Comprehensive Water Assessment Study

Village of Sherman, Chautauqua County, New York

Preliminary Engineering Report

August 2019

Barton & Loguidice

Comprehensive Water Assessment Study

Village of Sherman, Chautauqua County, New York

Preliminary Engineering Report

August 2019

Prepared For:

Village of Sherman
111A Mill Street
P.O. Box 568
Sherman, New York 14781

Prepared By:

Barton & Loguidice, D.P.C.
600 Riverwalk Parkway, Suite 400
Tonawanda, New York 14150

Table of Contents

Tables

Figures

Appendices

Executive Summary

The Village of Sherman owns and operates a water system that was originally constructed in the early 1800s and currently consists of two (2) well houses, a 300,000 gallon storage tank, and 7.9 miles of water distribution main. Several components in their water system do not meet current health standards or are in need of significant rehabilitation or replacement. Major deficiencies of the water system generally include:

1. inadequate chlorine contact time (4-log inactivation of viruses);
2. failed disinfection equipment in Well House No. 1;
3. well house facilities located in a flood plain without flood protection provisions;
4. Very hard water greater than 180 mg/L (hardness concentration of 281 mg/L as $CaCO_3$);
5. the lack of any automation or system monitoring;
6. the need for significant distribution system improvements; and
7. system components that have reached the end of their useful service lives.

As a result of the condition of the water system and a 2019 inspection performed the by the Chautauqua County Department of Health (CCDOH), the Village water system has been issued several serious violations.

As the first step toward planning for an upgrade, the Village applied for and received a $50,000 Community Planning Grant through the NYS Office of Homes and Community Renewal under the 2018 Consolidated Funding Application for completing this comprehensive evaluation of its drinking water system. This Preliminary Engineering Report (PER) assesses existing treatment and distribution system conditions, and evaluates alternatives for asset renewal and rehabilitation. This report recommends for the Village to proceed with the design and construction of a Drinking Water System capital improvement plan (CIP) to address its deficiencies.

The estimated probable base project cost for the recommended CIP is $2,401,000. If the Village decides to move forward with the addition of water softening and subcontract the installation of water meters, the project cost would increase to $3,206,000. It is envisioned that the NYSEFC's DWSRF program would serve as the core funding program for the Village's CIP, supplemented by grant funding provided by NYSEFC, the Water Infrastructure Improvement Act (WIIA) grant program, or HCR's Community Development Block Grant program. A Preliminary Plan to Finance was developed herein. After implementing the proposed project, water rates are estimated to be between $460 and $712 per EDU per

year dependent on the final scope and financing package for the project. Once implemented, the recommended CIP will provide the Village with safe and reliable drinking water for the foreseeable future.

1.0 Introduction

1.1 Authorization

The Village of Sherman retained the services of Barton & Loguidice, D.P.C. (B&L) on April 3, 2019 to prepare a Preliminary Engineering Report (PER) to evaluate the condition of its drinking water infrastructure. This report describes existing conditions of the water system, current deficiencies, and a recommended capital improvement plan (CIP) inclusive of estimated capital and user costs for implementation. The Village of Sherman has secured a $50,000 Community Planning Grant (CPG) through the Community Development Block Grant (CDBG) program to conduct this study.

1.2 Background

The Village of Sherman owns and operates a public water system that serves approximately 700 people. The Village's water system includes two (2) production wells located on the southwest side of the Village that satisfies the systems average daily demand of approximately 85,000 gallons per day (gpd). Storage for the system is provided by one (1) 300,000 gallon rectangular tank that is split down the middle. Various infrastructure in the water system is in need of upgrade and/or approaching the end of its useful life.

2.0 Project Area and Background Information

2.1 Location

The Village of Sherman is located in the southwest quadrant of Chautauqua County, New York, and west of Chautauqua Lake. The Village is surrounded by the Town of Sherman. A project location map is include as Figure 1.

2.2 Land Use of Project Area

The predominant land use in the Village project area is residential and commercial. The commercial area in Sherman primarily extends down the center of Village along Main Street (NYS Route 430) with mostly residential housing surrounding the area. There are no major industrial customers in the water system; institutional use includes the school which is the water systems largest user.

2.3 Environmental Resources

Preliminary screening through the New York State Department of Environmental Conservation Environmental Resource Mapper is included in Appendix A. Impacts to environmental resources as a result of this project are further explored in the Environmental Review section of this report.

2.4 Wetlands

Preliminary screening through the United States Fish and Wildlife Services National Wetlands Inventory has identified that parts of the project area are located in the vicinity of wetlands. A copy of the National Wetlands Inventory mapping is also included in Appendix A.

2.5 Floodplains

Portions of the Village of Sherman are partially located in a designated FEMA flood zone. FEMA Flood Zone mapping is shown in Appendix B. Based on FEMA's Flood Insurance Rate Map (FIRM), Zone A areas are in the 100 year Flood Zone, Zone B areas are in the 500 year Flood Zone, and Zone C areas are outside of all Flood Zones. Well No. 1 and Well No. 2 are both located within Zone A without flood protection provisions. Both sites are susceptible to and have experienced flooding in the past.

2.6 Agricultural Districts

There are agricultural districts located in the northeast and southwest areas of the Village of Sherman. A water system capital improvement project is not anticipated to impact these agricultural properties. A map showing the districts is included in Appendix C.

2.7 Presence of Outside Users

The Village of Sherman services approximately twenty-seven (27) outside users located in the Town of Sherman adjacent to the Village limits. These users are not part of any formal water district.

2.8 Population Trends & Projected Growth

Census and American Community Survey data indicates that the Village of Sherman population has fluctuated between 680 people and 735 people between 1990 and 2016. Currently the Village of Sherman is estimated to have a population of 700 people. For planning purposes, we are projecting a 5% population growth rate over the next 20 years, which equates to a population of 735 people in the year 2038. This modest population growth will not result in upsizing any of the water system's infrastructure.

Table 2-1: Village of Sherman - Population Data

2000 Population	2010 Population	2016 Population	Est 2018 Population	Est 2038 Population	20-Year Projected Growth
714	730	692	700	735	5%

2.8.1 *Financial Status of Village*

The Village of Sherman had a 2010 Census Median Household Income of $34,118, a 2017 American Community Survey Median Household Income of $38,750, and a 2017 American Community Survey Families below poverty rate of 7.8 percent. The Village has a 54.86% Low to Moderate income percentage which qualifies it for CDBG funding without the need for an income survey.

2.8.2 *Water System – Equivalent Dwelling Units (EDUs)*

An equivalent dwelling unit, or EDU, is the unit of measure by which a user is charged for water service. Based on the current Village EDU assessment structure, the Village of Sherman has approximately 395 EDUs.

2.8.3 *Status of Existing Debt, Reserve Accounts, and Water Rates*

The Village of Sherman Water Fund does not have any existing debt. In 2018, the Village of Sherman underwent an internal rate study and rate restructuring. The rate study resulted in a recent rate increase of $240 per year (96% increase) to help pay for the immediate replacement of failing infrastructure and build up capital reserve funds. The Village is utilizing the entire rate increase to fund their immediate need of replacing failing infrastructure and does not yet have any funds in a capital reserve account. The following table details the current projected table rates over the next four (4) years assuming a capital project is not completed.

Table 2-2: Projected Annual EDU Cost for Sewer Service, Period 2019 to 2022

Year	Total O&M Budget	Portion of O&M for Reserve Savings	Portion of O&M for Debt / CIP's	Projected Average Cost per EDU
2019	$150,000	$0	$60,000	$380
2020	$195,000	$0	$70,000	$492
2021	$203,000	$11,250	$51,500	$512
2022	$206,000	$20,500	$36,500	$515

2.8.4 *Anticipated Development*

The majority of the Village of Sherman is built out. The Village of Sherman is currently trying to promote redevelopment of older and/or abandoned structures, as well as development along the vacant parcels that border Interstate 86 on the south side of the Village, shown below. To date, there are no major development projects underway or expected.

3.0 Water Usage and Existing Facilities

A map of existing water facilities including pipe sizes and material is included as Figure 1. The Chautauqua County Department of Health (CCDOH) Sanitary Survey and Public Water Inspection referred to in later section of this report is include in Appendix D. Site visit photos showing existing infrastructure are included as Appendix E.

3.1 Water Usage

Current water usage is based on the Water System Operation Reports provided by the Village of Sherman. Usage data is summarized below and detailed in Appendix F. Usage has steadily decreased over the last several years, which is likely attributed to the operators replacing several sections of extremely old water main believed to date back into the 1800s. The below estimates were developed from historical water usage provided for the 3-year period 2016 through 2018.

Average Daily Demand (ADD):	84,936 GPD (59 GPM)
Max. Month Demand (Feb. 2017):	4.195 MG (Avg. 149,821 GPD)
Max. Day Demand (Oct. 4, 2016):	327,000 GPD (227 GPM)
99% Max Day Demand:	225,000 GPD (157 GPM)
Est. Max. Day Peak Hour Demand:	313 GPM
Estimated Water Loss %:	48% based on minimal data available

3.2 Groundwater Source and Treatment

3.2.1 *Overview*

The Village of Sherman currently utilizes two (2) drilled groundwater production wells, each housed in an individual pump house. The treatment process consists of disinfecting the well water with liquid sodium hypochlorite (chlorine). Each well pump house contains a vertical turbine well pump, a flow meter, and chlorine feed/disinfection equipment. A site plan displaying each well building can be seen on Figure 2.

Well House No. 1

Well House No. 2

3.2.2 *Water Quality*

The most recent water quality data, contained in Appendix G, was sampled from Well No. 1 by U.S. Department of Interior USGS on November 8, 2011. Based on a review of the water quality data, the well water meets all current drinking water standards and does not exceed any maximum contamination limits. However, it should be noted that Sherman's well water has a water hardness of 281 mg/L as $CaCO_3$, which is considered very hard water. Residents constantly complain about the hardness of Sherman water and several cannot afford to add, or are not physically capable of managing an in-house water softener. Residents who do not soften their water generally do not like to drink it, experience consistent failure of common household appliances (hot water tanks, washing machines, dishwashers), and those with sensitive skin report issues with eczema due the hard water.

3.2.3 *Wells, Well Pumps, Piping and Valves*

The Village has two (2) drilled steel cased groundwater wells with 25 HP Vertical Turbine well pumps located approximately 520 feet apart from one another. The wells, although located in relative close proximity, do not appear to impact each other. Operators did not report any current issues with Well Pump No. 1 (last replaced in 2015) or Well Pump No. 2 (last replaced in 2005). Operators will typically operate each well pump simultaneously for a combined output of 500 GPM (250 GPM each). The wells have not recently been inspected or redeveloped. Technical information on the wells can be found in Appendix H and summarized in Table 3-1 below.

Table 3-1: Existing Production Well Design Data

Well No.	Ground Elevation (ft amsl)	Casing	Screened Interval (ft bgs)	Design Point of Pump	Well Pump Size / HP
1	~1,532'	10" Inner at Screen	32' to 52'	250 GPM @ 241 TDH	8" / 25 HP
2	~1,532'	12" Inner	40' to 45'	250 GPM @ 202 TDH	6" / 25 HP

The output of each well pump is individually metered inside each well house. The water meters are antiquated and need in of replacement. The exposed well pump discharge piping and valves for both Well No. 1 and No. 2 are displaying significant signs of corrosion and deterioration likely as a result of the sodium hypochlorite being located in close proximity to the piping. The CCDOH has issued a violation for the condition of both well houses interior piping, meters, and valves stating they require complete replacement and citing NYSDOH Subpart 5-1.71b as basis for this violation.

3.2.4 *Well Buildings*

The Village Water System has two (2) different Well Buildings (Houses), one for Well No. 1 and one Well No. 2. Well Building No. 1 is a brick framed building with a small wood framed addition used for storage. Overall, Well Building No. 1 is in structurally sound condition, but does require various minor improvements including new pipe gallery grating, removal of abandoned control panels, and various general cosmetic updates and improvements.

Interior of Well House No. 1

Well Building No. 2 is a CMU structure half buried below grade and was found to be overall in poor condition. The only access to the well building is through a small “half” door which leads down onto a wobbly wooden step platform. Entering this Well Building is a safety hazard. The Well Building is extremely poorly lit and only kept dry through the use of a sump pump that is located in small open hole cut into the well house floor. The CCDOH issued a violation for the condition of this well house stating it should be replaced in its entirety and again citing NYSDOH Subpart 5-1.71b as basis for the violation.

Interior Well House No. 2

3.2.5 *Site Piping and Site Layout*

Site piping and valves located immediately adjacent to each well house are reaching of the end of their useful service lives. A critical valve located outside of Well House No. 1, that isolates Well House No. 1 from distribution system, no longer operates. This valve is required to make any improvements to Well House No. 1. The CCDOH has had a violation issued since 2015 for this valve no longer operating, stating it should be replaced and once again citing NYSDOH Subpart 5-1.71b as basis for the violation.

There is a monitoring well located in the vicinity of Well House No. 2 that has been reported by the CCDOH to be damaged. The CCDOH has issued a violation for the condition of this monitoring well as it must be properly abandoned and plugged to eliminate the potential contamination of the aquifer during flooding events. The CCDOH cited NYSDOH Subpart 5-1.71b as a basis for this violation.

The well site area has historically dealt with regularly occurring flooding events. According the FEMA Flood Insurance Map, from 1978, both well houses are located in the 100-year floodplain (FEMA Zone A flood zone). The land around both well houses is subject to annual flooding. The CCDOH has reported that flood waters actually enter and flood Well House No. 2 as it is located below the surrounding grade, which also floods. Operators state that the concrete pedestals which support the pump motor in both Well House No.1 and No. 2 have never been flooded over as they are elevated just above the highest experienced flood waters. However, with climate change and the regular occurrence of 100 year storms, both wells are at significant risk of being contaminated by surface water during flooding events which is a major health violation.

Historic Photo of Flooding Around Well House No. 2

Historic Photo of Flooding Around Well House No. 1

Current code and design practices require critical infrastructure to be protected from flooding by being located 3-feet above the 100 year flood plain, which Sherman's infrastructure is not. With the impacts of climate change and the increased frequency of severe weather events, the current constructed elevations of Well House No. 2 combined with lack of flood protection is a major issue for the Village. The CCDOH has issued a violation for pumping facilities located in flood plain citing NYSDOH Subpart 5-1.71b and NYSDOH Subpart 5-1 Appendix A, Section 8.2.1 and Section 6.1.1 as a basis for the violation.

3.2.6 *Disinfection*

The Village utilizes liquid sodium hypochlorite (chlorine) to disinfect their drinking water. Each well house contains a day tank of liquid sodium hypochlorite and a chemical feed pump which doses the well water as it exits the well house through an injection quill. The existing chemical disinfection equipment is reaching the end of their useful lives and is in need replacement. The chlorine containment setup is less than ideal as it consists of an old drum that was cut in half and mounted into a wooden frame. Additionally, neither well house has a proper isolated chemical room. Chlorine fumes have caused significant deteriorating of nearby exposed ductile/cast iron piping and valving.

Currently, the chlorine injection quill in Well House No.1 is deteriorated and inoperable. The Village operators do not have the tools or equipment to replace this injection quill internally without shutting down nearly the entire water system for several hours. Without a working chlorine injection quill in Well House No. 1, water from Well No. 1 cannot be treated with chlorine as it exits the Well House. Operators are forced to only operate Well No. 1 when Well No. 2 is running. Water from Well No. 2 is over chlorinated and blended with the unchlorinated Well No. 1 water in the transmission piping to ensure proper chlorine residuals are achieved. Should Well No. 2 or its chlorination system become inoperable, the Village will have no method of disinfection and be forced to be placed on a Boil Water Order. The current practice of disinfecting water from Well No. 1 has been deemed unacceptable by the CCDOH and a violation by the CCDOH was issued as a result. The CCDOH cited NYSDOH Subpart 5-1.30 as a basis for the violation.

Inoperable Injection Quill

Chlorine Set-Up Well No. 2

The Village water treatment system also lacks adequate chlorine contact time which is a major health hazard. Refer to Appendix I for existing chlorine contact time calculations. As shown in Appendix I, 4-

log inactivation of viruses (required by USEPA Groundwater Treatment Rule) does not occur prior to serving water to the systems first customers. CCDOH has had violation issued for lack of proper Chlorine Contact time since 2011 citing NYSDOH 5-1.30 as a basis for the violation.

3.2.7 *System Controls*

The control system that once operated both wells consisted of floats in the water storage tank which called each well pump to operate or shutdown based on the water in level in the water storage tank. This antiquated control system has completely failed and operators are forced to run the well pumps manually in hand mode. There are no automated controls or alarms signifying when the well pumps should be turned on or turned off. Operators have to manually monitor the level in the water storage tank and physically go to each well house to turn the pumps on. The lack of automation, controls, and system alarms has resulted in not only well pumps being left on in hand too long which overflows the water storage tank, but also customer pressure complaints when the water storage tank is taken down too low. Lastly, it should be noted that there is currently no easy way for operators to monitor water level within each well or any low well level alarms. The CCDOH has issued a violation for the lack of controls, automated operation, and alarms stating the wells and storage tank require controls with automatic alerting alarm features. The CCDOH cited Subpart 5-1.71b as a basis for the violation.

3.3 Water Storage Tank and System Pressures

3.3.1 *Water Storage Tank*

Water Storage Tank

The Village of Sherman currently has one (1) ground water storage tank that provides water storage and pressurizes the Sherman Water System. The tank is located on the North side of the village off of Miller Street. The storage tank is a 300,000 gallon cast-in-place concrete rectangular storage tank. The rectangular tank has a concrete wall running down the center of it, effectively splitting it down the middle into two (2) 150,000 gallon sections. This allows the water operator to take each half of the tank down separately for inspection, maintenance, and cleaning. The storage tank is mostly buried with dirt and grass to protect it from freezing. Design details of the water tank are summarized in Table 3-2 below.

Table 3-2: Existing Water Storage Tank

Name References in this Report	Construction	Size (gallons)	Top Water Elevation	Year Built	Dimensions/ Height
Tank 1	Concrete	300,000	1688' (Est.)	1995	60' x 49'/ ~14'

An internal inspection of water storage tank was not performed or reviewed as part of this study, but operators report the storage tank to be in overall good condition. In the past, Village operators have performed internal inspections of the tank and have not discovered any notable internal deficiencies. It is recommended for the Village to inspect and clean the water storage tanks approximately every five (5) years. During our evaluation we noted the following deficiencies in relation to the water storage tank:

- Operators have no way of measuring the water level inside the storage tank without physically going to the tank site, opening the hatch, and looking inside the tank. The tank does not have any level sensors or any high/low level alarms. Operators have to go the water tank site every day and sometimes multiple times a day to check the tank level and plan well pump operation. The CCDOH has issued a violation for the lack of automated tank level monitoring and alarm features citing Subpart 5-1.71b as a basis for the violation.
- The tank access hatches on the top of the water tank are located at the same elevation as the grass/sod that covers the water storage tank. The access hatches should be raised a minimum of 24-inches above the top of the tank and covering sod, so that rain water cannot easily penetrate into the storage tank. The current set up puts the drinking water system at risk of surface water contamination. The CCDOH has issued a violation for the access hatches citing Subpart 5-1 Appendix A Section 7.0.8.2 as a basis for the violation.

3.3.2 *Tank Operation*

The water level within the water storage tank dictate the pressures in the Village of Sherman's water system. As stated above, tank levels have to be physically observed by the Village water operator and there is no high level or low level alarms. The Village water operator tries to keep the level of the water storage tank between 10 feet and 13.5 feet, by operating the well pumps at appropriate times. Based on the lack of automation, it is common for the water tank to be accidently overflowed by the Village operator by leaving the well pumps on too long (which contributes the Village's 48% water loss) or to be drained down lower than desired by not turning on the well pumps soon enough.

3.3.3 *System Pressures*

Elevations in the water system range from 1,674 feet near the water tank to 1,534 feet at the lowest point in the Village. With the water operating levels that range between 1,683 feet and 1,687 feet, system pressures generally range between 19 PSI near the tank and 67 PSI at the lowest elevation. Hydraulic modeling for existing system pressures and fire flows are included in Appendix J. Based on the hydraulic modeling, there are approximately:

- Three (3) homes that experience pressures of less than 35 PSI during normal operation
- One (1) house that experiences pressures of less than 20 PSI during normal operations
- One (1) house located in an area with an available fire flow of less than 500 GPM at residual pressure of 20 PSI

Overall, system pressures for the majority of the users are acceptable, aside from three (3) users located immediately adjacent to the water storage tank. The CCDOH has issued a violation for inadequate system pressures citing Subpart 5-1 Appendix A Section 8.2.1 and resident complaints as a basis for the violation. Based on our analysis, it is believed that some of the resident complaints the CCDOH has responded to may have pressures greater than 35 PSI.

Based on the hydraulic model, every house but one (1) (located on Miller Street near the water tank) should experience fire flows in excess 500 GPM at a 20 PSI residual pressure. Unless the hydraulic grade of the water tank is raised, this house will always experience inadequate fire flow because the normal system pressure in the area is only approximately 19 PSI. A fire flow of 500 GPM would result in a residual pressure of approximately 17 PSI for this location.

3.4 Water Distribution and Transmission

The Village Sherman water system (shown in Figure 1) dates back to the early 1800s and contains approximately 8,700 feet of 12-inch piping, 26,800 feet of 8-inch piping, 3,300 feet of 6-inch piping, and 3,300 feet of 4-inch piping. In the last 15 years, operators have installed a significant amount of new water distribution main to replace antiquated or undersized main that has reached the end of their useful lives; however, there are still several of sections of main that require replacement. Although, operators have installed several miles of new ductile iron water main in the Village, much of the old antiquated water main is still active and has not been decommissioned. In several cases, this is a result of long side services being still connected to the antiquated water main. This is believed to a major contributing factor to the Village's 48% water loss rate. Known deficiencies of water distribution and transmission piping are listed below:

A. *Antiquated Water Main in need of Replacement* – Theses sections of water main have reached the end of their useful lives and may even be in excess of 100 years old. These water mains likely have significant tuberculation on their insides and cause water quality and brown water issues. The majority of valves along these sections no longer operate, which makes system maintenance and repairs extremely difficult to complete without shutting down a significant number of users. It is believed that these lengths of water main are major contributors to the Village's 48% water loss rate. The CCDOH has issued a violation for old deteriorated water mains citing NYSDOH Subpart 5-1.71(b) as a basis for the violation. The list of water mains that are antiquated, deteriorated, and in need of replacement are as follows:
   - 2,000 LF of 4-inch water main along Kipp Street from Main Street to approximately 157 Kipp Street
   - 950 LF of 4-inch and 6-inch water main along Franklin and Osbourne Street
   - 600 LF of 4-inch water main along Mill Street from Hart Street to Franklin Street

B. *Redundant Water Mains* – Theses sections of water main are redundant and unnecessary as they parallel more reliable, newer, and often larger mains. Redundant sections of water main can cause operators to make unnecessary repairs, increases the age of water in the distribution system, and reduces water quality. Many of these redundant mains are extremely old (100+ years) and have reached the end of their useful service lives. They are believed to be major contributors to the Village's 48% water loss rate. The Village cannot simply remove these water mains from service due to active connected water services or construction issues with internal forces cutting and capping these mains. The CCDOH has issued a violation for old deteriorated water mains that parallel new water mains citing NYSDOH Subpart 5-1.71(b) as a basis for the violation. The list of water mains that are considered redundant water mains and should be removed from service are as follows:

- 2,500 Linear Feet of 8-inch Water Main along Main Street from the dead end in the west of the village to Franklin Street
- 2,300 Linear Feet of 8-inch Water Main along Miller Street between Main Street and the storage tank access road
- 500 Linear Feet of 8-inch Water Main along Church Street between Main Street and Park Street
- 450 Linear Feet of 6-inch Water Main along Franklin Street between Main Street and the French Creek crossing

3.5 Residential Water Meters

The Village of Sherman currently bills water users based on individual water use measured by a water meter. The existing water meters are well over 20 years old and have exceeded their useful service lives. They do not have remote read features, which make the manual reading of meters very time consuming for Village operators. The Village has noticed water use immediately increases in residences with newly installed water meters and therefore it is believed the estimated water loss rate of 48% is artificially high due to inaccurate water meters.

