COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

IDENTIFICATION AND SCREENING OF ALTERNATIVES CHAPTER

FOR

TOWN OF NORTH ANDOVER

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4. IDENTIFICATION AND SCREENING OF ALTERNATIVES

4.1 Introduction

Previous chapters of the CWMP examined existing environmental and built conditions in North Andover and identified areas within Town that appear in need of improved wastewater management. This chapter evaluates wastewater management options to meet North Andover's wastewater needs. The purpose of identifying and screening alternatives is to identify the most advantageous wastewater management strategies for needs areas that also meet the goals of the CWMP. These strategies will be evaluated further in the next chapter.

This chapter provides information on several wastewater management options and screens the feasibility of these options. First, wastewater flow reduction through water conservation methods was evaluated. These methods may be implemented to reduce the quantity of flow to be disposed of in either sewers or subsurface systems, and can be applied to all wastewater management strategies, including areas with existing sewer. Next, this chapter looks at septage disposal practices where on-site wastewater systems are recommended for continued use. The chapter also provides an overview of various on-site, cluster, centralized and regional wastewater management options for the Town's wastewater needs areas. Finally, potential sites for cluster and centralized wastewater treatment and disposal facilities were screened using GIS information and visual surveys.

4.2 Wastewater Flow Reduction through Water Conservation

Before evaluating wastewater management options to meet North Andover's wastewater needs, it is important to look at approaches to reduce the Town's wastewater flow. Wastewater flow reduction can be achieved through water conservation. If less water is consumed through household, business and industrial use, there will be less wastewater that requires treatment. Water conservation can significantly improve the performance and longevity of septic systems, which benefits the users of the system as well as the integrity of adjacent surface and ground waters. Greater water efficiency can also delay, avoid and restrain capital costs to develop, treat and convey additional water, and reduce wastewater treatment capacity. Wastewater flow reduction through water conservation should be coordinated with the Town's existing and new wastewater management approaches.

As discussed in the Existing Conditions Chapter of this CWMP, the Town has implemented effective programs and made efforts to reduce overall water consumption. The following information identifies alternative water conservation methods that can be used in residential, industrial, commercial and institutional (ICI) applications to reduce wastewater flow. These water conservation recommendations are based on those provided in residential water conservation information included in the 2006 *Water Conservation Standards for the Commonwealth of Massachusetts (*2006 Water Conservation Standards*)*. These standards can be accessed on the Massachusetts Water Resources Commission's website for more detail regarding particular activities. The website is located at the following address: http://www.mass.gov/envir/mwrc/pdf/Conservation_Standards.pdf.

1. **Offer rebates for replacing inefficient fixtures and applications.** The Town currently offers residents the opportunity to purchase water savings devices through the Town's Department of Public Works at reduced cost. The Town should continue this program.

2. **Promote the use of high efficiency toilets (HETs) and other water saving sanitary devices.** "Dual flush" toilets that are used widely in Europe and Australia use less than 1.28 gallons per flush (gpf). Power-flush models use as little as 1.0 gpf. The current Federal and Massachusetts maximum water-use requirement for a gravity tank toilet is 1.6 gpf. Therefore, these HETs can save up to half a gallon of water per flush. According to information included in the 2006 Water Conservation Standards, research shows that many HETs provide equal or greater flushing power than conventional toilets.

   Low-flow showerheads, faucet aerators and toilet displacement apparatus are other available water saving devices. The Town may consider mandating their use for industrial, commercial and institutional users at their facilities. The use of these water saving devices by industrial, commercial and institutional large water consumers is likely to have a positive impact on water consumption.

3. **Promote the use of waterless plumbing fixtures.** The Town may want to go beyond current water conservation plumbing standards to conserve water by installing waterless plumbing fixtures such as composting toilets or a 3-ounce foam flush toilet. The 3-ounce foam flush toilet is flushed with only 6-ounces of a soapy solution (3 ounce pre-flush and 3-ounce post flush). It is recommended that Town buildings be used as demonstration sites for these technologies.

4. **Minimize and discourage use of garbage disposals.** It is recommended that Towns encourage residents to reduce the use of sink garbage disposals. Garbage disposals should not be used with septic systems. Therefore, if a homeowner discontinues use of his or her garbage disposal, it will improve septic system functionality.

   Compostable waste can be collected by homeowners and added to a compost pile. The finished compost can be added to the soil around the home or even spread thinly on the lawn to help boost its soil moisture retention capacity and reduce the need for watering.

5. **Educate homeowners about how water conservation reduces costs and benefits water quality.** Water conservation helps septic systems work better and last longer. In sewered areas, water conservation reduces the burden on wastewater treatment facilities. Decreasing the burden on septic systems and wastewater treatment facilities will likely provide a financial return to the investment in water-conserving fixtures and appliances.

4.3 Existing Septage Handling Practices

As discussed in the Future Conditions Chapter of this CWMP, septage disposal throughout unsewered areas in Town is currently contracted directly between the septic system owners and the pump-out companies. The Town's Department of Public Health (DPH) began to track septic system pump-out frequencies and volumes in 2002. This tracking systems helps the DPH determine the septic systems that are potentially failing. The DPH does not regulate the frequency of septic system pump-outs for homeowners. Septic system pump-outs are the responsibility of the homeowner. However, implementation of a Town-wide Septic System Management Plan is considered as a wastewater management approach in subsequent sections of this chapter.

4.4 Overview of Wastewater Management Approaches

Several different types of wastewater management options are available for consideration. A wastewater management approach denotes an overall classification of an option. Treatment and disposal approaches include on-site, cluster, centralized, and regional solutions. On-Site solutions include individual conventional Title 5 septic systems and individual Innovative/Alternative (I/A) septic systems through which each user has a treatment and disposal system located on the site where the wastewater is generated. Cluster or satellite solutions are slightly larger versions of on-site systems where wastewater from a small number of individual generators is conveyed to a common nearby location for treatment and disposal. Centralized solutions consist of in-town facilities intended to treat and dispose of significant wastewater volumes. A regional solution consists of connecting to an existing wastewater treatment facility that treats wastewater for several communities located near North Andover.

Both regional and centralized approaches are types of centralized solutions since wastewater is conveyed away from the generators, and is treated and discharged to a separate, centralized location. For North Andover, a regional approach would be constructing sewers for needs areas to flow to the Greater Lawrence Sanitary District (GLSD). A centralized approach would consider constructing a new groundwater discharge wastewater treatment plant to service the southern unsewered half of the Town. A surface water discharge wastewater treatment plant is not feasible to consider due to anti-degradation rulings that protect surface waters. Effluent discharge limits for a surface water discharge wastewater treatment plant would not be feasible to achieve.

A wastewater management technology identifies a specific treatment technology, or combination of technologies. For example, a FAST® treatment system is a technology that could be used where an advanced on-site system is needed. Overviews of specific available wastewater management technologies have been included for informational purposes. The focus of this CWMP is to develop preferred wastewater management approaches for the needs areas in Town.

Wastewater management systems generally include four major components: collection, treatment, effluent disposal, and residuals management. Collection systems convey wastewater from the generator (e.g. a residence) to a location for treatment. Treatment systems remove organic materials, nutrients, and other contaminants from wastewater. Effluent disposal systems reintegrate the treated wastewater with the environment. Residuals management systems dispose of the concentrated contaminants that were removed from the wastewater. Various technologies have been developed for each of these components. Combining these elements creates complete wastewater management systems such as on-site, cluster, centralized and regional wastewater management approaches.

Seven potential wastewater management approaches based on combinations of these wastewater management systems were established for North Andover. These approaches are listed below. Descriptions and preliminary evaluations of each approach are included in the following sections.

1. Conventional On-Site Systems
2. On-Site Systems with Innovative/Alternative (I/A) Technologies
3. Comprehensive On-site System Management Plan
4. Cluster Systems
5. Centralized System
6. Centralized System with Water Reuse
7. Regional System

4.4.1 Conventional On-Site Systems

On-site systems do not require a major collection component because, as the name indicates, the treatment and disposal components are located at the same site as the wastewater generation. The septic tank and leaching field provide the treatment component for conventional Title 5 on-site systems. Conventional leaching trenches, fields or leaching chambers provide the effluent disposal component for an on-site system. Septage hauling is the only practical option for residuals management for on-site systems.

The cost to install a new conventional on-site system (Title 5 subsurface disposal system) generally ranges between $10,000 and $26,000 (2007 dollars). Cost varies significantly based on site conditions. The cost to pump out the septic tank is essentially the only maintenance cost for a conventional on-site system. This cost depends on the total gallons pumps, but it will typically cost between $200 and $300, and should be done every two to four years. The homeowner contracts directly with a septage hauler to pump out the septic tank.

4.4.2 On-Site Systems with Innovative/Alternative (I/A) Technologies

Innovative/Alternative (I/A) treatment technologies can improve the treatment component of on-site systems where site limitations require additional treatment beyond what a conventional on-site system provides. There are many I/A technologies approved by the Massachusetts DEP for use in on-site applications. S E A had previously investigated approved I/A technologies and evaluated them based on cost, installation difficulty, operational constraints, and maintenance requirements. The most favorable systems include Single Home FAST®, JET® Aerobic Treatment System, and Norweco Singulair. Other systems include JET® Aerobic Tertiary Sand Filter, Saneco Intermittent Sand Filter, Cromaglass™, and Bioclere™.

The following summary provides descriptions of several favorable I/A technologies including unit process, structural components, Title 5 variances, maintenance and cost. More detailed information about I/A technologies and the MA-DEP I/A technology program can be located at the following internet address: http://mass.gov/dep/water/wastewater/septicsy.htm#ia.

The MA-DEP requires that all I/A technologies have a pressure dosed Soil Absorption System (SAS). Therefore, there is an operational cost associated with all I/A technology. The annual cost to operate the pump that delivers effluent to the SAS, for a typical three bedroom home, is generally less than $60 per year (2007 dollars). However, the estimated pump replacement cost can range between $2,000 and $2,600 dollars (2007 dollars).

Single Home Fixed Activated Sludge Treatment (FAST®) and Micro FAST® Systems

The Single Home and Micro FAST® Systems were developed by Bio-Microbics, Inc. The treatment system is an aerated submerged media bed installed in a second compartment of the septic tank. Solids settle in the first section of the tank and the wastewater overflows into the next section of the tank for treatment. Approximately 20-percent of the nitrified wastewater is returned to the first section of the tank where anaerobic conditions and carbon from the solids in the raw wastewater combine to denitrify returned wastewater. Nitrate levels are reduced to below 10 mg/l. Effluent from the system enters a pump chamber, where it is pumped to the SAS.

The difference in the two FAST® Systems is the maximum design flow approved by the MA-DEP. The Micro FAST® System is approved for a maximum design flow of 440 gpd, while the Single Home FAST® System is approved for a maximum design flow of 550 gpd. The system components include a blower with a housing cover and a vent pipe. The blower supplies oxygen to the media, and also circulates the wastewater through the media. The septic tank has a baffle to separate the primary and secondary chambers and the treatment unit is installed in the secondary chamber. A pump is required to deliver effluent to the SAS.

Under Title 5 regulations, the SAS for these FAST® Systems can be designed with a 50-percent reduction of the leaching field area or a 2-foot reduction of the required groundwater separation or a 2-foot reduction of the requirement for four feet of naturally occurring soil.

The pump out frequency of these systems is the same as a conventional on-site system, which is once every two to four years. Other necessary maintenance includes checking the blower to ensure that it is operating properly, monitoring the sludge level in the tank, and checking the effluent pump. The MA-DEP requires that the FAST® System be under a maintenance agreement throughout its life. No maintenance agreement can be for less than one year. The MA-DEP also requires quarterly testing of the effluent for the first year the system is in use. After the first year, the owner of the system may file with the local Department of Public Health for permission to stop testing.

The total estimated installation cost for either a Single Home FAST® or a Micro FAST® System is between $20,000 and $31,000, depending on site conditions (2007 dollars). A yearly maintenance agreement costs $300 to $520 per year. Testing costs $620 per year ($155 per visit for four visits). The blower must operate 24-hours a day; therefore, the cost to operate the blower and the pump is estimated to be between $200 and $300 per year.

JET® Individual Home Aerobic Wastewater Treatment System

The JET® individual home aerobic wastewater treatment plant, manufactured by JET, Inc., is an aerobic wastewater treatment system that uses a primary settling zone, aerobic treatment zone, and a secondary clarifying zone to treat wastewater. Solids settle in the primary chamber. In the aerobic zone, a fixed media encourages the growth of bacteria which treat the incoming wastewater. Aerobic conditions are maintained by an aspirator which mixes and disperses fine air bubbles through the aerobic zone. Clear effluent is produced in the final clarifying zone where solids are settled back into the aeration zone. Effluent from the system is discharged by a pump to the SAS. The system is approved for a maximum design flow of up 450 gpd.

The JET® Aerobic System is delivered as a pre-cast unit and constructed below grade. A conventional septic tank is not needed with this system, but a SAS is required. Since the unit does not require the installation of a separate septic tank, this technology is favorable in small lots with space constraints. The system includes a blower and an effluent pump.

Under Title 5 regulations, the SAS for these JET® Aerobic Systems can be designed with a 50-percent reduction of the leaching field area or a 2-foot reduction of the required groundwater separation or a 2-foot reduction of the requirement for four feet of naturally occurring soil.

The pump out frequency of this system is the same as a conventional on-site system, which is once every two to four years (same comment). Other necessary maintenance includes checking the blower to ensure that it is operating properly, monitoring the sludge level in the tank, and checking the effluent pump. The maintenance agreement cannot be for less than one year. Effluent testing is required by MA-DEP for the first year after installation of the system. After the first year, the owner of the system may file with the local Department of Public Health for permission to stop testing.

The estimated installation, maintenance agreement, and testing costs for the JET® Model J-353 System are similar to those for the FAST® System. This system includes both a blower and a pump; therefore, the estimated operational costs are also similar to the to FAST® System.

Norweco Singulair

The Singulair Bio-Kinetic wastewater treatment system, developed by Siegmund Environmental Services, Inc., is a package system which uses added air to aerobically treat domestic wastewater. The process is similar to the JET® System whereby wastewater enters the system and the treatment process takes place in a three compartment pre-cast concrete tank. The initial chamber removes solids from the wastewater by settling. The wastewater is then treated in a second chamber to which air is added to mix and aerate the liquid and promote aerobic digestion. The third chamber contains the Bio-Kinetic unit which promotes additional filtration and settling.

The SAS for these JET® Systems can be designed with a 50-percent reduction of the leaching field area or a 2-foot reduction of the required groundwater separation or a 2-foot reduction of the requirement for four feet of naturally occurring soil.

The pump out frequency of this system is the same as a conventional on-site system. Other necessary maintenance includes checking the blower to ensure that it is operating properly, monitoring the sludge level in the tank, and checking the effluent pump. The maintenance agreement cannot be for less than one year. Effluent testing is required by MA-DEP for the first year after installation of the system.

The estimated installation, maintenance agreement, and testing costs for the Norweco Singulair System are similar to those for the FAST® System. This system includes both a blower and a pump; therefore, the estimated operational costs are also similar to the to FAST® System.

4.4.3 Comprehensive On-site System Management Plan

To monitor on-site system compliance and maintenance, the Town might choose to adopt a Comprehensive On-site System Management Plan. To reduce homeowner costs and increase system maintenance, the Town may wish to establish a local or regional district for transport and disposal of septage pursuant to Title 5 of the Massachusetts Environmental Code. A Comprehensive On-site System Management Plan could be applied to areas with conventional on-site systems and homes that use on-site systems with I/A technologies. The comprehensive on-site management plan would not be a long-term solution, but it may help homeowners to extend the life of their septic systems.

The Town may consider implementing a long term On-site System Management Plan in the study areas considered to be a low priority wastewater need, or a short term plan in the high priority areas during the time period the areas are waiting for the construction of an alternative wastewater management solution. A Septic System Management Plan may consist of several approaches including the following.

1. **The Town mails reminders to homeowners to pump out their septic systems.** The Town could include mailings in water bills to residents that do not have sewer to remind people to have their septic system pumped out at least every two years. The mailing could explain the environmental benefits of frequent pump outs, and also information on how a well maintained septic system has a longer life span. A separate mailing would need to be sent to residents who have private drinking water wells.

2. **The Town mandates more frequent septic system pump outs.** The Town could mandate that septic systems located in known areas of high groundwater or near environmental resources be pumped out at least once every two years. The homeowner could continue to contract directly with the septic system hauler, but the Town could notify homeowners when they are due to have their septic system pumped. This approach may be difficult to enforce, since the homeowner will still be contracting directly with the septic system hauler, and it would be ultimately be the responsibility of the homeowner to initiate the pump-out. Therefore, the Town may consider the third approach to have more control over the program.

3. **The Town provides septic system pump out service to homeowners.** Instead of homeowners contracting directly with private septic system haulers, the Town could either contract with the private septic system haulers to pump out septic systems on a pre-set schedule or the Town could purchase septage hauling trucks to provide the service directly. In either scenario, the homeowner would pay a fee for the pump-out to the Town instead of to the private septic system hauler. The revenue from this fee would be used to either pay the septic haulers or to cover the Town's costs of purchasing septic hauling trucks and providing the services. The disadvantage of this option is that the Town would be opening itself to liability because either the Town's contractor or a Town employee would have to access private property in order to pump out the septic system.

This benefit of implementing a Comprehensive On-site System Management Plan is that the Town would have control over the frequency of septic system pump-outs, which would help protect the Town's natural resources and ensure public health. The drawback of implementing this type of on-site system management program is that it would also create more scheduling and management work for the Town, and potential liability for maintaining private property.

