

or expansion projects with a hydraulic model. Such projects are often very expensive and can significantly impact system operations. As a result, it is imperative that a hydraulic model is sufficiently calibrated to provide accurate results. Hydraulic calibration is the process of adjusting input data until the observed system performance (typically demands, pressures, and flow rates) reasonably correspond to the hydraulic model over a wide range of operating conditions.

A hydraulic model utilizes data describing the physical characteristics, consumption patterns, and boundary conditions to simulate the behavior of the real system. The physical data typically used in a water model includes information such as pipe length, diameter, roughness, and minor loss coefficients. The consumption patterns reflect the usage demands throughout the system, while the boundary conditions describe tank levels, valve settings, and pump status. The modeling software uses this information to develop a representation of the actual system conditions. The model provides simulated results of pressure and flow throughout the system, which can often aid decision-making.

2. Existing Water System Description

The existing Village water system is located within the ECWA Pressure Zone 1 (see **Figure No. 2**), which encompasses the entire Village water system as well as portions of the Towns of Hamburg and Eden water systems. The pressure zone is pressurized through three pump stations, which fill three water storage tanks (two elevated and one ground storage). Water is conveyed through several large transmission mains and distributed throughout the pressure zone through smaller distribution mains.

The Village is primarily served through two 250,000-gallon elevated water storage tanks (Long and Janice) located within the Village. The Hamburg (dominant station) and Lakeview Pump Stations, located in the Town of Hamburg, serve as the primary supply sources to these tanks based upon hydraulic conditions of the existing system. The Shadagee Pump Station, located in the Town of Eden, provides supply to the 300,000-gallon ground storage tank (Violet), which is the primary supply facility for the Hamlet of Eden. However, during high demand periods or emergencies, the Shadagee Pump Station also provides supply to the Village. The two Hamburg Pump Stations are owned and operated by the ECWA. The three tanks and the Shadagee Pump Station are owned by their respective communities and are operated by the ECWA under Lease Management Agreements.

Table No. 1 identifies the general location and parameters of each pump station.

Table No. 1 - ECWA Pressure Zone 1 Pump Stations

<i>Pump Station</i>	<i>Location</i>	<i>*Approximate Discharge Grade (ft)</i>	<i>*Approximate Rate of Discharge (gpm)</i>	<i>Approximate Rate of Discharge (gpd)</i>
Hamburg	Southwestern Blvd. near Camp Road	1,000	1,715	2,470,000
Lakeview	Lakeview Road near Schultz Road	1,030	1,200	1,730,000
Shadagee	Shadagee Road near Rt. 90 overpass	1,002	1,310	1,890,000

*Based on ECWA hydraulic model and/or information provided by ECWA

Table No. 2 identifies the general location and operating range of each tank.

Table No. 2 - ECWA Pressure Zone 1 Tanks

Tank (Type)	Location	Volume (gal)	Base Elevation (ft)	Overflow Elevation (ft)	Typ. Operational HGL (ft)
Long (Elevated)	Long Ave. near Hillview Pl.	250,000	920 (ground 822)	950	935-945
Janice (Elevated)	Charlotte Ave. Elementary near Janice Pl.	250,000	920 (ground 822)	950	935-945
Violet (Ground)	South end of Violet Parkway	300,000	945	971	964-969

3. Model Development

The existing ECWA water model was modified to evaluate the potential replacement of the Village's two existing elevated water tanks (Long and Janice) with a single elevated water storage tank. Three scenarios were developed which evaluated the existing water system and two potential new water storage facility sites. These scenarios were utilized to determine the required infrastructure improvements (i.e., transmission main) and the serviceability impacts (i.e., pressure, fire flow rates, etc.).

The existing water infrastructure within the ECWA model included all pipelines, tanks, and pump stations. To further understand the potential impacts of removing the existing water tanks and replacing them with a single tank, all pertinent fire hydrants were added to the ECWA model. The hydrant locations were created within the model by using a combination of existing water system plate maps and Google Earth to locate a hydrant's approximate location. Table No. 3 shows the physical parameters that were input for each system component.

Table No. 3 - Hydraulic Model System Components and Physical Parameter Inputs

System Components	Parameters
Transmission and Distribution Pipelines	<ul style="list-style-type: none"> • Length of pipe • Pipe Material • Coefficient of Friction (C-Factor)
Nodes/Junctions	<ul style="list-style-type: none"> • Elevation • Demand
Fire Hydrant	<ul style="list-style-type: none"> • Elevation
Water Storage Tanks	<ul style="list-style-type: none"> • Ground Elevation • Base Elevation • Overflow Elevation

<i>System Components</i>	<i>Parameters</i>
	<ul style="list-style-type: none"> • Diameter
Pump Station	<ul style="list-style-type: none"> • Elevation • Pump Curve • Pump Status

4. Demand Allocation

To develop an accurate hydraulic model, user demands (or consumption) were carefully allocated throughout the system. The base ECWA model was generated utilizing billing data for individual customer's accounts plus unmetered water loss/use (28 percent as reported by ECWA) and allocating that usage to the nearest node/junction within the model. The total average day base demand within the ECWA current model for the Village is 720,000 gallons per day.

The population in the Village has declined approximately 7 percent over the past 10 years with a 6 percent residential property vacancy as reported by the 2010 Census. Based on the recent decline in population, it is reasonable to assume that a population rebound is likely to occur. For the purpose of this evaluation, the model will be adjusted to show a 10 percent increase in current demands. Therefore, the total Village demand will be simulated at 995,000 gallons per day (including water loss).

5. Model Calibration

Model calibration is required to ensure an accurate hydraulic simulation. The calibration process usually involves the collection of flow and pressure measurements during a series of hydrant flow tests. The field measurements are then compared with the results predicted by the model under the same simulated conditions. Physical parameters are adjusted within the model until the results match the conditions observed in the field.

The flow tests used (**see Figure No. 3 - Fire Flow Test Locations**) for calibration were performed by a combination of ISO professionals (2010 to present) and ECWA professionals (2013). Measurements of static and residual (dynamic) pressure, along with the corresponding flow rates, were recorded (see Attachment A for Fire Flow Data Sheets). It should be noted, that the simultaneous pumps discharge rates and pressures along with the tank water elevation were adjusted within the model to match the system condition for each fire flow test. The water demands (Village = 865,000 gallons) within the existing ECWA model were not adjusted for the calibration process. Table No. 4 shows the measured static and residual (dynamic) pressures versus simulated results for the calibration.

Table No. 4 - Fire Flow Test (Measured vs. Simulated)

Test Number	Flow Rate			Static Pressure			Residual Pressure		
	Actual (gpm)	Sim. (gpm)	Diff. (gpm)	Actual (psi)	Sim. (psi)	Diff. (psi)	Actual (psi)	Sim. (psi)	Diff. (psi)
1	411	411	0	42	43.4	1.4	28	28.6	0.6
2	671	671	0	52	50.7	-1.3	42	45	3.0
3	503	503	0	58	56.4	-1.6	36	40.8	4.8
4	1,362	1,362	0	66	67.2	1.2	42	45.2	3.2
5	1,126	1,126	0	60	59	-1.0	54	51.1	-2.9
6	1,321	1,321	0	78	78.3	0.3	70	67.3	-2.7
7	1,776	1,776	0	72	69.5	-2.5	64	55.6	-8.4
8	1,034	1,034	0	66	64.7	-1.3	44	44.5	0.5
9	1,126	1,126	0	58	55.7	-2.3	50	45.1	-4.9
10	1,956	1,956	0	54	55.0	1.0	50	50.6	0.6
11	2,466	2,466	0	110	108.6	-1.4	78	78.4	0.4
12	2,466	2,466	0	96	95.9	-0.1	75	76.1	1.1
13	1,900	1,900	0	80	80.8	0.8	60	60.5	0.5
14	1,186	1,186	0	90	87	-3.0	64	63.9	-0.1
15	1,256	1,256	0	69	70.7	1.7	46	47.7	1.7
16	1,678	1,678	0	71	72.9	1.9	38	40.8	2.8
17	2,120	2,120	0	78	74.4	-3.6	60	64.8	4.8
18	950	950	0	64	60.5	-3.5	40	40.4	0.4
19	950	950	0	58	55.2	-2.8	40	42.6	2.6

Test Number	Flow Rate			Static Pressure			Residual Pressure		
	Actual (gpm)	Sim. (gpm)	Diff. (gpm)	Actual (psi)	Sim. (psi)	Diff. (psi)	Actual (psi)	Sim. (psi)	Diff. (psi)
20	920	920	0	53	51.0	-2.0	29	32.7	3.7
21	1,342	1,342	0	54	55.7	1.7	32	35.8	3.8
22	1,678	1,678	0	66	64.0	-2.0	54	52.3	-1.7
23	1,900	1,900	0	68	67.1	-0.9	52	57	5.0
24	1,574	1,574	0	64	66.7	2.7	36	40.6	4.6
25	1,574	1,574	0	64	61.4	-2.6	36	34.1	-1.9
26	1,610	1,610	0	45	45.0	0.0	32	33.9	1.9
27	1,536	1,536	0	60	59.6	-0.4	42	41.6	-0.4

% Test within 5 psi: 96%

% Test within 10 psi: 100%

% Test within 15 psi: 100%

6. Storage Analysis

6.1 Storage Capacity:

The current water storage tanks within the Village are clone 250,000-gallon elevated water storage tanks and provide a total usable storage capacity of 500,000 gallons. These tanks are located along Long Avenue east of the intersection of Hillview Place and at the north end of Janice Place on the Charlotte Avenue Elementary School property. Both water tanks have a base water level of 920 feet and an overflow level of 950 feet with an approximate tank diameter of 40 feet. It should be noted that the operating range of these two tanks is approximately 25 feet lower than the operating range of Violet Tank, the third tank within the Pressure Zone. This difference in elevation can create operational issues when filling and draining the tanks within the pressure zone.

Selection of the new tank(s) is required to meet the current Ten State Standards. The Ten State Standards state the following:

7.0.1 Sizing

Storage facilities should have sufficient capacity, as determined from engineering studies, to meet domestic demands, and where fire protection is provided, fire flow demands.

- a. Fire flow requirements established by the appropriate state Insurance Service Office should be satisfied where fire protection is provided.
- b. The minimum storage capacity (or equivalent capacity) for systems not providing fire flow protection shall be equal to the average daily consumption. This requirement may be reduced when the source and treatment facilities have sufficient capacity with standby power to supplement peak demands of the system.
- c. Excessive storage capacity should be avoided to prevent potential water quality deterioration problems.

Under the "current" standards stated above, the total usable storage capacity for the Village, limiting excessive capacity, is calculated below:

Current Average Day Demands:	720,000 gal.
Fire Flow (120 min @ 3,500 gpm):	420,000 gal.
<u>Growth Allowance:</u>	<u>50,000 gal.</u>
Required Village Storage Capacity:	1,190,000 gal.

USE:	1,200,000 gal.
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The current total capacity of the Village, 500,000 gallons, does not meet the current Recommended Standards for Water Works (Ten State Standards) for stand-alone finished water storage. However, this does not mean that the Village is deficient of water supply as the pump stations supplying the pressure zone each have back-up generation. Even though these facilities do not meet current Ten State Standards, general maintenance and/or rehabilitation investments are acceptable.

If replacement is deemed the Village's preferred and most economically feasible option, there are two types of water storage tanks currently acceptable to the ECWA: a steel Hydropillar tank or a composite tank. The Hydropillar is an elevated welded steel storage tank supported on welded steel, large diameter, support columns with vertical flutes. The composite tank takes the same welded steel tank and supports it on a reinforced concrete pedestal with stainless steel risers. The estimated construction cost for these tanks are as follows:

- Welded steel tank = \$2,900,000 to \$3,100,000 (Tank Height Ranging Between 150 feet and 165 feet)
- Composite tank = \$2,865,000 to \$3,000,000 (Tank Height Ranging Between 150 feet and 165 feet)

This study evaluated three potential new tank (single storage tank) locations. Each site was evaluated for accessibility to transmission mains, impacts on existing pump stations, and impacts on available fire flow.

