Tompkins County

Resiliency and Recovery Plan

Water Supply Drought Resilience Technical Memorandum

TETRA TECH

February 2022

Water Supply Drought Resilience Technical Memorandum

February 2022

PREPARED FOR

Tompkins County Department of Planning and Sustainability

121 E. Court Street
Ithaca, New York 14850

PREPARED BY

Tetra Tech

15350 SW Sequoia Parkway,
Suite 220
Portland, Oregon 97224

Phone: 503.684.9097
Fax: 503.598.0583
tetratech.com

This Water Supply Drought Resilience Technical Memorandum was prepared with funding provided by the New York State Department of State under Title 3 of the Environmental Protection Fund.

Tetra Tech Project #200-01298-21005

\\tt.local\IER\Projects\Portland\01298\200-01298-21005\Docs\Reports\2021-10-06_Tompkins County Drought Resilience TM+dpEdit.docx

CONTENTS

Tables

Figures

OVERVIEW

1.1 BACKGROUND

The *Tompkins County Hazard Mitigation Plan: 2013 Update* identified water supply as a vulnerable sector in need of further analysis. There are 16 municipalities in Tompkins County, ranging from rural towns and villages to the City of Ithaca. In general, the region is one of the less drought-prone areas in the state, but the frequency of abnormally dry to moderate droughts has increased since drought conditions began to be more closely monitored in 2000 and *ClimAID: The Integrated Assessment for Effective Climate Change Adaptation Strategies in New York Stat*e highlights the expected increase in drought events due to climate change. In 2016, Tompkins County experienced an extreme drought, bringing to light concerns with each of the county's three largest water purveyors—the City of Ithaca, Cornell University, and Southern Cayuga Lake Intermunicipal Water Commission (SCLIWC)—as well as with private groundwater wells. The 2016 extreme drought exposed potential vulnerabilities in countywide water resiliency.

The 2016 drought resulted in low stream flow to the City of Ithaca's reservoir between June and September. Reductions in available flow also occurred in Fall Creek, the water supply for Cornell University, and temporary water tanks were supplied to certain university customers for irrigation purposes, with water trucked from Cayuga Lake. Streams and shallow wells throughout the rural areas of the county dried-up over this period. SCLIWC, which draws its water from Cayuga Lake through its Bolton Point Water Treatment Plant, augmented water supplies to the City of Ithaca and Cornell during that period. While emergency distribution helped the City of Ithaca and standby distribution allowed Cornell University to respond to the crisis, each purveyor acknowledged that the drought exposed a variety of governance and infrastructure issues that need to be addressed in a coordinated planning effort.

The 2016 drought showed that governance and infrastructure improvements need to be addressed by the three large purveyors to reliably provide water in the areas that they serve. Additionally, any of the towns and villages in the rural areas relying on shallow wells are at risk due to droughts and the absence of a diversified source-of-supply.

1.2 OBJECTIVE

The objective of this technical memorandum is to analyze the redundancy of the countywide water systems and identify broad alternatives for creating a more resilient countywide drinking water supply. It provides the following:

- A preliminary identification of gaps regarding interconnection of the existing purveyors and clarification of the importance of interagency agreements.

- Identification of best practices to improve governance and to include recommendations to build drought resiliency in rural areas.
- Recommendations to address water resiliency on a more shared regional basis.

2. Study Area and Regional Agency Profiles

The majority of the population of Tompkins County is served by one of three water purveyors: City of Ithaca, Cornell University, or SCLIWC. These purveyors' interconnectivity is essential to the region's drinking water resiliency that relies on surface water. Creating greater connectivity between the purveyors can further increase available supply. The following sections describe the major purveyors and rural centers that represent the study area.

2.1 CITY OF ITHACA

The City of Ithaca is located in the center of Tompkins County at the south end of Cayuga Lake. The City of Ithaca Water Treatment Plant (rebuilt in 2016) draws water from Six Mile Creek at the 60' Dam Reservoir. Future demand is not currently tracked by the City, nor is it projected. The City Water Treatment Plant has a capacity of 55 million gallons per day (mgd) and a current average day production of 2.5 mgd. It currently serves 30,000 customers, including residents of the City of Ithaca and Town of Ithaca customers along Taughannock Boulevard including lakeshore properties along East Shore Drive and Taughannock Boulevard. The City also provides water to the Renwick Heights neighborhood.

Water availability has not historically been an issue in the City. However, there are potential issues that may affect the city's water reliability. Dredging and other maintenance tasks for the 60-foot dam at the reservoir are required for safety and to maintain or add capacity to the reservoir. Actions related to this are included in the City of Ithaca's Annex to the *Tompkins County Hazard Mitigation Plan: 2021 Updat*e and remain a significant cost concern to the City. During the drought in 2016, water was not released by the dam. Past monitoring data from the City shows that the reservoir is adequate to maintain supply for roughly 30 days beyond the point where water is no longer flowing over the dam.

The City of Ithaca water treatment plant recently underwent renovations as a part of its rebuild in 2016 to improve settling and filtration processes, providing more consistent water quality, and the distribution system was upgraded to increase distribution capacity to the Town of Ithaca.

2.2 SOUTHERN CAYUGA LAKE INTERMUNICIPAL WATER COMMISSION (SCLIWC)

The SCLIWC is a partnership of five municipalities receiving water through the Bolton Point Water Treatment Plant, drawing from Cayuga Lake. The Bolton Point Water Treatment Plant was built in 1976 and has a capacity of 6 mgd, a current average day demand of 2.6 mgd, and a maximum-day demand of 4.2 mgd. Water availability is typically not an issue. Supply is only constrained by the infrastructure and staffing available and any potential new agreements with existing and new members.

The water intake is approximately 3 miles north of Stewart Park, on the eastern side of Cayuga Lake, at a depth of 65 feet. During 2016, the Bolton Point system did not experience any restriction on its water supply. Short-term emergency interties[1] do exist between SCLIWC and the City of Ithaca and Cornell University during emergencies and planned maintenance periods. These interties were used to wheel water during the 2016 drought. The wheeling of water refers to the movement of water from one system to another through an intermediary system requiring interagency agreements.

2.3 CORNELL UNIVERSITY

Cornell University, located in northwest Ithaca, maintains the Cornell Water Filtration Plant. The filtration plant was built in 1928 and draws surface water from Fall Creek. The Fall Creek watershed has typically provided an abundant surface supply to a variety of users. The Cornell Water Filtration Plan utilizes just surface water. However, in 2016, flow in Fall Creek fell to below 10 cubic feet per second (cfs) (In the 96 years that the USGS has been monitoring flows in Fall Creek and the average low of 20cfs typically occurs in August; the average high (430 cfs) typically occurs in April; In some years the high reaches 4000 cfs) which severely constrained the Cornell Filtration Plant capacity and resulted in the need for temporary tanks on campus for water supply, among other measures.

The filtration plant has a capacity of 3.6 mgd and a current average day demand of 1.2 mgd. It serves a population of 33,000 on campus and in neighboring Cornell Heights area in the City of Ithaca and the Forest Home portion of the Town of Ithaca on the south side of Fall Creek. Because of the constrained service area, the majority of demand attributed to the campus, and conservation measures, demand has remained essentially flat despite campus population growth over the years.

2.4 RURAL TOMPKINS COUNTY

Water supply in rural Tompkins County is a mixture of private wells, local water districts, and, in part, the SCLIWC water district system. While water demand is currently met in normal years, the 2016 drought showed that water supply resiliency can be a concern during times of water stress due to reliance on single sources of supply and the isolated nature of the water districts. Supply to rural areas is limited by pumping and distribution infrastructure as some rural areas use a mix of private wells associated with small water districts and municipal wells. Figure 1 shows the water suppliers of Tompkins County.

Water demand for the urban and rural areas is shown in Table 1 which outlines the region's water supply infrastructure and frame it in the context of the region's layout and topography. Each of the main purveyors and outlying municipalities are compared, with rural areas separated into a separate subcategory. The distance from the terminal end of the SCLIWC system to the center of the respective rural center is listed to indicate how much effort would be needed to bring a transmission line to the area. In other words, the table indicates the quantity of water needed, the distance to the user, the elevation needed to pump, and the current demand, to provide an estimate of the distance required for water to the rural communities. Should connection to any of these areas be explored, Elevation from proposed receiving areas to the SCLIWC facility also puts into context what kind of pumping infrastructure would necessary.

[1] Physical connections between adjacent systems that can be used to share water in one or both directions depending on the agreed-upon operational parameters.

