ENGINEERING REPORT
FOR THE
TOWN OF HECTOR
AND
VILLAGE OF BURDETT
WATER SYSTEM IMPROVEMENTS
APRIL 28, 2004

I. GENERAL

The primary concern with the Water System is associated with the Town of Hector's wells. The Town's wells are located adjacent to Seneca Lake. The wells have been found to be under the influence of surface water. Therefore, the well water will need to be filtered if its use is to be continued. Other required improvements include: treatment improvements, increased well capacity, additional storage, hydraulic improvements, emergency power and security.

II. PROJECT PLANNING AREA

A. Location

The Town of Hector and Village of Hector are located northeast Schuyler County. Figure 1 is a Project Location Map. The system serves the area along NYS Rt. 414 from the Hamlet of Valois to the Village of Burdett. Appendix A is a Water System Map. The Town's wells are located adjacent to Seneca Lake. The majority of work will occur at the locations:

1. Pump Station/Treatment Facility on Peach Orchard Road.
2. New Water Main, Pump Stations and pressure reducing valve along County Road 2, County Road 4 and Mathews Road.
3. New Water Storage Tank in the Logan Road Area.
4. Well Site at Peach Orchard Point.
5. Rechlorination Facility at the Burdett Booster Pump Station.
6. New Water Main to loop NYS Rt. 79 and Factory Street, in the Village of Burdett.
7. Additional water storage tank at Burdett's existing storage tank.

B. Environmental Resources Present.

The surrounding project area consists of: lake waterfront, rural residential lands, commercial, lands, agricultural lands, Village of Burdett and wooded areas. There are no known floodplains in the project planning area. There are several historic sites in the project area. The appropriate investigations will be required during the planning phases to mitigate impacts. Measures will be incorporated into the design to mitigate adverse impacts to the critical environmental resources. Likewise, the related permits will be obtained prior to construction.

C. Growth Areas and Population Trends

The Town of Hector Water System has approximately 400 service connections and serves a population of approximately 875. In addition, the Town of Hector provides water for the Village of Burdett. The population of Burdett is 354, based upon the 2000 census. Therefore, the total population served by the Water System is approximately 1,229. The present average water use of water is 120,000 gallons per day (gpd), based upon water metering at the main pump station. The Town of Hector's average demand is approximately 90,000 gpd. The Village of Burdett's average demand is approximately 30,000 gpd.

This project includes the installation of a water storage tank near County Road 2 and Logan Road (County Road 4). This will allow service along the County Road 2 , Logan Road and Mathews Road . The estimated number of homes served in this area is 56. The estimated population of this service area is 171 people.

Some of the most densely populated portions of the Town of Hector are along the Seneca Lake Waterfront. Expansion of the water system to serve these areas is likely to occur.

During the period 1990 to 2000 the population in the Town of Hector increased by 9.7 percent. During that same period the population in the Village of Burdett decreased by 4.0 percent. For planning purposes, we estimate growth of approximately 15 percent over the next twenty years. This yields a future service area population of approximately 1,610 people. Assuming average water use of 100 gallons per capita per day, the future water consumption is estimated at 161,000 gallons per day.

III. EXISTING FACILITIES

A. Wells

The Town of Hector Water Supply consists of two shore wells, located in Smith Park on Peach Orchard Point. The wells were installed in 1974 and are located 25 feet apart; and are within 50 feet of Seneca Lake. The wells are readily accessible, fencing or other security measure are not present. The capacity of each well is approximately 118 gpm. The wells are pumped at a combined rate of 235 gallons per minute. The wells are gravel packed and screened; and require periodic redevelopment due to plugging. The wells are pumped with submersible pumps, controlled with a telephone telemetry system, based upon the level in the 6,000 gallon tank at the treatment facility. These pumps were replaced in 1996.

Based upon temperature, Total Dissolved Solids (TDS), pH and Micro Particulate Analysis (MPA) Tests the wells have been found to be under the influence of surface water. Therefore, these wells will need to be filtered to meet the New York State Department of Health regulations.

