May 2020

Schuylerville-Victory Board of Water Management Water System Master Plan

Villages of Schuylerville and Victory
Saratoga County, New York

Prepared for:

Schuylerville-Victory Board of Water Management
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VICTORY-SCHUYLERVILLE
BOARD OF WATER MANAGEMENT
WATER SYSTEM MASTER PLAN

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1.0 EXECUTIVE SUMMARY

This report provides the Schuylerville-Victory Board of Water Management (BOWM) with a document that serves as a planning tool for current and future upgrades needed to the water system within the Villages of Schuylerville and Victory. The report outlines the recommended system improvements over the next 30 years. The Master Plan identifies the following significant projects that are recommended to be undertaken by the BOWM:

1. Replace water treatment plant SCADA/controls at both plants.
2. Mitigate low water pressure concerns.
3. Replace water mains (70% of system is 100-120 years old).
    - Phase 1 Water Main Replacement (2020-2030): Approx. 17,000 feet or 28% of the system.
    - Phase 2 Water Main Replacement (2030-2040): Approx. 24,000 feet or 40% of the system.
4. Install redundant UV system at Fort Hardy WTP.
5. Miscellaneous rehabilitation items at Victory WTP.

The report includes a discussion on the priority of each project and options for phasing the water main replacement projects. Budget level cost opinions are also provided.

2.0 INTRODUCTION

C.T. Male Associates has been retained by the Schuylerville-Victory BOWM to prepare a Water System Master Plan. This involves first evaluating and assessing the current condition of the water network infrastructure in the Villages of Schuylerville and Victory, updating the water system mapping to include any new developments since the 1990s, and the prioritization and replacement of critical water lines. Other key components include analyzing the existing pressures within the system to identify low pressure problem areas and providing appropriate recommendations to amend this issue, as well as an investigation and discussion into any necessary upgrades to the water treatment plants.

This report provides a description of each project, budgetary cost opinions for the recommended improvements, and figures showing the location of the projects and characteristics of the water network.

3.0 EXISTING SYSTEM DESCRIPTION

A map of the Schuylerville-Victory BOWM system is located in Figure 1.

The water system for the Villages of Schuylerville and Victory is supplied by two groundwater source areas. The Fort Hardy Water Treatment Plant (WTP), established in 2006 and located in the Village of Schuylerville, draws from two wells located on the plant site near the Hudson River. The average daily production at the Fort Hardy WTP is approximately 190,000 gallons per day. The treatment process at the plant includes two filtration trains, including a 5-micron filter and a 1-micron absolute filter. Bypass water goes through a two-stage filtration.

The Victory WTP was originally constructed in 1975, ceased operation in 1981 and then was re-established in 2008. The Victory WTP is located just outside of the Village of Victory's southern boundary off Route 32. This plant is also supplied by two wells and uses two Greensand-Plus Filter Tanks to reduce the levels of iron and manganese present in the water before it enters the distribution system. The Victory WTP average daily production in 2019 was approximately 92,000 gallons per day, but the plant can operate at higher flows of up to 144,000 gpd. The plant is in satisfactory condition given its age. Upgrades to this plant include enclosing and isolating the chlorine tank in a closet, replacing the media in the filter tanks, and addressing corrosion issues within the plant's operating environment.

There is no record of when the media in the tanks was last replaced, and it is generally recommended that Greensand filter media be replaced no more than 10 years after first use.

Water from the two water plants is pumped into the distribution system and to a 600,000-gallon storage tank located on Cemetery Avenue. The water lines in the Village of Schuylerville are predominantly composed of cast iron pipes that was installed in the early 1900s, and thus are susceptible to breaks and leaks due to their age. The most recent extensions to the system include the addition of the Morgan's Run development, constructed in the late 1990s, where the mains consist of ductile iron piping. The water lines in Victory primarily consist of asbestos concrete pipe and are roughly the same age as the lines in Schuylerville. Since the abandonment of the Easton reservoir in 2004, a handful of residents that live east of the Hudson River, in the Town of Easton, now rely on the Schuylerville-Victory BOWM to provide water to their homes. These properties are served by a water main that crosses the Hudson River at two bridge crossings.

A total of approximately 61,500 feet (11.5 miles) of water mains are present in the system. Statistics on the water mains are provided in Table 1. The water main size and material is based upon local knowledge as there is limited record mapping.

Table 1- Existing Water Main Statistics

Size	Material	Total Length (feet)
6"	ACP	11,975
8"	ACP	2,840
4"	CIP	510
6"	CIP	12,025
8"	CIP	13,865
10"	CIP	1,040
2"	Copper	1,320
2"	DIP	360
4"	DIP	330
6"	DIP	2,830
8"	DIP	7,625
12"	DIP	5,930
10"	HDPE	800

In addition to each plant's individual upgrades, the BOWM is also looking to implement a Supervisory Control and Data Acquisition (SCADA) system to better manage and control the operations at the facilities. This will give operators an improved form of

communication between the plants and system. Both plants currently have Allen-Bradley systems installed for overseeing operations at the plants, which is now considered obsolete and unreliable.

A significant issue with the Schuylerville-Victory water system is the location/elevation of the existing storage tank on Cemetery Avenue. The tank has a diameter of approximately 60 feet and is at an elevation of 310 (USGS datum). The tank's current elevation is not high enough to provide the minimum recommended pressure of 35 psi to the existing service areas. This includes areas in the Village of Victory and Schuylerville consisting of Cemetery Ave, Burgoyne Ave, Schuyler Heights Drive, Monument Drive, and Morgan's Run. Homes located immediately adjacent to the tank are being serviced by it and only receive pressures in the range of 10 psi. The hydrants along Cemetery Avenue and Burgoyne Street near the monument are labeled to not be used for firefighting purposes as the pressures are too low.

4.0 RECOMMENDED IMPROVEMENTS

This section discusses the recommended improvements necessary for the Schuylerville-Victory water system. These improvements are considered capital projects and do not include items that are typically considered maintenance.

4.1 Pressure Zone Mitigation

C.T. Male prepared a skeletonized hydraulic model of the Schuylerville-Victory water system to determine the system pressures under normal operating conditions. The hydraulic grade line of the water system floats based upon the level of the Cemetery Avenue water tank. The bottom of the tank is at elevation 310, with the top of the tank at elevation 336, a 26-foot high tank. The water in the tank is generally at or near full with a limited fluctuation of the water level unless there is a fire fighting operation occurring in the system. With the tank near full, the hydraulic grade line of the system will be near elevation 335. AWWA recommends that a minimum service pressure for a municipal system be 35 psi at ground level. A typical range of pressures for a municipal system is 50-90 psi. A minimum pressure of 35 psi provides adequate domestic pressure for common household plumbing and appliances and provides adequate pressure for firefighting. With a hydraulic grade line of 335 feet, the existing storage tank can provide adequate pressures to properties located at or below a ground elevation of 255. Figure 2 provides a map of the pressure contours, with areas in hatching having pressures less than 35 psi.

The areas with inadequate pressure include: Cemetery Ave, Pond Street, Pine Street, Burgoyne Ave, Schuyler Heights Drive, Monument Drive, and Morgan's Run. Homes located immediately adjacent to the tank are being serviced by it and only receive pressures in the range of 10 psi, which is not adequate for typical domestic use.

There are three main options to address low pressures in water systems, including: Installing a taller, elevated water storage tank; converting the existing ground storage tank to "pump storage;" and installing in-line booster stations to boost the pressure of specific service areas. The following is a detailed description of each option:

Elevated Storage Tank

The common long-term solution to pressure zone mitigation for a water system is to install an elevated tank in lieu of a ground storage tank. If an elevated storage tank were to be installed to service the Villages of Schuylerville and Victory, the most reasonable location would be on the hill near the existing tank or near Morgan's Run. If the existing tank were to be replaced with an elevated tank, in order to provide a minimum pressure of 35 psi for all users, the average water level of the tank would need to be at elevation 390, requiring a 90-95 foot high elevated storage tank. In order to maintain the required storage volume, the elevated portion of the tank would be 50 feet in diameter, with 41-42 feet of storage volume in the elevated portion of the tank.

An elevated storage tank is not being proposed in this Master Plan due to the significant viewshed concerns with locating an elevated tank near the Saratoga Monument Site. The 155-foot tall monument owned and managed by the National Park Service is located 1,600 feet from the existing Cemetery Avenue water tank. If the tank were to be replaced with a nearly 100-foot tall water tank, the impact to the viewshed of the Saratoga Monument would likely be extensive. The tank could be located at another location, such as near Morgan's Run, but that location is still close to the monument. Locating the elevated tank far away from the distribution system as to not impact the viewshed for the Monument is not practical.

In addition to the viewshed encroachments possible with an elevated storage tank, the cost of a new glass-fused to steel elevated tank of this size is $2.5 million for the tank itself, not including the foundation or site work. There are other more reasonable and cost-effective options to mitigate the low pressure issues.

Pump Storage

Another option to mitigate pressure zone issues would be to convert the existing water tank to a pump storage tank. Pump storage tanks work by filling the tank with water from a directly from the water source (in this case the two water plants) and then pumping water out to the distribution system at a higher pressure. This setup generally works where there is a direct feed from the water plant to the tank, and then a separate transmission main out to the distribution system. Pump storage tanks work well in areas where an elevated storage tank is not preferred, such as areas with viewshed issues. Pump storage can be cost effective if the distribution/transmission system is built for this type of set up.

Unfortunately, the existing tank in the Schuylerville-Victory system cannot be easily converted to pump storage due to the layout of the distribution system. Direct transmission mains would need to be built from the each of the water treatment plants up to the tank with a new booster pump installed at the tank to pump back to the distribution system. Given the other priorities in this master plan to replace the aging infrastructure, pump storage is not considered as an option in this plan.

Booster Pumps

The recommended option for mitigating the pressure zone issues present in the Schuylerville-Victory water system is to install two neighborhood booster pumps and in-line booster pumps, as shown on Figure 7.

Two package booster pump stations would be installed to serve Morgan's Run and the Monument Drive area. The Morgan's Run pump station would boost the pressure by at least 30 psi, providing 65-75 psi of pressure for the neighborhood. This pump station would service 91 homes with a peak flow of 35 gpm. The Monument Drive pump station would boost the pressure by 40 psi, providing 65-75 psi of pressure for the neighborhood. This pump station would service 32 homes with a peak flow of 16 gpm.

Both of the pump stations would be package integrated pump stations, with the specific pumps and controls determined during the design process. The pump stations are a modest size and can be located in existing Village rights-of-way. The pump station enclosures can be designed to match the character of the neighborhood. Copies of general brochure and cut sheets for the pump stations are located in Appendix A.