Table 1. Main Regional Water Purveyors, Demand, and Capacity

Purveyor Facility	Distance from SCLIWC system or existing intertie[2]	Elevation @ terminal end of transmission line (ft)[3]	Water demand (MGD)[4]	Treatment or Supply Capacity MGD	Water Source[5]
SCLIWC (Bolton Point)			4.23	6	Surface water (Cayuga Lake)
Ithaca (Town of)	--	368	--	--	Surface (Bolton Point), Individual & Public Well Water System
Cayuga Heights	--	300	--	--	Surface water
Lansing	--	1090	--	--	Surface Individual & Public Well Water System
Lansing	--	328	--	--	Surface water
Dryden	--	700	--	--	Surface water, Individual & Public Well Water System
City of Ithaca	Intertie with SCLIWC	-196	4.47	6	Surface Water (Six-Mile Creek)
Cornell University	Intertie with SCLIWC	240240	1.55	3.6	Cornell WFP (Fall Creek)
Sub-Total			***10.5***	***15.6***	
Town of Danby	4.4	932	0.03	0.14	Individual Private Wells & Public Well Water System
Village of Groton	5.13	1300	0.73	0.7	Individual Private Wells & Public Well Water System
Town of Newfield	4.75	1000	0.26	0.3	Individual Private Wells & Public Well Water System
Village of Trumansburg	1.2	365	0.40	0.72	Public Well Water System
Village of Dryden	6.5	489	0.32	0.6	Individual Private Wells & Public Well Water System
Village of Freeville	4.68	443	0.04	0.125	Individual Private Wells
Town of Caroline[6]	4.5	1044	0.33	--	Individual Private Wells
Town of Enfield[4]	3	512	0.34	--	Individual Private Wells
Town of Groton[4]	5.5	1090	0.58	0.7	Individual Private Wells
Town of Ulysses	Intertie with SCLIWC	381	0.49	0.2	Surface Water, Individual & Public Well Water System
Sub-Total			***3.58***	***3.48***	
Total			**14.1**	**15.6**	

[2] Distance from existing system or intertie to the center of the community

[3] Elevation of the system transmission point to the center of town to indicate the magnitude of pumping needed

[4] Designated estimated demand based on 100 gallons/capita/day average use

[5] The supply capacity sources, in some cases private wells only or a combination of known public and private well capacity

[6] Estimated demand based on 100 gallons/capita/day average use

Water demand and capacity reflecting local needs are shown along with the existing respective facility water source. Many rural areas rely on private wells, with the resulting demand difficult to fully capture. For some rural areas, demand was estimated based on local population. A total of available water demand of Tompkins County and available capacity from the three primary purveyors' capabilities is shown on the Total line in Table 1. This reflects the entire region's water demand and compares it with the capacity of the three major purveyors, reflecting a current county-wide surplus of 1.5 mgd.

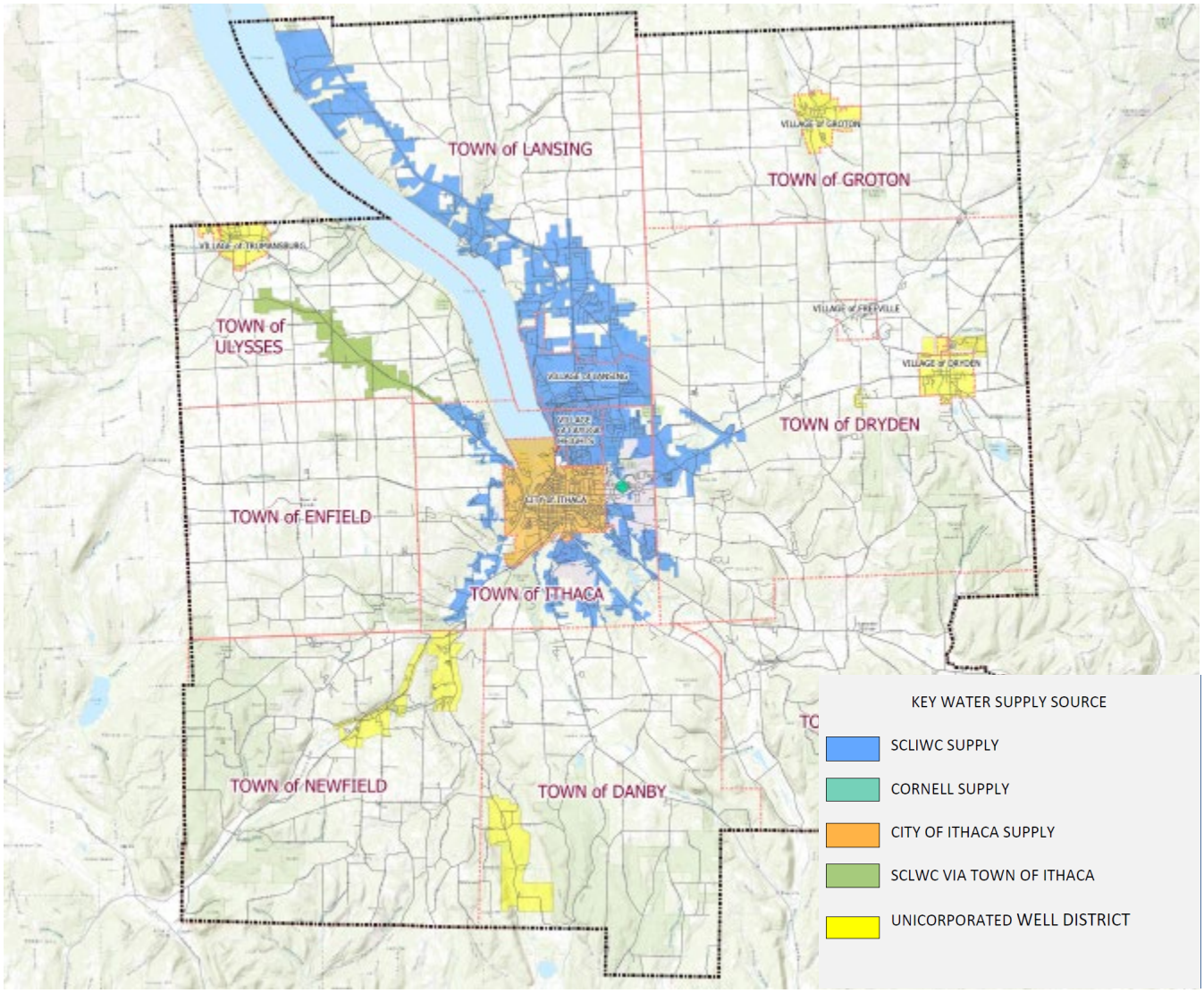


Figure 1. Tompkins County Municipal Water Suppliers

Source: T.G. Miller, David Herrick, IAED Water and Sewer Evaluation Update, December 2021

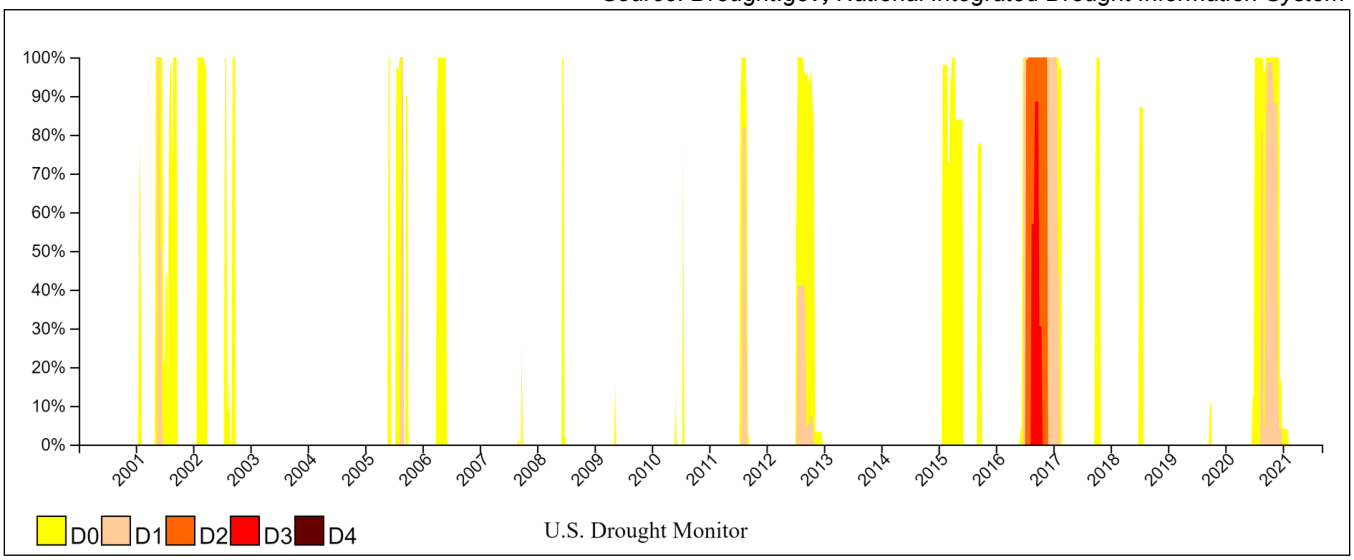
DROUGHT CONDITIONS

Droughts in Tompkins County historically occur with greatest effect between May and October. Abnormally dry periods are often observed, but severe or extreme droughts have not been typical. In general, New York State represents one of the historically more drought-resistant regions in the United States, however potential longer dry periods and drought concerns are suggested in the *ClimAID: The Integrated Assessment for Effective Climate Change Adaptation Strategies in New York Stat*e report. Tompkins County, similarly, is in a drought resistant region of New York positioned on the edge of Finger Lakes. Long sustained droughts are less prevalent, and groundwater levels are more stable, with quicker rates of recharge in Tompkins County than in other counties around New York State, due in part to the proximity of the Great Lakes. However, water quality issues should be considered in the event future drought conditions may create a reliance on Cayuga Lake, which may be increasingly affected by hazardous algal blooms due to climate issues.