The ECWA has asked the Village to consider the location of any potential new storage tank in close proximity to the ECWA 42-inch transmission main that traverses west to east across the Village. The ECWA has indicated that the existing 42-inch transmission main could provide the potential tank with a secondary source of supply. For this evaluation, the cost associated with the interconnection between the 42-inch transmission main and potential tank has been excluded. It is anticipated that a 16-inch interconnection would be utilized to minimize headloss as a flow rate of approximately 1,850 gpm is required to recover average day demands in 8 hours.

The three potential tank sites were located at the following locations; refer to **Figure No. 4 - Potential Tank Locations**:

- Existing Janice Tank Site - SBL: 183.18-5-8.1 (301 Charlotte Avenue)
- Erie County Fairgrounds - SBL: 183.10-1-8 (5600 McKinley Parkway)
- Hamburg High School - SBL: 183.17-1-1 (4111 Legion Drive)

Existing Janice Tank Site - This project location would require the demolition of the existing elevated water storage tank at the Janice Site (with planned decommissioning of Long Tank) and the construction of a new 1.2- million gallon elevated water storage tank. The potential tank would have a ground elevation of approximately 822 feet with a base water elevation of 944 feet and a maximum water elevation of 970 feet (approximate tank height 148 feet). The projected standard operating level would range between 962 feet and 970 feet with an average water level of 966 feet. It should be noted, that the existing 42-inch transmission main is located approximately 3,200 linear feet to the north of the Janice Site.

The Hamburg and Lakeview Pump Stations, as well as the transmission facilities, were evaluated to conceptually confirm if these standard operating conditions are feasible. The two pump stations were individually simulated within the model, with a single pump operating, under a maximum day demand condition in conjunction with a tank water level of 969.9 feet. This simulation was conducted to find the flow capacities available to fill the potential tank under a worst-case scenario. Utilizing only the existing transmission mains (no transmission improvements), both pump stations were capable of filling the potential tank. The Hamburg Pump Station provides the majority of the flow to the potential tank providing approximately 1,035 gpm or average day demands in 11.6 hours (worst-case condition would decrease in duration under an average/minimum day condition). Meanwhile, the Lakeview Pump Station provided marginal flows slightly under 45 gpm or average day demands in excess of 24 hours. With an average day demand fill rate in excess of 24 hours, the Lakeview Pump Station is not a recommended source of supply for the potential tank. It should be noted that recently the Lakeview Pump Station has been used sparingly since the commissioning of the new Shadagee Pump Station in February 2013.

The existing system's available fire flow rates were also evaluated with the potential water storage tank acting as the only source of supply, all pumps off, at the projected average tank operating level of 966 feet. Compared to existing fire flow rates throughout the ECWA Zone 1 (**see Figure No. 5**), the potential water storage tank provided flow rates (**see Figure No. 6**) with 91.4 percent of the fire hydrants simulated to have the same or higher than the current condition flow rates.

The projected project cost to construct the potential tank at this site is:

Elevated Tank:	\$2,900,000
SCADA and Site Work:	\$400,000
Transmission Improvements:	\$0,000
(Excludes Connection to 42-inch Main)	
Contingency, Legal, Engineering, and Administration (CLEA):	\$540,000
Estimated Construction Cost:	\$3,840,000

Erie County Fairgrounds Site - This project location would allow for the decommissioning of the existing elevated water storage tanks and would require the construction of a new 1.2-million gallon elevated water storage tank. The potential tank would have a ground elevation of approximately 813 feet with a base water elevation of 944 feet and a maximum water elevation of 970 feet (tank height 157 feet). The projected standard operating level would range between 962 feet and 970 feet with an average water level of 966 feet. It should be noted, that the existing 42-inch transmission main is located approximately 1,200 linear feet to the south of the Erie County Fairgrounds Site.

The Hamburg and Lakeview Pump Stations, as well as the transmission facilities, were evaluated to conceptually confirm if these standard operating conditions are feasible. The two pump stations were individually simulated within the model, with a single pump operating, under a maximum day demand condition in conjunction with a tank water level of 969.9 feet. This simulation was conducted to find the flow capacities available to fill the potential tank under a worst-case scenario. Utilizing existing transmission mains in conjunction with the installation of approximately 100 linear feet of 16-inch transmission main from Cherry Place to the tank site; both pump stations were capable of filling the potential tank. Similar and consistent with the three model scenarios, the Hamburg Pump Station provides the most flow to the tank providing approximately 1,045 gpm or average day demands in 11.5 hours (worst-case condition would decrease in duration under an average/minimum day condition). Meanwhile, the Lakeview Pump Station provided marginal flows slightly over 40 gpm or average day demands in excess of 24 hours. With an average day demand fill rate in excess of 24 hours, the Lakeview Pump Station is not a recommended source of supply for the potential tank.

The existing system's available fire flow rates were also evaluated with the potential water storage tank acting as the only source of supply, all pumps off, at the projected average tank operating level of 966 feet. Compared to existing fire flow rates throughout the ECWA Zone 1 (see **Figure No. 5**), the potential water storage tank provided flow rates (see **Figure No. 7**) with 89.2 percent of the fire hydrants simulated to have the same or higher than the current condition flow rates.

The projected project cost to construct the potential tank at this site is:

Elevated Tank:	\$3,100,000
SCADA and Site Work:	\$400,000
Transmission Improvements:	\$25,000
(Excludes Connection 42-inch Main)	
<u>CLEA:</u>	<u>\$580,000</u>
Estimated Construction Cost:	\$4,105,000

Hamburg High School Site - This project location would allow for the decommissioning of the existing elevated water storage tanks, and require the construction of a new 1.2-million gallon elevated water storage tank. The potential tank would have a ground elevation of approximately 804 feet with a base water elevation of 944 feet and a maximum water elevation of 970 feet (tank height 166 feet). The projected standard operating level would range between 962 feet and 970 feet with an average water level of 966 feet. It should be noted, that the existing 42-inch transmission main is located approximately 2,000 linear feet to the south of the Hamburg High School Site.

The Hamburg and Lakeview Pump Stations, as well as the transmission facilities, were evaluated to conceptually confirm if these standard operating conditions are feasible. The two pump stations were individually simulated within the model, with a single pump operating, under a maximum day demand condition in conjunction with a tank water level of 969.9 feet. This simulation was conducted to find the flow capacities available to fill the potential tank under a worst-case scenario. Utilizing existing transmission mains in conjunction with the installation of approximately 1,500 linear feet of 12-inch transmission main across the Hamburg High School property, both pump stations were capable of filling the potential tank. The Hamburg Pump Station provides the most flow to the potential tank providing approximately 1,110 gpm or average day demands in 10.8 hours (worst-case condition would decrease in duration under an average/minimum day condition). Meanwhile, the Lakeview Pump Station provided marginal flows slightly over 45 gpm or average day demands in excess of 24 hours. With an average day demand fill rate in excess of 24 hours, the Lakeview Pump Station is not a recommended source of supply for the potential tank.

The existing system's available fire flow rates were also evaluated with the potential water storage tank acting as the only source of supply, all pumps off, at the projected average tank operating level of 966 feet. Compared to existing fire flow rates throughout the ECWA Zone 1 (see **Figure No. 5**), the potential water storage tank provided flow rates (see **Figure No. 8**) with 97.4 percent of the fire hydrants simulated to have the same or higher than the current condition flow rates.

The projected project cost to construct the potential tank at this site is:

Elevated Tank:	\$3,100,000
SCADA and Site Work:	\$400,000
Transmission Improvements:	\$280,000
(Excludes Suction Line to 42-inch Main)	
<u>CLEA:</u>	<u>\$580,000</u>
Estimated Construction Cost:	\$4,360,000

Storage Required Maintenance/Rehabilitation:

In lieu of the new tank, the Village will need to rehabilitate the existing two water storage tanks. In 2009 and 2010 respectively, the Janice and Long tanks were inspected by O'Brien & Gere Engineers, Inc. The inspection reports outlined the maintenance, safety, and sanitary repairs required to keep both tanks in working condition. For the Janice Tank, which was constructed in 1957, it was recommended that the interior coating be removed and replaced within 1 to 2 years and the exterior coating required replacement within 2 to 3 years of the report. These recommendations were repeated in the inspection report for the Long Tank, constructed in 1948. However, the recoating of the interior and exterior for the Long Tank was suggested to occur in the next 2 years. In addition, the report noted several sanitary and safety repairs on both tanks, including foundation and grout repairs, ladder replacements, safety railings, rerouting of electrical lines underground, etc. Each report included an estimate of the construction costs associated with these repairs. In order to evaluate and prioritize the various identified repairs, GHD conducted a site inspection at both tank locations with a representative of a coating manufacturer, Tnemec Company Inc. Based on the inspection and follow-up discussion on current coating materials and methods, updated costs were prepared and are summarized below:

Table No. 5 – Summary of Tank Rehabilitation Construction Costs

	<i>Long Tank</i>	<i>Janice Tank</i>	<i>CLEA</i>	<i>Estimated Total Costs</i>
Previous Estimated Construction Costs	\$452,000	\$416,000	\$275,000	\$1,143,000
Updated Construction Costs	\$746,500	\$699,500	\$434,000	\$1,880,000

Attachment B includes a detailed breakdown of the projected costs for these repairs.

7. Findings

7.1 Standards

GHD completed a hydraulic analysis of the Village's existing water storage facilities and potential replacement of these facilities. The hydraulic analysis was completed to confirm that the existing and future water system meets New York State's recommended requirements for water storage capacity, pressure, and fire flow as specified by the Insurance Service Office (ISO) and Ten State Standards, which are detailed below:

Water Storage Capacity Recommended Requirements

Storage facilities should be sized to have sufficient capacity, as determined from engineering studies, to meet domestic demands, and where fire protection is provided, fire flow demands. The water storage facility shall be sized to minimize excess water storage which may result in potential water quality deterioration problems.

Water System Pressure Recommended Requirements

The Ten State Standards recommends that potable water systems under all flow conditions shall maintain a minimum ground level pressure of 20 psi at all points in the distribution system. In addition, normal working pressure in a distribution system should be approximately 60 psi to 80 psi and not less than 35 psi.

Fire Flow Recommended Requirements

The Ten State Standards state that in order for fire protection to be provided, water systems should be designed such that fire flows and facilities are in accordance with the Insurance Service Office (ISO). ISO requirements for residential (one- and two-family dwellings) fire protection with a minimum residual pressure of 20 psi (at ground level) are listed in Table No. 7.

Table No. 7 – ISO Fire Flow Requirements

<i>Distance Between Buildings</i>	<i>Needed Fire Flow</i>
More than 100 feet	500 gpm
31 to 100 feet	750 gpm
11 to 31 feet	1,000 gpm
10 feet or less	1,500 gpm

In commercial developments, the ISO requirements are determined based on individual building characteristics, such as the building's area, construction, occupancy, and exposure. The fire flow

requirements for individual commercial developments range from a minimum of 500 gpm to a maximum of 12,000 gpm. Typically, for other types of habitational buildings, the maximum needed fire flow is 3,500 gpm.

7.2 Existing System Evaluation

The existing Village water system meets or exceeds pressure and fire flow requirements. Water system pressures generally range between 40 psi and 80 psi with available fire flow rates ranging between 500 gpm to greater than 3,500 gpm. Meanwhile, the total water storage capacity was found to be below the recommended standards of average day demand plus fire flow for a stand-alone system. However, the Village and the entire Pressure Zone 1 are supplied by three pump stations all supported by back-up power generation. These stations have sufficient capacity to supply the Village and Pressure Zone 1 in the event of an emergency. This back-up support accounts for any water storage deficiencies, thereby allowing the Village to rehabilitate and maintain the existing facilities as necessary and required.

The projected cost for rehabilitation of the two existing tanks is **\$1,880,000**.