The program would be self-funded because the revenue from the homeowner pump-out fee would be designed to generate the funds for the administrative and operational costs to run the program. However, homeowners may or may not want to relinquish control of the frequency of their septic system pump-out maintenance. Specifically, homeowners may not understand why they would need to pay the Town a fee for this service when they are still responsible for their septic systems. Homeowners may prefer contracting directly with private septic system haulers for competitive pricing. Also, many homeowners may disagree with the required frequency of the pump-outs, considering they would need to pay the fee based on the frequency. Therefore, if the Town opts to implement an On-site System Management Plan, education would be needed to be part of the program to gain public support.

4.4.4 Cluster Systems

Cluster solutions are basically large versions of on-site systems where wastewater from a small number of generators is treated and disposed. Cluster solutions require small collection systems, but otherwise the character of the treatment, effluent disposal, and residuals management components is similar to on-site systems. Cluster systems would be an effective approach to serve a neighborhood of homes that are located in adequate Title 5 soil, but have small lots. The homes are recognized as being in a needs area because each individual lot is not large enough to site an adequate Title 5 System. A vacant lot near the area could accommodate an I/A system that would be sized to treat the wastewater from the homes in the needs area. This option would recharge the aquifer in the needs area, while solving the Title 5 problems of individual homeowners. Based on the fact that none of the wastewater needs areas in North Andover exhibit septic system problems because of small lot size, it is unlikely that the cluster system approach using a conventional Title V septic system will be a suitable wastewater management option. Therefore, only cluster systems using an I/A technology will be considered for North Andover.

The North Andover Department of Public Health regulations allow cluster systems. The local regulations have a provision that a shared system which meets all of the criteria of 310 CMR is exempt from the Town's typical rule that an on-site system must be placed entirely on the lot it serves. Before a shared system is allowed to go online, the MA-DEP requires that ownership be determined to ensure that the system will be properly maintained. Therefore, when a cluster system is implemented by private users, extensive legal procedures may be required by MA-DEP to assign ownership of a common system among multiple users. The cluster approach as presented in this CWMP would be implemented and owned by the Town instead of private users to insure proper wastewater management. Therefore, the Town of North Andover would assume administration of this cluster system approach.

Many I/A technologies that were discussed for on-site treatment may be used for larger design flows as a cluster system. The most favorable treatment technologies for use in cluster system applications include Modular FAST®, Cromaglass™, and Norweco Modulair. The Bioclere™ system is moderately favorable. The following summary of a Cromaglass™ System explains how an I/A technology could be utilized in a cluster system application.

Cromaglass™ Wastewater Treatment System

The Cromaglass™ System is available in several models that treat design flows between 500 gpd and 12,000 gpd. Larger design flows up to 200,000 gpd can be accomplished by installing multiple Cromaglass™ units. The system consists of a Sequencing Batch Reactor (SBR) technology that has been used in numerous applications worldwide.

The Cromaglass™ System is MA-DEP certified for General Use when used in conjunction with an otherwise fully complying Title 5 System. The system allows reduction in the size of the SAS by up to 67-percent.

The estimated construction cost for a Cromaglass™ System with a design flow of 10,000 gpd is approximately $500,000 to $700,000, depending on site conditions (2007 dollars). This estimate does not include the cost of transporting the wastewater from the homes to the satellite site. A system of this size would need to be maintained by a Massachusetts registered wastewater treatment plant operator on a schedule determined by MA-DEP.

4.4.5 Centralized System

A centralized treatment and disposal approach for North Andover to treat wastewater for the southern half of Town would require an extensive collection component. Collection system technologies have evolved significantly over the past few decades. Typical collection system components now include gravity sewer, low-pressure sewer, vacuum sewer, pump stations and force mains. Application of specific collection system components depend on local physical conditions, construction costs, and long-term operations costs. The technologies available to treat and dispose large volumes of wastewater are briefly described below, and the residuals management component of an overall centralized treatment solution would need to be explored in depth in the final phases of the CWMP should that approach be adopted.

Most conventional wastewater treatment facilities incorporate several different units that remove certain contaminants from wastewater. The headworks of a treatment facility screen out large debris and material. Primary clarifiers typically use gravity settling to remove settleable solids from wastewater. Secondary processes typically employ biological processes to remove organic material from wastewater. Tertiary processes typically remove residual organic materials and nutrients. The final stage of treatment typically includes disinfection of the effluent prior to discharge to either surface waters or groundwater. Technologies that remove both organic materials and nutrients have improved significantly over the past few decades as treatment processes have evolved. Four wastewater treatment processes are described below.

- RBC - Rotating Biological Contactor. This process uses a biomass adhered to a rotating medium to treat the wastewater. The cylinders are generally half-submerged in the wastewater, and the rotating creates mechanical aeration to sustain the aerobic processes. A modified version of the RBC is submerged deeper creating a more anoxic condition to reduce more nitrogen. Operation of RBCs can prove to be challenging, particularly if the chemical constituents of the wastewater change over time.

- SBR - Sequencing Batch Reactor. This process combines the aeration process and the clarifier process into one tank in lieu of two separate tanks constructed in series. Wastewater flows into the tank; aerators are turned on and then turned off to allow quiescent settling. The clarified effluent is subsequently decanted, and the process starts over again. SBRs can provide a very cost-effective approach to wastewater treatment.

- MLE - Modified Ludzack Ettiger. This process incorporates an anoxic zone to reduce total nitrogen and an aerobic zone to reduce Biochemical Oxygen Demand (BOD) and ammonia. The system uses extensive recycling of wastewater to balance the food for the different kinds of microorganisms that digest contaminants in wastewater.

- Bardonpho – This process is a multi-stage MLE process.

The capacity of centralized systems is generally very large; therefore, groundwater disposal of treated wastewater effluent requires significant land area. Geological conditions must be very favorable to support a large groundwater discharge.

Groundwater injection wells are an alternative effluent disposal technology to traditional leaching areas. Highly treated effluent is pumped into an injection well, which discharges to groundwater. There are not many injection wells currently in use in Massachusetts, as they are a relatively new concept for this use and they require highly transmissive sites that will not have negative impacts to sensitive resources. There is also a serious concern that if the treated effluent is not of exceptional quality, the nutrient levels in the effluent may cause growth of biofilm on the well screen and surrounding material. This effect can significantly reduce the capacity of the well over time.

4.4.6 Centralized System with Water Reuse

Another approach to consider is constructing a treatment plant to treat wastewater in the southern half of the Town and reuse the effluent from the WWTP. Water reuse is the practice of providing advanced treatment to wastewater so that it can be reused for certain purposes. It would serve as a partial alternative to groundwater discharge of the treated effluent, which would offset the gallons of water to be discharged into the ground, most likely on a seasonal basis. MA-DEP encourages water reuse for various applications that are not likely to threaten public health, which include spray irrigation of golf courses, landscaping, artificial recharge of aquifers in certain situations, and toilet flushing. The *Reclaimed Water Use Interim Guidance* issued by MA-DEP in 1999 (revised 2000) outlines the regulatory approach to these potential water reuse options. The guidance is intended to be a "dynamic working guidance" to facilitate the review of alternative, innovative means of wastewater reuse or disposal (MA-DEP 1999).

Water reuse applications have been installed in golf courses in a few Towns in Massachusetts, such as Kingston and Yarmouth, as a means to irrigate the golf course during the dry season. There is one golf course in Town, which is the North Andover Country Club, located at 500 Great Pond Road. This golf course is located in the watershed of Lake Cochichewick. As discussed in previous chapters of this report, Lake Cochichewick is the Town's public drinking water supply. Therefore, constructing a water reuse facility at the North Andover Country Club golf course is not feasible since it is located in the watershed of the Town's drinking water supply. However, a potential water reuse application is to irrigate the Town's soccer fields at the Foster Farm Field Soccer Complex, which is located in the eastern half of the middle of Town. This water reuse option will be explored further if the centralized treatment solution approach is adopted.

4.4.7 Regional Systems

A regional treatment and disposal approach would require a collection system extension to connect the needs areas with the GLSD regional treatment facilities. The regional treatment option for North Andover includes utilizing the existing capacity at the GLSD wastewater treatment facilities located in the northwest section of North Andover. As described in Chapter 1 – Existing Conditions, this facility treats wastewater flow from the City of Lawrence, City of Methuen and Town of North Andover, Andover and Salem, New Hampshire and has available treatment capacity. The regional approach utilizing the treatment capacity at GLSD, would combine treatment, effluent disposal, and residuals management because these three components are currently done at the GLSD facility.

4.5 Environmental Permitting Requirements

Permitting requirements will vary depending upon the sites and technologies selected. In general, the complexity of the permitting process is likely to increase proportionately with the flow volume and the distance between the generator and the treatment facility. The major permits and approvals, and their applicability to each of the four proposed approaches, are discussed in this section of the report.

The following tables identify the major environmental permits likely to be associated with the seven potential wastewater management approaches. The Town may need to obtain additional permits, such as those governing disposal of construction debris or hazardous waste. It is assumed that on-site systems would be privately-owned and cluster and centralized systems would be municipally owned. Collection systems associated with the transport of wastewater to a cluster system, centralized system or the GLSD facility approach would also be municipally owned. A discharge permit for the GLSD regional solution is not included here since the GLSD facility already has National Pollutant Discharge Elimination System (NPDES) permit. Typical applicability triggers are listed. The noted requirements for Title 5 permits apply to remediation of failed on-site and shared systems at current flow rates, not to new construction or increased flow.

4.5.1 On-Site Approach (Conventional and I/A Technologies)

Of the four proposed approaches, the on-site approach is anticipated to be the simplest and fastest to permit. It involves minimal investment of Town resources and presents no change in current operations. The Department of Public Health would continue to review and approve permit applications for new systems and for repairs to existing systems. The on-site approach is unlikely to require significant activity by other Town departments or compliance with non-wastewater regulations. Table 4.1 – On-site Permitting Requirements lists the anticipated on-site septic system approach permitting requirements.

Table 4.1
On-site Permitting Requirements

Program/Permit	Applicability	Regulatory Authority
Title 5 of the Massachusetts Environmental Code:	Subsurface sewage disposal for new systems with a design flow of < 10,000 gpd, or upgrades to existing systems with a design flow of < 15,000 gpd.	310 CMR 15.00
• Disposal System Construction Permit	Construction of on-site or cluster systems.	
• Local Upgrade Approval		
• Variances	DEP approval may be required.	
Groundwater Discharge Permit	Discharge of > 10,000 gpd of effluent to the ground for new systems.	314 CMR 5.00
Order of Conditions Wetlands Protection Act Rivers Protection Act	Disturbance or alteration of wetlands, waterways, or wildlife habitat.	310 CMR 10.00

Upgrading failing on-site systems with design flows of 10,000 gallons per day (gpd) or less is relatively straightforward. After obtaining a Disposal System Construction Permit from the Department of Public Health, generators (typically homeowners) may construct conventional on-site systems or I/A systems approved for remedial use.

If construction of such a system will not result in compliance with Title 5 regulations, the Department of Public Health may approve a Local Upgrade Approval or a variance. Both Department of Public Health and MA-DEP approval is necessary for installation of remedial systems requiring more than one setback variance (e.g., a reduction in both separation to groundwater and the size of the leaching field), and for installation of pilot systems and systems which have provisional approval. Groundwater discharge permits are required for new systems with design flows greater than 10,000 gpd. Upgrades to existing on-site systems with design flows greater than 15,000 gpd require a groundwater discharge permit as well.

While the burden would be on system owners to bring failing systems into compliance, until the majority of failing systems have been upgraded, the on-site approach could necessitate an increase in the Department of Public Health's level of effort to review and approve applications.

4.5.2 Comprehensive On-site System Management Plan

If the Town decided to implement a comprehensive on-site system management plan, the Town's existing by-laws would likely need to be amended in order to establish control of the septic system pump-outs to the Town instead of the homeowner, and to implement the fee based system. The Town may decide to establish a local or regional district for transport and disposal of septage pursuant to Title 5 of the Massachusetts Environmental Code.

The Town would not take responsibility for construction of the on-site systems. Therefore the permitting requirements to construct, repair or replace an on-site system would continue to be the responsibility of the individual homeowner.

4.5.3 Cluster Approach

The Town would be the owner and operator of any cluster system shared by multiple properties. Therefore, the Department of Public Health and the Department of Public Works (DPW) would ultimately be responsible for operation and maintenance of the facility, including permit compliance, even if day-to-day management were contracted out to a private operator. Table 4.2 – Cluster Permitting Requirements lists the anticipated cluster system approach permitting requirements.

Table 4.2
Cluster Permitting Requirements

Program/Permit	Applicability	Regulatory Authority
Title 5 of the Massachusetts Environmental Code:	Subsurface sewage disposal for new systems with a design flow of < 10,000 gpd, or upgrades to existing systems with a design flow of < 15,000 gpd.	310 CMR 15.00
• Disposal System Construction Permit	Construction of on-site or cluster systems.	
• Local Approval Upgrade		
• Variances	DEP approval may be required.	
• Use of Shared Systems	DEP approval is required.	
Groundwater Discharge Permit	Discharge of > 10,000 gpd of effluent to the ground for new systems or for a cluster shared system.	314 CMR 5.00
DEP Site Hearing	Acquisition and use of treatment facility site.	314 CMR 12.00
Land Application of Septage		310 CMR 32.00
Sewer Connection or Extension Permit	Flow > 15,000 gpd or construction of pumping station or sewer extension of any length.	314 CMR 7.00
Order of Conditions Wetlands Protection Act Rivers Protection Act	Disturbance or alteration of wetlands, waterways, or wildlife habitat.	310 CMR 10.00

Program/Permit	Applicability	Regulatory Authority
Chapter 91 Waterways License Public Waterfront Act	Disturbance or alteration of waterways or flowed or filled tidelands.	310 CMR 9.00
Historic Preservation	Site disturbance, demolition, or alteration of structures or archeological sites listed or eligible for listing on the Massachusetts or National Registers of Historic Places or Archeological Sites.	950 CMR 71.00
Natural Heritage and Endangered Species Program	Work that may affect endangered or threatened species or their habitat.	321 CMR 10.00
MEPA ENF/EIR Massachusetts Environmental Policy Act	Sewer construction, disturbance of wetlands above threshold levels.	301 CMR 11.00

A groundwater discharge permit is required for discharges in excess of 10,000 gpd. Also, a Sewer Extension Permit would be required for construction of any sewers and pump stations needed to convey the wastewater from the generators to the cluster system.

Both MA-DEP and the Department of Public Health must approve the use of cluster systems. The application for use of a cluster system must include:

- A proposed operation and maintenance plan.
- A description of the form of ownership which any component of the system serving more than one building or dwelling will take, together with relevant legal documentation. A description of the financial assurance mechanism proposed to ensure effective long-term operation and maintenance of the system, such as a proposed insurance policy naming the Department of Public Health and MA-DEP as additional insured's.
- A copy of a proposed Grant of Title 5 Covenant and Easement, as applicable.

Although the MA-DEP provides sample documents, preparation and review of these documents would require substantial effort by Town Counsel and the involvement of various Town departments. Prolonged negotiations between property owners could delay construction and thus compliance with regulations.

If a site for the system must be acquired, the Town would be obliged to complete the MA-DEP Site Hearing process, largely a formality. The Department of Public Health and/or MA-DEP would also need to approve residuals disposal plans.

The construction of sewers increases the likelihood that non-wastewater permits would be required, primarily waterways and wetlands related. An Order of Conditions from the Conservation Commission would be required if the site is within areas subject to protection under the Wetlands Protection Act or the Rivers Protection Act. If the selected site is within an area subject to protection under the Natural Heritage and Endangered Species Program, approval by the Program will also be required. There is some potential for sewer construction associated with the cluster approach to necessitate review by the North Andover and/or Massachusetts Historical Commission, the U.S. Army Corps of Engineers, and other agencies.

4.5.4 Centralized Approach

The centralized approach applies to larger areas of Town than the cluster approach; therefore, the treated discharge volume is anticipated to be significant. The Town would need to invest significant resources to implement a centralized approach. The Town would most likely be responsible for design, permitting, financing, operations and maintenance, and permit compliance.

The Town would need to obtain a sewer extension permit for the collection system. In this context, "extension" includes the construction of new sewer pipe in excess of 1,000 feet that does not connect to a Title 5 system. A groundwater discharge permit would be required since the discharge volume would exceed 10,000 gpd. Acquisition of a site for the facility would trigger the MA-DEP Site Hearing process.

If the selected recharge site is within an area subject to protection under the Natural Heritage and Endangered Species Program, approval by the Program will be required. An Order of Conditions from the Conservation Commission will be required if the site is within areas subject protection under the Wetlands Protection Act or the Rivers Protection Act. Extensive sewer construction associated with the centralized approach is more likely to necessitate review by the North Andover and/or Massachusetts Historical Commission, the U.S. Army Corps of Engineers, and other agencies. Table 4.3 - Centralized Permitting Requirements lists the anticipated centralized approach permitting requirements. This list is based on a permitting a groundwater discharge treatment plant instead of a surface water discharge treatment plant.