The Village has already begun the process of replacing all water meters in their system with Badger Recordall Beacon meters which will allow water operators to read meters remotely using cellular services. Every year the Village utilizes any remaining O&M budget funds to purchase and install new waters. As of June 18, 2019, only 29 of 326 meters have been replaced due to funding and manpower limitations. The CCDOH has issued a violation for the lack of accurate water meters citing Subpart 5-1.71b as the basis for the violation.

3.6 Summary of Deficiencies

This section summarizes the deficiencies described in the above sections:

Groundwater Source and Treatment

Deficiency No.	Description
1	The water system has extremely hard well water and as a result several residents complain of water taste issues, the constant need to replace household appliances, and dry skin.
2	Exposed piping and valving in both well houses are significantly corroded. This is a noted violation by the CCDOH.
3	The water meters in the well houses are antiquated and have reached the end of their useful lives. This is a noted violation by the CCDOH.
4	Neither well house has a separate isolated chemical room for sodium hypochlorite storage.
5	Well Building No. 1 requires various minor improvements including new pipe gallery grating, removal of abandoned control panels, and general cosmetic updates and improvements. The Well Building is located in the 100 year flood plain and is not protected from flooding. This well building has been reported by CCDOH to experienced flooding in the past. The lack of flood protecting is a noted violation by CCDOH and can result in untreated surface water entering the public water supply.
6	Well Building No. 2 is half buried and in extremely poor condition. This well house needs to be replaced in its entirety. The Well Building is located in the 100 year flood plain and is not protected from flooding. This well building has been reported by CCDOH to experienced flooding in the past. These items are noted violations by the CCDOH and can result in untreated surface water entering the public water supply.
7	The critical valve outside Well No. 1 is in operable and needs to be replaced. This is a noted violation by the CCDOH.
8	The monitoring well outside of Well House No. 2 is damaged and needs to be properly decommissioned. This is a noted violation by the CCDOH.
9	The chemical disinfection equipment (dosing pumps, piping, injection quills, containment, etc.) has exceeded their useful lives and are in need of replacement.
10	The current process of disinfecting Well No. 1 is unacceptable. Due to a failed injection quill, unchlorinated water from Well No. 1 is blended with over chlorinated water from Well No. 2 to achieve a proper chlorine residual. This is a noted violation by the CCDOH.
11	The current treatment system does not provide adequate chlorine contact time to achieve 4-log inactivation of viruses (required by USEPA Groundwater Treatment Rule) prior to serving water to the systems first customer. This is a noted violation by the CCDOH.
12	The treatment system does not have any automated controls, alarms, or monitoring systems. Operators manually check the level of the water tank and can only operate well pumps in hand mode. There are no alarm systems to alert operators of low tank level, high tank level, or low well level. This is a noted violation by the CCDOH.

Water Storage Tank and System Pressures

Deficiency No.	Description
13	The water tank does not have any level sensor, level alarms, or monitoring systems. Operators have to go the water tank site every day and sometimes multiple times a day to check the tank level and plan well pump operation. This is a noted violation by the CCDOH.
14	The tank access hatches are located flush with surrounding grade and need to be raised a minimum of 24-inches. This is a noted violation by the CCDOH.
15	Approximately three (3) homes experience pressures of less than 35 PSI during normal system operation and one (1) house would experience a residual pressure less than 20 PSI during fire flow conditions. This is a noted violation by the CCDOH.

Water Distribution and Transmission

Deficiency No.	Description
16	There are various sections of water main have reached the end of their useful lives and needs to be replaced. This is a noted violation by the CCDOH.
17	There are various sections of antiquated redundant sections of water main that need any remaining water services transferred off of them and be decommissioned. This is a noted violation by the CCDOH.

Residential Water Meters

Deficiency No.	Description
18	Approximately 297 water meters are no longer accurate, have exceeded their useful lives, and are in need of replacement. This is a noted violation by the CCDOH.

4.0 Recommendations and Alternatives to Address Deficiencies

This section details various recommended improvements that can be implemented to address the above listed deficiencies. Figures detailing recommended improvement alternatives are included as Figure 3 – Map of Recommended Improvements, Figure 4 – Preliminary Softening Treatment Building Floor Plan, Figure 5 – Preliminary Treatment Building Floor Plan and Figure 6 – Preliminary Well Site Layout. Additional information and calculations for the recommended improvements are included as Appendix J - Hydraulic Modeling, Appendix K – Water Softening Calculations, and Appendix L - Proposed Chlorine Contact Time Calculation.

4.1 <u>Groundwater Source and Treatment Improvement Recommendations</u>

4.1.1 *Install a Municipal Water Softening Process to Address Deficiency No. 1*

A. Description of Recommendation: The Village would not be mandated to address this deficiency, however the Village could install water softening process to soften the Village's drinking water from the current hardness 281 mg/L as $CaCO_3$ to hardness of about 80 mg/L as $CaCO_3$. Based on the water quality data, the flow rate, and the cost of softening, we recommend that for an Ion Exchange water softening process to be used. This process essentially works by using sodium to coat a media in water softener pressure vessel. As hard water passes through the water softener, calcium and magnesium ions (which causes water hardness) trade places with the sodium ions on the media in the softener. The sodium content of the water will therefore increase, while the calcium, magnesium, and hardness of the water will decrease. The water softener would be periodically backwashed to recharge the media with sodium. It should be noted that a major drawback of the Ion Exchange process, outside of increased O&M costs, is the sodium levels in the water would increase from 48.5 mg/l to approximately 140 mg/l. The public must be notified in advance of implementing this process as it could affect individuals with high sodium dietary restrictions. Preliminary ion exchange water softening calculations are included in Appendix K.

The water softener equipment would consistent of two (2) pressures vessels mounted on a skid and house in a building. It is anticipated that should the Village decides to move forward with a softening process, the softening building would be combined with a water chlorination/treatment as described later in this report. The water softening pressure vessels would backwash into a concrete backwash tank which would be drained at a slower, controlled rate into the sanitary sewer system. A preliminary floor plan of treatment building that would include water softening equipment is shown in Figure 4.

Ion Exchange Water Softening System

B. Alternative to Recommendation: There is no current Maximum Contamination Limit (MCL) on water hardness and therefore the “do nothing” alternative is a valid alternative for the Village to consider. This improvement would not be mandated by the Department of Health and does greatly increase sodium levels of the water. However, if the Village decides to “do nothing” the extremely hard water would continue to impact the Village in various other ways. Residents without softeners would continue to complain of water taste issues, household appliances would continue to prematurely fail, and residents with sensitive skin would continue to be affected by hard water.

There are two (2) additional water softening alternatives to the ion exchange process that were considered; nanofiltration and lime soda water softening. Nanofiltration essentially uses a filtration system to removed dissolved hardness and contaminants. Lime soda softening consist of mixing the hard water with lime soda which precipitates out the calcium and magnesium. The precipitate is then settled out of the water to separate the hardness from the soft water. Although these processes, would provide a better quality of water as they wouldn't increase sodium levels and nanofiltration could also filter out many other containments, they would not be cost affordable. In addition to having a much greater capital cost to construct, they both have much higher operation and maintenance costs and would be more complicated to operate compared to the ion exchange process.

It should be noted that if the Village does decide to move forward with water softening, the initial mixing of hard and soft water may temporarily cause issues in the water distribution system. The Village will likely experience cloudy water issues for about a year. Initially, resident complaints and additional required water main flushing can be expected.

4.1.2 *Remove Existing Well Buildings, Replace Existing Pumps with Pitless Submersible Well Pumps, and Construct a Single New Water Treatment Building to Address Deficiencies No. 2, 3, 4, 5, 6, 7, 9, 10, and 12*

A. Description of Recommendation: Due to the poor condition of the existing treatment infrastructure, the age of the two well buildings, and the close proximity of the them to each other, it is recommended to build a singular new water treatment building to replace the two (2) existing well houses. This would be accomplished by constructing a new water treatment building offline capable of treating the combined flow of both production wells. When the new treatment building is near completion the first of the two (2) production well would be taken out of service, inspected with a camera, cleaned and redeveloped if necessary, and replaced with a submersible well pump and a pitless adapter. The treatment building housing the well would be demolished. After the first well is replaced and successfully started up, the same process would occur to the second. A new water meter and a well level sensor would be installed for each well.

   The water treatment building would be constructed with a control room and a chemical room. There would be a separate entrance to the chemical room which would store the liquid sodium hypochlorite for chlorine disinfection to protect the control room from corrosion. The chemical room would also be equipped with new chemical feed pumps and modernized spill containment. The control room would be enlarged to house water softening equipment, should the Village decided to soften their water. A new a Supervisory Control and Data Acquisition (SCADA) system would be installed with operator adjustable operation set points to monitor, track, and automatically control the water system. The SCADA system would be equipped with an automatic dialer and alarms to alert the Village of any operation issues. Emergency power provisions would be provided to ensure continuous operation of the treatment building and Well No. 1.

The new water treatment building and the well pitless adapters would be installed at elevations a minimum of 3-feet above the 100 year flood plain. This would ensure each well is protected from potential the influence of surface water. New site piping would be installed to connect the wells to the water treatment building and the water treatment building to the distribution system. Refer to Figures 4 and 5 for Preliminary Treatment Building Layouts (with and without water softening). Refer to Figure 6 for a Preliminary Well Site Layout.

B. Alternative to Recommendation: As stated in Section 3, several violations were given out by the CCDOH in regards to Well No. 1 and No. 2. Well House No. 2 requires to be completely replaced and several components of Well House No. 1 are in need of replacement. The "do nothing" alternative will put the Village at risk of various major critical failures that could result in Boil Water Notices, the lack of proper treatment, or the inability to provide safe and reliable drinking water to Village residents. Doing nothing is not an option.

An alternative to our above recommendation, could be to individually renovate and replace each treatment building. This alternative would cost more and be more expensive to operate and maintain in the future. Based on the proximity of the two (2) wells to one another, consolidating the system with one properly sized and designed treatment building upgraded with modernized equipment and controls is the best option for the Village.

4.1.3 *Decommission Monitoring Well to Address Deficiency No. 8*

A. Description of Recommendation: It is recommended for the Village to decommission the damaged monitoring well. This would be accomplished by first disinfecting the casing of the well to ensure groundwater is not contaminated during its decommissioning. The screened portion of the well should be filled in with select backfill no less permeable than the material surrounding that portion of the well. The casing should then be cut off at least 24-inches below grade and the remainder of the well should be filled in with bentonite and a cementitious material to prevent surface water infiltration. All procedures should be documented and the Bureau of Water Resource Management should be notified.

B. Alternative to Recommendation: The monitoring well is no longer needed and it is not sensible to repair or replace it. The "do nothing" will put the ground water aquifer at risk for contamination, which would severely impact the Village water system. This monitoring well must be properly abandoned in order to address CCDOH violation No. 2D of the 2019 water system inspection report.

4.1.4 *Install Properly Sized Chlorine Contact Piping to Address Deficiency No. 11*

A. Description of Recommendation: It is recommended for properly sized chlorine contact piping to be installed to ensure 4-log inactivation of viruses prior to the first water customer. The length of chlorine contact piping will be completely dependent on the size of the piping and the desired design flow rate. Based on the anticipated site layout and a design flow of 500 GPM, there must be a minimum of 4,000 gallons of storage in system piping prior to the systems first customer to achieve proper chlorine contact time and 7,500 gallons of storage for a contact time of at least 15 minutes. Based on the site layout contained in Figure 6, we recommend for 350 feet of 24-inch C900 PVC piping to be installed as chlorine contact piping. Preliminary chlorine contact time calculations are included in Appendix L.

B. Alternative to Recommendation: The lack of chlorine contact piping is a major health violation and therefore doing nothing is not an option as the Village must address CCDOH violation No. 7 of the 2019 water system inspection report. As alternative to achieving 4-log inactivation of viruses through the use of chlorine contact piping, it is feasible to install a small storage tank on the Village well site to achieve proper CT. However, this alternative would have a much higher capital and operation and maintenance cost and therefore it is not a cost effective alternative.

4.2 <u>Water Storage Tank and System Pressures Improvement Recommendations</u>

4.2.1 *Install Level Sensors in the Storage Tank to Address Deficiency No. 13*

A. Description of Recommendation: It is recommended for a water level sensor to be installed in each half of the storage tank. The level sensors would be wired into a new remote terminal unit (RTU) installed on electrical backboard and located at the tank site. The RTU would communicate with a new control panel located inside the well site treatment building. A new control panel and a Supervisory Control and

Data Acquisition (SCADA) system at the well site treatment building would monitor and control well pump operations based on operator adjustable set points water tank level set points. The SCADA system would be equipped to send out an alarm to automatically alert operators of high or low water tank levels. The water tank level could be remotely operated and monitored from the well site treatment building.

B. Alternative to Recommendation: The current method of operation is archaic and very labor intensive. The "do nothing" will continue to make the water system extremely difficult to monitor and control therefore should not be considered. The above recommendations are extremely typical to a water system the size of Sherman system and there are no other sensible alternatives that should be evaluated. The improvement recommendations are required to address CCDOH violation No. 2B of the 2019 water system inspection report.

4.2.2 *Raise the Storage Tank Access Hatches to Address Deficiency No. 14*

A. Description of Recommendation: It is recommended for a riser to be installed on top of the water storage tank and for new access hatches to be installed 24-inches above the top of the tank/surrounding grade.

B. Alternative to Recommendation: There is no other sensible alternative to raising the water tank storage hatches. The "do nothing" will continue to put the Village water storage tank at risk of surface water contamination. Raising the access hatches must be completed in order to address CCDOH violation No. 5 of the 2019 water system inspection report.

4.2.3 *Do Nothing to Address Deficiency No. 15*

A. Description of Recommendation: It recommended for the Village to do nothing to address this deficiency. The cost of addressing this issue would be extremely high for only benefiting three (3) residential homes. We respectfully request for the CCDOH to reevaluate this violation. The Village should not allow any other homes to connect to the water system where system pressures do not meet Department of Health standards.

B. Alternative to Recommendation: The only way to increase pressures in the distribution system near the tank site to address Deficiency No. 15 would be to raise the height of the water storage tank or to install a booster pump station. Considering only three (3) residential homes have system pressures below minimum standards, we believe the cost of addressing this deficiency would far outweigh the benefit. Appendix J contains a Hydraulic Model which displays water system pressures and fire flows for the entire water system.

4.3 Water Distribution and Transmission Improvement Recommendations

4.3.1 *Replace Various Sections of Water Main In-Kind to Address Deficiency No. 16*

A. Description of Recommendation: It is recommended that all water mains with age, corrosion, and dependability issues to be replaced in kind with new water main. This would include:

- Replacing 2,000 feet of 4-inch main along Kipp Street from Main Street to 157 Kipp Street with 8-inch PVC water main
- Replacing 950 feet of 4-inch and 6-inch main along Franklin and Osborne Street from the 12-inch water main to Morris Street with 12-inch PVC water main
- Replacing 600 feet of 4-inch main along Mill Street from Hart Street to Franklin Street with 8-inch PVC water main

Each new section of main would be equipped with new isolation valves and hydrants, spaced in accordance with current design standards. Existing water services would be transferred to the new mains with goose necks and couplings in close proximity to the existing mains.

B. Alternative to Recommendation: There is no other sensible alternative to the in-kind replacement of the above listed sections of water main. The “do nothing” will put the system at risk for critical water main failure and continue to impact water quality with brown water. These sections of water main must be replaced in order to address CCDOH violation No. 3B of the 2019 water system inspection report.

4.3.2 *Decommission Various Sections of Redundant Water Main to Address Deficiency No. 17*

A. Description of Recommendation: It is recommended for all antiquated, redundant, unnecessary water main in the Village system to be removed for service. This would require transferring all active water services off of the old water mains and onto the newer parallel water mains. The redundant piping would then be cut and capped at the connections with other water mains and abandoned in place. This would include:

- Decommissioning 2,500 feet of 8-inch water main along Main Street from the dead end in the west of the village to Franklin Street
- Decommissioning 2,300 feet of 8-inch water main along Miller Street from Main Street to the storage tank access road
- Decommissioning 500 feet of 8-inch water main along Church Street from Main Street to Park Street
- Decommissioning 450 feet of 6-inch water main along Franklin Street from Main Street to the connection near French Creek

B. Alternative to Recommendation: There is no other sensible alternative to removing the above listed sections of all antiquated, redundant, unnecessary water main from service. The “do nothing” will put the system at risk for critical water main failure and continue to impact water quality. These sections of water main must be removed from service in order to address CCDOH violation No. 3A of the 2019 water system inspection report.

4.4 Residential Water Meters Improvement Recommendations

4.4.1 *Replace Remaining 297 Water Meters to Address Deficiency No. 18*

A. Description of Recommendation: It is recommended for the Village to replace the remaining 297 antiquated residential water meters. The Village is already working toward this as money and manpower are available to put toward water meter replacement. The Village has already selected and standardized on Badger Recordall Beacon meters which will allow water operators to read meters remotely using cellular technology. When implemented this improvement will increase operator efficiency, allow operators to read water meters more often for leak detection purposes, identify water leaks faster and easier, increase water meter accuracy, and replace several assets that are reaching the end of their useful lives.

B. Alternative to Recommendation: There is no other sensible alternative to the in-kind replacement of the existing water meters. The “do nothing” will continue the Village along a path of inaccurate billings, discourage water conservation, and make it impossible for the Village to track water loss. Water meters must be replaced in order to address CCDOH violation No. 3C of the 2019 water system inspection report.

5.0 Summary of Recommended Capital Improvement Plan

Below is a summary of the recommended capital improvement plan (CIP) for the Village of Sherman Comprehensive Water Assessment Study. The Village is not required to address Deficiency No. 1 and therefore would have the option to remove water softening from the recommended capital improvement project. Additionally, a substantial cost savings would be realized if the Village installed the water meters internally. For purposes of cost estimating and determining potential user cost impacts, these two (2) items were separated from the base project and considered optional potential project adders.

To Address Deficiency No.	Improvement
1	Install a Municipal Water Softening process (Optional Project Adder)
2, 3, 4, 5, 6, 7, 9, 10, 12	Remove Existing Well Buildings, Replace Existing Pumps with Pitless Submersible Well Pumps, and Construct a Single New Water Treatment Building
8	Decommission Monitoring Well
11	Install properly sized Chlorine Contact Piping
13	Install Level Sensors in the Storage Tank
14	Raise the Storage Tank Access Hatches
15	Do Nothing
16	Replace Various Sections of Water Main In-Kind
17	Decommission Various Sections of Redundant Water Main
18	Replace Remaining 297 Water Meters (Optional Project Adder: Contract out the Replacement of Water Meters)

6.0 Estimated Probable Project Costs

The estimated total probable project cost for the recommended CIP is $2,401,000 (with having DPW Staff install the water meters and without water softening) and $3,206,000 (with water softening and contracting out meter installations) inflated to 2021 dollars. This cost estimate includes the cost of all materials, labor, engineering, legal, and administration, as well as a 15% construction cost contingency. The cost estimate represents the maximum amount to be expended by the Village of Sherman for the recommended CIP, and would therefore be the amount of a bond resolution. A preliminary itemized cost estimate is provided in Appendix M and summarized below.

Groundwater Source and Treatment Improvements	$706,000
Water Storage Improvements	$37,500
Water Distribution and Transmission Improvement	$757,000
Base Project Total Construction Cost:	**$1,501,000**
Water Meter Purchase	$75,000
Inflation/ General Conditions:	$135,000
Contingency:	$225,000
Engineering /Legal /Administrative:	$465,000
Total Base Project Cost:	**$2,401,000**
Project Adders: Water Softening, Meter Install by Contractor	*$554,250*
Additional Soft Costs	*$250,000*
Total Base Plus Adders Project Cost:	***$3,206,000***

7.0 Operation and Maintenance

7.1 Operation Cost Changes

It is anticipated that the addition of water softening to the treatment process will increase the Village's annual water system operation costs.

- Addition of Water Softening Process
  - Additional Electrical Costs (Est. at $500/year)
  - Additional Equipment Maintenance costs (Est. at $2,000/year)
  - Additional Cost for Salt (Est. at $3,500/year)
  - Additional Building Maintenance costs (Est. at $500/year)

The cost of operation of the Village Water system will increase by approximately $6,500 per year.

7.2 Maintenance Cost Changes

The Village of Sherman is now starting to collect funds on a yearly basis for the replacement of existing failing assets (water main, water meter etc.) and to perform emergency repairs. The amount collected varies on yearly basis, but the Village Water Department historically utilizes the entire budgeted amount and sometimes more. After implementing the proposed capital project and correcting the systems deficiencies, the Village will not need such a large yearly budget for maintenance and emergency repairs. It is estimated that this capital project will result in a maintenance cost savings of $50,000 per year ($127 per EDU); however, the Village would have to pay off the capital project debt.

7.3 Water Reserves and Short Lived Asset Replacement

It is important for the Village of Sherman to start building a water reserve fund savings account to be used for short lived asset replacement, unforeseen capital expenditures, and smaller future capital improvement projects. Currently, the Village has no water reserve funds. Based on the infrastructure in the water system, it is recommended for the Village to collect approximately $18,000 per year ($46 per EDU) without the addition of water softening and $23,000 per year ($58 per EDU) if water softening is added for water reserve savings. Refer to Appendix N for more details.

8.0 Financing

8.1 Grant Funding and Project Financing Opportunities

Currently, there are several opportunities for a municipal water project to receive grant or low interest loan funding. Some opportunities this project may qualify for are as follows:

- NYSEFC Drinking Water State Revolving Fund (DWSRF) Program: The NYSEFC DWSRF program provides grant and loan funding for qualifying municipal water projects. Grants and loans are awarded based on the communities financial status indicated by municipality's 2017 median household income (MHI) combined with the public health need for the specific project determined by a scoring system published in the DWSRF Intended Use Plan (IUP). In review of the Sherman's 2017 MHI of $38,750, the Village financially qualifies for Hardship financing which could mean the project could be awarded a 60% grant (up to $3,000,000) and a 30-year loan at a 0% interest rate as long the project scores high enough on the IUP (i.e., above the hardship funding line). Based on the project specific data, this project was preliminary scored by B&L at 235 points (refer to Appendix O), which is above the draft 2020 IUP hardship funding line. It is therefore believed that the project will receive at a minimum a hardship loan (0%, 30 year) through the DWSRF program. The project may also receive grant funding through this program, but the availability of grant money is limited.

- New York Water Infrastructure Improvement Act Grants (WIIA): The WIIA program distributes grants through NYSEFC for clean and drinking projects. Eligible drinking water rehabilitation or replacement projects could receive up to $3,000,000 of grant or 60% of the total project cost. Priority will be given to water projects that demonstrate a public health need and hardship communities. If the project does not receive a 60% grant directly from the NYSEFC DWSRF program, this project would likely receive a WIIA grant for 60% of the total project costs.