B. Treatment Facility and High Service Pump Station

The Town of Hector's Treatment Facility and High Service Pump Station is located on Peach Orchard Road, approximately 1,000 feet west of Seneca Lake. Well water is pumped to a 6,000 gallon cast-in-place concrete. The tank has an overflow elevation of approximately 592 feet. The well water is disinfected with sodium

hypochlorite and a sequestering agent is added to help control "red water" associated with iron and manganese in the well supply. The 6,000 gallon tank is utilized for chlorine contact. The pump station is a concrete block structure, attached to the 6,000 gallon tank. The pump station is equipped with two 40 horsepower high service booster pumps. These pumps operate at approximately 200 gpm at 400 feet of head. The pumps are controlled with a telephone telemetry system, based upon the elevation in the Town's Water Storage Tank. The pumps alternate in operation. The present piping arrangement does not accommodate future expansion or additional pumps.

The 6,000 gallon tank provides 30 minutes of chlorine contact time, as required by the NYS Department of Health. However, the existing tank does not have sufficient capacity for pumping at higher rates, required during emergencies or to accommodate future expansion. The tank is partially buried and is in poor condition. The tank is difficult access, clean and maintain. Although the block building and tank are fairly secure, the site is not secured with fences.

C. Water Storage

1. Town of Hector Water Storage Tank

   The Town of Hector has one 236,000 gallon welded steel water storage tank, that was built in 1974. The tank is approximately 36.5 feet in diameter and 30 feet high. The overflow elevation is approximately 995 feet. The tank was drained, cleaned and inspected in the fall of 2003. Based upon the inspection the interior of the tank was found to be in need of painting. The tank exterior is in fair condition. The tank will need to be taken out of service for an extended period of time to repair and repaint the tank interior. This can not be done presently since no secondary means of storage is available.

   Storage facilities should have a capacity to meet fire flow demands and the average daily demand. The fire flow demands vary greatly throughout the water system, since building density and type of construction is highly varied. In the waterfront areas and hamlets of Valois and Hector, buildings are often spaced between 11' and 30'. At this spacing the required fire flow is 1,000 gallon per minute. Some commercial buildings in the area have higher demands. Based upon a needed fire flow of 1,000 gpm for two hours, 180,000 gallons is required for fire flows. Adding the average daily demand of 90,000 gallons per day yields a required storage volume of 270,000 gallons. Therefore, the existing tank is slightly under capacity. To accommodate growth, expansion and allow operation and maintenance additional water storage is required.

   The existing water storage tank site is not well secured; no fences or gates are present.

2. Village of Burdett Water Storage Tank

   The Village of Burdett has one 250,000 gallon welded steel water storage tank, that was built in about 1974. The tank is approximately 37.5 feet in diameter and 30 feet high. The overflow elevation is approximately 1050 feet. The tank is in poor condition. Leaks along welded seams have been a chronic concern. The tank will need to be

taken out of service for an extended period of time to repair and repaint the tank. This can not be done presently since no secondary means of storage is available.

Storage facilities should have a capacity to meet fire flow demands and the average daily demand. The fire flow demands vary greatly throughout the water system, since building density and type of construction is highly varied. In the Village of Burdett, homes are often spaced between 11' and 30'. There are many commercial buildings in the Village with spacing less than 10'. At this building spacing the required fire flow is 1,500 gallon per minute. Based upon a needed fire flow of 1,500 gpm for two hours, 180,000 gallons is required for fire flows. Adding the average daily demand of 30,000 gallons per day yields a required storage volume of 210,000 gallons. Therefore, the existing tank is near its capacity. To accommodate growth, expansion and allow operation and maintenance additional water storage is required.

The existing water storage tank site is not well secured; no fences or gates are present.

D. Distribution System

1. Town of Hector

The Town of Hector distribution system consists primarily of 8-inch diameter asbestos cement pipe (ACP). This piping was installed in 1974. There is approximately 14 miles of pipe in the Hector Water System. Appendix A includes the location of the water mains. Although the ACP has generally not been subject to breakage or hydraulic problems, there are health related concerns with the release of asbestos fibers into the water and into the air when repairs or work is done on the main. Furthermore, repair materials, fittings and appurtenances for ACP are increasingly difficult to obtain. Due to the vast quantity of pipe in the system replacement of the main is not practical. However, where increased capacity is needed or other construction activities are planned, replacement should be considered.