There are 15 homes on Cemetery Avenue and Burgoyne Street that have water pressures below 35 psi. It is not possible to install a booster pump for those streets due to the layout of the distribution system. In these cases, it is recommended that an in-line booster pump be installed in each home, similar to a booster pump for a well. These in-line booster pumps would be centrifugal pumps and be installed in basements or mechanical rooms. The downside to this alternative is that the BOWM would be performing work on private property and would need easements? from the property owner. The BOWM would also need to decide if they would own and maintain the booster pump or if it would be the responsibility of the property owner to maintain it after the initial installation.

4.2 Water Treatment Plant Upgrades

Upgrades are necessary to both of the water treatment plants, which are further discussed below.

4.2.1 New SCADA System

As discussed in Section 3.0, some upgrades to the two water treatment plants are necessary. The main priority is to upgrade the SCADA and plant control systems since the existing Allen Bradley system is obsolete and replacement parts are no longer manufactured. The system preferred by the system's operator is a PLC program migration from the Allen Bradley SLC to an Allen Bradley Control Logix setup. This system would could be controlled remotely through an ethernet connection with RF radio frequency. The system would be installed at both water plants. The SCADA system would also be tied into the Cemetery Avenue water tank as the current setup does not allow for full communication between the two WTPs and the water tank. The current setup only allows the operators to monitor tank level. The final specifications/design of the new SCADA and control system would be performed as part of the design/bidding process.

4.2.2 Fort Hardy WTP Redundant UV

Fort Hardy WTP requires a second UV to be installed to add required redundancy to the system. Redundant UVs are a NYSDOH requirement and therefore, installation of a second UV is considered priority. If the single UV unit were to fail and/or require maintenance, full disinfection of the water from the plant would not be possible. A second UV unit was

part of the original design plans for the WTP, but it was not installed for cost reasons. When the plant was constructed, space was left for a second UV to be installed (in the area of the blue piping), per Photo 1.

Photo 1- Fort Hardy UV Unit

Unfortunately, the existing UV unit's manufacturer is no longer in business, so it is not possible to install the same UV as the existing version. For the purposes of this master plan, options for different UV units for 200 gpm with a moderate UV transmission were assumed and the information provided in this report for informational and budgetary purposes only. Both Calgon and Trojan manufacture similar enclosed tube style UV units, with length of 2-3 feet, which would fit well in the existing piping arrangement. Appendix B contains brochures and cut sheets for the UV units. The BOWM may also look at replacing the existing UV unit entirely and installing two new UV units so that they are the same age, type and have a common control panel.

4.2.3 Victory WTP Improvements

Upgrades to the Victory WTP include:

- Enclosing and isolating the chlorine tank in an enclosure.
- Replace greensand filter media.
- Sandblasting and re-coating steel surfaces within the WTP.

There are many other maintenance-related items that need to be addressed at the Victory WTP, but those are items that are part of the system's maintenance program and are not larger capital costs covered under this Master Plan.

4.3 Water Main Replacement

The majority of the water mains within the Villages of Schuylerville and Victory are 100 to 120 years old and are well past their useful life. Figure 3 provides a condition assessment of the water mains and ranks them as poor/critical water mains, moderate and newer condition piping.

The newer condition piping are the ductile iron water mains, which were installed since the 1980's. The remaining water mains are all 100 to 120 years old, are all well past their useful life and thus require replacement. Prioritization of the water main replacement and phasing of the work is discussed in Section 5.0.

- Phase 1 Water Main Replacement (2020-2030): Approx. 17,000 feet or 28% of the system.
- Phase 2 Water Main Replacement (2030-2040): Approx. 24,000 feet or 40% of the system.

The remainder of the water mains in the system are not proposed to be replaced at this time. Piping installed in the 1980's has a typical life of 50-80 years depending on soil conditions, installation methods and maintenance.

Replacement of the water mains is recommended to be completed in different phases or work areas, which are further discussed in Section 5.0. This report assumes that the water mains will be replaced using traditional open cut methods on Village owned streets and directional drill/trenchless methods along NYSDOT and Saratoga County Roads. There are

some sections of parallel water mains on streets with 2" water lines as a secondary line. Some homes are connected to these small lines. The Master Plan assumes that these small diameter mains will be abandoned when the larger water main parallel to it is replaced and services established to the new water main.

Many of the older water mains in the system are 6-inch diameter or smaller. This is not sufficient for current firefighting standards. Any replacement of water mains would include a minimum of 8-inch DIP or HDPE pipe. Where the existing main is larger or is along a more critical loop, it is proposed to install a 12-inch main. These sections include the mains that feed the water treatment plants and tank.

5.0 PRIORITIZATION/CONSTRUCTION PHASING

The priority of the necessary upgrades or replacements to infrastructure within the Schuylerville-Victory water system were determined based upon several factors, including:

- Necessity of the project.
- Regulatory conditions or permit requirements.
- Public impact/number of customers impacted.
- Age/condition of the water main.
- Location of the water main.
- Critical nature of water main.
- Budget/project cost.

5.1 Priority Projects

Priority projects are items that should be addressed within the next five years, between 2020 and 2025 and include:

- Replace SCADA System: This item is considered immediate and should is recommended as a 2020 project.
- Install Second UV at Fort Hardy WTP: This item is considered an immediate priority and should be considered for a 2020 project as a redundant UV is required by

NYSDOH regulations. If the existing UV requires maintenance, the plant will not be able to meet the disinfection requirements.

- Pressure Zone Mitigation: This item is considered a 2 to 5 year project as the low system pressures are a burden on the customers in this part of the water system and has been an ongoing item of concern for the BOWM.

5.2 Water Main Replacements- 2020 to 2030

28% of the water system contains piping that is between 100 and 120 years old and are located in critical areas of the water system as shown on Figure 3. These pipes are in areas that connect the water treatment plants and/or the storage tank to the distribution system. Breaks in these mains would severely impact the ability of the water system to serve its customers, which is why this Master plan places them as critical or high priority.

Figure 4 provides mapping showing the water mains that are considered high priority that require replacement within the next 10 years. Figure 4 breaks out these water main replacements in to four manageable projects.

1. Project 1 will replace the water main from the Fort Hardy Park to NYS Route 29, crossing the Old Champlain Canal to the intersection with Broad Street. This crossing of the canal is an area prone to water main breaks. Project 1 also includes replacement of the water main on Gates Avenue/NYS Route 32 from Pearl Street to Pond Street. This area is a priority consideration for re-development of the mill property.

2. Project 2 will replace the water main on Cemetery Road from the water tank south to Pond Street, then continuing on NYS Route 32 to the Victory WTP.

3. Project 3 will replace the water main on US4/Broad Street. This is the main commercial corridor in the Village of Schuylerville. Water main breaks in this area disrupt businesses and traffic.

4. Project 4 will replace the water main on Green Street between Burgoyne Street and NYS Route 29. This is a 10-inch cast iron main that is the primary feed for the residential neighborhoods within the Village of Schuylerville.

5.3 Water Main Replacements- 2030 to 2040

40% of the water system contains piping that is between 100 and 120 years old and are located in less critical of the water system as shown on Figure 3. These pipes are well past their useful life but are not considered as critical as the water mains recommended for replacement under Phase 1. These areas serve Village streets and generally serve residential areas. Breaks in these mains are considered impactful to the residents on those specific streets, but the breaks would not impact the ability of the water system to function under normal conditions.

Figure 5 provides mapping showing the water mains that are considered critical that require replacement after 2030. Figure 5 breaks out these water main replacements in to five manageable projects.

1. Project 1 will replace the water line that serves residents in the Town of Easton. This includes replacement of the line over the two bridge crossings on the Hudson River. This line is prone to breaks but is not considered a high priority by the BOWM.

2. Project 2 will replace the remainder of the water mains in the Village of Victory not slated for replacement under Phase 1. These include Jay Street, Pine Street and Herkimer Street.

3. Project 3 will replace the water mains on Burgoyne Street, Monument Drive, Gates Avenue (Village portion), Pearl Street and Grove Street.

4. Project 4 will replace the water mains on portions of Pearl Street, Ferry Street, Church Street and Saratoga Street.

5. Project 5 will replace the water mains on the side streets in the Village of Schuylerville directly off US 4.

5.4 Victory WTP Improvements

The improvements proposed for the Victory WTP are not considered high priority when compared with the need to replace the SCADA system and install a redundant UV at the Fort Hardy WTP. For this reason, the Victory WTP improvements are suggested in the 2025-2030 time period.

6.0 PROJECT COST OPINIONS

Estimated construction cost opinions for the projects to be built under publicly bid construction contracts are provided in Appendix C. These costs are based upon quotations from manufacturers for the water treatment plant and pressure zone mitigation work. The water main replacement project cost opinions are based upon the results of recently designed and constructed projects overseen by C.T. Male in similar market areas. For the anticipated construction year, the costs were escalated from 2020 dollars by 3% per year. ***The costs presented below are for the construction year[1].***

The cost opinion suggested for budgeting purposes for the work is as follows:

- Fort Hardy WTP Improvements (SCADA and UV): $334,000
- Victory WTP Improvements (SCADA and Misc. Work): $172,500
- Pressure Zone Mitigation: $635,000
- Phase 1 Water Main Replacement: $5.86 million
- Phase 2 Water Main Replacement: $10.6 million

[1] See Appendix B for the construction year. Phase 1 water main replacement assumes an average construction year of 2025. Phase 2 water main replacement assumes an average construction year of 2035.

