned decentralized systems are proposed	• Development interest and infrastructure needs carry the possibility of coordinating and offsetting costs of required system investments • Potential to expand the user base among whom system costs are distributed • Opportunities for system enhancements, such as new sources of water supply, interconnections, and service area expansions

Observation Category	Summary of Challenge(s) Evaluation	Summary of Opportunity(ies) Evaluation
Interconnections Among Service Provider Systems	• Intermunicipal coordination and cooperation are required where systems are interconnected	• Potential for increased water system resiliency, security, and operational benefits • Increased service area sizes where connection to and extension of existing systems are available • Potential to increase capacity by redirecting sanitary flows • Leverage existing facilities and associated sunk costs to more efficiently provide service where desired or required
Intermunicipal Partnerships	• Resources and agreement needed to develop sustainable partnerships	• Provide a framework for long-term support of interconnections and intermunicipal service • Obtaining a grant and other financial assistance • Shared services • Potential for durable, sustainable, cost-effective service provision and expansion of services • Enhanced system-level capacity planning, capital project planning, and O&M activities
Municipal Development/Acquisition of Centralized System	• Process to create or acquire new systems is resource-intensive, can be complicated, and can require sustained commitment from decision-makers	• Provide benefits of centralized water and sewer service to new users or create a more sustainable means to continue said service delivery
Planning for Growth and Development	• Extensive proposed privately owned decentralized water and sewer infrastructure can, if appropriate local approval frameworks are not in place, increase future administrative and financial costs, as municipalities are often compelled to assume ownership • Heavy demand for service in the present can strain a municipality's ability to robustly plan for present and future needs and system expansion • Infrastructure to be constructed by a private entity but offered for dedication to a municipality creates resource and local code and oversight demands • Absence of coordination between local land use boards and operators and municipal boards relative to land development entitlement approvals vs. available capacity	• Ability to proactively plan for the implementation of a sewer system to serve anticipated growth in the user base can help create a framework for orderly, efficient creation and expansion of service • Potential to realize system enhancements and increase system resiliency • Where needs and projects are identified, opportunity to leverage diverse funding sources, including the private sector, to implement • Town Board approval requirement of Art. 10 transportation corp. formation allows municipalities to create frameworks to backstop service provision while minimizing cost to the municipality and users • Create codes and regulations designed to address undesirable aspects of and other challenges associated with private infrastructure
System-Level Analyses	• Can be time-consuming and expensive to undertake • Can be necessary in order to fully understand potential impacts of new or different system demands or proposed modifications, prior to decision-making	• Often provide the only firm basis upon which the most effective operational, as well as the ability to serve, and capital investment decisions can be made

Observation Category	Summary of Challenge(s) Evaluation	Summary of Opportunity(ies) Evaluation
Privately Owned Decentralized Systems	• Coordination between a town and its private suppliers is often necessary in order to address a range of considerations, from responding to resident inquiries to adding new connections • Not uncommon for systems to have experienced deferred maintenance, especially at times when the private owner exits the business • Without proper administrative, legal, and engineering planning, it can be costly to towns compelled to assume control • Under NYS law, ownership of private sewage works corp.'s must be assumed by the town within which they are located, where service is no longer provided by the owner	• In the absence of municipal ownership, new owners of private systems can represent an opportunity to provide needed investments and improvements • Municipalities in the approval process of Art. 10 transportation corporations have the ability to create administrative, legal, and financial backstops

Overarching Observations and Initial Recommendations

Taken together, the categories of challenges and opportunities, and their absolute and relative prevalence throughout the County, highlight those particular areas of need amongst the municipalities that lend themselves to regional assistance.

This section presents a synthesis of the challenges and opportunities outlined in the preceding section. It extends this evaluation to also address related aspects of the observed categories of challenges and opportunities, both by infrastructure type (i.e., water supply and wastewater management) as well as by shared needs and activities related to ownership, operation, and oversight of water supply and wastewater management infrastructure. This section also provides the basis for the recommendations advanced in this report.

Water Supply Infrastructure Considerations

- **Observations** – It is noteworthy that it is costly to create safe, clean drinking water; thus, one of the most effective things any water supplier can do to contain the costs of the provision of water is to reduce the amount of water that is lost in the distribution system. Investments in water line replacements are often the last priority—but require focus. In addition, aging water meters (the useful life is only 10 years) have a tendency to read low, thus not providing robust data to track and monitor usage. As with water lines, investment in meter upgrades is often not a priority, but should be a focus. As noted in the previous section, among the challenges in the County are issues with the age of infrastructure (lifecycle issues); need for and cost of capital improvements; issues with sources, such as a lack of required redundancy; and growth and development pressures.

- **Recommendations Discussion** – Development of a detailed understanding of the cost to produce water and the various cost components is a key to system financial sustainability, and budgeting in this regard is essential. Ensuring rates keep pace with these costs by evaluating rate structures in light of costs is recommended; developing a capital plan addressing identified system needs are key recommendations. Major capital projects often are feasible only with external financial support; developing knowledge of sources of grants and the requirements attached is recommended, and the County can support these efforts in various ways, such as offering assistance with income surveys.

Wastewater Management Infrastructure Considerations

- **Observations** – With respect to collection systems, the introduction of infiltration and inflow (I&I) causes hydraulic surges throughout the pipe network and can, under

extreme conditions, result in the overflow of untreated sewage to the environment. In addition, similar to leaking water lines, sending millions of gallons of stormwater to a wastewater treatment plant increases the operating costs of the treatment plant, so investments in tightening up sewer collection systems are prudent from an environmental and fiscal standpoint.

The effects of aging infrastructure on treatment capacity cannot be overstated. A treatment plant that was designed for a certain treatment capacity many years ago is likely, unless there has been major capital investment, to have experienced a dramatic reduction in treatment capacity in present times, often resulting in, at a minimum, operational challenges, and at most, regulatory compliance challenges and violations.

- **Recommendations Discussion** – Many municipalities in the County have similar needs concerning aging infrastructure and I&I. The County can support addressing these needs through shared procurements and technical assistance. For example, a program to address I&I is best undertaken starting with a condition assessment of the collection and conveyance system, such as using CCTV equipment to inspect mains and laterals or carrying out condition assessments of manholes. Facilitating procurement of these services and/or providing grants of assistance is a role the County can play.

System Inventorying, Mapping, and Recordkeeping

- **Observations** – This item represents an extension of the individual municipal evaluations. In general, the extent, quality, and content of existing inventory information across the County can be described as varied. Some municipalities have an extensive digital inventory with mapping and comprehensive attribute data for various system elements; many do not. Similarly, the availability of record mapping and plans from past capital projects and related historical information is also varied. Some systems are fully digitally mapped with locations, conditions, and flows, while others are dependent on decades-old water-damaged plans or a single laminated drawing. The variation in data collection does not correlate with population or system size, but rather with either resources, age, interconnections, upgrades, or a mix. With such a wide array of record-keeping, there is very little uniformity of data between municipalities.

- **Recommendations Discussion** – As a decision tool for the County and communities with respect to water and sewer infrastructure, recommendations as to how to prioritize and accomplish detailed mapping of water and sewer lines where they do not exist are vital to the success of a project of this nature. This detailed mapping work is often in the context of recommendations for water line replacement or sewer collection system

upgrades, which provide a source of funding and an impetus to accomplish the critical mapping work. Importantly, it is recommended that every community require that its consultants and developers provide AutoCAD and/or GIS shape files for all infrastructure work to ensure a municipality knows locations of infrastructure for operations and maintenance of the system.

There are a number of best practices for municipalities to consider when it comes to centralized record keeping, asset inventorying, and system mapping. Use of GIS as a tool to record this information in a standardized way is a best practice. Populating data for water and sewer infrastructure assets can be resource-intensive and time-consuming, requiring fieldwork, and digitizing existing mapping and other records can be a useful first step in order to support fieldwork. Workflows can also be built in contemporary GIS solutions to document inspections, maintenance activities, and other operational information. Given the economies of scale that can be realized with broader sharing of GIS resources, including software, storage, maintenance, and skilled personnel, barriers to use among individual municipalities due to, e.g., cost or staff capacity, can be reduced were the County to assume a lead role and create a shared GIS platform for water and sewer.

It may also be possible, depending on local capacity, to undertake data collection using staff, once a GIS database and workflows are created. GIS can also support other recordkeeping needs, such as the keeping of detailed records of all system components, including conveyances, pumps, tanks, treatment facilities, and other physical assets; documenting of all equipment purchases, repairs, and maintenance activities, including dates, costs, and service providers; and maintaining logs of daily operations, routine maintenance tasks, water quality sampling results, customer inquiries, and compliance activities.

Regulations and Permits

- **Observations** – Municipalities operating WWTPs in the County do so pursuant to SPDES permits. SPDES permits are issued for a period of five years, pursuant to Clean Water Act requirements, after which the permittee must seek renewal from NYSDEC. This renewal can involve either an administrative continuance or a full technical review. In an environment of scarce resources, NYSDEC has implemented a system known as Environmental Benefit Permit Strategy (EBPS)[3] to help prioritize where to direct resources needed to carry out a full technical review. The higher the rank on this list

[3] For more information, see https://dec.ny.gov/regulatory/permits-licenses/wastewater-stormwater-water-withdrawal/spdes-permit-program.