There are six pressure reducing valve vaults serving the Hector Water System. Five of these lower the water pressure to provide moderate pressures in the low elevation areas in the system. The other provides a back feed from the Village of Burdett Water System. The Town of Hector has been repairing and replacing these valves, in recent months. The pressure reducing valves are in good operation condition.

2. Village of Burdett

The Village of Burdett distribution system consists primarily of 8-inch diameter asbestos cement pipe (ACP). This piping was installed in 1974. Water is pumped to the Village's Water Storage Tank via a pump station located along County Road 5, near the Village Line. The pump station contains a pressure reducing valve for back feeding into the Town of Hector. The pumps and pressure reducing valve have recently been replaced, and are in good working order.

IV. PROBLEM EVALUATION

The following concerns need to be addressed:

A. Well Water Quality

The Town's wells have been shown to be under the influence of surface water. Under the NYS Department of Health's Surface Treatment Rule, water sources under the influence of surface water need to be filtered. The Town's treatment facility will need to be expanded to accommodate a filtration system.

There have been red water concerns with the existing supply. The Town has recently began to utilize a sequestering agent to help alleviate these concerns. However, this concern is not completely addressed.

B. Well Capacity

The newly adopted State Health Codes require that a well system should meet the maximum daily demand, with the primary well out of service. The maximum daily demand is estimated at approximately 240,000 GPD. The capacity of each of the Town of Hector's wells is approximately 118 gpm (170,000 GPD). Therefore, an additional well or improvements to the existing wells will be required.

C. Security

Presently, there are no fences at the well site, treatment facility, pump station or water storage tanks to prevent trespassing or tampering with the water system. More tamperproof durable construction and fencing is required at the sites for security and safety.

D. Chlorine Contact Tank

The existing 6,000 gallon chlorine contact tank needs to be enlarged to accommodate increases in flow and future growth. The existing tank should also be replaced due to the difficulty of access, operation and maintenance.

E. Water Storage

Additional water storage should be provided at both the Town of Hector and the Village of Burdett to meet the present storage requirements and to accommodate future growth. An additional tanks should also be provided to facilitate painting and maintenance of the existing water storage tanks. The Town of Hector should consider a new water storage tank at a higher elevation to allow service in the higher elevation areas of the Town and to improve hydraulic conditions in the higher elevations of the water system.

F. Water Main Extensions

1. Town of Hector

Due to the soil conditions along County Road 2 and the Logan Area many private well supplies are yield little water and water of poor quality. Due to agricultural activities water supplies in the area are subject to high nitrate levels. Hydrogen Sulfide and other organic material are prevalent in the wells up gradient of the waterfront. Many of the existing wells have been found to have bacteriological contamination. These wells have required additional costly treatment. Due to the corrosive characteristics of the existing wells, frequent costly repairs and replacement has been needed. Many of the wells have been found to have limited capacity and do not provide water as needed; posing serious health risks.

Another safety related concern is fire protection. Since the area is not served with a public system, fire protection is limited. Installation of a municipal water system will greatly increase the ability to fight fires.

Another area of concern are the waterfront properties. Some of the most densely developed portions of the Town of Hector are along Seneca Lake. Many of these cottages and homes pump water directly from the Lake with little or no treatment. Others have shallow wells that are susceptible to surface water influence. In addition, many of the seasonal cottages are being converted to year round homes. The increased water use coupled with septic systems constructed on small lots with high water table, results in degradation of the water supply. Expansion of the Hector Water System to serve portions of the waterfront is very likely to occur. Three areas have specifically been identified to be likely areas for water system expansion. These are the Norbud Road to Wickham Road area, Glen Eldridge Point and Valois Point.

2. Village of Burdett

The Village of Burdett Water System has several dead-end water mains. As a result fire flow conditions are limited and deteriorated water quality is a concern in some areas. In addition some commercial development is proposed in the southeast portion of the Village. A loop should be constructed to provide improved hydraulic conditions and to accommodate the proposed development.

G. Out of District Users

Presently there are 16 customers that are out of district users in the Town of Hector. Four of these are commercial users. An extension of the existing water district should be made, to include these properties.

H. Emergency Power

Presently, the there are no emergency generators to maintain water production, treatment and pumping. Emergency generators should be added at the well site and treatment plant facility. Future pump stations should be equipped with emergency generators.