FIGURES

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PROJECT NUMBER: 19.9155

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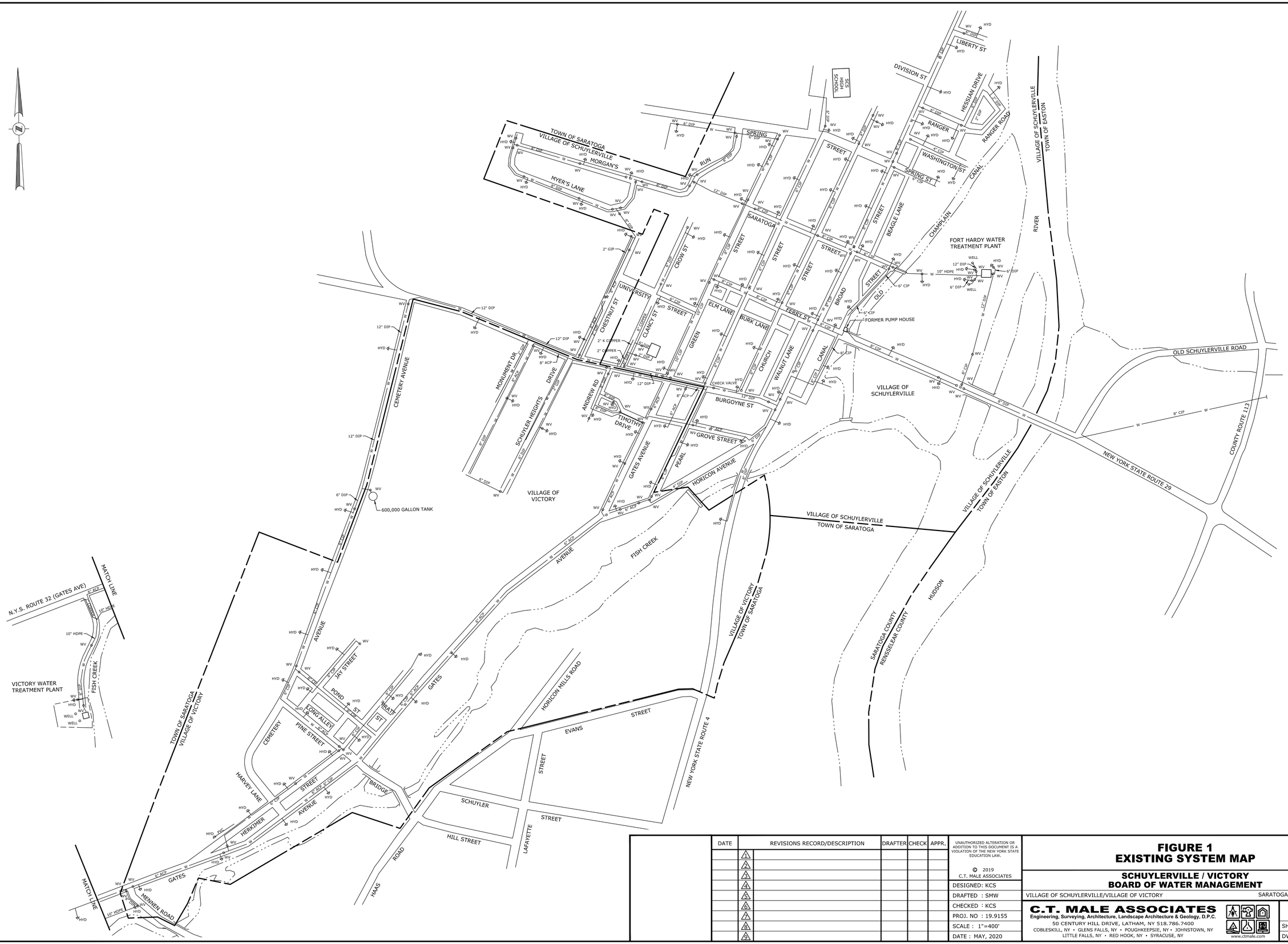

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FIGURE 1
EXISTING SYSTEM MAP

SCHUYLERVILLE / VICTORY BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

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FIG-1
SHEET 1 OF 7
DWG. NO: 20-0174

XREFS: NONE

PROJECT NUMBER: 19.9155

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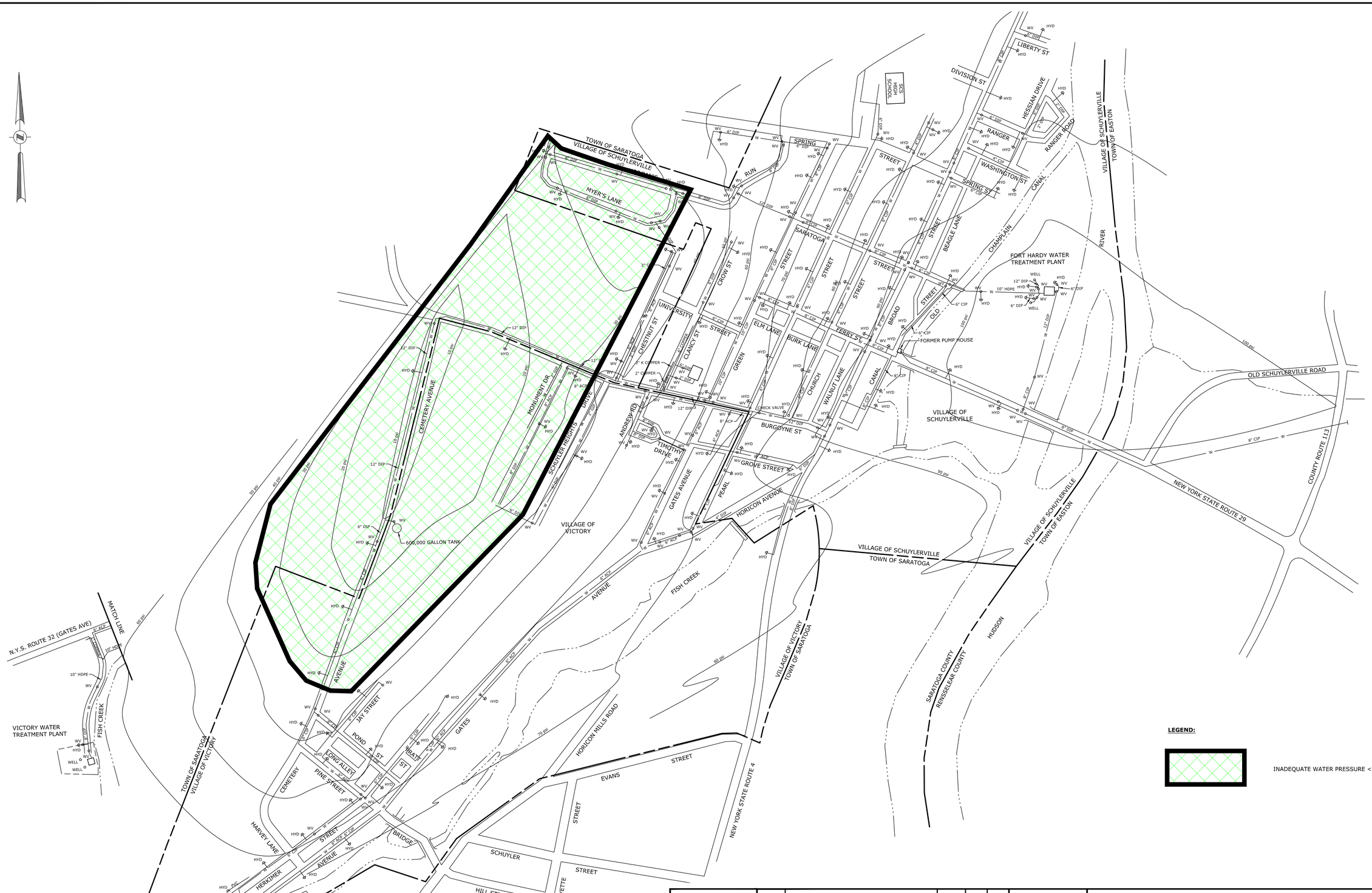
CAD DWG. FILE NAME: K:\Projects\19915\Civil\Drawings-Maps\FIGURE 2.dwg



LEGEND:

INADEQUATE WATER PRESSURE <35 PSI

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FIGURE 2
EXISTING PRESSURE CONTOURS

SCHUYLERVILLE / VICTORY BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

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FIG-2
SHEET 2 OF 7
DWG. NO: 20-0174

XREFS: NONE

PROJECT NUMBER: 19.9155

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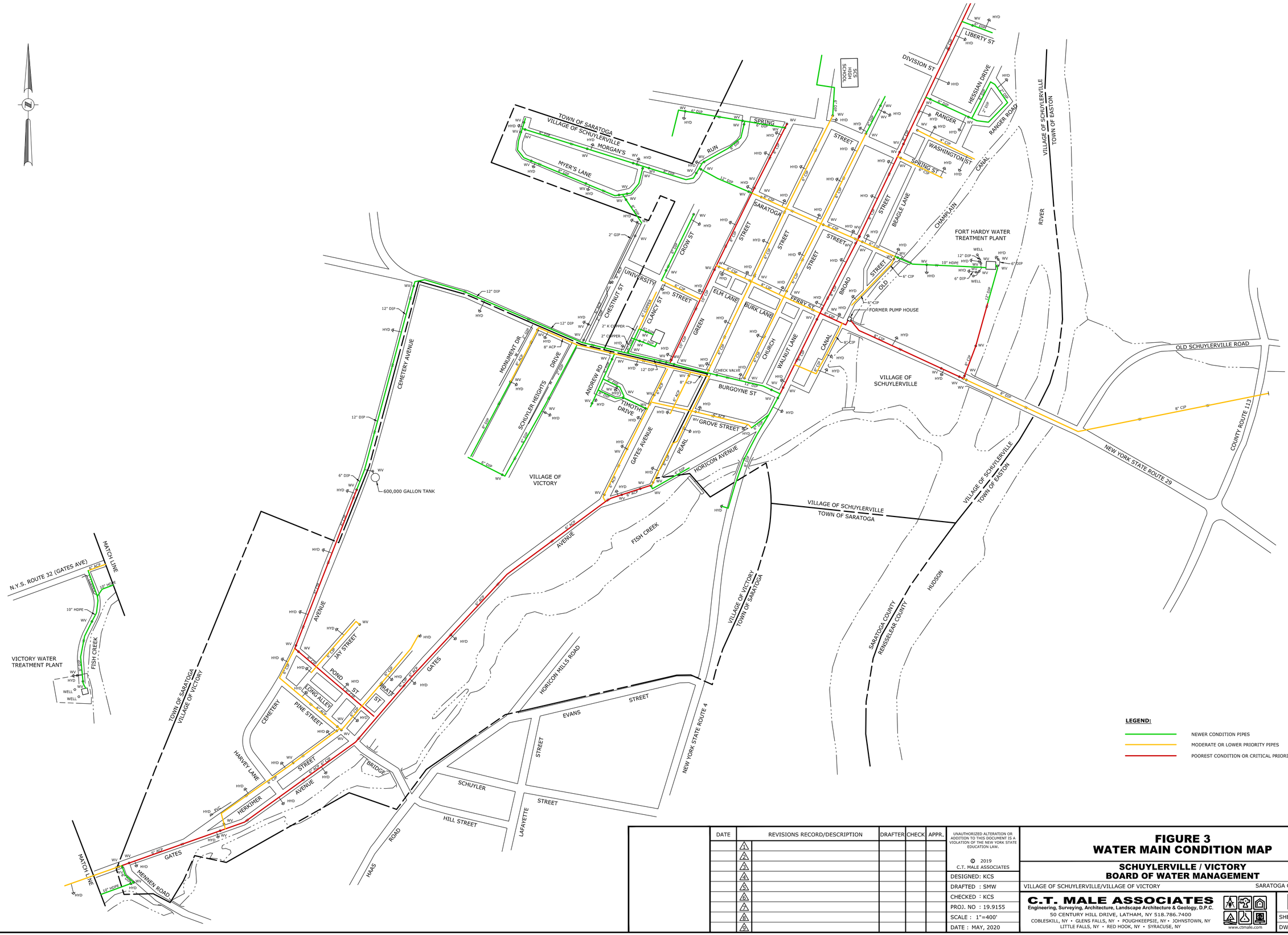