- Office of Homes and Community Renewal (HCR) Community Development Block Grant (CDBG) Public Infrastructure (PI) Grant: HCR's CDBG PI grant program provides up to $750,000 or $1,000,000 (with eligible co-funding) in grants for drinking water, clean water, and storm water projects. Grants are applied through the NYS Consolidated Funding Application (CFA) process and are awarded based on the public health need of the project and the financial need of the community. A critical requirement of this program is that the 51% or more of the project beneficiaries must be low to moderate income individuals. This project would benefit the entire Village of Sherman, which has a LMI% of 54.86% above the 51% requirement. Assuming that the Village does co-fund the project through NYSEFC or USDA, the Village would be a great candidate to receive up to $1,000,000 in grant funding through this program.

- USDA Rural Development (RD) Water and Environmental Program (WEP) Grants: The USDA WEP program provides grant funding and low interest loans to eligible drinking water, clean water, and storm water projects. The proposed project meets the eligibility criteria for the USDA RD WEP program and based on the 2010 MHI should qualify for a 38 year loan with a poverty category interest rate (currently 2.125%). The project may also qualify for grant funding through this program. Grants would be awarded based on the projected average annual cost of water service for a typical single-family home and similar system utility rates. Grants are only used to reduce the annual user cost of water to an affordable rate which is generally about 1.5% of the 2010 MHI. Based on the Village's 2010 MHI of $34,118, grant funding may be awarded to reduce the annual user cost of water to about $667 per year.

8.2 Plausible Funding Scenarios

Based on the funding opportunities described in Section 8.1, annual user cost impacts of the proposed water project was reviewed under four plausible funding scenarios. The Village should consult with a fiscal advisor regarding on these and other potential funding options prior to moving forward with the project. The following four (4) funding scenarios were analyzed:

- Scenario No. 1: EFC 0% Hardship, WIIA, and Max. CDBG – Under this scenario the Village would receive a 30 year 0% interest rate hardship loan through the NYSEFC DWSRF program. The Village would also receive a $1,000,000 CDBG PI grant and a 60% DWSRF or WIIA grant. This is believed to the best case funding scenario for this project.
- Scenario No. 2: EFC 0% Hardship, WIIA, and Modest CDBG - Under this scenario the Village would receive a 30 year 0% interest rate hardship loan through the NYSEFC DWSRF program. The Village would also receive a $500,000 CDBG PI grant and a 60% DWSRF or WIIA grant.
- Scenario No. 3: EFC 0% Hardship and WIIA - Under this scenario the Village would receive a 30 year 0% interest rate hardship loan through the NYSEFC DWSRF program and a 60% DWSRF or WIIA grant.

- Scenario No. 4: EFC 0% Hardship - Under this scenario the Village would only receive a 30 year 0% interest rate hardship loan through the NYSEFC DWSRF program and would not receive any grant funding.

8.3 Annual User Costs

The impact on annual user cost as a result of this project will largely be dependent on the projects final scope (i.e., water softening, contracted out meter installs), actual financing, and the amount of grant received by the Village of Sherman. Table 8-1 (detailed in Appendix P) estimates annual user cost impacts as result of the capital improvement project under the four different funding scenarios described above.

Table 8-1: Summary of Impacts on Annual User Cost

Financing	Project	Total Grant	Estimated Future Water Cost
Scenario No. 1: EFC 0% Hardship, WIIA, and Max. CDBG	Base	$1,840,600	$460
	Base and Adders	$2,323,600	$516
Scenario No. 2: EFC 0% Hardship, WIIA, and Modest CDBG	Base	$1,640,600	$477
	Base and Adders	$2,123,600	$533
Scenario No. 3: EFC 0% Hardship and WIIA	Base	$1,440,600	$494
	Base and Adders	$1,923,600	$550
Scenario No. 4: EFC 0% Hardship	Base	$0	$615
	Base and Adders	$0	$712

"The information contained herein IS NOT INTENDED TO BE AND DOES NOT INCLUDE advice or recommendations with respect to the issuance, structure, timing, terms or any other aspect of municipal securities, municipal derivatives, guaranteed investment contracts or investment strategies. Any opinions, advice, information or recommendations contained herein are understood by the recipients to be strictly *engineering* opinions, advice, information or recommendations. Barton & Loguidice is not a "municipal advisor" as defined by 15 U.S.C. 78o-4 or the related rules of the Securities and Exchange Commission. The parties to whom this information is being provided should determine independently whether they require the services of a municipal advisor."

9.0 Environmental Review

Ground disturbance resulting from the rehabilitation of the well sites and the installation of water main will likely impact environmental resources. Most impacts are expected to be temporary and largely confined to Village owner property or maintained/developed road right-of-ways. Further details regarding potential environmental impacts related to the proposed improvements are described below.

9.1 Wetlands and Surface Waters

The NYSDEC Environmental Resource Mapper (NYSDEC, 2019) and U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) (USFWS, 2019a) were reviewed to determine the presence of mapped wetlands within the project area. There is one (1) NYSDEC wetland mapped within 100 feet of the proposed project area including Wetlands SH-5 (mapped in the eastern portion of the Village). Two (2) NWI wetlands are mapped in the Village as well, one corresponds with NYSDEC-mapped wetlands and streams and the other is located in the northeast portion of the Village.

Field wetland delineations would be conducted during project design in order to locate and characterize all wetlands and streams within proposed disturbance areas. If wetland impacts cannot be avoided, permits from the NYSDEC and USACE would be necessary. It is anticipated that wetland impacts would be temporary in nature, as water main would be installed subsurface and it is likely that the well pump station rehabilitation will take place in the same location or adjacent to the current well sites.

9.2 Threatened and Endangered Species

A review of the USFWS Information for Planning and Conservation (IPaC) system indicated that the project area is within the range of three (3) federally listed species that may occur within the Village, including the northern long-eared bat (threatened) and two (2) clam species-clubshell (endangered) and rayed bean (endangered). The northern long-eared bat is also listed as threatened in New York State. Impacts to Northern long-eared bats can generally be avoided by conducting tree clearing during the bats' hibernation period (October 1st through March 31st). No Critical Habitat Areas were identified in the Village of Sherman.

A review of the NYS Environmental Resource Mapper and New York Nature Explorer databases indicated that two (2) state-listed species have been reported in the Village of Sherman: the Silverjaw minnow (Notropis buccatus) and Variegate Darter (Etheostoma variatum). Both of these species are listed as recently confirmed in the Village and were last reported in 2016. Potential impacts to all state- and federally-listed species will be further investigated during project design. If suitable habitat within the disturbance limits of the project, impacts will be avoided or minimized to the extent possible. It is anticipated that adverse impacts to these species can be avoided by prohibiting work in or near sensitive habitats and by implementing tree clearing timing restrictions.

9.3 Cultural and Historic Resources

An initial review of the NYS Historic Preservation Office (SHPO) Cultural Resource Information System (CRIS) indicated that portions of the Village of Sherman are within archaeologically sensitive areas. The project will be formally submitted to SHPO for review during the design phase. The SHPO may request that a Phase 1 Archaeological Survey be completed in order to further assess potential impacts to archaeological resources. Consultation with SHPO will continue throughout the project design phase to avoid and mitigate potential cultural resource impacts.

9.4 Environmental Permit Summary

Environmental permits that could potentially be necessary for the proposed project are summarized below. Applications for these permits would involve a single Joint Application for Permit package submitted to the USACE and NYSDEC.

- USACE Section 404 Clean Water Act Permit - temporary and/or permanent disturbances involving disturbance to wetlands or surface waters that qualify as Waters of the United States.
- NYSDEC Article 24 Freshwater Wetlands Permit - temporary and/or permanent disturbances to NSYDEC-regulated wetlands and/or their 100 foot buffer zones.
- NYSDEC Section 401 Water Quality Certification - temporary and/or permanent disturbances to wetlands or surface waters that qualify as Waters of the United States.

9.5 Smart Growth

The recommended CIP is consistent with Smart Growth principles and practices as it proposes to improve the design service life, reliability and integrity of existing infrastructure. A completed NYSEFC Smart Growth form is included in Appendix Q.

10.0 Recommendations for Project Implementation

It is recommended that this report be presented to the Village of Sherman residents, the NYS Department of Health, and potential funding agencies outlined herein. Additional steps and timeframe for project implementation generally include the following:

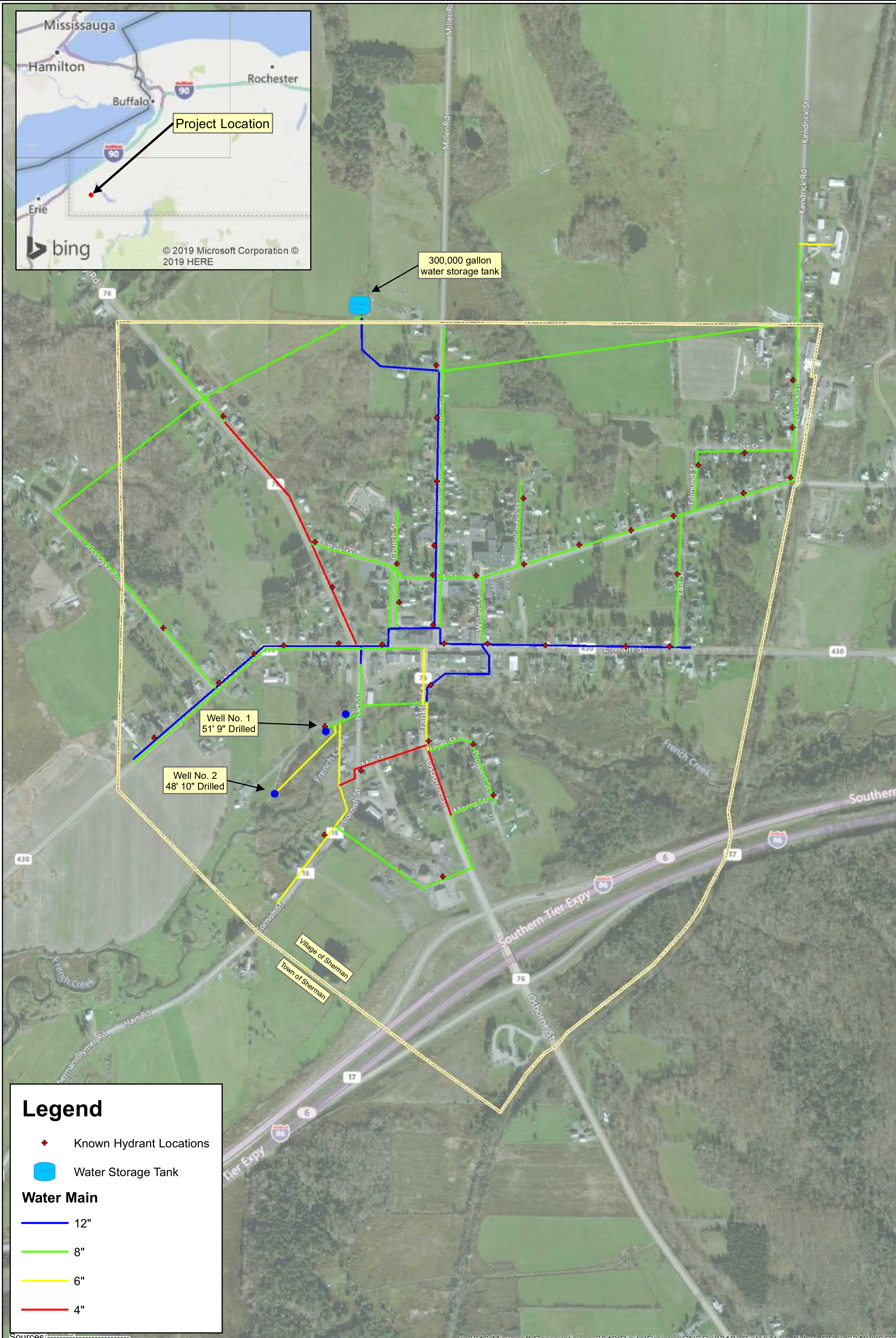
1.) Submit this Preliminary Engineering Report and completed IUP pre-application for inclusion into the NYSEFC Intended Use Plan (August 2019).
2.) Project scored and listed in the 2020 Final Intended Use Plan (October 2019).
3.) Complete an environmental review to satisfy SEQR/SERP requirements (October 2019).
4.) Complete bond resolution (December 2019).
5.) Submit DWSRF application (Early 2020).
6.) Submit CDBG PI Grant application (July 2020).
7.) Submit WIIA Grant application (September 2020).
8.) Secure CDBG/WIIA commitments (December 2020)
9.) Prepare design plans and specifications (TBD based on financing).
10.) Secure regulatory and funding agency approvals (TBD based on financing).
11.) Receive bids and award construction contracts (TBD based on financing).
12.) Construction of proposed facilities and infrastructure (TBD based on financing).

See Appendix R for EFC Engineering Report Certification Form.

Figures

Figure 1

Existing Water System Map



Barton & Loguidice

1 inch = 650 feet

Village of Sherman

Exisitng Water System

Chautauqua County | 8/26/2019 | New York

Figure 1

Project No. 2056.003

Figure 2

Existing Well Site Layout

VILLAGE OF SHERMAN
COMPREHENSIVE WATER ASSESSMENT STUDY

EXISTING WELL SITE LAYOUT

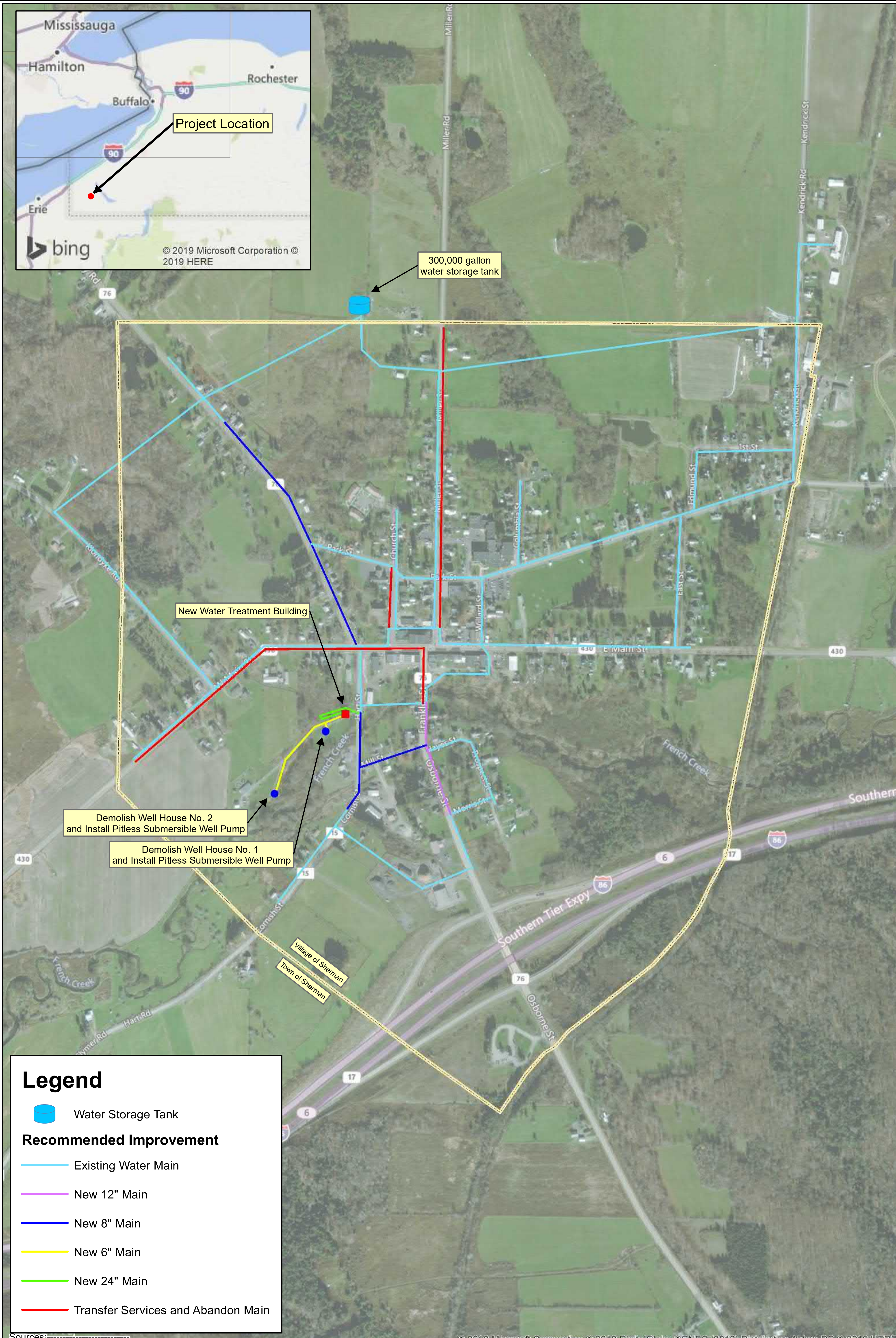
VILLAGE OF SHERMAN — CHAUTAUQUA COUNTY, NEW YORK

Barton & Loguidice

Date	AUG. 2019
Scale	1" = 75'
FIGURE	2
Project Number	2056.003.001

Figure 3

Recommended Improvements Map



Barton & Loguidice

1 inch = 650 feet

Village of Sherman

Recommended Improvements

Chautauqua County — New York

8/26/2019

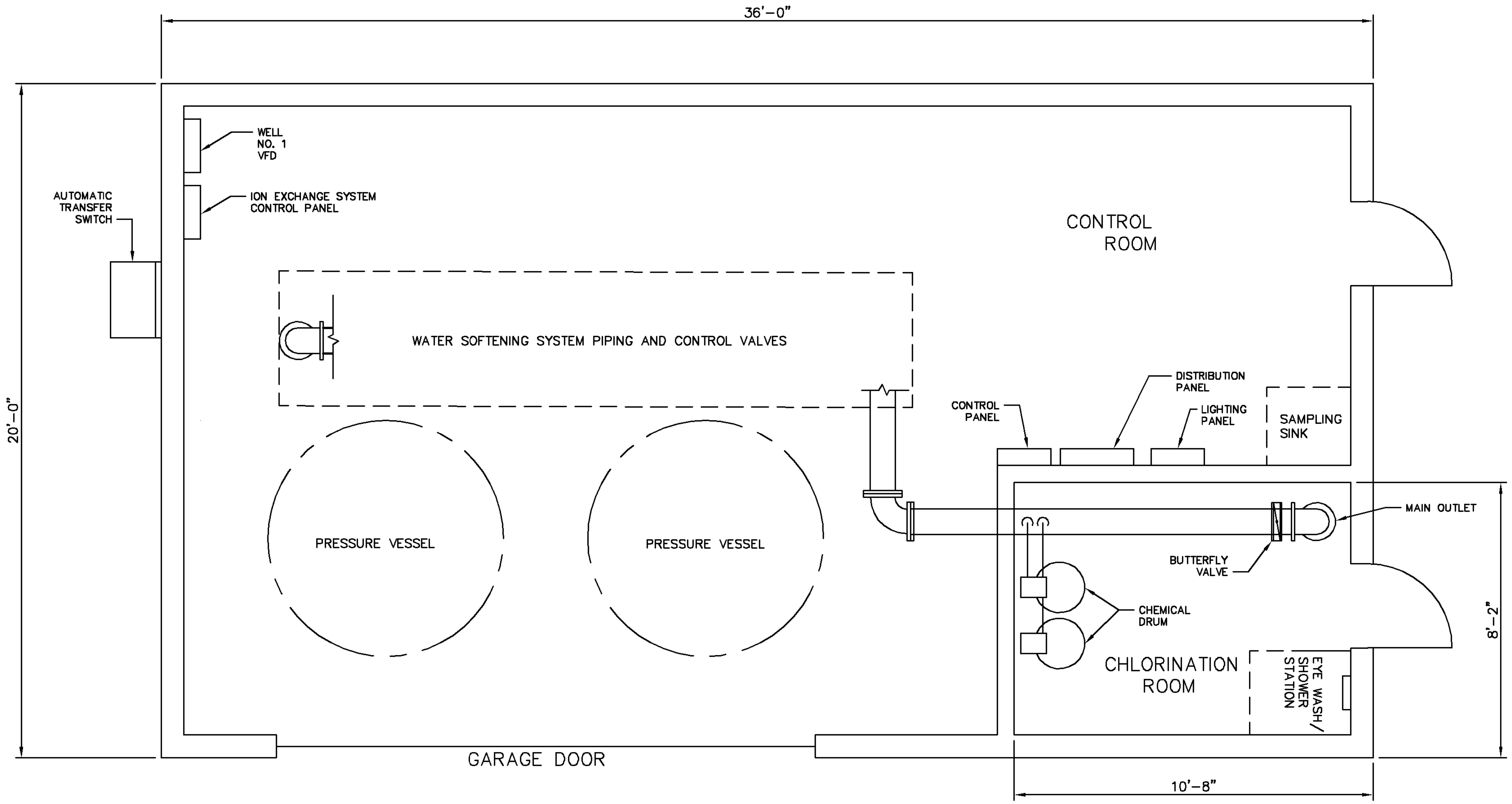
Figure 3

Project No. 2056.003

Path: K:\Projects\2000\2056003\Projects\Figure 3 - Recommended Improvements.mxd

Figure 4

Preliminary Softening Treatment Building Floor Plan



PLAN

SCALE: 1/4" = 1'-0"