(with a rank of 1 being the highest), the more likely it is that a permit will be selected by NYSDEC for full review. Review of NYSDEC's EBPS database suggests that a number of the WWTPs in the County appear on the EBPS list, with several facilities ranking relatively high on the list. It should be noted that permits not having undergone a full technical review within the five-year timeframe may be administratively (SAPA) continued so that the facility maintains permit coverage until an on-site, full review can be conducted.

Fundamentally, SPDES permits provide limits to the quantities and qualities of pollutants WWTPs are allowed to discharge to the environment, and the standards for setting these limits are set in regulation and applied during permit review. Permits that have been administratively continued several times were written to conform to discharge limits that have been superseded; moreover, the imposition of new permit limits, such as for nutrients like nitrogen and phosphorus, for pollutants for which effluent limits previously were not applied as part of the SPDES program, sometimes requiring very costly new processes or other upgrades.

It should be noted that, while a high EBPS ranking suggests a higher likelihood that a new permit will be written as part of a so-called NYSDEC-initiated modification, if a facility owner intends to make changes to a WWTP, such as increasing its treatment capacity or a major process change, a permit modification requested by the permittee is required, and such changes also provide an opportunity for NYSDEC to carry out a full technical review. Municipalities within the DRBC boundary are also subject to the standards DRBC may impose. Fundamentally, unanticipated permit changes initiated by NYSDEC can involve costly capital projects and/or treatment capacity reduction.

- **Recommendations Discussion** – The information provided by NYSDEC through EBPS provides an opportunity for permittees to understand their exposure to these issues and plan accordingly. Owners of these facilities should stay abreast of their EBPS rankings and develop an understanding of the age of their permits and changes to applicable regulations and related developments in these areas; in this way, owners can anticipate and plan for any modifications required to regulated facilities to ensure SPDES compliance.

System-Level Considerations and Capacity Analysis

- **Observations** – Based on research conducted for this report, many of the County's municipalities could benefit from undertaking system-wide modeling and other analysis of their water distribution and sanitary sewer collection and conveyance systems in order to understand current conditions, identify portions of the system where performance could be improved, assess likely outcomes of capital projects or

other modifications, and assess available capacity. While the data inputs and analysis tools are different for water as compared to sewer modeling, the aims are similar: Provide insights and decision support information at the level of an entire system.

- **Recommendations Discussion** – This type of modeling is also useful to inform the assessment of system capacity. Capacity is a complex topic when it comes to water and sewer infrastructure. On the one hand, sources of water supply and wastewater treatment plants each must be assessed individually. For example, without conducting a yield test, it is not always possible to know how much water a well can safely produce, especially as it ages and conditions change. Similarly, a wastewater treatment plant whose operation does not approach design flow may not be able to accept flows from an industrial facility without some form of pretreatment by the generator or capital investment at the plant. Regulations and permit limits also affect the determination of available capacity in these facilities.

  On the other hand, conditions in the network of pipes and other conveyances may mean that spare capacity at a water source or wastewater treatment plant cannot be accessed. Water distribution systems rely on pressure in order to provide service to individual users, and the specifics of pipe sizes, hydraulic grade lines, and booster stations may mean water cannot be delivered at the required flow and pressure to certain locations. Even if flow and pressure meet applicable standards, particular uses, like multi-story buildings or large distribution centers, may place demands on the system that it has not been designed to meet, or cannot meet, in a given location. Wastewater collection and conveyance systems typically include both gravity and pressure components, and each type of conveyance has a maximum amount of flow it can safely convey, based on diameter, material type, slope, etc. Finally, even though the system components may have historically been specified for a certain capacity, as equipment ages, it may be unable to perform at these specifications.

  This type of modeling and capacity assessment is beyond the scope of this report, but the information developed by these detailed, system-specific assessments is essential to a variety of operational needs as well as planning for the future.

Intermunicipal Considerations and Systems Interconnections

- **Observations** – This assessment has revealed a number of existing, planned, and potential opportunities for intermunicipal collaboration and system interconnections. In certain municipalities in the County, water supply systems have been interconnected in order to provide redundancy; in others, local officials reported activity investigating establishing these interconnections. The situation in the County is similar with respect

to sewer infrastructure, though capacity to accommodate additional flow is a more common reason for collaboration here.

- **Recommendations Discussion** – Most often, collaboration and system interconnection were identified as opportunities to help address local needs or solve problems. Implementing agreements between municipalities for the provision of these services, as authorized under NYS law, is a best practice and can help address challenges that can arise, such as system modifications and capacity planning. In addition to functional or physical consolidation and interconnection, another area that could benefit municipalities and districts is administrative consolidation where, when permitted by law, disparate systems function under one budget with one unified administration. Administrative consolidation has been carried out by several of the county's towns with respect to districts, creating more financially sustainable systems by sharing costs with larger user bases.

Privately-Owned, Decentralized Water and Sewer Systems

- **Observations** – Many users in the County are provided water and sewer service by private entities, which operate decentralized water and sewer systems they own. While these entities are regulated by the NYSDEC and NYSDOH, and may also be regulated by the Public Service Commission,[4] municipalities do not have control over service delivery and managing change, while, at the same time, residents depend on these private for-profit entities to provide essential services. The user costs for these systems can be regulated by the municipalities within reason; however, this is rarely the case. Where these systems have challenges associated with deferred maintenance, uncoordinated expansion and growth, and system design and specification, these challenges may ultimately become the municipality's.

  In the case of sewage works corporations, the host municipality must, under NYS law, assume control where the entity charged with ownership and operation ceases to perform these tasks. Similarly, even in the case of water works corporations, where NYS law does not necessarily require municipalities to assume control, municipal leaders and boards may face pressure to assume public control of the system.

[4] NYSDEC regulations and the NYS Public Service Law require that most decentralized private sewer and water systems with multiple connections form private sewage and water works corporations, pursuant to the NYS Transportation Corporations Law. The formation and oversight of these "Trans Corps" is an opportunity for municipalities to ensure durability of the service provision and mitigate potential issues down the line.

- **Recommendations Discussion** – A general recommendation is for municipalities to develop realistic and proactive policies and regulations concerning larger privately-owned decentralized water supply and wastewater management systems. These efforts should efficiently structure and anticipate municipal involvement, especially in the case of private decentralized wastewater systems.

  Frequently identified as a challenge in the Volume 2 municipal evaluations, there are a number of best practices and other tools available to municipalities at the planning stage of projects involving privately owned decentralized water and sewer systems to reduce exposure to future risk associated with their construction and operation. These range from very specific technical and land use standards to operations and use of authorities granted municipalities in NYS law as part of the requirement for consent to formation:

  i. Private water and wastewater treatment facilities should be considered a special use in all municipalities with zoning regulations.
  ii. Public utility buildings should be located on a separate property to allow for direct control over the land and to ensure property setbacks are utilized and protect from issues with property abandonment.
  iii. Treatment plant operations that generate odors should be contained within a permanent building with negative pressure HVAC and odor control practices.
  iv. Metal tanks should be at least partially buried below grade, and have cathodic protection systems and coating to prevent deterioration above the water line.
  v. Engineering documentation should be provided to the municipality for transparency and operations, and to demonstrate the flexibility of design for current and future needs.
  vi. If seasonally operated, require an operations plan for startup and decommissioning, and coordinate with code enforcement annually.
  vii. Always require a study to be completed in order to demonstrate that the infrastructure option chosen is the best way to serve the needs of the project and the greater community.
  viii. Always require a petition under Article 12 for the creation of a sewer and/or water district so that the special districts can be created prior to subdivision or site plan approval.
  ix. For the creation of sewer or water transportation corporations, the stock should be held in escrow, and the approving resolution should include an irrevocable offer of cession.

x. Maximize coordination among involved land use boards, which tend to have land development approval authority, and municipal boards that exclusively have transportation corporation approval authority.

Projects and Capital Investment

- **Observations** – As is the case with many water and sewer system owners and operators, many County municipalities have identified needed capital expenditures and which portions of a given system need what type of investment, though there may be variation in the specificity and details. For example, as reported to the project team and as data presented in Volume 2, of those municipalities with water supply systems 80% have identified capital projects needed or have capital projects under or planned for construction in the short term; similarly, 65% of municipalities with sewer systems.

- **Recommendations Discussion** – Documenting and developing lists of needed capital investment represents an opportunity to begin developing and implementing projects, including financial strategies, as many of the municipalities in the County have older water and sewer systems, and some challenges, such as water pipe condition, can be system-wide and, therefore, costly. In addition to the costs of these projects, major capital improvement projects can be challenging to implement, costing staff time, consuming bandwidth of local governing boards, and requiring careful outreach to constituents. It can also be challenging to develop a sufficient information base necessary to properly scope projects, carry out procurements, manage contractors, and pursue funding opportunities.

Governance of Water and Sewer Systems Under NYS Law

- **Observations** –The governance of public water and sewer infrastructure is largely dictated by New York State Law and local policies. For villages, the provision of water and sewer is a public good, and in most cases, in general, properties that are connected to public infrastructure or that could be connected because they are proximate to a pipeline, fund the debt of the systems, with properties that receive services funding the operations and maintenance.

  In towns, Town Law Article 12 provides the governance structure for special improvement districts such as water and sewer districts. A water or sewer district covers a distinct geography that is the service area for the infrastructure and generally costs of service are to be borne by those properties benefitted. NYS village law provides that water and sewer systems may be constructed at the joint expense of a village and the property benefitted; village law also provides that revenues in excess of

expenditures may be transferred to other funds and not necessarily limited to use for water system purposes.

