WATER SYSTEM FACILITY SITING AND HYDRAULIC EVALUATION REPORT

Town of East Hampton, Connecticut

September 2023

ENVIRONMENTAL PARTNERS
— An Apex Company —

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SECTION 1 EXECUTIVE SUMMARY

On behalf of the Town of East Hampton (the Town), Environmental Partners CT, Inc. (EP) has prepared this Water System Facility Siting and Hydraulic Evaluation report to aid the Town's efforts to expand its municipal water system. The Town is seeking funding to develop and expand its existing water supply system through the Drinking Water State Revolving Fund (DWSRF) Program administered by the Connecticut Department of Public Health (CTDPH).

EP produced a Preliminary Engineering Report (PER) in June 2022, which detailed existing water system facilities and sources, projected system demands, and potential future water supply sources. EP expanded upon the findings of the PER through an extensive assessment of potential water supply sources and developed recommendations for water system facilities based on groundwater exploration results and hydraulic modeling efforts. In this report, EP documents our findings and recommendations to date.

SECTION 1.1 PROJECT DESCRIPTION

The Town of East Hampton is seeking to design and construct a centralized municipal water system to serve its residents. The Town of East Hampton is located in the geographic center of Connecticut, and is bordered by Marlborough, Colchester, Haddam, East Haddam, Portland, Glastonbury, and the Connecticut River.

East Hampton's current population is 12,700 residents, the majority of which rely on private groundwater wells for their potable water supply. Over the past several decades, Town residents have experienced groundwater contamination of their water supply wells, rendering private wells unsafe for use. Contamination within the Town has only become more widespread in recent years with instances of private well contamination documented for several decades. Since the early 2000s, drinking water supplies have been compromised with widespread coliform, methyl tert-butyl ether (MBTE), and petroleum hydrocarbon contamination, contamination around the Village Center and Lake Pocotopaug areas. In recent years, the Town has now been informed of several instances of per- and polyfluoroalkyl substance (PFAS) contamination at private wells. Additionally, Town residents has experienced sodium and chloride contamination, which has threatening private well water quality in some area of East Hampton. Groundwater plume movement poses a threat for further contamination throughout the Town.

East Hampton serves a portion of the Town's residents with small, isolated Town owned water systems. The East Hampton Water Pollution Control Authority (WPCA) operates and maintains two water systems: the Village Center water system, which serves primarily "Village Center"-zoned parcels in the center of town, and the Royal Oaks water system, which serves mainly residential customers and the Memorial Elementary School. The WPCA is also responsible for the Town's sanitary collection and treatment system. Additionally, private developers and regional water authorities, such as the Connecticut Water Company, operate water supply systems ranging from 30 service connections to almost 200 service connections.

The Town wishes to establish a centralized water system to serve a greater proportion of the Town's residential, commercial, and industrial properties and promote growth within the Town.

SECTION 1.2 HISTORY OF THE PROJECT

Many areas within the Town of East Hampton have been plagued by poor groundwater quality in the past. In recent decades, the Town has experienced several bacteriological outbreaks and the presence of emerging groundwater contamination, such as PFAS, among both private well users and some of the WPCA's existing water supplies.

Section 1.2.1 Past Water Supply Evaluations

The extension of the Town's existing water system is essential for public health and future economic development. Establishing a centralized municipal water system has been a goal of policymakers and residents in town for decades. In the past, the Town's attempts to introduce a municipal water system failed when presented in both a 1962 referendum and more recently in a 2006 referendum. However, given the prevalence of emerging contaminants in resident's private well water in town and the unprecedented financial opportunity for state and federal grant and loan funding, there is no better time for establishing a municipal water system than now. EP noted in the Town's 2006 PER that population in the Town of East Hampton has been decreasing steadily since 2010 and projected development has not grown at the rate anticipated in the Town's 2010 Water Supply Plan (WSP). Establishing a municipal water system could greatly aid economic development in town and promote both commercial and residential growth.

The Town first explored establishing new water sources in 2006, and the results are documented in the 2006 Preliminary Engineering Report, produced by Maguire. The Town's most recent WSP update in 2010, approved by the Connecticut Department of Public Health, recommended that the Town establish several new water supply wells; however, no new sources have been established since the WSP was approved.

Section 1.2.2 2022 Preliminary Engineering Report

The Town contracted EP to produce a PER in 2022, which defined potential water supply sources in Town. Appendix A provides a copy of the 2022 PER, which describes existing water system facilities, further explores potential viable options for future water supply sources, and documents the need for expanding the Town's water service area.

While preparing the PER, the Town emphasized that the existing water supply sources provided little benefit due to aging infrastructure and water quality concerns due to elevated PFAS level. Since these treatment facilities would require extensive upgrades, the Town requested that EP optimize the Cobalt Landing Wellfield and evaluate other water supply sources.

EP also further evaluated the Town's existing water systems and population and demand projections. East Hampton has limited availability of groundwater supply like other communities in central Connecticut, which is known for its characteristically poor surficial geology for establishing groundwater supply sources.

The PER also documented the need for developing a water system hydraulic model, siting new facilities and delineating future water system service areas. In this report, EP presented our findings of this phase of the Town's water system expansion efforts.

Section 1.2.3 Groundwater Exploration and Water Quality Testing

EP performed a groundwater desktop study to identify potential sites for future water supply sources based on geological conditions, environmental features, and land ownership. From this study, EP explored and evaluated several alternatives for potential water supply sources within the Town. Ultimately, EP recommended developing the permitted Cobalt Landing Wellfield on Oakum Dock Road and conducting geological investigations at the Pine Brook site near Hog Hill Road.

The first goal of the subsequent phase of this project was to perform subsurface exploration and testing in the Pine Brook aquifer, including exploratory drilling, well development, and testing. This phase also included conducting water quality sampling at the Cobalt Landing Wellfield. While the investigations at the Pine Brook site yielded poor results, groundwater samples at the Cobalt Landing Wellfield yielded favorable results. **Appendix D** includes our report entitled, "Water Supply Exploration and Wellfield Testing, Pine Brook Site and Cobalt Wellfield" dated February 2023, which presents our findings and recommendations.

This Water System Facility Siting and Hydraulic Evaluation Report expands upon the findings of the February 2023 report on the Pine Brook site and the Cobalt Landing Wellfield. Based on the currently available water supply sources, EP established the proposed extent of the water system with feedback from the Town and modeled the proposed system using WaterCAD. From these hydraulic investigations and an extensive review of potential water system facility sites, EP proposed a Capital Improvement Plan (CIP) for planning purposes.

SECTION 1.3 PROJECT GOALS

As referenced previously, the Town's primary goal is to establish a centralized municipal water system and most importantly to provide the residents of East Hampton with reliable, safe drinking water. The residents of East Hampton will benefit greatly with the implementation of a centralized water system. By establishing a Town-wide public water system, the Town will be able to allocate its resources to providing safe and reliable drinking water to its residents. While private wells may be effective for many of the Town's residents, by switching to public water, residents can relinquish the responsibility of maintaining their water systems to the Town. By following State and federal regulations, the Town will monitor water quality and maintain the public water system thereby providing more oversight and better operational support of the water supply than residents with private wells. The Town will also dedicate local funding and labor support to maintaining water supply to its residents. Additionally, constructing a municipal water system will allow the Town to provide fire protection to its residents. Currently, the Town relies on bulk water during fire events. Having an on-demand water supply for fire protection will greatly benefit the Town and promote economic growth.

EP prepared this report to present recommended water system facility sites, water supply sources, preliminary water system design, and factors prioritized to select the most feasible and cost-effective solutions for further exploration of water supply sources for the proposed water system.

After establishing viable water supply sources, the Town can better define, site, design and construct other water system components, including water supply, treatment, distribution, storage, pumping, and piping improvements.

EP prepared a preliminary Capital Improvement Plan (CIP) for the improvements presented in this report. The CIP includes a cost estimate, including engineering and contingencies, for constructing the water system facilities and completing the permitting efforts required to commission the Town's water system. In total, EP estimated that the design and construction of the three Pressure Zone water system discussed in this report will cost approximately $125 million dollars (2023 dollars). Section 5 presents the proposed CIP with a detailed breakdown of planning-level project costs by facility and stage for the proposed water system.

SECTION 1.4 REPORT ORGANIZATION

Section 1 provides a project description and project goals.

Section 2 outlines the factors considered for planning the project.

Section 3 presents the water system facility sites, which were dictated by both locational factors as well as system hydraulics as discussed further in the following section.

Section 4 provides the hydraulic considerations taken to siting the water system facilities and delineating service zones.

Section 5 presents the recommended Capital Improvement Plan.

Section 6 provides project conclusions and recommendations for next steps.

SECTION 2

SECTION 2 PROJECT PLANNING

SECTION 2.1 PROJECT AREA

The Town of East Hampton is 36.8 square miles in area and has a total population of 12,717 (2020 Census). The Town's population is concentrated mainly around the center of Town, in a 6.5 square mile area designated as the "Village Center" area, near Lake Pocotopaug.

Section 2.1.1 Town's Available Water Supply Sources

Royal Oaks, Memorial School, and Village Center Groundwater Supplies

The Royal Oaks and Village Center Systems, owned and operated by the WPCA, utilizes groundwater wells to supply their respective systems. According to the 2010 WSP, the Royal Oaks System currently contains four groundwater wells: Well #1, Well #3, Well #4, and the Memorial School Well. Combined, these wells have a total safe yield of 39,852 gallons per day.

Photo 1 – Royal Oaks Wellfield

The Village Center System utilizes two groundwater wells: Well #1 and Well #2, with a total safe yield of 55,080 gallons per day according to the 2010 WSP.

Table 2-2 details the specific physical characteristics for each well.

Table 2-1 – WPCA-Owned Well Characteristics

	Royal Oaks System				Village Center System	
	Well 1	Well 3	Well 4	Memorial School	Well 1	Well 2
Location	Royal Oaks	Royal Oaks	Royal Oaks	Memorial School	Basement of Center School	Behind Baseball Backstop at Center School
Type	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled
Diameter	6-inch	6-inch	6-inch	8-inch	6-inch	8-inch
Depth	405 feet	405 feet	405 feet	N/A	160 feet	300 feet
Pumping Capacity	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm
Safe Yield	9.0 gpm	9.0 gpm	9.0 gpm	N/A	23 gpm	28 gpm

Cobalt Landing Wellfield

In addition to the six wells utilized by the WPCA for water supply, the WPCA owns two wells at the Cobalt Landing Wellfield, near the Connecticut River. The WPCA drilled these two wells in 2004 to determine the available water supply at this location in case of future water system expansion. The wells at the Cobalt Landing Wellfield are permitted to supply up to 0.90 MGD but are not currently operational or connected to any customers.

Photo 2 – Cobalt Landing Wellfield Existing Conditions

Section 2.1.2 Existing Water Treatment Facilities

The WPCA operates three treatment facilities: one for the Village Center System and two for the Royal Oaks System. The unit processes at the Village Center System treatment facility include initial sodium hypochlorite addition for oxidation of metals, potassium carbonate addition for pH adjustment, alkalinity adjustment, and softening, Greensand filtration for removal of metals, granular activated carbon (GAC) adsorption for PFAS removal, and final sodium hypochlorite addition for residual disinfection. The treatment facility for the Village Center System is located in the Center School. Following treatment, water enters the distribution system.

Photo 3 – Treatment Facility for the Village Center System

Similar treatment chemicals are used for treating the raw water supplied by Wells No. 1, 3, and 4 in the Royal Oaks System. The unit processes at the Village Center System treatment facility include initial sodium hypochlorite addition for oxidation of metals, potassium carbonate addition for pH adjustment, alkalinity adjustment, and softening, Greensand filtration for removal of metals, granular activated carbon (GAC) adsorption for PFAS removal, and final sodium hypochlorite addition for residual disinfection. The Memorial School Well pumps water into its own treatment facility within the Memorial School; the treatment process for this water is a dosage of soda ash and treatment via GAC for PFAS removal before being discharged to the school and distribution facility.

During meetings with the East Hampton Water Subcommittee, the Town has expressed concerns about the cost-effectiveness of continued operation of the WPCA three existing treatment facilities. With the limited available water supply and treatment required for PFAS removal, the Town's preference is to develop the Cobalt Landing wellfield with appropriate treatment for supplying the services area currently feed by the existing treatment facilities. EP recommends that this approach be evaluated in the final design phase of this project.

Due to the lack of available and viable water supply sources, EP recommends that the Town proceed with a preliminary water system design using the Cobalt Landing Wellfield as the Town's sole water source. However, we also recommend that the Town continue to assess any potential future water supply source with surrounding communities to supplement supply from the Cobalt Landing Wellfield.

Photo 4 – Treatment Facility for the Royal Oaks System

Section 2.1.3 East Hampton Geography

As stated previously, the water system service area is limited by available water supply and topography. Aside from the small Town-owned water systems described above, the Cobalt Landing Wellfield is the Town's water supply resource, which is located off Oakum Dock Road on the west side of town along the Connecticut River and is situated at an elevation of 10 feet Mean Sea Level (MSL). The wells have an active Diversion Permit valid through 2031 through the Connecticut Department of Energy and Environmental Protection which allows the wells to supply up to 0.90 MGD, though these wells are not currently operational and are not connected to any customers. Due to the permitted capacity of 0.90 million gallons per day (MGD), the Cobalt Landing Wellfield is the most productive source providing capacity for the proposed system expansion.

Since the major population base in East Hampton is the Village Center, the Town's biggest challenge is getting water from the Cobalt Landing Wellfield to the higher elevations along Route 66 and the Village Center. The Town has a unique topographic layout, with elevations ranging between 0 feet MSL to above 600 feet MSL. These conditions pose additional challenges, as the highest capacity water supply source is located at the lowest elevation in the town, with the most populated and vulnerable areas of the town concentrated around the highest elevations. Topography greatly impacts water system hydraulics, because water pressure is directly correlated with the water system's HGL.

The Connecticut Department of Public Health (CTDPH) guidelines recommends water suppliers maintain water service pressures above 35 psi for all water system customers during normal system demand periods and above 20 psi during fire flow and other emergency demand periods.

Additionally, maintaining normal service pressures below 100 psi is the best practice to reduce stress on interior plumbing and protect against water system surge events. Given these water supply guidelines, East Hampton's topographic conditions presents challenges to supply water from the Cobalt Landing Wellfield to the Town's most populous areas with residential wells compromised with poor water quality. Therefore, the Town must divide its water system into multiple service areas to convey water from the low elevations adjacent to the Connecticut River to the higher elevations near the Village Center. EP considered the cost-effectiveness of establishing multiple service areas based on the locations of servable populations. Each service area would require either its own pumps or pressure reducing valves, as well as potentially a storage tank.

From a system hydraulics and water supply perspective, hydraulic grade line (HGL) and available water pressure are the primary drivers for the siting of all water system facilities and service area delineations. EP reviewed East Hampton's topography and the availability of drinking water supply capacity to define the proposed water system service and locate water supply facilities for the proposed water system.

Section 2.1.4 Priority Service Areas

EP focused on the most populated sections of East Hampton along with residential properties that have been compromised by contaminated drinking water well as priority areas for establishing municipal water service. As discussed previously, the Town wishes to supply water to the most populated areas including the Village Center area of town, Lake Pocotopaug, and Route 66 at the time of the study. The Town's businesses and industrial facilities are concentrated around this area. These areas are already largely developed and have several locations with prior reports of private well contamination. Additionally, the Town has already sewered these more densely populated areas.

The Town expressed concerns about the number of contaminated private wells in this area of East Hampton and the continuing increase in groundwater contamination in recent years. The Town has documented instances of private well contamination for several decades. Since the early 2000s, private residential wells have been compromised by coliform, methyl tert-butyl ether (MBTE), and hydrocarbon contamination around the Village Center and Lake Pocotopaug areas. In recent years, the Town has been informed of several instances of PFAS contamination at private wells, as well as within its own WPCA wells.

Additionally, EP recommends prioritizing supplying public water to the four public schools within the Town's borders.

Under these considerations, EP further evaluated establishing a water system from the Cobalt Landing Wellfield to the Memorial Elementary School. To serve the most customers and maintain system looping, we established the southern boundary of the Town's service area to be Middletown Avenue (Route 16). While our objective is to serve the Town's most populated areas in the Village

Center area and Route 66 along with the residents around Lake Pocotopaug to the north, the limitation on available water supply will limit the potential service area.

Therefore, EP delineated the Town's proposed water system by determining where the availability of a public water system would present the greatest benefit to the greatest number and most vulnerable properties. To assist with the service area delineations, EP evaluated Town zoning and available reports documenting groundwater contamination. **Figure 2-1** presents zoning designations across the Town of East Hampton.

Section 2.1.5 Collaboration with the Water Subcommittee

The East Hampton Water Subcommittee was crucial in assessing and developing the preliminary water system when considering the Town's water supply priorities. While drafting the system service areas and facility siting recommendations, EP made several presentations to the Water Subcommittee and incorporated their feedback into the water system design detailed in this report.

EP prepared the *Water System Demands and Proposed Service Area Boundaries* memorandum for the Water Subcommittee, dated August 30, 2023. **Appendix B** provides a copy of this memorandum. In this document, EP details the considerations taken to determine the extent of the water system service area, as well as the process that we used to allocate the estimated water system demands. These considerations are expanded upon further in this report.

SECTION 2.2 ENVIRONMENTAL RESOURCES PRESENT

There are several surface water bodies within and near the Town. The Low Pressure Zone, Intermediate Pressure Zone, and the High Pressure Zone of the Town's proposed municipal water system are situated near the Connecticut River and Lake Pocotopaug. Additionally, the WPCA's sole wastewater treatment plant discharges into the Connecticut River. EP studied the feasibility of establishing water system facilities while considering the impacts to environmental resources at each site. Section 3.3 describes potential impacts to the siting of water supply facilities due to environmental resources. Our assessment of potential impacts to sensitive environmental receptors also influenced the extent of the proposed services areas and the siting of future water supply facilities.

As with all projects, the Town will take precautions to mitigate potential disruption and impact on environmental resources at the chosen project sites and surrounding areas. EP will also include specifications for all necessary environmental protection and sedimentation/erosion control measures in the final construction plans and documents for each facility and all water main. The Town also plans to provide personnel for construction observation to improve confidence that the Contractor follows these requirements and properly protects all surface and groundwater systems in East Hampton. The Town will submit all required environmental permitting documents during the final design phase.

SECTION 3

SECTION 3 PROJECT DESIGN

EP evaluated the most feasible and effective layout and service area for the Town's municipal water system. Ultimately, EP's goal for the Town's municipal water system configuration was to design a centralized water system that could serve the greatest number of residents within the Town of East Hampton, prioritizing the Town's businesses, schools, and contaminated areas, while considering the engineering feasibility of the system layout based on the topographic and environmental conditions within the town. EP based the system layout on the assumption that the Cobalt Landing Wellfield would be the Town's sole source of water until the Town identified additional future drinking water sources. Section 3.3.1 details EP's methodology for developing the system design.

This section describes the sites chosen for each water system facility. EP evaluated system hydraulics and resulting pressures to locate required water supply facilities and then finalized site selections. Section 4 presents a detailed description of the system's hydraulic considerations.

SECTION 3.1 SYSTEM LAYOUT

The proposed East Hampton municipal water system spans from the Connecticut River to near the eastern border of town. Using a zoned approach, EP estimates that the Town could serve customers from Route 16 to the south up to Route 66 to the north.

EP proposes designing a water system with three major pressure zones: the Low Pressure Zone, Intermediate Pressure Zone, and High Pressure Zone. Section 3.2 and Section 4 describe the driving factors in delineating the zone boundaries and the necessity for multiple zones. Under the proposed water system layout, the Town would operate one tank in each pressure zone during the initial buildout stage. The entire system would be fed by the Cobalt Landing Wellfield, with treatment at a singular treatment plant located in the Low Pressure Zone. Additionally, the Town would operate booster pumps in each pressure zone to raise the system's hydraulic grade to each subsequent pressure zone.

Due to constraints imposed by available water quantities from the Cobalt Landing Wellfield and estimates of system demand, EP recommends a phased approach to constructing the High Pressure Zone. Phase 1 of the High Pressure Zone encompasses the commercial areas on Route 66 and several schools. Phase 2 includes the areas around Lake Pocotopaug.

Under the proposed East Hampton water system design, EP recommends an initial buildout of 2.43 miles of water main. EP delineated the proposed water main configuration after evaluating desired service areas, available fire flow, and facility siting locations. The shape and extents of the proposed water system are constrained by both the location of the Cobalt Landing Wellfield and the areas of high population density for both current and future development in Town.

Following meetings and discussions with the Water Subcommittee, EP also recommends that the Town omits the customers within the Low Pressure Zone from its customer base due to the sparse population in this zone and the limited availability of water to serve more populated areas in the eastern part of Town. While EP does not recommend providing customer water service to this zone, the proposed water system can still offer fire protection to the properties in this zone. Therefore, Phase 1 of the initial system buildout will solely include water service to customers in the Intermediate and High (Phase 1) Pressure Zones, and fire protection for the Low, Intermediate, and High (Phase 1) Pressure Zones.

EP estimates that the total average day demand of the proposed service areas of the initial system buildout would total approximately 0.467 MGD. Due to the uncertainty of anticipated demands and peaking factors, EP recommends that the Town monitor demands as construction progresses to determine the maximum extent of water system service using the permitted Cobalt Landing Wellfield supply.

Figure 3-1, “Proposed Water System Facilities”, illustrates the proposed water system facility locations and water system layout.

SECTION 3.2 SYSTEM BOUNDARIES AND CONSTRAINTS

Section 3.2.1 East Hampton Topography

The Town of East Hampton has particularly interesting topographic conditions from a water system zoning perspective. The Town’s elevations range from 0 feet MSL to greater than 600 feet MSL. Most of the Town’s population resides above elevation 400 feet MSL, and the Town’s existing permitted wellfield, the Cobalt Landing Wellfield, is located at one of the Town’s lowest elevations, near 10 feet MSL. **Figure 3-2** displays a topographic map of the Town.