VILLAGE OF SHERMAN
COMPREHENSIVE WATER ASSESSMENT STUDY

PRELIMINARY SOFTENING TREATMENT
BUILDING FLOOR PLAN

VILLAGE OF SHERMAN CHAUTAUQUA COUNTY, NEW YORK

Barton & Loguidice

Date AUG. 2019

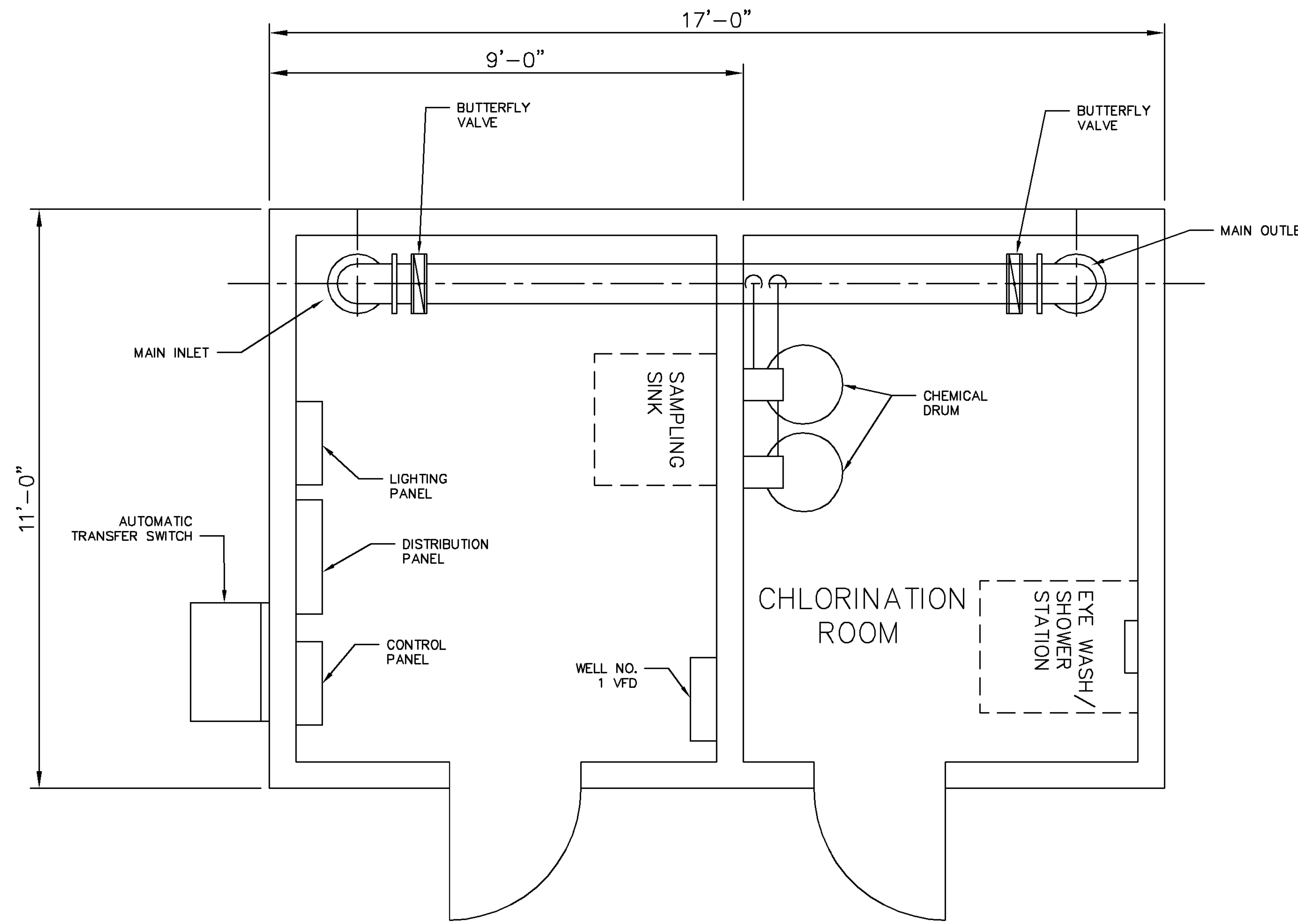
Scale 1/4" = 1'

FIGURE 4

Project Number 2056.003.001

Figure 5

Preliminary Treatment Building Floor Plan



PLAN

SCALE: 3/8" = 1'–0"

VILLAGE OF SHERMAN
COMPREHENSIVE WATER ASSESSMENT STUDY

PRELIMINARY TREATMENT BUILDING
FLOOR PLAN

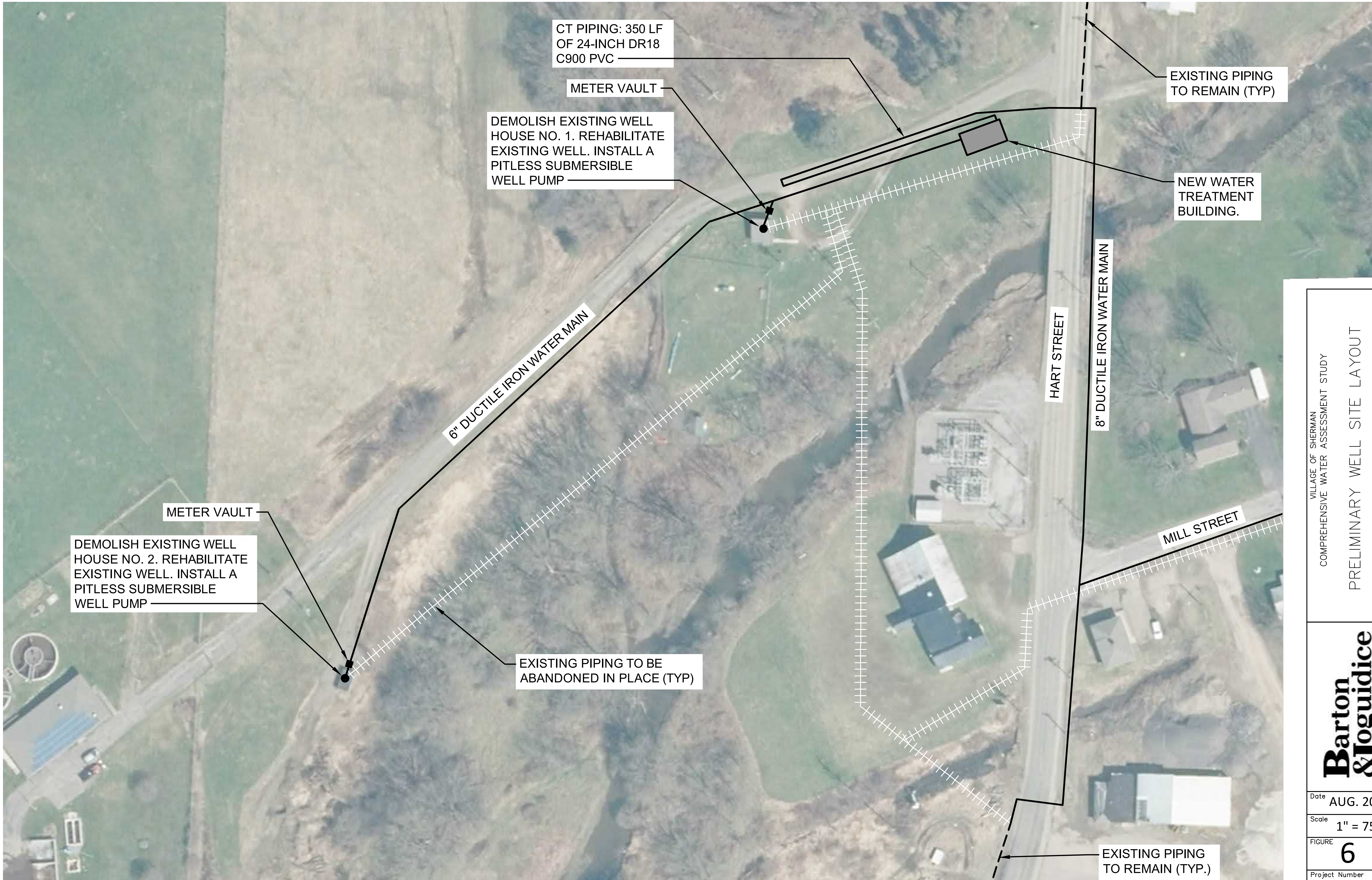
VILLAGE OF SHERMAN
CHAUTAUQUA COUNTY, NEW YORK

Barton & Loguidice

Date	AUG. 2019
Scale	3/8" = 1'
FIGURE	5
Project Number	2056.003.001

Figure 6

Preliminary Well Site Layout



VILLAGE OF SHERMAN
COMPREHENSIVE WATER ASSESSMENT STUDY

PRELIMINARY WELL SITE LAYOUT

VILLAGE OF SHERMAN — CHAUTAUQUA COUNTY, NEW YORK

Barton & Loguidice

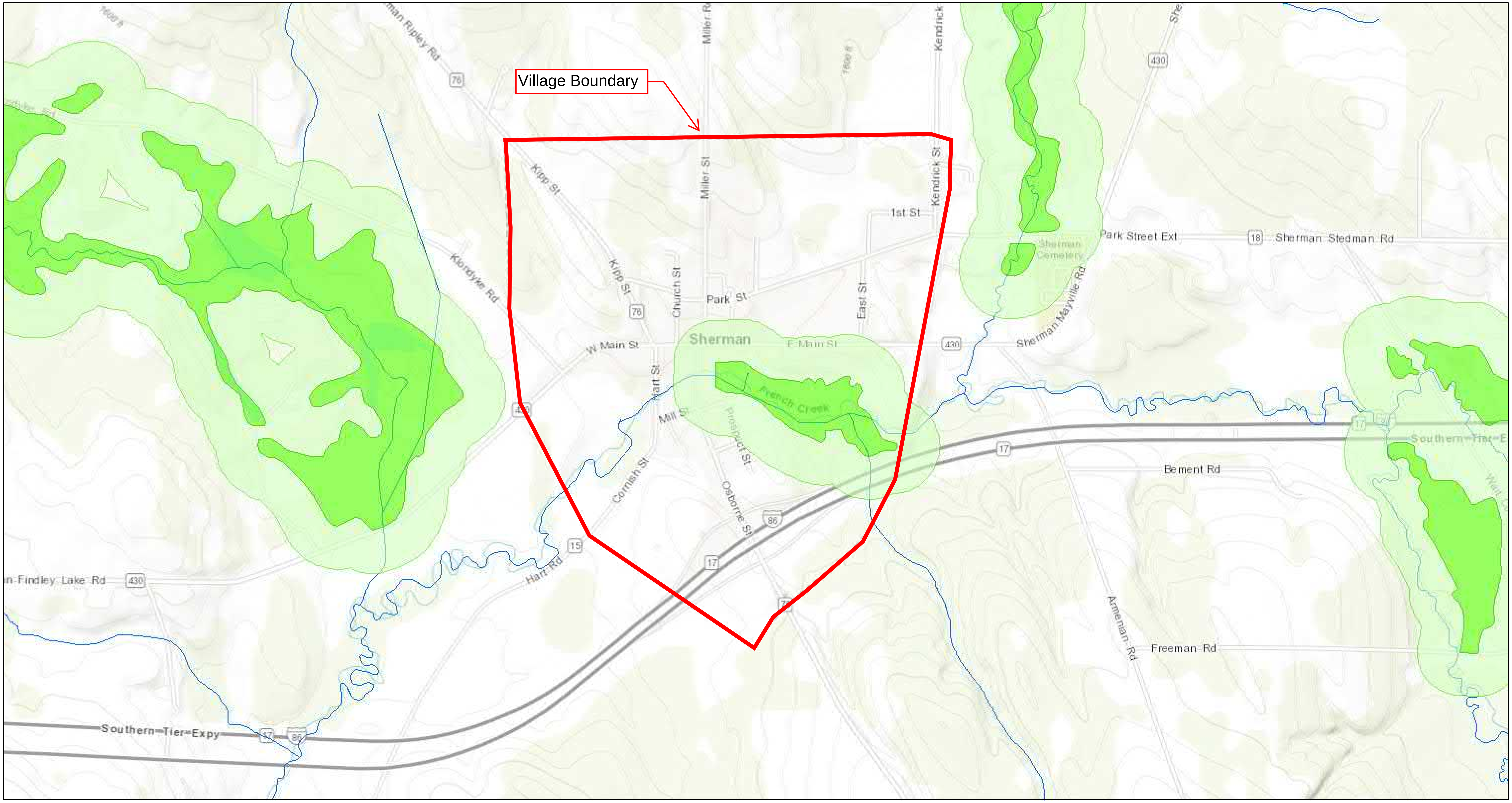
Date	AUG. 2019
Scale	1" = 75'
FIGURE	6
Project Number	2056.003.00

Appendices

Appendix A

Environmental Resource Mapper

Village of Sherman



- Unique Geological Features
- Waterbody Classifications for Rivers/Streams
- Waterbody Classifications for Lakes
- State Regulated Freshwater Wetlands
- State Regulated Wetland Checkzone

1:18,056

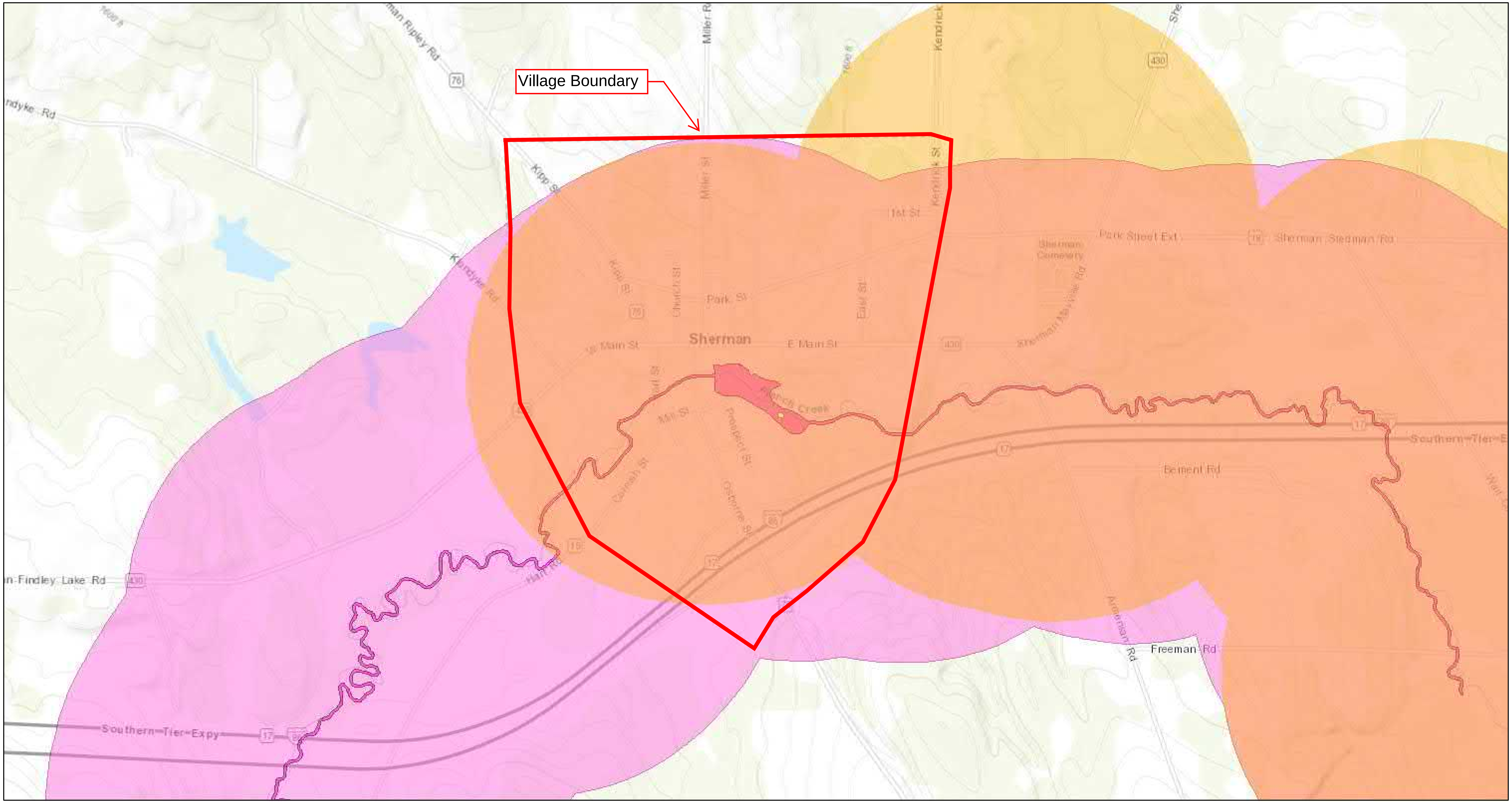
0 0.225 0.45 0.9 mi

0 0.35 0.7 1.4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

NYS Department of Environmental Conservation
Not a legal document

Village of Sherman



Significant Natural Communities

Natural Communities Near This Location

Rare Plants or Animals

1:18,056

0 0.225 0.45 0.9 mi

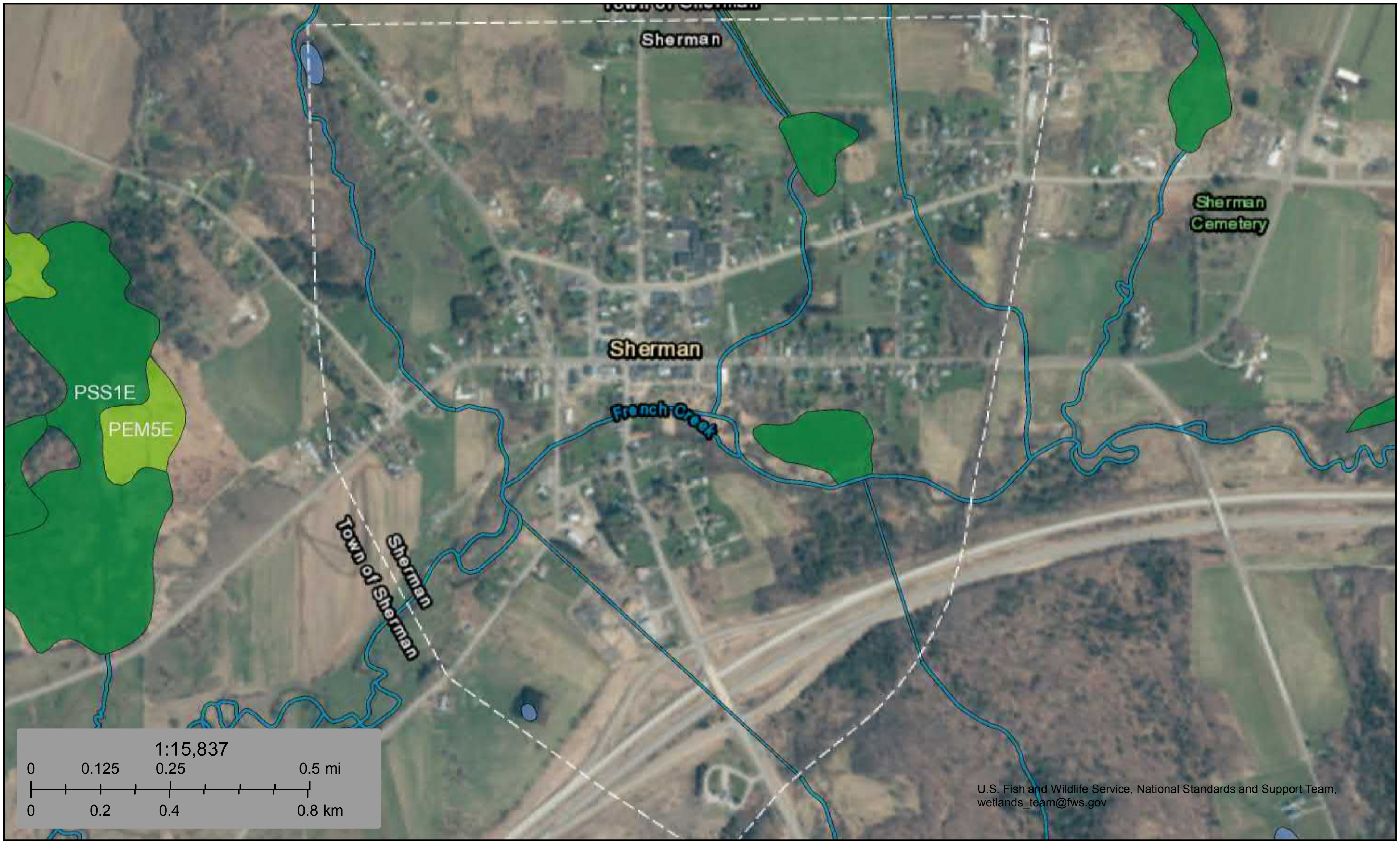
0 0.35 0.7 1.4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

NYS Department of Environmental Conservation
Not a legal document

U.S. Fish and Wildlife Service
National Wetlands Inventory

Village of Sherman



August 8, 2019

Wetlands

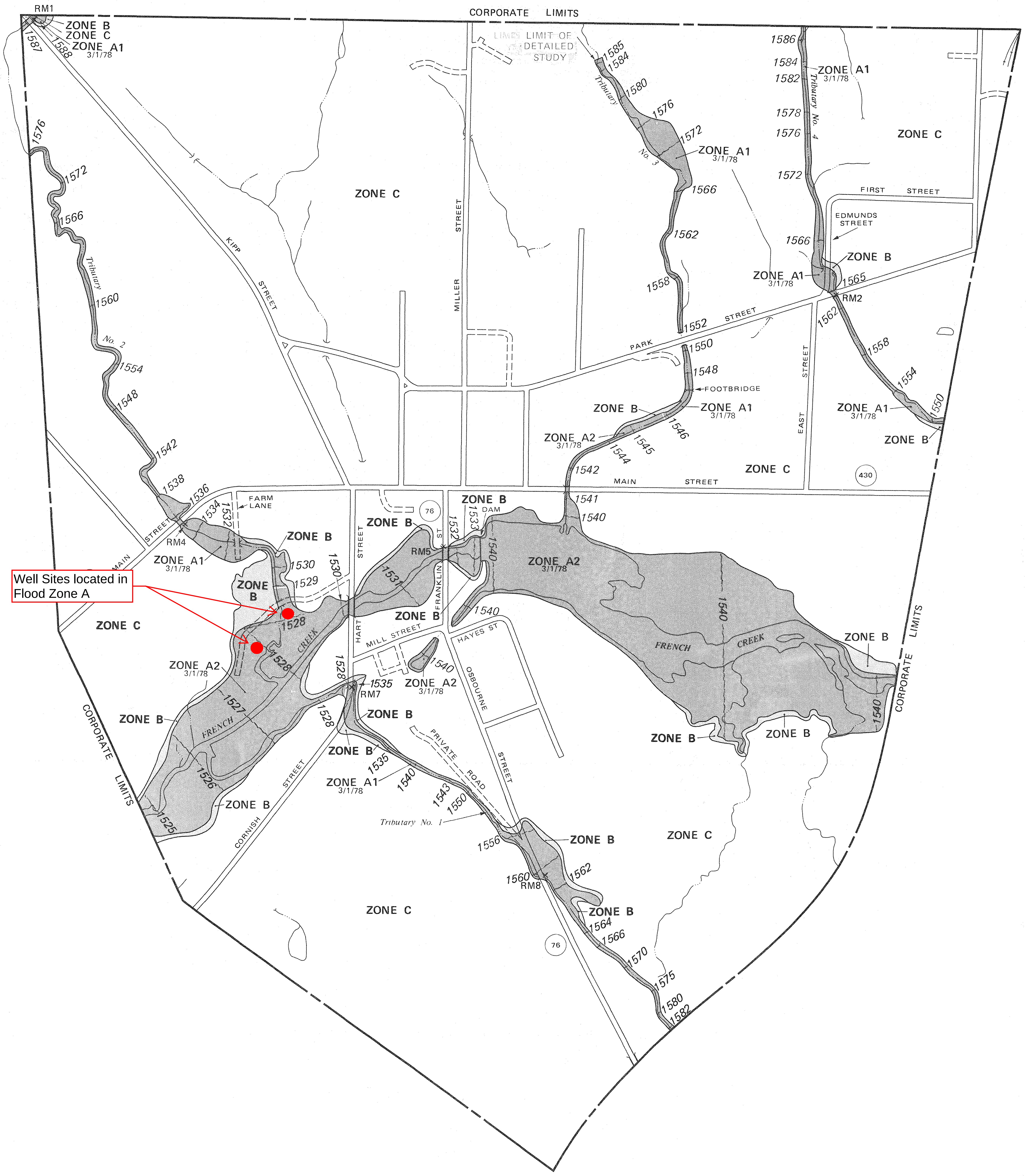
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Appendix B

FEMA Flood Zone Mapping



KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation in Feet	513
Base Flood Elevation Where Uniform Within Zone	(EL 987)**
Elevation Reference Mark	$RM7_x$
River Mile	• M1.5

**National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding with flood depth 1 to 3 feet; product of flood depth (feet) and velocity (feet per second) less than 15.
A1–A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by a flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Area between limits of 100-year flood and 500-year flood; areas of 100-year shallow flooding where depths less than 1 foot (Medium shading).
C	Areas outside 500-year flood. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V0	Areas of 100-year shallow flooding with velocity; flood depth 1 to 3 feet; product of depth (feet) and velocity (feet per second) more than 15.
V1–V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTE: Certain areas not in the Special Flood Hazard Areas (Zones A and V) may be protected by flood control structures.