The presence of a property within the boundary of a defined service area of a water or sewer district in a town grants that property a right to water or sewer services. These properties can demand service, and it must be provided; however, it is not free, it must be funded by those properties that benefit, and the timeline for the provision of service is based on reasonable efforts to advance the capital project(s) to provide the service.

Many of the County's municipalities maintain local laws governing the use of municipal water and sewer infrastructure. Implementing a sewer use law is a requirement to obtain and maintain a SPDES permit, for instance. However, as noted in the Volume 2 reports, not all municipalities' local laws were available for review as part of the CAPWI. It is not uncommon for municipalities to lack water use laws, for example, and both water and sewer use laws require regular assessment to ensure provisions both meet local needs as well as are reflective of current standards (e.g., for materials specifications).

- **Recommendations Discussion** –The governance of public water and sewer infrastructure is largely dictated by New York State Law and local policies. Towns must fund their systems on a benefit-basis. For villages, the provision of water and sewer is a public good, and in most cases, in general, properties that are connected to public infrastructure or that could be connected because they are proximate to a pipeline, fund the debt of the systems, with properties that receive services funding the operations and maintenance. Development of durable water and sewer use laws is an important element of local governance of this infrastructure.

Growth and Development, and Planning for Change

- **Observations** – Challenges with respect to governance of water and sewer systems in the County include, in some locales, a mismatch between the geography within a legally defined service area of a village or district and the ability of the existing infrastructure to support the demands of that area. In towns in particular, sewer and water district extensions have in the past been approved without evaluation of the ability of the systems to support the demands of the new service area or if an evaluation was conducted, it may not have assessed all aspects of service such as transmission or collection capacity or seasonal capacity. This has led to the creation of water and sewer districts wherein the properties have a right to service, but the existing facilities require improvement to provide that service.

A related issue with respect to governance is extension of service to areas associated with common plans for development (e.g., town water and sewer district extensions to serve housing projects), wherein the infrastructure within the development area is privately constructed, owned, and operated, but connected to a public water and/or sewer line for transmission of water or conveyance of wastewater. In the past, this private on-site infrastructure was not always evaluated from an engineering perspective with respect to its relationship to the integrity of the public system or its level of service. This has resulted in water extensions that experience low water pressure, and sewer conveyance systems that hydraulically challenge downstream public sewers.

- **Recommendations Discussion** – While not all County municipalities have growing populations, among the most frequent challenges identified in the Volume 2 reports are growth and development pressures, including ensuring adequate infrastructure is in place or is proposed for development, and assessing for anticipated future demand and/or potential connection and extensions. In addition, growth pressure is best addressed through examination of system-level and cumulative impacts associated with land development over time in order to prevent stress on utility systems.

  Water and sewer infrastructure considerations should be integrated into the land use decision-making process. This involves collaborative planning between municipalities and the agencies that regulate water and sewer infrastructure, including but not limited to NYSDEC and DOH, as well as DRBC. At the same time, municipalities must carry out their own thorough reviews of proposed water and sewer extensions, including by involving appropriate engineering and legal support. A detailed engineering assessment conducted by the community is an essential component of the review where these proposals are made. It is noted that investment interest also provides opportunities where new development is properly planned and considered with respect to, e.g., potential future extensions, needed capital investments, and expansion of the user base.

Finances

- **Observations** – With respect to finances, some public water and sewer systems may not have rates in place that adequately fund operations and maintenance or debt repayment. The cost of the provision of water and sewer services fluctuates generally in an increasing manner with the cost of licensed operators, power, residuals management (e.g., sludge handling and disposal), and other consumable costs, yet it is not uncommon to see water and sewer rates unchanged for a number of years. In addition, the rate structure or formula applied to users of these systems may not have

been evaluated for some time, and may in some cases be regressive, impacting those who can afford it the least the most. Also, in some cases, the distribution of costs among the users may not fully recognize the benefit each receives. And, with many residences occupied only seasonally, some rate structures fail to acknowledge that whether a structure is occupied seasonally or year-round, the ability to serve exists continuously and has a cost. The fixed costs of the provision of water and sewer services are the largest portion of the total cost of services, with the variables being a very small proportion of costs. Rate structures that do not take the continuous provision of services, whether used or not, into consideration are likely shifting undue burden onto year-round occupants.

Financing of public water and sewer is governed by NYS Law, which is a constraint on revenue to fund capital as well as operations and maintenance of such systems. For public sewer services, the costs of the provision of services are to be raised on a benefit basis and must fund only the actual cost of services. A 'profit' per se is not permitted by law. For water services, there is greater flexibility in the method of assessment of costs, and profit is permitted, so long as all costs associated with providing the water services are fully funded.

- **Recommendations Discussion** – In all communities, the only continuous, reliable source of revenue to operate water and sewer systems is the assessment of costs to the users. General funds may be applied to water and sewer services if there is a shortfall; however, the general fund must be paid back within the fiscal year. Solvent water and sewer budgets are a must. In addition, water and sewer budgets should take into account the creation of dedicated maintenance and capital funds to aid in fiscal planning. Rate stabilization can be achieved with proper planning, which includes incremental changes in the costs of services to respond to changes in the cost of labor and power, as well as residuals management, and planning in advance for the repayment of capital debt associated with improvement projects.

Grants and Financial Support

- **Observations** – There are grant funding resources as well as low-cost borrowing available to Sullivan County communities with water and sewer infrastructure, and many take advantage of these offerings. There are no grants or outside sources of funding to support the cost of operations and maintenance. Those costs must be funded by the service area benefited.

- **Recommendations Discussion** – As noted above, the County can assist communities to be positioned to take advantage of grant opportunities by, for example, facilitating income surveys and fostering increased coordination where intermunicipal projects. In addition, maintaining information about operating conditions (e.g., capacity of pump stations) and planning for system needs (e.g., developing a capital plan) and expansion in communities experiencing growth can help leverage investments made as part of the land development process to support undertaking of needed investments; coordination among land use boards, governing boards, and system operations personnel is important in this regard.

Small User Base

- **Observations** –With respect to both debt repayment and operations and maintenance costs, the number of users benefited dictates affordability. If the benefitted service area is very small, the burden on users can be very high. As the benefitted service area increases in user count, the cost of services decreases.

- **Recommendations Discussion** – To address very small user bases with high capital and operating costs, towns can implement administrative district consolidation. Under an administrative district consolidation, systems are linked financially but not physically, with all users sharing the costs for the provision of services. The towns of Fallsburg and Thompson have consolidated districts that have resulted in equitable and sustainable cost-sharing for the provision of water and sewer services. Villages may consider serving areas outside their incorporated boundaries in neighboring towns as a means to increase the user base and provide cost stabilization to all benefited users.

On-Site (Non-Centralized) Facilities

- **Observations** – As noted, centralized water and sewer systems are not present across much of the County, and while there are many privately-owned decentralized facilities in the County, a substantial proportion of water supply and wastewater management needs are met through the use of on-site facilities, like individual water supply wells and septic systems.

  While assessment of conditions of these facilities is beyond the scope of this report, with certain exceptions, these facilities are in use in nearly every municipality in the County; their design and construction are governed by a mix of NYS and local standards. Some of these facilities do require permitting. For example, water supply facilities with the ability to withdraw 100,000 gpd or more must register with NYSDEC

and operate pursuant to water withdrawal permits. And wastewater management facilities discharging more than 1,000 gpd to groundwater generally require a SPDES permit. In addition, the water and sewer systems for camps, swimming pools and food service establishments are regulated by NYSDOH.

Finally, the operation of these on-site facilities may be unsustainable for various reasons, such as due to soil conditions and small lot sizes that combine to make replacement of septic systems to current standards challenging

- **Recommendations Discussion** – Municipalities in the County may benefit from an assessment of whether to explore construction and operation of centralized systems. As noted in the Volume 2 reports, several municipalities in the County have recognized such a need or are in the process of evaluating whether centralized systems ought to be constructed. Land use boards considering development can be provided training with respect to review factors, and subdivision regulations can be updated.

Priority Recommendations and Implementation Plan

This section builds from the list of recommendations presented in the previous section to identify priorities and, for each priority recommendation, a detailed set of implementation steps. As noted in this report, the County does not own or operate centralized water and sewer infrastructure and, as such, has a different role as compared to the County's municipalities when it comes to providing these essential services within the County. For example, the County does not have land development permitting authority; program capital projects; employ or direct operations staff; set rates; or manage water and sewer budgets.

However, the County is in a unique position to help support those municipalities that presently, or may in the future be involved in, water and sewer service delivery by addressing shared needs within the unique context of Sullivan County. A total of fourteen priority recommendations are identified and include the following:

I. Water/Sewer Technical Assistance Program (WSTAP)
II. Asset Inventory Support
III. Water-Sewer GIS Platform
IV. Inflow and Infiltration (I&I) Mitigation Support
V. Financial Analysis and Rates Support
VI. Income Survey Support
VII. Water and Sewer System Modeling and Assessment Support
VIII. Water and Sewer Needs Interface and Clearinghouse

IX. Model Policy and Regulation Development
X. Water and Sewer Communities Consortium
XI. Shared Procurement Needs Support
XII. Shared Services Support
XIII. Water and Sewer in the Land Development Process Training
XIV. Municipal Officials Land Use Process Onboarding

The above-listed recommendations are further detailed in a series of one- and two-page sheets designed to serve as standalone resources supporting implementation by policymakers, elected officials, and staff. Each sheet provides important background information; entities positioned to lead and support implementation; timeframes and implementation considerations; and an action plan and funding options – all of which are tailored to the particular recommended action.