LEGEND:

- NEWER CONDITION PIPES
- MODERATE OR LOWER PRIORITY PIPES
- POOREST CONDITION OR CRITICAL PRIORITY PIPES

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FIGURE 3
WATER MAIN CONDITION MAP

SCHUYLERVILLE / VICTORY
BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

C.T. MALE ASSOCIATES
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FIG-3

SHEET 3 OF 7

DWG. NO: 20-0174

XREFS: NONE

PROJECT NUMBER: 19.9155

CAD DWG. FILE NAME: FIGURE 4.dwg

NOTES:

1. WATER MAIN SHOWN IN "RED" ARE LINES THAT SHOULD BE REPLACED IN THE FIRST 10 YEARS OF THE BOWM MASTER PLAN.
2. PHASE 1 REPLACEMENT IS BROKEN INTO 4 PROJECTS.
3. PROJECT 1 REPLACE WATER MAIN ACROSS CANAL TO FORT HARDY WTP AND WATER MAIN ON GATES AVE/RTE 32 FROM POND STREET TO PEARL STREET.
4. PROJECT 2 REPLACE WATER MAIN FROM CEMETERY ROAD TANK TO VICTORY WTP.
5. PROJECT 3 REPLACE WATER MAINS ON BROAD STREET/US 4.
6. PROJECT 4 REPLACE WATER MAINS ON GREEN STREET.

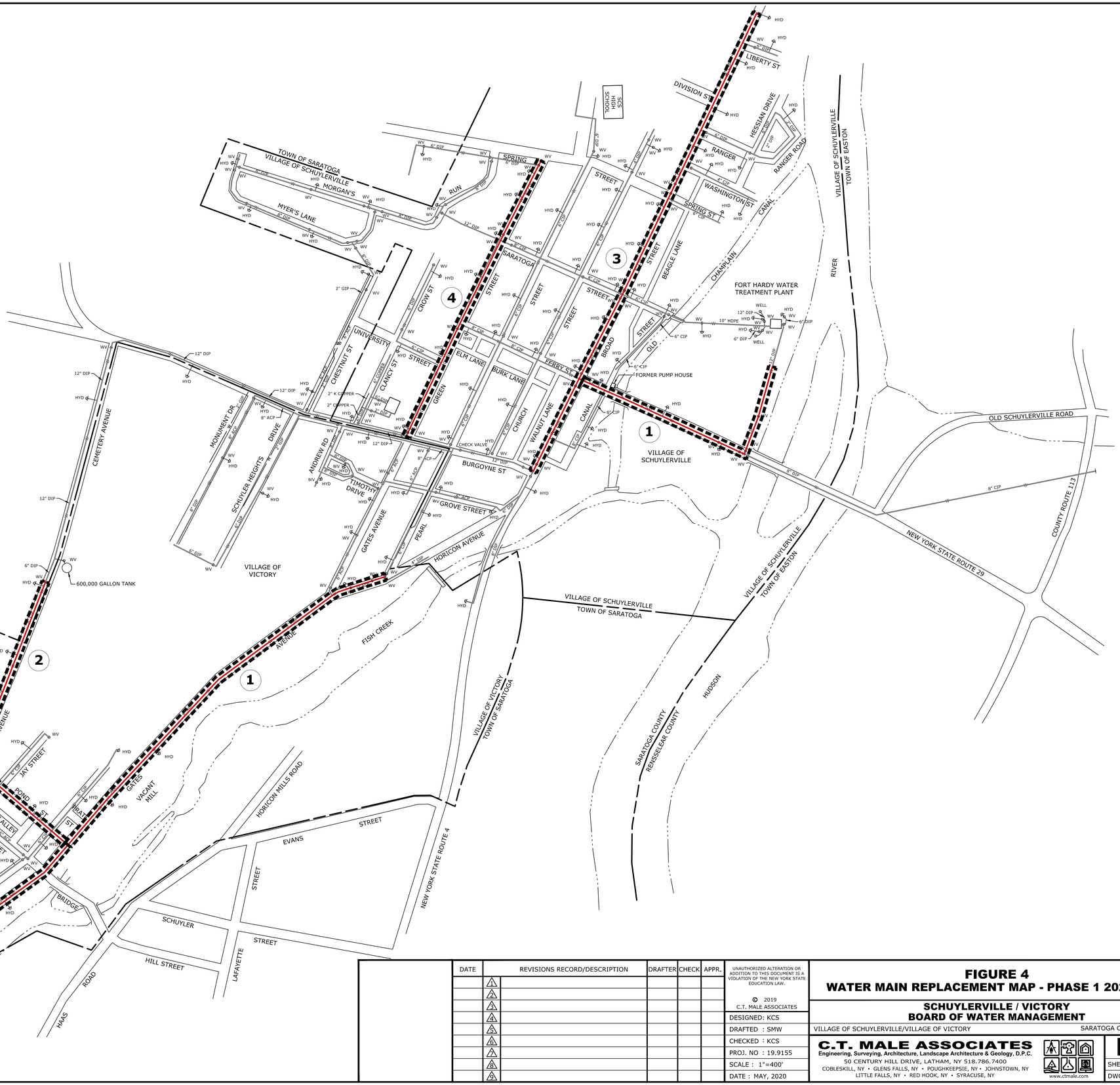

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FIGURE 4
WATER MAIN REPLACEMENT MAP - PHASE 1 2020-2030

SCHUYLERVILLE / VICTORY
BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

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FIG-4

SHEET 4 OF 7

DWG. NO: 20-0174

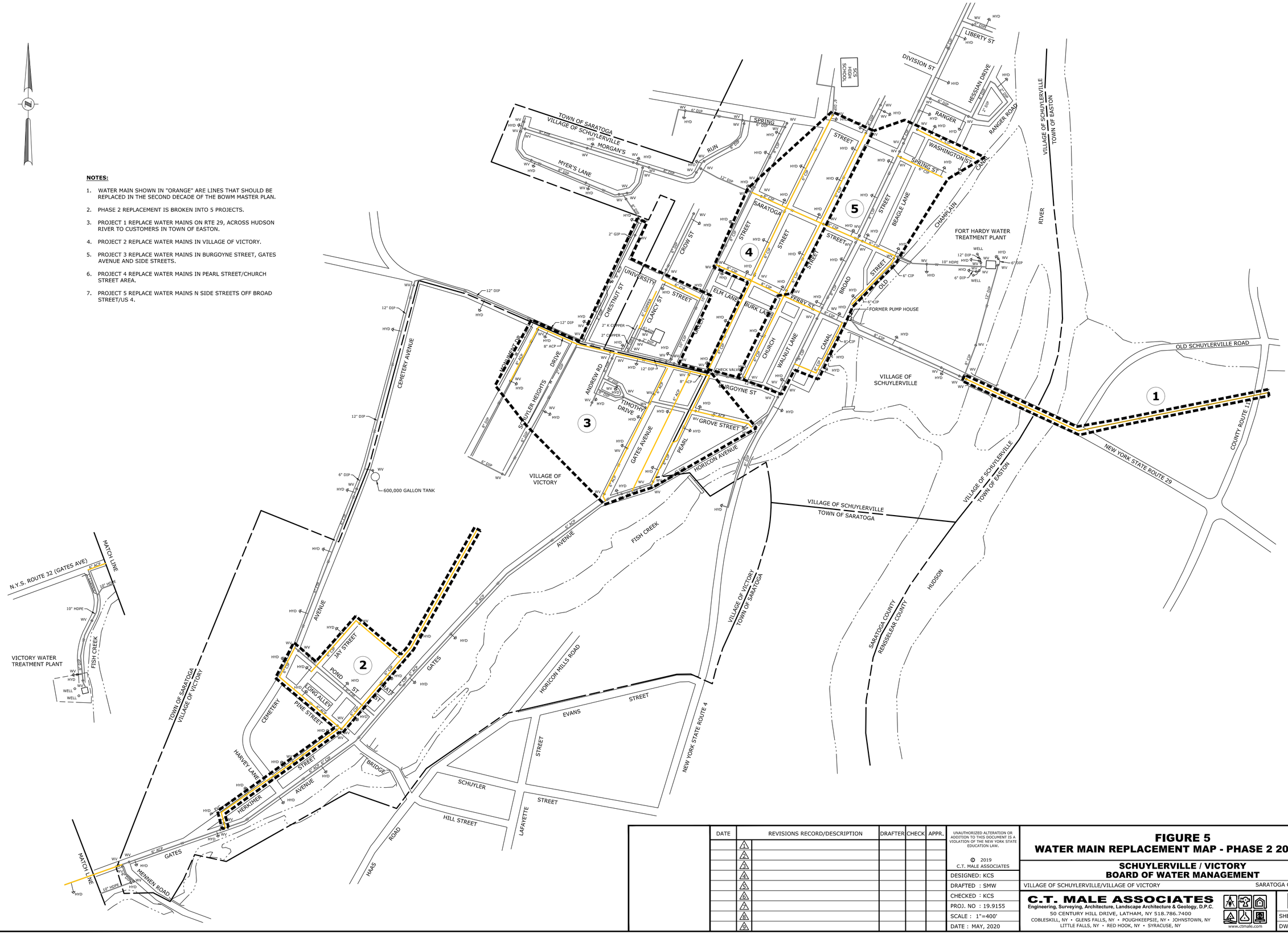
XREFS: NONE

PROJECT NUMBER: 19.9155

CAD DWG. FILE NAME: FIGURE 5.dwg

NOTES:

1. WATER MAIN SHOWN IN "ORANGE" ARE LINES THAT SHOULD BE REPLACED IN THE SECOND DECADE OF THE BOWM MASTER PLAN.
2. PHASE 2 REPLACEMENT IS BROKEN INTO 5 PROJECTS.
3. PROJECT 1 REPLACE WATER MAINS ON RTE 29, ACROSS HUDSON RIVER TO CUSTOMERS IN TOWN OF EASTON.
4. PROJECT 2 REPLACE WATER MAINS IN VILLAGE OF VICTORY.
5. PROJECT 3 REPLACE WATER MAINS IN BURGOYNE STREET, GATES AVENUE AND SIDE STREETS.
6. PROJECT 4 REPLACE WATER MAINS IN PEARL STREET/CHURCH STREET AREA.
7. PROJECT 5 REPLACE WATER MAINS N SIDE STREETS OFF BROAD STREET/US 4.



