Report
Final Draft

Town *of*

Haddam, Connecticut

Report on

Water System Evaluation Study
Higganum Village Center

February 2000

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1.0 INTRODUCTION

This water system evaluation study has been prepared to assist the Economic Development Commission (EDC) in determining the best course of action for providing public water to the Higganum Village. This study builds upon WSE's previous report titled *Report on Infrastructure Needs Tylerville Commercial Area and Higganum Village Center* and dated February 1999, that identified two viable options for providing public water. The viable options include the creation of a community water system that would utilize a new groundwater supply adjacent to Higganum and a connection to the existing water distribution system owned by, and located in, Middletown, Connecticut. The connection point to the Middletown system is located on Route 154 approximately 3½-miles north of the Village Center.

1.1 Purpose

The purpose of this study is to explore the feasibility of the two (2) water supply options in terms of technical constraints, initial capital cost, annual operation and maintenance cost, regulatory requirements, and impact on wastewater disposal. The water systems evaluated in this report include provisions for fire protection to the service area through the use of a storage tank. This report does not evaluate the use of a non-potable water system that would draw water from the Higganum Reservoir for fire protection.

1.2 Initial Design Criteria

During the initial evaluation phase of this project, the Economic Development Commission (EDC) selected a water demand for the commercial area, established the limits of the service area for the system, and selected a well development site. The results of those decisions are presented below.

1.2.1 Demand

The water demand calculated in the *Infrastructure Needs Report* is utilized for the schematic design of the water system options and is shown in Table 1-1. It is assumed that the water demand established for the design visions will be adequate for growth in the village during the next five (5) years. The water demand that was established for "full commercial development" is utilized as a guide for future expansion of water system components. A full discussion of the methodology utilized to establish the "design vision" and "full commercial development" water demand is included in Section 4.0 of the WSE report titled *Report on Infrastructure Needs*

Tylerville Commercial Area and Higganum Village Center and dated February 1999. Cost estimates presented in this report are based on creating a water system adequate to meet the "design vision (5 year)" water demand.

Table 1-1 Water Demand

Parameter	Full Commercial Development		Development to Design Vision (5 yr)	
Maximum Daily Water Demand	189,000 GPD	131 GPM	42,000 GPD	29 GPM
Average Water Demand	76,000 to 132,000 GPD	53 to 92 GPM	17,000 to 29,000 GPD	12 to 20 GPM

1.2.2 Service Area

The EDC chose the boundary for the service area, which is shown on Figure 1. The boundary of the service area is the same as the "study area" from the *Infrastructure Needs Report* with the following exception: the service area ends on the north side of Ponset Brook on Route 81 (Killingworth Road). It is assumed that properties south of the culvert may be connected to the water distribution system in the future. Therefore, the water demand indicated in Section 1-1 is utilized for the schematic design of the water system options. Within the service area the water system will include service lines to homes and businesses from a larger water distribution main in the public right-of-way. The water system in the service area will also include fire hydrants located along the right-of-way at appropriate spacing.

The service area concept is used initially for conceptual design of the water system. Property owners outside of the delineated service area that are located along a transmission main are not presently included in the water service. If the water demand of those owners can be met by the existing system, the Town may allow such connections. If the demand cannot be met, then the system components will need to be reevaluated for changes necessary to accommodate the new users.

1.2.3 Well Site Selection

In the *Infrastructure Needs Report*, two (2) specific properties were identified for a bedrock well site: Town-owned property north of the Haddam Elementary School and state-owned land, slated for transfer to the Town, on the west side of the Higganum Reservoir. No potentially productive, unconfined aquifers were identified.

During the development of this report, the Town requested consideration of the Granite Springs area as an alternate well site location. The Granite Springs complex consists of a ½ acre lot on High Street and a spring. The spring is located approximately ½-mile to the east of the High Street property. The owners of Granite Springs intend to bottle water from the spring and supplement the water with a groundwater supply well, located beneath the building. The estimated yield of the well is 20 gallons per minute (GPM). There is approximately 27-acres of wooded land adjacent to the bottling company and surrounding the spring that may be utilized as a well site.

The spring itself is contained in a 14-foot diameter stone masonry wall that is approximately 12-foot deep with a perforated overflow pipe. Overflow from the spring on December 30, 1999 appeared to be approximately 5 to 10 GPM.

Based on an anticipated withdrawal rate between 10 and 50 GPM, the Connecticut Public Health Code (Section 19-13-B51d) requires a 150-foot minimum separation from sources of pollution. While there is no specific ownership requirement in the code, it is assumed that regulators will require ownership of the separation area. Town-owned property north of the Haddam Elementary School and the state-owned land on the west side of the Higganum Reservoir are large enough to support a well field with a 2x2 array of four (4) wells located 100 foot apart. Currently the Granite Springs complex is not large enough to support a well field. However, the adjacent 27 acres of wooded land, if acquired, could be utilized. This report has not included the evaluation of the 27-acres of land, since it is not owned by Granite Springs or the Town and was not considered for evaluation during the initial selection of well sites by the EDC.

Following a discussion of the many and varied issues surrounding the location and selection of the well site, the EDC chose the school property for the well site. The location of the well site is shown on Figure 1. The proposed wells are located in a row along the base of Swan Hill for access along the woods road through the school property.

Additionally, Haddam Elementary School currently uses a well located in the basement of the building that is classified as a non-transient (fixed number of users), non-community (the users do not reside adjacent to the system) public water well. Currently, the domestic water demand for the school is met with water from this well. The well location, however, is inappropriate for use as a supply for the distribution system in the service area.

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Section 2

2.0 SCHEMATIC DESIGN

Based on the criteria initially determined with the EDC, WSE prepared schematic designs of the distribution system, the well site improvements, tank storage, and transmission mains. Figure 2 shows an overall water system schematic, which includes the source of supply, the service area, and tank storage. The purpose of the schematic designs is to quantify those aspects of the water systems that are necessary to prepare planning level cost estimates for construction of the systems.