7.3 Potential New Tank Evaluation

GHD alternatively evaluated the potential of replacing the existing water storage facilities with a single 1.2 million gallon elevated tank (capacity for average day storage plus fire flow) in conjunction with making minor transmission improvements. Three potential tank sites were evaluated for water system pressure impacts, fire flow impacts, existing pump station impacts, and public perception/impacts. All three potential tank sites provided improved water system pressures (approximate 10 psi increase) and available fire flow rates (approximately 90 percent of flow rates equal to or greater than existing).

The potential tank would require some operational changes to two of the three pump stations. The Shadagee Pump Station would operate as it currently does with the Hamburg and Lakeview Pump Stations having to operate closer to their full capacities. The Hamburg Pump Station has the capacity to fill the potential tank in less than 11 hours while meeting maximum day demands. Consequently, the Lakeview Pump Station is only capable of maintaining tank levels while meeting maximum day demands. This facility would require pump replacements to provide the ability to fill the tank and meet maximum day demands. It should be noted that this pump station is currently operated sparingly.

Each of the potential tank sites were selected to minimize the impacts on property values and public perception. The three locations either currently have a tank located on the property or are located near wooded areas or commercial facilities. Ultimately, the availability of property and the likelihood of a successful acquisition also played a role in the potential location.

Projected potential 1.2-million gallon elevated tank and transmission improvement summary:

Table No. 8 – Projected 1.2-Million Gallon Elevated Tank and Transmission Summary

<i>Impact</i>	<i>Potential Tank Locations</i>		
	<i>Existing Janice Tank</i>	<i>Erie County Fairgrounds</i>	<i>Hamburg High School</i>
Demolition / Decommissioning	Demo. of Janice \$25,000 Decom. of Long \$25,000	Decom. of Janice & Decom. of Long \$50,000	Decom. of Janice & Decom. of Long \$50,000
Ground Elevation	822	813	804
Base Water Elevation	944	944	944
Max Water Elevation	970	970	970
Hamburg Pump Station	<ul style="list-style-type: none"> • Capable of Filling Tank • Meets Maximum Day Demands 		
Lakeview Pump Station	<ul style="list-style-type: none"> • Capable of Filling Tank, but not recommended • Meets Maximum Day Demands 		
Additional Infrastructure / SCADA / Site Work Required	None	<ul style="list-style-type: none"> • 100 LF of 16" 	<ul style="list-style-type: none"> • 1,500 LF of 12"
Percent of Fire Hydrants Simulated to Equal or Greater Than Existing Fire Flow Rates	91.4%	89.2%	97.4%
Estimated Total Cost	\$3,890,000	\$4,155,000	\$4,410,000

Attachments:

- Attachment A - Fire Flow Data Sheets
- Attachment B - Detailed Tank Rehabilitation Estimated Cost Breakdown
- Attachment C - Figures

Appendices

Appendix A

Fire Flow Data Sheets

MJP RESIDUAL HYDRANT: H18-G07 DATE: 5/21/2013 TIME: 13:30 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 4560 LEWIS DR SIDE: N
1ST HYD E/O MCKINLEY PKY

TOWN OF HAMBURG

WATER DISTRICT: 845 SIZE OF MAIN: 6
FIRE DISTRICT.: 48020 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHARGE COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 42 RESIDUAL(Psi): 28
TOTAL FLOW(GPM): 411 GALLONS USED: 1,230
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 525

HYD FL NO LOCATION OF FLOW HYDRANTS

H18-H01 4670 LEWIS DR 2ND HYD E/O MCKINLEY PKY

TOWN OF HAMBURG SS: N

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 48020 SIZE MAIN: 6 BRCH: 6

- 1. 2.50 6.0 411 COMMENTS:
- 2.
- 3. TOT FLOW: 411

H-433

Hamburg - SP 54.6 psi
DP 107.1 psi
FL 2.1 MGAD

Lakewood - SP 50.6 psi
DP 80.0 psi
FL 0.0 MGAD

Shadagee - SP 68.8 psi
DP 130.5 psi
FL 1.6 MGAD

Long - 18.9 feet

Janice - 17.6 feet

Violet - 24.2 feet

Model
Static - 43.4
Residual - 28.6
Flow - 411

MJP RESIDUAL HYDRANT: H18-F06 DATE: 5/21/2013 TIME: 14:00 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 48 EUCLID AVE SIDE: N
1ST HYD W/O GEORGE ST

VILLAGE OF HAMB

WATER DISTRICT: 845 SIZE OF MAIN: 6
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 52 RESIDUAL(Psi): 42
TOTAL FLOW(GPM): 671 GALLONS USED: 2,010
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 1,257

HYD FL NO LOCATION OF FLOW HYDRANTS

H18-F08 113 EUCLID AVE C/O GEORGE ST

VILLAGE OF HAMB SS: S

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 99999 SIZE MAIN: 6 BRCH: 6

1. 2.50 16.0 671 COMMENTS:

2.

3.

TOT FLOW: 671

H-252

Hamburg - SP 55.1 psi
DP 108.3 psi
FL 2.2 MG/D

Lakewood - SP 50.6 psi
DP 80.7 psi
FL 0.0 MG/D

Shadagee - SP 88.8 psi
DP 130.5 psi
FL 1.6 MG/D

Long - 18.9 feet

Sanize - 17.6 feet

Violet - 24.8 feet

Model

Static - 50.7

Residual - 45

Flow - 671

MJP RESIDUAL HYDRANT: H18-E29 DATE: 5/21/2013 TIME: 14:30 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 226 PLEASANT AVE SIDE: S
1ST HYD E/O SICKMON AVE

VILLAGE OF HAMB

WATER DISTRICT: 845 SIZE OF MAIN: 6
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 58 RESIDUAL(Psi): 36
TOTAL FLOW(GPM): 503 GALLONS USED: 1,500
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 676

HYD FL NO LOCATION OF FLOW HYDRANTS

H18-E30 178 PLEASANT AVE C/O MARENGO ST

VILLAGE OF HAMB SS: S

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 99999 SIZE MAIN: 6 BRCH: 6

1. 2.50 9.0 503 COMMENTS:

2.

3.

TOT FLOW: 503

H-209

Hamburg - SP 56.3 psi
DP 107.4 psi
FL 2.2 MGAD

Lakeview - SP 52.9 psi
DP 78.7 psi
FL 0.0 MGAD

Shadefee - SP 94.0 psi
DP 117.5 psi
FL 0.0 MGAD

Long - - 18.9 feet

Janice - 17.6 feet

Violet - 21.1 feet

Model

Static - 56.4

Residual - 40.8

Flow - 503

MJP RESIDUAL HYDRANT: G18-C37 DATE: 5/21/2013 TIME: 15:00 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 150 CROWNVIEW TER SIDE: E
1ST HYD N/O FOXCROFT DR

VILLAGE OF HAMB

WATER DISTRICT: 016 SIZE OF MAIN: 8
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 66 RESIDUAL(Psi): 42
TOTAL FLOW(GPM): 1,362 GALLONS USED: 4,080
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 1,935

HYD FL NO LOCATION OF FLOW HYDRANTS

G18-C30 102 CROWNVIEW TER 2ND HYD N/O FOXCROFT DR

VILLAGE OF HAMB SS: E

NZLE SIZE PITOT FLOW WATER DST: 016 FIRE: 99999 SIZE MAIN: 8 BRCH: 6

1. 2.50 66.0 1,362 COMMENTS:

2.

3. TOT FLOW: 1,362

H-35

Hamburg - SP 54.7 psi
DP 107.6 psi
FL 2.1 MGAD

Lakeview - SP 50.8 psi
DP 79.6 psi
FL 0.0 MGAD

Shadasee - SP 88.8 psi
DP 129.4 psi
FL 1.6 MGAD

Long - 18.3 feet

Janice - 17.6 feet

Violet - 22.2 feet

Model

Static - 67.2

Residual - 45.2

Flow - 1,362

MJP RESIDUAL HYDRANT: H18-B36 DATE: 5/22/2013 TIME: 12:45 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: DIVISION ST SIDE: E
1ST HYD N/O NORWAY PL

VILLAGE OF HAMB

WATER DISTRICT: 845 SIZE OF MAIN: 8
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHARGE COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(PSTI): 60 RESIDUAL(PSTI): 54
TOTAL FLOW(GPM): 1,126 GALLONS USED: 3,375
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 3,137

HYD FL NO LOCATION OF FLOW HYDRANTS

H18-B27 360 DIVISION ST 2ND HYD N/O NORWAY PL

VILLAGE OF HAMB SS: S

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 99999 SIZE MAIN: 8 BRCH: 6

1. 2.50 45.0 1,126 COMMENTS:

2.

3.

TOT FLOW: 1,126

H-177

Hamburg - SP 55.3 psi
DP 109.5 psi
FL 2.1 MGD

Lakeview - SP 49.8 psi
DP 80.6 psi
FL 0.0 MGD

Shadyac - SP 88.0 psi
DP 130.6 psi
FL 1.6 MGD

Long - 20.8 feet

Janice - 19.5 feet

Violet - 24.0 feet

Model

Static - 59.0

Residual - 51.1

Flow - 1,126

MJP RESIDUAL HYDRANT: G18-D14 DATE: 5/22/2013 TIME: 13:15 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: BROWNING DR SIDE: N
C/O BOXWOOD CIR W

VILLAGE OF HAMB

WATER DISTRICT: 016 SIZE OF MAIN: 6
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 78 RESIDUAL(Psi): 70
TOTAL FLOW(GPM): 1,321 GALLONS USED: 3,960
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 3,850

HYD FL NO LOCATION OF FLOW HYDRANTS

G18-D13 BROWNING DR C/O BLAKE LN

VILLAGE OF HAMB SS: N

NZLE SIZE PITOT FLOW WATER DST: 016 FIRE: 99999 SIZE MAIN: 6 BRCH: 6

1. 2.50 62.0 1,321 COMMENTS:

2.

3. TOT FLOW: 1,321

H-50

Hamburg - SP 55.3 psi
DP 109.5 psi
FL 2.2 MGAD

Lakeview - SP 50.8 psi
DP 81.0 psi
FL 0.0 MGAD

Shadagee - SP 89.0 psi
DP 130.8 psi
FL 1.6 MGAD

MODEL

STATIC - 78.3

RESIDUAL - 67.3

FLOW - 1,321

Long - 20.8 feet

Janice - 19.8 feet

Violet - 24.6 feet

RESIDUAL HYDRANT

LOCATION.....: 7 BYRD DR SIDE: N
C/O SUNSET DR

VILLAGE OF HAMB

WATER DISTRICT: 016 SIZE OF MAIN: 6
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 72 RESIDUAL(Psi): 64
TOTAL FLOW(GPM): 1,776 GALLONS USED: 5,340
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 4,880

HYD FL NO LOCATION OF FLOW HYDRANTS

G18-D55 109 MEADOW RUN 1ST HYD N/O BROOKWOOD DR

VILLAGE OF HAMB SS: E

NZLE SIZE PITOT FLOW WATER DST: 016 FIRE: 99999 SIZE MAIN: 6 BRCH: 6

- 1. 2.50 28.0 888 COMMENTS:
- 2. 2.50 28.0 888
- 3. TOT FLOW: 1,776

H-65

*Humburg - SP 54.8 psi
DP 108.4 psi
FL 2.1 MGD*

*Larkenshaw - SP 50.8 psi
DP 81.4 psi
FL 0.0 MGD*

*Shadagee - SP 89.0 psi
DP 130.8 psi
FL 1.6 MGD*

Model

Static - 69.5

Residual - 55.6

Flow - 1,776

C-Factors @ 130

Long - 20.8 feet

Janice - 19.5 feet

Violet - 24.5 feet

MJP RESIDUAL HYDRANT: G19-H20 DATE: 5/22/2013 TIME: 14:30 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 6879 PICTURE LAKE DR SIDE: E
1ST HYD N/O BONNIE LN

TOWN OF HAMBURG

WATER DISTRICT: 013 SIZE OF MAIN: 8
FIRE DISTRICT.: 48020 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHARGE COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(PST): 66 RESIDUAL(PST): 44
TOTAL FLOW(GPM): 1,034 GALLONS USED: 3,120
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 1,540

HYD FL NO LOCATION OF FLOW HYDRANTS

G19-H12 6835 PICTURE LAKE DR 2ND HYD N/O BONNIE LN

TOWN OF HAMBURG SS: N

NZLE SIZE PITOT FLOW WATER DST: 013 FIRE: 48020 SIZE MAIN: 6 BRCH: 6

1. 2.50 38.0 1,034 COMMENTS:

2.