This map is for insurance purposes only and may not show all planimetric information outside of Special Flood Hazard Areas.

INITIAL IDENTIFICATION
JANUARY 3, 1975

CONVERSION TO REGULAR PROGRAM
MARCH 1, 1978

Consult NFIA servicing company or local insurance agent or broker to determine if properties in this community are eligible for flood insurance.

APPROXIMATE SCALE
400 0 400 FEET

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 1	1,592.05	Square cut on corner of southeast culvert head wall on Kipp Street at village corporate limits.
RM 2	1,566.29	Square cut on west end of south abutment of culvert at intersection of Park and Edmunds Streets.
RM 3*	1,569.71	Square cut on northwest abutment of railroad bridge over State Route 430 (Main Street).
RM 4	1,538.01	Square cut on corner of southwest culvert abutment on south side of State Route 430 (Main Street) where it crosses Tributary No. 2.
RM 5	1,538.50	Standard USGS disk stamped 57 Y.Z. 1952 on corner of northwest wing wall of State Route 76 (Franklin Street) bridge over French Creek.
RM 6*	1,565.99	Square cut on northeast head wall of railroad bridge over French Creek.
RM 7	1,532.86	Square cut on corner of southeast culvert abutment where County Road No. 65 (Cornish Street) crosses Tributary No. 1.
RM 8	1,558.84	Square cut on corner of northeast culvert abutment where State Route 76 (Franklin Street) crosses Tributary No. 1.

[1]National Geodetic Vertical Datum of 1929.
*Outside corporate limits.

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

VILLAGE OF SHERMAN, NEW YORK

CHAUTAUQUA COUNTY

COMMUNITY-PANEL NUMBER
361502-0001A

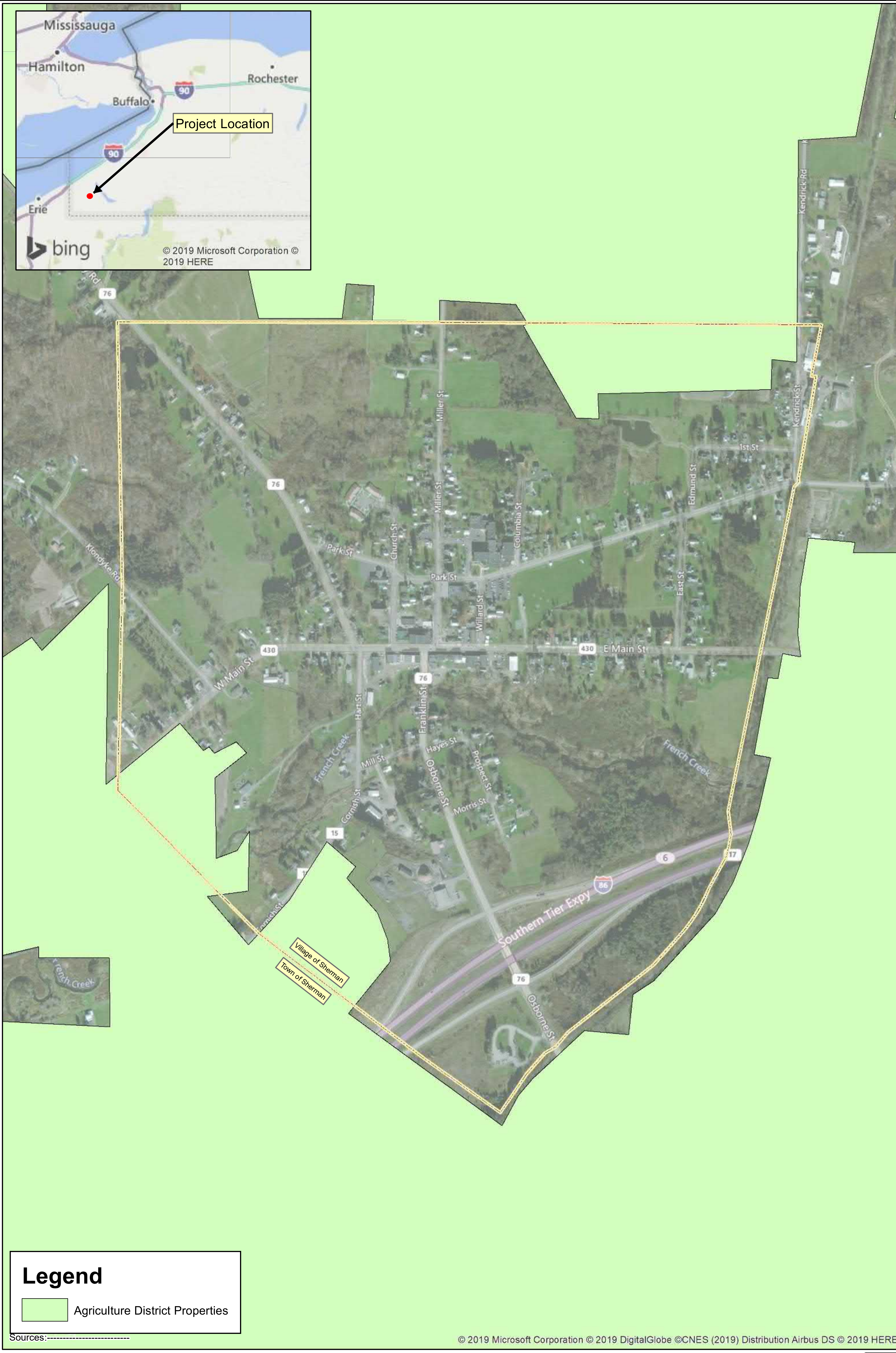
PAGE 1 OF 1

EFFECTIVE
MARCH 1, 1978

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

Appendix C

Agricultural District Map



Barton & Loguidice

N W E S

1 inch = 650 feet

Village of Sherman

Agriculture District Map

Chautauqua County | 8/26/2019 | New York

Appendix C

Project No. 2056.003

Appendix D

2019 CCDOH Sherman Public Water Supply Inspection Report

CHAUTAUQUA COUNTY
DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH – ENVIRONMENTAL HEALTH UNIT

GEORGE M. BORRELLO
County Executive

CHRISTINE SCHUYLER
Director of Health & Human Services
(Commissioner of Social Services/Public Health Director)

July 18, 2019

Mayor Colleen Meeder and Village Trustees
Village of Sherman
PO Box 629
Sherman, NY 14781

Re: Sanitary Survey and Public Water Supply Inspection

Dear Mayor Meeder and Village Trustees:

I conducted an inspection and sanitary survey of the Village's public water supply on June 18, 2019 with Doug Crane and CCDOH technician Casey Miller. The purpose of the inspection was to determine compliance with the provisions of Part 5 of the New York State Sanitary Code, which regulates all public water supplies in New York State. The inspection included evaluating the condition of the wells, treatment systems, storage tank, distribution system, pumps and controls, monitoring and reporting, management and operations and operator compliance.

The water system consists of two wells that are each pumped at 225 gallons per minute, chlorination treatment, a 300,000 gallon buried concrete water storage tank and distribution system. Well #1 was drilled in 1932 and well #2 was drilled in 1957. The well pumps are now manually controlled because the float system in the storage tank, which turned the well pumps on/off based on tank level, are inoperable. The well field is prone to flooding, especially well #2, which was designed so the pump motor is on a concrete pedestal so it is just above flood stage. However, well house #2 is inundated with water during floods, which has damaged the building; this is discussed later in this report.

Improvements and modifications to the system since my last inspection include the following:

- The Village updated its Cross Connection Control and Backflow Prevention Program regulations on February 8, 2016, which now must be phased in. The first phase consists of preparing a list of all commercial and municipal facilities and determining their degree of hazard. Once a list is prepared, CCDOH will assist in ranking the hazards. This needs to be completed in 2019.
- Improvements were in the process of being made to well house #2 including new steel siding and a new roof.
- New Badger Beacon meters were installed on 29 of the 326 services. These are able to provide real-time and historical water use data for each customer. They rely on cloud-based data storage and can be accessed by Village staff using smart phones and customers

can access their accounts to monitor their own water use. This new system will streamline meter reading and reduce water waste.

- The shed located on top of the storage tank that enclosed the tank hatches was destroyed by a windstorm. As discussed during the inspection, the shed does not need to be replaced, but risers must be installed on the tank hatches.

While the water system is operated and maintained in an adequate manner, there are some very serious problems that could result in water emergencies if they are not addressed. The following is a list of violations of Part 5 identified during my inspection:

1. **Subpart 5-1.30: Disinfection of a groundwater system is operating as designed.** At the time of the inspection, the chlorination system for well #1 was inoperable; the chlorination system for well #2 was working. Chlorine residuals are obtained by blending unchlorinated water from well #1 with chlorinated water from well #2. While adequate chlorine residuals were measured in the village, this practice is unacceptable and must be corrected. If well #2 were to break, and well #1 be the only operable well, the village would be placed on a Boil Water Order by CCDOH due to inadequate chlorine.
2. **Subpart 5-1.71(b): Exercise due care and diligence in the operation, maintenance and supervision of all sources** (5 violations):
    a. A valve must be installed for Well 1 near the tee where the transmission lines for Wells 1 & 2 meet. Without this valve, a potential critical point of failure exists if the water lines in the well house were to fail. Installation of this valve would allow repairs to be made to address Violation 1. Note that this has been an ongoing violation that was originally cited in my 2015 inspection report.
    b. The wells are currently being operated manually and storage tank water levels can only be checked by opening a hatch. The wells and tank require new controls so that the wells turn on/off based on tank level. In addition, the tank requires a low-level alarm that automatically alerts village staff when the tank is low. Consideration should also be given to installing water level transducers in the wells to report level data to a SCADA system.
    c. Well house 2 requires complete rehabilitation and should be replaced.
    d. The monitoring well near well #2 is damaged and must be properly abandoned and plugged to eliminate potential aquifer contamination during floods.
    e. Both well houses require complete rehabilitation of interior piping, valves and meters.
3. **Subpart 5-1.71(b): Exercise due care and diligence in the operation and maintenance of a distribution system** (4 violations):
    a. All old mains that parallel new mains must be shut down as soon as possible once the remaining services are connected to the new mains. This is also a potential critical point of failure that will jeopardize the water system if/when the old mains

fail. Note that this has been an ongoing violation since at least 2006. I understand the Village has been working on this over the years but it must be completed as soon as possible.

   b. Several areas in the distribution system experience roily water problems due to old deteriorated water mains. These mains are also in jeopardy of failing. This Department has taken a number of brown water complaints from your customers; where the problem is most serious, the Village has installed particle filters on customer services.
   c. There are approximately 300 meters that are very old and must be replaced. Residential meters should be calibrated or replaced every 15 years.
   d. There are a number of main-line valves that are very old, inoperable and near failure, some of which are leaking.

4. **Subpart 5-1 Appendix A, Section 8.2.1 inadequate pressure:** Distribution system must maintain a minimum working pressure of at least 35 psi (60-80 psi is recommended) and at no time less than 20 psi under all flow conditions (i.e. hydrants wide open). This Department has taken a number of low water pressure complaints from your customers.
5. **Subpart 5-1 Appendix A, Section 7.0.8.2: Inadequate Storage tank hatches:** Hatches must be elevated at least 24 inches above the top of the tank or covering sod, whichever is higher. The current Hatches are at ground level and will require risers to prevent contamination (see photo).
6. **Subpart 5-1 Appendix A, Section 8.2.1 Section 6.1.1 Pumping facilities located in a floodplain:** The elevation of the well house floor must be 3 ft above the highest known flood elevation. Well house 2 is subject to annual flooding – floodwaters not only surround the building but they also enter it. The well pump motor is built on a concrete pedestal that is approximately 3 ft above the well house floor and is just high enough to prevent floodwater from reaching the pump – see photos. A solution to prevent floodwaters from coming into immediate contact with the building must be devised.
7. **Subpart 5-1.30 Inadequate chlorine contact:** The time between when the water is chlorinated and the first customer in inadequate. To meet the USEPA Groundwater Rule CT (chlorine concentration and time) must achieve 4-log inactivation of viruses before the first water user. Note that this has been an ongoing violation that was originally cited in my 2011 inspection report.

Due to the number of violations and the fact that several pose a significant threat to the safety and reliability of the Village's water supply, I would like to develop a bilateral compliance schedule to address these violations.

Other issues to be addressed include:

- Eradicating the woodchucks living in the storage tank embankment.
- Interior inspection /cleaning of the east storage tank; the west storage tank was inspected and cleaned in 2006.

Please contact me at 753-4772 to schedule a meeting to develop the compliance schedule.

Sincerely,

William T. Boria

William T. Boria. P.G.
Sr. Water Resource Specialist

Cc: Doug Crane
April Kellerhouse / Hyland Hartsough, NYSDOH
Matthew Zarbo, P.E.

NEW YORK STATE DEPARTMENT OF HEALTH
Bureau of Water Supply Protection

Water System Field Compliance Report: A Review of Compliance with Subpart 5-1 of the New York State Sanitary Code

Public Water System Name: Village of Sherman	Street Address:
Town, Village, or City	County: Chautauqua

PWS ID Number: N Y 0 6 0 0 3 7 3

PWS Type: [X] C [ ] NC [ ] NTNC [ ] NP

Source Type: [ ] Surface [X] Ground [ ] GWUDI

Date of Service: 06 / 18 / 19

Begin Time: 09:30 End Time: 12:30

Disinfection Waiver Issued? [ ] Yes [X] No **4-Log Virus Treatment?** [ ] Yes [X] No

Field Visit Type [ ] Pre-operational [ ] Complaint [ ] Incident [ ] Illness [ ] Reinspection [X] Sanitary Survey [ ] Inspection

Public Health Hazard Types

Part 5 Subsection	Summary Description of Sanitary Code Requirement	SDWIS	Status
5-1.12(a)	Appropriate actions are taken in response to deteriorating source water quality or diminished effectiveness of treatment with potential for MCL violation.	SA	1
5-1.22(a)	Obtain health department approval prior to the construction or modification of a water system.	SB	1
5-1.23(a)	Obtain health department approval prior to use of an emergency water supply or alteration of a treatment process necessary to protect public health.	SD	1
5-1.27	Maintain minimum distribution system pressure of 20 psi at ground level.	SH	1
5-1.30	Bypass of any stage of treatment. blending wells for Cl_2	SJ	2
5-1.30	Disinfection of a groundwater source, surface water source or groundwater source influenced by surface water.	ND 41	1
5-1.30(b)	Filtration of surface source and groundwater influenced by surface water unless avoidance criteria is met.	42	4
5-1.30(b)(2)	Free chlorine residual disinfection concentration in the water entering the distribution system must be at least 0.2 mg/l and may not be less than the minimum concentration for compliance for more than four hours. Systems using other chemical disinfectants shall maintain residual disinfection levels entering the distribution system comparable to requirements for systems using chlorination.	41	1
5-1.30(g)	Maintain free chlorine residual at representative points in the distribution system.	NR	1
5-1.31	Protect the water distribution system from the creation of cross connections of sufficient hazard to adversely affect the health of water consumers.	SJ	1
5-1.71(a)	Exercise due care and diligence in the maintenance and supervision of all sources of the public water to prevent so far as possible, their pollution and depletion.	SN	2
5-1.71(b)	Exercise due care and diligence in the operation and maintenance of a water treatment plant and distribution system.	SO	2

Have all outstanding violations been resolved? [ ] Yes [X] No

Explain: (1) CT inadequate
(2) Cl_2 system not working as designed
(3) Δ system improvements still not complete.

Part 5 Requirements

Part 5 Subsection	Deficiency	Summary Description of Sanitary Code Requirement	SDWIS	Status
5-1.23(c)	M	Conspicuous posting of Sanitary Code Section 5-1.23, "Reporting Emergencies."	SF	1
5-1.29	S M	Finished (treated) water used for priming pumps.		4
5-1.30	S M	Redundant disinfection equipment provided.	ND	1
5-1.30 (e)	S	Complies with disinfection waiver provision.	ND	4
5-1.31(a)(3)	S M	Cross connection control program is implemented by supplier of water, including records of all device testing.	SJ	1
5-1.72(c)	S M	Complete daily records of operation of a water system.	09 10	1
5-1.72(d)	S M	Maintain records (e.g., sample results, reports, filter backwash recycle flow information).	09	1
5-1.72(b)	S	System is in compliance with Subpart 5-4. The correct number and level of operator(s) are available during plant operation. System has designated operators of appropriate grade level in responsible charge.	SQ SY 12	1
5-1.73	S M	Provide or have available test kit.		1
App.5-A 3.2.1	S M	Developed well sources sufficient to meet maximum day demand with the largest well out of service.		1
App.5-A 6.1	S	Pumps are accessible for maintenance and 3 feet above the 100 year flood plain. well 1+2 2		[illegible]
App.5-A.7.0.3	S M	Water tanks, hatches, roofing, and access ways are watertight, vermin proof, and secure. need risers		2
App.5-A.7.0.7	S M	Tank overflow terminates 12"-24" above grade with proper screen on outlet.		1
App.5-B.2(d)	S M	Finished grade of well is mounded to divert surface water.		2
App.5-B.5(g)	S	Vented, water tight, vermin proof sanitary seal well cap.	SO	4
App.5-D.3(b)	S M	Well casing in good condition and more than 18" above grade.		1

Chlorine Residual 0.81 mg/l Sample Collection Time 11:00
Point of Collection well house #2 tap
Chlorine Residual ______ mg/l Sample Collection Time ___ : ___
Point of Collection ______

Comments (4) tank risers needed
(5) Pump controls by manual only. } see forthcoming letter

Completed by [signature] Date 6 / 18 / 19

Received by [signature] Date 6 / 18 / 19

Status Codes: 1. No violation observed 2. All or parts of an item in violation 3. Item was not reviewed 4. Item not applicable 5. Item(s) corrected during inspection
Deficiency Codes: S: Significant Deficiency M: Minor Deficiency R: Recommendation

Village of Sherman water supply inspection 6/18/19

6/18/19 Well house #2

Well house #2 during a spring flood ~2000 – photo taken from the driveway. The monitoring well that requires proper abandonment and plugging is near the big tree.

Well house #1 taken on same day as above photo.

6/18/19 Inside well house #1.

6/18/19 Storage tank access hatches.

Appendix E

Photos of Existing Infrastructure

Well House No.1 Site

Well House No.1 Interior

Well House No.1 Interior

Well House No.1
Chlorine Injection Corp

Well House No. 2

Well House No. 2 Interior

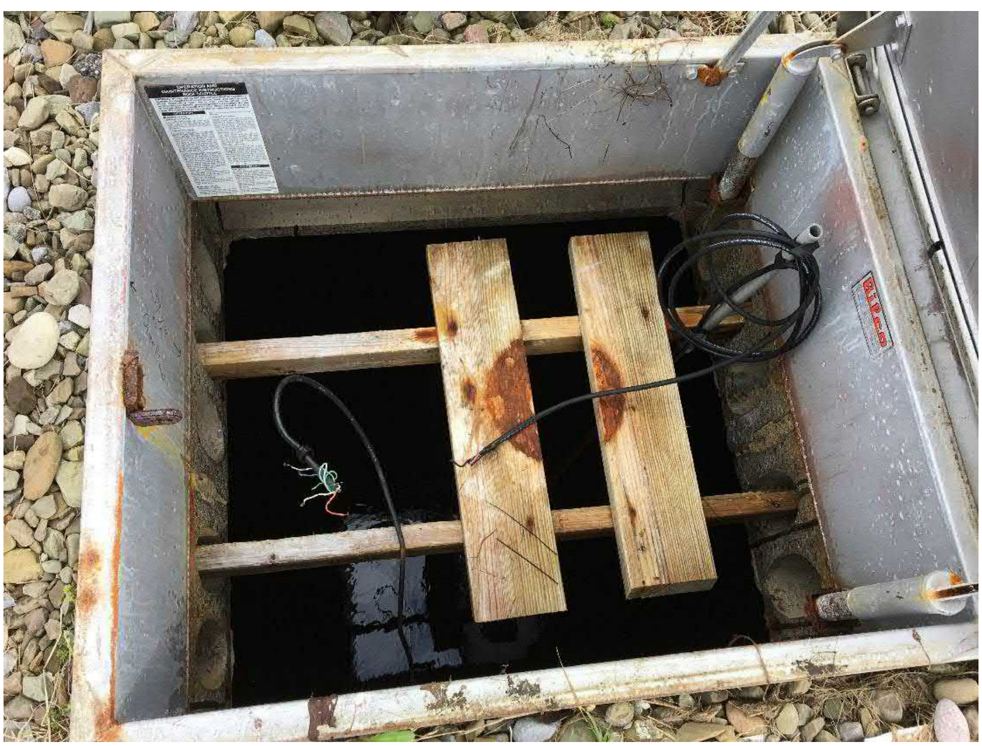
Well House No. 2 Interior

Well House No. 2 Interior

Storage Tank Site

Top of Storage Tank

Storage Tank Overflow



Interior of Storage Tank

Appendix F

Water Usage Data

2016 - 2018 Water Use Data

	2016			
	Average Daily Usage (GPD)	Max. Daily Usage (GPD)	Min. Daily Usage (GPD)	Total Amount Produced (gal.)
JAN	73,161	131,000	20,000	2,268,000
FEB	85,828	206,000	32,000	2,489,000
MAR	81,419	121,000	39,000	2,524,000
APR	DATA NOT AVAILABLE			
MAY	84,129	103,000	70,000	2,608,000
JUN	89,433	119,000	71,000	2,683,000
JUL	86,000	199,000	37,000	2,666,000
AUG	91,935	185,000	49,000	2,850,000
SEP	82,367	148,000	34,000	2,471,000
OCT	85,387	327,000	14,000	2,647,000
NOV	DATA NOT AVAILABLE			
DEC	91,065	111,000	74,000	2,823,000
YR AVG	**85,072**			**2,602,900**

	2017			
	Average Daily Usage (GPD)	Max. Daily Usage (GPD)	Min. Daily Usage (GPD)	Total Amount Produced (gal.)
JAN	114,097	207,000	38,000	3,537,000
FEB	149,821	285,000	71,000	4,195,000
MAR	90,613	176,000	21,000	2,809,000
APR	97,533	194,000	34,000	2,926,000
MAY	118,452	287,000	27,000	3,672,000
JUN	98,167	317,000	38,000	2,945,000
JUL	87,323	154,000	34,000	2,707,000
AUG	76,000	159,000	35,000	2,356,000
SEP	73,367	124,000	19,000	2,201,000
OCT	81,065	203,000	22,000	2,513,000
NOV	87,500	214,000	24,000	2,625,000
DEC	78,935	142,000	38,000	2,447,000
YR AVG	**96,073**			**2,911,083**

	2018			
	Average Daily Usage (GPD)	Max. Daily Usage (GPD)	Min. Daily Usage (GPD)	Total Amount Produced (gal.)
JAN	73,581	161,000	43,000	2,281,000
FEB	74,750	162,000	41,000	2,093,000
MAR	64,677	192,000	20,000	2,005,000
APR	79,867	184,000	12,000	2,396,000
MAY	93,516	61,000	30,000	2,899,000
JUN	81,800	256,000	36,000	2,454,000
JUL	79,806	140,000	34,000	2,474,000
AUG	70,774	308,000	28,000	2,194,000
SEP	67,667	120,000	28,000	2,030,000
OCT	66,581	162,000	36,000	2,064,000
NOV	64,000	115,000	33,000	1,920,000
DEC	67,226	188,000	30,000	2,084,000
YR AVG	**73,687**			**2,241,167**

Top 15 Water Usage Days

Date	Water Usage (gal.)
10/4/2016	327,000
6/2/2017	317,000
5/10/2017	313,000
8/16/2018	308,000
5/9/2017	287,000
2/3/2017	285,000
2/8/2017	279,000
6/13/2018	256,000
4/16/2018	222,000
11/15/2017	214,000
6/12/2017	208,000
1/9/2017	207,000
6/12/2018	206,000
2/6/2016	206,000
5/19/2017	205,000

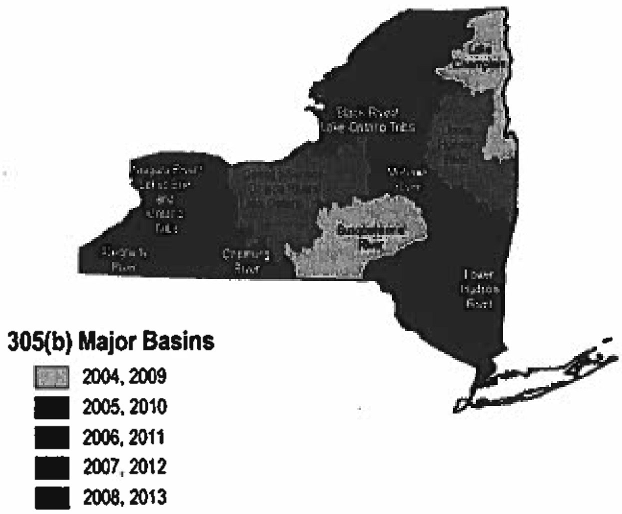
Summary	
Average Daily Demand	84,936
Max. Month Demand (Feb. 2017)	4.195 MG
Max. Day Demand (Oct. 4, 2016)	327,000 GPD
99% Max. Day Demand	225,000 GPD
Est. Max Day Peak Hour Demand	313 GPM

Appendix G

Water Quality Data

USGS
science for a changing world

305(b) Ground-Water Quality



About the project

The primary objective of the 305(b) ground water program is to assess and report on the ambient ground-water quality of bedrock and glacial-drift aquifers throughout New York State. As an ongoing cooperative project between the USGS and NYSDEC Division of Water, this study supports NYSDEC's responsibility to assess and report on the quality of New York's ground water as part of the requirements of section 305(b) of the Clean Water Act Amendments of 1977.