As stated previously, the CTDPH recommends maintaining water service pressures above 35 psi for all water system customers under normal operating conditions. Sustained pressures below 35 psi are considered unsafe for water system customers, as varying demand conditions and other system circumstances such as major water main breaks or pump failures can create vacuum conditions in pipes at low pressures, increasing the probability of contamination introduced post-treatment. Alternatively, prolonged pressures of 100 psi and above can put undue stress on water mains, leaving systems susceptible to leaks and breaks. EP carefully considered topographic conditions to dictate zone boundaries that would allow the Town to maintain customer pressures between 35 psi and 80 psi, with small areas of the proposed system having service pressures above 80 psi.

Additionally, we established zone boundaries to allow the Town to maintain service pressures above 20 psi during fire flow events. EP modeled customer service pressures under several zoning scenarios to determine the most feasible and effective zone boundaries while considering capital costs. EP evaluated the proposed water system layout presented in the 2006 PER by Maguire Group, Inc. (Maguire); Maguire proposed a three-zone system, with a Low Pressure Zone extending southwest of the WPCA Facility at 20 Gildersleeve Drive, the first phase of the High Pressure Zone from the WPCA Facility to the Memorial School, and a second phase of the High Pressure Zone north of Route 66. However, due to topographic conditions in the proposed High Pressure Zone, customers would likely be subjected to pressures exceeding 150 psi in the High Pressure Zone. Therefore, EP weighed the benefits and drawbacks of introducing an additional Intermediate Pressure Zone between the Low Pressure Zone and the High Pressure Zone. Ultimately, due to hydraulic limitations and projected water system demands, EP recommends establishing three pressure zones as a preliminary water system design. The Town can assess expansion of the system beyond our initial recommendation of three pressure zone boundaries after developing an additional water supply source.

Section 4 of this report presents the findings of EP's hydraulic investigations in detail.

Section 3.2.2 Available Supply and Demand Considerations

Additionally, EP considered the available water system supply when forming recommended system boundaries. As previously discussed, the Town's water system expansion is limited by the availability of viable water supply sources. East Hampton can only serve up to a certain threshold of customers without concerns of water supply volume. The Town has a maximum permitted water supply of 0.90 MGD from the Cobalt Landing Wellfield. EP used 2.0 as a conservative Maximum Day Demand (MDD)/Average Day Demand (ADD) peaking factor. With a 2.0 MDD/ADD peaking factor, the Town can plan to serve up to 0.45 MGD during an average day water demand supply scenario.

EP delineated a draft water system service area that could serve approximately 0.45 MGD of average day demand while serving the Town's priority service areas, including the Village Center area, Route 66 (south of Lake Pocotopaug), and East Hampton public schools. EP then reviewed the elevation range across the service areas while considering potential facility site locations to establish the required pressure zone boundaries.

Using a peaking factor of 2.0 is conservative; peaking factors for comparable communities tend to fall in the 1.6 to 1.8 range. Because supply capacity is finite, the consequence of overdesigning the system extents is severe. Water usage typically peaks during the summer months due to irrigation, so planning for a high peaking factor will help the Town to maintain water service throughout the year. Additionally, because the anticipated water demands are estimates, the Town should monitor water usage during system startup to accurately determine system demands.

Appendix B – Water System Demands and Proposed Service Area Boundaries Memorandum presents the considerations taken for estimating system demands in more detail.

Parcel Zoning

EP utilized US Census data and the Town's 2010 Water Supply Plan (WSP) to project future population and water consumption for the Town of East Hampton in the 2022 PER. EP refined these values during this phase of water system planning.

The Town of East Hampton zones parcels in twelve categories, defined by the Town of East Hampton Land Use Department, as shown in **Table 3-1** – East Hampton Zoning Designations.

Table 3-1– East Hampton Zoning Designations

Zoning Code	Description
C	Commercial
DD	Design Development
HOD	Housing Opportunity Development
I	Industrial
MUDD	Mixed-Use Development District
PO/R	Professional Offices/Residential
R-1	Lakeside and Village Residential
R-2	Single Family Residential
R-3	Residential (Resource)
R-4	Rural Residential
RL	Reserved Land
VC	Village Center

Demands by Parcel Zoning Designation

Residential Parcels

EP estimated the projected residential demand for parcels zoned as R-1, R-2, R-3, and R-4 using guidelines provided through the CTDPH Drinking Water Division's *Guidelines for the Design and Operation of Public Water System Treatment*. At a Census-estimated 2.5 persons per household and a design demand of 75 residential gallons per capita per day, each of the Town's residential service connections is estimated to carry an average daily demand (ADD) of 0.13 gpm.

Reserved Land Parcels

Reserved Land is classified as public land within the Town of East Hampton that is owned by local, state, or federal government entities. Reserved land within the water system boundaries was mostly observed as open space. EP estimated the water usage of each Reserved Land parcel according to the land use of each parcel. We assumed that open, undeveloped space will not require drinking water supply.

Commercial Parcels

EP analyzed each commercial parcel by type of business provided to assign relative demands. Applying water usage estimates based on similarly sized water systems in the northeast, EP approximated demands by parcel according to the commercial user demands presented in **Table 3-2** – Estimated Water Usage by Commercial User Type.

Table 3-2 – Estimated Water Usage by Commercial User Type

Commercial User Type	Estimated Water Usage (gpd)
Coin Laundry	6,200
Country club	1,900
Grocery	4,400
Restaurant	5,000
Senior Living	6,500
Detox/Health Center	4,300
Rehabilitation Center/Hospice	7,500
Electronics Plant	7,500
Hotel (about 100 rooms)	5,000
Hospital	19,000
Mobile Home/Trailer Park	26,200

Industrial Parcels

EP estimated the water demand of each Industrial-zoned parcel based on parcel size. As a general guideline, we estimated a daily Industrial user demands in gallons per minute by multiplying the acreage of each Industrial parcel by 12.4 gallons per day per acre, based on water usage estimates of comparably sized communities in the northeast.

Village Center Parcels

The Village Center parcel designation is specifically for the parcels in the Village Center area of town. These parcels carry multiple different uses and are mostly served by the WPCA's Village Center water system. EP utilized historic user billing data provided by the WPCA for the Village Center Water System to assign demands to the Village Center parcels that will be served by the proposed municipal water system.

Special Zoning Designation Parcels

EP individually assigned demands to the remaining parcels, designated as "DD", "HOD", "MUDD", and "PO/R", based on land use and building type using estimated demands from similar water systems in the region. We obtained full zoning descriptions from the *East Hampton Zoning Regulations*, amended in October 2022.

EP spatially allocated customer demand in the water system hydraulic model to evaluate the extent of water system service. Using the aforementioned demand allocation methodology, EP calculated the potential total average day demand of each water system pressure zone and performed an iterative process to amend the zones to meet the available water supply, 0.45 MGD.

After considering potential demands, EP found that the Low Pressure Zone would carry the smallest portion of system demand if served. The Town will need to evaluate which customers in the Low Pressure Zone are preferred to be served, if any. Section 4 further documents the necessity for the

Low Pressure Zone. Additionally, with the currently available water supply, EP delineated a border within the High Pressure Zone that maintained water main looping within each phase and maximized the number of customers served.

Table 3-3 presents the total ADD and MDD for each zone.

Table 3-3 – Estimated Average Day Demand by Pressure Zone

Pressure Zone	Estimated ADD (gpm)	Estimated ADD (mgd)	Estimated MDD (mgd)
Low Zone	32.29	0.046	0.093
Intermediate Zone	106.45	0.153	0.307
High Zone (Phase 1)	217.53	0.313	0.626
High Zone (Phase 2)	188.26	0.271	0.542
Total Estimated Demand (Int. and High (Phase 1) Zones)	323.98	0.467	0.933

The estimated ADD of the Low Pressure Zone includes all customers along the modeled transmission mains including bordering neighborhoods off those mains; many of these customers would not be able to receive water from the Town without using pressure reducing devices at their services where pressures would exceed 100 psi.

Section 3.2.3 Proposed System Boundaries

When utilizing the available water supply from the Cobalt Landing Wellfield, EP estimates that the Town can supply water to the general area of Route 16 to Route 66, from the WPCA Facility to the Memorial School.

The proposed water system will be composed of three pressure zones. The Low Pressure Zone will be predominantly used for providing fire flow to residents in the lower elevations near the Connecticut River and for pressure regulation at the water treatment plant. The High Pressure Zone will be constructed up to and including Route 66, with boundaries between Phase 1 and Phase 2 at Old Marlborough Road and Wells Avenue.

Appendix B presents additional considerations taken in delineating the service area boundaries.

Figure 3-3 presents the extent of EP's Proposed Water System Service Area.

SECTION 3.3 SITING CONSIDERATIONS

Several factors were taken into consideration when prioritizing the Town's water system facility sites. The Town preferred to focus the scope of this study solely on Town-owned parcels within the borders of East Hampton to avoid the purchase of land or easement. Additionally, EP focused on other factors such as zone topology, zone border locations, and environmental resources present when deciding on the water system facility sites. **Figure 3-4** presents the locations of the unencumbered Town-owned parcels assessed.

Section 3.3.1 Water Supply Sources

Cobalt Landing Wellfield

The Cobalt Landing Wellfield is located at the end of Oakum Dock Road in Portland, CT. The site is located west of the Village Center area of the Town, near the Connecticut River. The site is a 4.96 acre parcel of land, bordering the Connecticut River, which is currently being used as a marina facility. There are several buildings on the site and the site is adjacent to Saint Clements Castle, a historic estate and banquet hall.

The Cobalt Landing Wellfield consists of two public water supply wells, designated as Well 1 and Well 2. The Town installed the Cobalt Landing wells in 2004 and permitted them as a groundwater supply in 2006. The Town owns an easement housing the two groundwater wells.

The Water Diversion Program regulates activities that cause, allow, or result in the withdrawal from, or the alteration, modification, or diminution of, the instantaneous flow of the waters of the state through individual and general permits. CTDEEP requires that all groundwater withdrawals more than 50,000 gallons per day are permitted through the Water Diversion Program. The wellfield has a Diversion Permit which allows the Town to pump up to 0.90 MGD total from the wellfield, or 625 gallons per minute (gpm), which is valid through September 21, 2031. The initial safe yield of the combined wellfield was determined to be 743,000 gallons per day following pumping tests performed in the early 2000s.

In November 2022, EP conducted a well pumping and flushing field program at the Cobalt Landing Wellfield to confirm the well characteristics that informed the 2006 PER. EP coordinated with LaFramboise Well Drilling (LaFromboise) of Thompson, CT to conduct well testing at the Cobalt Landing Wellfield. LaFramboise provided pumps, meters, and all required equipment and appurtenances to pump and purge both wells prior to collecting water quality samples. LaFramboise performed a six-hour pump test at each of the Cobalt Wells to assess water quality, static water levels, well drawdown, pumping rate, and specific capacity. Specific capacity is defined as the quantity of yield per unit of drawdown in a well and is an indicator of well performance.

From this data, EP determined the potential well yield of the Cobalt Wells 1 and 2 to be 184.32 and 241.74 gpm, respectively. These results are based on six hours of pumping the Cobalt Wells individually, not simultaneously; therefore, when pumping together, well pumping drawdown interference will likely result in a lower total wellfield yield than the individual wells combined. EP recommends a longer term pumping test, such as an 18-hour pump test, to determine the total wellfield yield with both wells in use. EP also found that water quality at the site is excellent, with all analytes detected below the CTDPH Action Levels for Drinking Water. Groundwater pH was found to be low, which would likely require adjustment during treatment. EP recommends that the Town assesses the needed treatment processes to bring the raw water from the Cobalt Landing Wellfield into compliance with CTDPH requirements at a later design phase, in which the Town will perform pilot testing for the raw water at these wells.

Table 3-4 presents the results of the testing at the Cobalt Landing Wellfield performed in November 2022.

Table 3-4 – Cobalt Landing Wellfield Data (November 2022 Testing)

	Well 1	Well 2
Water Quality		
Temperature (degrees C)	12.5	13.3
Specific Conductivity (ug/cm2)	310.0	516.0
Dissolved Oxygen (mg/L)	6.25	7.78
pH	6.08	6.16
Turbidity (NTU)	0.75	0.28
Pumping Data		
Static Water Level (ft)	12.60	13.80
End of Test Water Level (ft)	28.00	23.40
Drawdown (ft)	15.40	9.60
Pumping Rate (gpm)	100	100
Specific Capacity (gpm/foot)	6.49	10.42
2004 Specific Capacity (gpm/foot)	5.64	6.49

Connecticut State Regulation 19-13-B51d requires that wells with a withdrawal rate of more than fifty gallons per minute must be located at least 200 feet from a system for disposal of sewage or other pollution and must be located at least 50 feet from the high water mark of any surface water body. The Town owns an easement around the Cobalt Landing Wellfield which allows them to control the sanitary radius of the wells.

2022 Desktop Groundwater Exploration Program

To promote redundancy and meet state and local regulations, water supply standards recommend using two independent water supply sources. EP conducted an extensive potential water source study in 2022 to find potential alternatives to the Cobalt Landing Wellfield. During this process, EP screened sites concerning aquifer potential, environmental receptors, potential sources of contamination, and other criteria. EP focused on potential parcels that were both large enough to support the development of a public water supply (i.e. could support the State-required sanitary radius of 200-feet for wells with a pumping rate greater than 50 gpm) and were located on Town-owned land.

We performed the screening process using readily available online databases, including the Connecticut Department of Energy and Environmental Protection's (CTDEEP) Geographic Information System (GIS) Protected Open Space data layers. This study also included a limited evaluation of the potential conservation of deed restrictions that may exist on these Town-owned properties that could exclude the use of land for public water supply development. Our initial screening efforts yielded 72 Town- and State-owned parcels that could support a 200-foot sanitary radius. Ultimately, EP identified one potential groundwater supply source of the 72 potential sites that could be assessed further as an addition to the permitted Cobalt Landing Wellfield: the Pine Brook Site. **Appendix C** presents the detailed screening criteria and results of the desktop study.

Pine Brook Area Groundwater Exploration Field Program

Following EP's recommendation, EP conducted a Groundwater Exploration Program during the summer of 2022. EP contracted Geologic Earth Explorations, Inc. (Geologic) to perform borings and attempt to install two 2-inch test wells and one 2-inch observation well at several potential well locations at the Pine Brook Site. Ultimately, Geologic concluded that the overburden lithology and thickness of saturated overburden at the Pine Brook site were not suitable for the development of a public water supply source.

Cobalt Landing Field Program

As discussed above, EP also conducted additional pumping and water quality testing at the Cobalt Landing Wellfield and found that the calculated individual well-specific capacities and potential well yield were consistent with measurements from 2004, and groundwater quality results were within the CTDPH Action Levels for Drinking Water. The results of the Groundwater Exploration Program, including pumping and water quality results at the Cobalt Landing Wellfield, are presented in **Appendix D**

Based on the groundwater exploration and analysis to date, EP recommends that the Town utilize the Cobalt Landing Wellfield as its primary water supply source. At this time, there are no other promising water supply sources within Town borders. Based on preliminary demand analyses, EP believes that the Cobalt Landing Wellfield can supply water to the proposed Intermediate and High (Phase 1) Zones. However, if the Town desires to expand its system beyond the 0.90 MGD threshold, additional investigation will be required. **Figure 3-5** presents an aerial map of the Cobalt Landing Wellfield Site.

EP considered utilizing the Town's existing WPCA water supply wells to supplement the flow from the Cobalt Landing Wellfield. The WPCA currently operates six water supply wells, which serve the Royal Oaks and Village Center water systems. The combined pumping capacity of these wells is 59.5 gpm, equivalent to 0.085 MGD. Due to the sources limited capacity and existing water quality issues, the Town has decided not included these existing well sources in the water system design or service capacity.

The Cobalt Landing Wellfield is located within the 100-foot wetland buffer zone and within the 200-foot riverine buffer zone. EP and the Town will coordinate with the local Inland Wetlands Watercourse Agency on all permitting requirements involved for constructing their water supply source in this location. **Figure 3-6** presents the mapped wetlands and environmental features around the Cobalt Landing Wellfield.

EP recommends constructing the well station housing the well pumps and necessary associated appurtenances within the Town-owned easement. According to the FEMA National Flood Hazard Layer (NFHL), the site is in the 100-year floodplain. If the Town decides to construct wells at this site, the CTDEEP and CTDPH will require site grading to bring the elevation of the wells above the base flood elevation and implementing flood proofing measures to protect the well building and equipment from flooding. The Town may also elect to install submersible pumps at the two Cobalt wells and explore siting the well building nearby and outside of the flood zone. If the well building is sited at a higher elevation, the Town would also construct piping from the Cobalt Landing Wellfield to the well building site. **Figure 3-7** delineates the mapped special flood hazard areas and flood zones at the Cobalt Landing Wellfield site.

The Cobalt Landing Wellfield is located near a reception hall and marina at the end of Oakum Dock Road. While the ability to establish a drinking water source is the main goal of the Town, the Town will coordinate siting enhancements with the property owner when constructing the wellfield improvements, so the property remains aesthetically pleasing for events at the marina.

Photo 3-5 – Cobalt Landing Wellfield Capped Wells

Photo 6 – Cobalt Landing Wellfield Existing Site Conditions

Future Water Supply Interconnections

EP recommends that the Town assess potential interconnections with neighboring municipalities or community water systems within East Hampton. While the Cobalt Landing Wellfield can serve a portion of the Town immediately, a redundant water supply is crucial in increasing the robustness of the water system. Additionally, the development of new water supply sources is cumbersome and time-consuming when considering the permitting and construction of groundwater and surface water sources.

The Town of East Hampton is bordered by the Towns of Portland, Glastonbury, Marlborough, Colchester, East Haddam, Haddam, and the City of Middletown. EP recommends that the Town begin discussing the possibility of a potential interconnection with a neighboring municipality to improve the redundancy of the East Hampton municipal water system and expand the water service area. However, with this approach, the Town cannot consider water supply through interconnections as a reliable water source should the donor system experience either a water supply emergency or a contamination event. The CTDPH would also require an inter-municipal water supply agreement between both systems where the system supplying the drinking water must ensure supply of their customers before serving East Hampton.

Purchase Community Water Systems in East Hampton

Alternatively, the Town could explore purchasing smaller community water systems within the Town's borders to integrate their supply capabilities into the Town's system. In addition to the two water systems owned by the WPCA, there are eleven permitted community water systems within the Town, according to the CTDPH Community Water System list. **Figure 3-8** locates each community water system within the Town of East Hampton.

Connecticut River Radial Collector Wells

Following EP's efforts to locate an additional groundwater supply source to supplement the Cobalt Landing Wellfield, EP contacted CTDPH to gauge the possibility of constructing radial collector wells to use the Connecticut River as a surface water supply source. Unfortunately, due to the Connecticut River's classification as a Class B surface water body, the CTDPH stated that they would not allow the Town to permit the radial collector wells as a source for potable water supply.

Section 3.3.2 Water Treatment Plant

To meet current drinking water standards and requirements, the CTDPH will require that the Town construct a water treatment plant to treat raw water from the Cobalt Landing Wellfield. EP recommends construction one treatment plant to treat all water entering the Town's proposed system before supply the water customers.

EP has located raw water piping in the Low Pressure Zone to convey raw water from the Cobalt Landing Wellfield to the proposed site of the water treatment plant. The Low Pressure Zone will have a storage tank to maintain system pressures while also providing storage volume for fire protection and emergency storage.

The Cobalt Landing Wellfield will pump to the water treatment plant via transmission main. To minimize the amount of raw water transmission main, EP located the water treatment plant in the Low Pressure Zone at the lowest elevations in Town and near the Cobalt Landing Wellfield. Additionally, the water treatment plant must be located in this Low Pressure Zone, if the Town extend service to any customers in this zone in the future. The Low Pressure Zone is the optimal location for the plant so the Town can provide adequate service pressures throughout the three proposed service zones.

EP proposes siting a water treatment plant facility at the Town-owned property at 8 Middle Haddam Road, near Route 66, in the proposed Low Pressure Zone. This proposed treatment plant site is a large, wooded, and mostly flat parcel situated east of the Cobalt Landing Wellfield. This parcel is optimal for the treatment facility due to its size, absence of sensitive environmental receptors, and proximity to the wellfield. EP ranked this site highest because it met the following criteria:

- Parcel size,
- Location in the Low Pressure Zone, and
- Town ownership.

Photo 7 – Proposed Cobalt Water Treatment Plant Site

Figure 3-9 illustrates an aerial map for the Proposed Cobalt Water Treatment Plant Site.

EP recommends constructing a 12-inch raw water, transmission main from the Cobalt Landing Wellfield to the proposed Cobalt Water Treatment Plant. This transmission main would be utilized to pump raw water from the wells to its final treatment for consumption. EP will determine the appropriate finished water treatment during the final design phase.

After undergoing treatment, finished water would be pumped from the treatment plant and distributed throughout the rest of the water system. EP recommends sizing the water treatment plant facility for additional future treatment equipment and potential increased capacity, should additional water supply sources become available in the future. Also, the Town should size the facility for upgrade needed to treat potential emerging contaminants as identified by state and federal regulatory agencies.

EP reviewed CTDEEP GIS Open Data layers and confirmed mapped wetland areas on the proposed water treatment plant parcel. The proposed Cobalt Water Treatment Plant building and associated site features will be sited outside of the wetland buffer zone, in the large undeveloped area in the northwest corner of the site. EP recommends conducting additional investigations and wetland flagging to properly define the wetland areas on the site. We confirmed that the proposed water treatment plant site does not fall in an NFHL flood hazard area. **Figure 3-10** displays the mapped wetlands and environmental features on the proposed Cobalt Water Treatment Plant site. **Figure 3-11** presents the special flood hazard areas in the vicinity of the proposed treatment plant.