2.1 Water Distribution System

Water main within the service area, shown on Figure 1, is required along the following roads: Route 154 (Saybrook Road), Route 81 (Killingworth Road), and Candlewood Hill Road. New water systems typically use 8-inch or 12-inch diameter, cement-lined, ductile iron (DI) pipes. There is little cost differential for the installation of an 8-inch diameter DI pipe and a 12-inch diameter DI pipe. However, the up front capital cost is significantly higher for the 12-inch diameter DI pipe and the potential flows from the area do not warrant the use of 12-inch pipe. Therefore, WSE recommends the distribution system consist of 3,700-linear feet of 8-inch DI main. Mains should be installed such that the top of the pipe is at least 4½-feet below the ground surface for protection against freezing and traffic loads.

Appurtenant construction includes fittings for bends and branches, 8-inch valves on the main, 1-inch copper service lines with brass corporations and curb stops (valves at the main and road right-of-way, respectively), and complete hydrant assemblies.

The water main will need to be installed on or beneath the bridge over Candlewood Hill Brook on Route 154. If installed beneath the bridge, the main should be constructed in a driven sleeve. The main may also be insulated and hung beneath the concrete bridge deck, provided floodway capacity is not reduced and the bridge structure is adequate to support the water main. It is also assumed that the Town Department of Public Works (DPW) garage on Depot Road will not be connected to the water system. Based on these assumptions, the main will not have to be installed on or under the Depot Road Bridge over Candlewood Hill Brook, providing a significant cost savings.

2.2 Well Site Improvements

The schematic design for well site improvements was prepared in accordance with the technical requirements of the Department of Public Utility Control (DPUC) Regulations for *Application Procedures and Criteria for Issuing Certificates of Public Convenience and Necessity for Small Water Companies (Section 16-262m-8)*. These regulations are jointly administered with the Department of Public Health (DPH). Schematic design of well site improvements includes the following: the number and arrangement of wells, water treatment, and standby power. These features were evaluated and/or designed to the degree necessary to create planning level cost estimates.

The DPUC/DPH regulations require atmospheric (unpressurized) tank storage, hydropneumatic (pressurized) tank storage, and pumps for the transfer of water from the atmospheric to hydropneumatic tank. The DPH has confirmed that this system arrangement is not necessary, since tank storage is combined and located at a separate location from the well field. Ideally, tank location is on the opposite side of the service area than the water supply source. The water storage tank could be located at an elevation that will eliminate the need for transfer pumps and provide a reservoir of water for use during fire flow conditions and pressure stabilization during peak flows. The tank requirements and schematic tank design are discussed in Section 2.5.

Chemical treatment, power and control centers, and standby power generator could be housed in a building located adjacent to the Town dog pound off of Dublin Hill Road to the east of the well field.

<u>2.2.1 Wells & Pumping</u>

The proposed wells, which could be located at the school property, would draw water from a consolidated aquifer, meaning that the water is located below the bedrock surface. The well site consists of bedrock overlain by glacial till. The surficial soil may yield 1 to 100 GPM, but the saturated thickness is typically 10-feet or less. The safe yield of a bedrock well is highly variable and must be determined as part of the installation of the well. If the yield tests for the school property fail to meet the desired demand, other sources for water must be evaluated.

Well pumping rates are based on the maximum daily demand of the system. For the five (5) year plan, the pumping rate would be 29 GPM, as shown on Table 1-1. It appears that a single well pumping at a minimum rate of 29 GPM would be adequate, provided the well yield is high enough. The DPUC regulations require, however, that a minimum of two (2) wells are provided with the required pumping capacity. The second well is either used as a backup to the primary well, or the wells are alternated during normal service. The second well is also utilized whenever the primary well is being serviced, to ensure continuous service.

Full commercial development conditions will require a pumping rate of 131 GPM. If the pumping rate of the initial two (2) wells is increased to 35 GPM, then a well field would consist of four (4) primary wells yielding a total of 140 GPM and a fifth backup well, yielding a minimum of 35 GPM. The schematic design, presented in this report, is based on two (2) initial wells with 35 GPM pumping rates.

2.2.2 Water Treatment

The Connecticut Department of Public Health (DPH) regulates water quality through the Public Health Code, Section 19-13-B102, "Public Drinking Water Quality Regulations". The regulations specify water treatment based on the water quality determined for the source. When water quality parameters exceed the initial treatment level, chemical treatment and disinfection may be required. If water quality parameters are further exceeded, filtration is required. Treatment determinations are based on evaluation of the following parameters: bacteriological (coliform), physical (color and turbidity), and inorganic chemicals. Water quality is also regulated after treatment as "ready for consumption" for the following parameters: physical (color, turbidity, odor), inorganic, pesticides, herbicides & PCBs, organic chemicals, radioactivity, and total coliforms. The regulations outline action levels and monitoring requirements for the various parameters.

Lacking actual analytical data for the source groundwater, we make several assumptions as to the necessity and extent of water treatment. First, we assume that groundwater from the proposed wells will not be "under surface water influence" and, therefore, that filtration is not required. We further assume, conservatively, that chemical treatment will be required. This would include disinfection and corrosion protection. Since most groundwater in New England is acidic, treatment should be considered for raising the pH to remain in compliance with EPA's Lead and Copper Rule regulations. We also anticipate that a system will be required to reduce lead and copper concentrations at the tap.