3. TOT FLOW: 1,034

H-101

Hamburg - SP 54.6 psi

DP 108.3 psi

FL 2.2 MGD

Lakeview - SP 49.9 psi

DP 80.6 psi

FL 0.0 MGD

Shadogee - SP 89.1 psi

DP 130.7 psi

FL 1.6 MGD

Model

Static - 64.7

Residual - 44.5

Flow - 1,034

Long - 20.8 feet

Jontze - 19.5 feet

Violet - 24.9 feet

MJP RESIDUAL HYDRANT: G19-D24 DATE: 5/29/2013 TIME: 9:30 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 214 PIERCE AVE SIDE: S
1ST HYD E/O ROSEDALE AVE

VILLAGE OF HAMB

WATER DISTRICT: 845 SIZE OF MAIN: 6
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(PST): 58 RESIDUAL(PST): 50
TOTAL FLOW(GPM): 1,126 GALLONS USED: 3,375
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 2,612

HYD FL NO LOCATION OF FLOW HYDRANTS

G19-D23 S6503 PIERCE AVE 1ST HYD W/O ROSEDALE AVE

TOWN OF HAMBURG SS: S

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 99999 SIZE MAIN: 6 BRCH: 6

- 1. 2.50 45.0 1,126 COMMENTS:
- 2.
- 3.

TOT FLOW: 1,126

H-5

Hamburg - SP 51.0 psi
OP 108.2 psi
FL 2.1 MGD

Lakeview - SP 43.5 psi
OP 80.4 psi
FL 0.0 MGD

Shadlee - SP 81.5 psi
OP 128.8 psi
FL 1.4 MGD

Long - 19.8 feet
Janice - 18.7 feet
Violet - 24.2 feet

MODEL

STATIC - 55.7
RESIDUAL - 45.1
FLOW - 1,126

MJP RESIDUAL HYDRANT: H18-F57 DATE: 5/29/2013 TIME: 10:00 PAGE 1

RESIDUAL HYDRANT

LOCATION.....: 75 LONG AVE SIDE: N
1ST HYD W/O HILLVIEW PL

VILLAGE OF HAMB

WATER DISTRICT: 845 SIZE OF MAIN: 8
FIRE DISTRICT.: 99999 SIZE BRANCH.: 6

PERFORMED BY: BM, RLS

COMMENTS.....: HYDRANT FLOW TEST REQUESTED BY BILL WHEELER, CRA ENGINEERING
PHONE: 856-2142, FAX: 856-2160, E-MAIL WWHEELER@CRAWORLD.COM

DISCHRG COEF: .90
PRESSURE RDGS: ELVTN USGS(FT): .0 STATIC(Psi): 54 RESIDUAL(Psi): 50
TOTAL FLOW(GPM): 1,956 GALLONS USED: 5,880
REQUIRED RESIDUAL PRESSURE...: 20 FLOW AT REQD RESIDUAL PRESSURE.: 6,212

HYD FL NO LOCATION OF FLOW HYDRANTS

H18-E64 103 LONG AVE 2ND HYD W/O HILLVIEW PL
VILLAGE OF HAMB SS: N

NZLE SIZE PITOT FLOW WATER DST: 845 FIRE: 99999 SIZE MAIN: 8 BRCH: 6
1. 2.50 34.0 978 COMMENTS:
2. 2.50 34.0 978
3. TOT FLOW: 1,956

A-139

Hambury - SP 50.2 psi
DP 107.2 psi
FL 1.9 MG/D

Lakeview - SP 43.5 psi
DP 80.5 psi
FL 0.0 MG/D

Shadagee - SP 81.5 psi
DP 128.8 psi
FL 2.4 MG/D

Long - 19.8 feet

Jamie - 18.7 feet

Violet - 24.5 feet

MODEL

Static - 55.0

Residual - 50.6

Flow - 1,956

MJM Flow Test - Residual Hydrant: G17 - C63 Date: 5/30/2012 CHI095-B
Location.: 5107 SOUTHWESTERN BLVD Side: SE Time: 14:00
6TH HYD NE/O ABEL RD TOWN OF HAMBURG

Discharge Coef: .90
Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 110 Residual(psi): 78
Total Flow(GPM): Gallons Used: 7,380
Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 4,310

Hyd Fl No Location Of Flow Hydrants

G17 G06 5151 SOUTHWESTERN BL 5TH HYD NE/O ABEL RD

TOWN OF HAMBURG SS: SE

Nzle Size Pitot Flow Water Dst: 012 Fire: 48026 Size Main: 12 Brch: 6

- 1. 2.50 54.0 1,233 Comments:
- 2. 2.50 54.0 1,233
- 3.

Tot Flow: 2,466

150 - G17G06

H-87

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

HAMBURG - SP 53.8 psi
DP 110.5 psi
FL 2.2 MGD

MODEL

Residual - 78.4 psi

LAKEVIEW - SP 49.5 PSI
DP 80.9 psi
FL 0.00 MGD

Flow - 2,466 gpm

Static - 108.6 psi

SHADAGEE - SP 90.3 psi
DP 119.2 psi
FL 0.00 MGD

LONG - 21.5 feet

JANICE - 19.8 feet

VIOLET - 19.9 feet



MJM Flow Test - Residual Hydrant: G17 - H02 Date: 10/25/2012 CHI095-B
 Location.: 5161 CAMP RD Side: E Time: 14:30
 1ST HYD N/O DARTMOUTH ST TOWN OF HAMBURG
 Discharge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 96 Residual(psi): 75
 Total Flow(GPM): Gallons Used: 7,380
 Required Residual Pressure...: 20 Flow at Regd Residual Pressure.: 4,939

Hyd Fl No Location Of Flow Hydrants

G17 H11A 5203 CAMP RD 1ST HYD N/O COMMERCE PL
 TOWN OF HAMBURG SS: E

Nzle Size Pitot Flow Water Dst: 012 Fire: 48027 Size Main: 12 Brch: 6
 1. 2.50 54.0 1,233 Comments:
 2. 2.50 54.0 1,233
 3. Tot Flow: 2,466

H-84

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

MODEL

Hambury - SP 50.1 psi
 DP 100.8 psi
 FL 1.3 MAG

Residual - 76.1 psi
 Static - 95.9 psi
 Flow - 2,466 gpm

Lakeview - SP 41.2 psi
 DP 80.0 psi
 FL 0.01 MAG

Shadagee - SP 78.5 psi
 DP 127.6 psi
 FL 1.4 MAG

Long - 20.8 feet

Janice - 19.4 feet

Violet - 23.8 feet

MJM Flow Test - Residual Hydrant: G17 - H37 Date: 10/25/2012 CHI095-B
Location.: COMMERCE PL Side: N Time: 14:45
1ST HYD W/O CAMP RD TOWN OF HAMBURG

Dischrge Coef: .90

Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 80 Residual(psi): 60
Total Flow(GPM): Gallons Used: 5,700

Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 3,439

Hyd Fl No Location Of Flow Hydrants

G17 H36 COMMERCE PL 2ND HYD W/O CAMP RD

TOWN OF HAMBURG SS: N

Nzle Size Pitot Flow Water Dst: 012 Fire: 99999 Size Main: 8 Brch: 6

1. 2.50 32.0 950 Comments:

2. 2.50 32.0 950

3. Tot Flow: 1,900

H-471

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

MODEL

Hamburg - SP 49.8 psi
DP 100 psi
FL 1.1 mag

Residual - 60.5

Static - 80.8

Flow - 1,900

Lakeview - SP 40.5 psi
DP 79.8 psi
FL 0.01 mag

Shadagee - SP 77.7 psi
DP 127.6 psi
FL 1.4 MGP

Long - 20.6 feet

Janice - 19.3 feet

Wanda - 24.1 feet

MJM Flow Test - Residual Hydrant: H17 - A43 Date: 10/25/2012 CHI095-B
Location.: 3863 HARVARD ST Side: S Time: 14:00
1ST HYD E/O COLLEGE ST TOWN OF HAMBURG

Dischrge Coef: .90
Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 90 Residual(psi): 64
Total Flow(GPM): Gallons Used: 3,570
Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 2,025

Hyd Fl No Location Of Flow Hydrants

H17 A44 3905 HARVARD ST 2ND HYD E/O COLLEGE ST

TOWN OF HAMBURG SS: S

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6

1. 2.50 50.0 1,186 Comments:

2.

3. Tot Flow: 1,186

H-378

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 50.1 psi
DP 100.8 psi
FL 1.3 MAG

MODEL

Static - 87.0

Residual - 63.9

Flow - 1,186

Lakeview - SP 41.2 psi
DP 80.0 psi
FL 0.01 MAG

Shadagee - SP 78.5 psi
DP 127.6 psi
FL 1.4 MAG

Long - 20.8 feet

Janice - 19.4 feet

Violet - 23.8 feet

* Open 150-103 Valve
150-104 Valve

} PER
ECWA

14

MJM Flow Test - Residual Hydrant: H17 - B38 Date: 7/21/2011 CHI095-B
Location.: 5286 SOUTH PARK AVE Side: E Time: 11:30
1ST HYD N/O SOWLES RD TOWN OF HAMBURG

Dischrge Coef: .90

Pressure Rdgs: Elvtn Usgs(ft): - - - - Static(psi): 69 Residual(psi): 46
Total Flow(GPM): Gallons Used: 3,780

Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 1,890

Hyd Fl No Location Of Flow Hydrants

H17 B22 5200 SOUTH PARK AVE 2ND HYD N/O SOWLES RD
TOWN OF HAMBURG SS: E @ HILBERT COLLEGE ENTRANCE

Nzle Size Pitot Flow Water Dst: 013 Fire: 48021 Size Main: 8 Brch: 6

1. 2.50 14.0 628 Comments:

2. 2.50 14.0 628

3. Tot Flow: 1,256

H-362

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Model

Hamburg - SP 50.7 psi
DP 129.6 psi
FL 3.2 MGD

Static - 70.7
Residual - 47.7
Flow - 1,256

LAKEVIEW - SP 43.8 psi
DP 109.5 psi
FL 1.7 MGD

Shadagee - SP -
DP -
FL -

LONG - 21.8 Feet

Janice - 18.1 Feet

Violet - 16.5 Feet

MJM Flow Test - Residual Hydrant: H17 - B22 Date: 7/21/2011 CHI095-B
Location.: 5200 SOUTH PARK AVE Side: E Time: 11:00
2ND HYD N/O SOWLES RD TOWN OF HAMBURG

Discharge Coef: .90
Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 71 Residual(psi): 38
Total Flow(GPM): Gallons Used: 5,010
Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 2,123

Hyd Fl No Location Of Flow Hydrants

H17 B38 5286 SOUTH PARK AVE 1ST HYD N/O SOWLES RD

TOWN OF HAMBURG SS: E

Nzle Size Pitot Flow Water Dst: 013 Fire: 48098 Size Main: 12 Brch: 6

1. 2.50 25.0 839 Comments:

2. 2.50 25.0 839

3. Tot Flow: 1,678

H-473

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 49.9 psi
DP 129.6 psi
FL 3.2 MGD

Lekeview - SP 43.8 psi
DP 109.5 psi
FL 1.7 MGD

Shadagee - SP —
DP —
FL —

Long - 21.5 feet

Janice - 18.1 feet

Violet - 16.6 feet

Model

Static - 72.9

Residual - 40.8

Flow - 1678

MJM Flow Test - Residual Hydrant: H17 - E57 Date: 11/17/2011 CHI095-B
 Location.: 5501 CAMP RD Side: E Time: 11:30
 3RD HYD N/O DEACON ST TOWN OF HAMBURG
 Dischrge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 78 Residual(psi): 60
 Total Flow(GPM): Gallons Used: 6,360
 Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 3,988