Table 4.3
Centralized Permitting Requirements

Program/Permit	Applicability	Regulatory Authority
Groundwater Discharge Permit	New discharge of > 10,000 gpd of effluent to the ground.	314 CMR 5.00
DEP Site Hearing	Acquisition and use of treatment facility site.	314 CMR 12.00
Land Application of Septage		310 CMR 32.00
Sewer Connection or Extension Permit	Flow > 15,000 gpd or construction of pumping station or sewers of any length.	314 CMR 7.00
Order of Conditions Wetlands Protection Act Rivers Protection Act	Disturbance or alteration of wetlands, waterways, or wildlife habitat.	310 CMR 10.00
Chapter 91 Waterways License Public Waterfront Act	Disturbance or alteration of waterways or flowed or filled tidelands.	310 CMR 9.00
Chapter 91 Waterways License Public Waterfront Act	Disturbance or alteration of waterways or flowed or filled tidelands.	310 CMR 9.00
Historic Preservation	Site disturbance, demolition, or alteration of structures or archeological sites listed or eligible for listing on the Massachusetts or National Registers of Historic Places or Archeological Sites.	950 CMR 71.00
Natural Heritage and Endangered Species Program	Work that may affect endangered or threatened species or their habitat.	321 CMR 10.00

Program/Permit	Applicability	Regulatory Authority
U.S. Army Corps Section 404 of the Clean Water Act Section 10 of the Rivers and Harbors Act of 1899	Water diversion; disturbance of > 5,000 s.f. of wetlands; waterways and/or wetlands fill and secondary impacts.	33 CFR 1251, et seq.
Water Quality Certification (WQC) Section 401 of the Clean Water Act	Discharge to surface waters involving disturbance of wetlands or land under water. If no WQC thresholds are exceeded but the project requires Category II review by the Army Corps, the Army Corps may allow the Order of Conditions to serve as the WQC. Required if an Individual Section 404 permit is required.	314 CMR 9.00
MEPA ENF/EIR Massachusetts Environmental Policy Act	Sewer construction, treatment facility construction, disturbance of wetlands above threshold levels.	301 CMR 11.00

4.5.5 Centralized Approach with Water Reuse

The centralized approach with water reuse would require the same permitting as the centralized approach listed in the previous section. Based on a water reuse application in the Town of Yarmouth, Massachusetts, it is likely that if the water were to be reused as an irrigation water source, then the Department of Environmental Protection (DEP) Groundwater Discharge Permit would allow the water to be used for irrigation to have higher nitrogen content than normally permitted for groundwater discharge. The higher nitrogen content would limit the need to apply commercial fertilizers to the soccer fields. The Groundwater Disposal Permit would also likely require more stringent water quality monitoring to protect public health.

4.5.6 Regional Approach

Wastewater and non-wastewater permit requirements for the regional approach would include those permits required to construct the sewer that would be needed to transport the wastewater from the needs areas to the GLSD wastewater treatment facility. Table 4.4 - Regional Permitting Requirements lists the anticipated regional approach permitting requirements.

Table 4.4
Regional Permitting Requirements

Program/Permit	Applicability	Regulatory Authority
Sewer Connection or Extension Permit	Flow > 15,000 gpd or construction of pumping station or sewers of any length.	314 CMR 7.00
Order of Conditions Wetlands Protection Act Rivers Protection Act	Disturbance or alteration of wetlands, waterways, or wildlife habitat.	310 CMR 10.00
Chapter 91 Waterways License Public Waterfront Act	Disturbance or alteration of waterways or flowed or filled tidelands.	310 CMR 9.00

Program/Permit	Applicability	Regulatory Authority
Historic Preservation	Site disturbance, demolition, or alteration of structures or archeological sites listed or eligible for listing on the Massachusetts or National Registers of Historic Places or Archeological Sites.	950 CMR 71.00
Natural Heritage and Endangered Species Program	Work that may affect endangered or threatened species or their habitat.	321 CMR 10.00
MEPA ENF/EIR Massachusetts Environmental Policy Act	Sewer construction, disturbance of wetlands above threshold levels.	301 CMR 11.00

The Massachusetts Interbasin Transfer Act (Chapter 658, Acts of 1983 MGL Chapter 21 8B-8D) and its regulations (313 CMR 4.00) authorize the Massachusetts Water Resources Commission (WRC) to review any action to increase the transfer of water between river basins. The Act specifically exempts transfers between basins within a single town.

North Andover would be exempt from the Interbasin Transfer Act, because the Town's public drinking water source and the GLSD regional treatment facility are both located within the Town's boundary. The Town's public drinking water system is Lake Cochichewick, which is located in North Andover in the Merrimack River Watershed. The GLSD treatment facility is also located in North Andover and discharges treated wastewater to the Merrimack River. Needs areas located in the southern portion of the Town are located in the Ipswich River Watershed. If the regional approach were implemented for the needs areas located in the Ipswich River Watershed, the Interbasin Act would not be triggered because the regional GLSD treatment facility is located within the Town's boundary.

4.6 Screening of Potential Site Locations

In order for the cluster and centralized management approaches to be feasible, an appropriate location is needed to site the treatment and disposal components associated with a cluster or centralized facility. Without an acceptable site, these approaches cannot be considered. Therefore, the feasibility of constructing in-town wastewater treatment and disposal facilities must be investigated before performing the screening of the wastewater management approaches. The following sections describe the investigations and screening of potential sites for locating cluster and/or centralized treatment and disposal facilities in North Andover.

4.6.1 Preliminary List of Potential Sites

A preliminary list of potential treatment and disposal sites was assembled using the 2007 North Andover assessors' database. The development of the list began with a calculation of the minimum land area required for a system. For both cluster and centralized systems, the SAS is the component that requires the largest land area. The required land area is a factor of both the quantity of wastewater flow to be discharged and the assumed land application loading rate.

A minimum land area of one acre was used as search criterion to screen potential sites. This was based on the estimated area that would be needed for the SAS of a cluster system. Using a design flow of 10,000 gallons per day (gpd), and a 50-foot buffer to allow for a separation between the effluent disposal field and abutters, between 40,000 and 70,000 square feet would be needed for the SAS. This calculation is based on using an I/A technology at the cluster system. DEP Title V design guidelines allows a 50% reduction in land area when using an I/A technology. It was calculated using soil loading rates between 0.2 gallons per day per square foot (gpd/sf) gpd/sf and 0.7 gpd/sf. Addtionals land would be needed for treatment components and effluent piping.

The total land area needed to construct a centralized treatment facility was calculated to be 40 acres, including land needed for the treatment plant equipment and the effluent disposal field. It was estimated that five acres of land would be needed to house the treatment plant buildings and equipment itself. To determine the size for the effluent disposal field, a disposal field discharge rate of 2 gpd/sf was used. A 300-foot buffer was used to separate the effluent disposal field from abutters. The size of the effluent disposal field was calculated based on an average daily flow of 782,000 gpd, which includes flow of 556,000 gpd from Study Areas 1 thru 10 and an Infiltration/Inflow (I/I) allowance of 226,000 gpd. To account for potential future flows, this design flow also includes flows from all the unsewered areas in the south section of North Andover, instead of just the priority areas. Based on an application rate of 2 gpd/sf and a 300-foot buffer zone, the needed area for the disposal field was calculated to be 35 acres. Therefore, the total land area needed for a centralized treatment facility and disposal field is approximately 40 acres.

The list of potential sites was initiated by selecting Town-owned parcels that are larger than one acre and that are substantially undeveloped. Conservation lands were subsequently removed from the list as those lands are protected. The procedures necessary to convert these lands for construction of in-town treatment and disposal facilities are complex. Article 97, the Constitutional Amendment approved in 1972, was passed to protect open space in the Commonwealth by requiring that a two-thirds vote in both the House and the Senate approve a disposition of land acquired for the purposes of "...the conservation, development and utilization of the agricultural, mineral, forest, water, air, and other natural resources." The Article is administered by the National Park Service (NPS) and according to the Attorney General of the Commonwealth; the following constitute "dispositions" under the Amendment: transfers of legal or physical control between agencies of government, between political subdivisions, between levels of government, and from public to private ownership. Dispositions include transfers by conveyance, eminent domain, lease, easement, and any other change of legal or physical control, whether the disposition is for the same or different use.

The process necessary for conversion includes obtaining an approving vote of the Conservation Commission and a two-thirds vote of approval from both the Town Meeting and the State Legislature. It would also require initiating the Environmental Notification Form (ENF) process through MEPA. In addition, the process includes seeking comments from the regional planning agency and the Massachusetts Historical Commission regarding the conversion. The conversion request to the NPS may determine replacement lands of equal or greater monetary and recreational value are required, in which a formal conversion request and supporting documentation of the replacement lands are required. Based on these conditions, our preliminary screening has excluded these lands from consideration.

Thirty-two sites (32) were identified throughout North Andover that meet the treatment and disposal site criteria in terms of size. These sites are summarized in Table 4.5 – Potential Site Locations for Treatment and Disposal Systems and displayed on Figure 4-1 – Potential Site Locations, which is attached at the end of this chapter. Town-owned sites are color coded orange on the figure and privately-owned sites are color coded green.

Table 4.5
Potential Site Locations for Treatment and Disposal Systems

Site Number	Unique ID	Owner (2007 data)	Address Number	Street	Status	Area (sq.ft.)	Area (acres)
A-1	2776	North Andover	0	Stevens Street	Vacant	45,869	1.05
A-2	783	North Andover	0	Pine Ridge Road	Vacant	46,086	1.06
A-3	**1592**	**North Andover**	**0**	**Vest Way**	**Vacant**	**47,785**	1.10
A-4	**2326**	**North Andover**	**0**	**Farnum Street**	**Vacant**	**49,789**	1.14
A-5	4737	North Andover	0	Greene Street	Vacant	52,969	1.22
A-6	1524	North Andover	0	Foster Street	Vacant	53,361	1.23
A-7	0	North Andover	0	Dale Street	Vacant	58,153	1.34
A-8	767	North Andover	0	Pine Ridge Road	Vacant	63,903	1.47
A-9	1400	North Andover	0	Hidden Court	Vacant	73,268	1.68
A-10	**1546**	**North Andover**	**0**	**Lot North of Site A-19**	**Vacant**	**101,190**	2.32
A-11	4602	North Andover	0	Davis Street	Vacant	117,307	2.69
A-12	8280	North Andover	0	Commonwealth Ave.	Vacant	122,970	2.82
A-13	3398	North Andover	0	Great Pond Road	Vacant	184,738	4.24
A-14	**589**	**North Andover**	**0**	**Salem Street**	**Vacant**	**185,478**	4.26
A-15	8113	North Andover	0	Chickering Road	Vacant	194,800	4.47
A-16	**38**	**North Andover**	**0**	**Ingalls Street**	**Vacant**	**205,255**	4.71
A-17	6275	North Andover	0	B & M Railroad	Vacant	222,984	5.12
A-18	870	North Andover	0	Bridle Path	Vacant	241,235	5.54
A-19	**1551**	**North Andover**	**0**	**Foster Street**	**Vacant**	**823,981**	18.92
A-20	595	North Andover	0	Sterling Lane	Vacant	1,071,794	24.61
A-21	**1509**	**North Andover**	**200**	**Boxford Street**	**Vacant**	**1,129,424**	25.93
A-22	**1609**	**North Andover**	**0**	**Foster Street**	**Vacant**	**1,610,457**	36.97
A-23	1047	Mds Realty	0	Hawkins Lane	Vacant	179,903	4.13
A-24	964	D.E.C.M. Essex	0	Pheasant Brook Road	Vacant	102,366	2.35
A-25	500	Lo Lachapelle	0	Salem Street	Vacant	274,428	6.30
A-26	168	James Hartigan	0	Forest Street	Vacant	426,888	9.80
A-27	2120	Boston Hill Rd.	0	Boston Hill Road	Vacant	239,580	5.50
A-28	4425	Eugene Willis	0	Stiles Street	Vacant	328,007	7.53
A-29	4377	Delius Brothers	0	Stiles Street	Vacant	669,953	15.38
A-30	3827	Bgf Trust	0	Turnpike	Vacant	520,106	11.94
A-31	2065	Jth Realty	0	Evergreen Lane	Vacant	65,340	1.50
A-32	2287	Carole Resca	0	Mill Road	Vacant	111,514	2.56

4.6.2 Initial Screening of Sites

An initial screening was performed of the preliminary sites using available GIS data. The initial screening was done to eliminate sites that are clearly not suitable for treatment and disposal of wastewater for the needs areas. Sites for cluster or centralized treatment facilities need to have some basic physical characteristics that make the treatment and disposal of wastewater potentially possible. Also, potential sites must have adequate acreage to support necessary treatment equipment and to accept large quantities of treated effluent with an adequate buffer from public areas and neighbors.

Twenty-two (22) large, undeveloped, Town-owned parcels were identified throughout Town, and ten (10) privately-owned parcels were identified within the needs areas. Utilizing privately-owned sites may pose difficulties for the Town. In order to construct a treatment and disposal system on privately owned land, the owner must agree to sell the site to the Town at fair market value. Therefore, our initial screening excluded the ten (10) privately-owned parcels from further consideration for potential sites.

As discussed in the Needs Analysis Chapter, Study Area 11 – Bradford Street is a priority area based on the industrial zoning. Wastewater loads from future industrial development in the area can cause negative impacts to nearby environmental resources. Based on the likelihood of future industrial wastewater flow in this area, the regional approach of extending the Town's sewer system to transport wastewater to the GLSD facility is the recommended wastewater management approach for this area. Therefore, other treatment alternatives are not considered for Study Area 11 – Bradford Street.

Based on estimated sewer collection system costs, it was assumed that potential sites located greater than 1-mile from needs areas would not be cost effective to warrant consideration. The cost to connect a needs area with a treatment and disposal site that is located 1-mile away can range from $600,000 to $1.2 million dollars, depending on the type of collection system. This cost does not include the cost of the collection system within the needs area.

Sites A-1, A-2, A-5, A-7, A-8, A-9, A-11, A-12, A-13, A-15, A-17, and A-18 are located in the northern extent of Town. These sites are not located close enough to the needs areas to warrant consideration.

Several sites located in the central and southern portions of Town contain significant wetland areas. These sites include A-16, A-20, A-24 and A-31. The extent of wetland in these sites prohibited them from further consideration.

Site A-6 was also not considered for further consideration. Approximately half of the 1.2 acre site is used by an existing cross-country utility pole easement. Figure 4-7B: Site A-19, Foster Street (View off of Foster Road through Site A-6) is a photograph of this site taken from Foster Street and shows this utility pole easement. Additionally, a significant portion of the land not being used for a utility easement consists of wetlands. Based on this information, there is not enough useable land at this site to warrant further consideration.

From this initial screening, eight Town-owned parcels were considered to be candidate sites and warranted site visits. These eight sites are represented in bold in Table 4.5 – Potential Site Locations for Treatment and Disposal Systems. Two of these candidate sites are physically located within high priority needs areas.

Based on the land requirement of 40 acres for a centralized system, the only possible site for this option would be combining useable land within Site A-21, Boxford Street and Site A-22, Foster Street. Site A-21, Boxford Street contains 26 acres of land and Site A-22, Foster Street contains 37 acres of land. Therefore, the remaining sites were not considered suitable locations for a centralized system.

4.6.3 Treatment and Disposal Site Visits

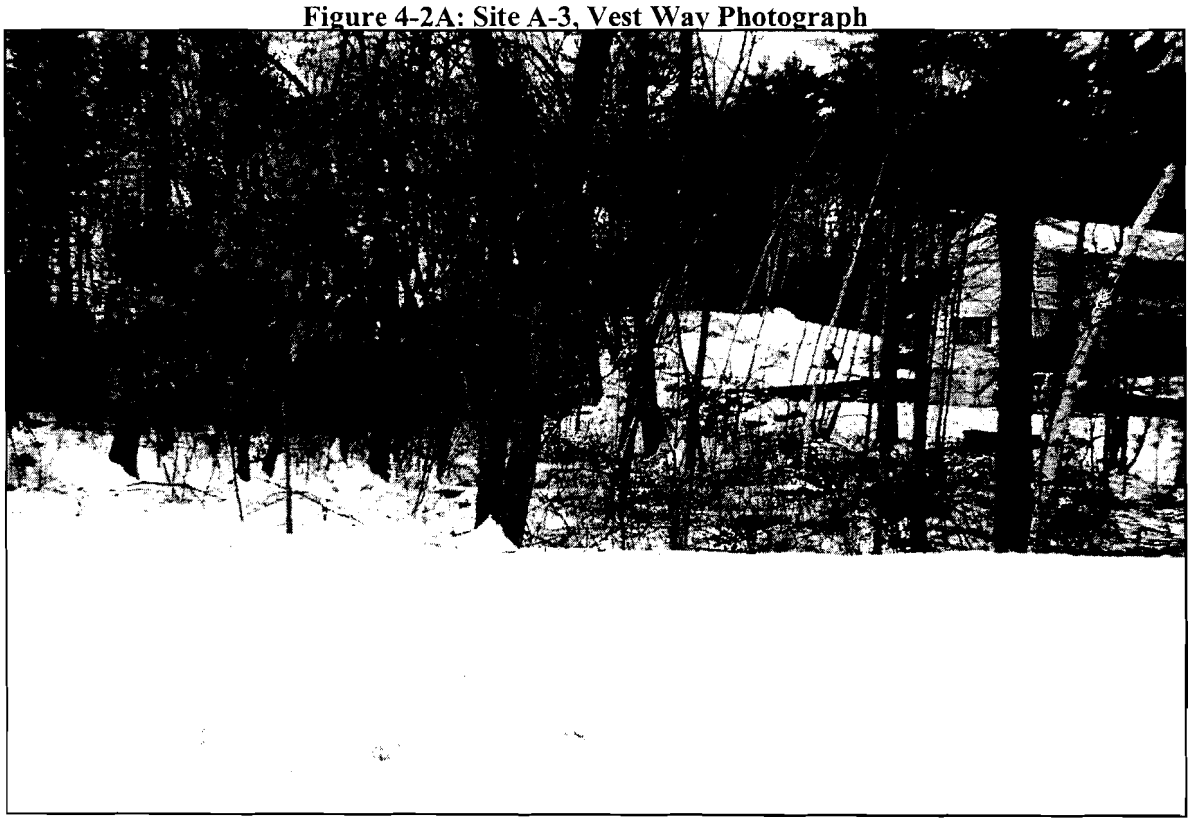
The eight Town-owned parcels were visually surveyed to assess their potential for supporting wastewater treatment and disposal facilities. A summary of the visual site inspections is provided in the following sections. Photographs taken during the site visit have been included as part of the site description. Site characteristics were noted such as ledge outcrops, wetlands, surface water, steep slopes, zoning, and existing development. Town-owned sites that could not be readily accessed from public ways were not surveyed.