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DESIGNED: KCS
DRAFTED : SMW
CHECKED : KCS
PROJ. NO : 19.9155
SCALE : 1"=400'
DATE : MAY, 2020

FIGURE 5
WATER MAIN REPLACEMENT MAP - PHASE 2 2030-2040

SCHUYLERVILLE / VICTORY BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 518.786.7400
COBLESKILL, NY • GLENS FALLS, NY • POUGHKEEPSIE, NY • JOHNSTOWN, NY
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FIG-5

SHEET 5 OF 7

DWG. NO: 20-0174

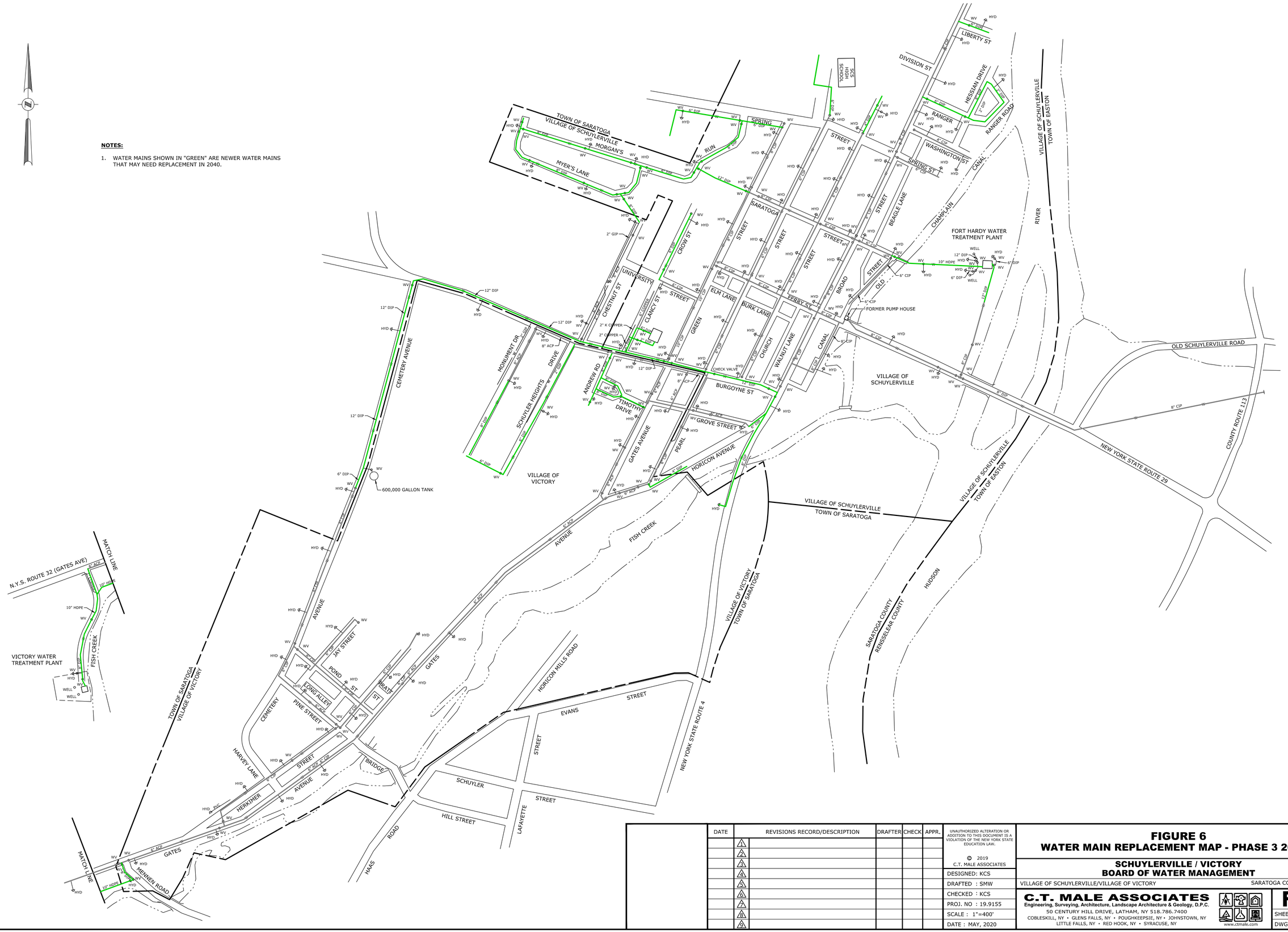
XREFS: NONE

PROJECT NUMBER: 19.9155

CAD DWG. FILE NAME: FIGURE 6.dwg

NOTES:

1. WATER MAINS SHOWN IN "GREEN" ARE NEWER WATER MAINS THAT MAY NEED REPLACEMENT IN 2040.



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DESIGNED: KCS
DRAFTED : SMW
CHECKED : KCS
PROJ. NO : 19.9155
SCALE : 1"=400'
DATE : MAY, 2020

FIGURE 6
WATER MAIN REPLACEMENT MAP - PHASE 3 2040 +

SCHUYLERVILLE / VICTORY BOARD OF WATER MANAGEMENT

VILLAGE OF SCHUYLERVILLE/VILLAGE OF VICTORY — SARATOGA COUNTY, NEW YORK

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FIG-6

SHEET 6 OF 7

DWG. NO: 20-0174

CAD DWG. FILE NAME: K:\Projects\19915S\Civil\Drawings-Maps\FIGURE 6.dwg

XREFS: NONE

PROJECT NUMBER: 19.9155

CAD DWG. FILE NAME: FIGURE 7.dwg

MORGAN'S RUN BOOSTER PUMP

MONUMENT DRIVE BOOSTER PUMP

CLOSE VALVE

CLOSE VALVE

600,000 GALLON TANK

FORT HARDY WATER TREATMENT PLANT

FORMER PUMP HOUSE

VICTORY WATER TREATMENT PLANT

VILLAGE OF VICTORY

VILLAGE OF SCHUYLERVILLE

TOWN OF SARATOGA

VILLAGE OF SCHUYLERVILLE

TOWN OF EASTON

VILLAGE OF SCHUYLERVILLE

TOWN OF SARATOGA

VILLAGE OF VICTORY

TOWN OF SARATOGA

SARATOGA COUNTY

RENSSELEAR COUNTY

HUDSON

RIVER

FISH CREEK

CANAL

MORGAN'S RUN

MYER'S LANE

SPRING RUN

SSCS HIGH SCHOOL

LIBERTY ST

DIVISION ST

HESSIAN DRIVE

RANGER

RANGER ROAD

WASHINGTON ST

SPRING ST

STREET

BEAGLE LANE

CHAMPLAIN

SARATOGA

UNIVERSITY

CHESTNUT ST

CLANCY ST

CROW ST

ELM LANE

BURK LANE

GREEN

CHURCH

WALNUT LANE

PERRY ST

BROAD

OLD

MONUMENT DR.

SCHUYLER HEIGHTS DRIVE

TIMOTHY DRIVE

ANDREW RD

BURGOYNE ST

GROVE STREET

PEARL

GATES AVENUE

HORICON AVENUE

CEMETERY AVENUE

OLD SCHUYLERVILLE ROAD

NEW YORK STATE ROUTE 29

COUNTY ROUTE 113

N.Y.S. ROUTE 32 (GATES AVE)

MATCH LINE

JAY STREET

POND ST

LONG ALLEY

PINE STREET

CEMETERY

HARVEY LANE

HERKIMER

MENNEN ROAD

GATES

HORICON MILLS ROAD

EVANS

SCHUYLER

LAFAYETTE

HILL STREET

HAAS ROAD

BRIDGE

NEW YORK STATE ROUTE 4

LEGEND:

AREAS TO BE SERVED OFF BOOSTER PUMPS. INCREASED PRESSURE TO 60-70 PSI

INSTALL INDIVIDUAL BOOSTER PUMPS AND HYDROPNEUMATIC TANKS AT EACH BUILDING

DATE	REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
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DRAFTED : SMW

CHECKED : KCS

PROJ. NO : 19.9155

SCALE : 1"=400'

DATE : MAY, 2020

FIGURE 7
PRESSURE ZONE IMPROVEMENT MAP

SCHUYLERVILLE / VICTORY BOARD OF WATER MANAGEMENT

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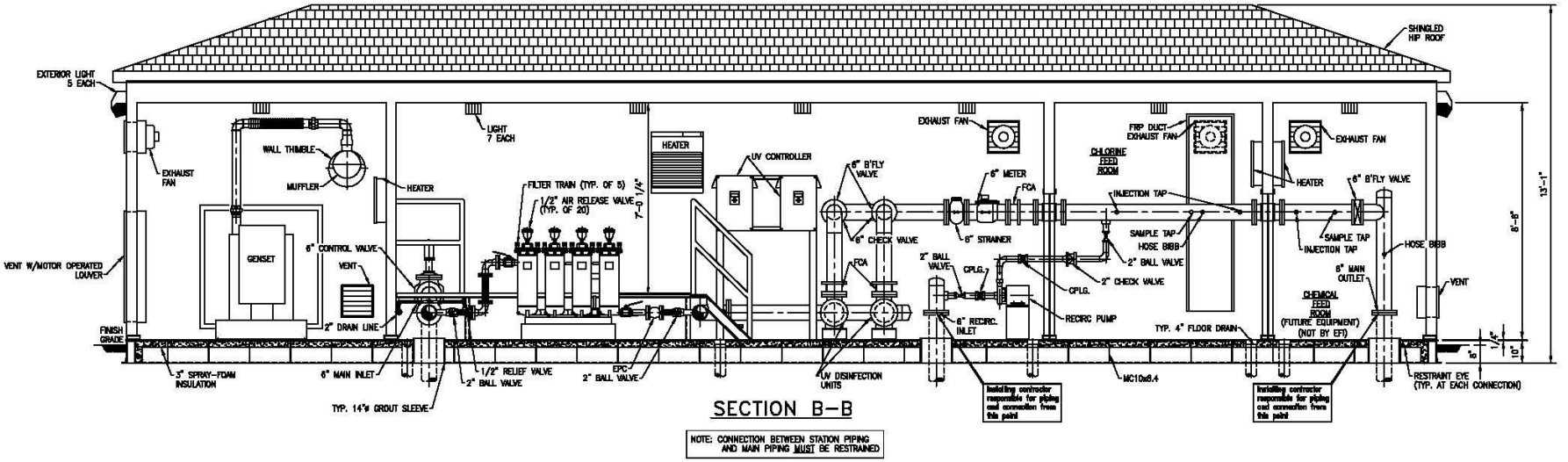
FIG-7