3.1 HISTORICAL DROUGHT EVENTS

The U.S. Drought Monitor is a national map service that has tracked drought data since 2000. The Drought Monitor synthesizes drought data from local and national services (the Palmer Drought Severity Index (PDSI) and the State Drought Index, for example) to track and project drought periods. While the drought condition record is not long (going back only to 2000), what is available indicates a recent history of dry periods, as shown in Figure 2..

Source: Drought.gov; National Integrated Drought Information System



D0, D1, D2, D3, and D4 represent abnormally dry, moderate, severe, extreme, and exceptional droughts, respectively.

Figure 2. Historical Drought Severity—Percent of Tompkins County Experiencing Drought Level

The period of 2010 to 2021 reflects an increase in abnormally dry to severe and even extreme droughts. Figure 2 highlights the 2016 summertime drought as the most severe drought since the U.S. Drought metric began tracking

data in 2000. Indications are that water purveyors can expect to encounter more frequent future moderate to extreme droughts associated with climate change.

The U.S. Drought Monitor data can be put into greater context when one reviews the longer-term Palmer Drought Severity Index (PDSI). The PDSI has decades worth of data that estimates the moisture of a soil and related agricultural impacts. As shown in Figure 3, this data, shown as dry periods (yellow-red) and wet periods (green-blue), reflects that for the most of the past 50 years, wet periods have dominated. However, droughts are still a common occurrence, and should a sustained severe drought occur similar to the mid-1960s (the deep red portion shown in Figure 3), the water resiliency concerns in Tompkins County would be exposed. The 1960s period of drought was longer and of higher intensity than that experienced in 2016.

3.2 PREDICTED ENVIRONMENTAL AND WATER SUPPLY CONDITIONS

According to the National Oceanic and Atmospheric Administration (NOAA), Tompkins County falls in moderately to extremely wet climate categories, depending on location. NOAA classifies the local region as W1 to W3 for long term drought forecasts, as shown in Figure 4. This forecast synthesizes 6-month, 1-year, and 5-year precipitation data sets as a predictive tool to estimate future regional rainfall totals. The model has time limitations and only predicts gross yearly rainfall based on past history; it does not take into account wet and dry seasons in a localized climate.

Surface water in the next 1- to 5-year range is predicted to be abundant; however, rainfall is predicted to occur in fewer events with greater intensity. While winters are projected to be wetter, summer and fall are projected to see rainfall amounts decrease by 5 to 10 percent by 2050 (NYSERDA, 2014). The reduction in frequency and increase in intensity of rainfall may impact groundwater recharge in rural Tompkins County. The monitoring of groundwater levels will be important in the future to determine how changing rainfall patterns will impact aquifers. Even though precipitation is projected to remain high, the PDSI provides an indication of long-term drought. PDSI trends are projected to reflect the overall status of soil moisture to become drier, as shown in Figure 5. Both historic and projected data are shown with the historic PDSI data going back to 1950 shown for context (up to +6 very wet and down to -6 very dry), and a projected 5-year PDSI map of New York as prepared by the Cornell Cooperative Extension.

Source: Drought.gov; U.S. Drought Monitor

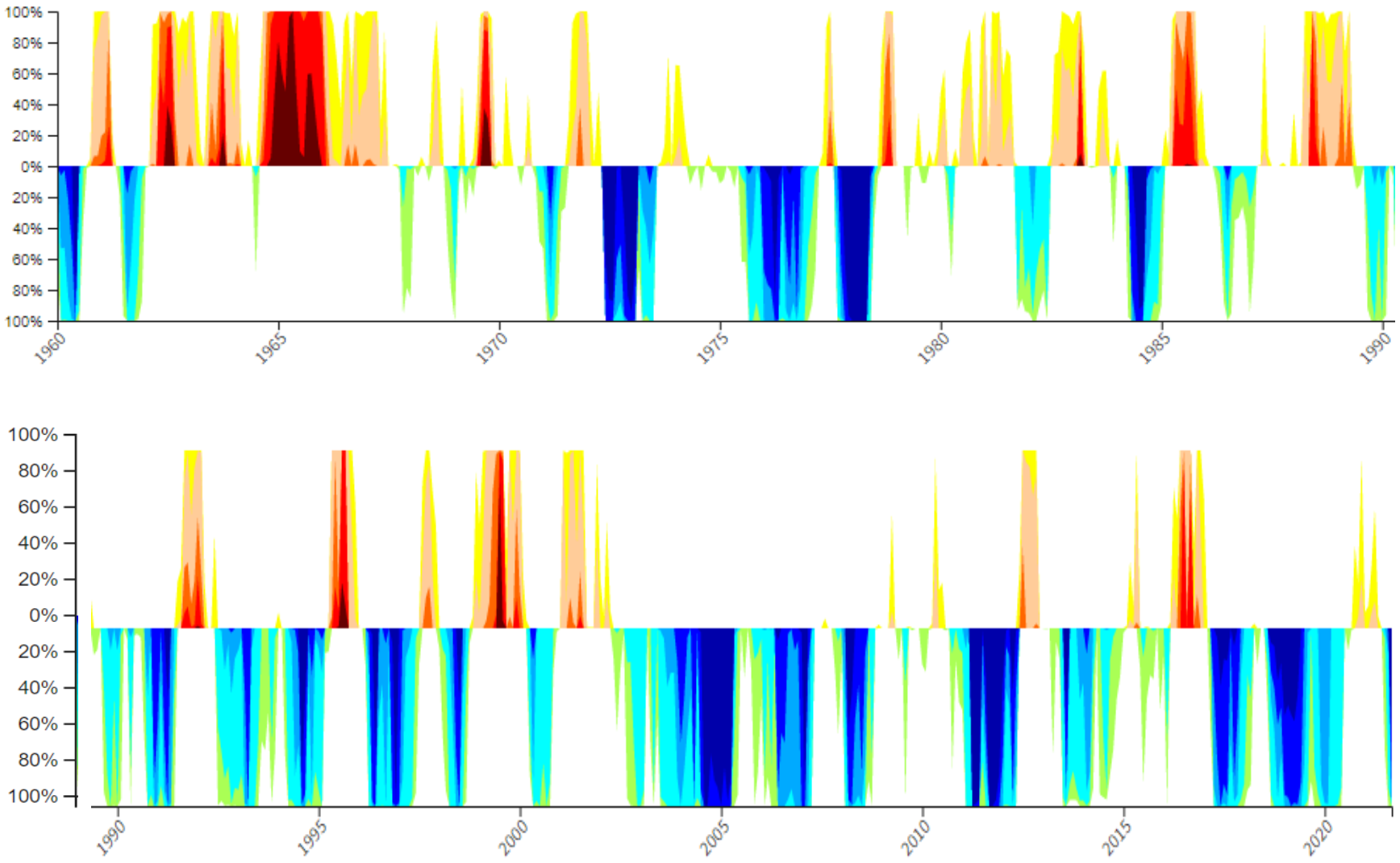
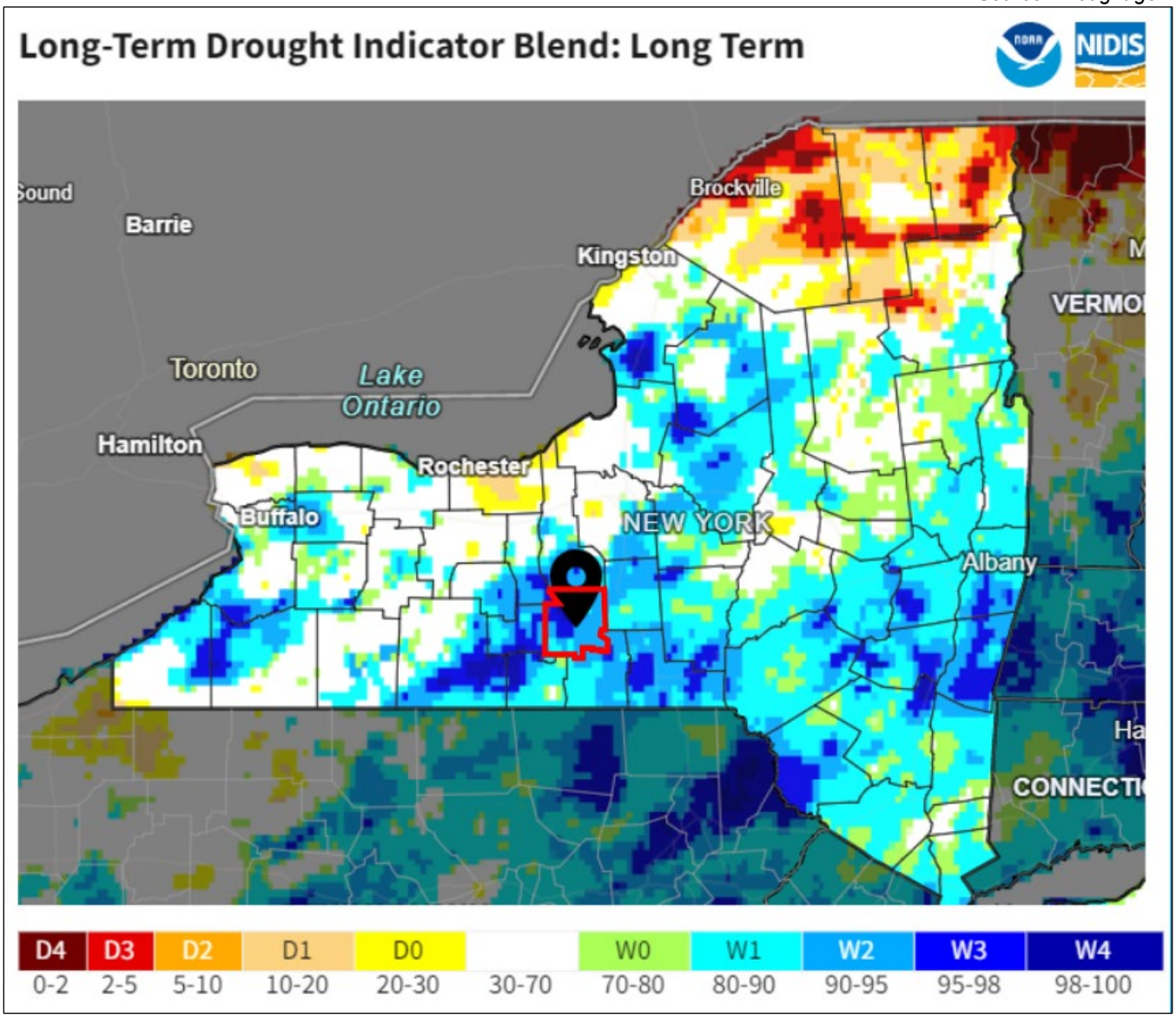