Site A-3, Vest Way

Site A-3 is a property located off of Vest Way. It consists of approximately one (1) acre of undeveloped Town land. The site is narrow, and its topography slopes downward moderately from Vest Way to the west. No wetlands were visible on the site and there is moderate to dense tree cover. Existing homes are located on both sides of this site. Figure 4-2A: Site A-3, Vest Way displays a photograph of the site taken from Vest Way looking south towards the site. Figure 4-2B: Site A-3, Vest Way GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

Vest Way was included in Study Area 3 – Bridges Lane, and this study area did not get ranked as a high priority in the Needs Analysis of this CWMP. Study Area 6 – Salem Street is the closest high priority study area, but it is located over a mile away from this site. According to the GIS soil information, the entire site contains soils that have severe limitations for a septic system Soil Absorption System (SAS) which would make construction of a cluster system difficult and expensive. **Based on this information, Site A-3, Vest Way is not recommended for further investigation as a potential cluster system site.**

Figure 4-2A: Site A-3, Vest Way Photograph



Site A-4, Farnum Street

Site A-4 is a property located at the intersection of Farnum Street and Gilman Lane. The 1.14 acre site is generally flat with dense trees and brush, and is located in Needs Area 8 – Farnum Street. According to GIS information, wetlands cover approximately 9,000 square feet of this site. Existing homes are located on the properties adjacent this site. Figure 4-3A: Site A-4, Farnum Street displays a photograph of the site taken from Farnum Street looking northeast towards the site, with Gilman Lane to the north. Figure 4-3B: Site A-4, Farnum Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

Approximately 9,000 square feet of this site is considered unusable land area due to wetlands. Considering this, less than an acre would be available for a cluster system. A cluster system constricted to less than an acre of land would potentially serve 10-15 homes under the best soil conditions. The Farnum study area holds over 350 parcels. Therefore, a cluster system at this site would provide a solution for less than five percent of the properties. Additionally, according to the GIS soil information, the entire site contains soils that have severe limitations for a septic system SAS, which would make construction of a cluster system difficult and expensive. **Consequently, Site A-4, Farnum Street is not recommended for further investigation as a potential cluster system site.**

Figure 4-3A: Site A-4, Farnum Street Photograph

Site A-10, Lot North of Site A-19

Site A-10, Lot North of Site A-19 is a property located between Vest Way and Winter Street northeast of Site A-19. It consists of over two (2) acres of undeveloped Town land. Site A-19 is described subsequently in this section as the candidate sites have been addressed in a numeric order to organize the text. Site A-10, Lot North of Site A-19 is not accessible from local roads. Therefore, no visual inspection was performed for this site. Figure 4-4: Site A-10, Lot North of Site A-19 GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

Site A-10 has adequate land area for a cluster system. Based on a review of the GIS information, this site contains no wetlands, but contains soils that have severe limitations for a septic system SAS. The land at the site has a ten percent slope downward towards the east and southeast. This site is not accessible from existing roads and is located over a mile from Needs Area 6 – Salem Street. It was originally included in the candidate site evaluation because it is located adjacent to Site A-19, which is located less than a mile from Needs Area 6 – Salem Street. Nevertheless, based on an existing utility easement through Site A-19, site topography, severe soils and lack of access, Site A-19 is not being recommended for further investigation. **Therefore, Site A-10 is not recommended for further investigation as a potential cluster system site.**

Site A-14, Salem Street

Site A-14 is a Town owned property located off of Salem Street, north of the intersection of Fuller Road and Foxwood Drive. The site was accessed from Salem Street. It consists of approximately four (4) acres of undeveloped land. The site also has dense tree and brush cover which was visible from Salem Street. The site is actually located within the sewered portion of Town. Figure 4-5A: Site A-14, Salem Street displays a photograph of the site taken from Salem Street looking southwest towards the site. Figure 4-5B: Site A-14, Salem Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

According to GIS information, wetlands cover approximately 35,000 square feet (0.8 acres) of this site and are located in the northeast quarter of the property closest to Salem Street. The land in the south half of the site has severe topography with a 30 percent upward slope. The remaining land area that appears suitable for a cluster facility totals approximately 35,000 square feet, which does not meet the minimum land area criteria for a cluster system. Additionally, the majority of the site contains soils that have severe limitations for a septic system SAS. Finally, considering that the site is located in the sewered portion of Town, if this area were used, it would require installing a sewer collection system adjacent to existing municipal sewers in order to access this site. This would not be an effective wastewater management approach for the Town. **Therefore, Site A-14, Salem Street is not recommended for further investigation as a potential cluster system site.**

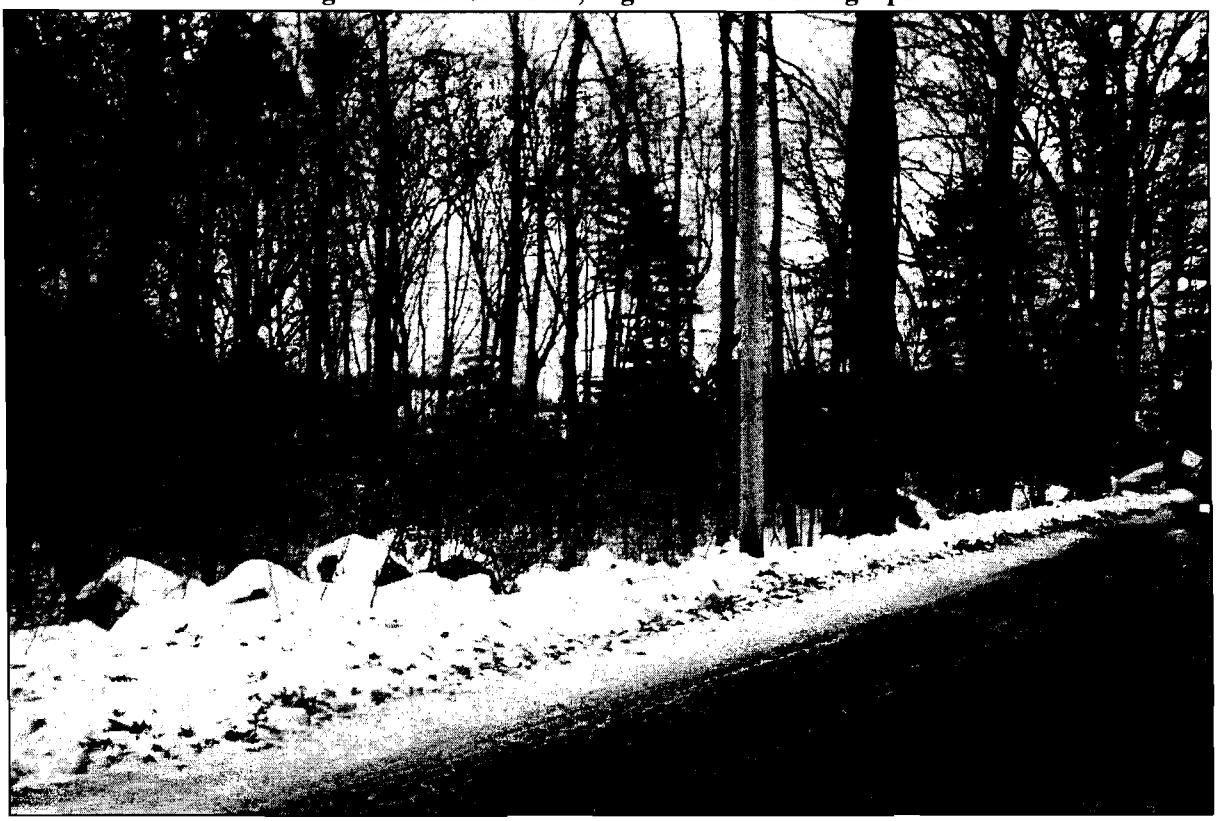
Figure 4-5A: Site A-14, Salem Street Photograph

Site A-16, Ingalls Street

Site A-16, Ingalls Street is a property located off of Ingalls Street, north of Crossbow Lane and is located in Needs Area 7 – Laconia Circle. The site was accessed from Ingalls Street. It consists of almost five (5) acres of undeveloped Town land, and is located across the street from conservation land. The site topography contains dense trees and brush and has generally flat topography. Large boulders were observed in the property along Ingalls Street. Figure 4-6A: Site A-16, Ingalls Street displays a photograph of the site taken from Ingalls Street. Figure 4-6B: Site A-16, Ingalls Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

According to GIS information, wetlands cover almost three acres of this site. The wetlands are located in the east half of the site. The majority of the upland at this site contains soils that have moderate limitations for a septic system SAS. It would difficult to site a cluster system at this site because the upland is divided into two areas by the wetlands. **Nevertheless, based on 1.8 acres of potentially useable land, Site A-16, Ingalls Street may warrant further investigation as a cluster system site.**

Figure 4-6A: Site A-16, Ingalls Street Photograph



Site A-19, Foster Street

Site A-19, Foster Street is a Town owned property that is located between Vest Way and Foster Street. It requires access through a private lane located off of Vest Way or through a Town-owned parcel (Site A-6). It consists of approximately 19 acres of partially developed Town land. Site A-19, Foster Street is not accessible from local roads. Therefore, no visual inspection was performed for this site. Figure 4-7A: Site A-19, Foster Street (East of Private Lane) displays a photograph of the site taken from Vest Way looking east of the private lane. Figure 4-7B: Site A-19, Foster Street (View off of Foster Road through Site A-6) displays a photograph of the site taken from Foster Street looking northwest. Figure 4-7C: Site A-19, Foster Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

A private lane runs through Site A-19, Foster Street. There is one acre of land located to the west of the private lane, which consists of mainly wetlands. The remaining 18 acres has no wetlands, but contains soils that have severe limitations for a septic system SAS. The site has a power line easement running across the eastern portion of the property that continues through Site A-6. The entire site slopes upward to the northwest. Severe slopes of 30 percent exist in the southeast section of the site. **Based on this information, Site A-19, Foster Street is not recommended for further investigation.**

Figure 4-7A: Site A-19, Foster Street (East of Private Lane) Photograph

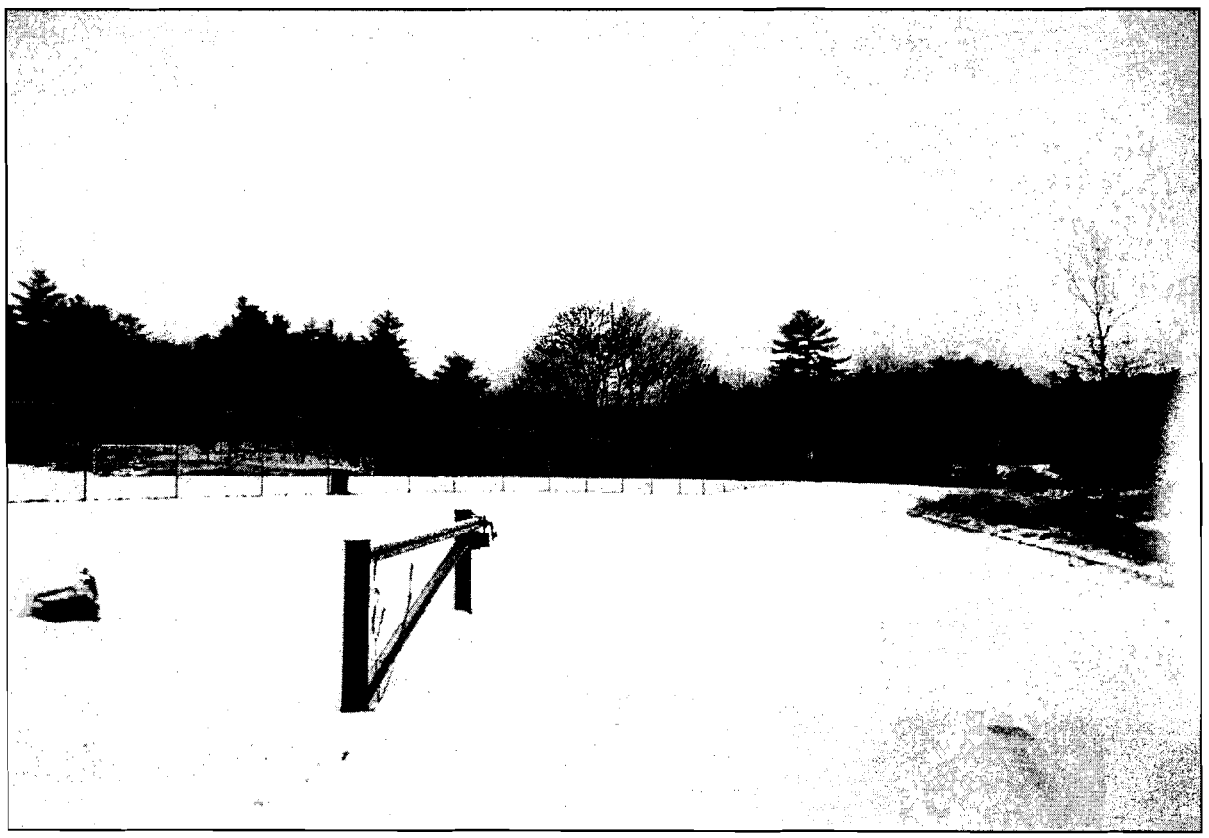
Figure 4-7B: Site A-19, Foster Street (View off of Foster Road through Site A-6) Photograph

Site A-21, Boxford Street

Site A-21, Boxford Street is a property located between Boxford Street and Foster Street. The site was accessed from Boxford Street. It consists of nearly 26 acres of partially developed Town owned land. The site contains a recreational area called the Foster Farm Fields Soccer Complex with soccer fields and a parking lot. The soccer fields and parking lot use about half of the land in the property. Figure 4-8: Site A-21, Boxford Street displays a photograph of the driveway access to site taken from Boxford Street looking north. Figure 4-9: Site A-21, Boxford Street and Site A-22, Foster Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

This site contains very few wetlands, and the site contains soils that have low, moderate and high limitations for a septic system SAS. The topography is generally moderate. The site is located south of Town owned Site A-22. Having two large Town owned adjacent lots creates a possibility to combine the useable land area between these two sites and potentially have enough land to site a centralized system. However, the Town purchased the Site A-22 land with intentions to build a school at the site. The Town does not currently have plans to build a school at this property, but does intend to build a school there in the future. Therefore, both sites cannot be combined to have enough land for a centralized system. **Based on this information, Site A-21, Boxford Street may warrant further investigation as a potential cluster system site, but not for a potential centralized system location.**

Figure 4-8: Site A-21, Boxford Street

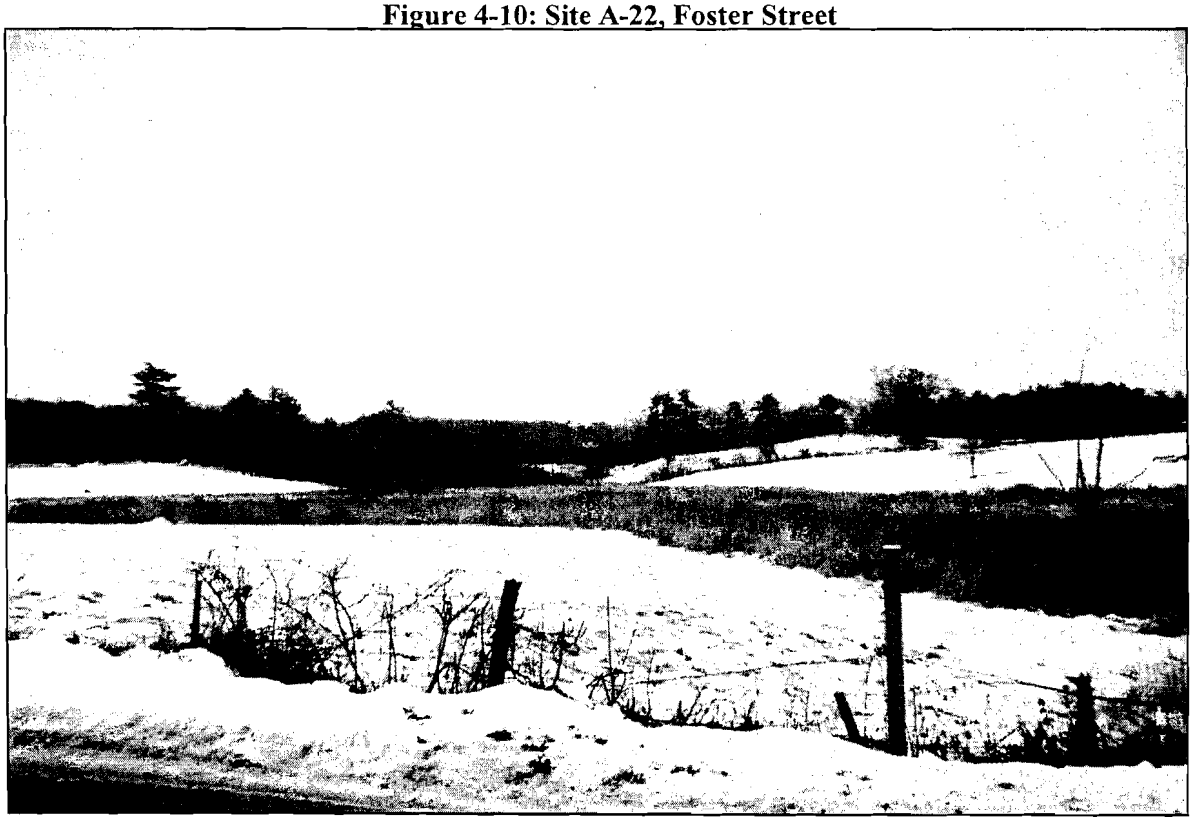


Site A-22, Foster Street

Site A-22, Foster Street is a property located between Foster Street and Boxford Street. The site can be accessed from Foster Street or through Town owned Site A-21, Boxford Street. The site was accessed from Foster Street. It consists of 37 acres of undeveloped Town owned land. The site has somewhat of a steep terrain with brush, and wetlands. The Town purchased this property in with plans to build a school on the land in the future. The Town does not currently have plans to build a school at this property, but does intend to build a school there in the future. Figure 4-10: Site A-22, Foster Street Photograph displays a photograph of the property taken from Foster Street looking southeast. Figure 4-9: Site A-21, Boxford Street and Site A-22, Foster Street GIS Information displays GIS information about the site, including proximity to conservation land and wetlands, soil severity, topography and an orthophoto of the site.