In addition, Attachment 1 to this report has been included to help support as an example of Model Policy and Regulation Development aimed specifically at addressing on-site decentralized water and sewer infrastructure, sometimes referred to as "package plants," in the planning process. While explicitly not a model law or regulation, it presents a framework for local regulation development as well as provides best practices, which would also be part of this recommended action, Model Policy and Regulation Development.

This document is structured to provide a basic overview of these installations, key considerations when incorporated into proposed land development projects, and also a rubric municipalities can use when considering making changes to their zoning and other codes, as well as an understanding of involvement of other regulatory agencies and applicable provisions of NYS law. The approach to and considerations for decentralized infrastructure taken in Attachment 1 can also be used to help develop a grant of technical assistance under the Water/Sewer Technical Assistance Program (WSTAP) recommended action.

Action I: Water/Sewer Technical Assistance Program (WSTAP)

Development and implementation of a County-led program providing Grants of Technical Assistance

Objective: The program would address shared municipal needs for operating water and sewer systems, create economies of scale, and support municipalities in optimizing these essential services. It would also reinforce other CAPWI recommendations, serving as a cornerstone for meeting Countywide water and sewer needs. **Administration:** County staff would manage applications, oversee projects, and handle consultant or vendor procurement. Municipalities would submit applications, designate project leads, support implementation, and contribute a reasonable match. Applications should provide enough information for the County to properly scope assistance.	**Need:** Municipalities that run water and sewer systems face similar challenges but often lack sufficient resources. The WSTAP would be a flexible, solicitation-based program requiring a local match (cash or in-kind) to help fill gaps in municipal capacity and advance priority projects. **Ongoing program evaluation and monitoring**: emerging needs will be essential. Many of the priority actions noted here could be carried out under WSTAP, though not all would recur annually. The program model could also be adapted to other areas—such as land use planning or GIS—where DPEM or other County units are positioned to offer support.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	Department of Grants Administration
Timeframe:	**Initial:** 9 months to develop, resource, and promote program **Subsequent:** Annually thereafter 3 months for solicitation, application deadline, and project selection + 9 months of assistance project implementation.
Implementation Steps	• Program Development • Budgeting and Staffing • Scope of Work Development • Consultant Procurement and Oversight • Developing and Issuing Solicitation to County Municipalities • Carrying Out Work Tasks • Program Evaluation and Monitoring of Emerging Needs
Action Plan:	1. Identify program development team. 2. Develop program foundation. Program elements would include determining: Eligibility criteria; application process; budget; outreach and engagement plan; annual and/or rolling grant/solicitation cycle; match requirements; level of effort (e.g., max. hours and/or funding) per grant of assistance/project; procurement protocol and needs; and program evaluation. 3. Identify staff lead and/or needed staff resources. 4. For first grant cycle, determine type(s) of assistance to offer and customize program parameters based on type(s) of assistance (e.g., create application forms, eligibility criteria, deadlines/schedules, outreach/solicitation materials, etc.). 5. Submit budget request and implement.
Funding Options:	Local or county funds; local match
Resources:	Example program: https://cdrpc.org/programs/technical-assistance; see also Attachment 1, which can form a basis for providing technical assistance to municipalities with respect to regulation of so-called “package plants”

Action II: Asset Inventory Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Development and Implementation of a County-led program that assists with collection of basic inventory data for water and sewer assets.

Objective: A County-led asset inventory assistance program would fund field data collection and digital documentation needed to create a baseline system inventory. This solicitation-based program would require a local match and aims to fill data gaps, maintain record continuity, and strengthen local capacity for project development. Data collected—typically via GPS and similar tools—would include the location, condition, age, material, size, depth, configuration, and connections of system assets such as manholes, pipes, meters, valves, hydrants, catch basins, pump stations, and cleanouts. **Administration**: The data collected as part of this program must be maintained; therefore, this action is, critically, supported by Action III: Information Management Support. It should be noted that this program could be extended beyond utilities to other types of public or private infrastructure, such as roadways, buildings, and recreation, where DPEM or other County Departments would be positioned to provide inventory assistance.	**Need:** Water and sewer systems are inherently challenging to inventory since much of the infrastructure lies below ground and was installed long before current operators and officials were instated. A combination of age and lack of records has led to a situation where the location, age, material, and condition of infrastructure may be unknown. In seeking to participate, municipalities generally would need to develop applications for assistance, identify their local project leads and contacts, provide support during implementation of the assistance project, and contribute a reasonable match of resources.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	Department of Grants Administration
Timeframe:	**Initial:** 9 months to develop, resource, and promote program
	Subsequent: Annually thereafter 3 months for solicitation, application deadline, and project selection + 9 months of assistance in project implementation.
Implementation Steps	• Program Development • Budgeting and Staffing • Scope of Work Development • Consultant Procurement and Oversight • Develop and Issue Solicitation to County Municipalities • Carrying Out Work Tasks • Program Evaluation
Action Plan:	1. Identify the program development team. 2. Develop program foundation; include determining: Eligibility criteria; application process; budget; outreach and engagement plan; annual and/or rolling grant/solicitation cycle; match requirements; level of effort (e.g., max. hours and/or funding) per project; procurement protocol and needs; and program evaluation. 3. Identify staff lead and/or needed staff resources. 4. First grant cycle: create application forms, eligibility criteria, deadlines/schedules, and outreach/solicitation materials. 5. Submit a budget request and implement.
Funding Options:	County funds; local match, DASNY Grants
Resources:	https://cdrpc.org/programs/technical-assistance

Action II: Asset Inventory Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Development and Implementation of a County-led program that assists with collection of basic inventory data for water and sewer assets.

Action III: Water-Sewer GIS Platform

Development and Implementation of a County-managed program that assists with GIS data acquisition, hosting, database maintenance, and digital mapping

Objective: The DPEM would provide GIS data management support, alongside the Department of GIS, through data analysis and data display in a meaningful way for each community. Critically, economies of scale are possible in terms of software licensing, storage, system development, system maintenance, and map making and analysis. While having utility independent of Action II: Asset Inventory Support, it is directly supportive of it. This action would also leverage existing GIS technology and staff capacity already maintained by the County. **Administration**: Day-to-day operations include database development, data creation, data maintenance, app development, custom map orders, and GIS problem resolution. Through coordination with the DPEM, the GIS platform could be expanded beyond the County's current programming to provide individualized platforms for each municipality, while continuing to meet the department's mission.	**Need:** Digital field data collection for water and wastewater infrastructure can be a timely and expensive process that usually involves GPS units, tablets, cameras, and measurements. Once the data has been collected, localities aren't always in a position to effectively store, manage, or use that data. The County's Department of Information Technology Services, GIS Program has developed a centralized platform for the hosting and sharing data layers, maps, and other digital land use resources through the ArcGIS Online interface. These platforms would contain town- or village-specific data layers and offer a secure interface for municipal officials and public works staff to access water and sewer infrastructure information. Municipal employees, consultants, or County staff could collect field data digitally using Survey123 and Field Maps within the existing ESRI ArcGIS Pro environment. Custom applications may also be developed for specialized municipal needs. Stored information can be delivered through web maps, custom map products, tabular reports, or mobile-friendly formats.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM),
Partner(s):	Department of Grants Administration, Department of Information Technology Services; Department of GIS
Timeframe:	County can provide management services immediately for existing data: Three months for solicitation and two months for data processing per municipality, Ongoing updates and coordination with municipalities as well as system maintenance.
Implementation Steps	• Program Development • Budgeting and Staffing • Software Platform Development and Data Hosting • Outreach to Municipalities • Carrying Out Work Tasks • Program Evaluation

Action II: Asset Inventory Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Development and Implementation of a County-led program that assists with collection of basic inventory data for water and sewer assets.

Action Plan:	1. Identify the program development team. 2. Develop program foundation. Program elements would include determining: Municipal data collection and maintenance collaboration methods; budget; outreach and engagement plan; and program evaluation. 3. Coordinate with IT Department and in-house GIS resources; engage IT software vendors as needed. 4. Identify staff lead and/or needed staff resources. 5. Create application forms, eligibility criteria, deadlines/schedules, and outreach/solicitation materials. 6. Submit a budget request and implement.
Funding Options:	County funds; local match, DASNY Grants
Resources:	https://cdrpc.org/programs/technical-assistance

Action IV: Inflow and Infiltration (I&I) Mitigation Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Help municipalities develop an information base to efficiently and effectively implement solutions to address I&I, including supporting capital project planning

Objective: Operators of sewer systems often know whether I&I is a problem, its severity, and likely sources. Because causes vary, solutions differ and may require costly capital projects. Detailed information linking issues to specific parts of the collection system is essential for proper planning, design, and implementation **Administration**: Implementation would follow a phased approach. **Phase 1** focuses on gathering information through interviews, records review, and visual inspections to develop a testing and inspection program. The output is an investigation protocol and design with recommended techniques for each system component; **Phase 2** uses this framework to carry out the investigation and define the necessary capital projects.	**Need:** Addressing non-wastewater flows entering the sanitary sewer system begins with interviews, record reviews, past project evaluation, and visual inspections. Data from treatment plants, pump stations, flow meters, and rainfall records help define system-wide and basin-specific peaking factors. Based on this information, field investigations—such as manhole inspections, smoke and dye testing, CCTV work, and flow monitoring—are selected to identify system conditions and potential issues. Because these methods can be costly, their design should be guided by known operating conditions. After investigations are completed, the final step is to identify rehabilitation capital projects and develop a preliminary scope, schedule, and budget for each.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM),
Partner(s):	Purchasing Department
Timeframe:	Six months for program development; three months for consultant procurement; annually thereafter, as needed and subscribed to

<table>
<tr><th colspan="3">Action II: Asset Inventory Support
Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)</th></tr>
<tr><td colspan="3">Development and Implementation of a County-led program that assists with collection of basic inventory data for water and sewer assets.</td></tr>
<tr><td>Implementation Steps</td><td colspan="2">• Program Development
• Budgeting and Staffing
• Consultant and/or Vendor Procurement and Oversight
• Developing and Issuing Solicitation to County Municipalities
• Carrying Out Work Tasks
• Program Evaluation</td></tr>
<tr><td>Action Plan:</td><td>Phase 1
1. Identify staff lead.
2. Develop program. As part of this, canvass municipalities for needs, understand extent and quality of data available to support the first phase and tailor offers of assistance accordingly.
3. Determine whether to include in WSTAP for the grant period.
4. Develop scope of work and conduct consultant procurement.
5. Issue WSTAP solicitation and implement projects.</td><td>Phase 2
1. Evaluate recommendations across participating municipalities and determine extent of shared investigation needs.
2. Determine whether to include in WSTAP for the grant period.
3. Develop scope of work and conduct consultant/vendor procurement.