I. Distribution System

1. NYS Rt. 414 near Wickham Road

NYS Rt. 414 near Wickham Road is at an elevation of approximately 900 feet. Static pressures are only about 36 psi. During fire flows this area is susceptible to dangerously low pressures. Fire flows in this area are also below the 500 gpm at 20 psi minimum residual.

2. Dugue Road

The west end of the water main on Dugue Road is at an elevation of 820 feet. Static pressures are sufficient. However, during fire flows in the north portions of the water system, pressures in this vicinity are reduced to dangerously low levels.

3. Water Hammer in north portion of Water System

The north end of the Hector Water System is essentially a closed system, there are no water storage tanks and no significant loops. Pressures in this area are controlled by pressure reducing valves. Rapid changes in flow rates through the pressure reducing valves and stopping and starting the high service pumps give rise to pressure surges. A surge tank or pressure relief valve should be considered to reduce the risk of system damage.

4. Fire Hydrants

In many portions of the Water System fire hydrant spacing exceeds the maximum of 600-feet. Additional fire hydrants should be installed to improve fire protection and insurance ratings.

5. Asbestos Cement Pipe

The vast majority of water main in the Hector and Burdett Water Systems is comprised of asbestos cement pipe. Wherever possible this material should be replaced with an approved material.

J. Chlorine Residuals

Due to the rural nature of the Hector and Burdett Water Systems, residence times in the water system are extended. As a result chlorine residuals are often low. This is especially true in the Village of Burdett System, since it is located over five miles from the treatment facility. Presently, there are no rechlorination facilities in the Water System.

V. ALTERNATIVES AND RECOMENDATIONS

A. Filtration

There are several filtration options available to address the concerns with the surface water influence on the existing wells. The following criteria were considered in the selection process:

- Ease and simplicity of operation.
- Versatility and effectiveness.

- Initial capital costs and long term operation and maintenance costs.
- Space requirements. The Town of Hector has very little land available at the present treatment facility.
- Disposal of filtrate. Being located near Seneca Lake, it is preferred to avoid treatment and surface discharge of backwash water.

The Town has considered the following options: conventional rapid sand, slow sand, diatomaceous earth and cartridge and bag filters. Redundancy will be required to meet health requirements and to provide continuous operation. The advantages and disadvantages of each of these options is discussed below.

1. Conventional Rapid Sand Filtration

   Conventional sand filtration is proven to effectively treat a variety of raw waters. The treatment process can be more complicated than other options, since use of coagulants may be necessary and backwashing is involved. However, technical assistance relating to the rapid sand filtration is readily available due to its popularity. Conventional rapid sand filters have high initial costs and require a moderate amount of space. However, operation and maintenance is relatively low, since filter media is not lost at a high rate and media is inexpensive.

   Generally, design filtration rates of 2 gpm/ft^2 are required for rapid sand filters. Using a design flow rate of 161,000 gallons per day. At least two filters each with a surface area of approximately 56 square feet would be required.

   Rapid Sand Filters need to be backwashed. However, since the Hector Water Supply is from wells, raw water quality is relatively high. Frequent backwashing will not be required and large amounts of sludge will not be generated. Backwash could be directed to a septic system; where sludge would be collected in a septic tank and wash water directed to the subsurface for disposal.

   The minimum backwash requirements for rapid sand filters are 15 gpm/ft^2 for a 15 minute period. Therefore, the backwash rate would be 795 gpm. A volume of 11,925 gallons would be generated for a 15 minute backwash. However, with an extended air scour, this backwash period and rate could probably be reduced.

2. Slow Sand Filtration

   Like conventional rapid sand filtration, slow sand filtration is a proven technology and is effective on a variety of raw waters. Operation is relatively simple and technical assistance is readily available. Slow sand filters have high initial costs primarily due to the large size requirements. However, long term operation and maintenance is relatively low, since media replacement is not a high cost. Operation costs are also relatively low, since slow sand filters are not backwashed. Slow sand filters are generally cleaned manually, by removing the upper layer of sand and filtered material. This material is then disposed of. Cleaning the filters is fairly labor intensive. However, it is not required frequently.