Section 3.3.3 Water Storage Tanks

Under the proposed water system layout, EP has sited storage tanks in each of the proposed service areas required to provide both fire protection and emergency storage while also equalizing pressures during all water supply conditions. EP evaluated the proposed tank sites using considerations including land ownership, available space, location respective to zone boundaries, and water system hydraulic conditions.

Low Pressure Zone Water Storage Tank

EP recommends siting the Low Pressure Zone Water Storage Tank at the Town-owned parcel at 1 Public Works Drive or the Town-owned parcel at the corner of Gildersleeve Drive and Route 66. Both potential tank sites are located near the WPCA Pollution Control Facility at 20 Gildersleeve Drive. **Figure 3-12** presents a site map of the potential tank locations.

Photo 8 – Proposed Low Pressure Zone Tank Site Existing Conditions (Alternative #1, 1 Public Works Drive)

Photo 9 – Proposed Low Pressure Zone Tank Site (Alternative #1, 1 Public Works Drive)

Photo 10 – Proposed Low Pressure Zone Tank Site (Alternative #2, 5 Gildersleeve Drive)

As discussed previously, the Low Pressure Zone service connections will require the installation of pressure reducing valves (PRVs) to limit water pressures and mitigate potential breaks in customers' internal plumping systems. Additionally, due to water supply constraints, EP does not recommend serving the Low Pressure Zone during initial system buildout, as discussed previously. By siting a tank in the Low Pressure Zone, the Town will maintain steady pressures at the Cobalt Water Treatment Plant, which minimizes potential hydraulic surges at the plant.

Since the Town has limited supply at the Cobalt Landing Wellfield, EP recommends careful consideration and prioritization of serving customers in this Low Pressure Zone. The Town can consider adding water services in this area after supplying customers in the intermediate and high zones and confirming that supply water supply is available. If drinking water is not provided, EP does advise providing fire protection to the properties in this Low Service Zone.

Regardless of service to customers, at a minimum, the proposed system must maintain pressures above 20 psi during a fire flow event as recommended by the CTDPH and the Insurance Services Office (ISO). To properly moderate pressures and potentially provide domestic water supply to customers in the future, the Town should design a tank with an overflow elevation of 398-feet. At this overflow elevation, EP recommends constructing a standpipe storage tank at 1 Public Works Drive. If the Town were to elect to construct an elevated storage tank, the Town may use the 20 Gildersleeve Drive site. However, as discussed in Section 5, the cost difference associated with adding a pedestal to the tank to bring the stored water to a proper elevation may be prohibitive. We will consider all current and future water supply and fire protection options during the final design phase of this storage tank.

EP reviewed CTDEEP GIS Open Data Layers for mapped environmental receptors and flood zones in the vicinity of the tank alternative sites. There are mapped wetlands, classified as Freshwater Forested/Shrub Wetland, in the area of tank site Alternative #2, at the corner of Gildersleeve Drive and Route 66. There are no mapped wetlands around tank site Alternative #1. EP will assist the Town with the delineation of wetland resource areas during the next phase of design. The CTDEEP GIS data does not show mapped Special Flood Hazard Areas in the vicinity of either tank site.

Figure 3-13 displays the mapped wetland areas, and **Figure 3-14** presents the mapped flood hazard layers in the area.

Intermediate Pressure Zone Water Storage Tank

EP evaluated several locations for potential storage tanks in the Intermediate Pressure Zone. Ultimately, EP recommends siting the Intermediate Pressure Zone Water Storage Tank at the back of the Town-owned parcel on 4 Middletown Avenue, near the Ambulance Association building. **Figure 3-15** shows a site map of the proposed tank site at the Ambulance Association parcel.

Photo 11 – Potential Intermediate Pressure Zone Water Storage Tank Site

EP recommends siting the tank in the higher elevations of the undeveloped land behind the building. Following preliminary modeling efforts, EP recommends designing an elevated storage tank with an overflow elevation of 587 feet. At this overflow elevation, this tank will maintain system pressures between 35 psi and 100 psi in the Intermediate Pressure Zone and provide ample fire protection throughout the Intermediate Zone. This tank design will be refined in later phases of the design process while providing equalizing pressures and providing both fire protection and emergency storage.

While reviewing this site, E confirmed that the proposed Intermediate Pressure Zone Water Storage Tank is not located near CTDEEP mapped wetlands and is also not located in any mapped NFHL flood hazard areas. **Figure 3-16** shows the wetland areas in the vicinity of the site. **Figure 3-17** displays the mapped special flood hazard layers around the proposed tank site.

There are some areas with overhead power lines in and around the parcel. EP will evaluate the final location of the water storage tank in later design phases and will coordinate the tank location with the power company.

High Pressure Zone (Phase 1) Water Storage Tank

During Phase 1 of the water system construction, EP recommends siting the High Pressure Zone water storage tank at the eastern, wooded area of the Memorial Elementary School parcel (20 Smith Street). This Town-owned parcel extends to Smith Street and has ample space for siting a standpipe. This location boasts one of the highest elevations to site a tank in Town thereby maximizing the potential number of customers and the extent of the High Pressure Zone.

Photo 12 – Proposed Memorial School Tank Site

The eastern portion of the Memorial Elementary School site is primarily forested land. EP recommends siting a tank with an overflow elevation of 698 feet at this location to provide adequate pressure throughout the proposed High Pressure Zone.

Figure 3-18 provides a site map of the proposed High Pressure Zone tank site.

Following a review of CTDEEP GIS Open Data Layers and NFHL data, EP determined that the proposed High Pressure Zone Water Storage Tank site is favorable because there are no mapped wetlands resource areas or Special Flood Hazard Areas near the site. **Figure 3-19** displays the mapped wetland areas, and **Figure 3-20** presents the mapped flood hazard layers near the proposed tank site.

Section 3.3.4 Booster Pumping Stations

Similar to the proposed tank sites, EP investigated site conditions for the proposed booster pumping station sites. Due to the increasing topography across the proposed water service area, we sited booster pumping stations needed within each zone to boost the hydraulic grade line from the Cobalt Water Treatment Plant through the Intermediate Pressure Zone to the High Pressure Zone.

Depending on final system mapping and surficial geology at the proposed sites, EP will confirm whether the booster pumping station can be constructed above- or below-grade at the selected sites.

Intermediate Pressure Zone (Gildersleeve) Booster Pumping Station

EP confirmed that the large parcel at the proposed Low Pressure Zone tank site is ideal for also siting the Intermediate Pressure Zone Booster Pumping Station due to site elevations, available space, and land ownership. Therefore, EP proposes siting the Intermediate Pressure Zone Booster Pumping Station at the corner of Gildersleeve Drive and Route 66. **Figure 3-21** shows a site map of the proposed pump station site, the Gildersleeve Booster Pumping Station.

Photo 13 – Proposed Intermediate Pressure Zone Booster Pumping Station Site

Similarly to the findings at the Low Pressure Zone Tank Alternative #2, there are some mapped wetland areas classified as Freshwater Forested/Shrub Wetland in the vicinity of this proposed site. During the next phase, EP will perform wetland flagging, survey, and mapping of the proposed booster pumping station and locate the station outside of the wetland areas to minimize disturbance to these environmental resources. **Figure 3-22** presents environmental resource areas on the proposed Intermediate Pressure Zone Booster Pumping Station site. **Figure 3-23** present an overview of the environmental receptors and special flood hazard areas in the vicinity of the proposed booster pumping station.

High Pressure Zone Booster Pumping Station

EP evaluated several alternatives for the High Pressure Zone Booster Pumping Station site. Due to the layout of the Intermediate Pressure Zone and proposed High Pressure Zone Tank site location, siting a booster pumping station on the eastern zone border is preferable hydraulically. Pumping in the direction of the High Pressure Zone Tank minimizes the distance between the hydraulic grade boost and the tank.

The first alternative considered was siting a booster pumping station at the Fire Department at 3 Barton Hill Road. EP alternatively considered siting a booster pumping station at the Center School. Finally, EP considered siting a booster pumping station at the Town-owned property on Watrous Avenue.

All three potential sites are owned by the Town of East Hampton. EP evaluated the three alternative sites due to their proximity to the proposed High Zone (Phase 1) Tank at the Memorial School. By siting the High Zone Booster Pumping Station in the Village Center area, the Town can minimize the length of transmission main required from the Intermediate to High Zone, beneficial for both minimizing construction costs and head loss. The Watrous Booster Pumping Station would likely require the least length of transmission main into Phase 1 of the High Zone, followed by the Fire Department Booster Pumping Station and the Center School Booster Pumping Station. Due to fire flow concerns, all booster pumping stations would also likely require discharge piping running from the booster pumping station to the intersection of Summit Street and Bevin Court, and to Barton Hill Road at Airline Avenue. This additional transmission piping will aid in diverting water to all areas of Phase 1 of the High Pressure Zone and shorten the path of water to the west side of the pressure zone.

All three potential booster pumping station sites have ample room to site an aboveground booster pumping station, but if preferred, could house a subgrade pumping station. The Watrous Pump Station boasts the most undeveloped space available for siting a facility, followed by the Center School. However, the Center School has space that is currently being utilized for treatment for the WPCA Village Center water system.

EP recommends siting the High Zone Booster Pumping Station at the Center School because this location is Town-owned, centrally located, and would not require significant building construction. EP recommends that the Town abandon the existing equipment at the treatment area in the Center School and install the required booster pumps in this area to realize significant cost savings.

There are no mapped wetland areas or NDDB areas on the Center School parcel following a review of information available from CTDEEP GIS Open Data Layers. Additionally, according to data obtained from the NFHL flood zone database, the Center Street Booster Pumping Station does not fall in the 100-year floodplain. The Center Street Booster Pumping Station may also be sited within the footprint of the WPCA's existing treatment facility at this site, mitigating potential adverse environmental impacts that could be associated with developing on undisturbed land.

Figure 3-24 – Center Street High Pressure Zone Booster Pumping Station Site shows an aerial map of the proposed pump station site.

Section 3.3.5 Water Mains

EP has located most of the transmission and distribution system water mains within the limits of existing roadways. During the next phase of the project, EP will work with the Town while locating its existing sewer system piping during the survey and mapping tasks.

During a site visit, EP walked portions of the Airline State Park Trail and confirmed that the trail is a priority alternative for water main installation. The Airline Trail stretches from Thompson, CT to East Hampton. The trail is primarily gravel and is used by Town residents for walking and passive recreation. The trail is ideal for a water main alignment, as it could transport water almost directly from the western end of Town to the Village Center Area.

Photo 14 – Airline Trail

SECTION 3.4 PERMITTING

During the next phase of design, EP and the Town will work closely with local and state agencies to ensure regulatory requirements are met throughout the final design, bid, and construction phases.

Currently, the Cobalt Landing Wellfield has an active Diversion Permit through 2031. EP recommends that the Town begin addressing their needs for the Diversion Permit renewal process prior to its expiration in 2031 and potential increasing the permitted wellfield capacity, if possible. Each well will also require environmental permitting through the local Inland Wetlands and Watercourse Agency due to their location in the riverine buffer area and regulated wetland resource areas. EP will assist the Town while communicating with CTDPH, CTDEEP, and the Army Corps of Engineers (ACOE) as soon as possible to assess the permitting requirements needed for bringing the Cobalt Landing Wellfield online.

In addition to the permitting requirements associated with the Cobalt Landing Wellfield, the Town will also need to work with local authorities on obtaining the required building permits during construction of its water system facility buildings.

SECTION 4

SECTION 4 HYDRAULICS EVALUATION

SECTION 4.1 DESIGN CRITERIA

As discussed in Section 3, the system boundaries and constraints of the water system service areas are influenced by topography, projected demands, and available water supply. After developing the Town's hydraulic model, EP confirmed the anticipated hydraulic conditions throughout the proposed water system. Using the hydraulic model, we simulated future supply conditions in the proposed system, which are influenced by system topography, population density, and project water demands. All these factors are major influences and the top drivers for the design of the proposed water system.

Figure 3-2 illustrates the topographic conditions of the Town of East Hampton and EP has included this topographic data in the water system hydraulic model.

Section 3 presented the proposed water system zoning, which considered CTDPH Guidelines for maintaining acceptable water system service pressure (i.e., above 35 psi during domestic water supply conditions and above 20 psi for fire protection) throughout the proposed distribution system. Additionally, EP evaluated facility siting and distribution main sizing alternatives needed to maintain pressures below 100 psi, protecting customers' internal plumbing systems and reducing the likelihood of future leaks and breaks in the distribution system.

As discussed in Section 3, EP established the water storage tank overflow elevations to maintain proper hydraulic conditions in each pressure zone.

Table 4-1 presents and summarizes system pressure zone hydraulics in each of the proposed pressure zones. **Figure 4-1** displays a hydraulic schematic of the proposed water system.

Table 4-1 – Proposed Water System Pressure Zone Hydraulics Summary

Pressure Zone	Hydraulic Gradeline (Tank Overflow Elevation) (feet)	Lowest Customer Ground Elevation (MSL)	Highest Customer Ground Elevation (MSL)
Low	398	200.0	295.9
Intermediate	587	309.5	451.0
High (Phase 1)	698	415.2	599.0
High (Phase 2)		466.0	585.7

If the Town decides to supply drinking water to residents in the Low Pressure Zone below 200 feet MSL, we recommend installing pressure-reducing devices at their property lines to maintain service pressures below 100 psi. Section 4.2.4 includes recommendations for serving low elevation customers if the Town elects to do so in the future.

SECTION 4.2 WATER SYSTEM DESIGN

Section 4.2.1 Cobalt Landing Wellfield and Water Treatment Plant

The Cobalt Landing Wellfield and Water Treatment Plant are the starting point of all hydraulic considerations for the rest of the water system. EP will design the Cobalt Landing Wellfield to pump raw water to the proposed water treatment plant at 8 Middle Haddam Road, near Route 66. Following treatment at the Cobalt Water Treatment Plant, finished water pumps will convey the treated water to the water distribution system to the treatment plant finished water pumps with convey treated water to the intermediate zone at the desired hydraulic grade. The high service zone booster pump station will then convey water to the Phase 1 area of the high services area.

During the final design phase, EP will design the booster pump stations in each service zone to satisfy all water demands downstream while also meeting water pressures and storage volume requirements. Using the base elevation of the water treatment plant, EP will hydraulically design all booster pumps to adequately supply the maximum and minimum elevations with acceptable pressures in both the intermediate and high pressure zone.

Section 4.2.2 Water Storage Tanks

Distribution storage provides water for peak demands of short duration, minimizes pressure fluctuations during periods of demand changes in the distribution system, while also providing reserve storage volumes for fire protection. Storage tanks also provide emergency short term supply for shortages caused by temporarily unavailable source water supply.

The Town's ability to maintain tank water level and storage volume is essential to providing adequate water system pressures throughout the proposed water system. During all operating conditions, the Town must maintain water levels in the storage facilities above the minimum elevations to ensure adequate pressures throughout the system. EP has calculated the minimum water level elevation for each tank by determining the water level needed to provide the highest customer in each zone with at least 20 psi of pressure during a fire event. We have also tentatively sized each tank to provide each customer with at least 35 psi of pressure during typical domestic water supply conditions. EP confirmed overflow elevations to the topography in each pressure zone to provide adequate pressures and hydraulic gradelines of each pressure zone. **Table 4-2** presents the minimum tank elevations used for preliminary sizing of the storage tanks in each service zone.

Table 4-2 – Water Storage Tank Minimum Elevations

Pressure Zone	Estimated ADD (mgd)	Highest Customer Ground Elevation (MSL)	Min. Water Elevation for 20 psi	Min. Water Elevation for 35 psi
Low Zone	0.046	295.9	342.1	376.75
Intermediate Zone	0.153	451.0	497.2	531.85
High Zone (Phase 1)	0.313	599.0	645.2	679.85
High Zone (Phase 2)	0.271	585.7	631.9	666.55

EP proposes siting one tank in the Low, Intermediate, High (Phase 1), and High (Phase 2) Pressure Zones to each pressure zone. During the final design phase, we will size the tanks to maintain adequate service pressures in each zone during normal and emergency events while providing equalization and fire protection storage as described below.

EP proposed tank operating ranges and overflow elevations for each tank which, at a minimum, could provide at least 35 psi to customers during typical operations. The usable storage of each tank is based on the overflow elevation of the tank and the highest customer served in its respective zone.

Additionally, each proposed tank is sized to carry at least 630,000 gallons of fire storage, equivalent to the volume of water needed to provide a fire flow of 3,500 gpm for a 3-hour duration. Because East Hampton has not been evaluated by the Insurance Services Office (ISO) for parcel-specific needed fire flowrates, EP assumed the maximum residential ISO fire flow requirement of 3,500 gpm for 3 hours. According to ISO standards, the water system must provide maximum residential fire flow of 3,500 gpm for 3 hours. When determining system adequacy, ISO requires the water system to provide fire flow up to 3,500 gpm, while any property owners with higher fire flow requirements are responsible for the remainder of the flow. Due to the low demands of the system in comparison to the volume needed for fire events, the majority of each zone's necessary storage capacity is largely dominated by fire flow volume. EP assumed ADD demands occurring during the firefighting period.

EP proposed tank characteristics based on residential service pressures and necessary fire flow storage. EP worked with a tank supplier, CST Industries, to evaluate the needs of the Town and assess the most feasible and effective tank design for each zone's storage tank. These options are assessed in Section 5.

Water storage tanks have design flexibility. Tanks may be elevated on a pedestal, constructed as a cylindrical standpipe, or an underground reservoir. EP will review and further document tank types during the final design phase and review capital costs and benefits to each storage tank alternative to properly inform the Town of tank options.

Since industry standards recommend system wide storage below five days of system demand to minimize water age, EP will perform further hydraulic assessments of system storage to maintain adequate storage while minimizing water age throughout the distribution system. During this preliminary storage evaluation, EP has determined that East Hampton should maintain a maximum system-wide storage of 2.25 million gallons (MG).

EP took the most conservative approach to the preliminary design of the Memorial Storage Tank. This tank serves the largest pressure zone in the system and will supplement water supply to customers around the Lake Pocotopaug area during Phase 2 of the High Pressure Zone expansion, as well as the Intermediate Zone during fire flow events. For these reasons, EP sized this tank as the largest in the water system during this preliminary design phase.

Table 4-3 displays the minimum nominal tank volumes and base elevations of each tank needed to provide fire protection, emergency supply and equalization storage to each zone.

Table 4-3 – Preliminary Water Storage Tank Volumes

Pressure Zone		Base (Ground) Elevation (feet)	Minimum Nominal Volume (MG)	Proposed Tank Volume (MG)
Low Pressure Zone	Alt. #1 (1 Public Works Drive)	370	0.676*	0.632
	Alt. #2 (5 Gildersleeve Drive)	295	0.676*	0.632
Intermediate Pressure Zone		531	0.648	0.658
High Pressure Zone (Phase 1)		651	0.943	0.948

* Assumes water service will be provided to the Low Pressure Zone. Without service, the nominal tank volume is 0.63 MG.

Using the proposed storage tanks presented in **Table 4-3**, the Town's system would be able to maintain 2.24 MG of storage.

Section 4.2.3 Water Distribution Mains

The Town's proposed water distribution piping network will transport finished water from the water treatment facility to its customers. EP proposes that the Town construct 33.4 miles of water main throughout construction of the Low, Intermediate, and High (Phase 1) Pressure Zones, ranging in diameter from 6 inches to 16 inches. **Table 4-4** summarizes the proposed water system distribution piping characteristics for each zone including diameter and length.

Table 4-4 – Distribution System Piping by Diameter

Zone	Length (ft) 6"	8"	12"	16"	Total Length (ft)
Low	0	14,956	7,107	0	22,063
Intermediate	0	22,838	37,323	0	60,161
High (Phase 1)	6,759	40,355	41,572	5,513	94,199

EP recommends that the Town utilizes Class 152 ductile iron water main throughout its water system.

Figure 4-2 presents a map of the water distribution system layout.

Section 4.2.4 Booster Pumping Stations

EP configured the three pressure zone water system to supply drinking water to as many customers as possible while maintaining adequate service pressures. We also considered the capital costs and operational challenges associated with constructing and operating storage facilities, booster pumps, and other water system facilities. EP sited the booster pumping stations and determined the hydraulic gradeline of each pressure zone with the goal of providing adequate pressures and water supply volume to customers at the highest and lowest elevation in each zone.

EP sited one booster pumping station at the border of each pressure zone to elevate the pressures and hydraulic grade in the subsequent pressure zone.

Additionally, EP cautions that some residential customers at higher elevations will require the installation of individual booster pumps to maintain a minimum pressure of 35 psi during normal system conditions.

Section 4.2.5 Pressure Reducing Devices

Water suppliers use pressure reducing devices primarily for reducing the hydraulic gradient and water system pressures.

Due to the range in elevations across East Hampton, EP recommends that some customers install pressure reducing devices to maintain service pressure under 100 psi. Pressure reducing valve stations reduce water pressures from higher to lower pressure zones.

Currently, under the proposed system configuration, EP does not recommend extending water service to customers in the Low Pressure Zone due to limited water supply and the cost to serve these customers. The Low Pressure Zone encompasses an area near the Connecticut River where elevations are below 200 feet MSL. Future customers in this pressure zone will require pressure reducing devices to maintain pressures below 100 psi. **Figure 4-3** maps the locations in the Low

Pressure Zone which would require pressure reducing devices for water service under the proposed system configuration.

As discussed, EP has sized the Memorial School Tank as the largest tank in the water system during this preliminary design phase. As stated previously, water storage tank design is heavily dependent on and dictated by fire flow volumes. EP recommends that the Town constructs a pressure reducing valve (PRV) from the High Pressure Zone to the Intermediate Pressure Zone, which can be used to supplement the Intermediate Zone storage volumes in the event of a fire or an emergency. We are recommending this PRV enhance fluctuations in water storage volumes thereby reducing age down in the High and Intermediate Zone storage tanks. This recommendation will also provide redundant fire protection to the Intermediate Zone, while also increasing the robustness of the water system.