Hyd Fl No Location Of Flow Hydrants

H17 E58 5533 CAMP RD 2ND HYD N/O DEACON ST

TOWN OF HAMBURG SS: E

Nzle Size Pitot Flow Water Dst: 012 Fire: 48027 Size Main: 12 Brch: 6
 1. 2.50 40.0 1,060 Comments:
 2. 2.50 40.0 1,060
 3. Tot Flow: 2,120

H-477

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 51.6 psi
 OP 108.1 psi
 FL 1.4 MAD
 Lakeview - SP 42.8 psi
 OP 112.5 psi
 FL 1.5 MAD
 Shadapee - SP -
 OP -
 FL -

MODEL
 RESIDUAL - 64.8
 STATIC - 74.9
 FLOW - 2,120

Long - 22.4 feet
 Janze - 20.8 feet
 Violet - 23.8 feet

MJM Flow Test - Residual Hydrant: H17 - F30 Date: 10/25/2012 CHI095-B
 Location.: 5683 SOUTH PARK AVE Side: W Time: 15:00
 1ST HYD N/O QUINBY DR TOWN OF HAMBURG

Dischrge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 64 Residual(psi): 40
 Total Flow(GPM): Gallons Used: 2,850
 Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 1,318

Hyd Fl No Location Of Flow Hydrants

H17 F29 4123 KNOLL DR 1ST HYD W/O SOUTH PARK AVE
 TOWN OF HAMBURG SS: S

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6
 1. 2.50 32.0 950 Comments:
 2.
 3. Tot Flow: 950

H, - 352

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

MODEL

STATIC - 60.5
 RESIDUAL - 40.4
 FLOW - 950

Hamburg - SP 49.8 psi
 DP 100 psi
 FL 1.1 MGD

Lakeview - SP 40.5 psi
 DP 79.8 psi
 FL 0.01 MGD

Shadagee - SP 77.7 psi
 DP 127.6 psi
 FL 1.4 MGD

Long - 20.6 feet

Janice - 19.3 feet

Violet - 24.1 feet

MJM Flow Test - Residual Hydrant: H17 - E63 Date: 8/11/2009 CHI095-B
Location.: SCRANTON RD Side: NW Time: 12:15
1ST HYD SW/O MONROE AVE TOWN OF HAMBURG

Dischrge Coef: .90
Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 58 Residual(psi): 40
Total Flow(GPM): Gallons Used: 2,940
Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 1,422

Hyd Fl No Location Of Flow Hydrants

H17 F33 OP 5380 SCRANTON RD 1ST HYD N/O LINCOLN AVE
TOWN OF HAMBURG SS: E

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6

1. 2.50 32.0 950 Comments:

2.

3.

Tot Flow: 950

H-299

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 47.7 psi
DP 107.7 psi
FL 1.6 MGD

Lakeview - SP 38.3 psi
DP 112.2 psi
FL 1.7 MGD

Shadagee - SP -
DP -
FL -

Long - 20.1 feet

Janice - 18.4 feet

Violet - 20.0 feet

MODEL

Static - 55.2

Residual - 42.6

Flow - 950

MJM Flow Test - Residual Hydrant: H17 - F39 Date: 7/14/2010 CHI095-B
Location.: 4252 QUINBY DR Side: N Time: 9:30
4TH HYD W/O FAIRGROUND DR TOWN OF HAMBURG

Dischrge Coef: .90

Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 53 Residual(psi): 29
Total Flow(GPM): Gallons Used: 2,760
Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 1,093

Hyd Fl No Location Of Flow Hydrants

H17 G33 4308 QUINBY DR 3RD HYD W/O FAIRGROUND RD

TOWN OF HAMBURG SS: N

Nzle Size Pitot Flow Water Dst: 013 Fire: 48022 Size Main: 8 Brch: 6

1. 2.50 30.0 920 Comments:

2.

3. Tot Flow: 920

A-325

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 51.6 psi
DP 116.3 psi
FL 2.3 MAD

Lakewood - SP 44.6 psi
DP 109.9 psi
FL 1.6 MAD

Shadagee - SP -
DP -
FL -

Long - 22.7 feet

Jantze - 21.2 feet

Violet - 19.4 feet

MODEL

Static - 51.0

Residual - 32.7

Flow - 920

MJM Flow Test - Residual Hydrant: H18 - A05 Date: 3/25/2010 CHI095-B
Location.: 5562 SCRANTON RD Side: NW Time: 10:45
3RD HYD S/O MONROE AVE TOWN OF HAMBURG

Dischrge Coef: .90

Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 54 Residual(psi): 32

Total Flow(GPM): Gallons Used: 4,020

Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 1,698

Hyd Fl No Location Of Flow Hydrants

H18 A06 5546 SCRANTON RD 1ST HYD SW/O STRNAD DR

TOWN OF HAMBURG SS: NW

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6

1. 2.50 16.0 671 Comments:

2. 2.50 16.0 671

3. Tot Flow: 1,342

H-182

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hambury - SP 55.9 psi
DP 91.3 psi
FL 0.2 MAG

Lakeview - SP 46.3 psi
DP 112.2 psi
FL 1.6 MAG

Shadagee - SP -
DP -
FL -

Long - 21.5 feet

Janire - 20.3 feet

Violet - 19.9 feet

MODEL

Static - 55.7

Residual - 35.8

Flow - 1,342

MJM Flow Test - Residual Hydrant: H18 - A31 Date: 7/24/2012 CHI095-B
 Location.: MAELOU DR Side: W Time: 10:30
 2ND HYD NW/O LEGION DR TOWN OF HAMBURG

Dischrge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 66 Residual(psi): 54
 Total Flow(GPM): Gallons Used: 5,040
 Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 3,467

Hyd Fl No Location Of Flow Hydrants

H18 A16 OP 5646 MAELOU DR 3RD HYD NE/O LEGION DR
 TOWN OF HAMBURG SS: SE

Nzle Size Pitot Flow Water Dst: 012 Fire: 48027 Size Main: 8 Brch: 6
 1. 2.50 25.0 839 Comments:
 2. 2.50 25.0 839
 3. Tot Flow: 1,678

H-475

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

MODEL

Hamburg - SP 51.1 psi
 DP 118.2 psi
 FL 3.0 MAGD
 Lakeview - SP 46.6 psi
 DP 81.2 psi
 FL 0.00 MAGD
 Shadagee - SP 85.4 psi
 DP 127.4 psi
 FL 1.5 MAGD

Static - 64.0
 Residual - 52.3
 Flow - 1,678

Long - 19.7 feet
 Janice - 17.0 feet
 Violet - 21.0 feet

MJM Flow Test - Residual Hydrant: H18 - A21 Date: 6/15/2010 CHI095-B
 Location.: ELMVIEW AVE Side: S Time: 9:30
 2ND HYD E/O GRIMSBY DR VILLAGE OF HAMB

Dischrge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 68 Residual(psi): 52
 Total Flow(GPM): Gallons Used: 5,700
 Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 3,439

Hyd Fl No Location Of Flow Hydrants

H18 A18 ELMVIEW AVE 1ST HYD E/O GRIMSBY DR

VILLAGE OF HAMB SS: S

Nzle Size Pitot Flow Water Dst: 016 Fire: 99999 Size Main: 8 Brch: 6

1. 2.50 32.0 950 Comments:

2. 2.50 32.0 950

3. Tot Flow: 1,900

H-285

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 48.9 psi
 DP 115.9 psi
 FL 2.1 MGAD

MODEL

Static - 67.1

Lakeview - SP 40.0 psi
 DP 107.1 psi
 FL 1.5 MGAD

Residual - 57

Flow - 1,900

Shadagee - SP -
 DP -
 FL -

Long - 19.5 feet

Janice - 17.2 feet

Violet - 19.4 feet

MJM Flow Test - Residual Hydrant: H18 - A53A Date: 6/15/2010 CHI095-B
Location.: 5893 CAMP RD Side: E Time: 10:00
2ND HYD N/O OCKLER AVE TOWN OF HAMBURG

Dischrge Coef: .90

Pressure Rdgs: Elvtn. Usgs (ft): Static (psi): 64 Residual (psi): 36
Total Flow (GPM): Gallons Used: 4,740
Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 2,009

Hyd Fl No Location Of Flow Hydrants

H18 A53 5887 LAKE AVE 1ST HYD S/O STALEY DR

TOWN OF HAMBURG SS: SE

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6

1. 2.50 22.0 787 Comments:

2. 2.50 22.0 787

3. Tot Flow: 1,574

H-168

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 49.7 psi
DP 117.0 psi
FL 2.1 MGD

Lakeview - SP 40.0 psi
DP 108.6 psi
FL 1.5 MGD

Shadagee - SP -
DP -
FL -

Long - 20.1 feet

Janice - 17.5 feet

Violet - 19.4 feet

MODEL

Static - 66.7

Residence - 40.6

Flow - 1,574

MJM Flow Test - Residual Hydrant: H18 - A53 Date: 6/15/2010 CHI095-B
 Location.: 5887 LAKE AVE Side: SE Time: 10:30
 1ST HYD S/O STALEY DR TOWN OF HAMBURG

Discharge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 64 Residual(psi): 36
 Total Flow(GPM): Gallons Used: 4,740
 Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 2,009

Hyd Fl No Location Of Flow Hydrants

H18 A53A 5893 CAMP RD 2ND HYD N/O OCKLER AVE

TOWN OF HAMBURG SS: E

Nzle Size Pitot Flow Water Dst: 013 Fire: 48027 Size Main: 8 Brch: 6

1. 2.50 22.0 787 Comments:

2. 2.50 22.0 787

3. Tot Flow: 1,574

H-167

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 48.9 psi
 DP 112.7 psi
 FL 2.2 MGD

Lakeview - SP 40.0 psi
 DP 107.1 psi
 FL 1.5 MGD

Shadagee - SP -
 DP -
 FL -

Long - 19.9 feet

Janice - 17.5 feet

Violet - 19.4 feet

MODEL

Static - 61.4

Residual - 34.1

Flow - 1,574

MJM Flow Test - Residual Hydrant: H18 - G38 Date: 5/14/2012 CHI095-B
 Location.: MCKINLEY PKWY Side: W Time: 10:50
 C/O NEWTON RD TOWN OF HAMBURG

Dischrge Coef: .90
 Pressure Rdgs: Elvtn Usgs (ft): Static (psi): 45 Residual (psi): 32
 Total Flow (GPM): Gallons Used: 4,830
 Required Residual Pressure...: 20 Flow at Reqd Residual Pressure.: 2,292

Hyd Fl No Location Of Flow Hydrants

H18 G40 4562 NEWTON RD 6TH HYD W/O CARLTON DR

TOWN OF HAMBURG SS: N

Nzle Size	Pitot	Flow	Water Dst:	013	Fire: 48020	Size Main: 8	Brch: 6
1. 2.50	23.0	805	Comments:				
2. 2.50	23.0	805					
3.		Tot Flow:			1,610		

H-436

Bottom

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll

Hamburg - SP 51.5 psi
 DP 107.1 psi
 FL 1.8 MGAD

Lalco view - SP 45.3 psi
 DP 84.9 psi
 FL 0.00 MGAD

Shadagee - SP 83.3 psi
 DP 129.8 psi
 FL 1.5 MGAD

MODEL
 Static - 45
 Residual - 33.9
 Flow - 1,610

Long - 18.9 feet

Jamce - 17.2 feet

Water - 20.5 feet

MJM Flow Test - Residual Hydrant: H18 - G62 Date: 5/14/2012 CHI095-B
 Location.: BOSTON STATE RD Side: N Time: 9:50
 1ST HYD W/O MCKINLEY PKY TOWN OF HAMBURG
 Discharge Coef: .90
 Pressure Rdgs: Elvtn Usgs(ft): Static(psi): 60 Residual(psi): 42
 Total Flow(GPM): Gallons Used: 4,620
 Required Residual Pressure...: 20 Flow at Req'd Residual Pressure.: 2,364