Generally, design filtration rates are limited to 0.1 gpm/ft^2 for slow sand filters. Using a design flow rate of 161,000 gallons per day. Two filters each with a surface area of approximately 1,118 square feet would be required. Due to the space limitations at the site, this option is not preferred.

3. Diatomaceous Earth Filters

Diatomaceous earth (DE) filters are used in a comparatively small number of municipalities. Operation is more complex than rapid sand filter systems, since a DE slurry must be introduced after each cleaning to form the filter cake on the septum. Initial capital costs are moderate for DE filters, since there size can be relatively small. Operations costs are moderate due to the need to purchase DE and dispose of spent DE.

Most DE systems also require recirculation or holding pumps to maintain a pressure across the filter when the unit is not in operation. This is to prevent the filter cake from dropping off the filter septum. DE filters need to be cleaned. This is generally achieved by backwashing, similar to rapid sand systems. However, there are some units that are designed to be manually cleaned, where a dry cake is removed from the septum. In either case, the DE is lost with each cleaning. Therefore, this option will generate larger quantities of waste material than any other option. Backwash could be directed to a septic system; where sludge would be collected in a septic tank and wash water directed to the subsurface for disposal. Or the filter cake could be directly disposed of depending upon the system.

Generally, design filtration rates of 1.0 gpm/ft^2 is required for DE filters. Using a design flow rate of 161,000 gallons per day. Two filters each with an effective surface area of approximately 112 square feet would be required. Since DE filters operate under pressure or vacuum conditions the filter area can stacked within a vessel, so that area requirements are relatively small. Due to the increased complexity, relative rarity and additional waste generated this option is not recommended.

4. Cartridge and Bag Filters

Bag and Cartridge filters have been used primarily in industrial and food production applications. Recently, the technology is being used in small public water systems, therefore experience with these system is limited. However, the systems are relatively simple to operate and maintain. Initial costs for the filter units is low to moderate. However, replacement of the filter bags or cartridges can be costly depending upon the life of the filters. Generally, a series of increasingly fine filters are installed. The filter area of most bag and cartridge filters is relatively small, therefore, the capacity to hold filtrate is not high. Thus, Cartridge and Bag Filters have limited life and must be periodically replaced.

The Town of Hector has completed a pilot study utilizing a 20 micron, 5 micron and 1 absolute micron rated filters in series. Based upon the pilot study replacement of filters was determined to be potentially cost

prohibitive. However, additional study is being completed to determine if a cost effective selection of filters can be found to meet the needs of the system.

Due to reliability, versatility, ease of operation and low operation costs, rapid gravity filtration is recommended. A minimum of two filter units with a surface area of at least 56 square feet will be required. The system will also include a backwash tank and septic system for backwash water. Sand filtration is also expected to improve the red water concerns.

The filtration will include replacement of many of the electrical controls to improve operational efficiency and control.

B. Well Capacity

Additional wells should be drilled or infiltration galleries should be constructed to meet maximum day demands and accommodate future growth. The capacity of the proposed well or infiltration gallery should be approximately 250 gpm.

C. Security

Fences should be installed at the well site, treatment facility, pump stations and tank sites to improve security and safety.

D. Chlorine Contact Tank

The Town's chlorine contact tank needs to be replaced. To accommodate future growth a 12,000 gallon capacity tank is recommended. This volume would meet the needs for backwashing and provide additional chlorine contact time required for future growth. The new contact tank should be designed to facilitate cleaning, operation and maintenance. A low maintenance material such as concrete will be utilized.

E. Water Storage Tank

Several locations were considered for the an additional storage tank in the Town of Hector. The primary goal is to provide additional storage and to allow the existing tank to be taken out of service for maintenance, painting and repairs. However, the Town also hopes to serve areas in need of public water and areas where future development is anticipated. As a result, the water storage tank is proposed to be installed in the area near County Road 2 and County Road 4, known as Logan. Refer to Figure 2. There is a relatively high density of homes in this area and elevations are high enough to suit a secondary water storage tank. An area just east of County Road 4 and north of County Road 2 has ground elevations of approximately 1,450'. This elevation will provide excellent pressures in the Logan are and allow future extensions in many parts of the Town.

The highest point in the Village of Burdett is at the location of the existing tank. The second tank for the Village of Burdett should also be installed at this location.