EP will confirm and finalize the locations of pressure reducing devices during later design phases when we will analyze potential locations where service pressures are above 100 psi for extended periods.

SECTION 4.3 ANTICIPATED SERVICE PRESSURES

Using the Town's hydraulic model, EP simulated service pressures under several water system operational and demand scenarios. We assessed system conditions when the Town's storage tanks are nearly full, and all booster pumps are operating to represent system pressures at a maximum hydraulic gradeline in each service zone. Alternatively, EP simulated the minimum hydraulic gradeline with minimum pressures in each zone while the Town's storage tanks are nearly empty, and all booster pumps are off. The latter scenario is important for evaluating system pressures during potential water system emergencies.

Figure 4-4 presents the anticipated service pressures at each model node during average day demands with the maximum hydraulic gradeline in each zone. **Figure 4-5** illustrates the anticipated service pressures at each model node during average day demands with the minimum hydraulic gradeline in each zone.

SECTION 4.4 AVAILABLE FIRE FLOW

Currently, the Town provides minimal fire flow from the current water supply systems. The Town relies on water tankers to provide fire flow during fire events.

EP utilized the hydraulic model to analyze the available fire flow in each pressure zone. When the new water system is implemented, the Town will be responsible for providing adequate available fire flow throughout the water distribution system. Available fire flow is contingent on several factors, including water main sizes and node hydraulic gradelines.

The ISO sets fire protection criteria and establishes site-specific fire flow requirements, usually for buildings with special use classifications. However, ISO has not evaluated East Hampton for site-specific fire flow requirements, which led EP to utilize general ISO standards for town-wide fire flow analyses. ISO sets fire flow requirements for standard residential dwellings by approximate house spacing. House spacing in East Hampton varies, with single-family dwellings spaced greater than 30 feet in less populated areas but as close as 10 feet in more densely populated locations, such as the Village Center and Royal Oaks areas. **Table 4-5** summarizes needed fire flow requirements for various building densities.

Table 4-5 – ISO Needed Fire Flow for 1- and 2-Family Dwellings

Distance Between Buildings	Needed Fire Flow
More than 30 feet	500 GPM
21 to 30 feet	750 GPM
11 to 20 feet	1,000 GPM
0 to 10 feet	1,500 GPM

Additionally, ISO may require higher fire flowrates for larger commercial and industrial buildings depending on the size of the building and building use.

To conservatively simulate available fire flows in the hydraulic model, EP assumed MDD conditions and half-full storage tank levels. We analyzed each zone under a worst-case scenario, in which there is no pumping into each zone, only out of the zone. By conservatively modeling and designing the water system for fire flow events, EP is protecting the Town from under sizing the water mains and tanks in the water system.

For this fire protection assessment, EP also evaluated the current piping configuration and characteristics under full system buildout. The Town will allocate extensive resources toward constructing a municipal water system; therefore, EP recommends that the Town consider the water supply needs of this future zone during the initial system buildout because the Town's end goal is to expand water service around Lake Pocotopaug. By properly sizing water mains, the Town can seamlessly incorporate the High Pressure Zone (Phase 2) customers while alleviating some of the capital burdens of expanding the water system around the lake. EP modeled and designed the proposed water main diameters throughout the system to be able meet fire flow requirements around Lake Pocotopaug once Phase 2 of the High Pressure Zone is brought online.

Based on our analysis and sizing of the proposed water main, EP has provided at least 1,500 GPM of available fire flow to all the proposed distribution system. ISO requires at least 1,500 GPM of available fire flow for areas of the system with less than 10 feet between buildings. Therefore, the Town would satisfy the most stringent ISO requirements for residential properties with the current configuration of the water supply system.

Ultimately, EP has designed the proposed water system to satisfy all residential fire flow requirements. ISO will require further analysis to determine whether the Town can provide fire protection to all the commercial and industrial parcels potentially served by the proposed water system. Therefore, EP recommends that the Town work with the Fire Chief to determine whether the available fire flow rates at each junction in the system are acceptable for the existing commercial and industrial building structures in East Hampton. EP will determine final water main sizing later in the design process.

Figures 4-6 through **4-9** display the available fire flow at each model junction during a fire emergency.

SECTION 4.5 PHASING CONSIDERATIONS

To reiterate previous discussions, EP recommends that the Town pursues building the water system from the Cobalt Landing Wellfield easterly to the High Pressure Zone using a phased approach. Currently, EP estimates that the Town can provide water to meet an ADD of up to 0.45 MGD. As documented in this water supply assessment, the Town is projected to reach its maximum service potential of 0.9 MGD with the Intermediate and Phase 1 of the High Pressure Zones as delineated in this report. However, if average customer consumption proves to be less than the State recommended projection of 75 gallons per day, or if the summer peaking factor proves to be lower than 2.0, to the own could potentially extend the service area to include the Low Pressure Zone, as well as some additional customers around Lake Pocotopaug.

EP and the Town will consider and address final phasing considerations in later design phases when finalizing the system demands and construction costs. EP recommends that the Town begin evaluating potential future funding options for this multi-Contract construction project.

EP recommends that the Town constructs the water distribution system’s skeletal system at first, with mostly main transmission mains, and then constructs capillary mains in side streets and smaller developments. Additionally, EP recommends that the Town construct the skeleton of each pressure zone starting from the Cobalt Landing Wellfield and moving easterly before moving to construct the next pressure zone.

SECTION 5

SECTION 5 RECOMMENDED CAPITAL IMPROVEMENT PLAN

SECTION 5.1 DESCRIPTION OF PROPOSED PROJECTS

Table 5-1 summaries the water system facilities and piping for the proposed East Hampton municipal water system as recommended by EP.

Table 5-1 – Water System Facilities Summary

Pressure Zone	Ductile Iron Water Main (ft)				Total Water Main (ft)	Treatment Facilities	Booster Pumps (to subsequent zone)	Tanks	Water Supply Wells
	6"	8"	12"	16"					
Low	-	14,956	7,816	-	22,772	1	1	1	2
Intermediate	-	24,855	37,803	-	62,658	0	1	1	0
High (Phase 1)	6,759	41,319	41,572	5,513	95,163	0	0	1	0

SECTION 5.2 OPINION OF PROBABLE PROJECT COSTS (OPCC)

EP has included opinions of probable project costs (OPPC) in this section for the recommended water system improvements. We compiled the probable project costs based on data generated from projects of similar scope for public water suppliers of comparable size in the area. All costs associated with the recommended improvements are planning level and preliminary estimates with appropriate contingency. Project costs are likely to vary based on changes to scope, design intent, and regional and local economic conditions during project implementation.

Project costs include the construction and/or implementation of each project and a 20 percent allowance for engineering services. The cost estimate for engineering services includes preliminary design, design, permitting, bidding assistance, construction administration, resident project representation, and record drawings services unless otherwise noted. The engineering services will include survey, geotechnical evaluations and permitting for all proposed system components. The OPPC also includes a 30 percent contingency to account for planning level estimates and unforeseeable factors that may affect cost such as inflation and market conditions.

Section 5.2.1 Cobalt Landing Wellfield Development and New Pumping Improvements

EP formulated recommendations and next steps for developing the Cobalt Landing Wellfield following the field testing conducted in November 2022 as discussed previously.

Cobalt Landing Wellfield Development and Rehabilitation

Following the well testing program, LaFramboise recommended that the wells should be brushed and bleached to remove mineral buildup in the short term, followed by purging each well using an air lifting technique to remove sediment at the bottom. Following this maintenance, the Town can commence a 48-hour pump test.

Additionally, CTDPH will require pumping and monitoring program to demonstrate that the wells are not under the influence of surface water and meet CTDPH Maximum Contaminant Levels (MCLs) and Action Levels. EP recommends that the Town perform a preliminary design evaluation to reassess the optimized operating capacity of the Cobalt Landing Wellfield and confirm whether the wellfield can sustain the 0.90 MGD permitted capacity. Following our review of the recent pump testing data produced by LaFramboise and the Town's needs for a higher capacity source, we recommend that the Town consider permitting the Cobalt Landing Wellfield at a higher capacity if hydraulic conditions prove favorable. With favorable results, both CTDEEP and CTDPH may consider a higher permitted capacity for the Cobalt Landing Wellfield water supply source. The evaluation will also perform an extensive evaluation of water quality analysis and required treatment piloting to confirm water treatment requirements for the Cobalt Water Treatment Plant.

Also, the Town will assess the pumping, architectural, instrumentation, and electrical requirements needed to pump the raw water from the wellfield to the proposed water treatment plant site on Middle Haddam Road.

Raw Water Pumping and Associated Facilities

Following the Cobalt Landing Wellfield preliminary design evaluation, the Town will size, design, and construct the pumping facilities to convey the raw water supply from the wellfield to the proposed water treatment plant. EP understands that the Town's concerns about the aesthetics of a proposed municipal pump station building located near the Saint Clements Marina. Therefore, we recommend that the Town coordinate the design and construction of the required pumping facilities with the Marina and provide an architectural facility layout and associated facilities that will appeal to the existing landscape and surrounding environments. The raw water pumping components will include:

- Raw water pumping,
- Yard piping,
- Raw water pump station (siting to be coordinated with Marina officials),
- Instrumentation and SCADA for remote communication,
- Electrical equipment (including a generator for standby, emergency power), and
- Site security and landscaping.

Estimated costs associated with the Cobalt Landing Wellfield rehabilitation and raw water pump station construction, testing, and startup are presented in the project Opinion of Probable Construction Costs, **Table 5-8**.

Section 5.2.2 Cobalt Water Treatment Plant

As discussed in Section 3 of this report, the Town of East Hampton's municipal water system will require a centralized water treatment plant for the Cobalt Landing Wellfield. The treatment plant will be engineered to treat raw water from the Cobalt Landing Wellfield which meets or exceeds CTDPH requirements using treatment processes dictated following a treatment pilot study described above. Following the treatment assessment, EP would perform the preliminary design, final design, and construction of the treatment facility.

Based on initial investigations, it appears that the Cobalt Water Treatment Plant will likely be primarily used to treat iron and manganese and adjust pH. The pilot study will confirm whether the proposed treatment processes necessitate sequestration of iron and manganese treatment or green sand filtration for removal at this facility. The work required to add sequestration to the treatment process may include, but is not limited to, equipment addition, chemical injection equipment and storage, chemical feed piping, SCADA/instrumentation, power, security, and landscaping improvements.

EP recommends that the Cobalt Water Treatment Plant is sized and designed with the ability to integrate additional treatment processes for current and potential emerging contaminants, such as PFAS treatment, if necessary.

Greensand filtration may be the most effective option for treating the Town's water supply because iron and manganese concentrations may increase in the future required filtration and removal of both components. EP estimated design and construction costs for the Cobalt Water Treatment Plant based on similar facilities recently erected in the region. EP recommends sizing the treatment plant with the capacity to treat 1.5 MGD. **Table 5-8** presents the opinion of probable construction costs associated with designing and constructing the 1.5 MGD Cobalt Water Treatment Plant.

Section 5.2.3 Booster Pumping Stations

EP proposes constructing two booster pumping stations during the preliminary design of the municipal water system. The second High Pressure Zone booster pump station sizing and design in a future phase. In the near term, EP recommends that the Town progresses with surveying each potential booster pumping station site to deliver finished water to the Intermediate and High Pressure Zones.

The water treatment plant finished water pumps will supply water to each subsequent pressure zone in the system. Based on testing completed at the Cobalt Landing Wellfield, all finished water pumps will be sized the maximum approved and permitted capacity at the Cobalt Landing Wellfield with redundant pumping and standby power to enhance operating capabilities. At this phase in the design process, the pump size of each booster pump is subject to change. EP will evaluate the final proposed pump characteristics at a later phase in the design process.

EP estimated conservative booster pump size requirements using projected maximum day demands, the designed tank overflow elevations, and pump station sites. **Table 5-2** presents the booster pump characteristics.

Table 5-2 – Preliminary Booster Pump Characteristics

Pump	Design Flowrate (gpm)	TDH (feet)
Gildersleeve Booster Pumping Station	648	281
Center School Booster Pumping Station	435	152

EP anticipates that the required footprint of the Gildersleeve Booster Pumping Station will be roughly 35-feet by 20-feet. As previously discussed, the Center School Booster Pumping Station can be sited in the space currently utilized by the WPCA for the Village Center Water System treatment and pumping facilities. Therefore, the cost of the Center School Booster Pumping Station includes retrofits only, and no building construction.

EP estimated probable construction costs using recent bid pricing from similar construction projects in the region. The cost of each booster pumping station is presented in **Table 5-8**.

Section 5.2.4 Storage Tanks

EP proposes constructing three water storage tanks in the preliminary water system layout. As presented in Section 3, the Low, Intermediate, and High (Phase 1) Pressure Zones will each be supplied by a water storage tank.

Based on hydraulic modeling efforts, EP proposes the following storage tank characteristics for each zone. These characteristics are based solely on hydraulic conditions in the proposed system with volumes to provide fire protection, emergency, and equalization storage. EP recommends that our initiate sizing of the storage tanks be evaluated further during the preliminary design phase for each component.

For this evaluation phase, EP worked with CST Industries to prepare planning-level cost estimates for the water storage tanks. Aquastore™ Glass-Fused-To-Steel tanks are an excellent option for the Town because of their durability, low maintenance, and low life cycle cost. These tanks can be customized to the needs of each zone. EP analyzed the required water storage volume and tank site elevations to propose the following tank alternatives for further exploration, as shown in **Table 5-3**. We listed below storage tank alternatives for different sites, volumes, and layouts and recommend confirmation of these options during the final design phase. EP and the Town must clarify and confirm tank siting, water supply objectives, and storage volume needs before selecting the best alternative for each storage tank.

Table 5-3 – East Hampton Municipal Water System Water Storage Tank Summary

	Base (Ground) Elevation	Tank Overflow Elevation	Aquastore Tank Model/Pedestal Height	Notes
Low Pressure Zone Tank (Alternative #1 at 1 Public Works Drive)	370	389	76D x 19H / N/A	Can provide water service for consumption
	370	398	62D x 28H / N/A [(2)]	Can provide water service for consumption
Low Pressure Zone Tank (Alternative #2 at 5 Gildersleeve Drive)	295	364	70D x 24H / 45.2	Fire storage only
	295	371	62D x 28H / 47.1	Fire storage only
	295	364	56D x 38H / 31.4	Fire storage only
Intermediate Pressure Zone Tank Alternatives [(1)]	531	569	59D x 33H / N/A	Requires a site build-up of 5 feet
	531	587	45D x 56H / N/A [(2)]	
	531	569	56D x 38H / N/A	
High (Phase 1) Pressure Zone Tank Alternatives [(1)]	651	684	70D x 33H / N/A	
	651	698	59D x 47H / N/A [(2)]	

Notes: [(1)] EP has listed storage tank alternative sizes that meet the anticipated storage needs for both the Intermediate and High Pressure Zones.
[(2)] Recommended alternative

Low Pressure Zone Water Storage Tank

As previously discussed in Sections 3 and 4, the Low Pressure Zone Water Storage Tank may be sized to both serve customers in the Low Pressure Zone and provide fire flow storage, or to solely provide fire flow storage.

From a constructability and cost standpoint, constructing a tank at the elevated area of 1 Public Works Drive is far more cost effective; this site is located at an elevation that would not require the construction of a pedestal to raise water to the desired hydraulic grade to provide a minimum of 20 psi to the Low Pressure Zone. Adding a pedestal increases tank costs by over $3 million for the proposed tanks.

Additionally, utilizing a tank with a slightly larger operating range provides operational flexibility. Therefore, EP recommends that the Town further assess the 62D x 28H ground storage tank option during subsequent design phases.

Intermediate Pressure Zone Storage Tank

EP proposes constructing a standpipe for the Intermediate Pressure Zone Water Storage Tank, as the ground service at the tank site is sufficient to provide service pressure. The large range of pressures in this proposed zone creates constraints for tank size and operating range. Therefore, EP recommends that the Town construct the 45D x 56H tank model. This tank would provide greater operational flexibility and optimize the zone control scheme. Additionally, storing more water at a higher elevation compared to the shorter tank alternative will help protect against potential low pressures during fire events.

High Pressure Zone (Phase 1) Water Storage Tank

Similar to the Intermediate Pressure Zone, EP recommends that the Town construct a standpipe to serve Phase 1 of the High Pressure Zone. The 59D x 47H tank model provides both adequate equalization storage and sufficient operating range for the tank to cycle every day. Opting for a narrower and taller tank will grant the Town more flexibility for repairs and during emergencies.

Section 5.2.5 Water Main Construction

EP estimated water main improvement costs based on a cost per linear foot basis from recent bid results in the central Connecticut area and these costs will be reassessed and adjusted during the final design phase. The new water main unit costs include the material costs for piping and appurtenances (valves, hydrants, etc.), installation, full-width mill and overlay, and appurtenant items required for a complete project. Unit costs for the construction of water main projects include costs associated with traffic control and police detail requirements necessary to complete such work and include engineering and contingency allowances. **Table 5-4** presents the unit costs for construction items which are based on recent bid tabulations for similar projects in the area.

Table 5-4 – Unit Costs for Water Main Projects

Water Main Diameter	Cost per Linear Foot (1)
6-inch	$275
8-inch	$300
12-inch	$400
16-inch	$500

Notes: (1) Water main costs are current (September 2023) and includes water main appurtenances, services, paving, and construction allowances.

At this phase in the water distribution system design, EP based the cost estimate for system-wide water main construction on the premise that the existing WPCA water mains will be abandoned as requested by the Town. The condition of these mains are unknown and many of the existing mains, especially those in the Village Center area, will need to be upsized. EP recommends that the Town assess its existing water main conditions to determine whether its existing distribution systems may be tied into the Town's centralized water system during the design phase.

Table 5-5, 5-6, and 5-7 present the approximate proposed length of water main construction by street and zone.

Table 5-5 – Low Pressure Zone Water Main Construction by Street

	Length of Main (ft)		
Street Name	**6"**	**8"**	**12"**
Off Oakum Dock Road	-	394	-
Oakum Dock Road	-	201	-
Off Oakum Dock Road (Toward Fern Lane)	-	680	-
Fern Lane	-	1,747	-
Depot Hill Road	-	799	-
Middle Haddam Road	-	-	3,495
Off Middle Haddam Road (WTP)	-	-	405
Bates Drive	-	706	-
Shipyard Road	-	1,368	-
Old Middletown Road	-	1,516	-
Keighley Pond Road	-	2,376	-
Coughlin Road	-	512	-
W High Street	-	947	2,579
Off Gildersleeve Drive (to BPS)	-	-	90
Gildersleeve Drive	-	-	901
Long Hill Road	-	3,710	346

Table 5-6 – Intermediate Pressure Zone Water Main Construction by Street

	Length of Main (ft)			
Street Name	**6"**	**8"**	**12"**	**16"**
Charles Mary Drive	-	2,212	-	-
William Drive	-	1,531	-	-
Hog Hill Road	-	551	518	-
Middletown Avenue	-	-	9,902	-
Gildersleeve Drive	-	-	338	-
W High Street	-	-	8,757	-
Airline Trail	-	-	7,213	-
Off Airline Trail	-	-	159	-
Childs Road	-	3,709	1,063	-
Off Childs Road	-	-	1,653	-
Long Crossing Road	-	3,031	-	-
Off Long Crossing Road	-	96	-	-
Forest Street	-	760	596	-
Chestnut Hill Road	-	532	-	-
Old Middletown Avenue	-	3,156	-	-
Off Middletown Avenue (Ta	-	-	474	-
Old Coach Road	-	1,250	-	-
Skinner Street	-	3,927	-	-
Hilltop Drive	-	1,056	-	-
Main Street	-	-	4,122	-
Niles Street	-	1,170	-	-
Off Niles Street	-	286	-	-
Walnut Avenue	-	-	1,519	-
Barton Hill Road	-	-	206	-
Summit Street	-	-	1,165	-
Off Summit Street (BPS)	-	-	118	-
Starr Place	-	487	-	-
Bevin Blvd	-	260	-	-
Off Bevin Blvd	-	427	-	-
Bevin Road	-	414	-	-

Table 5-7 – High Pressure Zone (Phase 1) Water Main Construction by Street

	Length of Main (ft)			
Street Name	6"	8"	12"	16"
Main Street	-	-	3,027	-
S Main Street	-	-	1,960	-
N Main Street	-	-	1,105	-
Colchester Avenue	-	-	5,286	-
Dale Drive	-	984	-	-
Dziok Drive	569	400	-	-
Cedar Ridge Road	1,084	-	-	-
Holly Drive	1,043	-	-	-
Harlan Place	-	1,586	-	-
Off Harlan Place	-	1,917	-	157
Chatham Fields Road	-	1,144	-	-
Huckleberry Acres Road	-	1,088	-	-
Sunset Drive	-	1,342	-	-
Edgerton Street	-	-	3,046	-
Off Smith Street (Tank)	-	-	-	1,181
Smith Street	848	556	-	3,411
Dogwood Drive	-	-	1,715	-
Royal Oaks Avenue	-	995	895	-
Mathieu Lane	-	1,065	-	-
Rachael Drive	-	270	-	-
Ray Lane	-	245	-	-
Julia Terrace	-	527	-	-
Arch Drive	-	943	-	-
Viola Drive	-	4,364	-	-
Walnut Avenue	-	-	2,652	-
Watrous Street	-	-	925	-
Summit Street	-	665	2,309	-
Off Summit Street (BPS)	-	-	110	-
Barton Hill Road	-	-	4,132	-
Airline Avenue	-	498	-	-
Crescent Street	-	878	-	-
Forest Street	-	-	1,895	-
Hyde Farm Ter	-	616	-	-
Mary Ann Drive	-	1,099	-	-
E Hayes Road	-	1,124	-	-
Hayes Road	-	800	-	-
Maple Street	-	1,500	-	-
Oak Knoll Road	-	2,392	-	-
Steepleview Drive	-	370	-	-
Bevin Blvd	-	1,605	-	-
Off E High Street	-	1,122	-	-
Markham Lane	-	474	-	-
Bevin Court	-	443	-	-
Bishop Hill Road	-	-	844	-
Flanders Road	-	842	415	764
Lakeview Street	-	-	1,887	-
W High Street	-	-	6,293	-
Old West High Street	-	877	-	-
W Point Road	1,138	-	-	-
Carrier Road	911	-	-	-
Wells Avenue	1,166	-	-	-
Hills Avenue	-	-	1,509	-
Laurel Glen Drive	-	1,107	-	-
Melburn Avenue	-	564	-	-
Fairlawn Avenue	-	1,325	-	-
N Maple Street	-	1,684	1,567	-
Maplewood Drive	-	509	-	-
Beechcrest Drive	-	903	-	-
Sherry Drive	-	2,028	-	-
Bevin Avenue	-	468	-	-

Section 5.2.6 System-wide Opinion of Probable Construction Costs

The OPPC presented in this section represent all the costs for the study, design, and construction, including contingencies and engineering assistance for bidding, construction administration, and resident engineering services for construction projects. Police details are included in the OPPC but should be revisited prior to budgeting the capital project for a funding request. Prior to a capital project being undertaken, the Town should perform a detailed cost estimate to confirm the financing of all the capital projects.