Figure 3. Past Precipitation—Percent of Tompkins County Experiencing Dry or Wet Period, 1950 – Present

(Blue/Green represents periods of time of high precipitation; red/yellow represents periods lacking precipitation)

Source: Drought.gov



Tompkins County Outlined in Red

Figure 4. Long-Term Precipitation 5-Year Forecast by NOAA Based on Total Rainfall

Source: Cornell Cooperative Extension

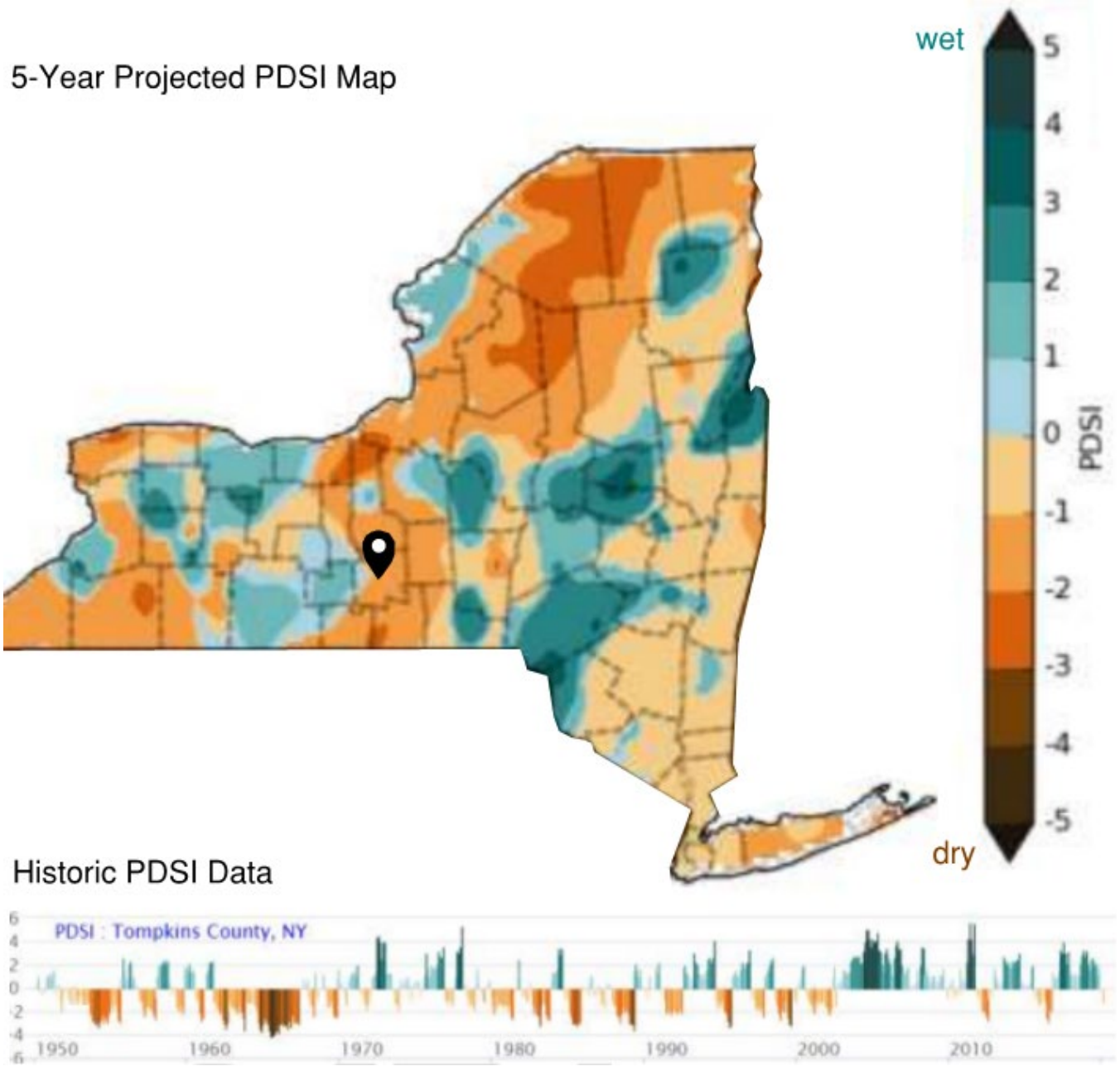


Figure 5. PDSI Data 5-Year Projection and Historical PDSI Data Since 1950

(PDSI Data 5-year Projection on Map; Historical PDSI Data Since 1950 on chart)

4. REGIONAL WATER SUPPLY INFRASTRUCTURE

Customers in Tompkins County receive their potable water by a combination of groundwater and surface water in both private and public municipal systems, depending on location. Some rural areas depend on direct pumping of groundwater from wells for water and are not incorporated into municipal service areas. These are often low population areas of the County, making districts and connections to existing water infrastructure difficult.

The county's three major water purveyors have some excess production capacity but are not physically connected via any distribution network to rural towns and villages for additional supply water.

4.1 GENERAL WATER QUALITY ISSUES

The wheeling of water depends on the availability of physical infrastructure to distribute, pump, and store the water. Compatibility of the water chemistry of different sources in terms of source water and treated water must also be considered. SCLIWC, the City of Ithaca, and Cornell University all use surface water sources that typically have compatible characteristics.