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cement lined, ductile iron pipe. The Middletown Water Pollution Control Authority (WPCA) requires a formal request from the Town to evaluate a connection to their system. Upon receipt of a formal request, the WPCA will determine any modifications to the Middletown system that may be required and also the residual pressure and flow available at the connection point. If the Town determines the connection is a viable option, a formal request should be presented to the WPCA to verify the WSE design assumptions. No alternate transmission main routes were identified. In order for Middletown to provide water to Higganum, an arrangement must be developed that is acceptable to the State Water Use Coordinating Committee, since the Connecticut Water Company (CWC) holds exclusive service rights to Haddam.

2.5 Tank Storage

Distribution storage is provided to meet peak demands of short duration, minimize pressure fluctuations during periods of demand changes in the distribution system, and furnish a reserve for fire fighting. Storage may also serve to provide an emergency supply in case of temporary breakdown of pumping facilities or water main break. Equalization, fire, and emergency storage are typically allocated at specific levels within a storage facility to ensure the storage volume will be available at a hydraulic gradient adequate for the intended purpose. Equalization storage is provided within the top portion of the tank, with fire storage positioned immediately below. Emergency storage is located within the lowest portion of the tank. The following presents an analysis of the Higganum Village distribution storage needs.

<u>2.5.1 Equalization Storage</u>

Based on information presented in the American Water Works Association (AWWA) M32, Manual of Water Supply Practices - Distribution Network Analysis for Water Utilities, the volume of water required for equalization storage within a tank should be approximately 15-percent to 25-percent of the maximum day demand for the area served by the tank. As noted previously, the maximum day demand projected for full commercial development of the Higganum Village Center is approximately 189,000 gallons per day. The Town should plan to provide between 28,500 and 47,250 gallons of equalization storage. Based on our experience with similar water systems, WSE recommends equalization storage of approximately 25-percent of the maximum day demand, which is 47,250 gallons.

According to the DPUC Regulations *(Section 16-262m-8)*, a minimum pressure of 35 psi should be provided to customers under normal demand conditions. Thus, only the volume of water within a tank that will provide a pressure of 35 psi to the highest customer elevation can be considered usable as equalization storage. Most communities begin receiving pressure complaints from customers when water pressures dip below 50 psi, due to this WSE recommends the future highest elevated customer receive a water pressure of 50 psi (115-feet). A review of Figure 1 for Higganum Village Center indicates the highest elevation served in the system could potentially be 140-feet (USGS). This elevation is found at the Middletown Water System connection location on Saybrook Road. The volume required for equalization storage, 47,250 gallons, would be provided above the elevation of 255-feet (140-feet + 115-feet) (USGS). The current highest building in the Higganum Village Center, at 140-feet, would receive a water pressure of approximately 55 psi (266-feet – 140-feet) when the tank is filled to its capacity at an elevation of 266-feet.

2.5.2 Fire Storage

Fire protection requires tank storage to supply the high flows that are required during a fire event, which range from 2,000 GPM to 12,000 GPM (American Water Works Association, Manual M31, Fire Flow Requirements). The required fire flow depends upon the structure and contents of buildings, the proximity of other buildings, weather conditions, and the length of time the fire has been burning. Theoretical calculations of fire flow by various agencies attempt to incorporate these variables. Using the Insurance Services Office, Inc. (ISO) method and lacking specific data for structures (construction class, floor area, number of floors, combustibility class, wall exposures, sprinklers and fire communication potential), the needed fire flow was estimated using a one-story, 16,000-square foot building of masonry construction with joists. Occupancy is considered "combustible" and minimal exposure or communication of fire is anticipated. The needed fire flow, rounded to the nearest 250 GPM, is 2,500 GPM. The period of time the fire flow is available is also a key component in determining fire protection tank storage, since quantity is the product of rate and time. In accordance with the National Fire Protection Association guidelines, for 2,500 GPM or less, the recommended fire duration is two (2) hours or a total of 300,000 gallons of water. This fire storage volume must be available at a pressure of 20 psi (46-feet) to the highest house elevation in the system. For a potential highest customer elevation previously noted as 140-feet (USGS), the volume of water required for fire storage would need to be provided above an elevation of 186-feet (140-feet + 46-feet) to be considered usable fire flow.

2.5.3 Emergency Storage

Any storage provided within the tanks below the elevation required to maintain the 20 psi pressure for fire storage is considered emergency storage, and would be used during pipeline breaks, raw water contamination, natural disasters, power outages or equipment failures. The volume required is a function of risk with respect to an interruption of supply and, typically, estimated to contain up to two days of the average day water demand.

2.5.4 Storage Tank Location

The best location to minimize costs is Swan Hill, adjacent to the potential well field. This would eliminate the 3,000-linear feet of transmission main to the storage tank. Since ownership of Swan Hill is unclear at this time, the proposed tank is located on the land to be acquired by the Town from the State adjacent to the Higganum Reservoir at the location shown on Figure 1. The location of the tank requires installation of an additional 3,000-linear feet of transmission main between the tank and service area along Maple Avenue and Hull Avenue.

2.5.5 Storage Tank Sizing and Options

The storage tank could be a standpipe or an elevated storage facility. A preliminary design of both tanks is presented for comparison.

Due to the height of the tank necessary to provide a minimum water pressure of 50 psi to every customer, a standpipe would need the approximate dimensions of 96-feet high and 28-feet in diameter. This would provide 47,250 gallons of equalization storage to the service system over the top 11 feet of the tank. The approximate capacity of the tank would be 450,000 gallons. This tank would provide 100,000 gallons more than the required 347,250 gallons of storage and if built before the water demand increased, could have stagnation problems. When the water demands are low the tank will not drain and refill at the rate required to maintain the chlorine residual within the tank. This could lead to the growth of coliform bacteria within the system. If this were to occur, the town would need to install a local chlorine circulation system at the tank site and perform maintenance on the system at regular intervals until the water demand increased. The need for circulation systems on oversized tanks is all too frequent and adds to the long term cost of the standpipe.