Issue WSTAP solicitation and implement projects.</td></tr>
<tr><td>Funding Options:</td><td colspan="2">County funds; municipal match; NYSEFC; NYSDEC (WQIP)</td></tr>
<tr><td>Resources:</td><td colspan="2">USEPA, Guide for Evaluating Capacity, Management, Operation, and Maintenance (CMOM) Programs at Sanitary Sewer Collection Systems, January 2005</td></tr>
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Action V: Financial Analysis and Rates Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Provide municipalities in the County with support aimed at financial sustainability and transparency and equity in charges for services

Objective: Projects undertaken as part of this action would, at a high level, involve analysis of costs to provide services, capital project and reserve fund budgeting, review of applicable codes, best practices for accounting and budgeting, and rate structure analysis and recommendations.	**Need:** Fundamentally, municipal costs for the provision of water and sewer service should be paid for by fees, rents, and other revenues collected by the municipality. Operation and maintenance costs can and do vary in time, due to changes in costs of materials and unforeseen expenses, like repair of mains, complicating budgeting processes. Having a detailed accounting of the cost basis is essential to inform budget decisions made by municipal leaders. On the capital side, planning for needs and establishment of reserves is desirable. On the other hand, rates are often set in local law and their basis, as in many jurisdictions in NYS, in Sullivan County, varies considerably within and between the municipalities evaluated as part of the CAPWI. Rates charged users and those benefitted should cover costs and also be equitable, transparent, in proportion with benefits derived from the service, and efficient to administer.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	Department of Grants Administration; Department of Purchasing
Timeframe:	**Initial:** 6 months for program development, 3 months for consultant procurement;
	Subsequent: Annual or at needed/specified intervals
Implementation Steps	• Program Development • Budgeting • Scope of Work Development • Consultant Procurement and Oversight • Develop and Issue Solicitation to County Municipalities • Carrying Out Work Tasks • Program Evaluation
Action Plan:	1. Identify staff lead/program manager. 2. Develop program, including cost estimates, for inclusion in County budget. 3. Develop consultant support scope of work (SOW). The SOW should include: data gathering (e.g., historical budgets, codes, water production data, water/sewer use data, planned/needed capital projects, rates, etc.), budget and rates analysis, alternatives development, preparation of user impact evaluation, report and recommendations preparation, and presentation to municipal boards. 4. Issue RFP based on SOW and select consultant. 5. Develop and issue solicitation to municipalities. 6. Implement program with participating municipalities; conduct consultant oversight.
Funding Options:	County funds revenue; cash and in-kind contributions from participating municipalities
Resources:	--

Action VI: Income Survey Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Provide income documentation assistance to municipalities contemplating capital projects for which they will seek grant funding

Objective: Qualifying for more aggressive funding packages based on income can be the sine qua non when municipalities contemplate undertaking water and sewer projects. In particular, income within a service area is needed to document funding eligibility under the Community Development Block Grant program, USDA Rural Development Water/Wastewater Loan/Grant program, and NYSEFC's Clean Water State Revolving Fund program. Income surveys can be costly to administer but can be of significant value where a service area qualifies for these funding sources. **Administration:** There are a number of consulting firms either specializing in such surveys or capable of providing these services.	**Need:** To qualify for certain NYS and federal water and wastewater funding programs, municipalities must demonstrate that the service area meets certain thresholds for income. Typically, these services areas do not align precisely with other datasets, such as the geographies used by the Census Bureau; in addition, American Community Survey data are estimations for which the margin of error is large and therefore may not precisely indicate the true figure and, therefore, may lead to suboptimal project financing scenarios. Income surveys must meet standards of funding agencies with respect to survey instruments, response rates, and other methodological parameters. It typically involves compiling a Master List of Households for system users, including identifying both occupied and vacant households, and also seasonal residences. Surveys are mailed to all homeowners and renters known to reside at the service address, Door-to-door canvassing of non-respondents to achieve the required return rates (70% or better, depending on funding source) is typically also required and is useful to verify and refine the initial Master List with respect to identifying vacant units and verifying property status. Finally, it involves processing survey returns and generating final reports and supporting documentation.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	N/A
Timeframe:	Eight months to develop capacity; four months to implement each survey (surveys are valid for five years)
Implementation Steps	• Program Development • Scope of Work Development • Consultant Procurement and Oversight • Develop and Issue Solicitation to County Municipalities • Carrying Out Work Tasks • Program Evaluation
Action Plan:	1. Identify need and opportunities. Canvass municipalities for planned projects. Alternatively, use existing service area mapping and Census data to develop understanding of potentially qualifying service areas. 2. Develop program. Educate involved staff with respect to funding requirements, methods, and deliverables. Create outreach/WSTAP application materials. Determine whether consultant support is needed. 3. Implement assistance and conduct program evaluation.
Funding Options:	County funds; local match
Resources:	--

Action VI: Income Survey Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Provide income documentation assistance to municipalities contemplating capital projects for which they will seek grant funding

Action VII: Water and Sewer System Modeling and Assessment Support

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Provide assistance to municipalities understanding model inputs that are readily available or relatively inexpensive (e.g., flow monitoring in a gravity sewer) these conditions in order to support operational, capital, and land use decision-making

Objective: Capacity assessment and modeling is a technical exercise and often requires inputs of detailed system inventory information (e.g., pipe types, slopes, elevations, etc.). This action would involve an assessment of available system inventory and status information to ensure these data are available; this component may be relatively more or less important in a given scenario, and the products of this action for municipalities may be recommended inventory information to collect, partial assessments (e.g., well capacity or sanitary sewer flow monitoring), and/or complete modeling.

Administration: Where flow monitoring and sourcewater assessment is involved, more specialized subconsultants with the needed equipment and expertise may also need to be made available (i.e., potentially as part of an agreement with the prime consultant).

Need: Understanding system conditions in water supply and wastewater management is essential. In water supply systems, hydraulic models support the design and sizing of new infrastructure, retrofits, operational optimization of tanks and pumps, and evaluation of water quality. Assessing source-water capacity is also critical.

Wastewater systems require permit-driven monitoring and reporting of flows and constituents, but understanding conveyance capacity—gravity sewers, forcemains, and pump stations—is equally important.

Gathering the detailed data needed for decisions—from system optimization to land-use development review—requires inventory information and engineering analysis, which are often costly. Most assessments depend on having a baseline level of inventory and operational data. For example, source-water capacity assessments may require well drawdown testing or reservoir hydrogeologic studies; distribution modeling needs accurate pipe and component data; and gravity sewer modeling requires pipe size, type, and slope, while pump station conditions can often be evaluated from runtime logs.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	Department of Grants Administration; Purchasing Department
Timeframe:	6 months for program development, 3 months for consultant procurement Annually thereafter, as needed and subscribed to
Implementation Steps	• Program Development • Scope of Work Development • Consultant Procurement and Oversight • Develop and Issue Solicitation to County Municipalities • Carrying Out Work Tasks • Program Evaluation

Action VI: Income Survey Support *Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)*	
Provide income documentation assistance to municipalities contemplating capital projects for which they will seek grant funding	
Action Plan:	1. Identify staff lead. 2. Develop program. As part of this, canvass municipalities for needs, understand extent and quality of data available to support modeling and assessments, and tailor offer of assistance accordingly. Some amount of program development will likely be needed each period in which this action is offered. 3. Determine whether to include in WSTAP for the grant period. 4. Develop scope of work and conduct consultant procurement. 5. Issue WSTAP solicitation and implement supported projects.
Funding Options:	County funds; local match; NY Rural Water Association
Resources:	--

Action VIII: Water and Sewer Needs Interface and Clearinghouse

Establish a County-level single point of contact to coordinate all stakeholders in water and wastewater management for more efficient, optimal outcomes.