Beyond the raw water characteristics are seasonal changes to water chemistry that may occur. Water quality at Bolton Point and the City of Ithaca can be impacted by the occurrence of cyanobacteria harmful algal blooms (HABs). The source waters experience naturally occurring blooms significant enough to require treatment modifications. Per NYDEC, between 6/29/2021 and 10/7/2021, there have been 117 reports of HABs in Cayuga Lake in portions of Seneca, Seneca, and Tompkins counties. The issue of HABs occurrence has been proactively addressed within the plant to provide the necessary treatment as needed and the City of Ithaca will have a response tool in place in 2022. While the water is treated to be a safe potable water source, the acceptability of the water by the Cornell University and City of Ithaca systems should be confirmed before any investment in infrastructure.

One of the issues that arises in considering the wheeling of water by purveyors from the urban area to rural areas is that the rural areas predominantly use groundwater, which can have different chemical characteristics and can lead to a variety of issues when mixed with the purveyor non-groundwater sources. A thorough evaluation of mixing potential between the county's surface water sources and rural groundwater sources should also be analyzed. Incompatible water may dictate moving to a solely surface water source for some communities.

4.2 BOLTON POINT WATER TREATMENT PLANT AT VILLAGE OF LANSING

The Bolton Point Treatment Plant is the largest treatment plant in the county. Water capacity is limited only by what the plant can produce which is largely limited by staffing. Historically, there has not been a need for withdraws from Cayuga Lake beyond the permitted 6 mgd, nor have there been any limits placed on withdrawals.

The plant typically operates 18 hours per day on weekdays and 12 hours per day on weekends but is capable of 24/7 operation.

In addition to interties, pumping improvements would be needed in the City of Ithaca system, and likely Cornell University, to move water from the SCLIWC system to those systems. From there, water could be moved to other parts of the county. An engineered system study of options outlined in the *Ithaca Area Economic Development (IAED) Water and Sewer Evaluation Update, December 2021*would be helpful in getting a sense of precise improvement needs.

4.3 CITY OF ITHACA WATER TREATMENT PLANT

The City of Ithaca Water Treatment Plant draws water from Six Mile Creek. The City does not actively track or project water demand; however, current observed average day demand is 2.5 mgd. The treatment plant has a production capacity of 4 mgd. The plant was recently updated and rebuilt in 2016 to provide room for expansion of treatment up to 6 mgd and to include granular activated carbon. The City of Ithaca's raw water is high in manganese and sodium. While there are no regulatory issues, the high manganese has led to past customer complaints. In 2016 the system did receive brown water complaints largely tied to high manganese issues.

Available supply is not currently an issue; however, dredging projects for the dam and reservoir are an ongoing concern to maintain the storage capacity. While formal monitoring is not yet in place, staff report that water overtops the dam structure in typical years. However, it was noted that water did not overtop during the 2016 drought.

Currently, there is not an intertie from the City of Ithaca to the SCLIWC systems. An intertie is defined as a physical connection, typically paired with a use agreement, to allow for water to be supplied from one system to another to meet daily demand or specified for emergency use.

Currently, there is an existing one-way intertie from Cornell University system to the City of Ithaca. Cornell's system can provide water to the City during emergencies, maintenance evolutions, or projects, but that intertie cannot provide water to in the other direction due to hydraulic constraints the prevent adequate service pressure and fire flow.

Potentially, the City could help supply SCLIWC and Cornell with redundancy and some infrastructure improvements. An engineered system study of options referenced in the *IAED Water and Sewer Evaluation Update, December 2021*would be helpful in getting a sense of precise improvement needs.

4.4 CORNELL WATER FILTRATION PLANT

The Cornell Water Filtration Plant serves the campus of Cornell University as well as small parts of the City and Town of Ithaca. The Cornell Water Treatment Plant draws water from Fall Creek and historically has had reliable water supply. During the 2016 drought, temporary water tanks filled by water trucked from Cayuga Lake were supplied to certain customers on campus requiring irrigation, highlighting the lack of redundancy and existing infrastructure.

The Cornell University system has limited intertie capabilities with the SCLIWC system. These capabilities were added following the 2016 drought.

Cornell's system provides some redundancy to the City of Ithaca's system, as well as SCLIWC. An engineered system study of options outlined in the *IAED Water and Sewer Evaluation Update, December 2021*would be helpful in getting a sense of precise improvement needs.

4.5 RURAL AREAS

Rural areas that lie outside of the 3 large water purveyor service areas make up the majority of Tompkins County. Figure 6 outlines the infrastructure from Bolton Point to the outlying districts and indicates locations of regional storage tanks. The rural areas of the county rely primarily on groundwater for the source-of-supply. Current New York State standards require redundant source-of supply to meet demand and for that capacity be calculated assuming that the best producing well out of service or unavailable. A sample of available well data concerning location are shown in Figure 7 and quantified in Figure 8. Figure 9 is a summary of drilled well depths, with each point representing a well depth range of 10 feet. Please note: these figures represents only limited data from the New York State Department of Environmental Conservation's Well Water Program which collects well data from 2000-2021 and should be considered illustrative rather than an exhaustive well inventory.

While some of these noted wells are very deep, the median well depth is somewhere between 140 and 150 feet. The shallowest quartile of well depths is roughly 82 feet, with the shallowest at 23 feet deep.

To provide redundant water supply to wells the most reliable way to do that is to supply water to key rural locations from one of the major water purveyors. While the SCLIWC is best equipped in terms of capacity, source availability, and proximity, substantial capital investment would be required to provide a redundant water supply from SCLIWC to key rural locations. This would provide true redundancy by providing water from a unique secondary source. However, creating a regional redundant water supply requires addressing a number of potential issues. Questions that need to be addressed on a regional level include:

- How much water is available to meet demand?
- Are there surface and groundwater compatibility issues?
- Will local and state ordinances allow for regionalization of the water system outside of the current boundaries?
- Are there other unintended development impacts to an added build out of water systems?
- How does demand breakdown between domestic and agricultural uses? That breakdown will inform an approach to conservation.
- Are enough rural communities interested to make a regional redundant system financially feasible?
- Is the cost of capital investment justified by stakeholders to address only a periodic event?
- Operationally, switching to a regional surface water source as the primary supply and groundwater as a secondary source is preferred. I s that acceptable to all stakeholders?
- Are rate increases that would be required for regionalization of the water supply be acceptable?
- Does the climate change forecast alone justify the investment?
- Since Cayuga Lake use is not restricted by water right limitations does aquifer recharge make sense and does the geology make it an option?
- With the apparent infrequency of severe drought events and capacity in the Bolton WTP, is trucking potable water to rural users a suitable alternative to an acute crisis over capital investment? What needs to be in place to allow for a smooth roll-out of such a system in a crisis?

Table 1, found on page 5, shows categories to consider in order to understand the region's water supply infrastructure and frame it in the context of the region's layout and topography. Each of the main purveyors and outlying municipalities are compared, with rural centers separated into a separate subcategory. The distance from the terminal end of the SCLIWC system to the center of the respective facility is listed to indicate how much effort would be needed to bring a transmission line to the area. Should connection to any of these areas be explored, Elevation from the SCLIWC facility to the facility center also puts into context what kind of pumping infrastructure would necessary.

Water demand and capacity reflecting local needs are shown along with the existing respective facility water source. Many rural areas rely on private wells, with the resulting demand difficult to fully capture. For some rural areas, demand was estimated based on local population. A total of available water demand of Tompkins County and available capacity from the three primary purveyors' capabilities is shown on the Grand Total line in Table 1. This reflects the entire region's water demand and compares it with the capacity of the three major purveyors, reflecting a current county-wide surplus of 1.5 mgd.