According to GIS information, wetlands cover approximately nine (9) acres of this site and are located in along the north and west borders of the property. The site contains soils that have moderate and high limitations for a septic system SAS. The topography is generally moderate in the southeast section of the property. The land located in the middle of the property has about a ten percent slope. It appears that this terrain separates the wetlands from the upland. This site is located north of Town owned Site A-21. Having two large Town owned adjacent lots creates a possibility to combine the useable land area between these two sites and potentially have enough land to site a centralized system. However, the fact that the Town intends to use this land for a future school reduces the likelihood the Town would consider constructing a centralized system or cluster system at this location. **Based on this information, Site A-22, Foster Street is not recommended for further investigation.**

Figure 4-10: Site A-22, Foster Street



4.7 Cluster System Cost Analysis

A preliminary cost analysis was done to further evaluate the feasibility of cluster systems. Since the cluster system alternative is based on a certain number of homes flowing to the cluster system, the homes that utilize to the cluster system would share the cost of the cluster system project.

A design flow of 10,000 gpd, which is the maximum design capacity for a Title 5 disposal system, is equivalent to the design flow from twenty two (22) four-bedroom homes based on Title 5 flow guidelines. If a large conventional Title system or an I/A system such as a Cromaglass™ system were designed as a cluster system to treat 10,000 gpd, it would serve twenty-two homes. Using the median cost of $600,000 for a treatment and disposal system of this size, each home would need to pay $27,000 to cover the capital cost of the treatment and disposal system. This cost does not include the cost to transport the wastewater from the homes to the satellite site or engineering design costs, which would substantially increase the capital cost. Construction of a similar system with a smaller design capacity would cost even more on a per user basis. Based on this cost analysis, the cluster approach for a design flow of 10,000 gpd does not appear to be cost effective on a per user basis.

As discussed in the environmental permitting requirements section of this chapter, cluster systems that can serve more than 10,000 gpd require a groundwater discharge permit. Groundwater discharge permits require that a full treatment process be designed and constructed, instead of designing to Title V requirements. A 15,000 gpd system that requires a groundwater discharge permit is estimated to cost between $1.0 and $1.5 million dollars to construct. A 15,000 gpd system could serve up to 35 homes. Using $1,250,000 for the cost of the 15,000 gpd treatment plant, each home would need to pay $37,000 to cover the cost of the treatment system. This does not include the cost to transport the wastewater from the homes to the satellite site or engineering design costs. Based on this cost analysis, the mid-sized cluster system approach for a design flow of 15,000 gpd does not appear to be cost effective on a per user basis.

Finally, an 80,000 gpd WWTP was evaluated for cost-effectiveness. The size of the WWTP was based on the land available at Site A-21, Boxford Street. As explained in the previous section, this site contains a recreational area called the Foster Farm Fields Soccer Complex with soccer fields and a parking lot. The portion of the site which is not used by the recreational fields and parking lot was estimated to be 365,000 square feet or 8.3 acres. Two acres was subtracted from this useable land area to account for the area needed to house the treatment plant buildings and equipment. Using a 200-foot buffer and a 50 percent SAS reserve area, it was calculated that the remaining land area for the SAS would be 48,000 square feet. Using 2 gpd/sf, this site could receive approximately 96,000 gpd of treated effluent for subsurface disposal from the treatment plant. Using 440 gpd per home, a treatment plant designed for this flow would serve 218 homes. A treatment plant of this size is estimated to cost $3,000,000 to construct or $14,000 per home. This cost does not include engineering design costs or the cost to transport the wastewater from the homes to the satellite site. Based on this cost analysis, the large-sized cluster system approach for a design flow of 96,000 gpd does not appear to be cost effective on a per user basis.

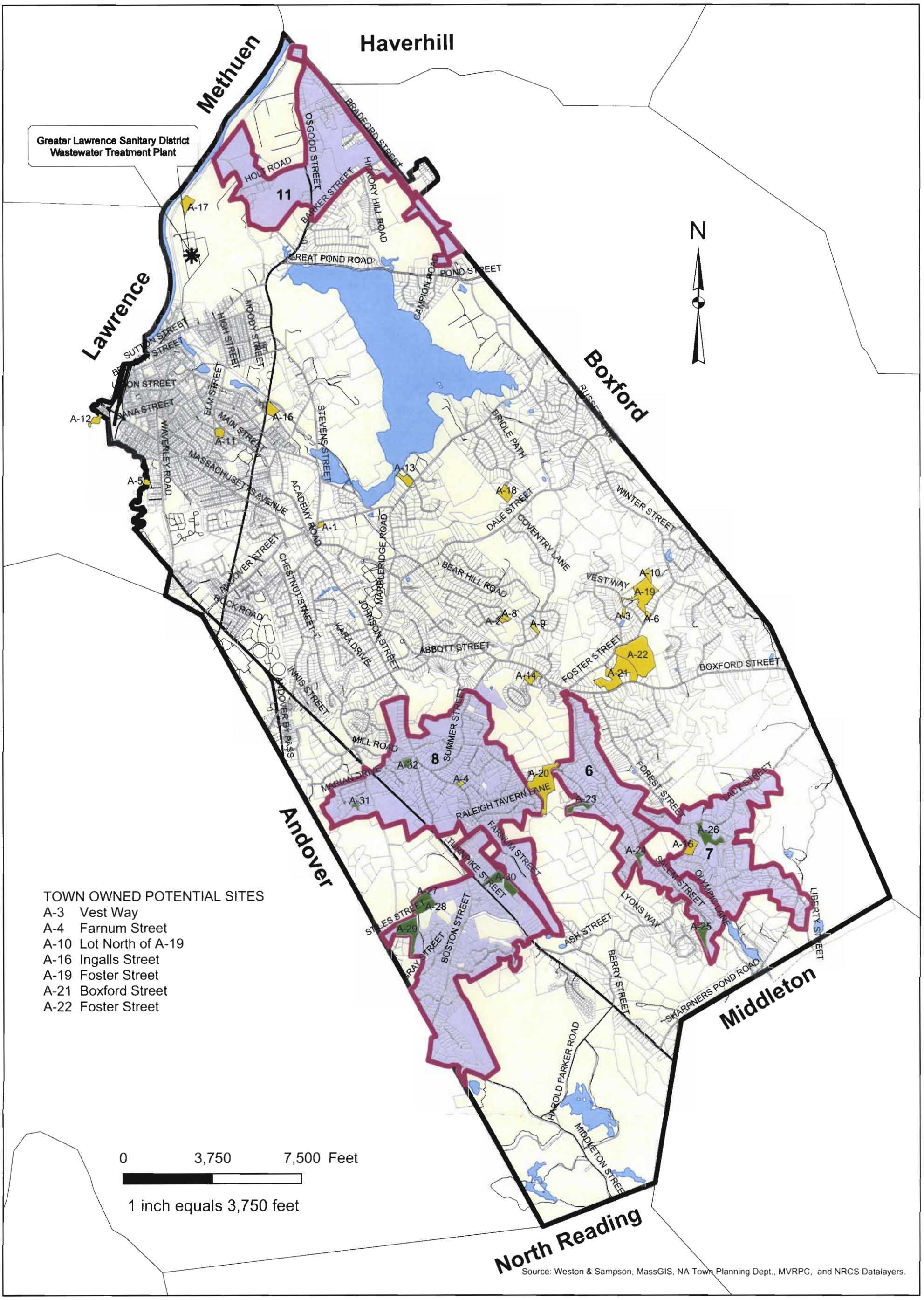
4.8 Screening Results

Seven different wastewater management approaches were evaluated as part of this identification and screening of alternatives process. Based on the wastewater management alternatives, preliminary site screening and cost analyses, we recommend that cluster systems and centralized system (with and without water reuse) not be considered for further study. Therefore, we recommend that the use of on-site systems with I/A Technologies as needed, a Comprehensive On-site System Management Plan, and the regional approach be further evaluated.

The implementation of on-site systems with I/A Technologies and Comprehensive On-site System Management Plan will be further evaluated. The Board of Health does currently permit the use of I/A Technologies for new systems, and will approve Title V variances with approved I/A Systems on a case by case basis. I/A Technologies are being used successfully in Town. Therefore, a program to help increase the use of I/A Technologies will be evaluated. Additionally, a Comprehensive On-site System Management Plan with the use of conventional on-site systems and on-site systems with I/A Technologies should be further evaluated to identify whether or not it will meet the wastewater management needs of the Town.

The cluster system approach is not recommended for further evaluation for several reasons. First, the cluster system cost analysis determined that cluster systems would not be cost effective for North Andover. In addition, there are not enough Town-owned potential sites suitable for cluster systems. Site A-21, Boxford Street and Site A-22, Foster Street would be an option but are located outside of a needs area. These sites are located closest to Needs Area 6 - Salem Street, but there would be increased cost of transporting the wastewater from this needs area to the cluster system site. Site A-16, Ingalls Street was an option for Needs Area 7 - Laconia Circle, but the available land would not be able to serve the entire area, and the cost to permit and construct a cluster system of this size would be significant and not cost effective. Site A-21, Boxford Street contains sufficient land for a large cluster system, but the cost to construct a WWTP at this site and also construct sewers to transport the wastewater to this site would be cost prohibitive for the Town. Finally, the Town would be responsible for ownership and maintenance of the cluster system, which is not ideal.

The centralized system approach (with and without water reuse) is not recommended for further evaluation for two main reasons. First, there is not enough available Town owned land to enable construction of a centralized WWTP. Second, it would not be cost-effective for the Town to finance the construction of a new centralized wastewater treatment plant and the sewers that will transport the wastewater to the centralized facility when there is available treatment capacity at the GLSD facility, where the wastewater from the sewered areas of Town currently receives treatment. Therefore, the regional wastewater management approach is also recommended for further evaluation.



TOWN OWNED POTENTIAL SITES
A-3 Vest Way
A-4 Farnum Street
A-10 Lot North of A-19
A-16 Ingalls Street
A-19 Foster Street
A-21 Boxford Street
A-22 Foster Street

Legend
- WW Alternatives Sites - Town Owned
- WW Alternatives Sites - Private Owned
- Priority Study Areas
- Water