Hyd Fl No Location Of Flow Hydrants

H19 C08 6411 BOSTON STATE RD 5TH HYD W/O BRENNER DR
 TOWN OF HAMBURG SS: N

Nzle	Size	Pitot	Flow	Water Dst:	846	Fire:	48020	Size Main:	8	Brch:	6
1.	2.50	21.0	768	Comments:							
2.	2.50	21.0	768								
3.				Tot Flow:	1,536						

H-450

F2=Prior F3=Exit F5=Redisplay F8=Calc Flow F15=Print Extract Roll Bottom

Hamburg - SP 52.5 psi
 DP 107.2 psi
 FL 1.9 MGD

Lakeview - SP 47.1 psi
 DP 80.9 psi
 FL 0.00 MGD

Shadyside - SP 87.0 psi
 DP 120.3 psi
 FL 0.3 MGD

Long - 18.9 feet

Juniper - 17.5 feet

Violet - 19.5 feet

MODEL

Static - 59.6
 Residual - 41.6
 Flow - 1536

Appendix B

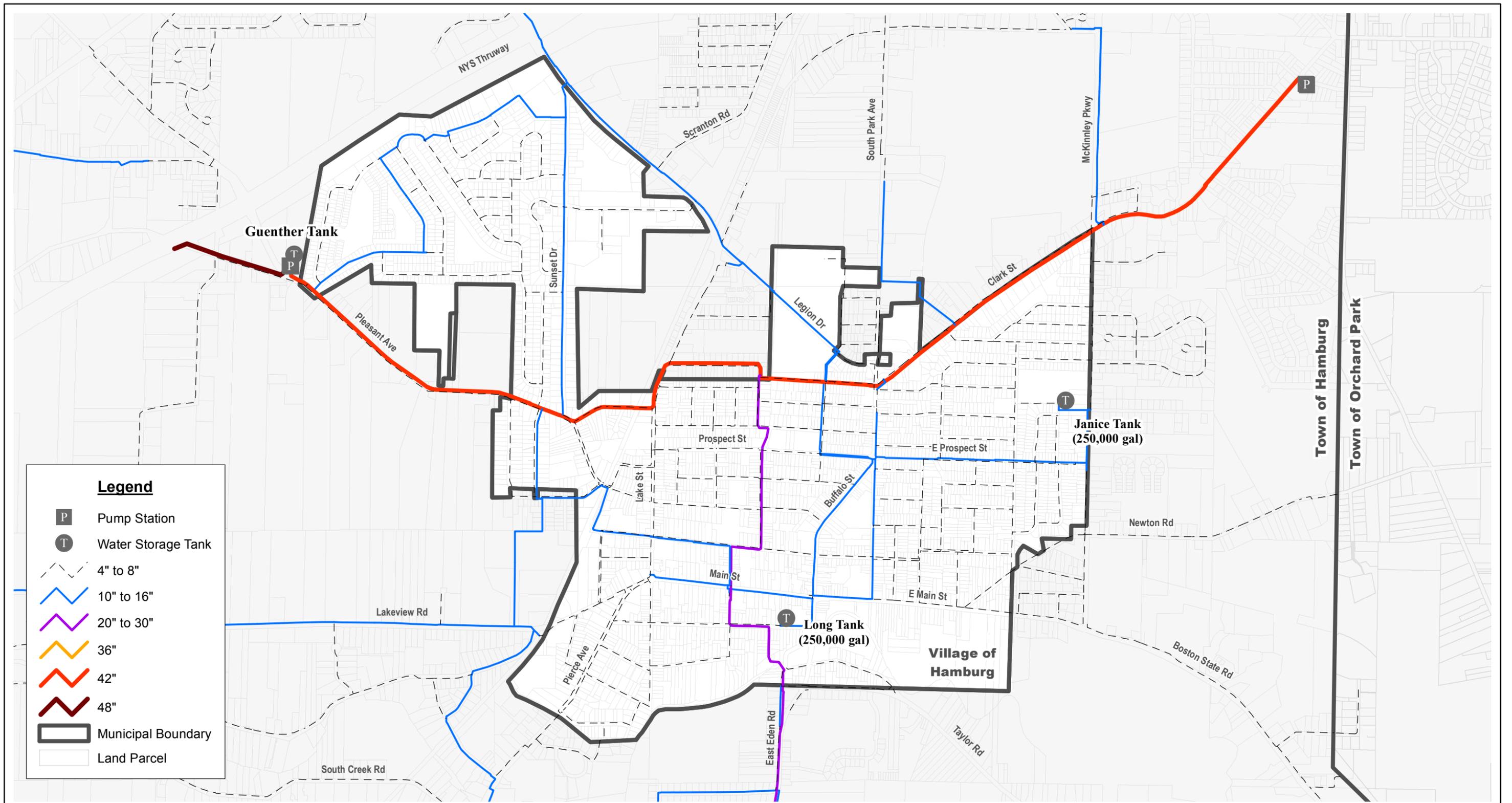
Tank Rehabilitation Costs

Attachment B - Tank Rehabilitation Costs

	Long Tank	Janice Tank
Mobilization	\$ 10,000	\$ 10,000
Clean and Paint Interior		
SP 10, 2-Coat System	\$ 185,000	\$ 185,000
Cathodic Protection System	\$ 11,000	\$ 11,000
Removable Clog-Resistant Vent	\$ 8,300	\$ 8,300
Lead Joint Isolations	\$ 3,300	\$ 3,400
TOTAL Interior Construction Costs	\$ 217,600	\$ 217,700
Clean and Paint Exterior		
SP 6, Complete Clean, Epoxy/Polyurethane System	\$ 440,000	\$ 360,000
Remove Exterior Ladder Safety Cage	\$ 2,200	\$ 2,200
TOTAL Exterior Coating	\$ 442,200	\$ 362,200
Additional Sanitary and Safety Repairs		
Grout Repair	\$ 3,300	\$ 3,400
Foundation Repair	\$ 3,300	\$ 3,400
Replace Riser Opening Safety Grate	\$ 3,900	\$ 3,900
Relocated Overflow Pipe and Install Elastomeric Check Valve	\$ 15,000	\$ 15,000
Exterior Ladder Replacements	\$ 14,000	\$ 14,000
Replace Balcony Safety Railing Members	\$ 11,000	-
Install Balcony Safety Railing Opening and Closure Chains	\$ 5,500	-
Enlarge Balcony Safety Railing Opening and Install Closure Chains	-	\$ 5,600
Replace Balcony Safety Railing Members	-	\$ 12,000
Existing Vent Modifications	\$ 1,700	-
Enlarge Riser Manhole	-	\$ 12,000
Interior Riser Ladder Removal	-	\$ 2,300
Interior Riser Ladder Replacement	-	\$ 12,000
Interior Riser Ladder Safe-Climbing Device	-	\$ 3,900
Vandal Deterrent	-	\$ 2,300
Reroute Electricity (underground)	\$ 11,000	\$ 12,000
Contingency Items	\$ 7,700	\$ 7,800
TOTAL Additional Repairs	\$ 76,400	\$ 109,600
Total Construction Costs	\$ 746,200	\$ 699,500
Contingency, Legal, Administration & Engineering	\$ 223,860	\$ 209,850
Total Costs	\$ 970,060	\$ 909,350
ROUND	\$ 970,000	\$ 910,000

Appendix C

Figures



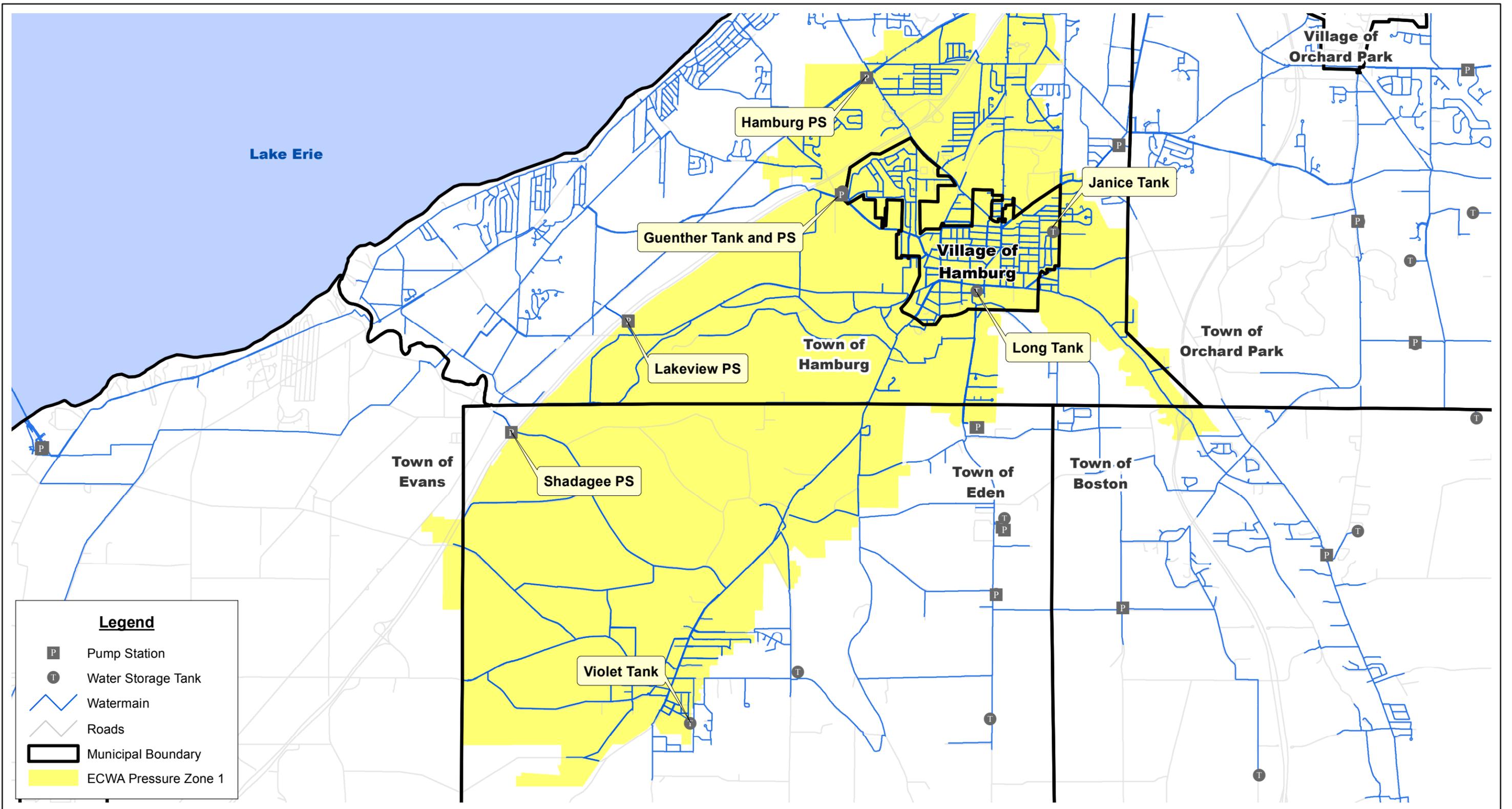
Scale: 1" = 1,500'

Figure No. 1 - Existing Village Water System Map

Village of Hamburg
Water System Consolidation Study



**CRA Infrastructure
& Engineering, Inc.**



Legend

- P Pump Station
- T Water Storage Tank
- Watermain
- Roads
- Municipal Boundary
- ECWA Pressure Zone 1



Scale: 1" = 5,700'

Figure No. 2 - ECWA Pressure Zone 1

Village of Hamburg
Water System Consolidation Study



CRA Infrastructure & Engineering, Inc.