Source: 2021 Bolton Point GIS

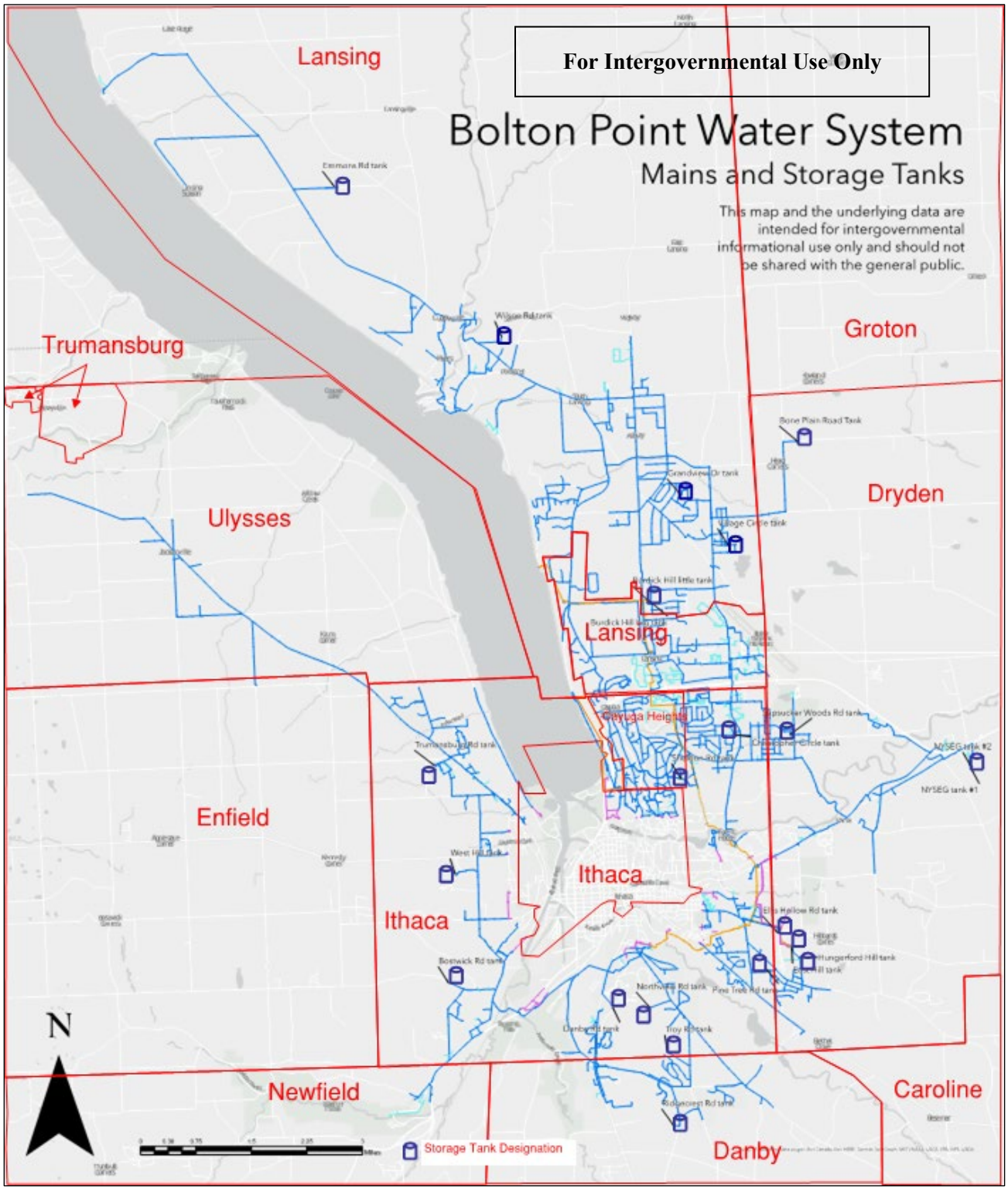


Figure 6. Bolton Point Transmission Line and Location of Storage Tanks

Source: 2021 Tompkins CountyGIS

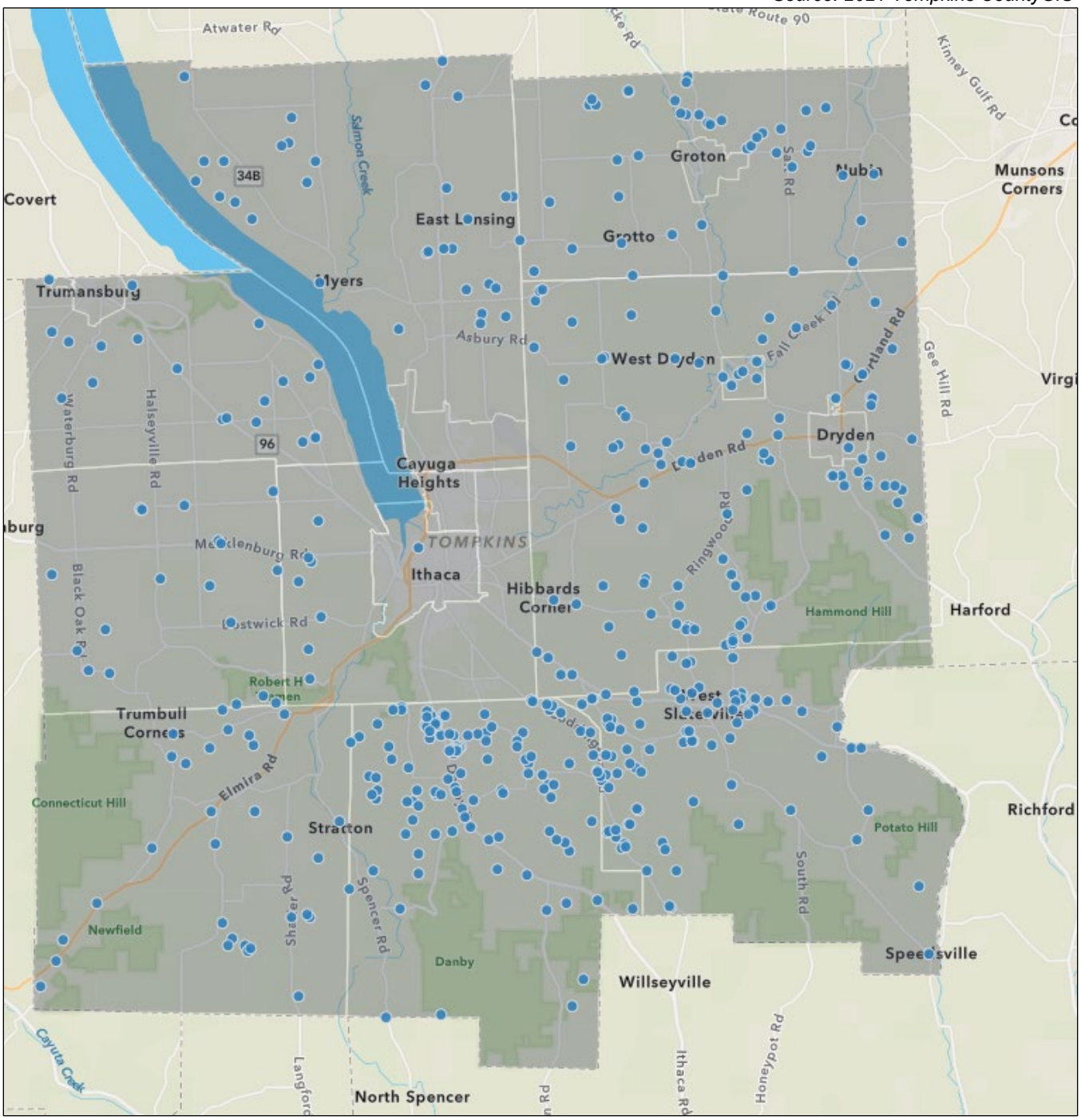


Figure 7. Water Well Program Data (NYSDEC) for Representative Private Well Locations in Tompkins County*

**Note: Not Exhaustive List of Private Data in Tompkins County, wells shown are those documented by NYSDEC from 2000-2021*

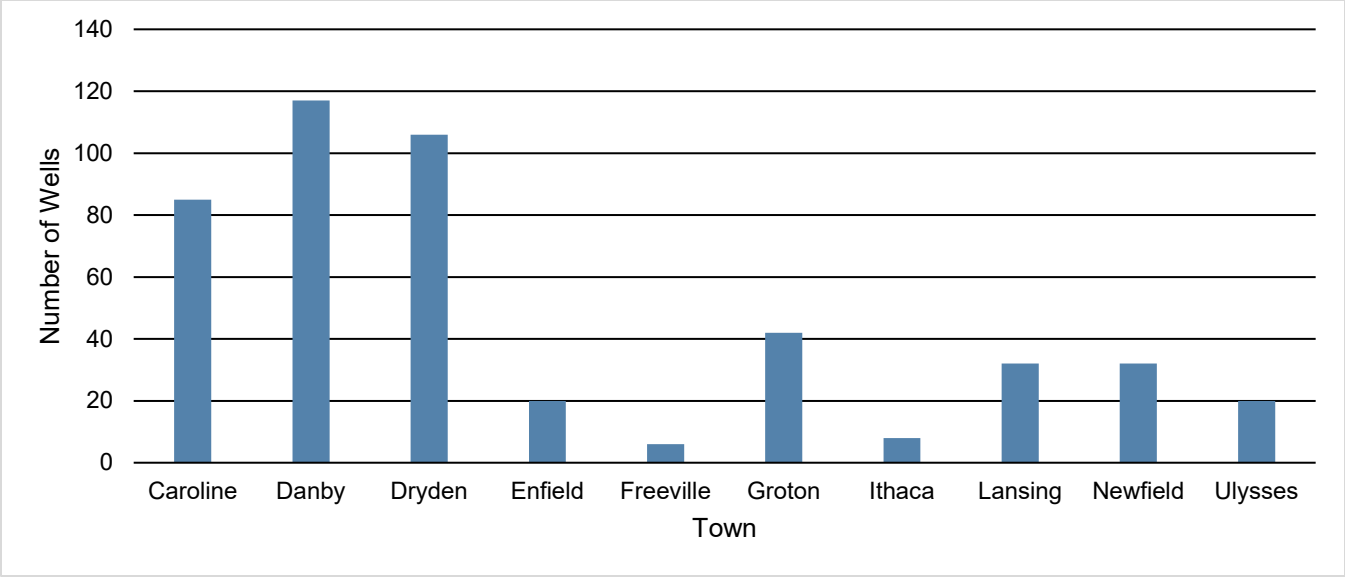


Figure 8. Representative Number of Private Wells per Town in Tompkins County Based on NYSDEC Water Well Program Data**