SHEET 7 OF 7

DWG. NO: 20-0174

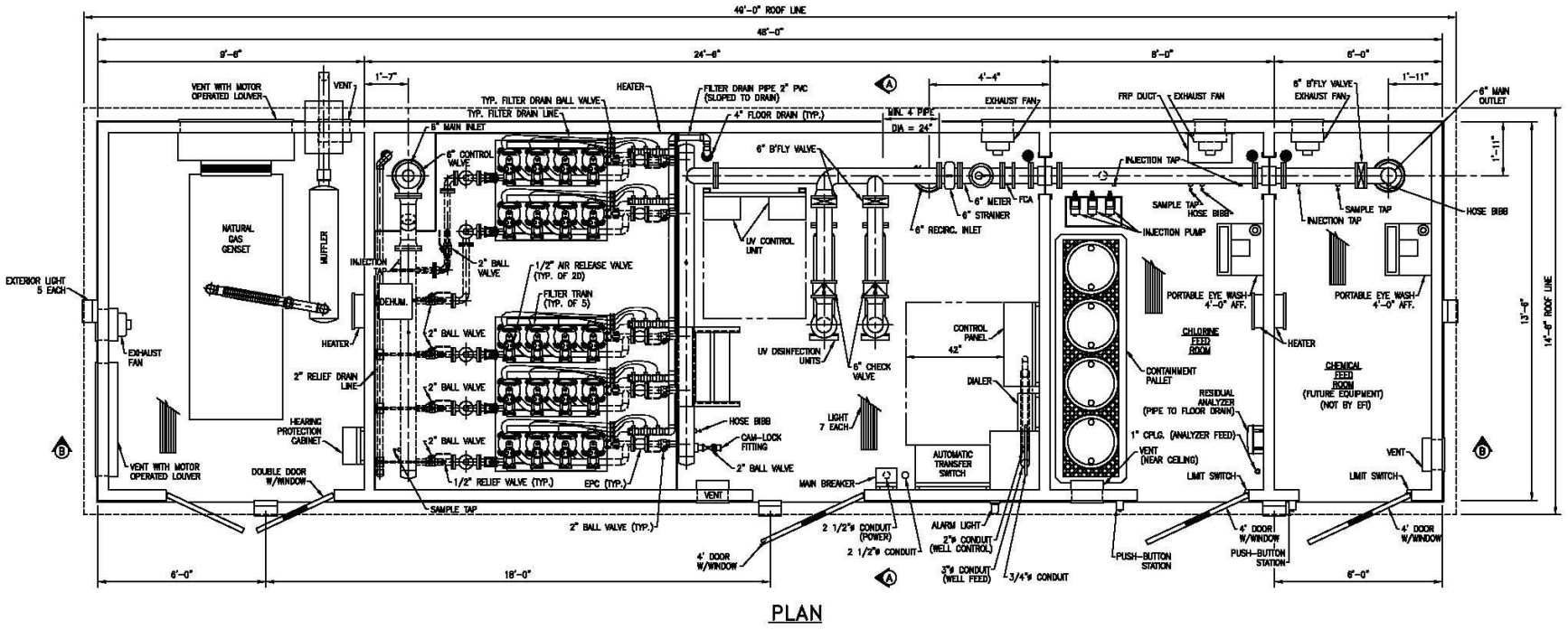
CAD DWG. FILE NAME: K:\Projects\19955\Civil\Drawings-Maps\FIGURE 7.dwg

APPENDIX A
BOOSTER PUMP STATION SCHEMATICS



SECTION B–B

NOTE: CONNECTION BETWEEN STATION PIPING AND MAIN PIPING MUST BE RESTRAINED


49'-0" ROOF LINE
48'-0"
9'-6"
24'-6"
8'-0"
6'-0"
1'-7"
4'-4"
1'-11"
VENT WITH MOTOR OPERATED LOUVER
VENT
TYP. FILTER DRAIN BALL VALVE
TYP. FILTER DRAIN LINE
HEATER
FILTER DRAIN PIPE 2" PVC (SLOPED TO DRAIN)
4" FLOOR DRAIN (TYP.)
MIN. 4 PIPE DIA = 24"
EXHAUST FAN
FRP DUCT
EXHAUST FAN
6" B'FLY VALVE
EXHAUST FAN
6" MAIN OUTLET
6" MAIN INLET
6" CONTROL VALVE
6" B'FLY VALVE
INJECTION TAP
6" METER
FCA
6" STRAINER
6" RECIRC. INLET
SAMPLE TAP
HOSE BIBB
INJECTION TAP
SAMPLE TAP
HOSE BIBB
INJECTION PUMP
NATURAL GAS GENSET
MUFFLER
UV CONTROL UNIT
EXTERIOR LIGHT 5 EACH
INJECTION TAP
DEHUM.
2" BALL VALVE
1/2" AIR RELEASE VALVE (TYP. OF 20)
FILTER TRAIN (TYP. OF 5)
PORTABLE EYE WASH 4'-0" AFF.
PORTABLE EYE WASH 4'-0" AFF.
13'-6"
14'-6" ROOF LINE
EXHAUST FAN
HEATER
2" BALL VALVE
UV DISINFECTION UNITS
6" CHECK VALVE
CONTROL PANEL
42"
CHLORINE FEED ROOM
HEATER
2" RELIEF DRAIN LINE
2" BALL VALVE
DIALER
CONTAINMENT PALLET
CHEMICAL FEED ROOM
(FUTURE EQUIPMENT)
(NOT BY EFI)
RESIDUAL ANALYZER (PIPE TO FLOOR DRAIN)
HEARING PROTECTION CABINET
2" BALL VALVE
LIGHT 7 EACH
HOSE BIBB
CAM-LOCK FITTING
2" BALL VALVE
1" CPLG. (ANALYZER FEED)
VENT (NEAR CEILING)
VENT WITH MOTOR OPERATED LOUVER
DOUBLE DOOR W/WINDOW
1/2" RELIEF VALVE (TYP.)
EPC (TYP.)
AUTOMATIC TRANSFER SWITCH
MAIN BREAKER
VENT
LIMIT SWITCH
LIMIT SWITCH
VENT
SAMPLE TAP
2" BALL VALVE (TYP.)
2 1/2"ø CONDUIT (POWER)
2 1/2"ø CONDUIT
ALARM LIGHT
2"ø CONDUIT (WELL CONTROL)
3"ø CONDUIT (WELL FEED)
3/4"ø CONDUIT
4' DOOR W/WINDOW
4' DOOR W/WINDOW
4' DOOR W/WINDOW
PUSH-BUTTON STATION
PUSH-BUTTON STATION
6'-0"
18'-0"
6'-0"

PLAN


CM
E
F
I
Excellence
From
Innovation
To provide the highest quality products
in order to exceed customer expectations
EXIT


Prime Wrap
Moisture Barrier


Power
Generation

APPENDIX B
UV BROCHURES

TROJAN UV SWIFT™ SC

DRINKING WATER TREATMENT

Water Confidence for Communities Large & Small

Trojan's proven UV solutions provide validated, cost-effective disinfection

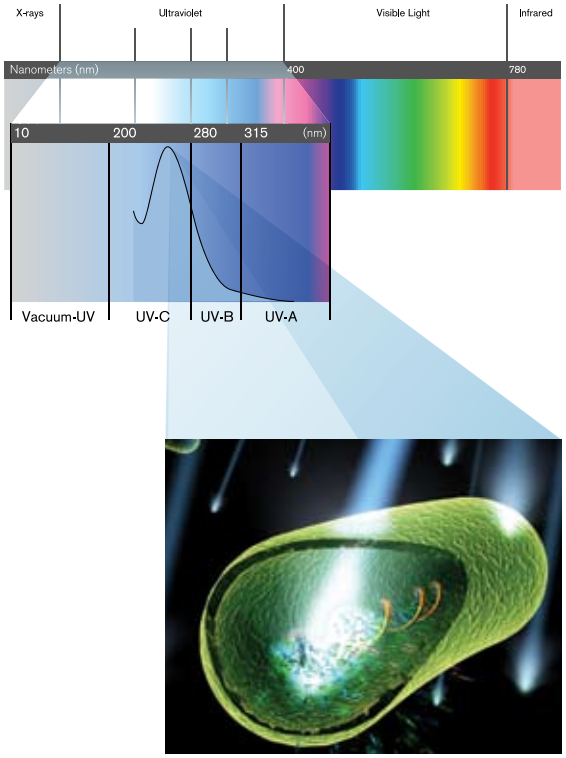
Trojan Technologies is an ISO 9001: 2000 registered company and for more than 25 years has set the standard for proven UV technology and ongoing innovation. With unmatched scientific and technical expertise, and a global network of specialists, representatives and technicians, Trojan is trusted more than any other firm as the best choice for municipal UV solutions – worldwide. The TrojanUVSwift™SC is one of the reasons why. With units designed to treat flow rates of 15 GPM to 15.4 MGD (0.6 to 2430 m^3/hr), these compact, robust UV systems offer communities an efficient, economical solution for drinking water disinfection. Like all Trojan drinking water products, the TrojanUVSwift™SC is bioassay validated, having undergone rigorous DVGW and USEPA certification to ensure verified dose delivery, maximum public safety and peace of mind.

It's engineered and built to provide reliable performance, simplified maintenance, and reduced operating costs with innovative features like a hydraulically optimized, "L-shaped" reactor, high-intensity amalgam lamps and optional automatic or manual sleeve wiping.