S E A
S E A CONSULTANTS INC.
Scientists/Engineers/Architects

Figure 4-1

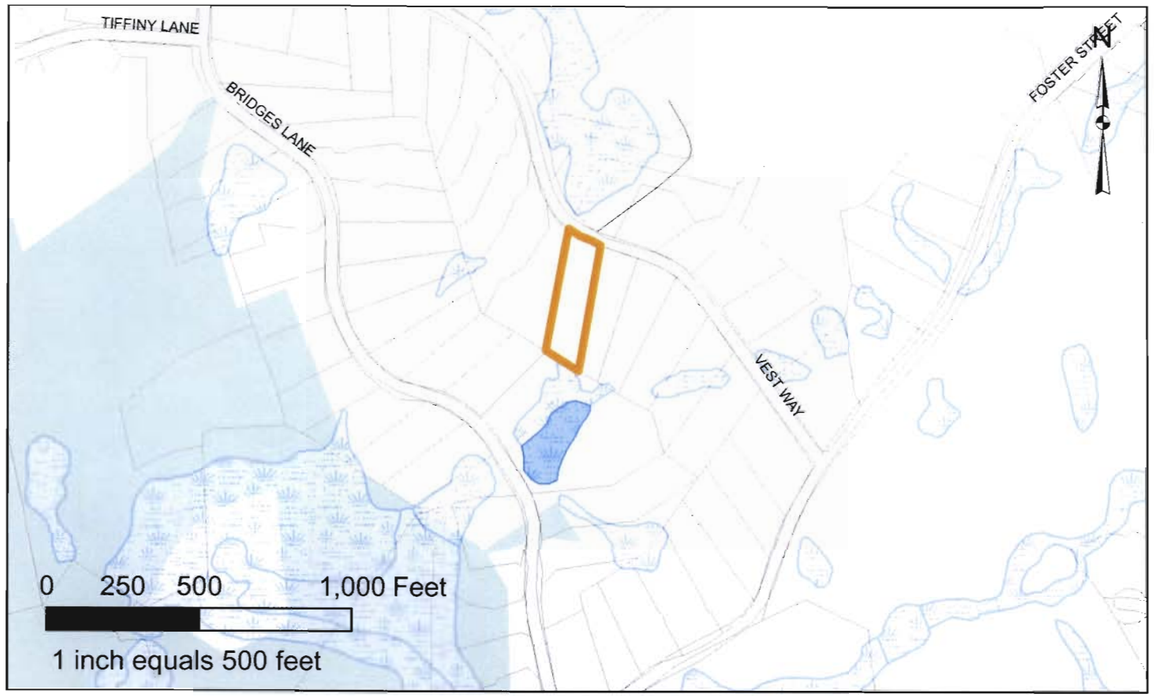
Potential Site Locations

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

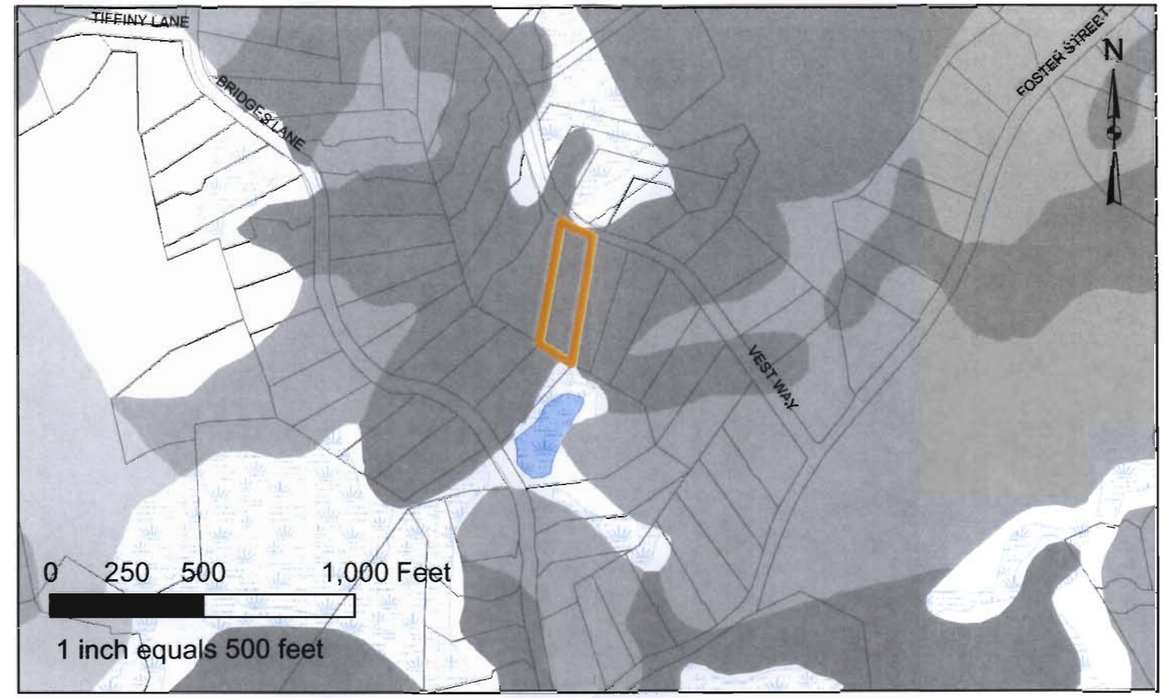
Town of North Andover, Massachussetts

G:_clients\North Andover MA\2007053 - CWMP\GIS\Needs Analysis MCC\Figure 4-3.mxd

Figure 4-2B: Site A-3, Vest Way
GIS Information



Conservation Land and Wetlands

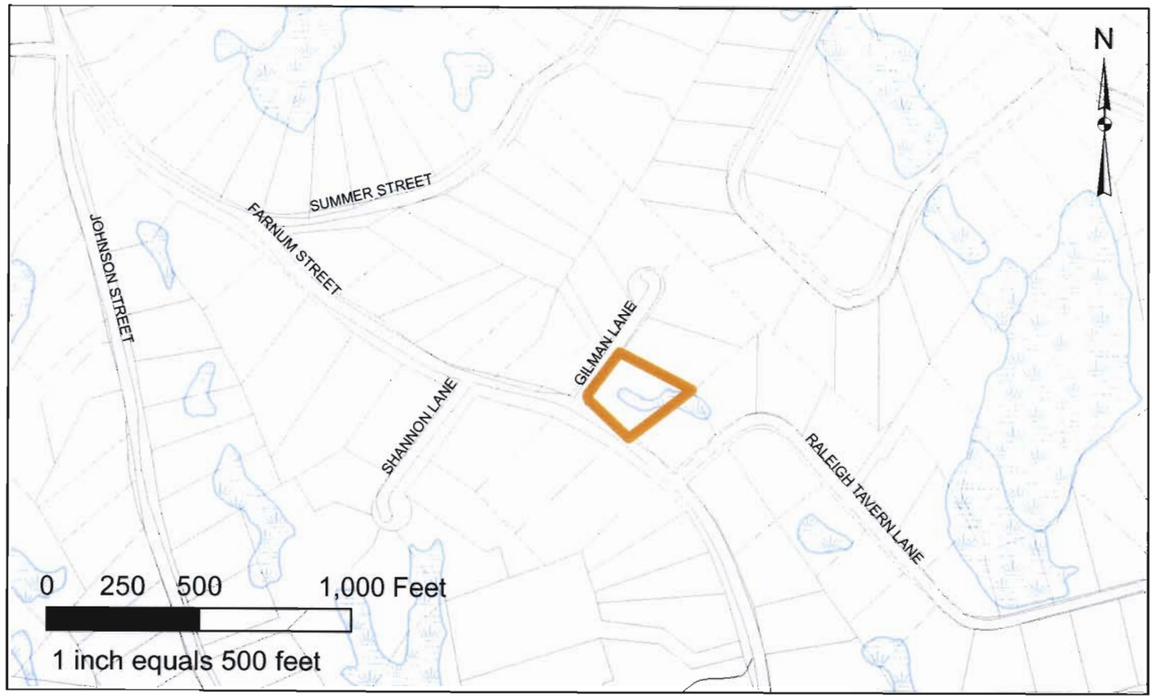


Soil Severity

Contour Lines

Orthophoto

Figure 4-3B: Site A-4, Farnum Street
GIS Information



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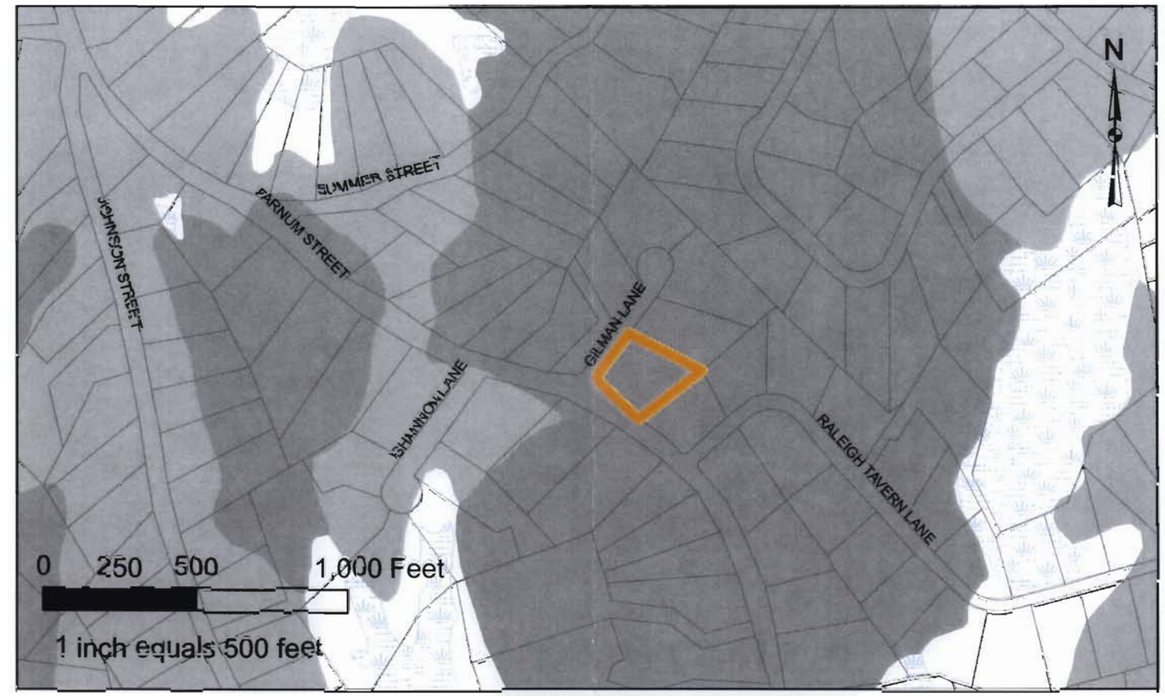
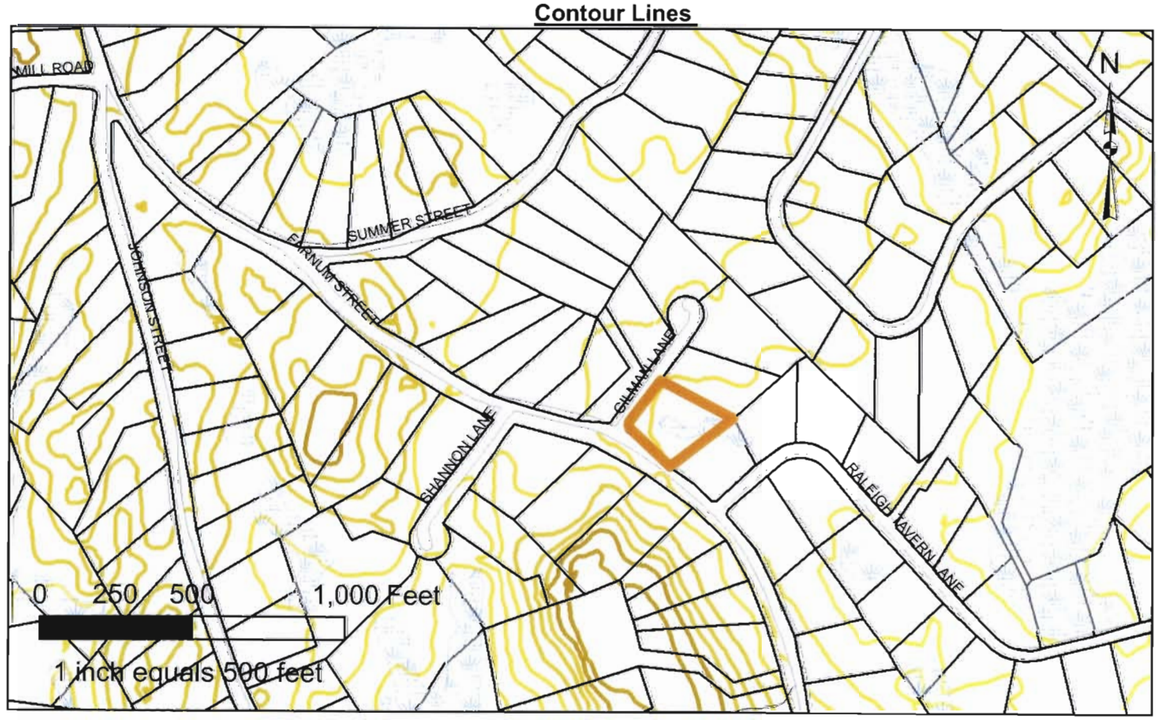


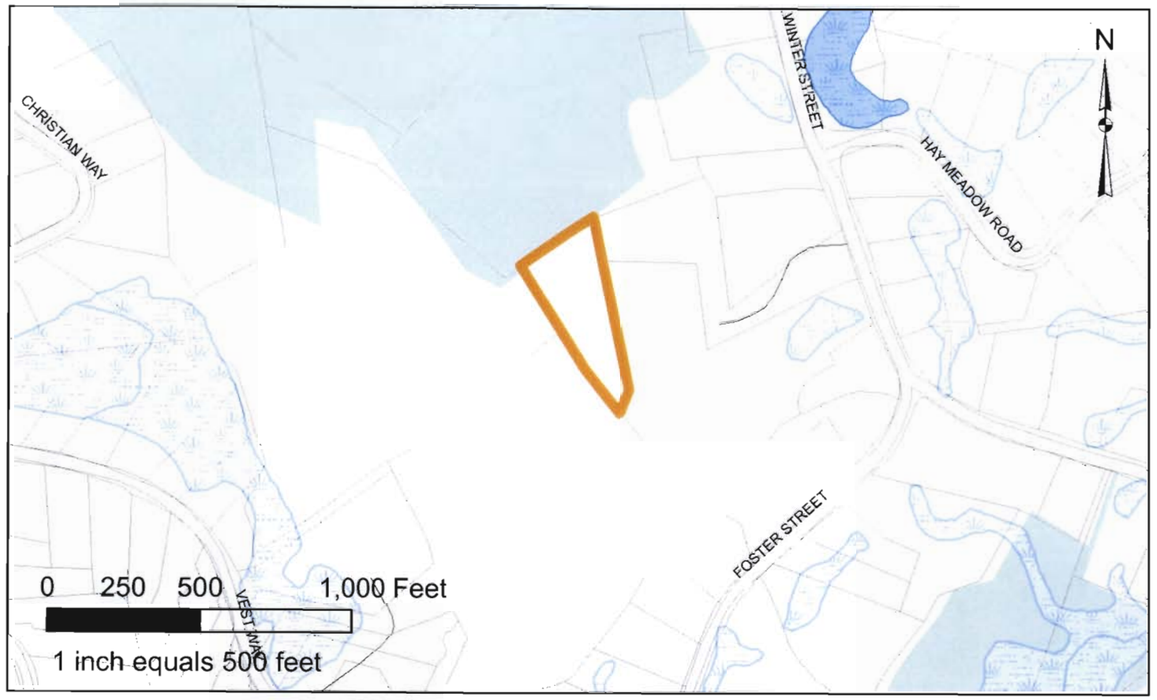
Soil Severity

Contour Lines



Orthophoto

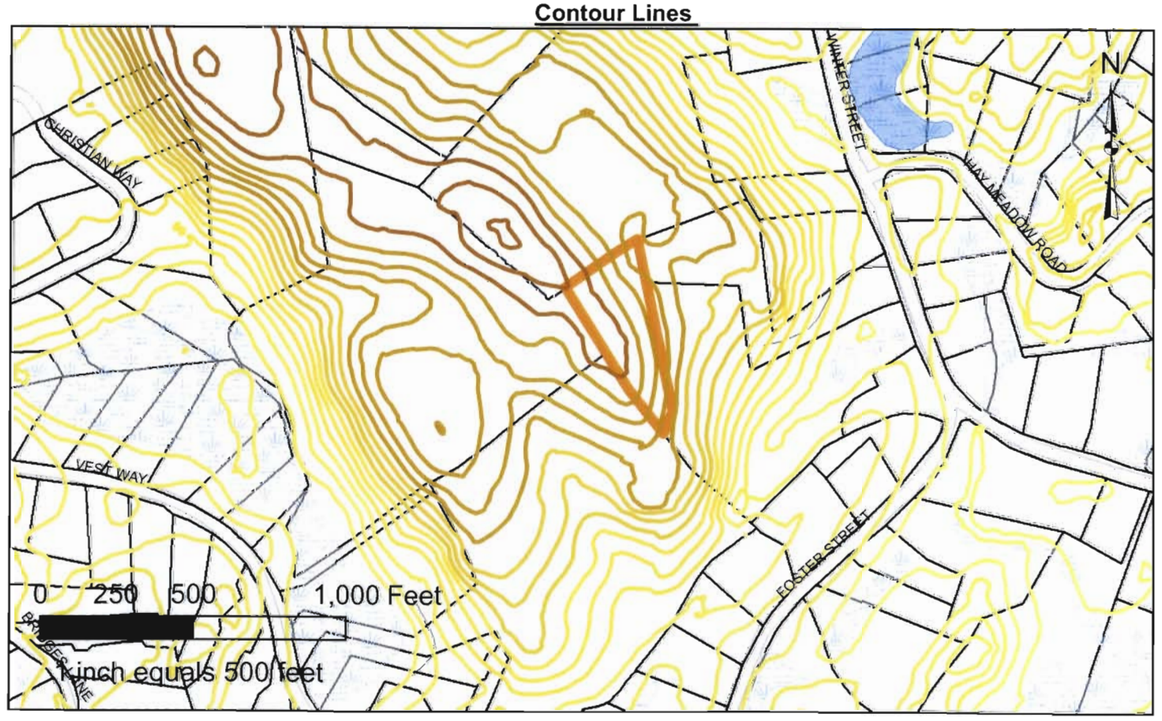
Figure 4-4: Site A-10, Lot North of Site A-19
GIS Information



Conservation Land and Wetlands

Soil Severity

Contour Lines



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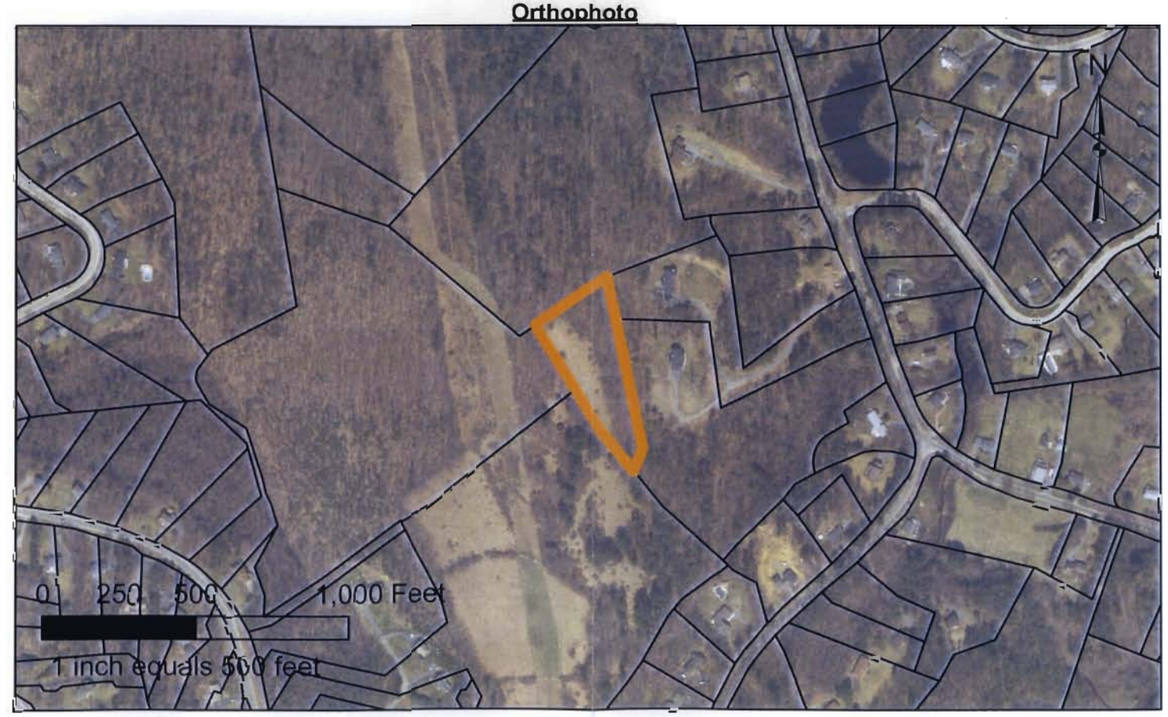
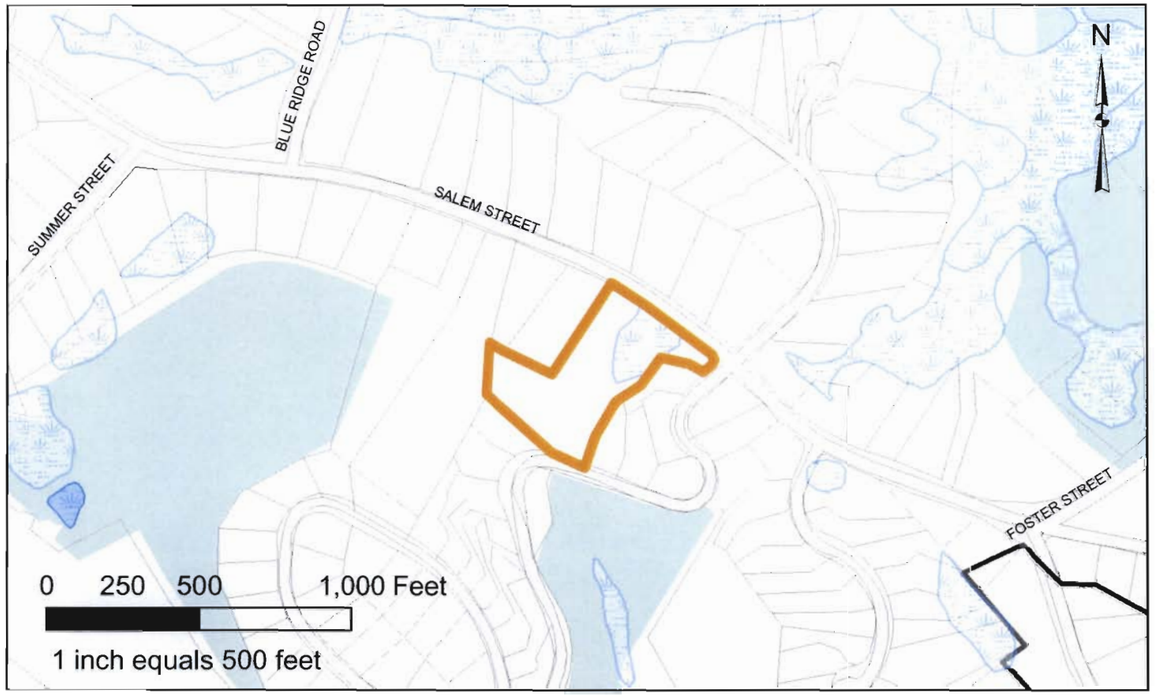
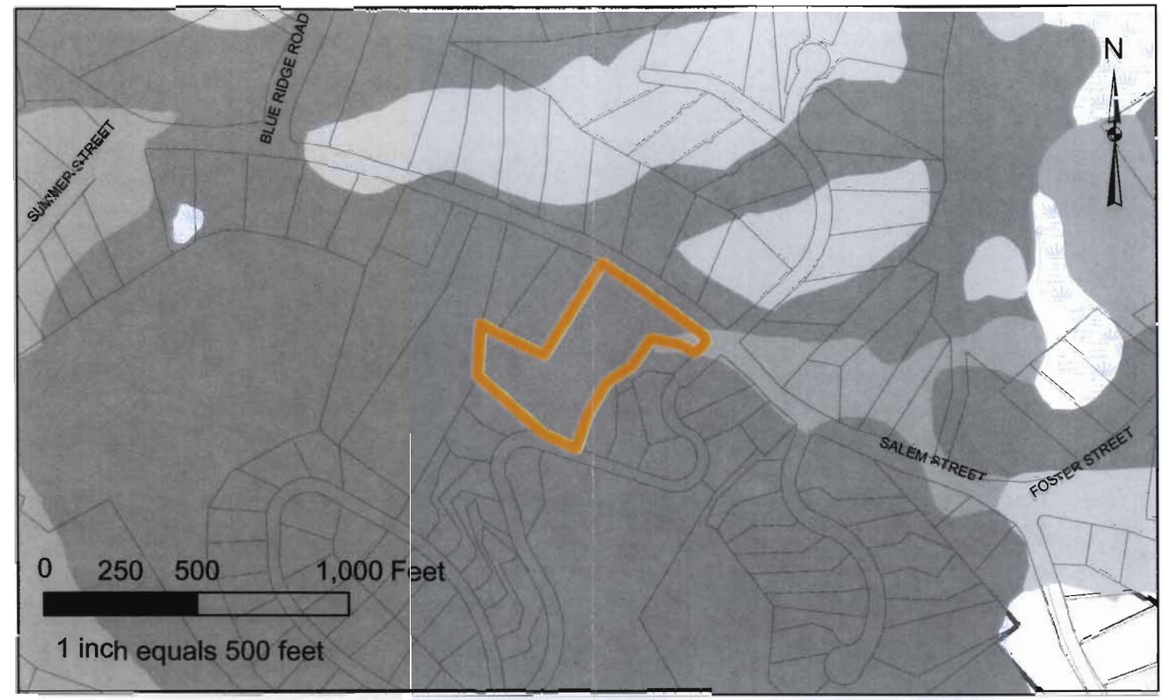