Two to three of the 14 major hydrologic basins around the state are evaluated each year; in 2011 samples will be collected in the Mohawk River Basin and Western New York (Niagara and Allegheny River Basins, Lake Erie, and Western Lake Ontario Basins). Water samples are collected from domestic wells and public supply wells using standard USGS protocols (click here for an overview of how samples are collected). Samples are analyzed for a wide range of constituents, including physical parameters (such as pH and temperature), nutrients, major ions, trace elements including mercury and arsenic, Coliform bacteria, radon, total organic carbon, volatile organic compounds, and pesticides.

Well Selection Information for Homeowners and Public Water Supply Managers

2011 Analytes

Sampling Information

Data and Reports from Previous Basin Studies

Basin	Year	Data Link	Report
Delaware River Basin	2010	DATA - NWISweb	
Genesee River Basin	2010	DATA - NWISweb	
St Lawrence River Basin	2010	DATA - NWISweb	
Lake Champlain Basin	2009	DATA - NWISweb	(Open-File Report 2011-1180)
Susquehanna River Basin	2009	DATA - NWISweb	
Chemung River Basin	2008	DATA - NWISweb	(Open-File Report 2011-1112)
Eastern Lake Ontario River Basin	2008	DATA - NWISweb	(Open-File Report 2011-1074)
Lower Hudson River Basin	2008	DATA - NWISweb	(Open-File Report 2010-1197)
Oswego, Seneca, and Oneida River Basins	2007	DATA - NWISweb	(Open-File Report 2009-1257)
Upper Hudson River Basin	2007	DATA - NWISweb	(Open-File Report 2009-1240)

Mohawk River Basin	2006	DATA - NWISweb	(Open-File Report 2008-1086)
Niagara River, Lake Erie, Allegheny, and Western Lake Ontario Basins	2006	DATA - NWISweb	(Open-File Report 2008-1140)
Delaware River Basin	2005-06	DATA - NWISweb	(Open-File Report 2007-1098)
Genesee River Basin	2005-06	DATA - NWISweb	(Open-File Report 2007-1093)
St Lawrence River Basin	2005-06	DATA - NWISweb	(Open-File Report 2007-1066)
Lake Champlain Basin	2004	DATA - NWISweb	(Open-File Report 2006-1088)
Susquehanna River Basin	2004-05	DATA - NWISweb	(Open-File Report 2006-1161)
Chemung River Basin	2003	DATA - NWISweb	(Open-File Report 2004-1329)
Mohawk River Basin	2002	DATA - NWISweb	(Water-Data Report NY-02-1, pages 502-520)

Personnel

Liz Nystrom and Tia-Marie Stevens (USGS Troy)
Rich Reynolds and Paul Heisig (USGS Troy)
Jim Reddy (USGS Ithaca)
Dan Kendall (NYSDEC Division of Water)

Links

Ambient Groundwater Quality Monitoring Program, New York State Department of Environmental Conservation

USGS
science for a changing world

305(b) Ground-Water Quality - Well Selection Information for Homeowners and PWS personnel

Homeowner/PWS FAQ's

Why is my well a candidate?

Homeowners - If you received a letter from the USGS about sampling your well, it is a candidate because a well completion report was filed with the New York State Department of Environemntal Construction when your well was constructed. The well completion report contains basic information about the well, for example, how deep it is, and what kind of rock it is drilled into. *This information helps us understand the results of the water quality tests.*

Public Water Supplies - All public supplies that use ground water in the study area are candidates for sampling.

What is the USGS sampling for?

Because we want a general overview of the ground-water quality, we sample for a wide range of properties and compounds, including *pH, bacteria, nutrients, metals, ions, radon, volatile organic compounds, and pesticides*. Altogether, we sample for more than 100 different compounds.

What information does the USGS need in order to sample my well?

We need to know basic information about the well, such as how deep it is and if it has a screen or not.

Homeowners - we need to know if your well is the same well we have a completion report for; this is why we ask when it was drilled and who it was drilled by, etc.

Public Water Supplies - sometimes we have information from a USGS database and need to try to match this to the wells currently in use. Sometimes we have no information at all and need basic information such as how many wells the WD has and corresponding construction data (depth, diameter, screen placement, etc.) for the wells we are likely to sample. Construction logs are very helpful if they exist. If your town or village is close to the borders of our study area, we need to know the general location of the wells to make sure they are in the study area.

We need to know if we can sample untreated water, preferably as close to the well as possible.

Homeowners - a drain valve (usually a garden-hose type spigot) is almost always installed very close to the pressure tank; this is usually where we sample.

Public Water Supplies - we usually sample at the same location you would use to collect raw samples.

We need to know if there is somewhere to drain excess water. If there isn't a drain, we have to haul buckets of water around. We can drain to a sink, sump, or to the ground outside if there a door or window near the spigot (for example a bilco door out of the basement).

What information will I get?

You will get a copy of all the data for your well. Some of the data comes back right away (bacteriological), some takes a while (sometimes as much as 6 months). When all the data comes in, we'll compile a data table for you. Generally, as the data comes back from the lab, if we notice anything unusual we'll give you a call to let you know.

Will it cost me anything?

All analytical costs are paid for by USGS and NYSDEC. All we need from you is access to the water.

How does the USGS decide which wells to sample?

We choose wells for sampling based on the availability of construction information about the well, and to achieve a good geographical distribution within the study area. We sample approximately half homeowner wells and half public supply wells, and try to sample about half wells finished in sand and gravel and half wells finished in bedrock. We don't target specific municipalities, industries, or agricultural practices when selecting sampling sites. Sampling does focus on locations of greatest ground water use.

What will the USGS do with the data?

The USGS will publish a data report of the results (for example Open-File Report 2004-1329). Your name will not be included in the report (the wells are identified by the sequential number on the well completion report).

How long will it take to collect the sample?

USGS personnel will collect the sample. Sampling usually takes ***1 to 2 hours***. Part of the reason it takes so long is that we need to remove the water that is already in the well. This is because we want to sample ambient groundwater, not water that has been sitting in the well casing.

How do you collect the sample?

The sample is collected using standard USGS protocols. Click here for a general overview of how samples are collected.

When do you collect the sample?

Sampling typically starts for the year in August. We usually sample Monday through Thursday, from morning through early afternoon. Some of the samples we collect are time sensitive, and the receiving hours of the laboratories limit when we can sample.

I have more questions. Who do I contact?

Contact Liz Nystrom (USGS Troy) or Jim Reddy (USGS Ithaca) if you have more questions.

Online ground-water quality resources

General

- USGS Ground Water and the Rural Homeowner
- USEPA Ground Water and Drinking Water
- USEPA Private Drinking Water Wells
- American Ground Water Trust
- Water Systems Council
- National Ground Water Association Wellowner.org

Drinking water standards

- USEPA Current Drinking Water Standards
- NYSDOH Current Drinking Water Standards

Radon

- USEPA Radon in Drinking Water
- USEPA Citizen's Guide to Radon

305(b)

- NYSDEC Full 2004 305b report

U.S. Department of the Interior, U.S. Geological Survey
Maintainer: New York District
URL: http://ny.water.usgs.gov/projects/305b/homeowner_info.htm
Last update: 10:10:39 Wednesday 20 April 2011

305(b) Ground-water Quality Sampling - Analytes 2011

Compound	*CAS No*	*Detection limit*	*Units*
Physical Properties			
pH			standard units
Dissolved oxygen			mg/L, percent saturation
Specific conductance			uS/cm
Color		1	Pt-Co unit
Temperature			degrees Celsius
Major Ions			
Acid Neutralizing Capacity (ANC), laboratory	471-34-1	4	mg/L
Alkalinity, laboratory	471-34-1	4	mg/L
Boron	7440-42-8	1	ug/L
Calcium	7440-70-2	0.022	mg/L
Chloride	16887-00-6	0.06	mg/L
Fluoride	16984-48-8	0.04	mg/L
Iron	7439-89-6	4.6	ug/L
Magnesium	7439-95-4	0.008	mg/L
Manganese	7439-96-5	0.16	ug/L
Potassium	2023695	0.022	mg/L
Residue, 180 degrees Celsius (TDS)		12	mg/L
Silica	7631-86-9	0.029	mg/L
Sodium	7440-23-5	0.06	mg/L
Sulfate	14808-79-8	0.09	mg/L
Nutrients			
Nitrogen, ammonia as N	7664-41-7	0.01	mg/L
nitrogen, ammonia + organic nitrogen	17778-88-0	0.05	mg/L
nitrogen, nitrite	14797-65-0	0.001	mg/L
nitrogen, nitrite + nitrate		0.02	mg/L
Organic carbon		0.3	mg/L
phosphorus, phosphate, ortho	14265-44-2	0.004	mg/L
Trace Elements			
Aluminum	7429-90-5	2.8	ug/L
Antimony	7440-36-0	0.18	ug/L
Arsenic	7440-38-2	0.09	ug/L
Barium	7440-39-3	0.3	ug/L
Beryllium	7440-41-7	0.02	ug/L
Cadmium	7440-43-9	0.05	ug/L
Chromium	7440-47-3	0.21	ug/L
Cobalt	7440-48-4	0.02	ug/L
Copper	7440-50-8	0.7	ug/L
Lead	7439-92-1	0.036	ug/L
Lithium	7439-93-2	0.15	ug/L
Manganese	7439-96-5	0.4	ug/L
Mercury	7439-97-6	0.005	ug/L
Molybdenum	7439-98-7	0.05	ug/L

Nickel	7440-02-0	0.12	ug/L
Selenium	7782-49-2	0.05	ug/L
Silver	7440-22-4	0.015	ug/L
Strontium	7440-24-6	0.8	ug/L
Thallium	7440-28-0	0.06	ug/L
Uranium, natural	7440-61-1	0.014	ug/L
Zinc	7440-66-6	2.4	ug/L

Dissolved Gases

O_2			mg/L
CH_4			mg/L
CO_2			mg/L
N_2O			mg/L
N_2			mg/L
Ar			mg/L

Radionuclides

Radon-222	14859-67-7	20	pCi/L
Gross-alpha radioactivity	12587-46-1	3	pCi/L
Gross-beta radioactivity	12587-47-2	4	pCi/L

Bacteria

Total Coliform		1	Colonies per 100 mL
Fecal Coliform		1	Colonies per 100 mL
E coli (if other coliform bacteria present)			Positive/negative
Heterotrophic plate count		1	Colonies per mL

Volatile Organic Compounds

1,1,1-Trichloroethane	71-55-6	0.1	ug/L
1,1,2-Trichlorotrifluoroethane	76-13-1	0.1	ug/L
1,1-Dichloroethane	75-34-3	0.1	ug/L
1,1-Dichloroethylene	75-35-4	0.1	ug/L
1,2-Dichlorobenzene	95-50-1	0.1	ug/L
1,2-Dichloroethane	107-06-2	0.2	ug/L
1,2-Dichloropropane	78-87-5	0.1	ug/L
1,3-Dichlorobenzene	541-73-1	0.1	ug/L
1,4-Dichlorobenzene	106-46-7	0.1	ug/L
Benzene	71-43-2	0.1	ug/L
Bromodichloromethane	75-27-4	0.1	ug/L
Bromoform	75-25-2	0.2	ug/L
Chlorobenzene	108-90-7	0.1	ug/L
Chloroform	67-66-3	0.1	ug/L
cis-1,2-Dichloroethylene	156-59-2	0.1	ug/L
Dibromochloromethane	124-48-1	0.2	ug/L
Dichlorodifluoromethane	75-71-8	0.2	ug/L
Dichloromethane	75-09-2	0.2	ug/L
Diethyl ether	60-29-7	0.2	ug/L
Diisopropyl ether	108-20-3	0.2	ug/L
Ethyl tert-butyl ether	637-92-3	0.1	ug/L
Ethylbenzene	100-41-4	0.1	ug/L
m- and p-Xylene	179601-23-1	0.2	ug/L

o-Xylene	95-47-6	0.1	ug/L
Styrene	100-42-5	0.1	ug/L
tert-Butyl methyl ether	1634-04-4	0.2	ug/L
tert-Pentyl methyl ether	994-05-8	0.2	ug/L
Tetrachloroethylene	127-18-4	0.1	ug/L
Tetrachloromethane	56-23-5	0.2	ug/L
Toluene	108-88-3	0.1	ug/L
trans-1,2-Dichloroethylene	156-60-5	0.1	ug/L
Trichloroethylene	79-01-6	0.1	ug/L
Trichlorofluoromethane	75-69-4	0.2	ug/L
Vinyl chloride	75-01-4	0.2	ug/L

Pesticides and Pesticide Degradates

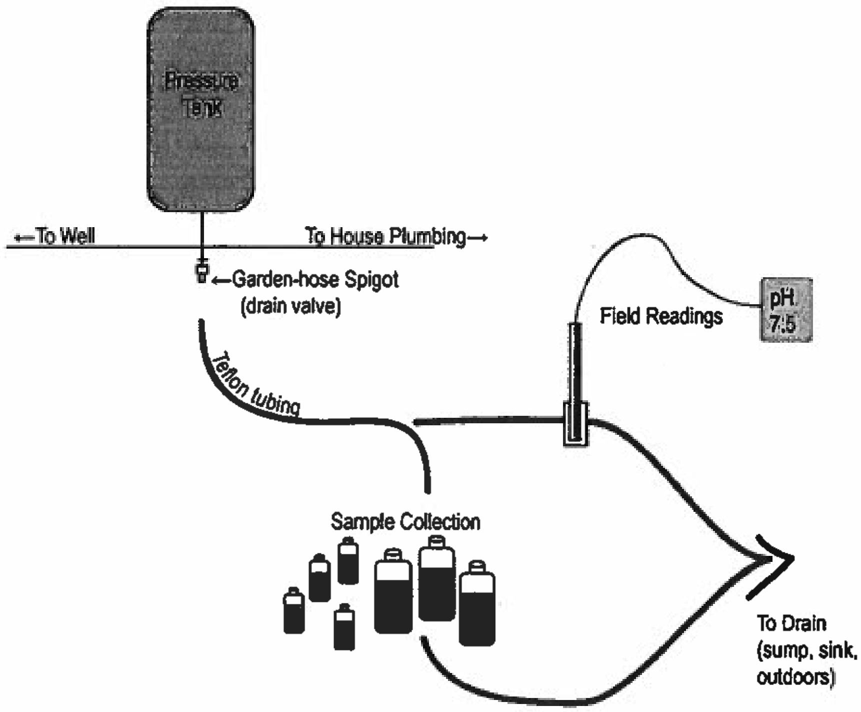
alpha-HCH	319-84-6	0.004	ug/L
Acetochlor	34256-82-1	0.01	ug/L
Alachlor	15972-60-8	0.008	ug/L
2,6-Diethylaniline	579-66-8	0.006	ug/L
Atrazine	1912-24-9	0.008	ug/L
Azinphos-methyl	86-50-0	0.12	ug/L
Benfluralin	1861-40-1	0.014	ug/L
Butylate	2008-41-5	0.004	ug/L
Carbaryl	63-25-2	0.06	ug/L
Carbofuran	1563-66-2	0.06	ug/L
Chlorpyrifos	2921-88-2	0.0036	ug/L
cis-Permethrin	61949-76-6	0.01	ug/L
Cyanazine	21725-46-2	0.022	ug/L
Dacthal	1861-32-1	0.0076	ug/L
2-Chloro-4-isopropylamino-6-amino-s-triazine {CIAT}	6190-65-4	0.006	ug/L
Diazinon	333-41-5	0.006	ug/L
Dieldrin	60-57-1	0.008	ug/L
Disulfoton	298-04-4	0.04	ug/L
EPTC	759-94-4	0.0056	ug/L
Ethalfluralin	55283-68-6	0.006	ug/L
Ethoprophos	13194-48-4	0.016	ug/L
Desulfinylfipronil amide		0.029	ug/L
Fipronil sulfide	120067-83-6	0.012	ug/L
Fipronil sulfone	120068-36-2	0.024	ug/L
Desulfinylfipronil		0.012	ug/L
Fipronil	120068-37-3	0.018	ug/L
Fonofos	944-22-9	0.0048	ug/L
Lindane	58-89-9	0.004	ug/L
Linuron	330-55-2	0.06	ug/L
Malathion	121-75-5	0.016	ug/L
Parathion-methyl	298-00-0	0.008	ug/L
Metolachlor	51218-45-2	0.02	ug/L
Metribuzin	21087-64-9	0.012	ug/L
Molinate	2212-67-1	0.004	ug/L
Napropamide	15299-99-7	0.008	ug/L
p,p'-DDE	72-55-9	0.002	ug/L
Parathion	56-38-2	0.02	ug/L
Pebulate	1114-71-2	0.016	ug/L
Pendimethalin	40487-42-1	0.012	ug/L
Phorate	298-02-2	0.02	ug/L

Prometon	1610-18-0	0.012	ug/L
Propachlor	1918-16-7	0.006	ug/L
Propanil	709-98-8	0.01	ug/L
Propargite	2312-35-8	0.02	ug/L
Propyzamide	23950-58-5	0.0036	ug/L
Simazine	122-34-9	0.006	ug/L
Tebuthiuron	34014-18-1	0.028	ug/L
Terbacil	5902-51-2	0.024	ug/L
Terbufos	13071-79-9	0.018	ug/L
Thiobencarb	28249-77-6	0.016	ug/L
Tri-allate	2303-17-5	0.0046	ug/L
Trifluralin	1582-09-8	0.018	ug/L

USGS
science for a changing world

305(b) Ground-Water Quality - Overview of Sample Collection

Typical Setup at Homeowner Well



Samples at production wells are usually collected where PWS personnel collect raw water samples (can be at tap off main line, spigot, sink, hydrant, etc.)

- First, some Teflon tubing is connected to existing plumbing as close to the well as possible; in homes, this is often at a garden hose spigot at the pressure tank. Then, the well pump is run to remove standing water from the well casing. The excess water is drained outside, away from the well, or to a sink or sump. Sometimes, especially at private homeowner wells, a second faucet is opened to increase the water flow.
- The tubing is connected to a meter that measures pH, temperature, specific conductance, and dissolved oxygen. After the standing water is removed from the well and the readings from the meter stabilize, they are recorded and the tubing is disconnected from the meter.
- Next, the tubing is connected to a "sampling chamber" made out of a PVC frame and a plastic bag. The sampling chamber is used to prevent atmospheric contamination, for example, from vehicle exhaust when sampling outdoors. The sampling chamber allows sampling for some compounds at very low concentrations. The sampling chamber sits on a plastic container that is used as a portable sink.
- About 20 different sample bottles are filled in the sampling chamber. Each bottle is used in a different analysis. Some bottles are filled directly from the tubing, others are filled with water that is filtered; some samples are preserved with acid; most samples are chilled.
- After collecting the samples, the bacteriological sample is hand delivered to a local lab for processing; the rest of the samples are shipped overnight to other laboratories for analysis.
- The location of the well is measured with a handheld global positioning system (GPS) unit for accurate mapping of the sample site.

U.S. Department of the Interior, U.S. Geological Survey
Maintainer: New York District
URL: http://ny.water.usgs.gov/projects/305b/sampling.htm
Last update: 14:21:30 Wednesday 09 June 2010
Privacy Statement || Disclaimer

BIOTRAX TESTING LAB, INC.
Biotrax Testing
4978 Broadway
Depew, NY 14043

Certificate of Analysis

Date	Project #	Analyst
11/10/2011	2981	EL

Customer Fax	Total Pages
	1

Account #	

Project Start Date	Time
11/8/2011	1530
Project ID	Sherman Vlg ~~CU866~~ CU2131

Name / Address

US Geological Survey
James Reddy NYSDEC-USGS Coliform Samples
C/O Columbia Analytical Services
1565 Jefferson Rd # 300 Ste 360
Rochester, NY 14623

Laboratory Analysis Report
Trade Secret

Test	Analytical Method & Analyte	Results / Units	Analysis Date & Time
TCMF	Total Coliform in Potable Water Method- SM 18 9222B-Membrane Filter/ 100 ml Location....................Sherman Vlg CU866 Date & Time Sampled....................11-8-2011 0900 EST Date & Time Plated....................11-8-2011 1530 EST Chlorine ....0.0 Temp <4C (On Ice)	<1 CFU/ 100 ml	11-9-2011 1600
Fecal Coliform	Fecal Coliform Determination in Potable and Non-Potable Water Method- SM 18 9222D Location....................Sherman Vlg CU866 Date & Time Sampled....................11-8-2011 0900 EST Date & Time Plated....................11-8-2011 1530 EST Chlorine ....0.0 Temp <4C (On Ice)	<1 CFU/ 100 ml	11-9-2011 1600
SPC Water	Standard Plate Count Potable/Non-Potable Water Method- SM 18 9215B Location....................Sherman Vlg CU866 Date & Time Sampled....................11-8-2011 0900 EST Date & Time Plated....................11-8-2011 1530 EST Chlorine ....0.0 Temp <4C (On Ice)	<1 CFU/ ml	11-10-2011 1600

ACCREDITED IN ACCORDANCE WITH nelac

All work is complete!