An elevated storage tank meeting the required storage could also serve the Higganum Village Center system. It would include the 47,250 gallons required for equalization storage and 300,000 gallons for fire flow. Elevated storage tanks are manufactured at 100,000-gallon intervals up to 500,000 gallons. A 400,000 gallon elevated storage tank would best serve the Higganum Village Center needs, however there is still the possibility of stagnation at low water demands. The tank's dimensions are approximately 47-feet in diameter with the water stored over a 30-foot head range. These dimensions may vary slightly depending on the manufacturer of the tank, but represent the general dimensions the town can expect to see.

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Table 2-1 Water Storage Tank Analysis Results

Criteria	Result or Value	
Fire Flow	2,500 GPM at minimum 20 psi	
Fire Duration	2 hours	
Minimum Normal Demand Pressure in Service Area	50 psi	
High Ground Elevation in Service Area	140 feet USGS	
Minimum Tank Water Surface Elevation for Fire Storage	186 feet USGS	
Minimum Tank Water Surface Elevation to Provide 50 psi to Highest Ground Elevation	255 feet USGS	
Overflow Elevation of Tank	266 feet USGS	
Tank Capacity		
Equalization Storage	47,250 Gallons	
Fire Storage	300,000 Gallons	
Total Useable Storage Required	**347,250 Gallons**	
	Standpipe Tank	*Elevated Tank*
Total Storage Provided	450,000 Gallons	400,000 Gallons
Diameter	28 feet	47 feet

Section 3

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3.0 COST ESTIMATE BASIS

In this section, the basis of planning level cost estimates is presented. Using information generated in the schematic designs, overall cost estimates (See Section 5.0) have been developed. The planning level costs are typically the initial capital cost of the system necessary to meet the five (5) year demand. Certain components of the system will be adequate well beyond that demand, and others will require improvements to meet increased demand in the future. Where appropriate, the cost estimates also include engineering fees. Legal fees and land acquisition cost are not included in the estimates. All prices are based on December 1999 ENR costs. An evaluation of operation and maintenance cost is also presented.

3.1.1 Groundwater Exploration

The first phase of a well supply development includes groundwater exploration, which encompasses an engineering evaluation of the well site to determine potential test well locations. The locations of the test wells require approval by the DPUC/DPH in the first phase of the certificate process for a new water supply. Following DPUC/DPH approval, a well driller is hired to install the test wells and perform a pump test for a minimum of 72-hours. Since the test wells will extend into bedrock, it is not possible to monitor drawdown of the adjacent aquifer. The pump test relies strictly on the results of drawdown at the test well. Analytical samples are collected during the pump test and submitted to a testing laboratory for analysis. It is anticipated that the test wells will be 8-inches in diameter. The overall cost of groundwater exploration, including engineering fees, drilling cost for two (2) test wells, pump test cost, and analysis cost is estimated at $100,000.

3.1.2 Well Site Improvements

Improvements to the well site, following the groundwater exploration, include the following:

- the cost of conversion from individual test wells to an operational well field,
- the cost of water treatment equipment,
- the cost of power, standby power, and control equipment, and
- the cost of the chemical treatment building.

Conversion of the test wells would consist of installation of a submersible well pump and a "pitless adapter" which supports the well pump, well discharge line, and electronics (level measurement and power/control for the pump). The pitless adapter also provides a horizontal connection to the branch pipe in the well field. Further, the adapter seals the top of the well to prevent contamination from the surface. The branch piping that leads to each well joins a larger header pipe that leads to the chemical treatment building. The chemical treatment building could contain the water treatment equipment, electrical controls for power, pumping and metering, and the standby generator.

The estimated cost for converting the individual test wells to an operational well field is $80,000. Developing the site with a building and the necessary equipment for the well, such as electrical controls and the standby generator, is estimated at $200,000. These costs may vary after sampling of the test wells and specific types of water treatment are determined.

3.2 Distribution System and Transmission Mains

The estimated cost of the distribution system and transmission mains was determined by using per foot prices that reflect the presence of service lines, the type of pavement repair, and the anticipated removal of rock from the trench. The initial unit price of a distribution main is estimated to be $85 per linear foot of 8-inch and $100 per linear foot of 12-inch main. The initial unit price includes the main with services and fire hydrants, excavation and backfill, rock removal from the trench, trench pavement repair, services, engineered design and contingency. Based on recent bid prices, service connections to the main, including corporations, curb stops, copper service line, excavation, backfill, and restoration, account for ten (10) percent of the bid price for the main. Therefore, the estimated unit price for a transmission main is $77 per linear foot for 8-inch and $90 for 12-inch main.

Where water main trench in the state right-of-way is located in pavement, an overlay from the centerline to the gutter will be required. The initial unit price includes trench repair only. The estimated cost differential between the overlay and trench repair is three dollars ($3) per linear foot.

One additional cost modification is included for anticipated bridge crossings. The estimated cost of a bridge crossing, using insulated pipe and hangers, is an additional $500 per linear foot of main. This cost does not include a structural analysis of the bridge or the cost for a driven sleeve beneath the channel, if the pipe cannot be attached to the bridge. One bridge crossing is required in the distribution system on Route 154 over Candlewood Hill Brook, with an estimated length of 50-feet. Another bridge crossing is required on the transmission main from the well site to the service area. The length of the bridge over Higganum Brook on Dublin Hill Road is approximately 50-feet.

The total initial capital cost of the various mains is included in Section 5.1.

3.3 Tank Storage

The standpipe storage tank measuring 96-feet high and 28-feet in diameter is estimated at a base cost of $337,500, including fabrication and erection. WSE estimates the base cost of the elevated storage tank at $450,000, including fabrication and erection. Tank foundation, field painting, telemetry controls, site work, and engineering design for a storage tank must also be included in the tank estimate. The total estimated cost for these storage tanks, including contingency is $475,000 and $650,000 respectively.