The Benefits of UV

Broad-spectrum, cost-effective protection that offers unparalleled safety

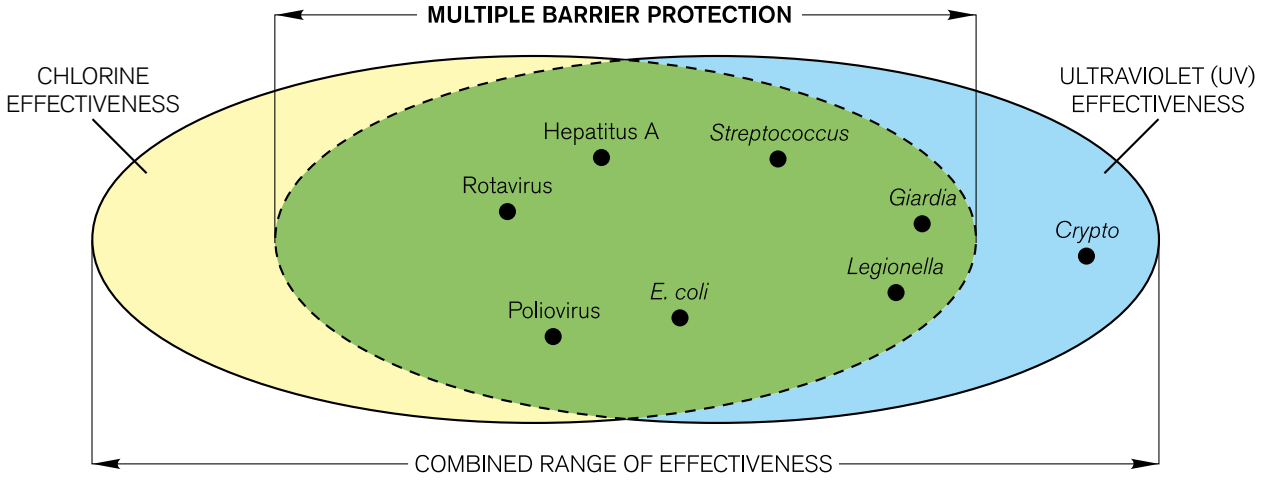
- UV light is an environmentally-friendly, chemical-free way to safeguard water against harmful pathogens
- Proven in thousands of installations, UV is widely accepted and endorsed worldwide for disinfection of drinking water
- UV offers broad-spectrum protection against a wide range of pathogens, including bacteria, viruses, and chlorine-resistant protozoa
- UV treatment provides *Cryptosporidium* and *Giardia* inactivation of up to 4-log at low doses
- UV is a reliable, cost-effective part of a multi-disinfectant treatment strategy often used in conjunction with chlorine to provide a dual barrier
- UV does not create disinfection by-products (DBPs) and does not affect taste
- At approximately 1/5 the cost of ozone disinfection and 1/10 the cost of membrane filtration, UV is the most cost-effective approach for multi-barrier treatment strategies



Ultraviolet light is invisible to the human eye, but a highly effective, chemical-free way of inactivating microorganisms in water. UV light penetrates the cell wall of the microorganism and alters its DNA so it can no longer reproduce or cause infection.

Benefits of a Multiple Barrier Treatment Approach

- UV offers a cost-effective, secondary barrier of protection to safeguard drinking water against virtually all microorganisms treated by chlorine – as well as proven inactivation of chlorine-resistant protozoa, including *Cryptosporidium* and *Giardia*. Dual barrier treatment using UV provides significantly greater community safety and reduced liability risk for municipalities



TROJAN UVSWIFT™ SC

Designed for efficient performance

Amalgam Lamps

Utilizes high-output amalgam lamps. Each is located within its own protective quartz sleeve and supported by a removable, sleeve holder assembly. Designed for easy lamp replacement.

UV Sensor

Highly accurate, DVGW approved, photodiode sensor monitors UV output within the reactor. Mounted within the sensor port on the side wall of the reactor for easy access.

Sleeve Wiping System

Optional manual or automatic systems available; both operate online, without interrupting disinfection. Fluorocarbon wipers are mounted in stainless steel yoke around the quartz sleeve of each lamp. The manual system is driven by hand using an external handle. The automatic system allows cleaning at preset intervals using a motor driven wiper assembly.

UV Reactor

Type 316L stainless steel. Can be installed vertically or horizontally. Reactor configurations are available with multiple inlet/outlet diameters. Rated to 150 PSI (10 BAR). A drain port is located opposite the outlet flange.

Control Panel (CP)

Epoxy-painted, carbon steel cabinet is designed for indoor, wall-mount installation. Houses a microprocessor-based controller with I/O connection points, and electronic power supplies. Distributes power to the UV reactor as well as the UV sensor and optional automatic wiping system. UV intensity, lamp elapsed time and lamp status are continuously monitored and displayed on the operator interface, located on the control panel door.

Remote Monitoring & Control

Robust microprocessor-based controller provides standard input/out signals for on/off control from a remote location. Programmable digital and analog I/O capabilities can generate unique alarms for individual applications, and send signals to operate valves and pumps. All units feature optional SCADA communication via ModBus for remote monitoring and control, and D-Series systems offer dose pacing.

Key Benefits
TrojanUVSwift™SC

Proven performance – full bioassay validation. TrojanUVSwift™SC systems meet the stringent, internationally-recognized standards of DVGW and USEPA – having undergone comprehensive validation at a wide range of flow rates and UV transmittance levels.

Assurance of NSF 61 compliance. TrojanUVSwift™SC systems meet the stringent standards of NSF International.

Compact footprint for installation flexibility. The TrojanUVSwift™SC can handle maximum flow capacity in minimal space. Its compact design allows it to be installed vertically or horizontally in restrictive spaces, thereby lowering installation costs. The system can even be installed immediately after a 90° elbow and other upstream piping configurations.

Fewer lamps required to treat a given flow. Trojan's use of efficient, high-intensity amalgam lamps minimizes the lamps, seals, and maintenance to meet dose delivery requirements.

Sleeve wiping system reduces maintenance costs. The TrojanUVSwift™SC can be equipped with a highly effective manual or fully automated sleeve wiping system to minimize the frequency and costs of cleaning. Both options work while the UV unit is online and disinfecting.

Designed for maximum operating efficiency. High-efficiency, electronic ballasts ensure cost-effective operation. Trojan's high-capacity D-Series models can be equipped with optional dose pacing that adjusts lamp output to match dose to actual disinfection requirements – minimizing operating costs and extending lamp life.

Local service. Global support. Trojan's comprehensive network of certified service providers offers ongoing maintenance programs and fast response for service and spare parts.

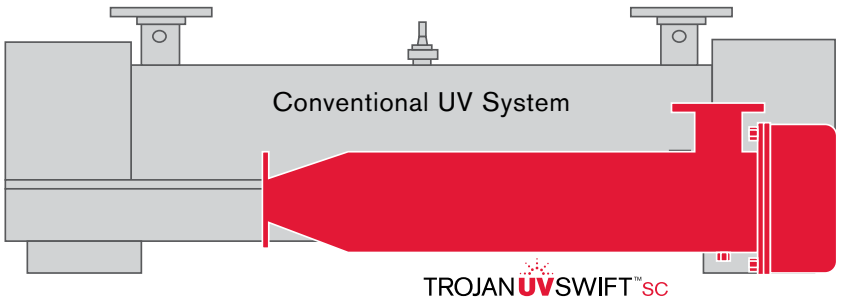
Guaranteed performance and comprehensive warranty. Trojan systems include a Performance Guarantee and comprehensive protection for your investment. Ask for details.

Compact Reactor for Installation Flexibility

Efficient, cost-saving design can be installed vertically or horizontally

Benefits:

- Compact footprint simplifies installation and minimizes related capital costs – making it ideal for retrofit applications into existing water treatment plants
- Engineered to fit into restrictive pipe galleries
- Designed for horizontal or vertical installation to allow maximum flexibility
- Lamps and sleeves are fully serviceable from one side – allowing the system to be installed tight to walls, other equipment or piping
- Validated with a 90° elbow installed immediately before the reactor to ensure consistent dose delivery – even under challenging hydraulic conditions created by upstream piping
- "L-shaped" reactor design is 40% more efficient than "U-shaped" systems
- Low head-loss design simplifies integration into existing processes, and minimizes the need for additional pumps and their associated capital and operating costs
- Compact wall-mounted control panel can be located up to 82' (25 m) from the reactor



The highly efficient "L-shaped" design and LPHO amalgam lamps result in an extremely compact footprint, as shown in the size comparison with a conventional "U-shaped" low-pressure system – both of which are capable of treating approximately 175 GPM (40 m^3/hr) at 90% UVT.

Developed using advanced Computational Fluid Dynamic (CFD) modeling, and incorporating high-output amalgam lamps, the TrojanUVSwift™SC is extremely space efficient. Its compact footprint allows the system to be integrated into restrictive pipe galleries of water treatment facilities – vertically or horizontally – reducing installation costs and eliminating the need for additions to buildings.

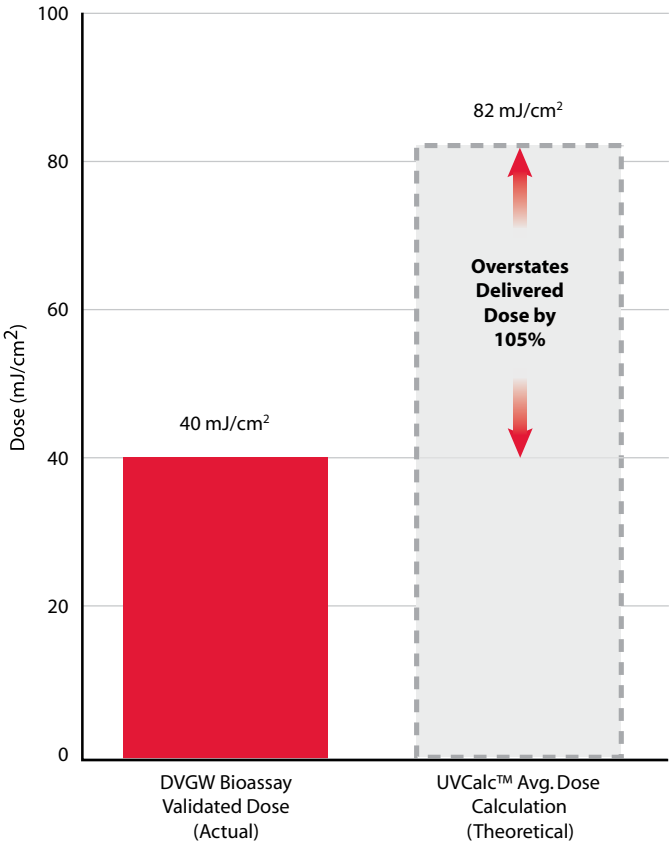
Bioassay Validated Performance

In-field testing ensures public safety over wide range of operating conditions

Benefits:

- All TrojanUVSwift™SC units are certified for source water of various qualities, having been DVGW bioassay tested under a range of UV transmittances (UVT) and flow rates
- The stringent standards of Deutsche Vereinigung des Gas und Wasserfaches e.v. – German Association of Gas and Water (DVGW) are recognized by the USEPA and internationally
- Bioassay performance data for the TrojanUVSwift™SC line was generated under the worst-case orientation – with a 90° elbow at the inlet
- Bioassay validation is widely endorsed as the evaluation standard for UV technologies because it provides the most accurate assessment of equipment sizing needs to ensure public health protection
- Theoretical calculations can significantly overstate dose, jeopardizing water quality and community safety
- Trojan systems meet the stringent standards of NSF International, fully complying with NSF 61

Actual Delivered Dose vs. Theoretical Dose Calculation (at 225 GPM)



The graph above highlights an actual comparison of DVGW bioassay validation results with theoretical dose calculations using UVCalc™ for a TrojanUVSwift™SC at a flow rate of 225 GPM. The theoretical calculation overstates the delivered dose by 105%. Had a drinking water system been selected based on the results of the calculated dose, public safety could be seriously compromised.

DVGW

NSF International

Energy Efficient, High-Output Amalgam Lamps

Need for fewer lamps reduces capital and O&M costs

Efficient, low-pressure, high-output amalgam lamps allow TrojanUVSwift™SC systems to deliver the required UV dose with fewer lamps and lower operating costs.