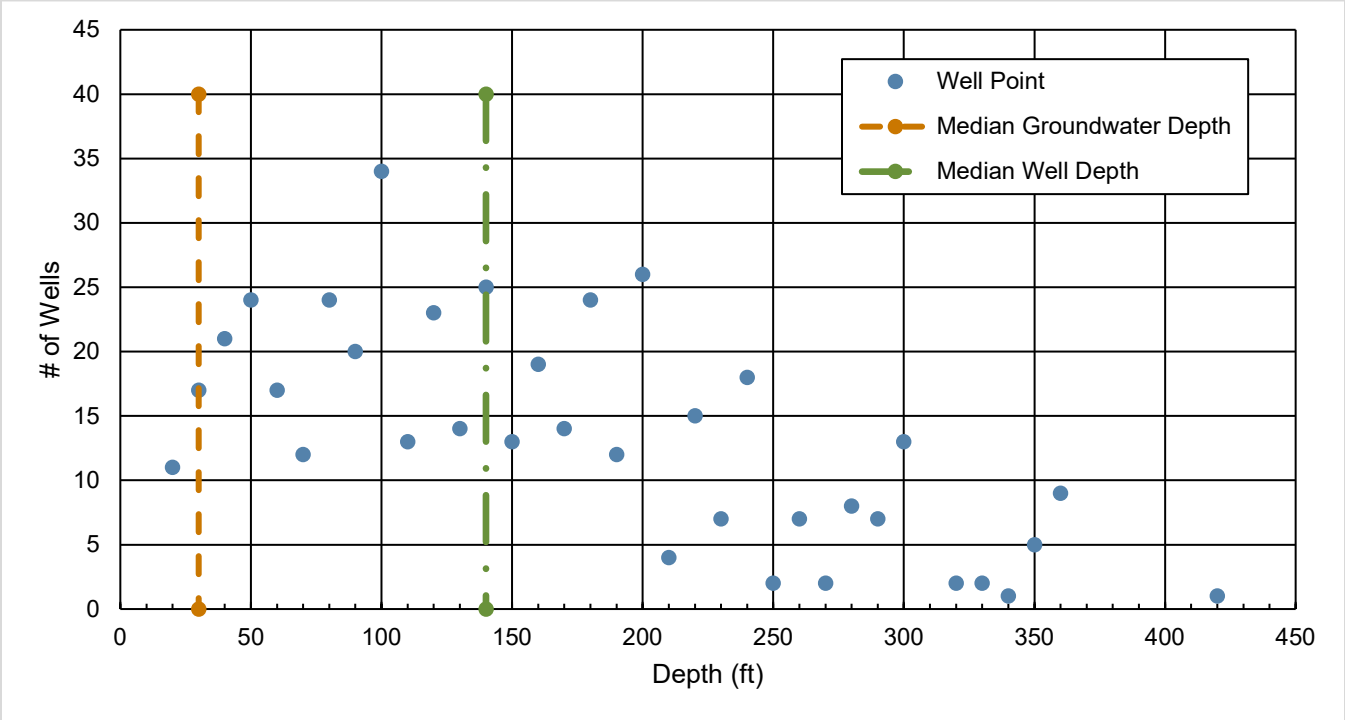


Figure 9. Representative Groundwater and Drilled Well Depths in Tompkins County Based on NYSDEC Water Well Program Data**

***Note: Not Exhaustive List of Private Well Data in Tompkins County, (2000-2021)*

5. EXISTING INTERAGENCY WATER SHARING AGREEMENTS

Currently, 9 of 12 municipalities that receive municipal water participate in inter-municipality service agreements. These agreements allow for redundancy in systems and increase water supply reliability and security. Currently 90 percent of water supplied from municipal systems is distributed between municipalities that operate under intermunicipal agreements, highlighting their prevalence and importance in the region.

As the largest water provider in the region, SCLIWC maintains interagency water sharing agreements that address the management of water use and with five municipalities, Cornell University, and the City of Ithaca. This agreement was finalized in 1986 and does not reflect current water quality and quantity concerns. Other agreements exist between the Towns of Ithaca and Ulysses; and the Town of Ulysses and Village of Trumansburg.

Intertie agreements are local and agency specific. Based on the findings of this technical memorandum it would be anticipated that as agencies negotiate the updating of existing agreements, and development of new agreements they could address issues of:

- Water quality
- Supply during HAB events
- Nature of the intertie (i.e., unidirectional, bi-directional, emergency use only, demand dependent)
- Intertie ownership and operation and maintenance responsibilities
- Duration of service
- Metering
- Pricing of supplied water
- Addressing the wheeling of water rather than operation for consumption

5.1 TOWNS OF ITHACA AND ULYSSES AGREEMENT

The SCLIWC has an existing transmission main stretching along the west side of Cayuga Lake which ends at the Pearsall Place Control Valve Building as shown in Figure 6.This enables the Town of Ulysses to receive water from the Town of Ithaca with the source from Bolton Point. The Town of Ulysses is not a member of the SCLIWC but has an agreement with the Town of Ithaca to provide water. This water supply serves Water District No. 3 in Ulysses and charges the 12-inch water main from the Woolf Pump Station in the Town of Ithaca. The agreement is for 159,000 gallons per day. A similar agreement also allows Water District No. 4 in Ulysses to draw 3,000 gallons per day to fill a 500,000-gallon Town of Ithaca Trumansburg Road tank.

5.2 TOWN OF ULYSSES AND VILLAGE OF TRUMANSBURG AGREEMENT

Water sharing agreements between the Town of Ulysses and Village of Trumansburg go both ways. The Village supplies two small Ulysses water districts with well water from the village's two existing wells. The Town of Ulysses has an agreement to receive Trumansburg well water to supply Ulysses Water District No. 2 via a 500,000-gallon tank. None of the current supply to Trumansburg comes from Bolton Point and all of it is well water, either from Ulysses or from the village's two main wells.

5.3 CORNELL UNIVERSITY, CITY OF ITHACA AND SCLIWC AGREEMENT

Sharing agreements exist between the trio of main purveyors for emergency allocations and all three purveyors have expressed interest in expanding those agreements. Since the 2016 drought, these agreements have been reviewed and ways to strengthen them were considered in the *Water Disruption 2016 After-Action Report* from Cornell University. While all three purveyors have indicated that expanded, updated agreements would be worth pursuing, none of the agreements have been modified at this time .

Existing agreements primarily address short-duration needs where water would be supplied from the Bolton Point Water Treatment Plant. These would include water deliveries to the City of Ithaca and Cornell University.

The longest disruption of service for which an agreement has been utilized was the recent rebuild of the City of Ithaca Water Treatment Plant, which lasted 354 days.

There are also agreements between Cornell University and the City of Ithaca. These agreements are quite limited in extent and cover limited areas in each other's jurisdiction.

There are currently no existing agreements between the SCLIWC, Cornell University, and Ithaca to send surplus water via pump station or other means to the Bolton Plant from either the City or Cornell systems for further distribution around the County. For example, distribution from Bolton Point to Ulysses and Trumansburg through aforementioned agreements or to supply any SCLIWC members during times of drought. This primary weakness in existing agreements is also reflected in the inability of water to be wheeled between either City of Ithaca or Cornell University Purveyors and the SCLIWC distribution network. Updated agreements between purveyors could increase daily production rates and boost regional supply capabilities.

In addition to written agreements, infrastructure connectivity has been considered. The SCLIWC Bolton Point transmission line has mains from the Bolton Point Water Treatment Plant to the Cornell Water Treatment Plant and into parts of the City of Ithaca. Additional infrastructure connectivity would likely still be needed for water wheeling purposes.

6. Opportunities and Needs to Address Regional Drought Resiliency

Opportunities exist to strengthen regional resiliency to droughts. These can be achieved through more robust water conservation measures, construction of infrastructure to facilitate the wheeling of water, and updating/negotiating interagency emergency water sharing agreements. These actions will extend the resources that are available and provide agreement on the decision making, manner, quantity, and conditions under which water assistance can be requested and provided. The inter-agency agreements are of particular importance, as all three major water purveyors indicated supply and availability of water is not the primary concern, but rather supply redundancy. If additional resources are needed in the rural areas and the extension of infrastructure is not possible another consideration is the drilling of deeper, potentially more resilient wells.