EP has presented the OPCC for the projects listed in the prior sections in **Table 5-8**.

Table 5-8 – East Hampton Municipal Water System Opinion of Probable Construction Costs

Item No.	Item Description	Opinion of Probable Construction Cost	Engineering and Contingency (45%) (1)	Planning Level Cost Estimate
1	Cobalt Landing Wellfield Permitting and Well Development	$350,000	$157,500	$507,500
2	Cobalt Landing Wellfield Raw Water Main to WTP	$1,491,200	$671,100	$2,162,300
3	Cobalt Landing Wellfield Construction	$1,623,800	$ 730,800	$2,354,600
4	Cobalt Landing Water Treatment Plant	$9,419,500	$4,238,800	$13,658,300
5	Low Pressure Zone Water Mains	$6,323,800	$2,845,800	$9,169,600
6	Low Pressure Zone Water Storage Tank (0.632 MG)	$2,900,000	$1,305,000	$4,205,000
7	Intermediate Pressure Zone Water Mains	$22,577,700	$10,160,000	$32,737,700
8	Gildersleeve BPS	$600,000	$270,000	$870,000
9	Intermediate Pressure Zone Water Storage Tank (0.658 MG)	$3,020,000	$1,359,000	$4,379,000
10	High (Phase 1) Pressure Zone Water Mains	$33,639,800	$15,138,000	$48,777,800
11	Center School BPS Retrofit	$500,000	$225,000	$725,000
12	High Pressure Zone Water Storage Tank (0.948 MG)	$3,235,000	$1,455,800	$4,690,800
13	Permitting	$500,000	$225,000	$725,000
Total Planning Level Cost Estimate (2023 Dollars)				$124,962,600

Note: (1) Engineering services are estimated at approximately 20% and contingencies are estimated at approximately 25% of construction cost.

SECTION 5.3 CIP PHASING

Table 5-8 lists the OPPC associated with constructing the Low, Intermediate, and Phase 1 of the High Pressure Zone. All costs are in September 2023 dollars (current Engineering News Record (ENR) Index of 13472.56).

As previously discussed, the proper phasing of capital improvements is crucial when establishing the Town's municipal water system. While the Town intends to fund the proposed project with available federal and state grants and loans, these agencies and their funding process may affect the final design and construction schedule; therefore the project phasing will be up to the Town's discretion. EP recommends that the Town begin to host workshops with relevant parties and residents to determine the best course of action for phasing the construction of their water system. Ultimately, phasing may be dependent on the pace of design and the availability of funding.

EP recommends discussing the construction schedule with the Town prior to recommending the draft schedule.

SECTION 6

SECTION 6 CONCLUSIONS AND NEXT STEPS

The Town has taken significant steps toward establishing a centralized municipal water system. While initial efforts toward developing a new municipal water system did not proceed in 2006, the Town has reinvigorated this initiate with significant grant in 2022, which produced an updated PER, the Desktop Groundwater Exploration Program, groundwater exploration at the Pine Brook site and this Water System Facility Siting and Hydraulic Evaluation Report.

The Town's intent is to present this municipal water system project to the residents of East Hampton for approval in 2024. The Town's recent efforts and these supporting documents will help inform the residents of the benefits, scope, and costs of this project.

With this report, the Town has documented the siting of facilities, delineated the extent of water supply service and provided a preliminary water system layout, which is a crucial step toward bringing the municipal water system to fruition. Using the water supply from the Cobalt Landing Wellfield, EP modeled a fully functional municipal water system with the intent of meeting all state and federal regulatory requirements. Due to the length of main proposed for the water system, EP recommends that the Town begin by constructing skeletal, main transmission mains, beginning with the Low Pressure Zone, and working into the Village Center and Memorial School areas.

Next, EP recommends that the Town meet with CTDPH and the CTDEEP to determine the next steps in commissioning the Cobalt Landing Wellfield for a drinking water supply and potential increasing the permitted capacity, if possible. The Town should also confirm all federal, state, and local permitting requirements during the next phase of the project. In addition to verifying all permitting requirements, EP recommends that the Town begin the preliminary design of the water system with the next state grant funding for this project, with initial tasks to include:

- Wetland flagging,
- Aerial flyover survey,
- Detailed site mapping,
- Subsurface explorations,
- Soil sampling, and
- Geotechnical evaluation.

These preliminary engineering tasks will be performed for each water supply facility referenced in the report at the selected parcel following the final selection of the initial alternatives. The wetland flagging and delineation are required at each site to finalize the potential location and extent of the water system facilities.

The scope of work for the subsequent phase of the water system preliminary design includes the following tasks.

SECTION 6.1 DIGITAL PHOTOGRAPHIC MAPPING

EP will provide digital mapping to the extent of the proposed service area for this initial phase of the project. Our survey subconsultant will perform aerial imagery of all sites with the accuracy of producing 1” = 40-feet scale mapping with two-foot contours. EP will perform the following tasks to produce the site survey and mapping:

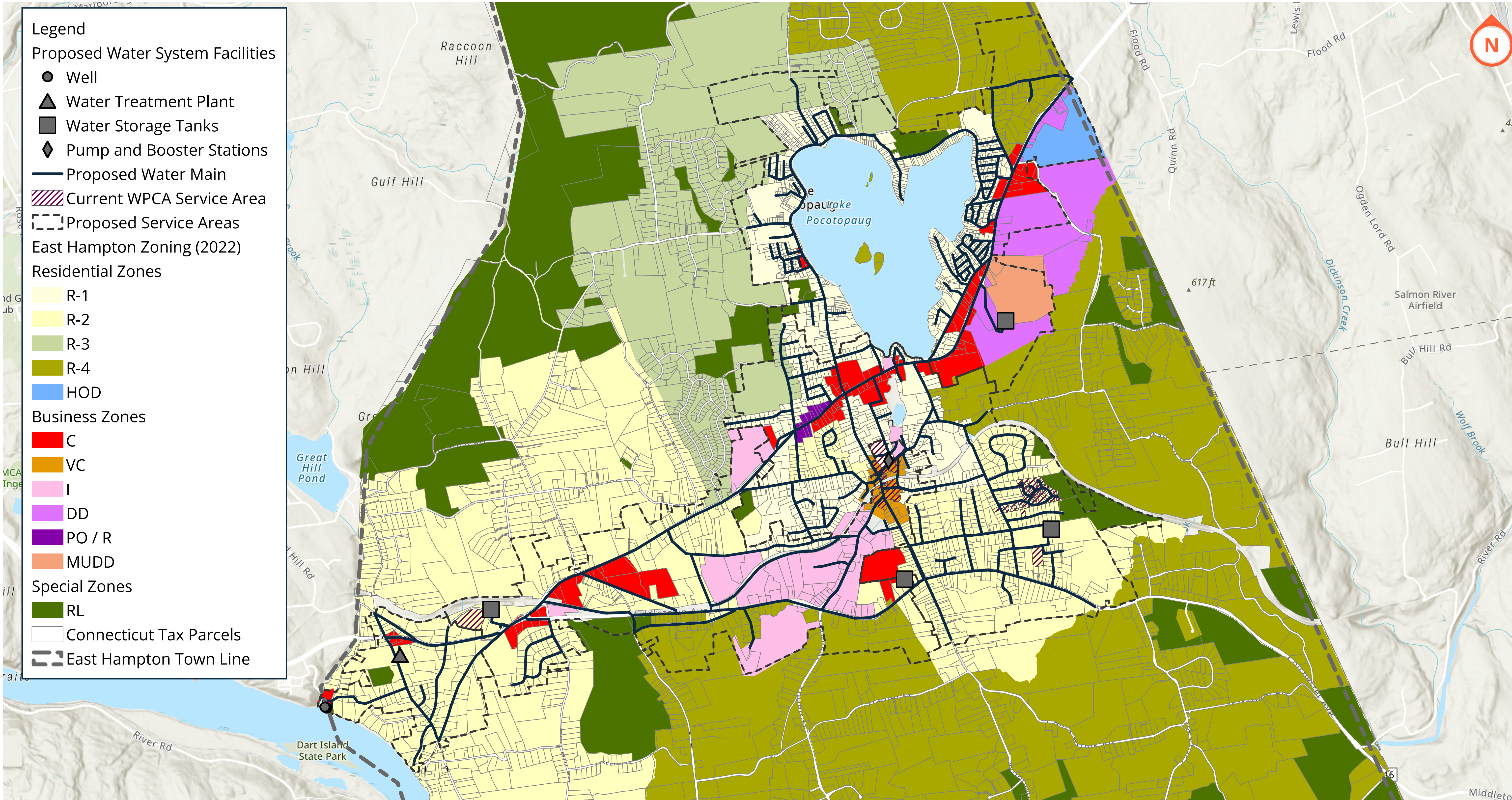
- Coordinate required survey and mapping with survey subconsultant for each water system facility, including the water treatment plant, booster pumping stations, and water storage tanks.
- Attend up to two meetings with the Town to discuss survey and mapping.
- Collect information and data for survey from the WPCA and the Town.
- Perform ground control survey with horizontal control based on Plane Coordinate System for the State of Connecticut and vertical control based on the North Atlantic Vertical Datum of 1988, unless otherwise specified.
- Establish up to four bench marks and provide descriptions.
- Establish ground base control using airborne global positioning system (GPS).
- Perform quality control reviews of all aerial imagery and mapping produced by the survey subconsultant.
- Provide analytical aerial triangulation utilizing the basic control surveys. The ground control will be supplemented by establishing six horizontal and vertical photo control points per model by means of analytical aerial triangulation.
- Produce digital topography mapping. All photogrammetric data will be acquired digitally. All digital files will be creased on a KLT/Digital Softcopy Photogrammetric Workstation. The planimetric and topographic mapping of the project areas will be compiled and delivered at a scale of I"= 40', with a contour interval of two feet. All work shall conform to National Map Accuracy Standards. All files will be in layered form containing features that are visible from the aerial photography. The features that are expected to be captured as part of the survey are listed in Attachment A. The data will be in manuscript form and will not include field edits. This data will be furnished on compact disk in layered form, suitable for use with AutoCAD software in a PC compatible environment.
- Provide ESRI geodatabase formatting. The AutoCAD data and mapping will be provided in ESRI Geodatabase format, and will include polygon topology with buildings, roads, driveways, and sidewalks will be provided as polygons in the geodatabase.
- Perform wetland flagging services to delineate the wetland boundaries at each water system facility site.
- Prepare and present technical memorandum with potential water system facility location findings and recommendations for Town review following the survey, mapping, and wetland delineation phase.

SECTION 6.2 GEOTECHNICAL SCOPE OF WORK

- Coordinate subsurface explorations by boring subcontractor to determine soil conditions and groundwater elevation at location of proposed water treatment plant, above-grade booster pump station, storage tank sites, and along the proposed water main alignments. EP anticipates up to two, 20-foot-deep borings at the proposed water treatment plant, pump station, and storage tank sites. EP anticipates that one boring will be needed every 300-feet of water main length at a depth of ten feet.
- Coordinate site visit of geotechnical expert to monitor subsurface explorations, assess soil conditions and log soil samples during boring subcontractor's work.
- Conduct laboratory testing of soils.
- Prepare technical memorandum with geotechnical findings, evaluation, and recommendations.

Following the geotechnical, survey, and wetland flagging activities at each site, the Town may progress with the water facility layouts, water system design, and permitting for bid and construction should funding be available.

FIGURES



ENVIRONMENTAL PARTNERS
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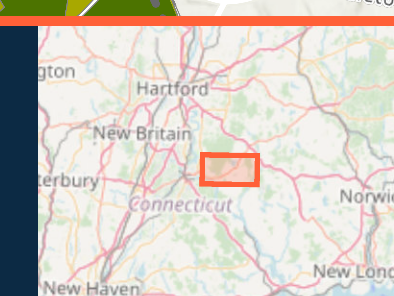
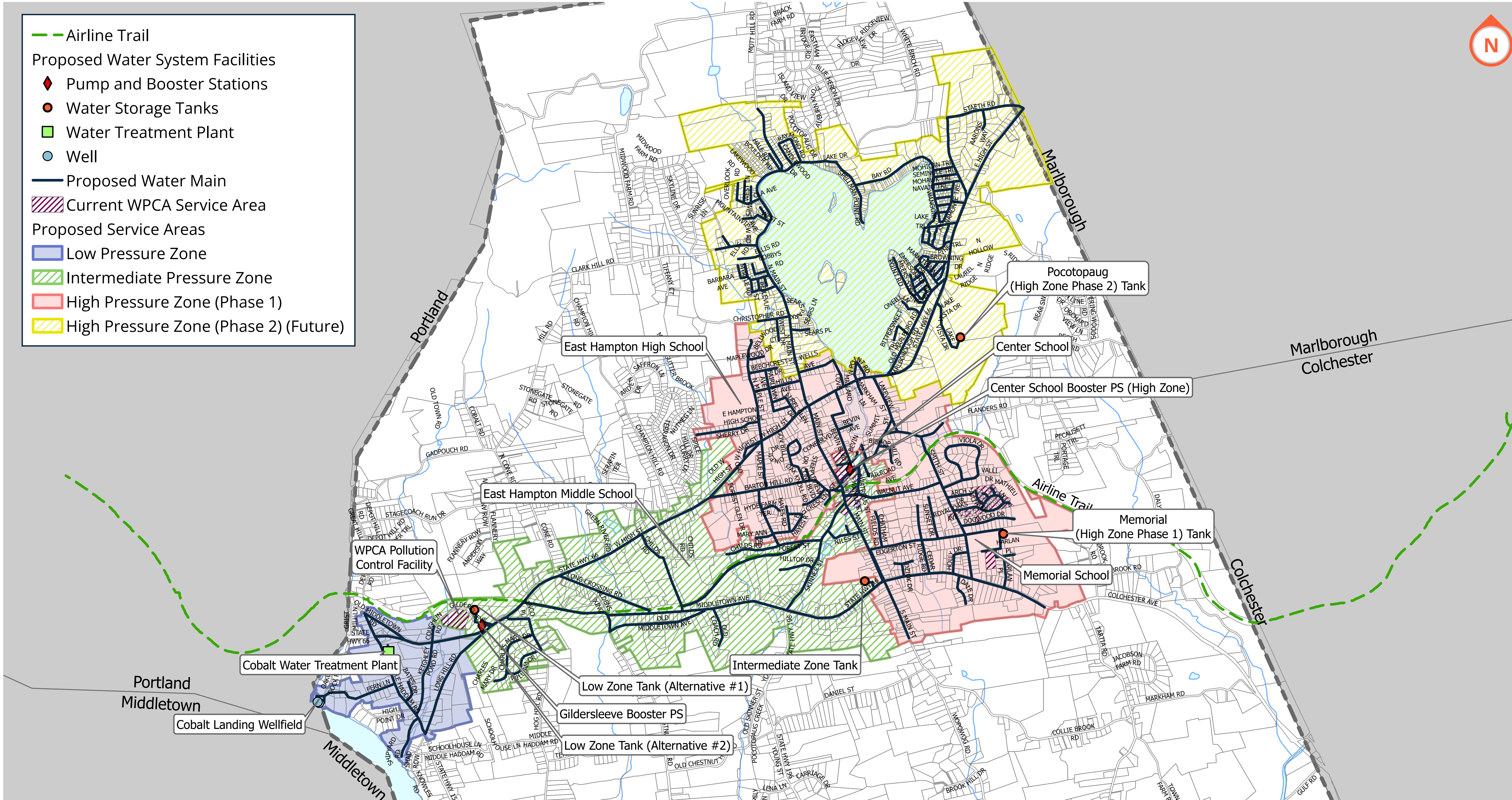
Figure 2-1
East Hampton Zoning and Proposed Water System (Full Buildout)

East Hampton, Connecticut
September 2023

0 1,500 3,000 6,000 Feet



Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
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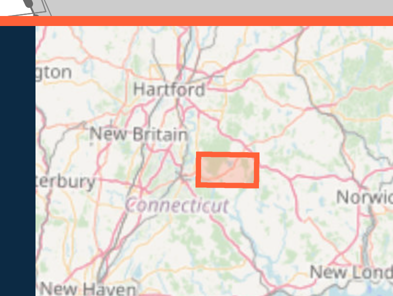
Figure 3-1
Proposed Water System Facilities (Full Buildout)
East Hampton, Connecticut
September 2023

0 1,500 3,000 6,000 Feet



Disclaimer: This map is intended for planning purposes

ENVIRONMENTAL PARTNERS

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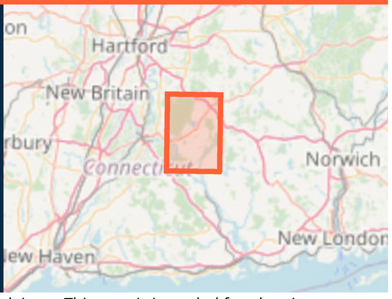
Figure 3-2

Contour Map

East Hampton, Connecticut

September 2023

0 2,500 5,000 10,000 Feet



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Disclaimer: This map is intended for planning purposes

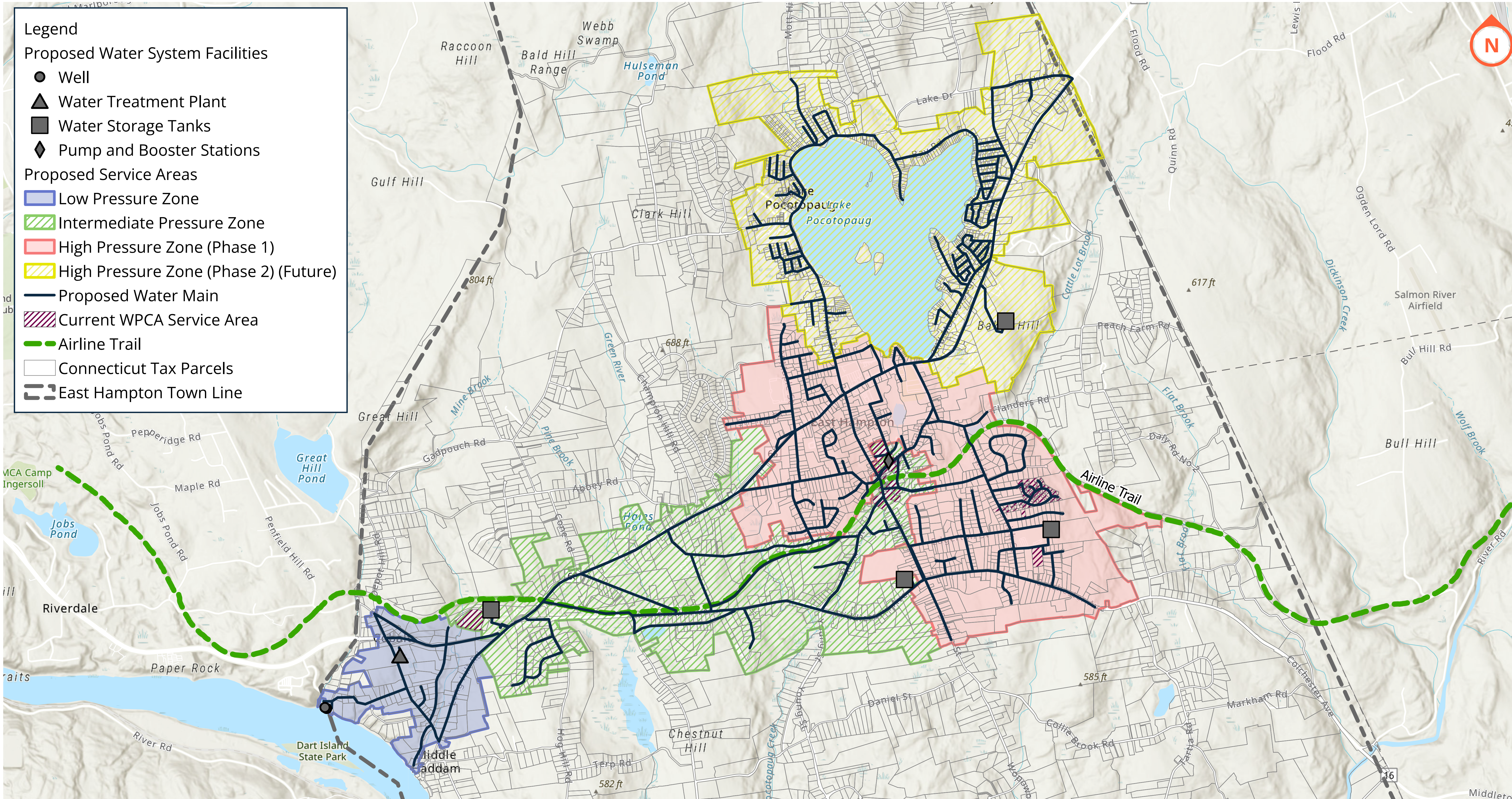


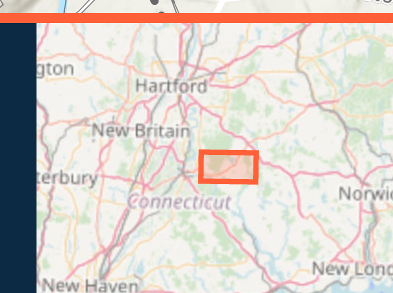
Figure 3-3

Proposed East Hampton Water System Service Area (Full Buildout)