The Town should weigh the costs and benefits of the two tanks to determine which would best suit the community and the future goals. The elevated storage tank would store less water, while reducing the problem of stagnation. The standpipe storage tank could store an emergency supply of water, but may incur an additional cost for the prevention of stagnation. These options, in addition to the aesthetics, location, and cost difference will need to be considered to determine the final storage facility. For the purposes of this study, the standpipe has been chosen assuming stagnation will not be a problem.

3.4 Operations and Maintenance

Although not included in the initial cost of a system, the operations and maintenance (O&M) cost can be sizeable, especially for smaller systems. The per capita O&M cost for a smaller, independent system is generally higher than the O&M cost of an outside provider, such as the WPCA, will charge. For the purposes of this report, the O&M costs are viewed over a 10 year annual cost that have been evaluated as a present worth cost for comparison. It was assumed that increased cost due to inflation represents 3% per year during the present worth analysis.

For a water supply system that uses a new groundwater supply, O&M costs are incurred for electricity, equipment maintenance, chemical supply, sampling and testing, and personnel. From WSE experience, O&M costs for a similar sized system are estimated at $6,500 per month of

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operation, or $96,000 per year. The present worth of an annual cost of $78,000 over ten years with 3% inflation is $740,000. This represents the present total O&M cost to run the groundwater supply system for ten years

For public water system connections, the O&M cost is translated into a user charge for water. Several options exist for the O&M and billing of the distribution system, but for this report it will be assumed that the WPCA will perform the O&M on the system and bill the customers directly. Operational charges for the connection to the Middletown system could not be determined, lacking a formal request to the WPCA regarding the connection to Higganum. However, it shall be assumed that the cost will be similar to the Connecticut Water Company (CWC) which operates in the area. Using the CWC current rate schedule that metered users pay, a total system cost can be evaluated using the average water demands (presented in section 1.2.1 of this report) and the assumption that there will be 100 service connections in ten years. The present cost for the entire system in 2010 based on the CWC rate schedule is $61,800. This is the estimated cost that the customers will pay directly to the WPCA for water service.

The present worth cost for the entire system in 2001 is dependent on the amount of customers that connect to the system. If 20 customers connect during the year, the present worth cost the customers will pay to the WPCA is $12,360. For the purposes of comparison, it will be assumed that the amount of customers is increased incrementally from 20 in 2001 to 100 in 2010. The total present worth cost of water by the WPCA over ten years would is estimated at $378,000

The storage tank will require painting of the interior and exterior, this should occur at approximately 20- or 25-year intervals of service. Since this report is looking at a 10-year present worth analysis, no present worth cost was included for the repainting of the storage tank.

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Section 4

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Section 4

4.0 PERMITTING AND FUNDING

4.1 Permitting Requirements

The following state and local permits have been identified:

4.1.1 Certificate of Public Necessity

As previously discussed, community water systems must adhere to the Connecticut State Regulations regarding "Application Procedures and Criteria for Issuing Certificates of Public Convenience and Necessity for Small Water Companies", issued by the Connecticut DPUC on September 28, 1987. These regulations describe the three (3) phase process that is required to apply for a certificate, the design criteria for small public water systems, and financial, managerial, and technical qualifications of the applicant. The first phase (I-A) of the certification process is approval for the selection of well sites and permission to obtain a well drilling permit. The next phase (I-B) is an evaluation of the well yield and water quality so that the system can be designed in accordance with the regulations. The final phase (II) is certification of the system, which allows construction of the distribution, storage, and treatment systems to begin.

The certification process is a joint effort between the DPUC and the DPH, which regulates water quality issues. There is a regulatory schedule for review of applications by the DPUC/DPH. Phase I-A reviews are to be completed within 60-days of filing; Phase I-b, within 30-days of receipt of additional information; and Phase II, within 60-days of the final submissions on the system. The total review period is 5-months, but delays often occur during the review process, and the schedule does not include engineering and exploration time between submittals.

4.1.2 Diversion Permit

A diversion permit will be required from the Connecticut Department of Environmental Protection (DEP) since the maximum daily water demand from the two wells is greater than 50,000 GPD. Recently, the DEP has added a general permit for withdrawal of up to 250,000 GPD under certain conditions, which includes water supply interconnections, community water systems, and diversions up to 250,000 GPD. General permits are characteristically easier to obtain than individual permits. General permits for diversion permit reportedly take 4-months to acquire. One key component in the diversion permit process is the impact of the groundwater removal on adjacent surface water bodies and wetlands. Aquifer testing is also needed to determine the potential impact on adjacent water bodies or wetlands.

4.1.3 Road Encroachment Permit

The majority of the water distribution and transmission work will require an Encroachment Permit from the Connecticut Department of Transportation (DOT). The permit is administered by the District offices, which in the case of Haddam, is District II in Norwich. The contractor completing the work submits the application for the encroachment, together with bonds and insurance to the District Engineer. Prior to that time, the DOT is involved in an informal way checking that the drawings and specifications agree with State standards and the encroachment permit regulations. Prior to application for a permit, the DOT *may* stamp a set of drawings and specifications as generally acceptable to the DOT. The DOT has recently increased their requirements for pavement replacement and utility line coordination. Based on the pavement serviceabiltiy rating of a roadway, one-half of the roadway (or between adjacent roadway joints) may have to be milled and overlaid with 1½-inches of pavement.

4.1.4 Wetlands

Local wetland approvals will be required from the Wetlands Commissions in Haddam. The water system is anticipated to only impact wetland buffers for water main installed in roadway right-of-way. It is anticipated that less than 5,000-square feet of wetland will be impacted by the installation of the water system, eliminating application to the Army Corps of Engineers for approval.