Figure 4-5B: Site A-14, Salem Street
GIS Information

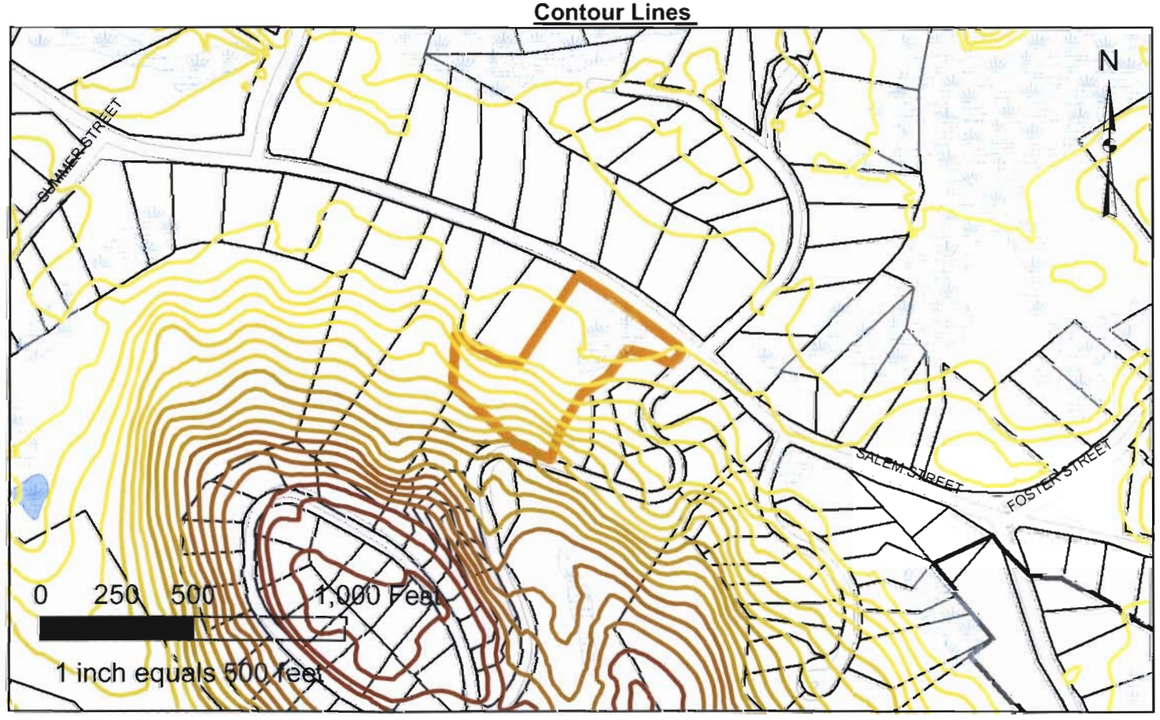


Conservation Land and Wetlands



Soil Severity

Contour Lines



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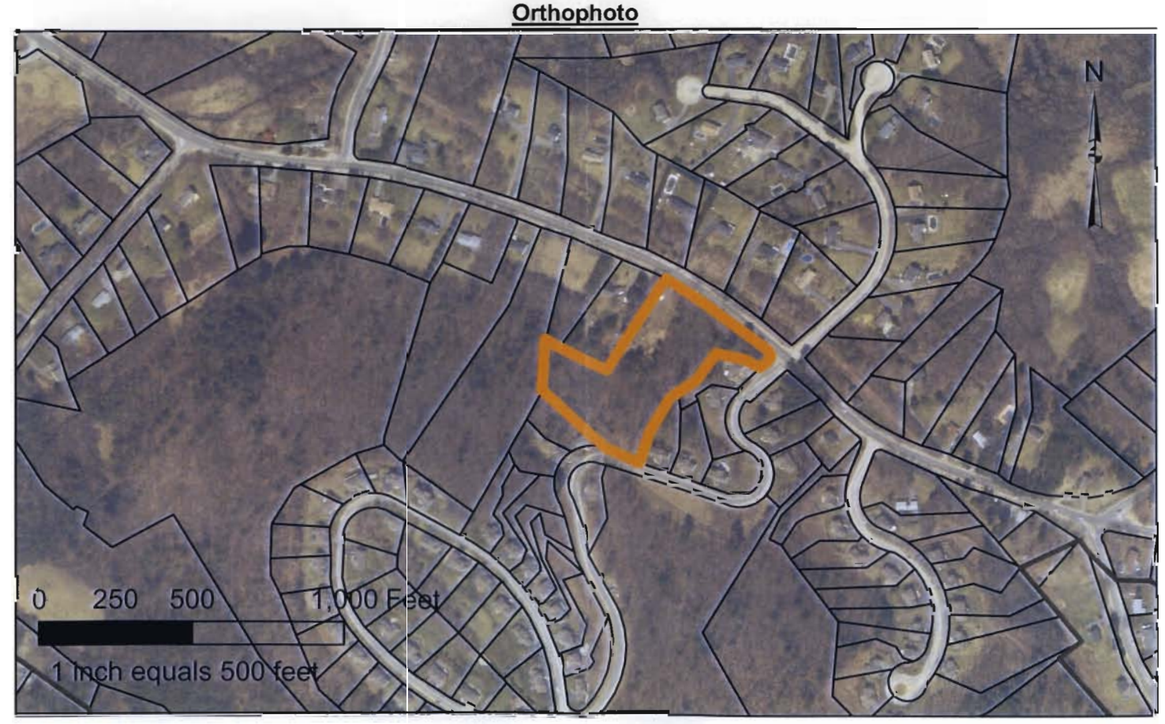
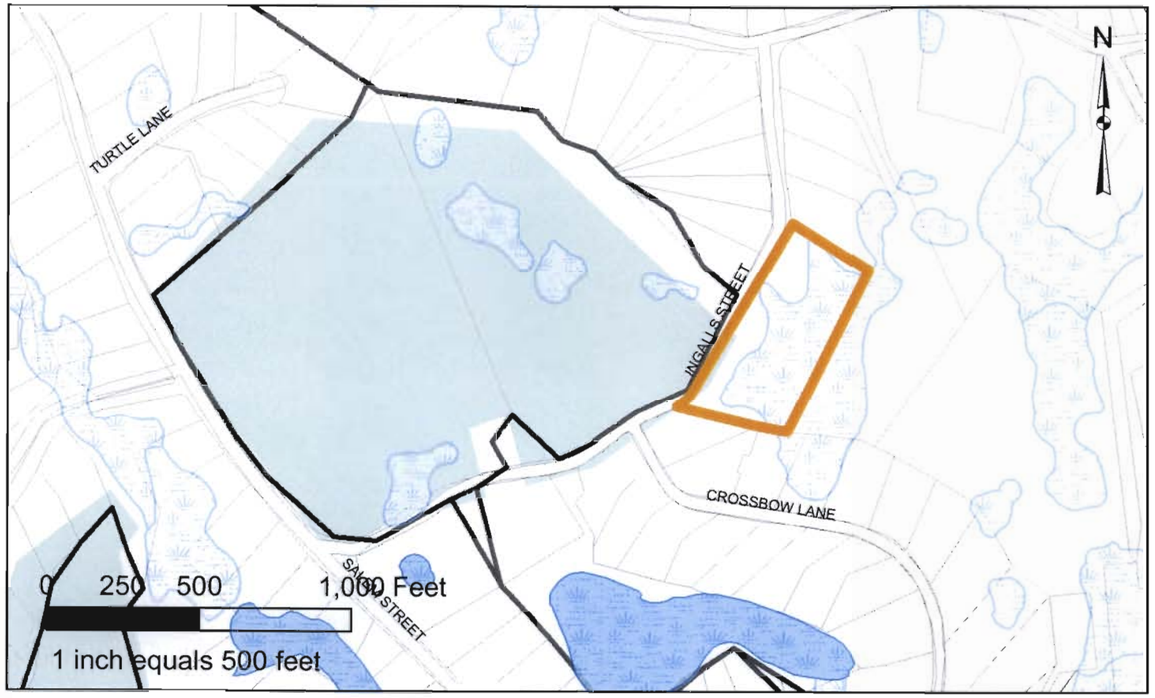
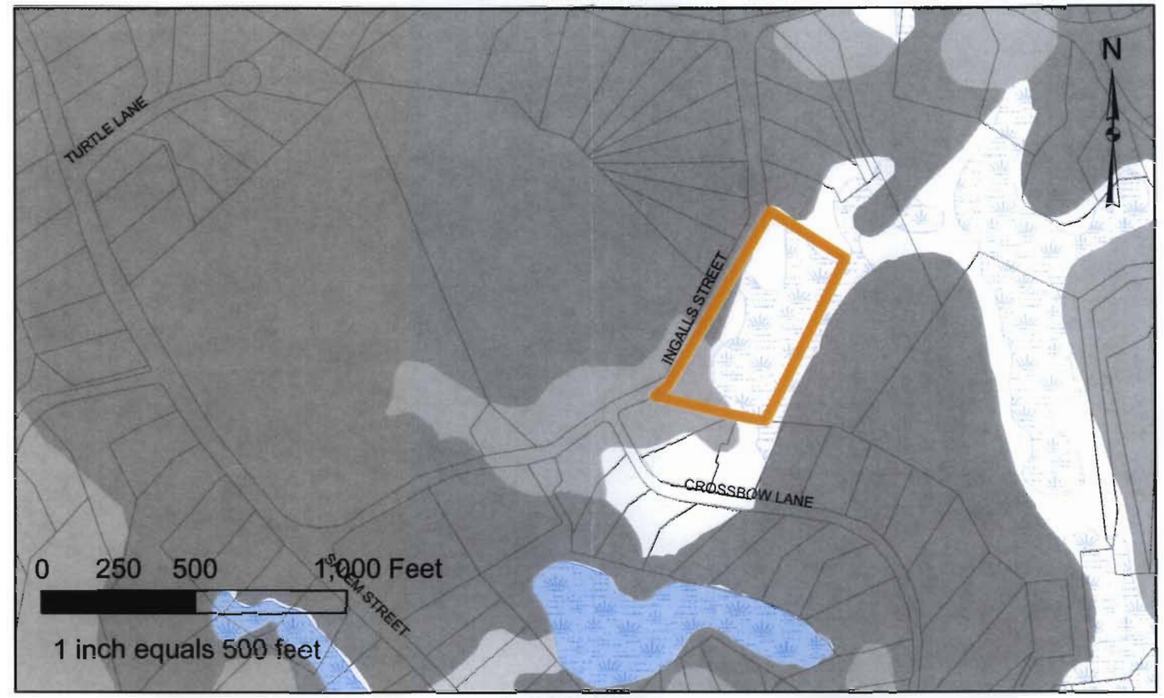