6.1 LEGAL AGREEMENT NEEDS

The City of Ithaca and Cornell University would benefit from new water sharing agreements since their supplies depend on surface water from streams (Six-Mile Creek and Fall Creek), which can experience low flows during dry periods.

Interagency agreements between SCLIWC and the City of Ithaca and SCLIWC and Cornell University may also help the Bolton Point and City of Ithaca Water Treatment Plants hedge against any disruptions in its system from the emerging HABs containments on Cayuga Lake. While the likelihood of drought impacting a water system is much higher than HABs, agreements and associated improvements that increase redundancy would still provide benefits to all county water users.

Being able to wheel water around the east, west, and south portions of the lake would increase resiliency for all parties. Sharing agreements between the appropriate agencies can help establish fair rate structures by which water providing entities are compensated for water provided to other agencies in the agreement.

Interagency agreements between rural municipalities and SCLIWC should also be explored. The possibility of providing additional water to those outlying communities that would require additional infrastructure to tie to the urban water systems. As SCLIWC owns tanks throughout the region, agreements with other municipalities could provide additional storage, redundancy, and resiliency to the rural area groundwater systems.

6.2 INFRASTRUCTURE EXPANSION

Infrastructure needs mostly involve physical connection between systems, including transmission, storage, and booster pumping. Another area of important infrastructure is expanding treatment capacity to allow for the enhanced regionalization to be processed at the receiving plant. Infrastructure improvements would go a long way

to improve redundancy but is also the most expensive. However, it also provides the opportunity for cost sharing for shared facilities. A more complete understanding of the opportunities and needs will require a more detailed analysis.

6.3 DEEPENING OF WELLS

It was reported that during the 2016 drought, rural groundwater wells began to drop or run dry. Groundwater sources are typically resilient against acute drought events. When they are not, it is an indication that the wells are shallow, which would not be unexpected in a typically water rich location as Tompkins County. Evaluation of well depth and geotechnical conditions is beyond the scope of this review; however, an evaluation of deeper aquifer availability – in part utilizing existing aquifer studies where available - is recommended to determine if more resilient groundwater supplies are available in the region. Drilling deeper wells is not inexpensive, but the availability of that deeper groundwater resource is important to know, and exploration could, again, be a shared cost when multiple communities could benefit. Investment in deeper wells is much more sound investment than other marketed improvements such as the unhelpful "injection" of wells which is a commonly marketed private solution.

6.4 CONSERVATION PROGRAMS

The first step in water resiliency is implementing conservation practices to best manage the existing resource. An emphasis on water savings is a clear option to help mitigate water demand across the County even outside of drought conditions. The Cornell University *After-Action Report on the 2016 Drought* points to conservation efforts reducing water demand upwards of 20 percent. It is unclear if this reduction was calculated as the result of water conservation or water restrictions. Conservation and education efforts have proven track records of working and can be inexpensive compared to infrastructure investment. Formal conservation programs and incentives in individual systems can have a benefit; however, regionally coordinated (countywide) initiatives can increase program success and spread the program cost. Best practices, including rate structures, are often highly localized. General planning steps are highlighted in water conservation program materials from the American Water Works Association (AWWA) planning manual (M52 and awwa.org/Resources-Tools/Resource-Topics/Water-Conservation) including guidance on:

- Water conservation rates
- Water use efficiency measures
- Community involvement
- Financing and pricing
- Conservation performance measurement, tracking, and reporting

6.5 DATA COLLECTION AND TRACKING OF WATER DISTRICT WELLS

Increased monitoring of groundwater in relation to active supply wells is another area that can provide information to users and water districts. Since so many towns rely on groundwater, having a record of which wells are expected to run dry first would be important step for developing emergency plans for when to pull from other sources. While this information exists for some areas thanks to regional USGS aquifer studies, increased aquifer level monitoring in towns and villages heavily dependent on wells will help inform future decisions on investments in infrastructure and agreements.

7. RECOMMENDATIONS

Based on the available data, infrastructure, existing agreements, and water resources, Tompkins County has a shared need to address the water resiliency, but there is not a regional structure in place to coordinate the entire county. To begin to address the issue, this technical memorandum recommends the following:

A) Establish a formal regional water providers' consortium (drought planning team) representing the key stakeholders committed to addressing the water supply issues on a regional (or even just Countywide) basis. Convene the consortium regularly to continue to progress the issues, needs and solutions. Suggested members of such a consortium would include:

- Tompkins County Environmental Health Department
- Tompkins County Department of Planning & Sustainability
- SCLIWC
- City of Ithaca
- Cornell University
- Rural center water providers
- State agencies including the Department of Environmental Conservation as appropriate

This consortium could initially address:

- Develop a regional profile of current and future demand and availability
- Determine if there are there surface and groundwater compatibility issues
- Support creation of updated interagency agreements between SCLIWC, the City of Ithaca, and Cornell University
- Address existing ordinances that currently prevent regionalization of the water system.
- Research the legal ability to provide backup water to key locations outside of current service area boundaries. If legal, identify any unintended consequences of such provision, including potential negative impacts to development, land use and the environment to creating a more regionalized water system
- Determine if rural community stakeholders are interested in a regional redundant system and if there is interest outline necessary infrastructure needed to support this
- Come to consensus as to whether the climate change forecast alone justifies the capital investment to address a periodic event
- Determine the cost sharing structure for capital investment, water rates, ownership, and operation and maintenance, etc.

- Determine if alternative, acute-drought solutions, such as trucking potable water to rural users, are adequate given the infrequency of severe drought events
- Evaluate well depth and geotechnical conditions or an evaluation of deeper aquifer availability to determine if more resilient groundwater supplies are available in the region.
- Increase monitoring of groundwater in active supply wells to provide drought information to users and water districts.
- Identify funding mechanisms to conduct an engineered system study for an interconnected regional system specifying specific infrastructure improvement needs
- Develop and prioritize a list of regional water infrastructure capital needs to provide water for participating stakeholders based on the *IAED Water and Sewer Evaluation Update, December 2021*
- Implement a regional water conservation program

B)) To maximize current supplies and reduce demands, and in turn potentially reduce the capital investment for regionalization, the consortium could begin to address coordinated regional conservation through the following:

- Define demand in terms of domestic, industrial, and agricultural uses. That breakdown will inform an approach to conservation.
- Develop and implement a regional conservation program.
- Draft and ratify an updated Intermunicipal Agreement in 2022 or 2023 to help support the coordinated transmission and compensation for longer term disruptions including drought that in particular allows for the potential of wheeling water through the SCLIWC, City of Ithaca, and Cornell University systems.
- Explore key funding opportunities for infrastructure improvements to allow water to be supplied from the City of Ithaca to SCLIWC
- Develop a regional water resource portfolio and the availability of additional resources such as available capacity from Cayuga Lake, the region's most reliable source-of-supply
- Analyze existing aquifer studies to determine more reliable groundwater resources, and as appropriate conduct further studies.
- Recommend that all water providers develop a water restriction protocol to implement during acute events when conservation is inadequate.
- Recommend that all water providers meter and calculate production, demand, water loss, and projection of future needs.
- Recommend that all water providers review existing interagency agreements, identify system-specific gaps and unaddressed needs, and update or create new agreements.

REFERENCES

1. Tompkins County Department of Planning & Sustainability. 2013, 2021. Tompkins County Hazard Mitigation Plan: 2021 Update. Planning - Climate Adaptation | Tompkins County NY.

2. T.G. Miller, David Herrick. December 2021. IAED Water and Sewer Evaluation Update, December 2021.

3. NOAA. September 29, 2021. National Current Conditions. National Current Conditions | Drought.gov.

4. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. September 9, 2021.Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/.

5. New York State. 2014 NYSERDA Evaluation Reports. https://www.nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/Evaluation-Contractor-Reports/2014-Reports.

6. Tompkins GIS Division. 1, October, 2021.Tompkins County Open Data. https://tcdata-tompkinscounty.opendata.arcgis.com/.

7. Brent Gotsch. Cornell Cooperative Extension. 2021. Climate Change and Water. Cornell Cooperative Extension | Climate Change and Water.

8. Tu J, Xia ZG, Clarke KC, Frei A. Impact of urban sprawl on water quality in eastern Massachusetts, USA. Environ Manage. 2007 Aug;40(2):183-200. doi: 10.1007/s00267-006-0097-x. Epub 2007 Jun 4. PMID: 17557170.

9. Cornell University, Environmental Health and Safety, Emergency Management. Regional Drought Water Disruption 2016 Ithaca Campus After Action Report/Improvement Plan. January 10, 2017.