4.1.5 Water Main Extension Approval

The Department of Public Health must be notified before making modifications to an existing public water system that have "sanitary significance" (19-13-B102 (d)(2)). Approval must be obtained prior to starting construction. The format of the notification is generally a letter prepared by the utility.

4.2 Potential Sources of Funding

The funding sources were identified by Ms. Ann Faust, Grants Administrator for the Town of Haddam. Ms. Faust has identified grants from the United States Department of Agriculture for water supply systems, Community Development Block Grants from the Housing and Urban Development Department for job creation, and grants under Title IX from the Department of

Commerce for sudden loss of income. The demographics of the Town are not generally favorable for acquiring grants. Other possible sources of funding are the State Bond Commission and grants available from the Connecticut Department of Environmental Protection. Ms. Faust is continuing her research into grant funding.

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Section 5

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Section 5

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5.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

Water systems utilizing a groundwater supply or a connection to an existing public water system were studied to provide the EDC with technical, economic, and permitting information necessary to fully consider the options available. Initial system configuration decisions by the EDC were utilized to create schematic designs of water systems, and the schematic designs were utilized to create planning-level cost estimates. Permitting by various state and local agencies is also summarized. In this section, we provide brief summaries of the initial cost of the water systems, the anticipated permitting effort and the impact on wastewater design.

5.1 Summary of Initial Capital Cost

Table 5-1 presents a summary of the initial cost of a water system for the Higganum Village Center, which utilizes a new groundwater source. The estimates are based on the schematic designs and cost basis presented in Sections 2.0 and 3.0.

Table 5-1 Cost – New Groundwater Source

System Component	Estimated Initial Cost
Groundwater Exploration	$100,000
Well Site Improvements	$280,000
Transmission Mains	
Transmission Main Well Site to Service Area (8-inch)	$170,000
Transmission Main Service Area to Tank Storage (12-inch) *	$280,000
Distribution Mains (8-inch)	$350,000
Storage Tank (Standpipe)	$475,000
15% Contingency	$250,000
Total Option Cost	$1,905,000

* Component will not be necessary if tank is located on Swan Hill.

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Table 5-2 presents a summary of the initial cost of a water system for the Higganum Village Center, which utilizes a connection to the Middletown system. The estimates are based on the schematic designs and cost basis presented in Sections 2.0 and 3.0.

Table 5-2 Cost – Public Water Supply Connection

System Component	Estimated Initial Capital Cost
Transmission Main Public Water System to Service Area (8-inch)	$1,520,000
Additional Transmission Main To Tank Storage (12-inch) *	$280,000
Distribution Mains (8-inch)	$350,000
Storage Tank (Standpipe)	$475,000
15% Contingency	$395,000
Total Option Cost	$3,020,000

* Component will not be necessary if tank is located on Swan Hill.

5.2 Operation and Maintenance Cost

The ten-year present worth O&M cost for groundwater supply is $740,000, while the WPCA connection cost is $378,000. The present worth of O&M for a ten year period is estimated at $362,000 less than the independent supply well alternative. The groundwater supply alternative also does not include a cost for a water meter reader or billing staff. In the WPCA connection alternative, administrative items such meter reading or billing are incorporated as part of the water rates.

The costs above are based on 100 water service connections ten years in the future. If only 50 connections are made, it is fair to assume that less money would be collected from water use rates. In a smaller system such as Higganum, O&M monetary problems could develop if numerous service connections are not made to alleviate costs of O&M. An advantage to connecting to the WPCA system is that the WPCA would be directly responsible for this and the HigganumVillage Center could develop at a slower pace without affecting the water system.

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5.3 Required Permits

For a water system supplied using new groundwater wells, the following permits are anticipated:

- Certificate of Public Necessity from the DPUC jointly with the DPH.
- Diversion Permit from the DEP.
- Road Encroachment Permit from the DOT.
- Wetlands Permit from the Haddam Wetlands Commission.

For a water system supplied by a connection to the Middletown system, the following permits are anticipated:

- Road Encroachment Permit from the DOT.
- Wetlands Permit from the Haddam and Middletown Wetlands Commissions.
- Water Main Extension Approval from the DPH.

5.4 Impact on Wastewater Systems

Creation of a water system in the service area will primarily impact wastewater disposal by reducing the separation distances required under the Connecticut Public Health Code, Section 19-13-B100 or B103, "Regulations and Technical Standards for Subsurface Sewage Disposal Systems". The code requires separation of 75 to 100-feet between drinking water wells and on-site wastewater disposal systems. The separation reduces to 10-feet from a water service line, therefore increasing the available land for development.

5.5 Recommendation

Based on the information presented in this report, WSE recommends that the Town of Haddam develop a new groundwater source to serve the Higganum area. The new groundwater source development is approximately $753,000 less than an extension of water main to the service area from Middletown when O&M costs are evaluated over a ten year period. This cost differential is sufficient reason to consider new groundwater source development as the desired alternative for a public water system in Higganum. WSE recommends a formal request be made to the Middletown WPCA to explore potential water pressure and flow. If the WPCA were willing to pay for part of the lengthy water main needed to connect it with Higganum, the WPCA alternative would be more closely priced with the groundwater alternative.