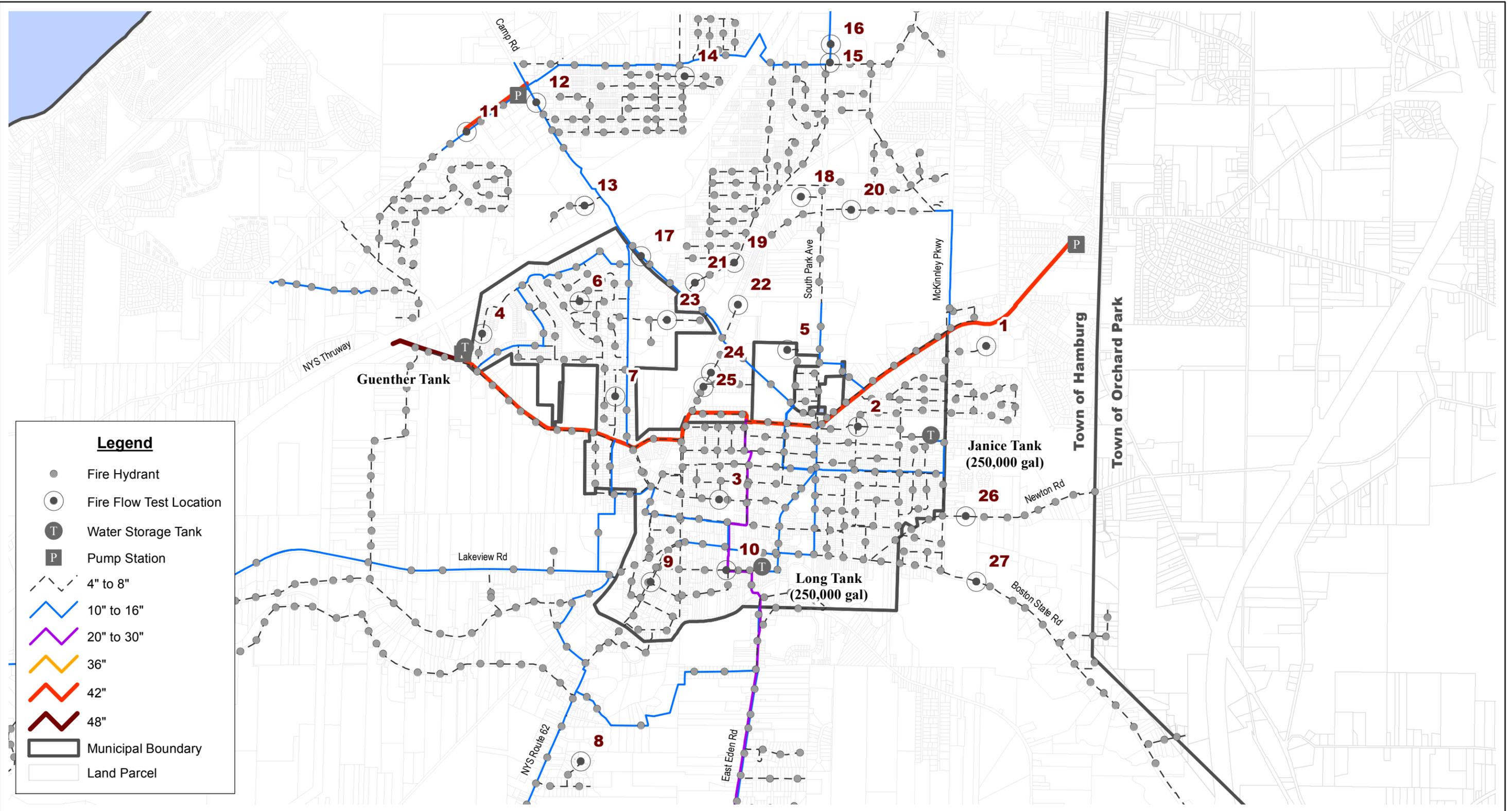


Figure No. 3 - Fire Flow Test Locations



Scale: 1" = 2,500'

Village of Hamburg
Water System Consolidation Study



CRA Infrastructure & Engineering, Inc.

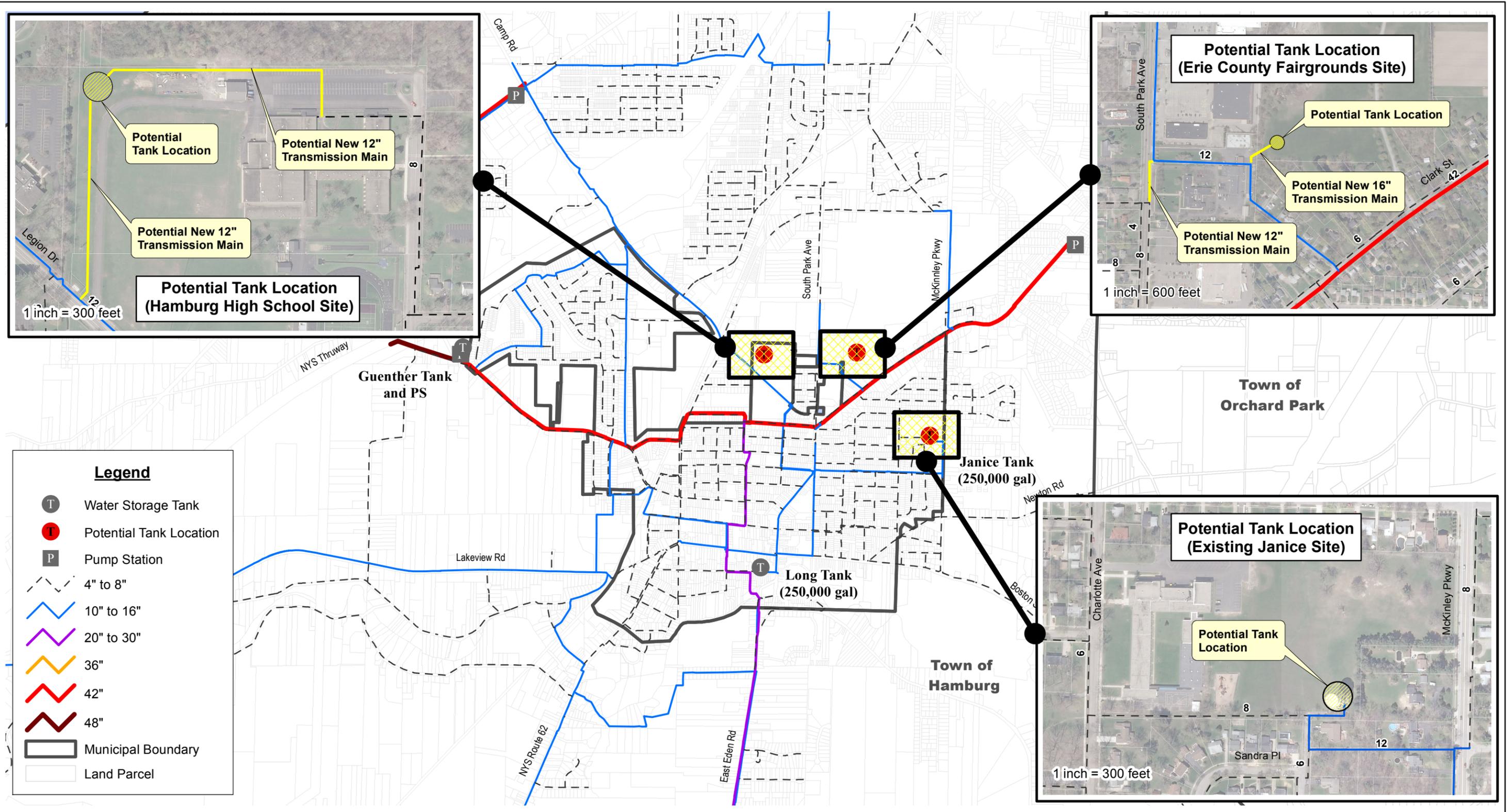


Figure No. 4 - Potential Tank Locations

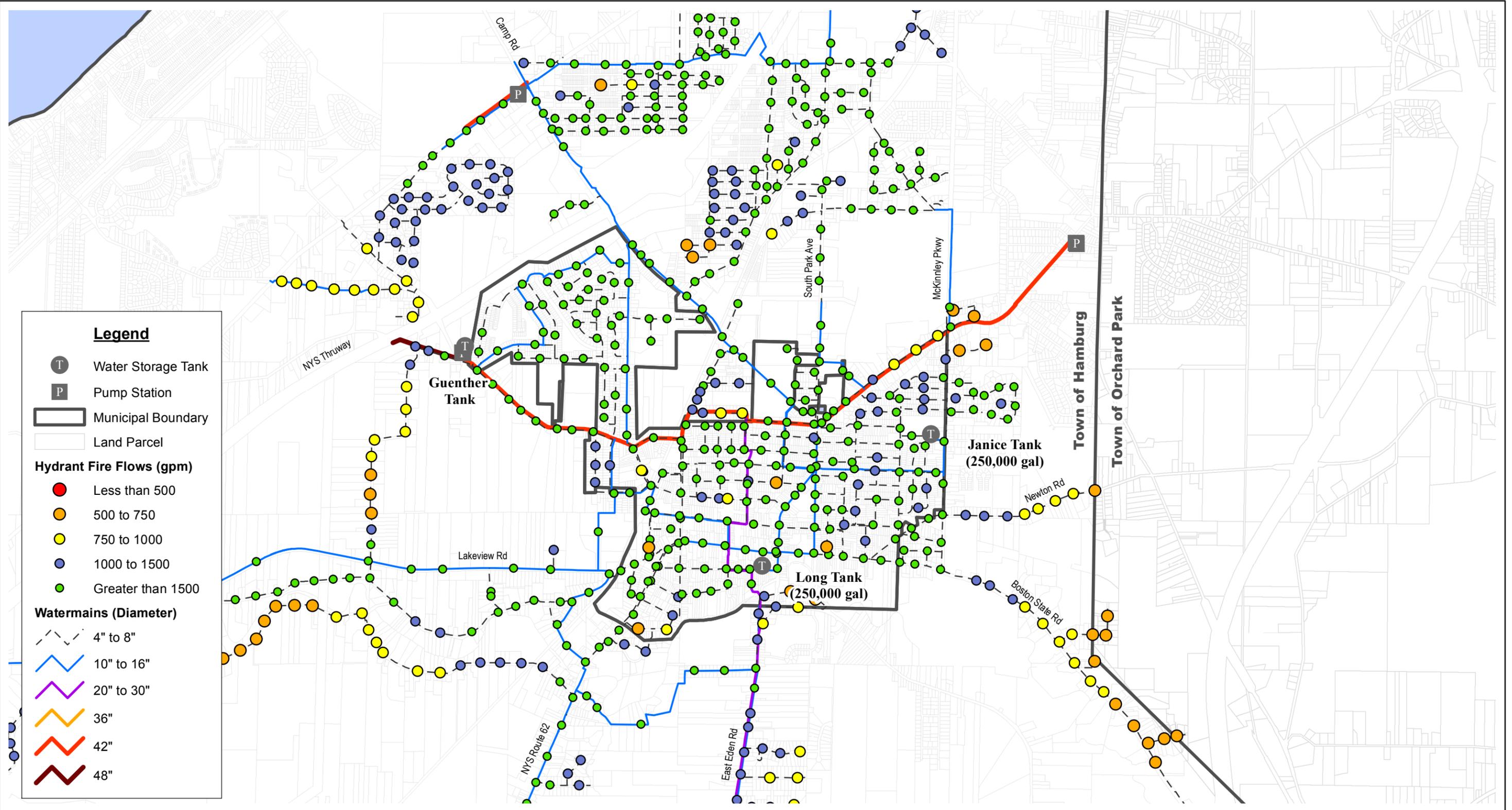


Scale: 1" = 2,500'

Village of Hamburg
Water System Consolidation Study



CRA Infrastructure & Engineering, Inc.