Reviewed By [signature]

Phone #	Fax #	biotrax@earthlink.net
716-651-0146	716-651-0774	E-mail

United States Department of the Interior

U. S. GEOLOGICAL SURVEY
WATER RESOURCES DISCIPLINE
New York Water Science Center
30 Brown Road
Ithaca, New York
(607) 266-0217

27 February 2012

Re: Groundwater sample from Community Water System well in Village of Sherman

Ann Gilbert
Village of Sherman
111 Mill Street
Sherman, NY 14781

Dear Ms. Gilbert:

The U.S. Geological Survey (USGS) in cooperation with the New York State Department of Environmental Conservation (NYSDEC) has recently conducted a study of the groundwater quality in your area. This study is part of a statewide 305(b) effort to assess the groundwater quality from aquifers throughout the State. Doug Crane assisted us in the arrangements for sample collection at the Village of Sherman, well #1.

The water sample was collected by the USGS from existing plumbing, near the wellhead, before the holding tank or any contact with water treatment. The water sample we collected from your well has been analyzed for a wide range of elements and chemicals, including nutrients, trace metals, common anions and cations, volatile organic compounds, pesticides, bacteria, dissolved gases, gross alpha and gross beta radiochemistry, and radon-222. A complete report of the water-quality results for the water sample from your well is included with this letter.

You will notice that many of the constituents were not detected in your water sample. This is indicated by a less-than sign (<) preceding the reported result. An "E" preceding the result indicates that the constituent was detected in your sample, but the value is an estimate because of low and inconsistent trace-level concentrations. An "M" indicates that the constituent was present in your sample but was not quantified because of its low concentration. An "R" indicates that a radiochemical result was below the analytical detection level.

If you have any questions about this study or the results, please feel free to call me at 607-266-0217 (ext. 3006), or send email to jreddy@usgs.gov. Our NYSDEC contact for this work is Dan Kendall in Albany (518-402-8211).

Thank you for your assistance.

Sincerely,

Jim Reddy
Project Leader

Organic Constituent	MCL or SDWS in milligrams per liter (mg/L) and micrograms per liter (µg/L) **
Alachlor	2 µg/L
Aldicarb	3 µg/L
Atrazine	3 µg/L
Benzene	5 µg/L
Benzo(a)pyrene	0.2 µg/L
Carbofuran	40 µg/L
Tetrachloromethane	5 µg/L
Chlordane	2 µg/L
Chlorobenzene	100 µg/L
Dibromochloropropane	0.2 µg/L
2,4-D	70 µg/L
Dinoseb	7 µg/L
Hexachlorobenzene	1 µg/L
Lindane	0.2 µg/L
Methoxychlor	40 µg/L
Simazine	4 µg/L
Tetrachloroethylene	5 µg/L
Toluene	1000 µg/L
Trichloroethylene	5 µg/L
Total trihalomethanes	80 µg/L
Vinyl chloride	2 µg/L

Bacteria

Total coliform	Any positive detection is not allowable
Fecal coliform	Any positive detection is not allowable
Escherichia coli (E. coli)	Any positive detection is not allowable
Heterotrophic plate count	No more than 500 bacterial colonies per milliliter

---

[1] **MCL** – Maximum Contaminant Level, defines the highest concentrations of contaminants allowed in public water supplies, as set by the New York State Health Department and the U.S. Environmental Protection Agency (USEPA).

* **SDWS** – Secondary Drinking Water Standard [sometimes referred to as Secondary Maximum Contaminant Level (SMCL) or Secondary Drinking Water Regulation (SDWR)] is a drinking water standard that is not enforcable by law, but levels above this standard can affect color, taste, or smell of the water.

** Some results are shown in the attached list of constituents as micrograms per liter (µg/L). Note that µg/L X 1000 = mg/L; please check the concentration units for proper comparison to a specific MCL or SMCL.

DISTRICT CODE 36

UNITED STATES DEPARTMENT OF INTERIOR - GEOLOGICAL SURVEY
420926079355501 -- CU2131

PROCESS DATE 2-16-12

WATER-QUALITY DATA

Date	Station name	Station number	Record number	Hardness, water, mg/L as CaCO3 (00900)	Geologic unit code	Color, water, fltrd, Pt-Co units (00080)	Dissolved oxygen, lab, mg/L (62971)
NOV 2011 08...	CU2131	420926079355501	01200202	281	112SDGV	<1	2.3

Date	Dissolved oxygen, mg/L (00300)	pH, water, unfltrd field, std units (00400)	pH, water, unfltrd lab, std units (00403)	Salinity, water, unfltrd ppth (00480)	Specif. conductance, wat unf lab, uS/cm @ 25 degC (90095)	Specific conductance, wat unf uS/cm @ 25 degC (00095)	Temperature, water, deg C (00010)	Altitude of land surface feet (72000)	Depth of well, feet below LSD (72008)	1,2-Dichloroethane-d4, surrog, wat unf % recvy (99832)	14Bromofluorobenzene surrog. VOC Sch wat unf % recvy (99834)	alpha-HCH-d6, surrog, wat flt 0.7u GF percent recovry (91065)	Diazinon-d10 surrog. wat flt 0.7u GF percent recovry (91063)
NOV 2011 08...	3.0	7.7	7.7	.3	772	783	12.1	1530	52.00	109	97.7	92.5	85.1

Date	Toluene-d8, surrog, Sch2090 wat unf percent recovry (99833)	Sample volume, Schedule 2001, mL (99856)	Dissolved solids dried @ 180degC wat flt mg/L (70300)	Calcium water, fltrd, mg/L (00915)	Magnesium, water, fltrd, mg/L (00925)	Potassium, water, fltrd, mg/L (00935)	Sodium, water, fltrd, mg/L (00930)	ANC, wat unf fixed end pt, lab, mg/L as CaCO3 (90410)	Alkalinity, wat flt fxd end lab, mg/L as CaCO3 (29801)	Carbon dioxide water, unfltrd mg/L (00405)	Chloride, water, fltrd, mg/L (00940)	Fluoride, water, fltrd, mg/L (00950)	Hydrogen sulfide water, unfltrd mg/L (71875)
NOV 2011 08...	91.6	963	434	89.5	14.0	2.41	48.5	253	245	21.5	93.2	.06	U

Date	Silica, water, fltrd, mg/L as SiO2 (00955)	Sulfate water, fltrd, mg/L (00945)	Ammonia + org-N, water, fltrd, mg/L as N (00623)	Ammonia water, fltrd, mg/L as N (00608)	Diss. nitrogen gas water, unfltrd mg/L (00597)	Nitrate + nitrite water, fltrd, mg/L as N (00631)	Nitrite water, fltrd, mg/L as N (00613)	Orthophosphate, water, fltrd, mg/L as P (00671)	Aluminum, water, unfltrd recoverable, ug/L (01105)	Barium, water, unfltrd recoverable, ug/L (01007)	Beryllium, water, unfltrd recoverable, ug/L (01012)	Cadmium water, unfltrd ug/L (01027)	Chromium, water, unfltrd recoverable, ug/L (01034)
NOV 2011 08...	8.08	12.8	<.07	.011	20.94	1.30	<.001	<.004	<4	108	<.02	.09	<.30

U.S. Geological Survey
30 Brown Road
Ithaca, NY 14850-1573
Phone: 607-266-0217

CU2131

Sherman Village, well #1

WATER-QUALITY DATA

Date	Cobalt water, unfltrd recover -able, ug/L (01037)	Copper, water, unfltrd recover -able, ug/L (01042)	Iron, water, fltrd, ug/L (01046)	Iron, water, unfltrd recover -able, ug/L (01045)	Lead, water, unfltrd recover -able, ug/L (01051)	Lithium water unfltrd recover -able, ug/L (01132)	Mangan- ese, water, fltrd, ug/L (01056)	Mangan- ese, water, unfltrd recover -able, ug/L (01055)	Mercury water, unfltrd recover -able, ug/L (71900)	Molyb- denum, water, unfltrd recover -able, ug/L (01062)	Nickel, water, unfltrd recover -able, ug/L (01067)	Silver, water, unfltrd recover -able, ug/L (01077)	Stront- ium, water, unfltrd recover -able, ug/L (01082)
NOV 2011 08...	.04	<.70	11	7	.18	2.9	103	103	<.005	.1	<.19	<.01	157

Date	Thall- ium, water, unfltrd ug/L (01059)	Zinc, water, unfltrd recover -able, ug/L (01092)	Anti- mony, water, unfltrd ug/L (01097)	Argon, water, unfltrd mg/L (82043)	Arsenic water, unfltrd ug/L (01002)	Boron, water, fltrd, ug/L (01020)	Selen- ium, water, unfltrd ug/L (01147)	1,2-Di- chloro- ethane, water, unfltrd ug/L (32103)	1,2-Di- chloro- propane water, unfltrd ug/L (34541)	1,4-Di- chloro- benzene water, unfltrd ug/L (34571)	2,6-Di- ethyl- aniline water, fltrd 0.7u GF ug/L (82660)	CIAT, water, fltrd, ug/L (04040)	Aceto- chlor, water, fltrd, ug/L (49260)
NOV 2011 08...	<.06	28.6	<.2	.7290	.48	31	.17	<.2	<.1	<.1	<.006	E.001	<.010

Date	Ala- chlor, water, fltrd, ug/L (46342)	alpha- HCH, water, fltrd, ug/L (34253)	Atra- zine, water, fltrd, ug/L (39632)	Azin- phos- methyl, water, fltrd 0.7u GF ug/L (82686)	Ben- flur- alin, water, fltrd 0.7u GF ug/L (82673)	Butyl- ate, water, fltrd, ug/L (04028)	Car- baryl, water, fltrd 0.7u GF ug/L (82680)	Carbo- furan, water, fltrd 0.7u GF ug/L (82674)	Chlor- pyrifos water, fltrd, ug/L (38933)	cis- Per- methrin water fltrd 0.7u GF ug/L (82687)	Cyana- zine, water, fltrd, ug/L (04041)	DCPA, water, fltrd 0.7u GF ug/L (82682)	Desulf- inyl- fipro- nil amide, wat flt ug/L (62169)
NOV 2011 08...	<.008	<.004	E.002	<.120	<.014	<.004	<.060	<.060	<.004	<.010	<.022	<.008	<.029

Date	Desulf- inyl- fipro- nil, water, fltrd, ug/L (62170)	Diazi- non, water, fltrd, ug/L (39572)	Diel- drin, water, fltrd, ug/L (39381)	Disul- foton, water, fltrd 0.7u GF ug/L (82677)	EPTC, water, fltrd 0.7u GF ug/L (82668)	Ethal- flur- alin, water, fltrd 0.7u GF ug/L (82663)	Etho- prop, water, fltrd 0.7u GF ug/L (82672)	Fipro- nil sulfide water, fltrd, ug/L (62167)	Fipro- nil sulfone water, fltrd, ug/L (62168)	Fipro- nil, water, fltrd, ug/L (62166)	Fonofos water, fltrd, ug/L (04095)	Lindane water, fltrd, ug/L (39341)	Linuron water, fltrd 0.7u GF ug/L (82666)
NOV 2011 08...	<.012	<.006	<.008	<.04	<.006	<.006	<.016	<.012	<.024	<.018	<.005	<.004	<.060

WATER-QUALITY DATA

Date	Malathion, water, fltrd, ug/L (39532)	Methyl parathion, water, fltrd 0.7u GF ug/L (82667)	Metolachlor, water, fltrd, ug/L (39415)	Metribuzin, water, fltrd, ug/L (82630)	Molinate, water, fltrd 0.7u GF ug/L (82671)	Napropamide, water, fltrd 0.7u GF ug/L (82684)	p,p'-DDE, water, fltrd, ug/L (34653)	Parathion, water, fltrd, ug/L (39542)	Pebulate, water, fltrd 0.7u GF ug/L (82669)	Pendimethalin, water, fltrd 0.7u GF ug/L (82683)	Phorate water, fltrd 0.7u GF ug/L (82664)	Prometon, water, fltrd, ug/L (04037)	Propachlor, water, fltrd, ug/L (04024)
NOV 2011 08...	<.016	<.008	<.020	<.012	<.004	<.008	<.002	<.020	<.016	<.012	<.020	E.001	<.006

Date	Propanil, water, fltrd 0.7u GF ug/L (82679)	Propargite, water, fltrd 0.7u GF ug/L (82685)	Propyzamide, water, fltrd 0.7u GF ug/L (82676)	Simazine, water, fltrd, ug/L (04035)	Tebuthiuron water, fltrd 0.7u GF ug/L (82670)	Terbacil, water, fltrd 0.7u GF ug/L (82665)	Terbufos, water, fltrd 0.7u GF ug/L (82675)	Thiobencarb water, fltrd 0.7u GF ug/L (82681)	Triallate, water, fltrd 0.7u GF ug/L (82678)	Trifluralin, water, fltrd 0.7u GF ug/L (82661)	1,1,1-Trichloroethane, water, unfltrd ug/L (34506)	CFC-113 water, unfltrd ug/L (77652)	1,1-Dichloroethane, water, unfltrd ug/L (34496)
NOV 2011 08...	<.010	<.02	<.004	<.006	<.03	<.024	<.02	<.016	<.005	<.018	.1	<.1	<.1

Date	1,1-Dichloroethene, water, unfltrd ug/L (34501)	1,2-Dichlorobenzene water, unfltrd ug/L (34536)	1,3-Dichlorobenzene water, unfltrd ug/L (34566)	Benzene water, unfltrd ug/L (34030)	Bromodichloromethane water, unfltrd ug/L (32101)	Chlorobenzene water, unfltrd ug/L (34301)	cis-1,2-Dichloroethene, water, unfltrd ug/L (77093)	Dibromochloromethane water, unfltrd ug/L (32105)	Dichlorodifluoromethane wat unf ug/L (34668)	Dichloromethane water, unfltrd ug/L (34423)	Diethyl ether, water, unfltrd ug/L (81576)	Diisopropyl ether, water, unfltrd ug/L (81577)	Ethylbenzene water, unfltrd ug/L (34371)
NOV 2011 08...	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.2	<.2	<.2	<.2	<.2	<.1

Date	Methane water, unfltrd mg/L (85574)	Methyl t-butyl ether, water, unfltrd ug/L (78032)	Methyl tert-pentyl ether, water, unfltrd ug/L (50005)	meta- + para-Xylene, water, unfltrd ug/L (85795)	Organic carbon, water, unfltrd mg/L (00680)	o-Xylene, water, unfltrd ug/L (77135)	Styrene water, unfltrd ug/L (77128)	t-Butyl ethyl ether, water, unfltrd ug/L (50004)	Tetrachloroethene, water, unfltrd ug/L (34475)	Tetrachloromethane water, unfltrd ug/L (32102)	Toluene water, unfltrd ug/L (34010)	trans-1,2-Dichloroethene, water, unfltrd ug/L (34546)	Tribromomethane water, unfltrd ug/L (32104)
NOV 2011 08...	.0020	<.2	<.2	<.2	<.5	<.1	<.1	<.1	<.1	<.2	<.1	<.1	<.2

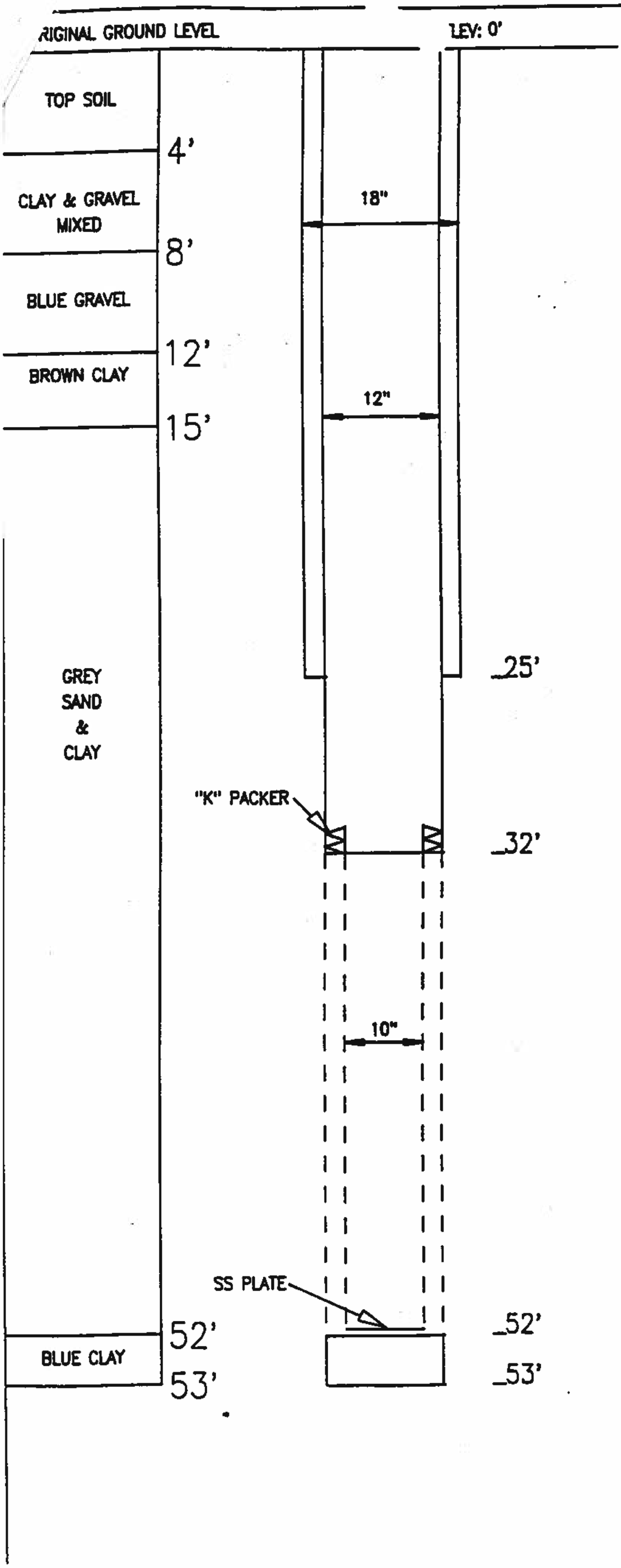
420926079355501 -- CU2131

WATER-QUALITY DATA

Date	Tri-chloro-ethene, water, unfltrd ug/L (39180)	Tri-chloro-fluoro-methane water, unfltrd ug/L (34488)	Tri-chloro-methane water, unfltrd ug/L (32106)	Vinyl chlor-ide, water, unfltrd ug/L (39175)	Gross alpha radioac water unfltrd pCi/L (01519)	Gross beta radioac water unfltrd pCi/L (85817)	Rn-222, water, unfltrd pCi/L (82303)	Uranium natural water, unfltrd ug/L (28011)
NOV 2011								
08...	<.1	<.2	<.1	<.2	R.1	1.9	730	.262

Appendix H

Well Technical Information



#1

MATERIAL

PIPE
25' OF 18" DIA. 3/8" WALL WT. ST. PIPE
32' OF 12" 45# WT. ST. PIPE T&C
(1) 18" REINFORCING BAND

SCREEN 20' OF 12" #6 GA. ARMCO T&C; (1) 12" ST. CUTTING SHO
20' OF 10" SS SCREEN w "K" PACKER & SS BOTTOM PLATE– 60

PLUG

GRAVEL

SEAL

PUMP

SIZE	8"	NUMBER	109115L
STAGES	10	TYPE	RKL
SETTING	36'-1-1/2"	COLUMN	
TUBING	WL	SHAFTING	1-3/16"
BOWLS		IMPELLERS	BR.
IMP.SHAFT		SUCTION	9'11" OF 6"
STRAINER		PRESS B.P.	105
HEAD	TF613M	AIR LINE	45'

MOTOR

MAKE	U.S.	TYPE	HOLLOW SHAFT
VOLTS	230/460	CYCLE	60
PHASE	3	AMP.	65/32.5
H.P.	25	RPM	1760
FRAME	284TPA	NON REV.	
MODEL		SERIAL #	421/305R34
UPPER BRG.	7310B	LOWER BRG.	6210

GEAR DRIVE

MFG.		MODEL	
RATIO		SERIAL #	
HVY. THRUST		NON REV.	

ENGINE

MFG.		MODEL	
PRM		CONTINUOUS H.P.	
FUEL		SERIAL #	

WELL

STARTED	5/15/89	CLEAR DEPTH	51'9"
FIRST TEST	5/15/89	METHOD	
FINAL TEST	6/23/89	GUAR. CAP.	250 GPM
ACCEPTED	6/23/89	GUAR. PRESS	105
B.P. ELEV		FORMATION	SAND
DIST. TO G.W.		DRILLER	

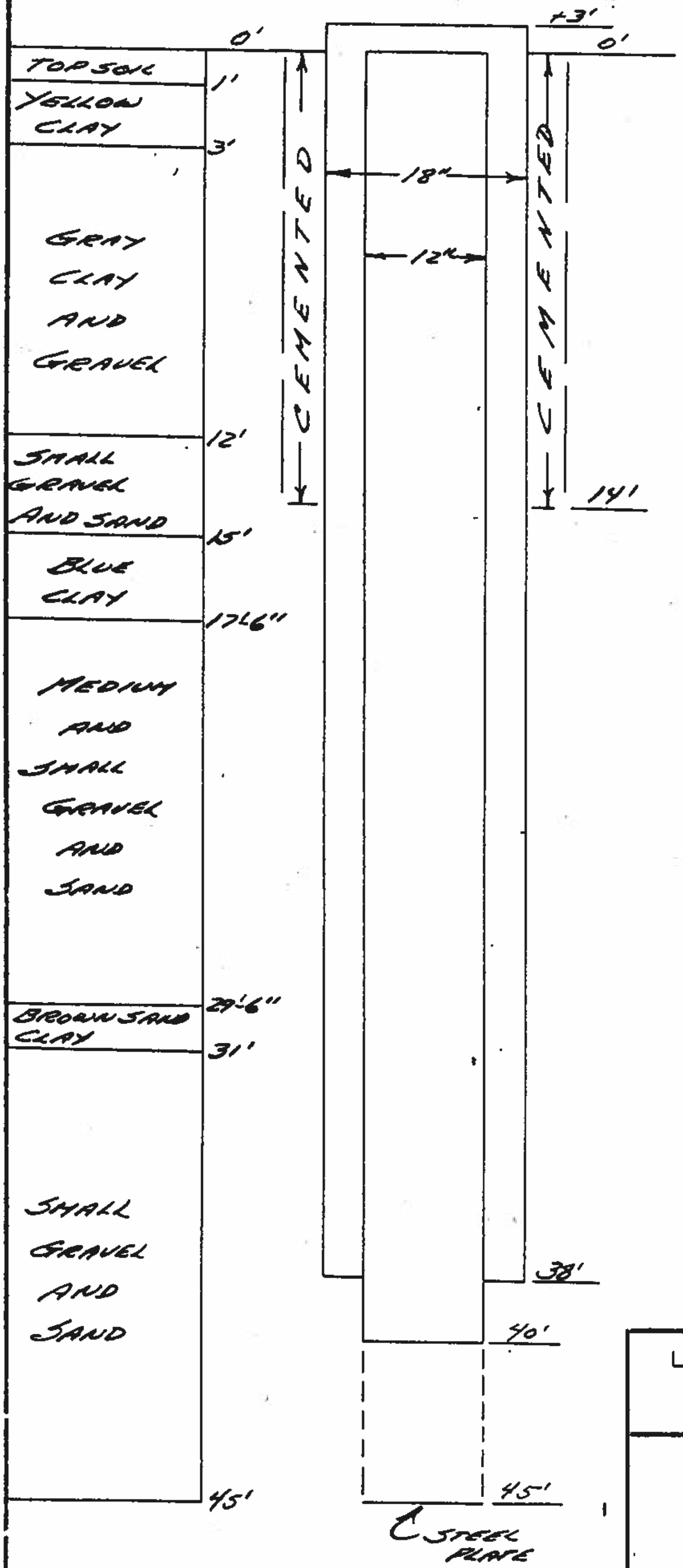
DATE	6/23/89			
STATIC LEVEL	6'0"			
PRODUCTION	300 gpm			
PUMP LEVEL	18'			
WATER TEMP.				