We recommend a 250,000 gallon water storage tanks to accommodate future growth and to provide additional storage for both systems. This volume will provide a redundancy in the water system to allow the existing tanks to be taken out of service for maintenance and painting, and meet the daily demands and fire flows.

Three types of tanks were reviewed to address the need for additional storage

1. Glass Coated Steel Tanks

   Glass Coated Steel Tanks have relatively moderate initial costs and low maintenance requirements. These tanks consist of steel panels with a glass coating fused onto the steel. The coating is moderately durable and resistant to corrosion. The panels are bolted together to form the walls of the tank. Some maintenance is required to recoat the bolts. Ice formation is a concern with these tanks, special operation is required to minimize ice formation, during cold weather.

2. Painted Steel Tanks

   Painted Steel Tanks have the lowest initial costs. These tanks are generally welded in the field and coated with epoxy paints. Steel tanks are long lasting and durable, but can have moderate maintenance costs for repainting and corrosion control.

3. Pre-stressed Concrete Tanks

   Pre-stressed Concrete Tanks have the higher initial costs. These tanks consist of reinforced concrete panels that are erected in place and wrapped with steel reinforcement and then coated in the field with concrete. These tanks are highly durable and resistant to vandalism and intrusion. The concrete tanks are also highly resistant to corrosion. Maintenance required for pre-stressed concrete tanks is very low, no recoating or painting is required. Due to their strength and durability ice formation in these tanks does not pose the concerns that it does with the glass coated steel tanks.

Pre-stressed concrete tanks are recommended for this project. This alternative was selected due to the durability and safety offered by the concrete tanks. The proposed storage tank sites are somewhat remote, therefore the tamperproof nature of the concrete tanks is an important quality. The low maintenance requirements offered in concrete tanks make operation costs low. Painted welded steel tanks and glass coated bolted steel were excluded due to their higher maintenance costs and lower durability. The size of the tanks were determined based upon estimated needs. Two 250,000 gallon tanks will more than double the storage capacity in the Water System. This will also allow the existing tanks to be taken out of service for maintenance, painting and repairs.

Once the new water storage tanks are completed, the existing water storage tanks should be taken out of service repaired and repainted.

F. Water System Extensions

1. Town of Hector

   Four areas for water system extensions are being consider. One would be completed in conjunction with installation of a new water storage tank in the Logan area. The other three would serve areas along Seneca Lake; including Valois Point, Club Seneca Area and Glen Eldridge Point. These last three areas would not result in improvements to the existing water system. They are included for

planning purposes only.

a. Logan Area

The first will be completed in conjunction with the second storage tank in the Logan Area. This requires the installation of 31,700 linear feet of ductile iron water main along County Road 2, County Road 5 (Logan Road) and Mathews Road. Two pump stations and four pressure reducing valves will be required. Appendix A of this report includes the hydraulic model for this extension. The hydraulic analysis includes the existing and proposed hydraulic conditions. The proposed water main will serve approximately 56 homes. A water district in this area should be formed to allow service in this area.

The loop along Mathews Road will connect to the existing line on NYS Rt. 414. This will greatly improve fire flows in flows in this area, including near Wickham Road where static pressures and fire flows are substandard.

b. Valois Point

Presently, this area is not serviced with public water. Many homes draw directly from Seneca Lake or have wells of poor quality and quantity. This would include the installation of approximately 5,000 linear feet of water main, a pressure reducing valve and service approximately 35 homes and a mobile home park. Connection would be made at the existing water main on Lake Road and extend to the north and south along the waterfront. A separate water district would be formed to serve this area. The residents of the district would be responsible for the costs for extension of water service to this area.

c. Club Seneca Area

Presently, this area is not serviced with public water; and includes the remainder of Norbud Road and portions of Club Seneca Road, Mapes Road, Mathews Road and Wickham Road along the waterfront. Connection would be made to the existing water main on Norbud Road and extend southerly along the waterfront. Many homes draw directly from Seneca Lake or have wells of poor quality and quantity. This would include the installation of approximately 8,800 linear feet of water main, two pressure reducing valves and service approximately 42 homes. A separate water district would be formed to serve this area. The residents of the district would be responsible for the costs for extension of water service to this area.

d. Glen Eldridge Area

Presently, this area is not serviced with public water. Many homes draw directly from Seneca Lake or have wells of poor quality and quantity. This would include the installation of

approximately 1,200 linear feet of water main, two pressure reducing valves and service approximately 16 homes. Connection would be made to the water main at the end of Glen Eldridge Road and extend to the north along the waterfront. A separate water district would be formed to serve this area. The residents of the district would be responsible for the costs for extension of water service to this area.