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Figures

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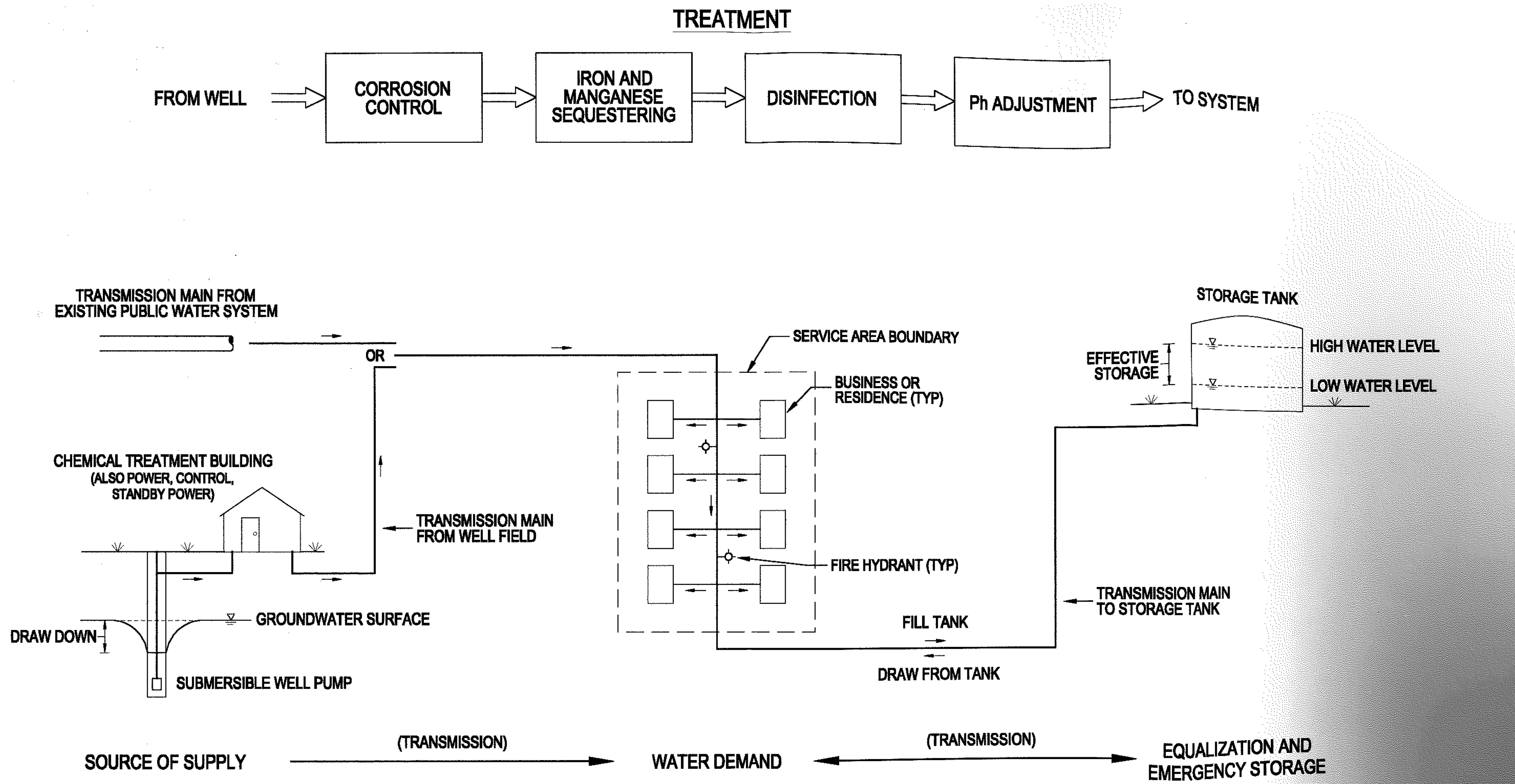