Benefits:

- The TrojanUVSwift™SC requires 1/2 to 1/3 fewer lamps to deliver the required dose compared to traditional UV systems using low-pressure lamps
- With fewer lamps, the TrojanUVSwift™SC is very compact and can be located in small spaces, reducing installation costs
- Trojan high-efficiency, amalgam lamps draw less energy than competitive high-output systems – minimizing operating costs
- Fewer lamps means reduced annual maintenance costs for lamp change-outs

Robust Sleeve Wiping Systems

Optional manual or automatic wiping ensures consistent dose delivery

The optional wiping systems reduce maintenance costs. Operators have a choice of the manual system that is operated by hand, or motorized system (shown above) which can be programmed to wipe automatically at preset intervals.

Benefits:

- Wiping systems minimize fouling of the quartz sleeves
- Ensure consistent UV dose delivery for maximum public safety
- Systems operate online while the lamps are disinfecting, reducing downtime
- Automatic wiping system can be programmed to wipe lamp sleeves at preset intervals

User-Friendly Digital Controller

Intuitive system provides at-a-glance system status and allows remote operation

The TrojanUVSwift™SC controller and high efficiency electronic ballasts have been proven in thousands of installations. The Control Panel features a user-friendly digital interface, and can be mounted up to 82 ft (25 m) from the reactor.

Benefits:

- Robust, microprocessor-based controller combines extensive functionality with an operator-friendly, digital interface
- Display provides at-a-glance, real-time system status information
- Programmable digital and analog I/O capabilities allow remote on/off control and alarm code differentiation for fast identification of changes in system status
- Optional dose pacing on high capacity D-Series systems minimizes energy use while maintaining required dose
- Optional ModBus protocol communicates with plant SCADA system for centralized monitoring of UV performance, lamp status, power levels and other parameters

Designed for Easy Maintenance

Operator-friendly design for easy routine maintenance

The TrojanUVSwift™SC design simplifies maintenance procedures. For example, lamp changeovers require no tools and take less than five minutes per lamp.

Benefits:

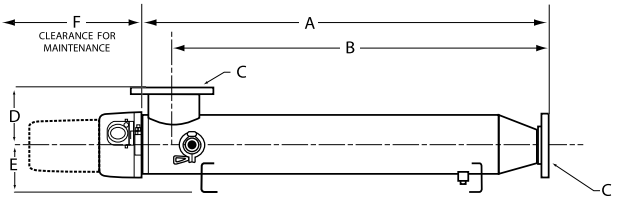
- Single-ended UV lamps simplify annual replacement
- Lamps require less than 5 minutes each to change – without tools or need to drain the reactor
- Externally mounted sensor allows easy access
- Optional automatic or manual sleeve wiping system reduces the frequency, inconvenience and cost of manual cleaning

TROJAN UVSWIFT™ SC

System Specifications

Model #	A02	B03	B04	B06	B08	D06	D12	D30
Maximum Validated Disinfection Flow Rate (98% UVT 40 mJ/cm²): GPM (m³/hr)	57 (13)	132 (30)	185 (42)	330 (75)	577 (131)	1190 (270)	2555 (580)	10695 (2430)*
UVT Range	Nominal range of 80% to 98%					70% to 98%		
Number of Lamps:	2	3	4	6	8	6	12	30
Electrical Requirements:								
Standard Voltage	120	208 to 240 Volt, single phase, 2 wire + GND, 60 Hz L-L, 50 Hz L-N						
Connected / Operating Power (W) Single Phase	320 / 320	1060 / 510	1310 / 660	1810 / 960	2310 / 1260	1810 / 1560	3300 / 3060	7810 / 7560
Ballast Type	Electronic, Constant Power					Electronic, Variable Power		
Sensors:								
Sensors Per Reactor (1 per 10 lamps, as per DVGW)	1						2	3/1*
Control Panel:								
Materials of Construction	Painted Mild Steel (Gray)							
Dimensions: inches	16 x 14 x 6	24 x 16 x 10	24 x 16 x 10	24 x 16 x 10	24 x 24 x 10	24 x 16 x 10	24 x 24 x 10	48 x 36 x 10
cm	41 x 36 x 15	61 x 42 x 25	61 x 42 x 25	61 x 42 x 25	61 x 61 x 25	61 x 42 x 25	61 x 61 x 25	122 x 91 x 25
Rating	Type 12 (IP54)							
Remote ON/OFF (24V - 280V) / Analog Output	Standard/ 4 Optional Outputs (model dependent)							
Intensity Pacing & SCADA Comm, Optional	Not Available					✔		
Panel Weight — lbs (kg)	40/18	70/32	75/34	80/36	100/45	80/36	110/50	300/136
Water Chamber – Engineered Materials/Options:								
Materials of Construction, Stainless Steel	316L (1.4404 / Europe)							
Max Operating Pressure PSI (BAR)	150 (10)							
Max Fluent Temp °F (°C)	104 (40)							
Sleeve Cleaning Mechanism, Optional	Manual	Manual /Automatic				Automatic		
Reactor Weight (Wet/Dry) (lbs)	65/34	149/72	149/75	160/81	162/85	551/275	839/400	2382/1200
Mounting Feet	Optional					Standard		
Dimensions – Inches (cm)								
A:	33 (84)	47 (119)	47 (119)	47 (119)	47 (119)	66 (170)	68 (173)	70 (178)
B:	30 (75)	43 (109)	43 (109)	43 (109)	43 (109)	60 (152)	59 (150)	56 (142)
Flange Size / Alternate Flange Orientation (✔) C:	3 (80DN)	4 (100DN)	4 (100DN)	6 (150DN)	6 (150DN)	8 (200DN) /✔	12 (300DN) /✔	20 (500DN) /✔
D:	6 (15)	8 (20)	8 (20)	8 (20)	8 (20)	11 (27)	14 (35)	21 (53)
E:	6 (15)	7 (18)	7 (18)	7 (18)	7 (18)	9 (23)	12 (30)	18 (45)
F:	50 (127)	60 (152)	60 (152)	60 (152)	60 (152)	70 (178)	70 (178)	70 (178)

* per USEPA protocols, D30 only



Find out how your drinking water treatment plant can benefit from the TrojanUVSwift™SC – call us today.

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Hach/Trojan Technologies (China): 86-10-65150290

MDW-003 (0907) TROD-1033

TROJAN UV
WATER CONFIDENCE™

APPENDIX C
BUDGET LEVEL COST OPINIONS

Budgetary Cost Estimate - Fort Hardy WTP				
Description	Quantity	Unit	Unit Price	Subtotal
UV Upgrades- 1 New Redundant Unit	1	LS	$43,000.00	$43,000.00
New Control System	1	LS	$175,000.00	$175,000.00

2020 Construction Cost Subtotal	$218,000.00
20% Contingency	$43,600.00
2022 Construction Cost Subtotal (3% increase/ year)	$278,000.00
Engineering (Preliminary, Design, Construction Administration, Survey) 15%	$41,700.00
Legal/Admin (IMA, Bonds, Contracts, District) 5%	$13,900.00
Total Budget Estimate	$333,600.00

Budgetary Cost Estimate - Victory WTP				
Description	Quantity	Unit	Unit Price	Subtotal
Replace Greensand Media (materials)	1	LS	$23,314.64	$23,314.64
Labor for Greensand Media Replacement	5	DAY	$1,270.00	$6,350.00
Chlorine System in Closet	1	LS	$5,000.00	$5,000.00
Miscellaneous Coatings Rehab	500	SF	$18.00	$9,000.00
New SCADA	1	LS	$65,000.00	$65,000.00

2020 Construction Cost Subtotal	$108,664.64
20% Contingency	$21,732.93
2022 Construction Cost Subtotal (3% increase/ year)	$138,000.00
Engineering (Preliminary, Design, Construction Administration, Survey) 20%	$27,600.00
Legal/Admin (IMA, Bonds, Contracts, District) 5%	$6,900.00
Total Budget Estimate	$172,500.00

Budgetary Cost Estimate - Booster Pump Installation				
Description	Quantity	Unit	Unit Price	Subtotal
Morgan's Run Booster Pump	1	LS	$170,000.00	$170,000.00
Pressure Activated Gate Valves	2	EA	$5,000.00	$10,000.00
Monument Drive Booster Pump	1	LS	$170,000.00	$170,000.00
Monument Dr & Schuyler Heights Connect Services to DIP	5	EA	$3,500.00	$17,500.00
Individual Booster Pump/Hydropneumatic Tank Cemetery Ave & Burgoyne Street	15	EA	$3,200.00	$48,000.00

2020 Construction Cost Subtotal	$415,500.00
20% Contingency	$83,000.00
2022 Construction Cost Subtotal (3% increase/ year)	$529,000.00
Engineering (Preliminary, Design, Construction Administration, Survey) 15%	$79,350.00
Legal/Admin (IMA, Bonds, Contracts, District) 5%	$26,450.00
Total Budget Estimate	$634,800.00

Budgetary Cost Estimate - Phase 1 Water Main Replacement				
Description	Quantity	Unit	Unit Price	Subtotal
8" DIP by Open Cut	4,000	LF	$150.00	$600,000.00
8" HDPE by Directional Drill	6,625	LF	$200.00	$1,325,000.00
12" DIP by Open Cut	1,300	LF	$190.00	$247,000.00
12" HDPE by Directional Drill	5,000	LF	$225.00	$1,125,000.00
Cross Old Champlain Canal at Ferry Street	250	LF	$300.00	$75,000.00

2020 Construction Cost Subtotal	$3,372,000.00
20% Contingency	$674,000.00
2025 Construction Cost Subtotal (3% increase/ year)	$4,690,000.00
Engineering (Preliminary, Design, Construction Administration, Survey) 20%	$938,000.00
Legal/Admin (IMA, Bonds, Contracts, District) 5%	$234,500.00
Total Budget Estimate	$5,862,500.00

Budgetary Cost Estimate - Phase 2 Water Main Replacement				
Description	Quantity	Unit	Unit Price	Subtotal
8" DIP by Open Cut	15,000	LF	$150.00	$2,250,000.00
8" HDPE by Directional Drill	8,800	LF	$200.00	$1,760,000.00
Route 29 Bridge Crossings	1,050	LF	$500.00	$525,000.00

2020 Construction Cost Subtotal	$4,535,000.00
20% Contingency	$907,000.00
2035 Construction Cost Subtotal (3% increase/ year)	$8,478,000.00
Engineering (Preliminary, Design, Construction Administration, Survey) 20%	$1,695,600.00
Legal/Admin (IMA, Bonds, Contracts, District) 5%	$423,900.00
Total Budget Estimate	$10,597,500.00