New 8-inch water mains, two pump stations and four pressure reducing valves should be should be installed to provide water service to the residents along County Road 2 and County Road 4 and Mathews Road, in the Town of Hector. This extension will provide badly needed public water supply and fire protection to approximately 56 homes. This extension will address water quality and well yield concerns in this area. This will also add loop in the water system and improve hydraulic conditions in along NYS Rt. 414 near Wickham Road.

2. Village of Burdett

Figure 3 includes a the location of a proposed loop that will eliminate dead-end water main on Factory Street and NYS Rt. 79. This loop will improve fire flow by approximately 110 gpm. This loop will also accommodate expected development.

New 8-inch water mains should be installed to loop the dead-end mains on NYS Rt. 79 and Factory Street; and to accommodate the expected development.

At all the connection points asbestos cement pipe should be removed and replaced with ductile iron pipe or other suitable material.

G. Water District Extension

The existing water district should be extended to include the existing out of district users. This will ensure a fair and equitable distribution of costs for water service.

H. Emergency Power

Presently, the there are no emergency generators to maintain water production, treatment and pumping. Emergency generators should be added at the well site and treatment plant facility. Future pump stations should be equipped with emergency generators.

I. Hydraulic Conditions

1. NYS Rt. 414 near Wickham Road

By completing the water system extension to Logan and along Mathews Road hydraulic conditions will be improved in the Wickham Road area. Available fire flows will increase from 272 gpm at a residual of 20 psi to 759 gpm at a residual of 40 psi.

2. Dugue Road

To reduce the pressure loss during fire flow conditions a check valve vault should be built to maintain pressure on the Dugue Road Water Main.

3. Water Hammer in north portion of Water System

A surge tank or pressure relief valve should be considered to reduce the risk of system damage, due to water hammer.

4. Fire Hydrants

In many portions of the Water System fire hydrant spacing exceeds the maximum of 600-feet. Additional fire hydrants should be installed to improve fire protection and insurance ratings.

J. Chlorine Residuals

A rechlorination facility should be constructed to improve chlorine residuals. The facility should be built at the Village of Burdett's Pump Station. The system should include a chlorine analyzer and pace chlorine injection based upon residual level and flow rates.

VI. PROJECT DETAILS

A. Environmental Impacts

There would be no significant environmental impacts with this project, since most work will occur at the existing sites and within the right-of-way. The appropriate environmental and archeological studies will be completed prior to initiating construction. The appropriate permits and design modifications will minimize impacts upon the environment.

B. Land Requirements

Additional land will be required for the pump stations, pressure reducing valves and water storage tank. Additional land may also be required for the filtration equipment and chlorine contact tank. The majority of new water mains will be located within the right-of-way, therefore little additional land will be needed for the water main work.

C. Construction Requirements

There are no unusual site constraints. The project can be completed utilizing conventional construction methods. Presently, there are no fences at the sites to prevent trespassing. Fencing, gates, secure hatches and ladder gates will be included in this to improve the security of the water system.

D. Cost Estimates

Table 1 is a Detailed Cost Estimate for the selected alternative. The costs are summarized as follows:

1.	Construction	$3,789,775.00
2.	Land Acquisition	$30,000.00

3.	10% Contingency	$378,977.50
4.	Engineering	$416,875.25
5.	Legal and Administrative	$265,284.25
	Total Project Costs	**$4,880,912.00**

E. Advantages/Disadvantages.

This alternative will meet the needs in a cost effective manner. This alternative also addresses the health and safety concerns associated with the facilities. This project will also provide potable water and fire protection in areas presently not served.

VIII. CONCLUSIONS AND RECOMMENDATIONS.

The Town of Hector and Village of Burdett should seek grants and loans to complete the water system improvements.

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