Legend

- T Water Storage Tank
- P Pump Station
- Municipal Boundary
- Land Parcel

Hydrant Fire Flows (gpm)

- Less than 500
- 500 to 750
- 750 to 1000
- 1000 to 1500
- Greater than 1500

Watermains (Diameter)

- 4" to 8"
- 10" to 16"
- 20" to 30"
- 36"
- 42"
- 48"



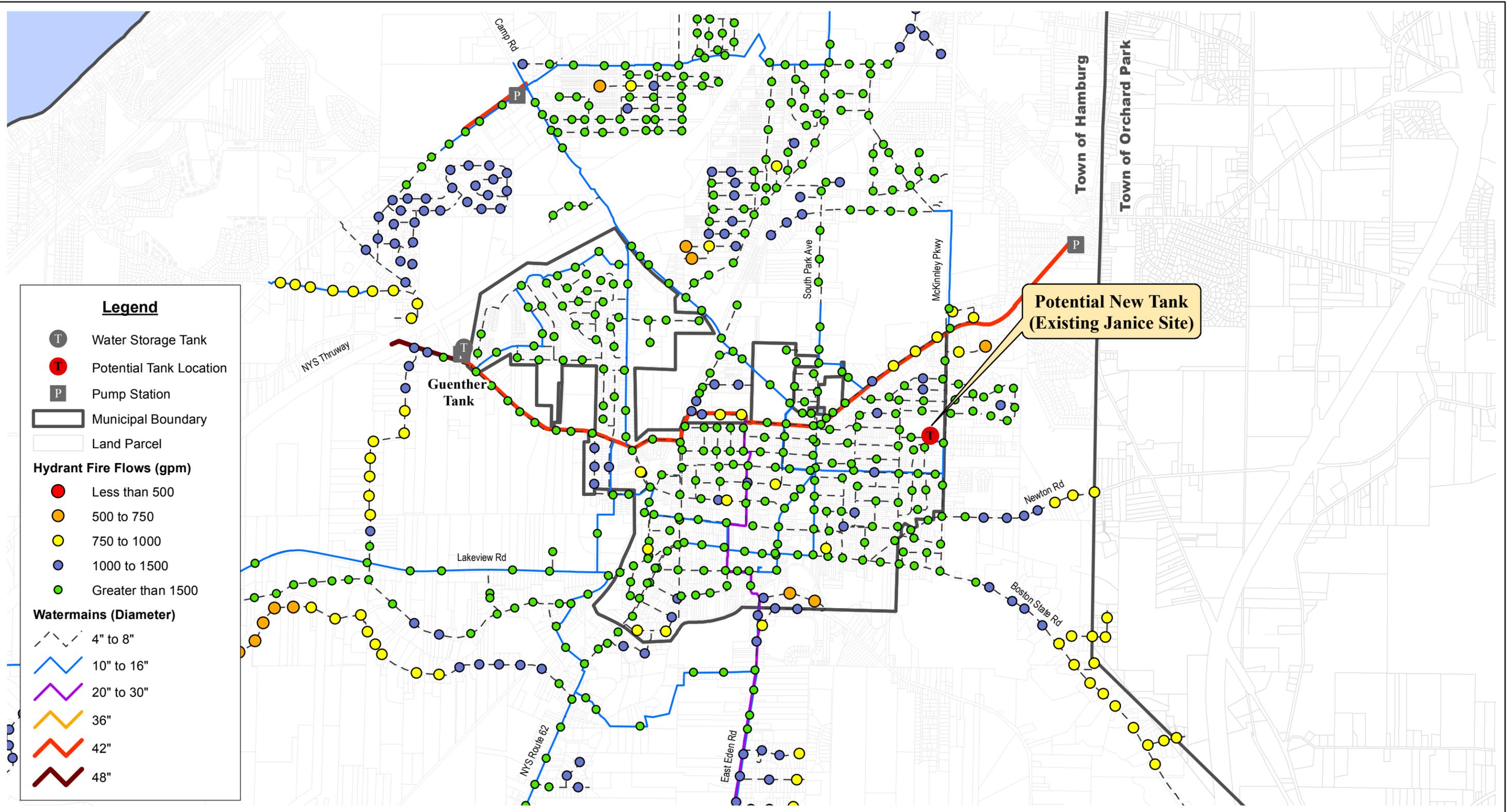
Scale: 1" = 2,500'

Figure No. 5 - Existing Available Fire Flow

Village of Hamburg
Water System Consolidation Study



CRA Infrastructure & Engineering, Inc.



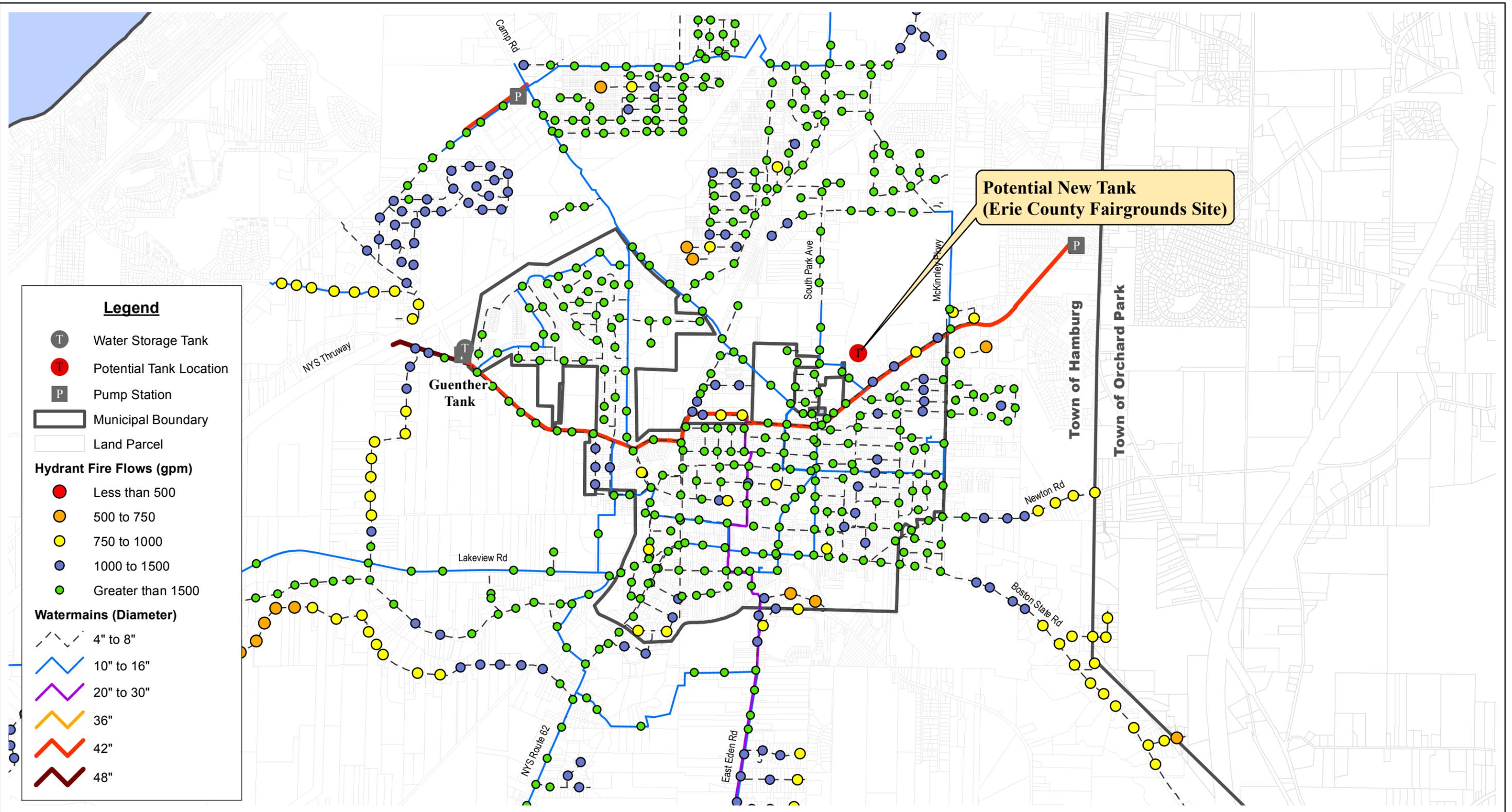
Scale: 1" = 2,500'

**Figure No. 6 - Potential Available Fire Flow
(Potential New Tank at Existing Janice Site)**

Village of Hamburg
Water System Consolidation Study



**CRA Infrastructure
& Engineering, Inc.**



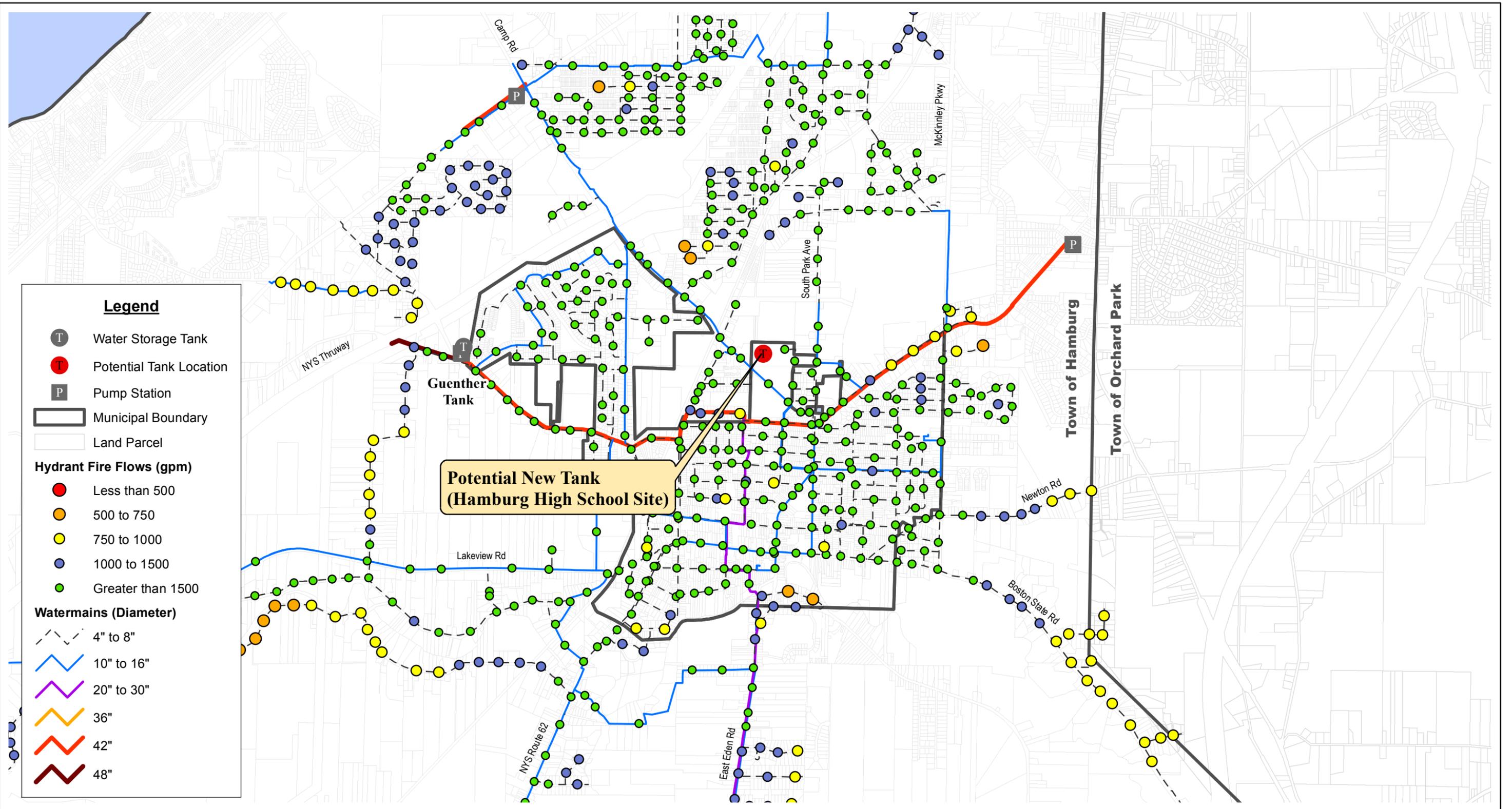
Scale: 1" = 2,500'

**Figure No. 7 - Potential Available Fire Flow
(Potential New Tank at Erie County Fairgrounds Site)**

Village of Hamburg
Water System Consolidation Study



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Scale: 1" = 2,500'

**Figure No. 8 - Potential Available Fire Flow
(Potential New Tank at Hamburg High School Site)**

Village of Hamburg
Water System Consolidation Study



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