Objective: Create capacity at the County level to provide a single point of contact or relationship management function to connect these various actors involved in provision of water supply and wastewater management, including municipalities, regulators, land development process participants, and other stakeholders with the overriding aim of arriving at optimal outcomes efficiently. A model for this action is the role DPEM presently serves where NYSDOT is or could be involved, especially during the GML 239-m referral process. This action involves developing subject matter knowledge, such as applicable regulations; regulatory agency structure; permit types and contents; and involved technologies. Equally important: it involves cultivating and sustaining relationships across the domain, from municipal officials to involved agencies. Building trust is key.	**Need:** Sullivan County municipalities engage with centralized water and sewer infrastructure in several ways. Town and planning boards review development proposals that involve new or expanded systems, whether publicly or privately owned. Private developers seek clarity on regulations, requirements, and procedures when proposing new infrastructure or connecting to existing systems. Municipalities also undertake their own projects. For existing systems, building and codes departments handle questions and provide oversight. Municipalities that own and operate infrastructure must comply with multi-level regulatory oversight and permit conditions. Regulatory agencies, however, often have limited resources and may become involved inconsistently or late in the process; staff turnover further complicates knowing whom to contact. Municipal officials are not typically subject matter experts but must make informed decisions. Access to accurate information—efficiently and at the right time—is essential.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	NYSDOH; NYSDEC; DRBC; NYCDEP
Timeframe:	Three months to initiate program; Ongoing thereafter
Implementation Steps	• Program Development • Staffing • Outreach to stakeholders • Pursue ongoing education and training • Program Evaluation
Action Plan:	1. Identify staff lead and single point of contact and build knowledge of the domain. 2. Create program structure, including assessment of existing "touch points" like 239-m referrals, standing committees, or other existing points of contact with municipal officials as well as regulatory staffs; set up interfaces, like online forms, email, website, etc. 3. Outreach to municipal officials and regulatory staffs. This could include: Listening tour to engage with municipal officials and understand issues and activities, meetings with regulatory agency staff, engagement with those involved in the land development process, outreach to contract water and wastewater operators active in the County, etc. 4. Build and maintain open lines of communication between municipalities, the public, regulatory agencies, and other stakeholders. 5. Document and institutionalize.
Funding Options:	County funds; local match
Resources:	New York Water Environment Association, Wastewater Management Handbook for Local Representatives (2nd ed.), Jan. 2013

Action IX: Model Policy and Regulation Development

Could be implemented as part of a broader Water/Sewer Technical Assistance Program (WSTAP)

Development of a suite of recommended codes, development standards, and best practices that is driven by and responsive to the County's water and wastewater needs

Objective: Create capacity at the County level to provide a single point of contact or relationship management function to connect these various actors involved in provision of water supply and wastewater management, including municipalities, regulators, land development process participants, and other stakeholders with the overriding aim of arriving at optimal outcomes efficiently. A model for this action is the role DPEM presently serves where NYSDOT is or could be involved, especially during the GML 239-m referral process. This action involves developing subject matter knowledge, such as applicable regulations; regulatory agency structure; permit types and contents; and involved technologies. Equally important: it involves cultivating and sustaining relationships across the domain, from municipal officials to involved agencies. Building trust is key.	**Need:** When new centralized water or sewer systems are proposed, communities must put proper local development frameworks in place. This includes site-level planning, service area needs, and long-term operational and administrative considerations. While state agencies regulate most design and operational standards, municipal boards still oversee key land-use decisions and hold fiduciary responsibility for systems they own. For privately proposed systems, municipalities can regulate facility siting and construction through zoning, site plan review, and special use permits. State laws generally require private centralized systems with multiple connections to form sewage or water works corporations ("Trans Corps"), giving municipalities a tool to ensure reliable, long-term service. Where municipal districts are involved, NYS law provides several pathways for creating, extending, or consolidating water and sewer districts. These processes involve significant legal, engineering, and financial steps and can be costly if handled ad hoc. Creating a clear guide to relevant laws and procedures would help streamline and strengthen local decision-making.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	NYSDOH; NYSDEC; DRBC; NYCDEP
Timeframe:	As needs, resources, and time dictate – anticipate 6-12 months development time per item
Implementation Steps	• Needs Assessment • Allocation of Staff Resources • Identification of Needed Resources • Materials Development and Publication • Program Evaluation
Action Plan:	1. Identify staff lead(s). 2. Prioritize topics/deliverables, including conducting outreach to municipalities as well as internal assessment of inquiries and issues encountered by County staff. 3. If/as needed, onboard expert assistance, which could include engineering or legal resources. 4. Produce deliverable(s) and promote among constituent municipalities.
Funding Options:	County funds; local match
Resources:	See Attachment 1 for an example of guidance that can be provided to County municipalities with respect to regulation of so-called "package plants"

Action X: Water and Sewer Communities Consortium

Creation of a regular series of more informal engagements among involved municipal staff and partners, coordinated and led by County DPEM staff, that is focused on problem-solving, knowledge transfer, and emerging issues identification in the water and sewer areas.

Objective: This action would result in creation of a regular series of more informal engagements among involved municipal staff and partners, coordinated and led by County DPEM staff, that is focused on problem-solving, knowledge transfer, and emerging issues identification in the water and sewer areas. Meeting frequency could be quarterly to start. Meetings could be a combination of planned presentations or other features coupled to updates from municipalities and partners and open discussion. The Consortium could also spearhead regular communications on key topics, such as a quarterly newsletter, as well as identify topics for potential white papers or other research activities of collective interest and relevance.	**Need:** Municipalities that provide water and sewer services face similar regulatory, financial, and operational challenges. Creating opportunities for dialogue around these shared issues—along with emerging trends—supports more effective, coordinated responses. This action proposes establishing a Countywide forum to leverage the collective experience and expertise of those involved in providing these services and to communicate shared needs to County officials. Modeled on MS4 support organizations, this Consortium would be open to all municipal officials, operators, consultants, and managers involved in water and sewer services. While not focused on daily operations, it would connect operational staff with those responsible for governance and administration. Agencies such as NYSDEC and NYSDOH could also be invited. Because water and sewer systems share many administrative and financial structures, creating separate groups may be unnecessary. To gauge and build interest, the County could host a Sullivan County Water and Sewer Summit for municipalities and partners. As the Consortium continues to meet, participants can propose discussion topics and presentations.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	NYSDEC, NYSDOH, DRBC, NYCDEP
Timeframe:	6 months to coordinate and organize initially; Quarterly thereafter
Implementation Steps	• Identify Staff and Meeting Space Resources • Outreach to Involved Municipal Officials and Others • Develop Meeting Format, Agendas, and Programs • Program Evaluation
Action Plan:	1. Identify staff lead, secure logistics; develop program for Water and Sewer Summit. 2. Conduct outreach to involved municipal officials, supporting personnel, and partners to raise awareness and solicit ideas. 3. Host Summit and conduct evaluation. 4. Develop quarterly (or another appropriate frequency, annually) program and implement meetings.
Funding Options:	County funds
Resources:	See, for example, the August/September 2014 issues of the eNewsletter, *Plan On It*, produced by Ductchess County Planning Federation, available from: https://www.dutchessny.gov/Departments/Planning/Docs/AugSept2014-DCPFeNews-printerfriendly.pdf

Action XI: Shared Procurement Needs Support

Facilitate cost savings by sharing procurement and developing economies of scale across a variety of materials and services required when operating water and wastewater systems.

Objective: This action is to facilitate cost savings by sharing procurement and developing economies of scale across a variety of materials and services required when operating water and wastewater systems. Municipalities operating centralized water and wastewater systems need to purchase a variety of goods and services. Although these needs vary by the technologies and processes involved, operators often have similar needs spanning a variety of types of goods and services. A key part of this action is to work with municipalities, water/sewer operators, and other involved staff (e.g., municipal engineers) to determine needs. Where a new procurement is to be developed or issued, proper development of specifications is essential. The County can also work to help identify opportunities for piggybacking on contracts meeting public procurement requirements and assist municipalities when surplusing used equipment to determine if surplus items can fill a local need.	**Need:** Costs for many items used in water and sewer operations can be reduced when municipalities coordinate purchases and increase quantities. Capital items such as water meters, meter-reading equipment, software, pipe, repair clamps, and slip-lining materials, as well as consumables and services like chemicals, sludge hauling, CCTV inspections, contract operations, and emergency repair services, may offer savings when procured jointly. Collaboration can also help municipalities evaluate vendors for quality and value and streamline procurement processes by sharing specifications and leveraging County procurement resources. However, not all items benefit from economies of scale, and many municipal operators already have procurement practices based on deep system knowledge and experience. This effort aligns with other recommendations—such as forming a County Water and Sewer Consortium—and will require outreach to understand current procurement approaches and identify where coordination and County support can provide the greatest benefit.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	Department of Purchasing Providers of centralized "piggyback" contracts; municipal staffs and contract operators
Timeframe:	4months where procurement development and request for bids involved Ongoing where activities primarily involve needs identification and coordination.
Implementation Steps	• Identified Candidate Shared Procurements • Develop Approach (e.g., new procurement, piggybacking) • Implement Procurement • Program Evaluation
Action Plan:	1. Identify staff lead and create working group. Creating a working group provides an opportunity to facilitate needed inter-departmental collaboration, as well as to involve water and sewer system operators, both municipal staff and contract. 2. Develop inventory of needs, procurement practices, and marketplace. This will involve outreach to municipalities and their representatives as well as potentially vendors and service providers. 3. Evaluate opportunities for economies of scale and opportunities to create efficiencies where the County might lead procurement solicitations. 4. Implement procurement and evaluate performance and future needs.
Funding Options:	County funds (Staff time and cost of procurement processes)
Resources:	--

Action XII: Shared Services Support

Develop a database with the potential shared assets of each municipality and assisting with the development of intermunicipal agreements and other potential actions for sharing or consolidating.