Figure 4-6B: Site A-16, Ingalls Street
GIS Information

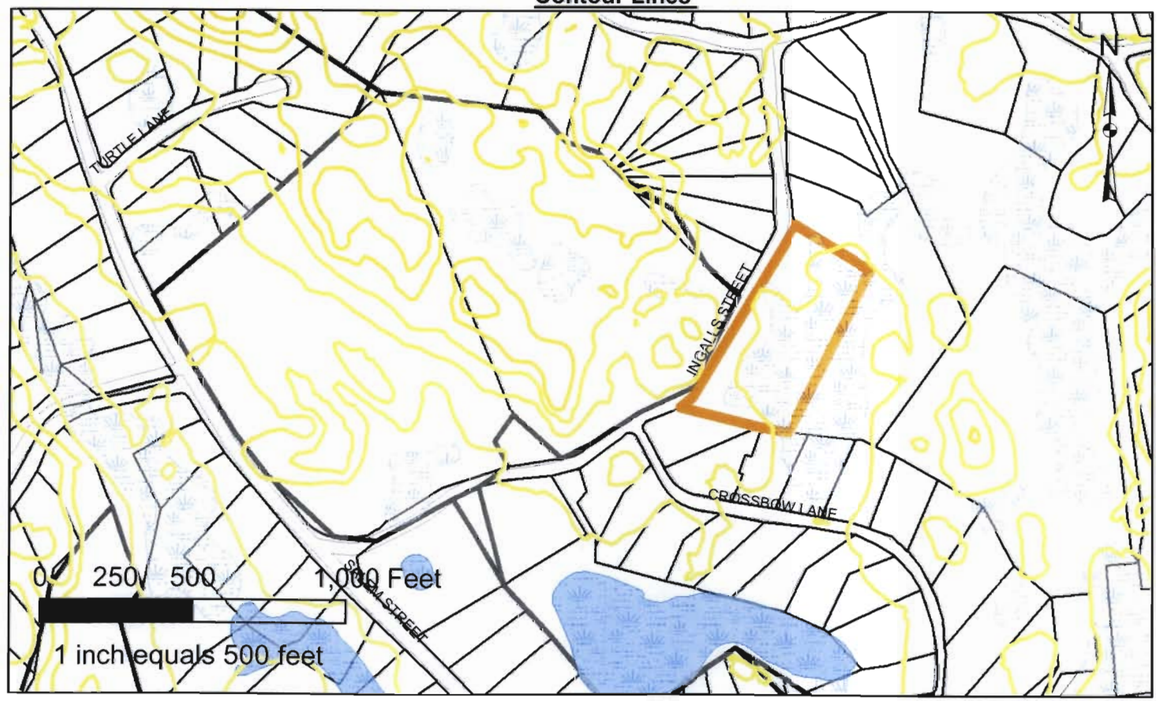


Conservation Land and Wetlands



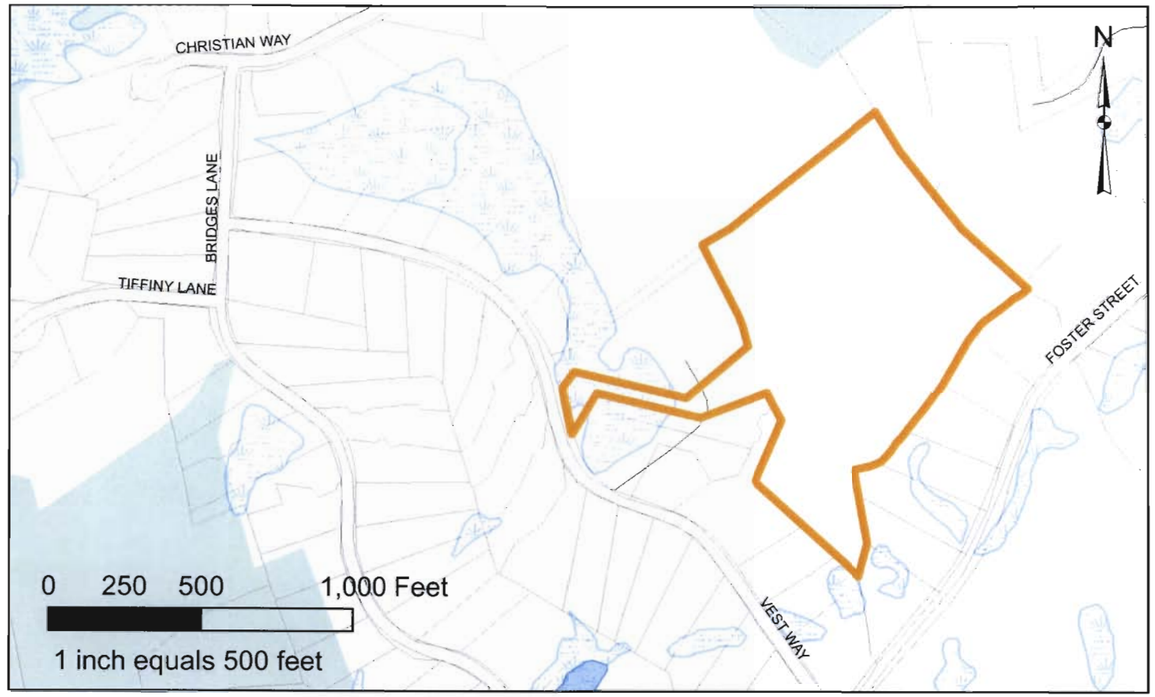
Soil Severity

Contour Lines

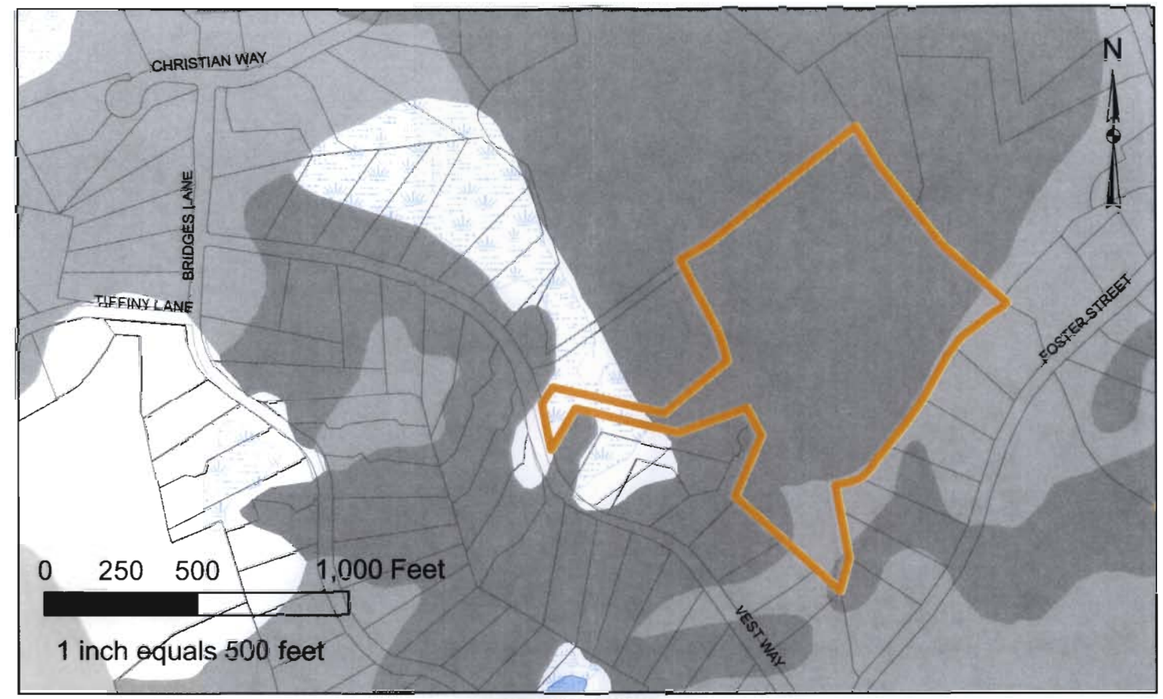


Orthophoto

Figure 4-7C: Site A-19, Foster Street
GIS Information



Conservation Land and Wetlands



Soil Severity

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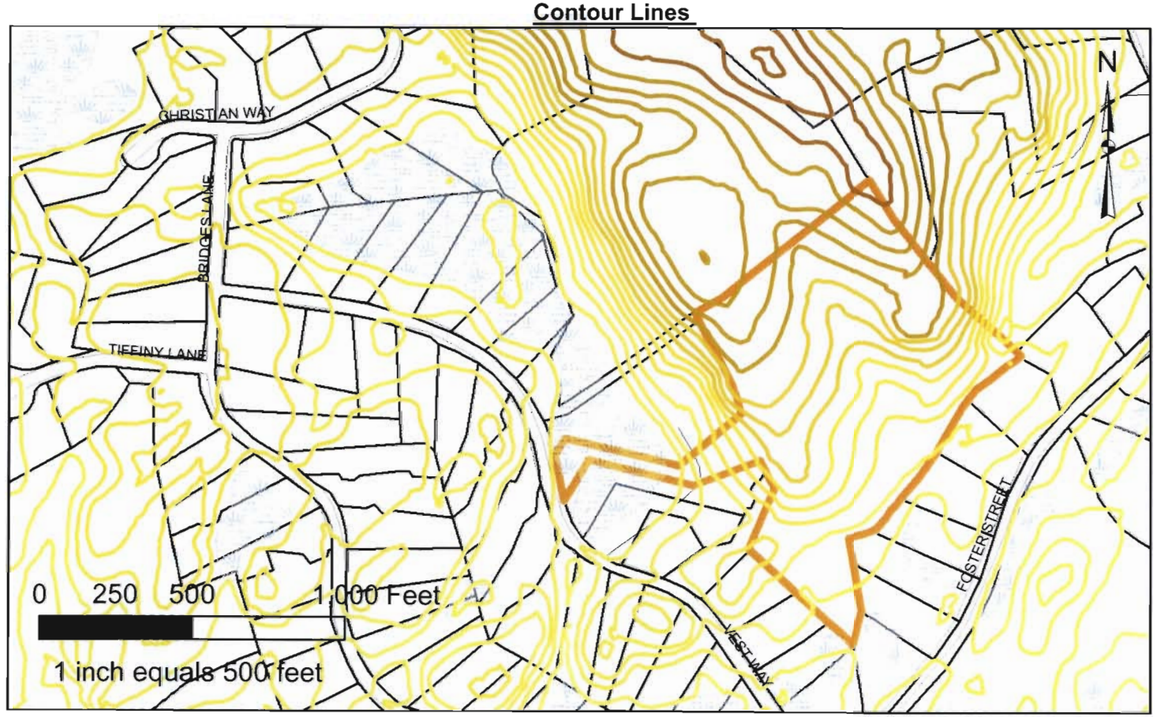

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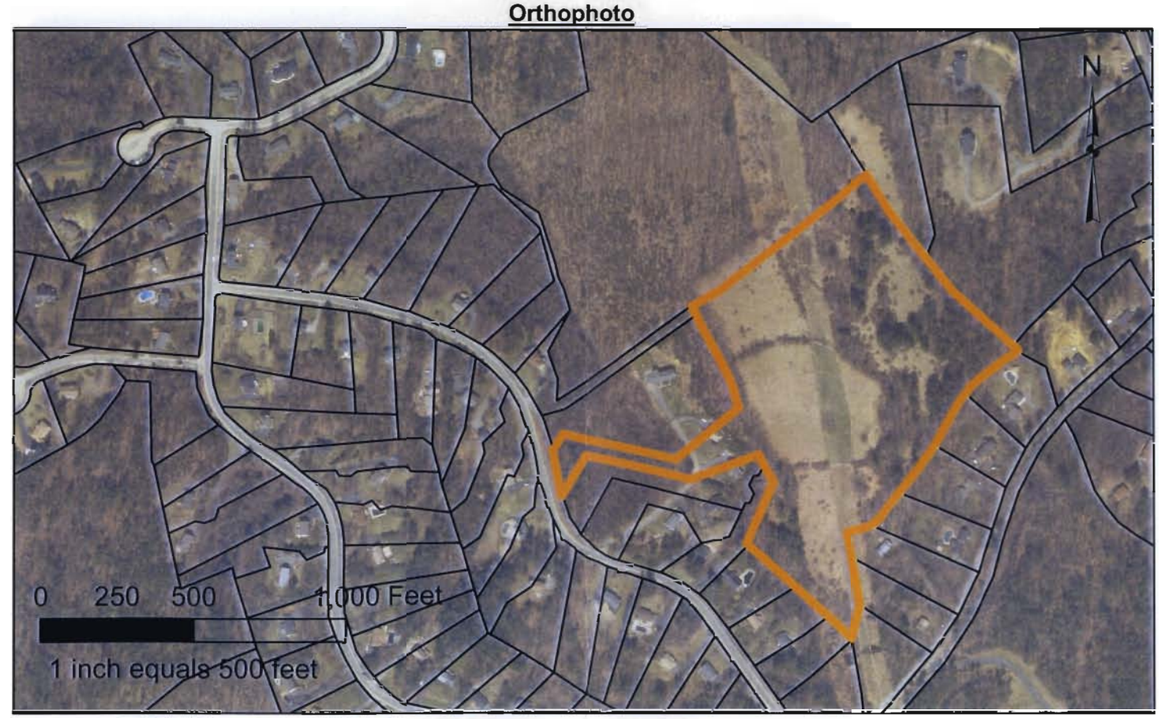
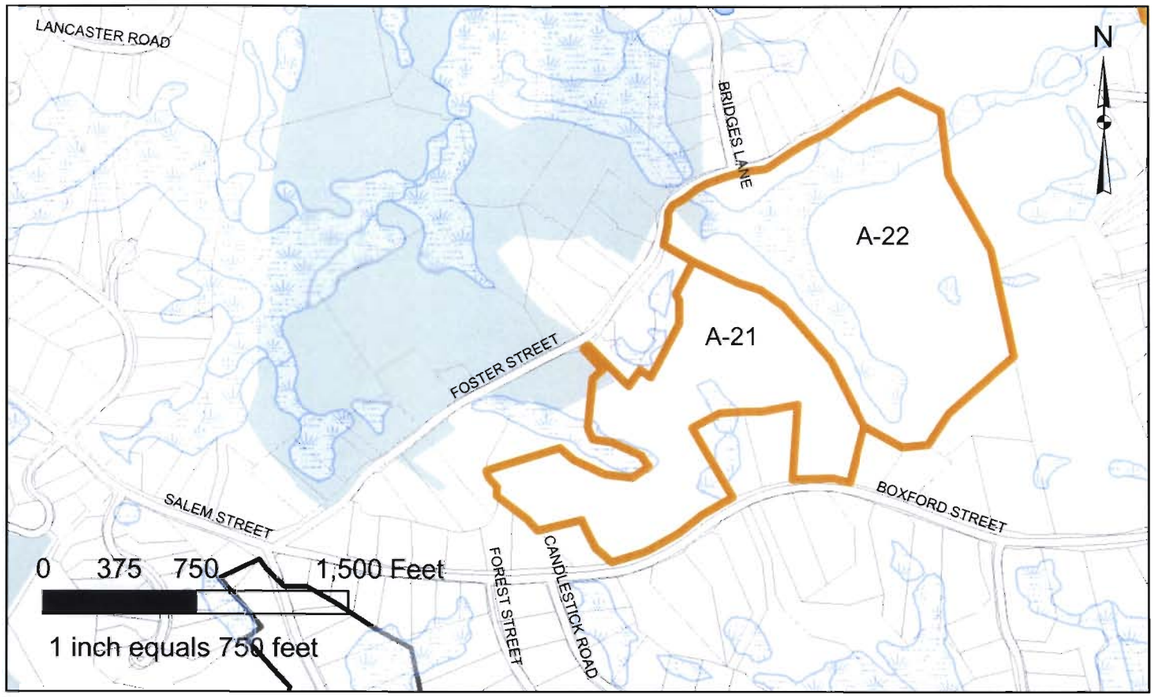
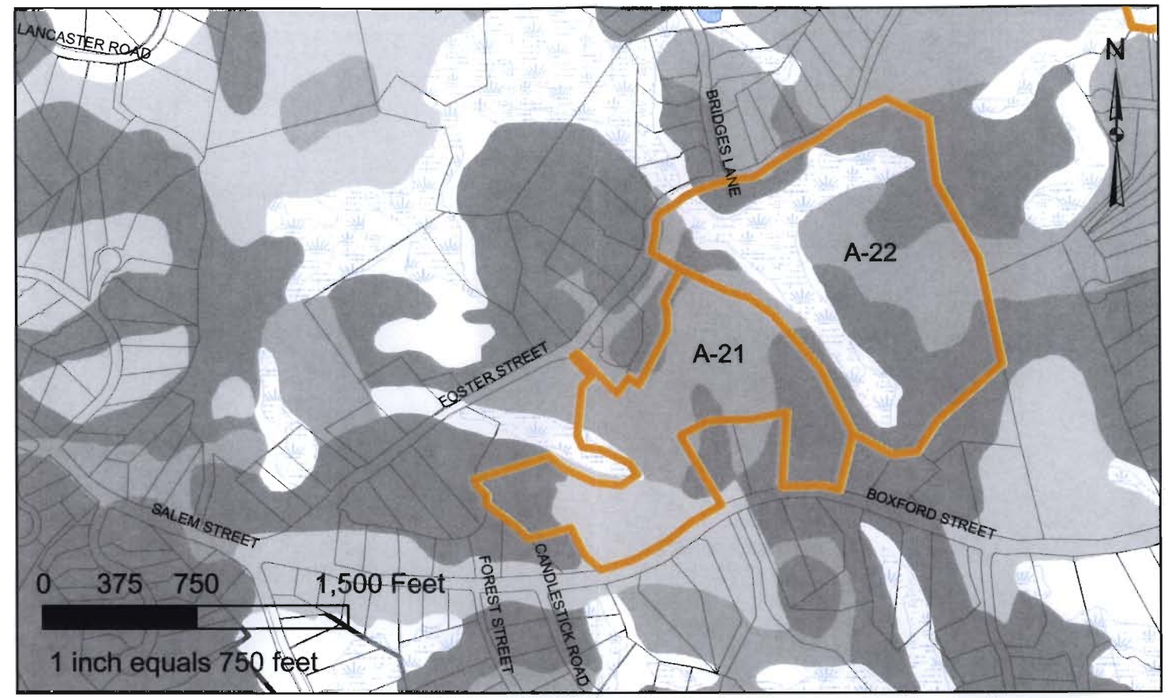


Figure 4-9: Site A-21, Boxford Street and Site A-22, Foster Street
GIS Information

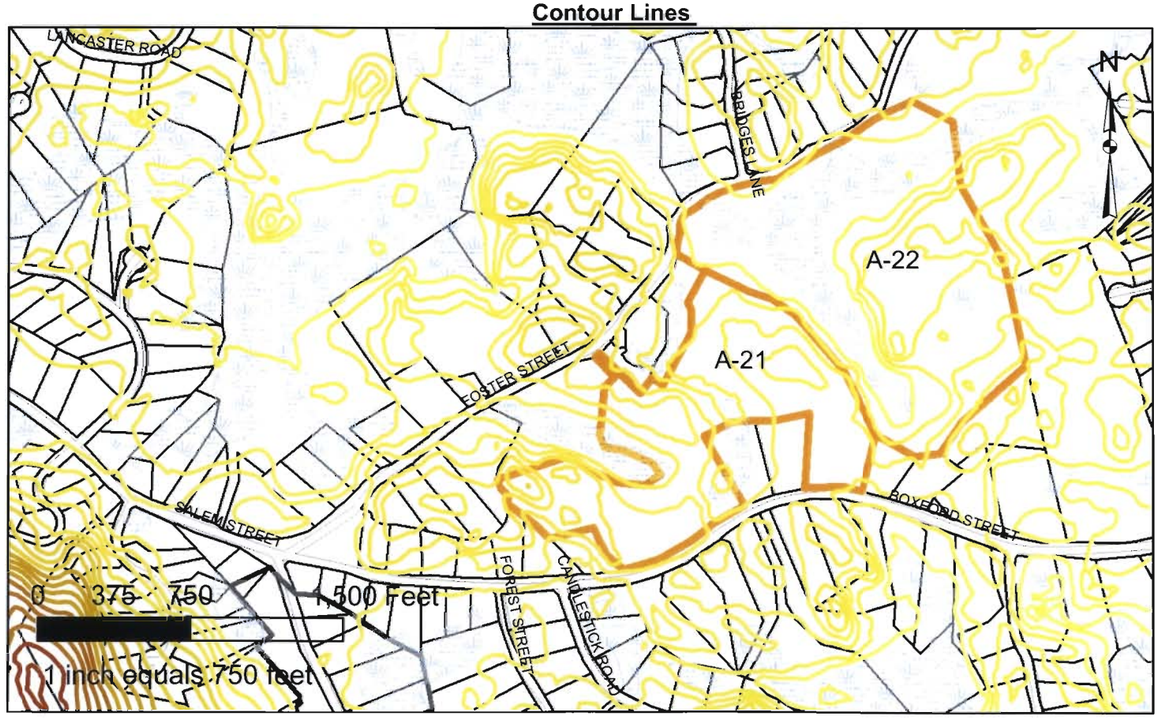
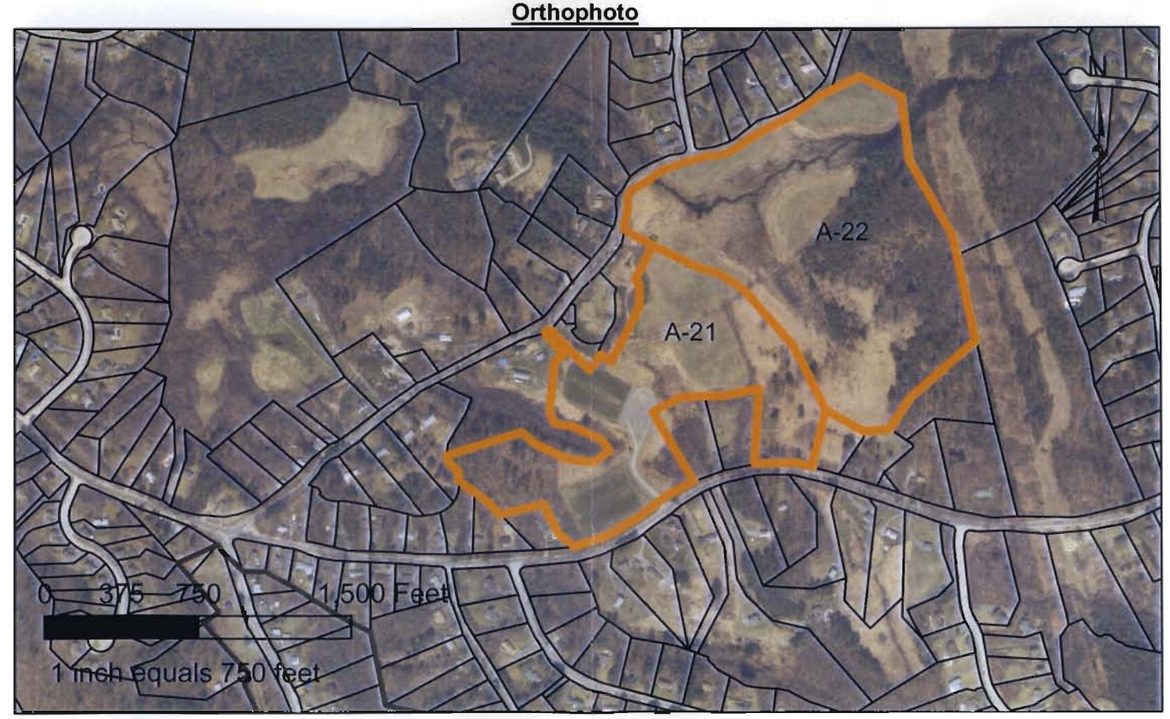


Conservation Land and Wetlands



Soil Severity

Contour Lines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