FIGURE 2
WATER SYSTEM SCHEMATIC
HIGGANUM VILLAGE CENTER
HADDAM, CONNECTICUT
FEBRUARY 2000 NOT TO SCALE

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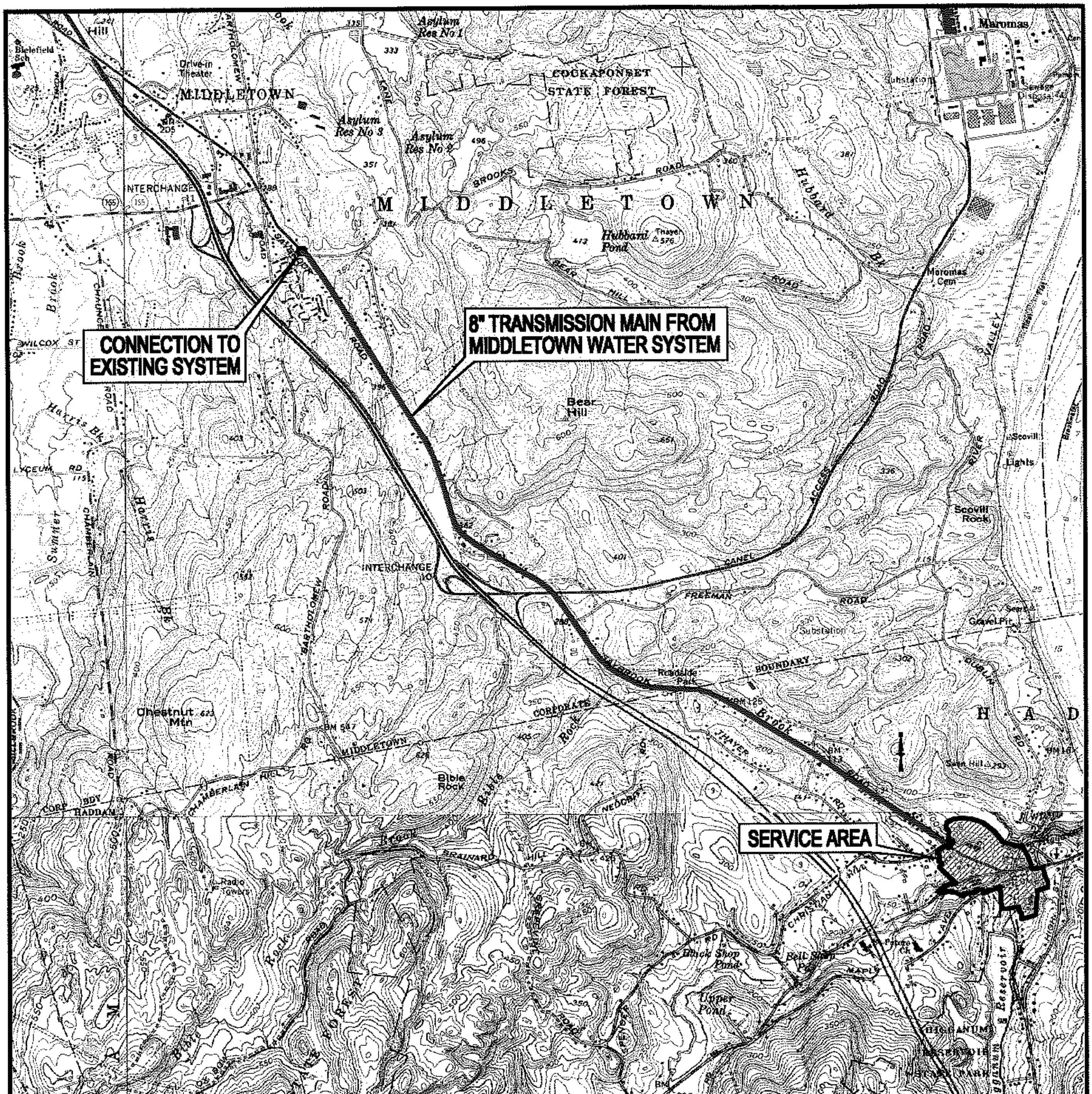
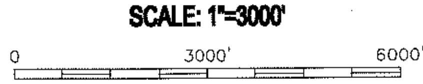
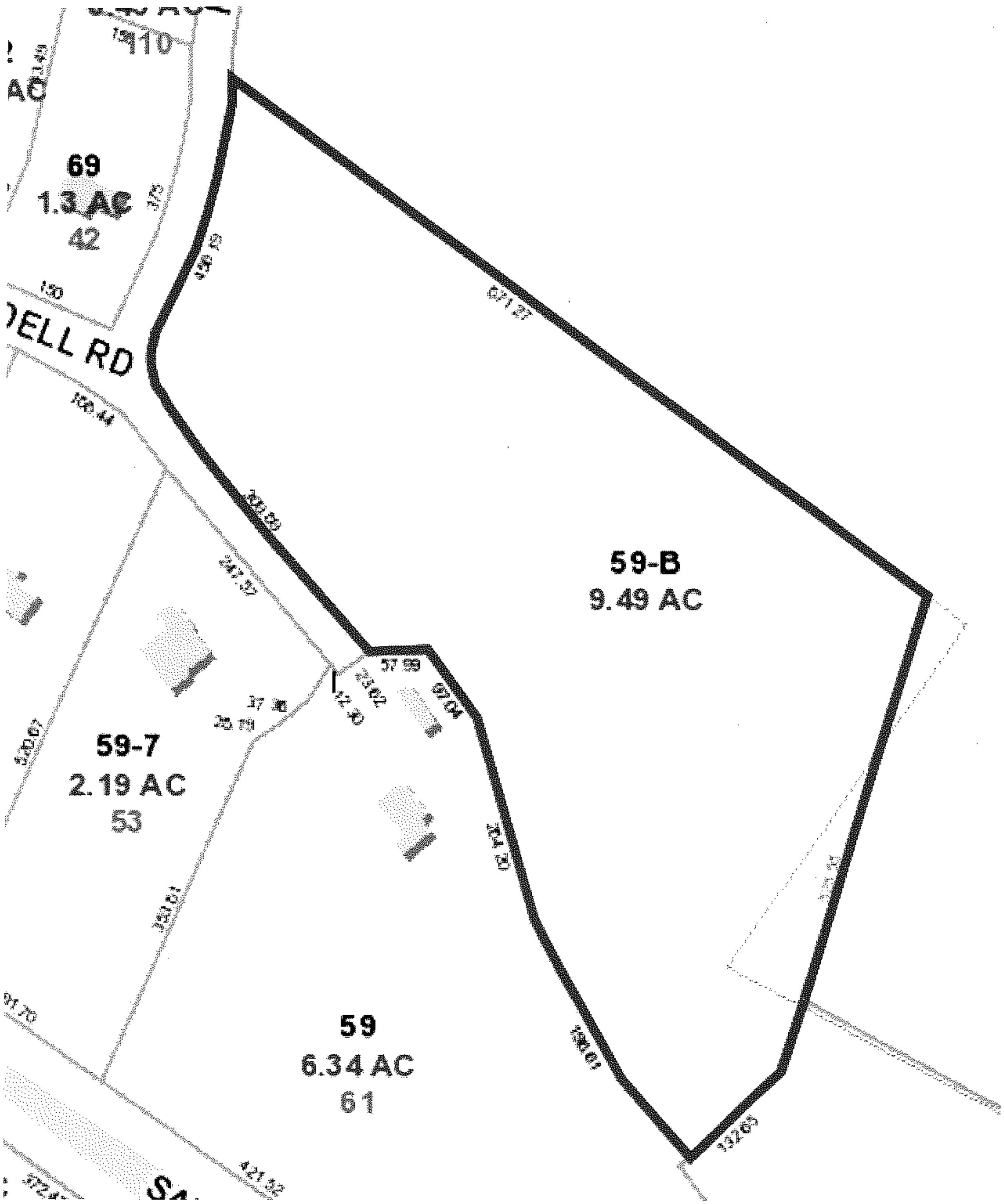


FIGURE 3
CONCEPTUAL WATER MAIN LAYOUT
HIGGANUM VILLAGE CENTER
HADDAM, CONNECTICUT

SCALE: 1"=3000'




110
69
1.3 AC
42
DELL RD
59-B
9.49 AC
59-7
2.19 AC
53
59
6.34 AC
61
57.99