Objective: his action involves an initial effort to develop a database with the potential shared assets of each municipality and assisting with the development of intermunicipal agreements and other potential actions for sharing or consolidating services. Regarding water and sewer systems, Sullivan County municipalities have the option to share management, labor, records keeping, information technology, and equipment (data collection devices, sewer cameras, or specialized vehicles). **Administration:** While the sharing of services organically occurs between neighboring municipalities and especially between towns and their constituent villages, the County would aid in coordinating the availability of the resources between all municipalities, where practicable. The County may also play an intermediary role in the consolidation of districts and services within and between municipalities.	**Need:** As municipal expenses continue to rise, the need for increased micro- and macro-regional resource sharing and consolidation proves to be the most rational solution for most communities. At the State level, shared services fall under local government efficiency, whereas the expansion or development of new local service delivery initiatives can realize reduced costs of municipal operations and the incorporation of enhanced technologies and processes for the modernization of local service delivery. Shared services are open to nearly all aspects of local governance. The most popular shared services throughout the State include DPW, Information Technology Services (ITS), Emergency Services, Code Enforcement, Municipal Planning, and Water/Wastewater Management Systems. The primary ways to share these services are through an intermunicipal agreement (IMA) for either the sharing of resources and/or personnel, or through the creation of a joint department. A countywide shared services initiative (CWSSI) is also an option for the centralization of shared services.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	County Attorney, County DPW, County Public Safety, County ITS, Municipal Attorneys, New York State Association of Towns, New York State Conference of Mayors and Municipal Officials, New York Department of State
Timeframe:	12 months of program development time; Ongoing assistance thereafter
Implementation Steps	• Assessment of Existing Shared Services Activities and Additional Opportunities • Outreach to Municipalities • Development of Database of Shared Resources • Ongoing Coordination, Outreach, and Communications
Action Plan:	1. Identify staff lead and needed resources (e.g., supporting partners, e.g., NYSDOS, and/or consultant support). 2. Research and develop materials and build out the program. 3. Outreach to municipalities, and work to institute this outreach as a regular, annual element of County activities. 4. Implement the shared service and consolidation initiative.
Funding Options:	Local Government Efficiency Grants; County funds
Resources:	--

Action XIII: Water and Sewer in the Land Development Process Training

Provide training and education about the intersection of water and sewer infrastructure and land development review

Objective: The purpose of this action is to provide training and education about the intersection of water and sewer infrastructure and land development review. The training would highlight key issues, relevant considerations, and best practices for planning and zoning officials as well as elected leadership. For example, questions like what aspects of private wastewater system proposals should be addressed as part of, e.g., a site plan or subdivision application? What questions do you ask where applicants proposed proposes to extend existing infrastructure? How are opportunities for coordination/interconnection/extension properly included in review processes, and how can boards address planning for expansion in the future when confronted with a single project proposal? In addition, the training would also address questions about who pays the capital cost of new infrastructure. The training would ideally be offered to contribute to planning and zoning board continuing ed requirements. The materials developed as part of the training can include slide decks and fact sheets that can be posted to the County's website for future use.	**Need:** The land use and development process is a key site of municipal involvement in provision of centralized water and wastewater service. Reviewing boards encounter project proposals involving construction of new infrastructure and connections to existing systems. Decisions made during the land development review process have long-term implications, including with respect to system capacity as well as land development patterns. In addition to zoning and other land use codes, the environmental review process (SEQR) also provides an important mechanism to evaluate needs and potential impacts due to land development proposals. This process also provides an important opportunity for coordination among governing boards, land use boards, and operations staff.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	NYSDOS; Consulting Engineers and Planners
Timeframe:	4 months per training; Annually or other frequency as needed
Implementation Steps	• Identify Candidate Topics and Potential Trainers • Outreach to Municipalities • Conduct Training(s) • Program Evaluation
Action Plan:	1. DPEM staff develop several "focus areas" relevant to water and wastewater infrastructure, such as site plan considerations for sewer infrastructure, regulatory environment, or water and sewer considerations during SEQR processes. 2. DPEM integrates water/sewer training into current training offerings and cycles and conducts outreach to water and sewer practitioners to provide training on specific topics. 3. Conduct training, publish relevant materials, and evaluate offering.
Funding Options:	Additional funding likely not needed if built into current offerings.
Resources:	--

Action XIV: Municipal Officials Land Use Process Onboarding

Developing an understanding of the land use process and the roles of various boards in applying local requirements among the local officials involved

Objective: Developing an understanding of the land use process and the role of the various boards in applying local requirements among the local officials involved is the aim of this action. The onboarding program would assume little or no familiarity with the land use process. The content would provide an overview of the structure and function of comprehensive plans and proceed to provide fundamental knowledge of the role and substance of, and processes involved in, zoning, site plan review, land subdivision, and use and area variances. **Administration:** This onboarding program could involve both text and in-person materials, such as a packet of materials supplemented by an in-person (or hybrid or remote) event. The materials would need to be updated periodically to keep consistent with evolving codes, case law, and practice. It is expected that this course could be developed internally, with DPEM staff and other County resources, but NYSDOS provides similar training events and resources, and any County-led program could be coordinated with NYSDOS; it should also be possible to employ the assistance of consultants.	**Need:** Elected and appointed officials serving the County's municipalities on town and village boards and planning and zoning boards often arrive in their roles without familiarity with the local land use process, including comprehensive planning, zoning, site plan and special use permit review, subdivision review, and granting relief from land development regulations in the form of variances. There is an array of NYS and local laws governing the practice and procedures, but application of these requirements is the responsibility of local officials. While not only related to water and sewer infrastructure, the decision-making that occurs within this framework has important implications for the development and change of this infrastructure, which in turn affects everything from future land development patterns to the cost of providing these services.

Implementation Lead:	Division of Planning, Community Development, and Environmental Management (DPEM)
Partner(s):	NYSDOS, County Attorney, New York Planning Federation, New York State Association of Towns New York State Conference of Mayors and Municipal Officials
Timeframe:	Six to twelve months program development time; Annually thereafter
Implementation Steps	• Develop content equivalent to a basic 2-hour training course • Outreach to municipalities aimed at reaching newly elected and appointed board members • Implement annually onboarding program
Action Plan:	1. Identify staff lead and needed resources (e.g., supporting partners, e.g., NYSDOS, and/or consultant support). 2. Research and develop onboarding materials and program. 3. Outreach to municipalities, and work to institute this outreach as a regular, annual element of County activities. 4. Implement onboarding
Funding Options:	County funds
Resources:	--

Attachment 1: Regulating Decentralized Water And Wastewater Treatment Infrastructure

What is Decentralized Infrastructure?

Often referred to as 'package plants', water supply and wastewater collection and treatment systems that are built and operated by private entities to serve a development rather than a municipality are one type of Decentralized Infrastructure or Systems. Such systems are located near the point of demand for water or generation of sewage. In water and sewer, generally, privately-owned infrastructure that provides water supply or wastewater collection and treatment is considered decentralized. These systems are generally regulated in the same manner as municipally owned systems. It is important to note that decentralized systems may be owned by public or private entities; however, in general, centralized systems often refer to public infrastructure.

What is a "Package Plant"?

As a kind of decentralized infrastructure, a "package plant" is a pre-manufactured, modular, compact water or wastewater treatment system, assembled in a factory and transported to a site. These systems are commonly used to treat water and/or wastewater in small communities, residential subdivisions and in rural areas. The mere fact that these systems are pre-manufactured is not necessarily an indicator of the quality of the equipment provided or treatment. In fact, some pre-manufactured systems provide very high-quality water treatment.

Why Should Municipalities Care?

Package plants are often used by property owners to provide water and wastewater treatment when a development is distant from public centralized infrastructure for a connection, yet conditions (demand for water and/or sewer or environmental setting) indicate the need for common provision of water and/or sewer services. The deployment of packaged plants is not alone a concern. However, without careful specification, there can be a mismatch between technology and treatment demand. The systems can be a "cheap" solution that is not sustainable or durable – and frequently employ proprietary technologies, resulting in a "Black Box" without flexibility to address variable demands. When proposed as part of an individual land development project, the opportunity to consider broader neighborhood needs and the future of this type of water and sewer service in a community is not always taken. In addition, these systems:

- may vary in quality and ability to meet regulatory requirements;
- can be poorly constructed and installed;
- sometimes include processes that are highly sensitive to variability in flow or temperature (e.g., due to seasonal fluctuations in population served);
- need maintenance and proper operations, with owners sometimes adopting a "set-it-and-forget-it" attitude and, over time, failing to undertake needed maintenance;
- can have limited capacity and flexibility to meet growing/changing needs;
- can be located poorly; and
- can be smelly and noisy.

Perhaps most importantly, if abandoned or where an extended period of disinvestment has occurred, they can become the responsibility of the municipality – both under the law (for wastewater) and in practical terms. Under Article 10 of the NYS Transportation Corporations Law (TCP), the "the local governing body" becomes responsible for the infrastructure, as Section 119 requires that title shall pass to the municipality in the event of abandonment or discontinuance of the maintenance and operation of the system.

In the case of water works corporations, where NYS law does not necessarily require municipalities to assume control, municipal leaders and boards frequently face pressure to assume municipal control of the system from properties served.

In either case, the costs, operations and maintenance, and pressure to ensure wastewater and water services to the community are more often than not become an issue for the municipality. Without proper administrative, legal, and engineering planning, it can be challenging for the municipalities compelled to assume control to address uncertainty with respect to human health and the environment.