LOCATION SKETCH

NONE

HYDRO GROUP
VILLAGE OF SHERMAN
NEW YORK
WP-03
LAYNE WELL & PUMP DIVISON.

DRAWN BY: MAS
STATE #



PUMP & MOTOR ORIGINALLY FROM LAYNE WELL #2

Material

Pit: 41' OF 18" STEEL PIPE WELDED
40' OF 12" STEEL PIPE T.&C.

Screen: 5' OF 12" EVERDUR

Cone: STEEL PLATE

Pump

Type PLCS

Setting 34'8"

Suction 3' OF 6"

Basket NONE

Discharge 6"

Tubing 2"

Shafting 1 3/16"

Shop No. 21980

Size 10"

Stages 7

Impellers BRONZE

Head 7F618

Press B. P. 72#

Air Line 37'

Motor

Make U.S.

Volts 220

Phase 3

H. P. 25

Frame 364-4

Model CFU

Type HOLLOW SHA[FT]

Cycle 60

Amp. 62

R. P. M. 1800.

Form VERTICAL

Serial 2052318

Well BAILED

Started 5-22-57

First Test 6-6-57

Final Test 9-2-57

Accepted 9-2-57

Clear Depth 48'11"

Static Level 3'

Production 250

Pumping Level 21'

Guarantee 250

Press. 72#

Driller: N.J. KAHLER

Installer: R.L. PETERSON

LAYNE-NEW YORK CO., INC. NEW YORK, N. Y.
WATER SUPPLY CONTRACTORS

SHERMAN, VILLAGE OF
SHERMAN, N.Y.

DRAWN BY SRB   PW2   APPROVED BY

LAYNE WELL NO. 3   DRAWING NO.

Appendix I

Existing Chlorine Contact Time Calculation

Appendix J

Hydraulic Model

Barton & Loguidice

JOB	2056.001.003		
SHEET NO.	1	OF	1
CALCULATED BY	MJZ	DATE	8/7/2019
CHECKED BY		DATE	
SUBJECT	Existing Chlorine Contact Time Calculation		

Contact Time at Maximum Pumping Rate

Max Future Design Flow 500 gpm

First User to the North			First User to the South		
Pipe 1 Diameter	8	inches	Pipe 1 Diameter	8	inches
Pipe 1 Length	570	feet	Pipe 1 Length	50	feet
Pipe 2 Diameter	N/A	inches	Pipe 2 Diameter	6	inches
Pipe 2 Length	N/A	feet	Pipe 2 Length	475	feet
Pipe 3 Diameter	N/A	inches	Pipe 3 Diameter	4	inches
Pipe 3 Length	N/A	feet	Pipe 3 Length	235	feet
Pipe Volume	1,488	gallons	Pipe Volume	982	
Contact time	**2.98**	**min**	**Contact time**	**1.96**	

First User to the North - Log Removal of Viruses by Free Chlorine

Baffling Factor 1

CL Conc	pH	Temp	Peak Flow	Storage Volume	Total Detention Time (TDT)	Contact Time	CT Calc	Ct Req	Inactivation Ratio	Log Removal
mg/L		°C	GPM	Gallons	Vol/Peak Flow	min	Cl Conc x Contact Time	Table B2*	CT calc / CT req	4 X Inactivation Ratio
1	7	5	500	1488	2.98	2.98	2.98	8	0.37	1.49

Minimum of 4 Log Removal Required

* Source: EPA Guidance Manual (LT1ESWTR Disinfection Profiling and Benchmarking)

First User to the South -Log Removal of Viruses by Free Chlorine

Baffling Factor 1

CL Conc	pH	Temp	Peak Flow	Storage Volume	Total Detention Time (TDT)	Contact Time	CT Calc	Ct Req	Inactivation Ratio	Log Removal
mg/L		°C	GPM	Gallons	Vol/Peak Flow	min	Cl Conc x Contact Time	Table B2*	CT calc / CT req	4 X Inactivation Ratio
1	7	5	500	982	1.96	1.96	1.96	8	0.25	0.98

Minimum of 4 Log Removal Required

* Source: EPA Guidance Manual (LT1ESWTR Disinfection Profiling and Benchmarking)

Appendix K

Water Softening Calculation

JOB	2056.001.003
SHEET NO.	1 OF 1
CALCULATED BY	GDM
DATE	8/1/2019
CHECKED BY	
DATE	
SUBJECT	Water Softening Calculation

	mg/L	mg/meq	meq/L
Ca^{2+}	89.5	20	4.475
Mg^{2+}	14	12	1.17
Na^{+}	48.5	23	2.11
K^{+}	2.41	39	0.062
HCO_3^{-}	298.9	61	4.9
SO_4^{-}	12.8	48	0.27
Cl^{-}	93.2	35.5	2.63

Hardness = [[Ca^{2+}] + [Mg^{2+}]] x 50 mg/meq

Hardness = 282 mg/L as $CaCO_3$

Want to reduce hardness to 80 mg/L as $CaCO_3$

- Keeping proportion of Ca^{2+} and Mg^{2+} the same

Hardness = [0.79 Ca^{2+} + 0.21 Mg^{2+}] x 50 = 80 mg/L

Hardness = [0.79 Ca^{2+} + 0.21 Mg^{2+}] = 1.6 meq/L

Softened Equivalence

Ca^{2+} =	(0.79) x 1.6 = 1.26 meq/L
Mg^{2+} =	(0.21) x 1.6 = 0.34 meq/L

Impact on Sodium

	Raw	Softened	Total
Ca^{2+}	4.475	1.26	3.125
Mg^{2+}	1.17	0.34	0.83
Na^{+}	2.1	2.1	2.1
			6.145 meq/L

Sodium Concentraion after softening

[6.145 meq/L] x [23 mg Na^{+}/meq] = 141 mg/L Na^{+}

Sodium levels will increase from 48.5 mg/L to 141 mg/L when softening down to 80 mg/L $CaCO_3$ in water

Appendix L

Proposed Chlorine Contact Time Calculation

Barton & Loguidice

JOB	2056.001.003		
SHEET NO.	1	OF	1
CALCULATED BY	MJZ	DATE	8/12/2019
CHECKED BY		DATE	
SUBJECT	Existing Chlorine Contact Time Calculation		

Maximum Pumping Rate

Max Future Design Flow 500 gpm

Minimum Storage Volume for 4x Inactivation of Viruses - Log Removal of Viruses by Free Chlorine

Baffling Factor 1

CL Conc	pH	Temp	Peak Flow	Storage Volume	Total Detention Time (TDT)	Contact Time	CT Calc	Ct Req	Inactivation Ratio	Log Removal
mg/L		^oC	GPM	Gallons	Vol/Peak Flow	min	Cl Conc x Contact Time	Table B2*	CT calc / CT req	4 X Inactivation Ratio
1	7	5	500	4000	8.00	8.00	8.00	8	1.00	4.00
Minimum of 4 Log Removal Required										

* Source: EPA Guidance Manual (LT1ESWTR Disinfection Profiling and Benchmarking)

Minimum Storage Volume for Minimum Detention Time of 15 minutes

Max Future Design Flow 500 gpm x 15 Minutes = 7500 gallons

Pipe Sizes and Lengths Required Assuming DR18 C900 Pipe will be used

Volume = 4000 gallons

Size	Length (LF)
7.98	1540
11.65	722
15.35	416
17.2	331
19.06	270
22.76	189

Volume = 7500 gallons

Size	Length (LF)
7.98	2887
11.65	1355
15.35	780
17.2	621
19.06	506
22.76	355

Appendix M

Budgetary Project Cost Estimate

Item	Description	QTY	Unit	Unit Cost	Total
Groundwater Source and Treatment Improvements					
1	Remove Existing Well Buildings	1	LS	$20,000.00	$20,000
2	Scope and Redevelop Existing Wells	2	EA	$10,000.00	$20,000
3	Install New Submersible Pitless Well Pumps with Level Sensors	2	EA	$70,000.00	$140,000
4	Water Treatment Building	1	LS	$75,000.00	$75,000
5	SCADA System with Auto dialer	1	LS	$75,000.00	$75,000
6	Chlorine Disinfection Equipment	1	LS	$20,000.00	$20,000
7	Well Water Meters	2	EA	$25,000.00	$50,000
8	Emergency Power Provisions	1	LS	$75,000.00	$75,000
9	6" Ductile Iron Site Piping	800	LF	$70.00	$56,000
10	24" C900 PVC Site Piping	350	LF	$120.00	$42,000
11	8" Ductile Iron Site Piping	800	LF	$75.00	$60,000
12	Decommission Existing Monitoring Well	1	LS	$3,000.00	$3,000
13	Site Improvements (Fencing, Gravel Driveway, Restoration)	1	LS	$50,000.00	$50,000
14	New Sanitary Sewer Lateral	1	LS	$20,000.00	$20,000
				Category Sub Total	**$706,000**
Water Storage Improvements					
15	New Water Tank Level Sensors and RTU	1	LS	$30,000.00	$30,000
16	Raise and Replace Storage Tank Access Hatches	1	LS	$7,500.00	$7,500
				Category Sub Total	**$37,500**
Water Distribution and Transmission Improvement					
17	8-inch PVC Water Main	2,600	LF	$75.00	$195,000
18	12-inch PVC Water Main	950	LF	$80.00	$76,000
19	Hydrants	10	EA	$5,500.00	$55,000
20	Valves	12	EA	$2,000.00	$24,000
21	Water Main Connections	8	EA	$5,000.00	$40,000
22	Water Service Transfers (Along New Water Main)	42	EA	$1,500.00	$63,000
23	Water Service Piping (Pex)	5,760	LF	$25.00	$144,000
24	Water Service Transfers (Along Existing Main)	40	EA	$2,500.00	$100,000
25	Cut and Caps to Decommission Existing Water Main	12	EA	$5,000.00	$60,000
				Category Sub Total	**$757,000**
				Total of all Categories	**$1,501,000**
			Inflation to 2021	4%	**$60,000**
			Contractor General Condition	5%	**$75,000**
			Contingency	15%	**$225,000**
				SUBTOTAL OF CONSTRUCTION COSTS	**$1,861,000**
			Purchase of New Water Meters	$250 each	**$75,000**
			Engineering/Legal/Administrative	25%	**$465,000**
				Base Project Total	**$2,401,000**

Item	Description	QTY	Unit	Unit Cost	Total
Potential Project Adders					
1a	Water Softening Equipment and Installation	1	LS	$440,000.00	$440,000
2a	Additional Building Space for Water Softening	1	LS	$40,000.00	$40,000
3a	Installation of Water Meters	297	EA	$250.00	$74,250
			Additional Inflation, General Conditions, and Contingency	20%	**$111,000**
			Additional Engineering/Legal/Administrative	25%	**$139,000**
				Base plus Adders Project Total	**$3,206,000**

Appendix N

Short-Lived Asset Cost Estimate

Drinking Water System - Short Lived Assets					
Item	**QTY**	**UNIT COST**	**TOTAL COST**	**Estimated Life (Years)**	**Required Annual SLA Reserve Contribution**
Well Pumps and Appurtences	2	$30,000	$60,000	20	$3,000
I/C Allowance	1	$15,000	$15,000	15	$1,000
Emergency Power	1	$20,000	$20,000	20	$1,000
Building Mainteance	1	$20,000	$20,000	10	$2,000
Flow Meters	1	$10,000	$10,000	20	$500
Chlorination Equipment	1	$15,000	$15,000	15	$1,000
Water Meters	325	$250	$81,250	20	$4,063
Miscellaneous Allowance	1	$5,000	$5,000	1	$5,000
Optional Water Softening	1	$100,000	$100,000	20	$5,000
Total Annual SLA / Reserve Contribution					$18,000
Total Annual SLA / Reserve Contribution with Softening					$23,000

Appendix O

Preliminary DWSRF IUP Scoring Estimate

Factor from DWSRF Project Scoring Sheet	Possible Score	Applicable Item(s) from Project Scope
A. MCL/Treatment Technique Violations		
1. a. i. Microbiological - Filtration	**100**	2
1. a. iii. Microbiological - CT Disinfection	**30**	4
5. Inorganic/Physical - Other Health Related	**25**	2, 3, 5, 6, 7, 8, 9
C. System Reliability/Dependability Issues		
1. Complete replacement or major rehabilitation of existing treatment facility for primary contaminants that has exceeded design life and/or does not meet the design standards in the current edition of Recommended Standards For Water Works.	**20**	2
2. Upgrade, replace and/or install major vulnerable system components to meet the design standards in the current edition Recommended Standards For Water Works.	**10**	2, 5, 6,7, 8, 9
3. Aged mains and appurtenances	**5**	7, 8
4. Redundancy of critical components (pumps, valves, chemical feed-systems, etc.)	**5**	2
6. Control/automation for operational efficiency (computerization, control valves, metering, laboratory upgrading)	**5**	2, 5, 9
D. Governmental Needs (more than one may apply)		
5. Consistent with Water Resources Management Strategy	**5**	All
6. Proposes operational changes that improve and insure adequate technical, managerial and financial capacity of the system in order to insure compliance	**5**	2, 5, 9
E. Financial Need	**25**	The 2013 MHI is artificially high a newer MHI should be used 2010 Census - $34,118 2013 ACS - $43,958 2014 ACS - $39,167 2015 ACS - $35,238 2017 ACS - $38,750
TOTAL ESTIMATED POSSIBLE SCORE	**235**	

Project Scope

1.) Install a Municipal Water Softening process (Optional Project Adder)
- The Village has extremely hard water resulting in several resident complaints

2.) Remove Existing Well Buildings, Replace Existing Pumps with Pitless Submersible Well Pumps, and Construct a Single New Water Treatment Building
- DOH has issued many violations for the poor condition of this infrastructure
- This would eliminate the blending of chlorinated water with unchlorinated water (DOH Violation)
- This upgraded would include SCADA/telemetry system automation and monitoring (DOH Violation)
- New Infrastructure would be installed with flood protection provisions. The current risk of surface water contamination caused by flooding through the top of the well would be eliminated. Current constructed elevations do not guarantee wells are protected from flood (surface) water intrusion. (DOH Violation)

3.)Decommission Monitoring Well
- The monitoring well is damaged and could contaminate the ground water source (DOH Violation)

4.) Install properly sized Chlorine Contact Piping
- Currently the system does not provided adequate Chlorine Contact Time (DOH Violation)

5.) Install Level Sensors in the Storage Tank
- Aside from opening hatch at the top of the tank, there is no way to verify tank level (DOH Violation)

6.) Raise the Storage Tank Access Hatches
- Access hatches are installed at grade making the tank at risk for surface water contamination (DOH Violation)

7.) Replace Various Sections of Water Main In-Kind
- New water main will be installed with new hydrants and valves to replace old main and valves (DOH Violation)

8.) Decommission Various Sections of Redundant Water Main
- Redundant antiquated parallel mains put system at risk of failure and contamination (DOH Violation)

9.) Replace Remaining 297 Water Meters
- Current water meters are extremely inaccurate and must be replaced (DOH Violation)

Appendix P

Estimated Annual User Costs

Total Base Project Cost		$2,401,000	Total Base Plus Adders Project Cost		$3,206,000

		Scenario No. 1: EFC 0% Hardship, WIIA, and Max. CDBG	**Scenario No. 2: EFC 0% Hardship, WIIA, and Modest CDBG**	**Scenario No. 3: EFC 0% Hardship and WIIA**	**Scenario No. 4: EFC 0% Hardship**
Rate		0%	0%	0%	0%
Term Length		30	30	30	30
WIIA Grant (60%)		$840,600	$1,140,600	$1,440,600	$0
CDBG Grant		$1,000,000	$500,000	$0	$0
Total Grant		$1,840,600	$1,640,600	$1,440,600	$0
Annualized Project Cost		**$18,680**	**$25,347**	**$32,013**	**$80,033**
Number of EDU's	**395**				
Current Projected 2020 Water Budget	**$195,000**				
Current Budgeted Amount for SLA/ Reserves	$0				
Current Budgeted Amount for Future Debt /CIP	$70,000				
Suggested Amount for SLA/ Reserves (Base Project)	$18,000				
Reduction in Est. Capital Spending due to Base Project	$50,000				
Est. Water Budget Required for Base Project		$181,680	$188,347	$195,013	$243,033
Future Avg. Annual Cost of Water (Base Project)		**$460**	**$477**	**$494**	**$615**
Additional Cost of Base plus Adders Project					
Increase in Grant Amount (WIIA at 60%)		$483,000	$483,000	$483,000	$0
Total Grant		$2,323,600	$2,123,600	$1,923,600	$0
Annualized Project Cost		**$29,413**	**$36,080**	**$42,747**	**$106,867**
O/M and SLA Reserve for Water Softening	$11,500				
Est. Water Budget Required for Base Plus Adder Project		$203,913	$210,580	$217,247	$281,367
Future Avg. Annual Cost of Water (Base Plus Adder Project)		**$516**	**$533**	**$550**	**$712**

Appendix Q

Smart Growth Assessment Form

Smart Growth Assessment Form

This form should be completed by the applicant's project engineer or other design professional.[1]

Applicant Information

Applicant: Village of Sherman Project No.: TBD

Project Name: Sherman Comprehensive Water Assessment Study

Is project construction complete? ☐ Yes, date: ☑ No

Project Summary: (provide a short project summary in plain language including the location of the area the project serves)

The project will rehabilitative the two well sites and the distribution system in the Village of Sherman to improve water quality and reliability. The well site rehabilitation will mainly consist of replacement of groundwater pumps, construction of a new treatment building with contact time piping, and possible implementation of water softening. The distribution system upgrades will consist of replacement of old, undersized 4" and 6" water mains with new 8" or 12" mains, and service transfer and abandonment of dual mains in some areas of the Village. New controls will also be installed to monitor the wells and storage tank as none are currently being implemented.

Section 1 – Screening Questions

1. Prior Approvals

1A. Has the project been previously approved for EFC financial assistance? ☐ Yes ☑ No

1B. If so, what was the project number(s) for the prior approval(s)? Project No.:

Is the scope of the project substantially the same as that which was approved? ☐ Yes ☐ No

IF THE PROJECT WAS PREVIOUSLY APPROVED BY EFC'S BOARD AND THE SCOPE OF THE PROJECT HAS NOT MATERIALLY CHANGED, THE PROJECT IS **NOT** SUBJECT TO SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

2. New or Expanded Infrastructure

2A. Does the project add new wastewater collection/new water mains or a new wastewater treatment system/water treatment plant? ☐ Yes ☑ No

Note: A new infrastructure project adds wastewater collection/water mains or a wastewater treatment/water treatment plant where none existed previously

2B. Will the project result in either: ☐ Yes ☑ No

An increase of the State Pollutant Discharge Elimination System (SPDES) permitted flow capacity for an existing treatment system;

OR

An increase such that a NYSDEC water withdrawal permit will need to be obtained or modified, or result in the NYSDOH approving an increase in the capacity of the water treatment plant?

Note: An expanded infrastructure project results in an increase of the SPDES permitted flow capacity for the wastewater treatment system, or an increase of the permitted water withdrawal or the permitted flow capacity for the water treatment system.

[1] If project construction is complete and the project was not previously financed through EFC, an authorized municipal representative may complete and sign this assessment.

IF THE ANSWER IS “NO” TO BOTH “2A” and “2B” ON THE PREVIOUS PAGE, THE PROJECT IS NOT SUBJECT TO FURTHER SMART GROWTH REVIEW. SKIP TO SIGNATURE BLOCK.

3. Court or Administrative Consent Orders

3A. Is the project expressly required by a court or administrative consent order? ☐ Yes ☑ No

3B. If so, have you previously submitted the order to NYS EFC or DOH? If not, please attach. ☐ Yes ☐ No

Section 2 – Additional Information Needed for Relevant Smart Growth Criteria

EFC has determined that the following smart growth criteria are relevant for EFC-funded projects and that projects must meet each of these criteria to the extent practicable:

1. Uses or Improves Existing Infrastructure

1A. Does the project use or improve existing infrastructure? ☑ Yes ☐ No

Please describe:

This project will involve replacement of various assets of the Village water system including well pumps and aging water mains.

2. Serves a Municipal Center

Projects must serve an area in either 2A, 2B or 2C to the extent practicable.

2A. Does the project serve an area **limited** to one or more of the following municipal centers?

- i. A City or incorporated Village ☑Yes ☐No
- ii. A central business district ☑Yes ☐No
- iii. A main street ☑Yes ☐No
- iv. A downtown area ☑Yes ☐No
- v. A Brownfield Opportunity Area (for more information, go to www.dos.ny.gov & search “Brownfield”) ☐Yes ☑No
- vi. A downtown area of a Local Waterfront Revitalization Program Area (for more information, go to www.dos.ny.gov and search “Waterfront Revitalization”) ☐Yes ☑No
- vii. An area of transit-oriented development ☐Yes ☑No
- viii. An Environmental Justice Area (for more information, go to www.dec.ny.gov/public/899.html) ☐Yes ☑No
- ix. A Hardship/Poverty Area ☑Yes ☐No
  Note: Projects that primarily serve census tracts and block numbering areas with a poverty rate of at least twenty percent according to the latest census data

Please describe all selections:

The Village of Sherman is a densely populated Village with a downtown business district surrounded by neighborhoods. Over half of the Village is considered to be of low to moderate income levels.

2B. If the project serves an area located outside of a municipal center, does it serve an area located adjacent to a municipal center which has clearly defined borders, designated for concentrated development in a municipal or regional comprehensive plan and exhibit strong land use, transportation, infrastructure and economic connections to an existing municipal center? ☐Yes ☑No

Please describe:

The project upgrades existing infrastructure and does not look to extend water to new areas for future planned development.

2C. If the project is not located in a municipal center as defined above, is the area designated by a comprehensive plan and identified in zoning ordinance as a future municipal center? ☐Yes ☑No

Please describe and reference applicable plans:

The project is located in a municipal center

3. Resiliency Criteria

3A. Was there consideration of future physical climate risk due to sea-level rise, storm surge, and/or flooding during the planning of this project? ☑Yes ☐No

Please describe:

The Well and Well Houses are located in flooding prone area's and will now be designed to be protected against flooding.

Signature Block: By entering your name in the box below, you agree that you are authorized to act on behalf of the applicant and that the information contained in this Smart Growth Assessment is true, correct and complete to the best of your knowledge and belief.

Applicant: Village of Sherman	Phone Number: 716-761-6781
(Name & Title of Project Engineer or Design Professional or Authorized Municipal Representative)	
[signature]	8/25/19
(Signature)	(Date)

Matthew J. Zarbo P.E.

Appendix R

EFC Engineering Report Certification Form

Engineering Report Certification

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Drinking Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report: Sherman Comprehensive Water Assessment Study

Date of Report: August 2019

Professional Engineer's Name: Eric A. Pond, P.E.

Signature:

Date: 8/30/19