What can a Municipality Do to Regulate Package Plants?

Be Prepared

Municipalities cannot ban these systems, as jurisdiction over these systems/activities is vested in other entities. As such, it is easy to assume that other entities, such as the state, will look out for the interests of a local community. This is not the case. The state does have a job to do to protect human health and the environment, but the state does not make local land use decisions. However, municipalities have several tools they may use in order establish a robust framework for the planning, design, construction, and operation of these systems. This framework should be aimed at proper specification, creating administrative and financial backstops, and – ultimately – minimizing costs and other burdens if and when

municipal control occurs. There are steps that can be taken to ensure that this infrastructure is an asset instead of a liability, especially in light of the potential that these systems may become municipally owned, operated and maintained in the future.

Transportation Corporations Law

A Transportation Corporation is a type of business corporation in New York State that owns and operates a utility, including water and sewer utilities. If there is more than one customer of a private water or sewer system, the state-issued permit holder must be a Transportation Corporation. The State Transportation Corporations Law (TCP) provides a framework for the creation of such business corporations and provides rights and privileges for the operation of these entities. Working in concert with the structure provided in State Law, municipalities may adopt local laws to extend and bolster that authority. There are provisions in the TCP governing water and wastewater service relating to, municipal consent to formation of the transportation corporation, reimbursement of engineering review costs, financial security (construction and O&M), and oversight of financial performance. Municipalities should use the existing State law to the maximum extent and supplement terms and conditions with local laws to meet community objectives.

Zoning and Land Use

To regulate the appropriate location of package plants and ensure the quality and sustainability of decentralized infrastructure, municipalities should review their land use regulations. Among the actions to consider are:

1. Amend zoning codes to treat decentralized water and sewer systems in the same manner as any other land use:

- Define decentralized infrastructure and add these as land uses to the use table to permit or prevent this type of land use in the various zoning districts
- Make decentralized infrastructure subject to special use permits
- Include dimensional and performance requirements in the zoning code:
    - Treatment infrastructure required to be on a separate lot
    - Setbacks for treatment infrastructure
    - Lot coverage for treatment infrastructure
    - Require any treatment units that may emit odors to be located in a structure equipped with odor control
    - Require noisy equipment to incorporate sound attenuation
    - Siting Criteria in terms of topography, flood risk, location to sensitive receptors
    - Review materials of construction for durability

- Require written operations plans accommodating the likely operating scenarios (e.g. seasonal, high/low flow, etc.)

2. Review zoning district regulations that support or encourage decentralized infrastructure in locations where it is not welcome. For example, density bonuses and conservation subdivision may unwittingly lead to proposed projects that are otherwise unworkable without decentralized infrastructure. Do not assume that expense for decentralized infrastructure will act as a gate keeper for the spread private water and sewer systems in areas of the community where they are not desirable.

Special Districts (for towns)

To the extent that a town permits decentralized water and/or sewer systems, require the filing of a petition to the town board under NYS Town Law Article 12 for the creation of special district(s) with boundaries coincident with the service area of the decentralized water or wastewater infrastructure. In this way, in the event of abandonment, the municipality has a ready way to assess costs to those benefitted by the system(s).

Conclusion

Local municipalities cannot ban decentralized infrastructure. Package plants are not in and of themselves bad. However, it is not a given that private water and sewer systems will be assets not liabilities. Utilizing existing land use codes can help to regulate decentralized infrastructure and ensure standards that are protective of human health, community character and the environment. Each municipality has different needs and local codes, so there is no 'model law' or one-size-fits-all approach to be had. That said, many of the foregoing provisions and recommendations apply broadly. The next section includes a step-by-step guide in how to develop regulations for Decentralized Infrastructure.

Steps for Decentralized Infrastructure Regulations Development

Local Law Drafting Considerations

1) Review applicable sections of local code, such as zoning, subdivision, and water/sewer use laws. Identify enabling legislation and make sure to reference these and other powers reserved to the municipality under NYS law.

2) Provide the intent behind enacting the law. What problems is your municipality looking to solve/avoid through this law?

a. Quality and ability to meet regulatory requirements.
b. Maintenance and proper operations.
c. Uncoordinated expansion.
d. Limited capacity and flexibility.
e. Unfavourability of locations.
f. Noise and odor.
g. Mismatch between technology and demand.
h. Supplementing state and regional agency permit reviews with local regulations.

3) Define all terminology: Package Wastewater Plant; Sewer Works; Privately-Owned Decentralized Sewer System; etc.

4) Develop policies and procedures where these are or may be authorized in local code. For example, form of performance guarantees and procedures for oversight of sewage works corporations can be adopted by resolution of the governing board.

Zoning Law Considerations

5) Choose in which zones a package potable water source or wastewater treatment plant, public or private, shall be permitted or require special use.

6) Review the current municipal code for district regulations that support or encourage decentralized infrastructure in locations where it is not welcome (e.g., density bonuses, conservation subdivisions, etc.). Consider changes to clarify locations where such infrastructure is not encouraged.

7) Provide a framework to locate utility buildings on a separate parcel to allow for direct control over the land, ensure proper setbacks, and protect from issues associated with abandonment.

8) Develop dimensional and performance requirements, including:

a. Customized setbacks from property lines
b. Customized buffers from structures and natural features

c. Maximum lot coverage
d. Accessory structures, fencing, vegetation, lighting, and signage
e. Odor and noise control components
f. Operations plans
g. Durability demonstration for materials

9) Develop application material requirements, including:
a. Plans, engineering report, elevations, and perspectives for all proposed structures
b. Map with all land uses and zoning classifications within 1,000 feet of the site
c. Landscaping plan criteria with existing and proposed vegetation

10) Incorporate the following best practices into the requirements:
a. Treatment plant operations that generate odors should be contained within a permanent building with negative pressure HVAC and odor control practices.
b. Metal tanks should be at least partially buried below grade and have cathodic protection systems and coating to prevent deterioration above the water line.
c. Engineering documentation should be provided to the municipality for transparency and operations, and to demonstrate the flexibility of design for current and future needs.
d. If seasonally operated, require an operations plan for seasonal startup and decommissioning, and coordinate with code enforcement annually.
e. Require a study to be completed in order to demonstrate that the infrastructure option chosen is the best way to serve the needs of the project and considers the greater community.
f. Require that a petition under Article 12 for the creation of a water or sewer district so that the special districts can be created prior to subdivision or site plan approval.

11) Consider including in the zoning law a standard set of approval conditions to be attached to special use permits addressing, e.g., adherence to applicable regulatory and permit standards; operator license requirements; operational reporting requirements (e.g., copies to the municipality of reports to regulatory authorities); requirements for trans-corp formation; other best practices (see #10a-f, above), as appropriate; etc.

Exercise Rights Under Transportation Corporations Law

12) Make sure to require the formation of a transportation corporation, where required. In general, formation of a transportation corporation (also known as a “Transcorp” or “T-Corp” is generally required where a project involves water and wastewater systems serving more than one property. Specifically, for water supply, a transportation

corporation is required for the sale, furnishing and distribution of water for domestic, commercial and public purposes but this service is not to be provided by a municipality.[1] Sewage-works corporations are generally required where a project involves non-municipal ownership and operation of a sewer system serving more than more than one separately owned property and requiring a SPDES permit from NYSDEC.[2] Systems requiring transportation corporation formation include both a) conveyance-only systems serving more than one property that are connected to a municipal water supply source or wastewater treatment system and b) conveyance and decentralized supply and treatment infrastructure.

13) Adopt local law that mirrors the sewer-works shall requirements for water-works corporations.

14) Enforce all requirements of the transportation corporations law, stating that they shall happen. Recite these requirements in the required municipal consent to formation resolution to be adopted by the local governing board.

15) Exercise right to require an option to purchase (irrevocable offer of cession). The sewer transportation corporation stock must be held in escrow, and as part of the resolution authorizing consent to formation, the municipal board should exercise its rights to require an option to purchase the system.

16) Sewage works transportation corporations law includes added provisions supporting the requirement to assume municipal ownership in the event of a default. Municipalities should adopt a local law requiring that these provisions also apply to the formation of water works corporations.

17) Ensure that an engineering peer review is carried out. Funding for these services shall be provided by the entity proposing the infrastructure.

18) Develop criteria for requiring the posting of a performance bond for the completion of construction, other security for labor and materials, and for the cost of retaining engineering services.

19) Develop the criteria for requiring a guarantee for at least five years of operations and maintenance and include in local law or policy documents.

20) Stipulate that the rates of the transportation corporation shall be reviewable at intervals of not more than five years or at any time by petition of the corporation or motion of the board to ensure rates are fair, reasonable, and adequate.

[1] See Article 4-B of the NYS Public Service Law

[2] See 16 NYCRR Part 750

Other Best Practices

21) Ensure that, where NYS town governments are involved, special district(s) are formed coincident with the water-works and sewage-works corporation service areas to provide a legal, financial, and administrative backstop should the corporation abandon or otherwise discontinue the system. Formation should be by petition under Art. 12 of the NYS Town Law.

22) Maximize coordination among involved land use boards, which tend to have land development approval authority, and municipal boards that exclusively have transportation corporation approval authority.

23) Hold all applicants to the municipality's standards for public infrastructure.

24) Coordinate and cultivate relationships with private suppliers in order to be prepared to take over, if ever necessary, and understand the needs, limitations, and operations of the system.