East Hampton, Connecticut

September 2023

0 1,500 3,000 6,000 Feet



ENVIRONMENTAL PARTNERS

— An Apex Company —

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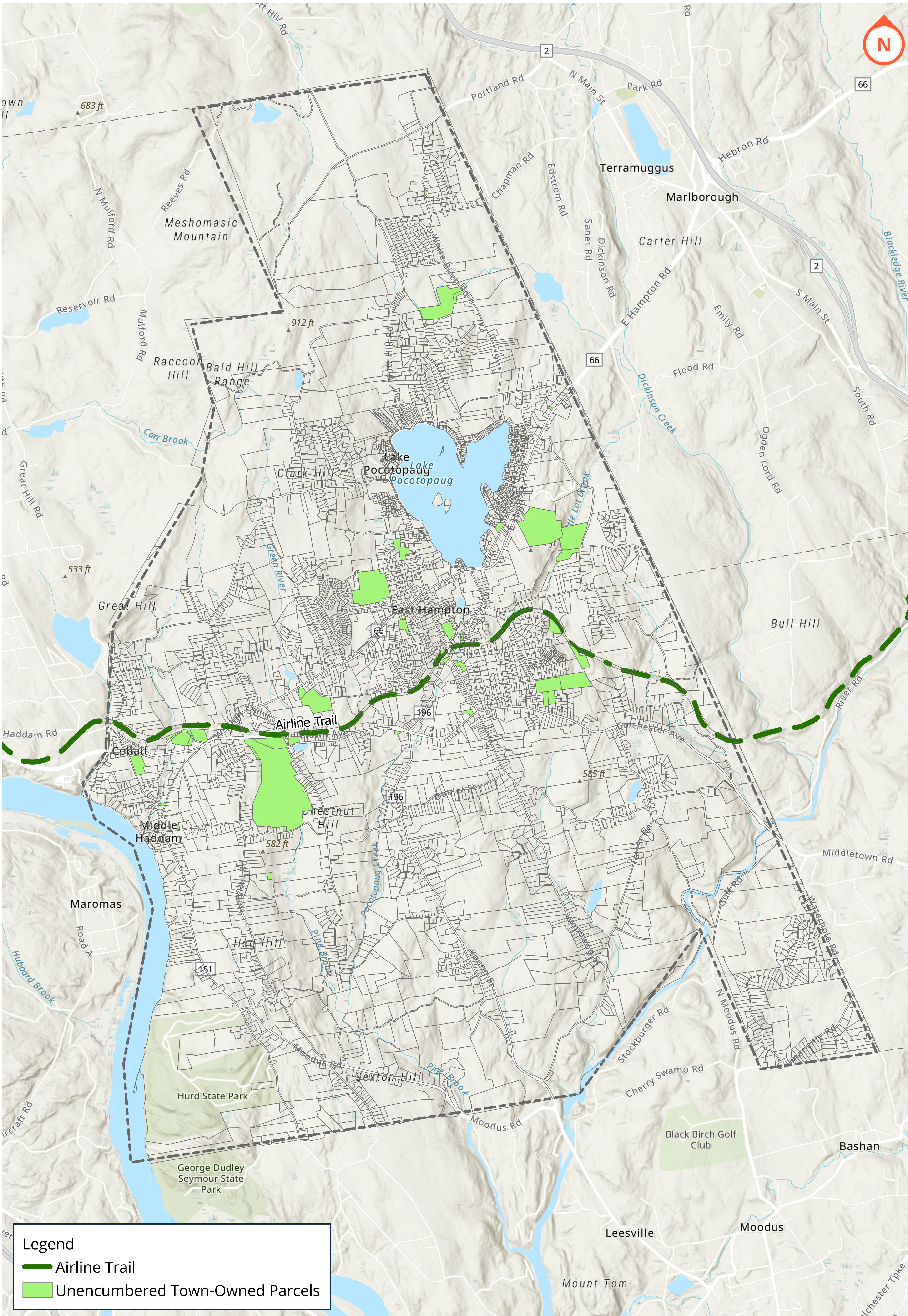


Figure 3-4

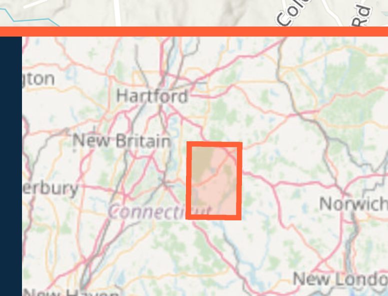
Unencumbered Town-Owned Parcels

East Hampton, Connecticut

September 2023

0 2,500 5,000 10,000 Feet

ENVIRONMENTAL PARTNERS — An Apex Company —



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ENVIRONMENTAL PARTNERS
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Figure 3-5
Cobalt Landing Wellfield
East Hampton, CT
September 2023

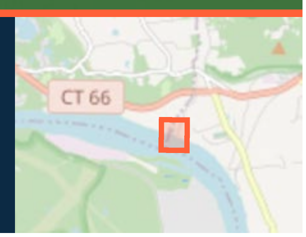
0 50 100 200 Feet

Disclaimer: This map is intended for planning purposes

ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-6
Cobalt Landing Wellfield Environmental Features
East Hampton, CT
September 2023

0 50 100 200
Feet

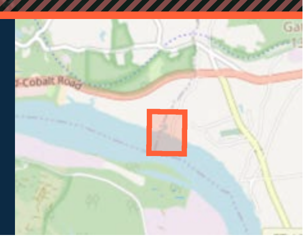


Disclaimer: This map is intended for planning purposes

ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-7
Cobalt Landing Wellfield Flood Zones
East Hampton, CT
September 2023

0 50 100 200
Feet



Disclaimer: This map is intended for planning purposes

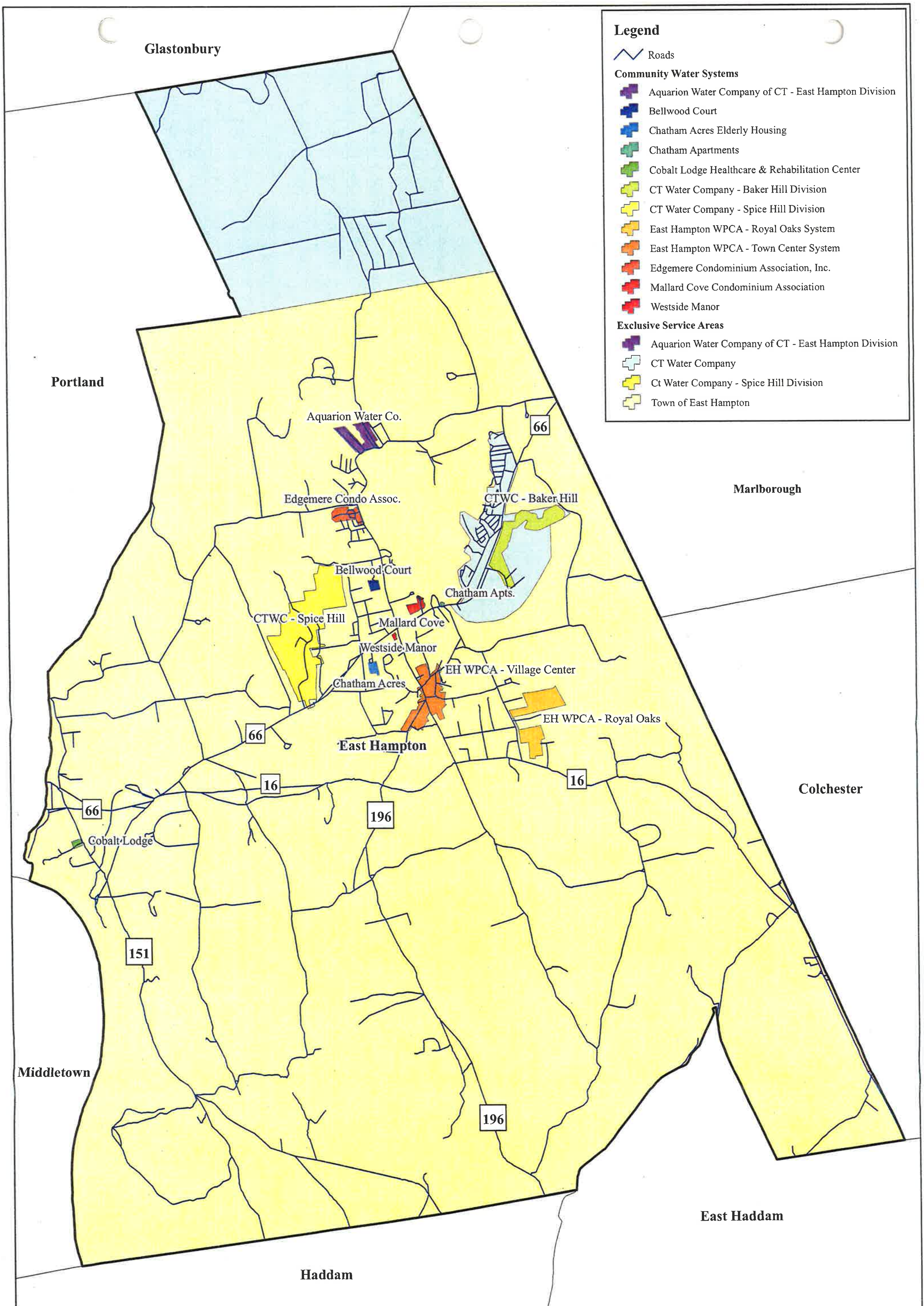


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Figure 3-8

Community Water Systems & Exclusive Service Areas

LOCATION: **East Hampton, CT**

MMI#: 3083-06
MXD: H:\AppFig1.mxd
SOURCE: CT DEP, CT DPH

N

Town of East Hampton Water Supply Plan

Map By: SJB
Date: 9/17/2010
Scale: 1:42,000

SHEET: **Appended Figure 1**

ENVIRONMENTAL PARTNERS
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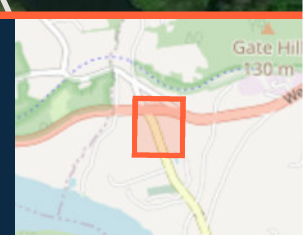
Figure 3-9
Cobalt Water Treatment Plant
East Hampton, CT
August 2023

0 50 100 200
Feet



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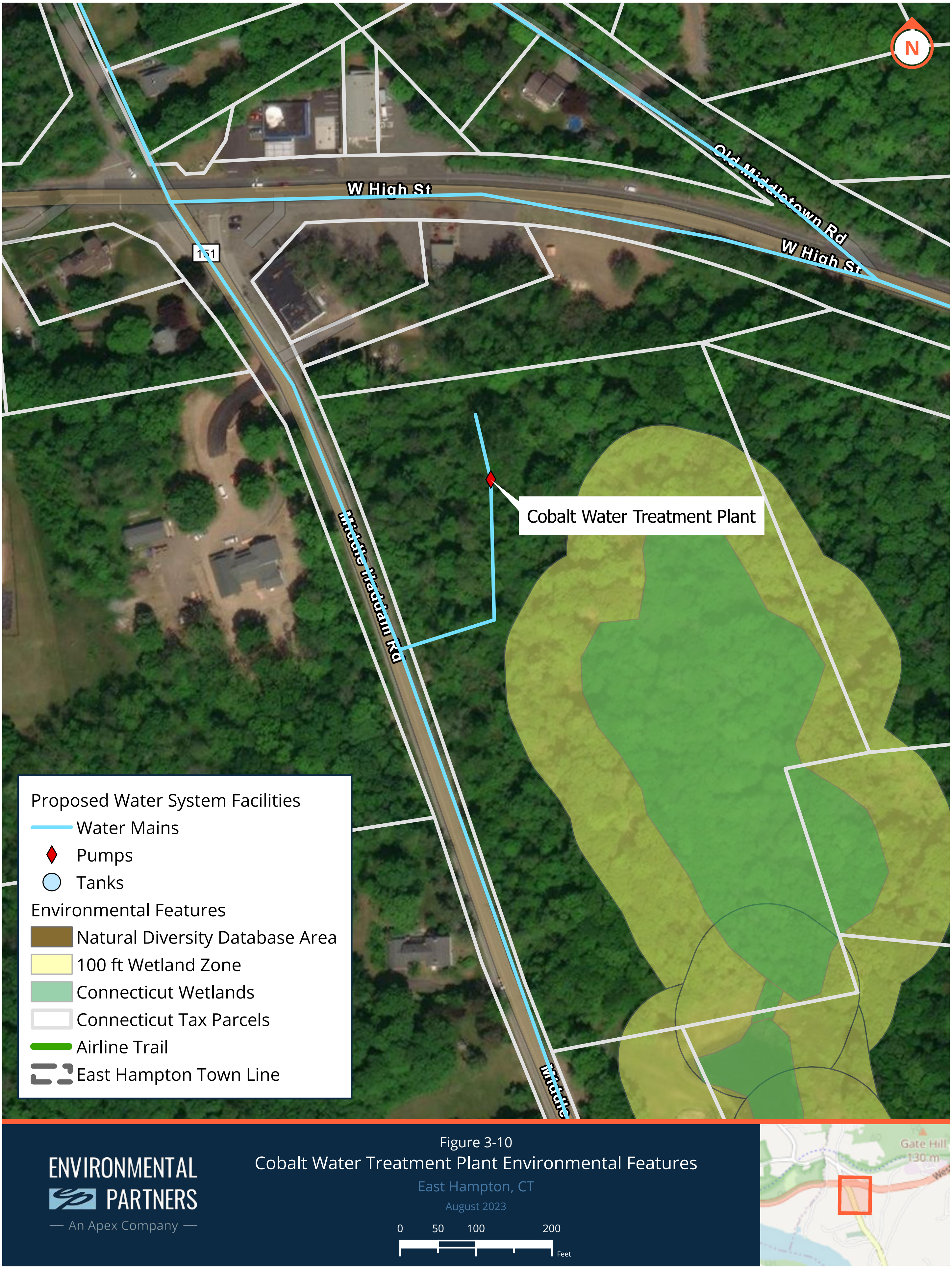

ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-10
Cobalt Water Treatment Plant Environmental Features
East Hampton, CT
August 2023

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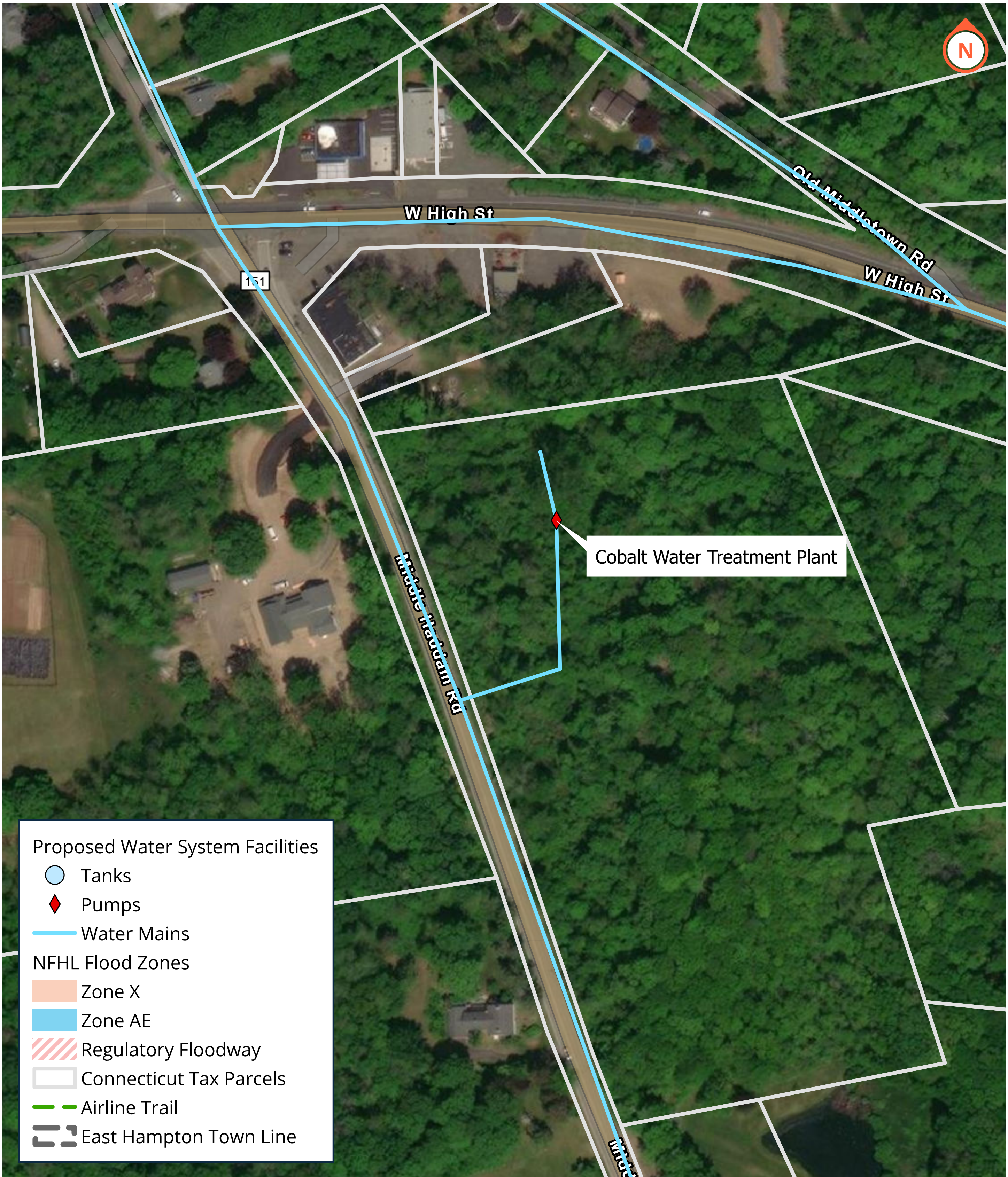
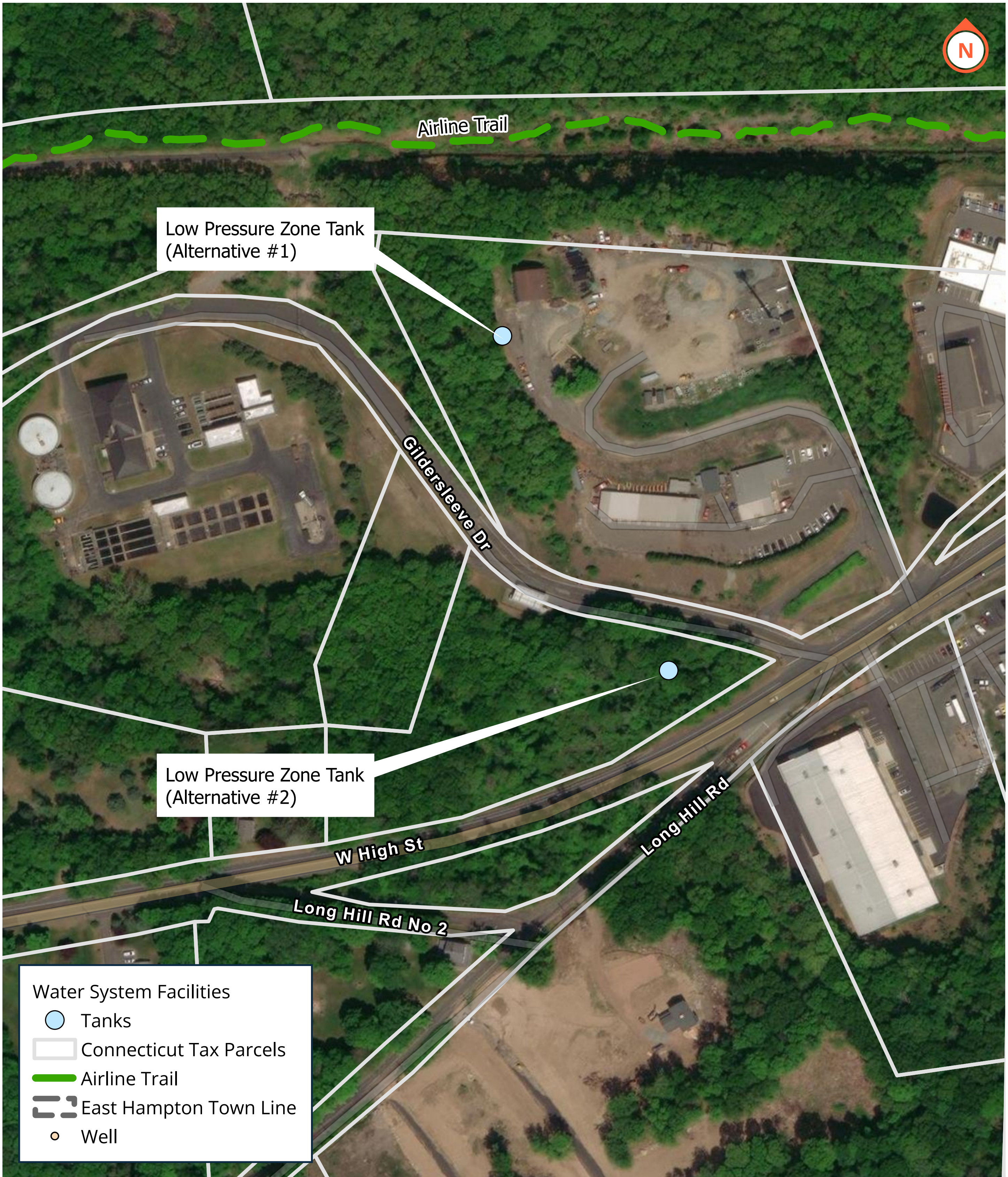


ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-11
Cobalt Water Treatment Plant Flood Zones
East Hampton, CT
September 2023

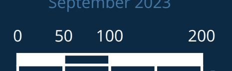
0 50 100 200 Feet

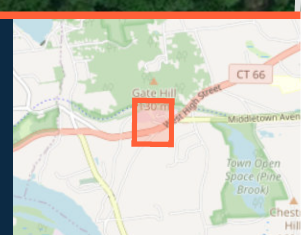
Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-12
Low Pressure Zone Tank
East Hampton, CT
September 2023





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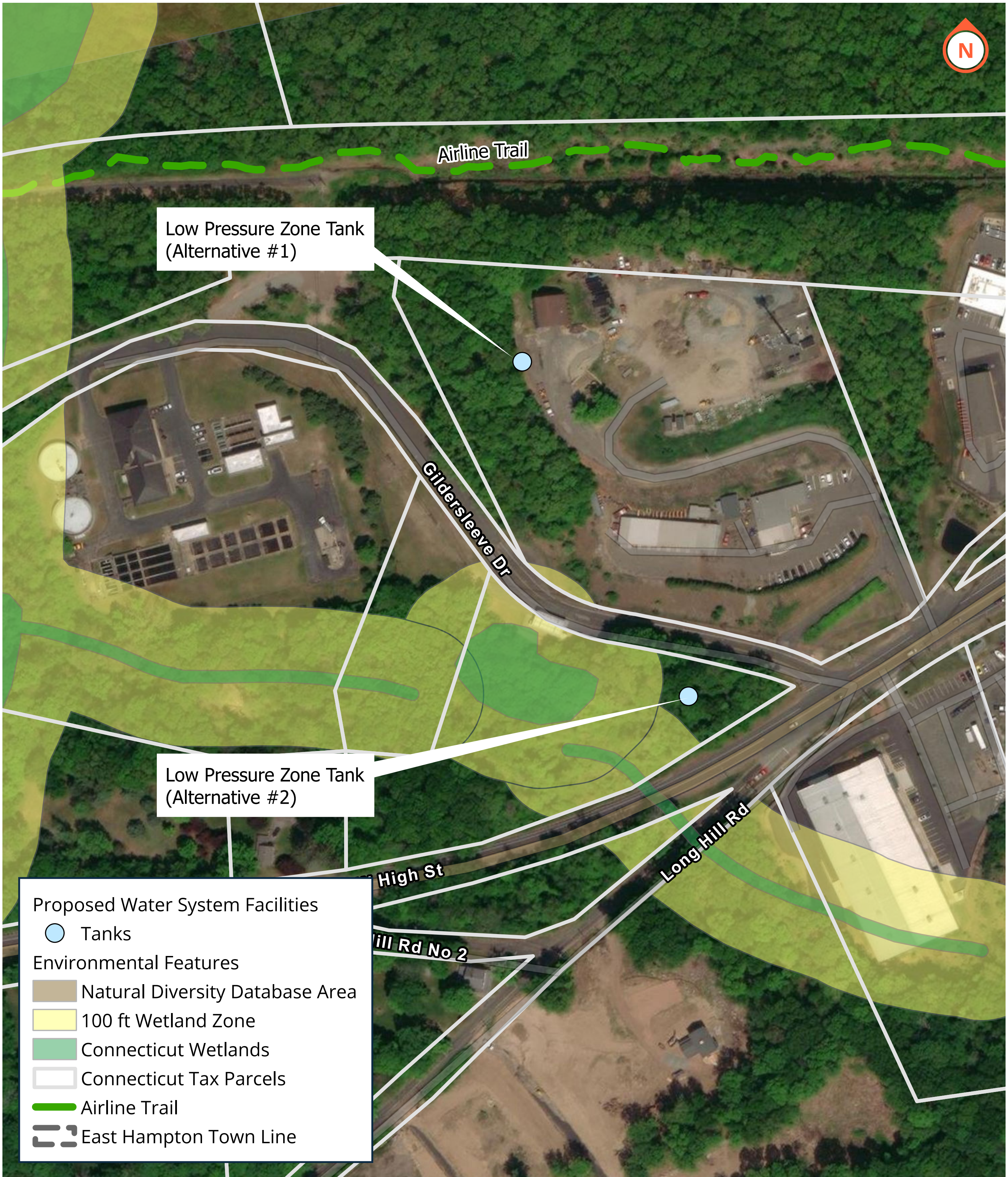

ENVIRONMENTAL PARTNERS
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Figure 3-13
Low Pressure Zone Tank Environmental Features
East Hampton, CT
September 2023

0 50 100 200 Feet

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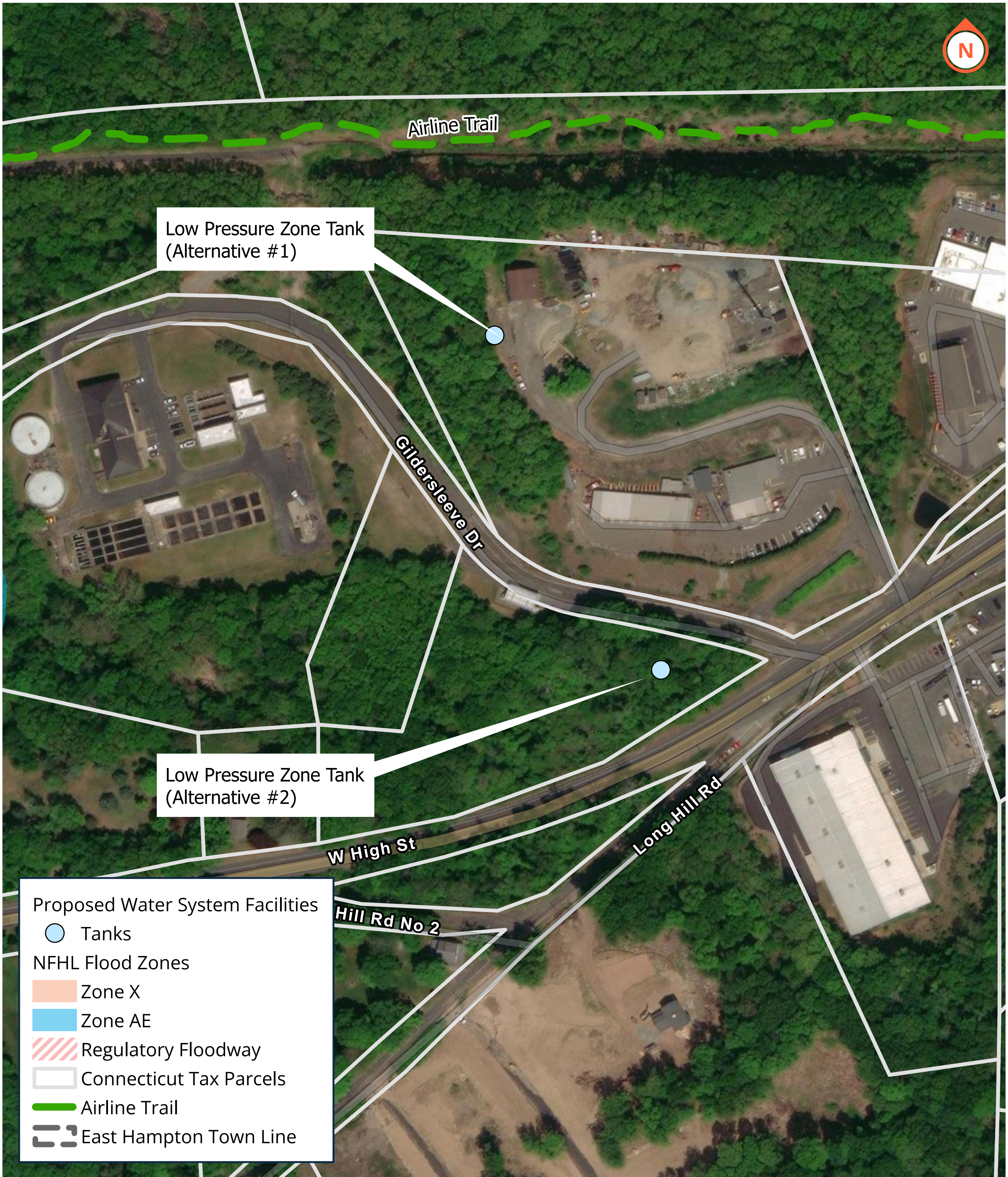


ENVIRONMENTAL PARTNERS

— An Apex Company —

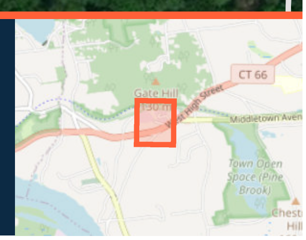
Figure 3-14

Low Pressure Zone Tank Flood Zones

East Hampton, CT

September 2023

0 50 100 200 Feet



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ENVIRONMENTAL PARTNERS
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Figure 3-15
Intermediate Pressure Zone Tank
East Hampton, CT
September 2023

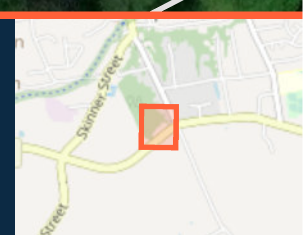
0 50 100 200 Feet

Disclaimer: This map is intended for planning purposes

ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-16
Intermediate Pressure Zone Tank Environmental Features
East Hampton, CT
September 2023

0 50 100 200
Feet



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ENVIRONMENTAL PARTNERS
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Figure 3-17
Intermediate Pressure Zone Tank Flood Zones
East Hampton, CT
September 2023

0 50 100 200 Feet

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ENVIRONMENTAL PARTNERS
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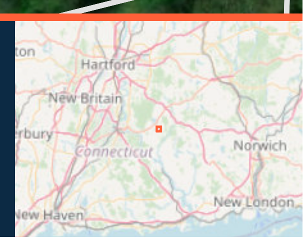
Figure 3-18
Memorial School Tank (High Pressure Zone Phase 1)
East Hampton, CT
September 2023

0 50 100 200 Feet



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ENVIRONMENTAL PARTNERS
— An Apex Company —

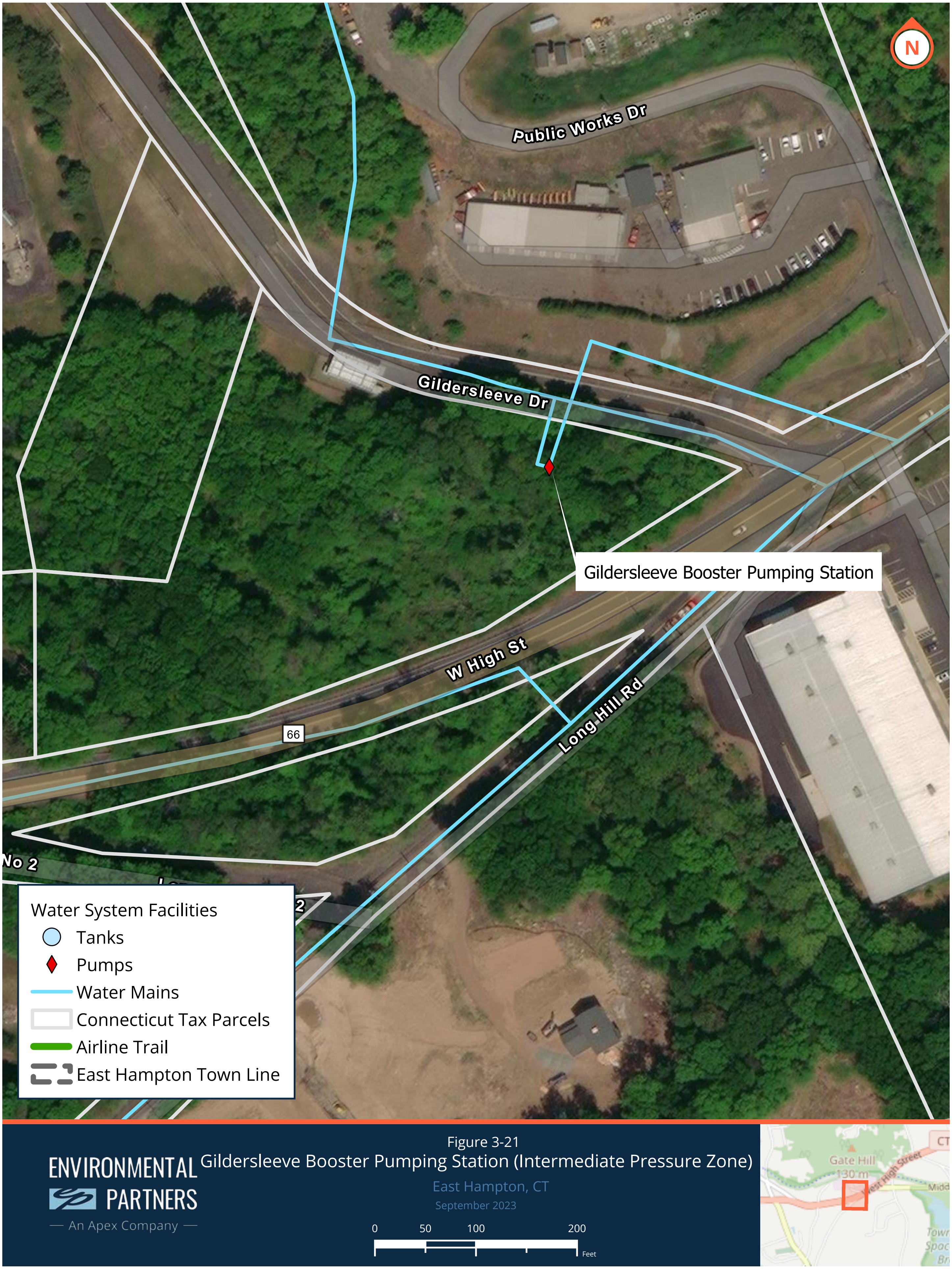
Figure 3-19
Memorial School Tank Environmental Features
East Hampton, CT
September 2023

0 50 100 200 Feet

Disclaimer: This map is intended for planning purposes

Figure 3-20
Memorial School Tank Flood Zones
East Hampton, CT
September 2023

Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
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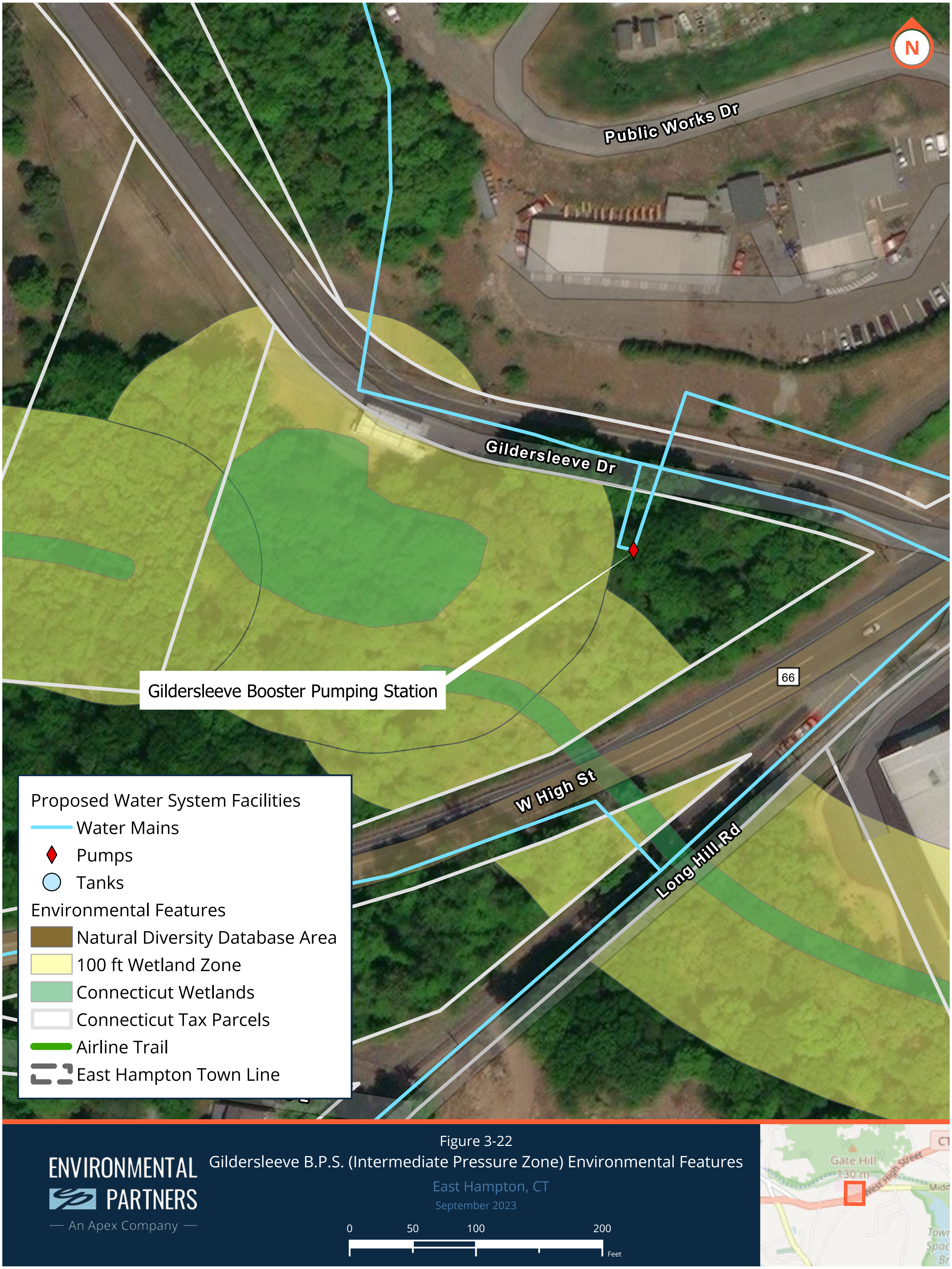
Figure 3-21
Gildersleeve Booster Pumping Station (Intermediate Pressure Zone)
East Hampton, CT
September 2023

Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
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Figure 3-22
Gildersleeve B.P.S. (Intermediate Pressure Zone) Environmental Features
East Hampton, CT
September 2023

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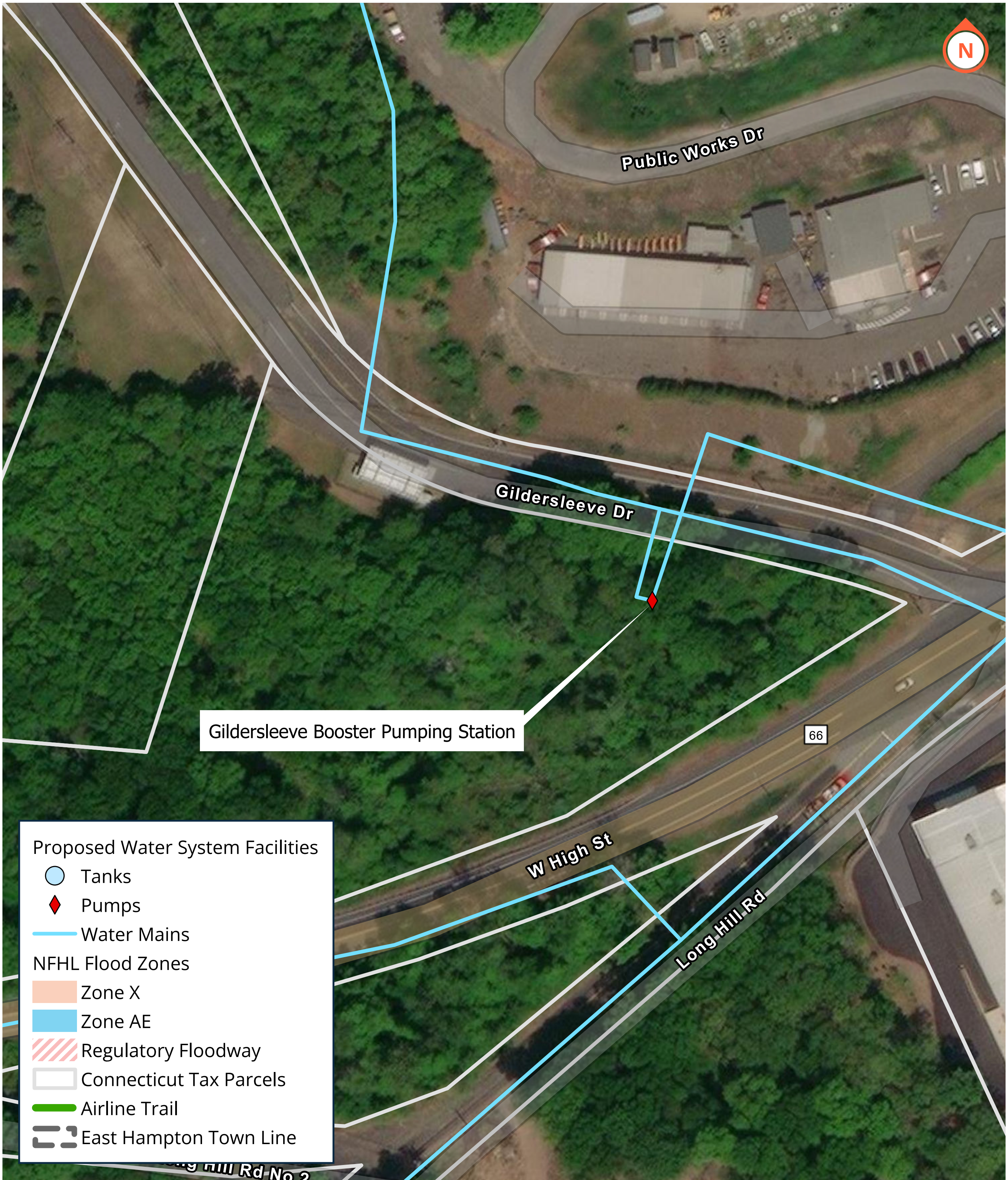
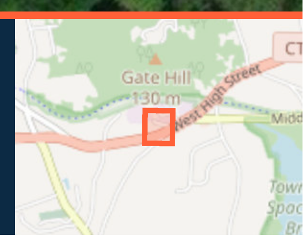


ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 3-23
Gildersleeve B.P.S. (Intermediate Pressure Zone) Flood Zones
East Hampton, CT
September 2023

0 50 100 200
Feet



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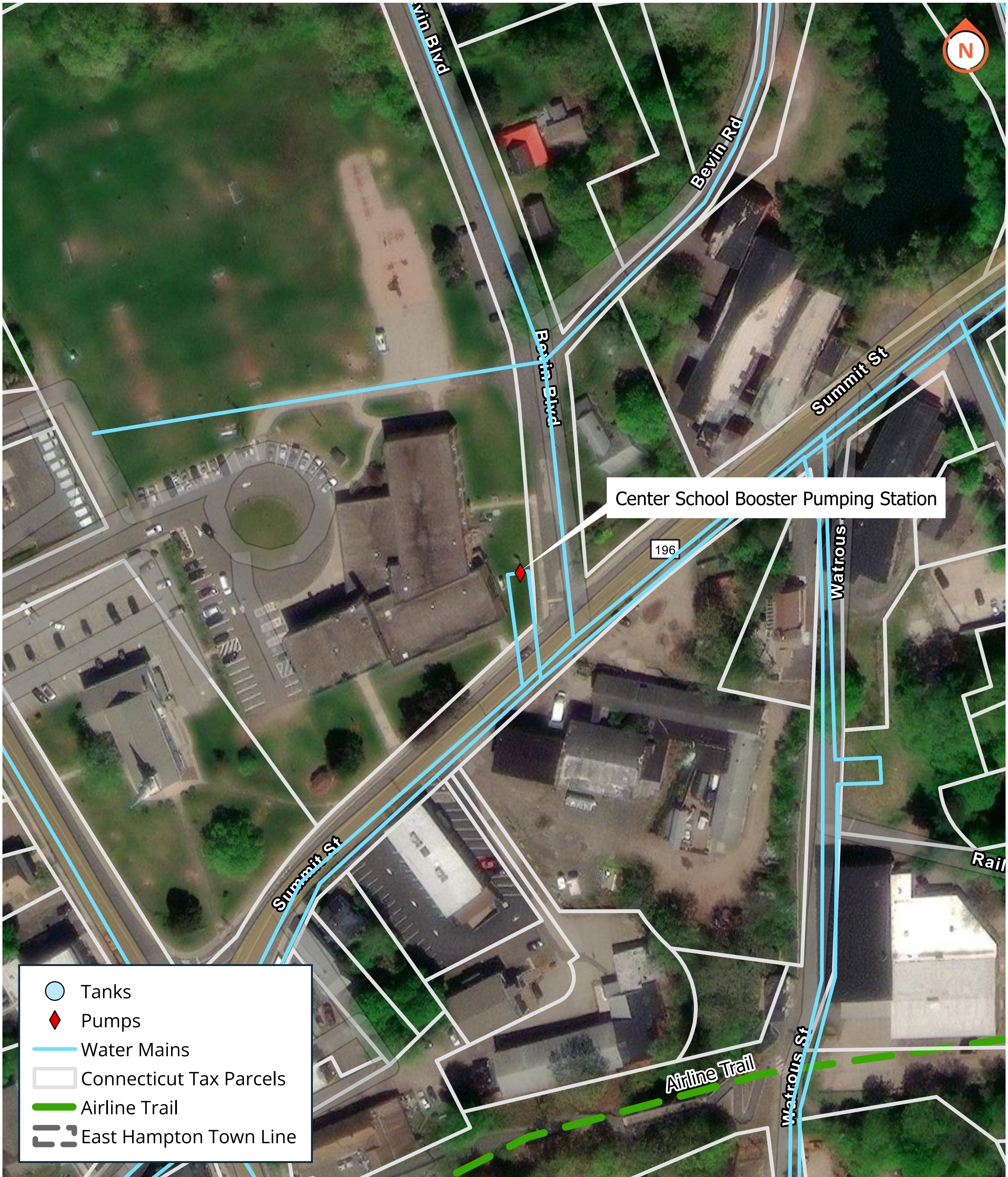

ENVIRONMENTAL PARTNERS
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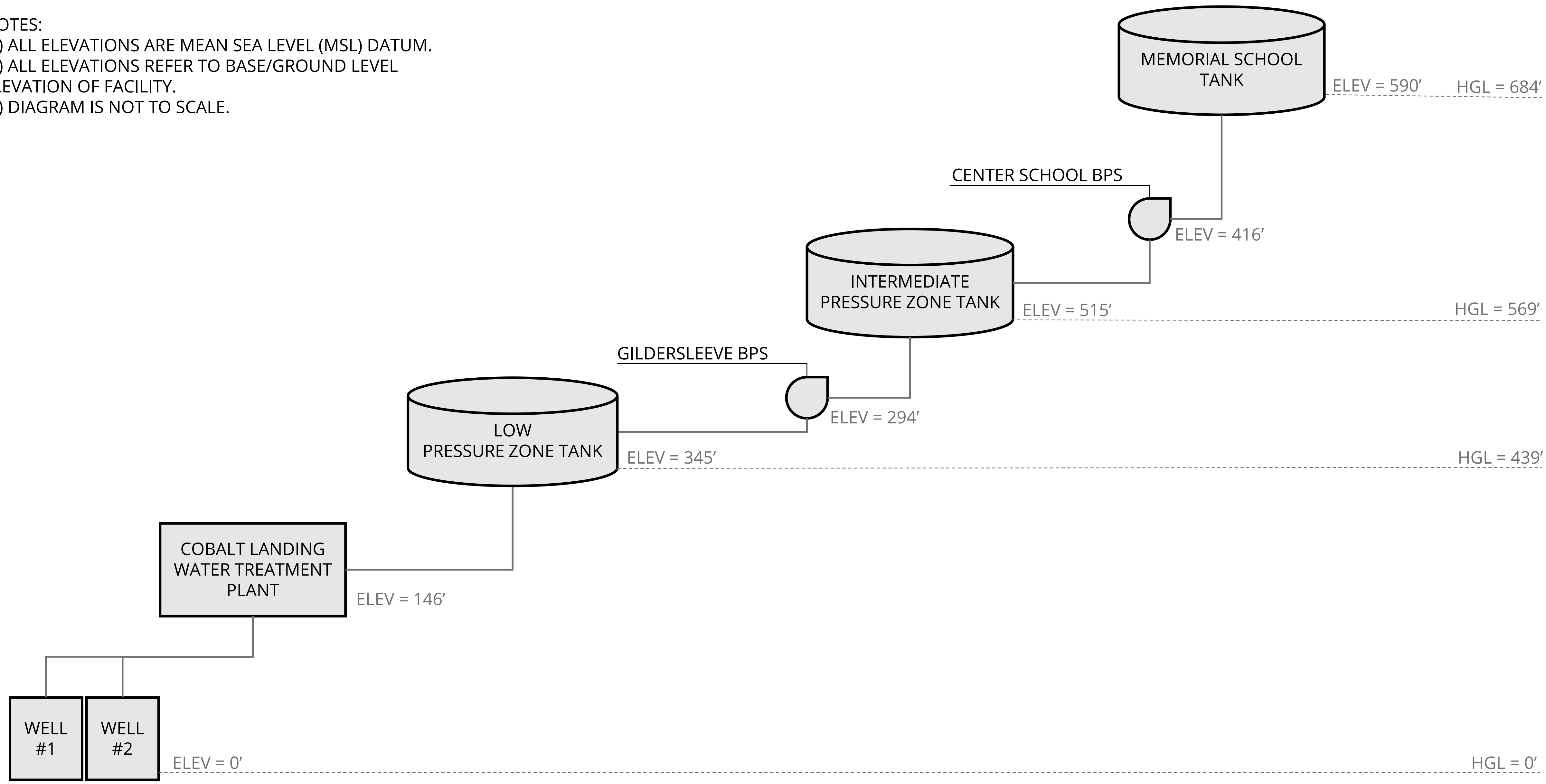
Figure 3-24
Center School Booster Pumping Station (High Pressure Zone)
East Hampton, CT
September 2023

0 50 100 200 Feet

Disclaimer: This map is intended for planning purposes

Figure 4-1 – East Hampton Water System Schematic

NOTES:
(1) ALL ELEVATIONS ARE MEAN SEA LEVEL (MSL) DATUM.
(2) ALL ELEVATIONS REFER TO BASE/GROUND LEVEL ELEVATION OF FACILITY.
(3) DIAGRAM IS NOT TO SCALE.



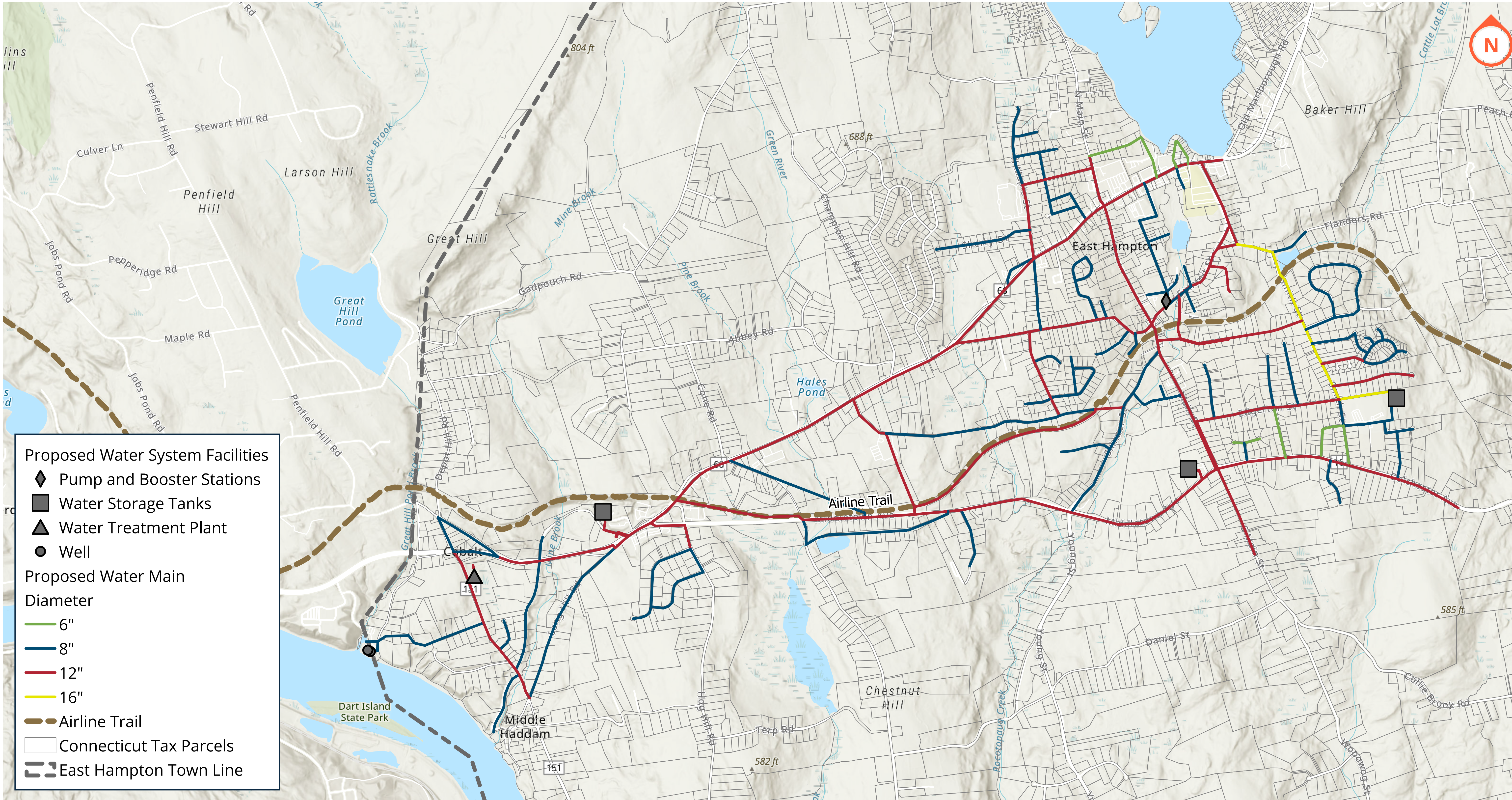


Figure 4-2

Proposed Water Mains by Diameter (Low, Intermediate, and High (Phase 1) Pressure Zones)

Town of East Hampton, Connecticut

September 2023

ENVIRONMENTAL PARTNERS
— An Apex Company —

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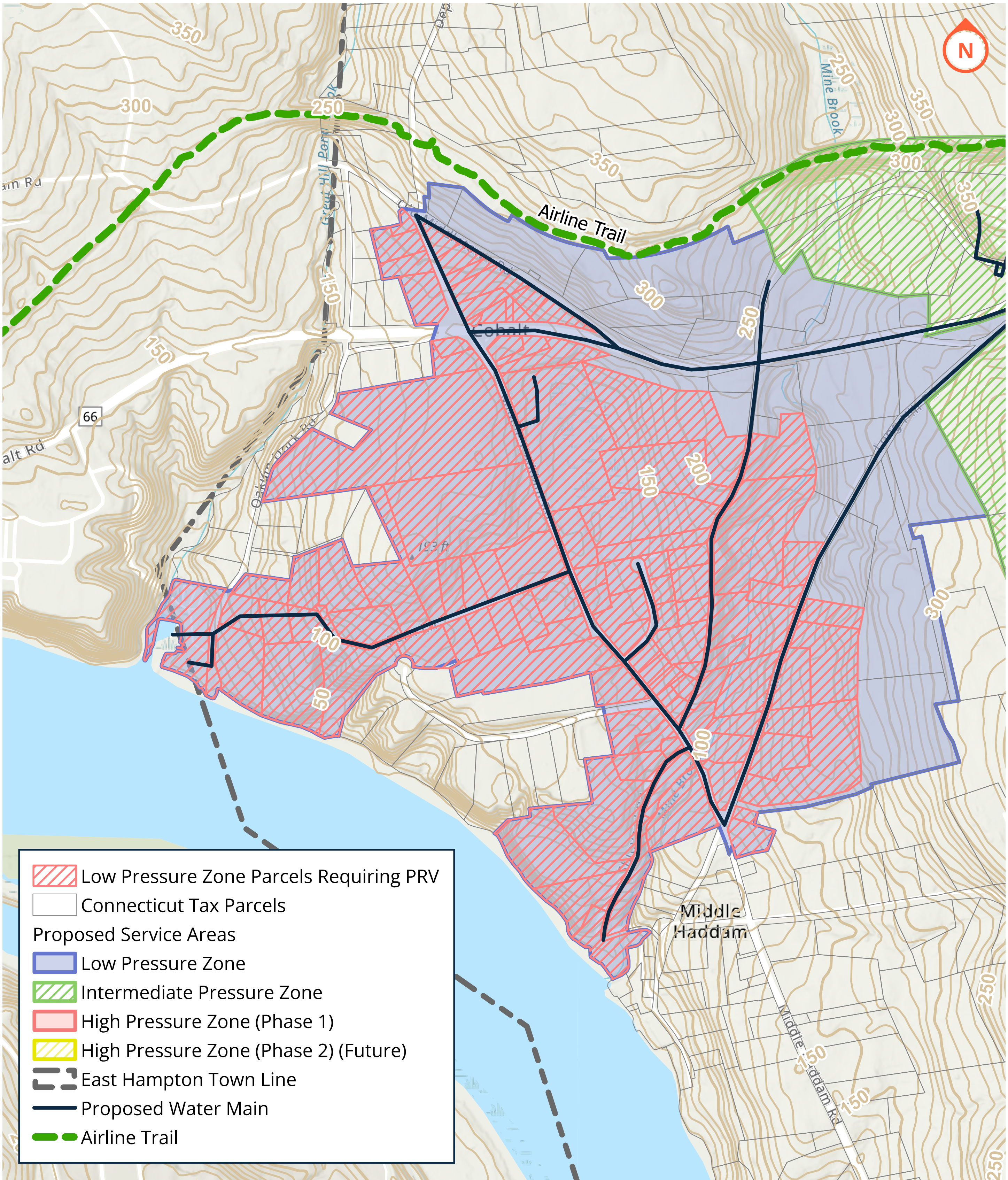

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Figure 4-3
Low Pressure Zone Parcels Requiring PRV for Service
East Hampton, Connecticut
September 2023

0 200 400 800 Feet

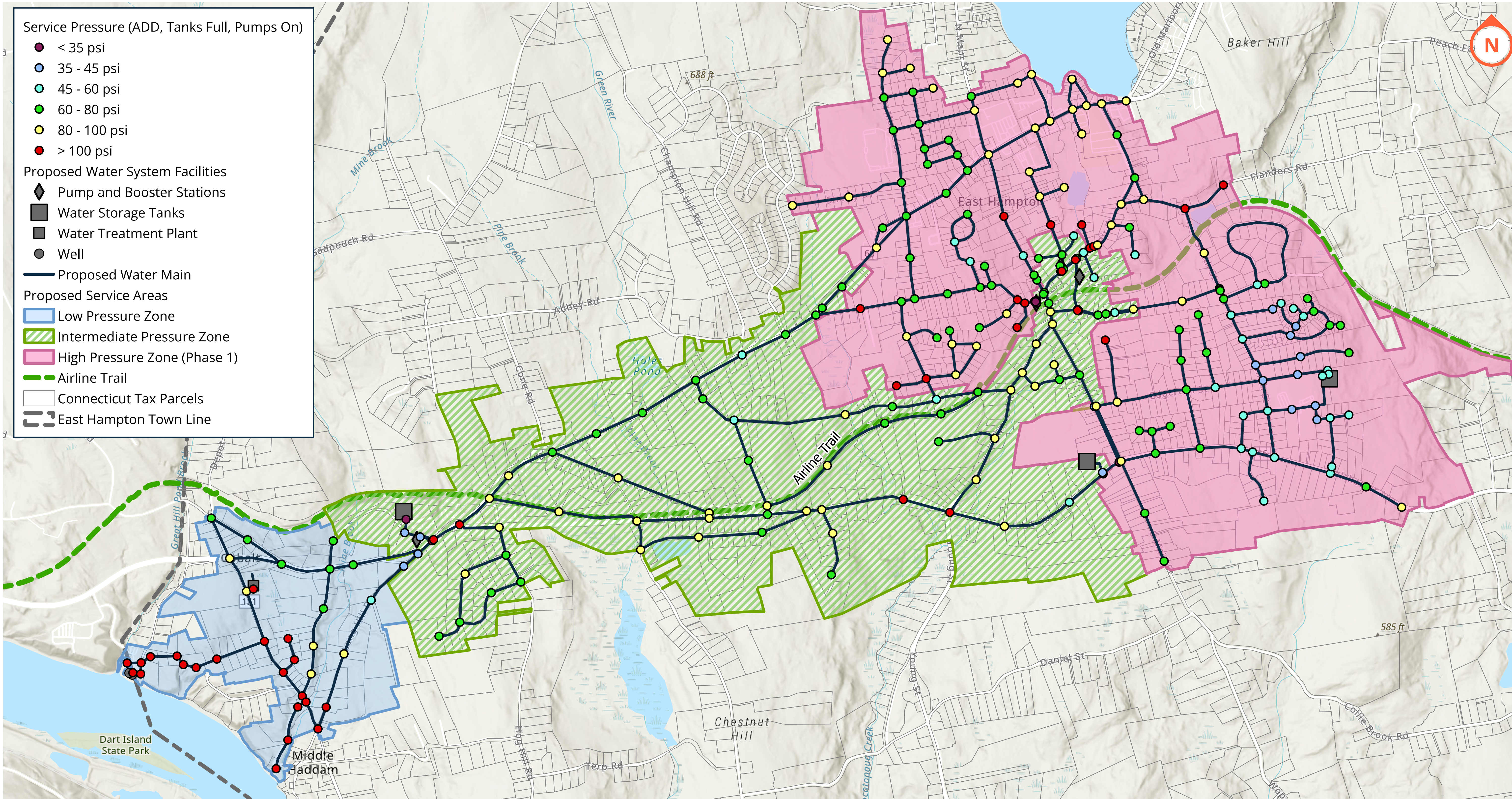


Figure 4-4

Service Pressures (ADD, Tanks Full, All Pumps On)

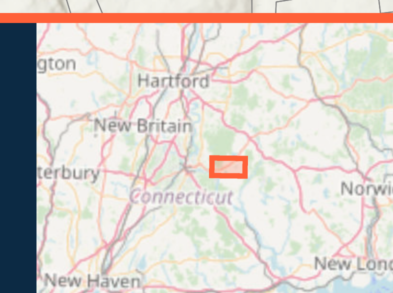
Town of East Hampton, Connecticut

September 2023

ENVIRONMENTAL PARTNERS

— An Apex Company —

0 | 2,500 | 5,000 | 10,000 Feet



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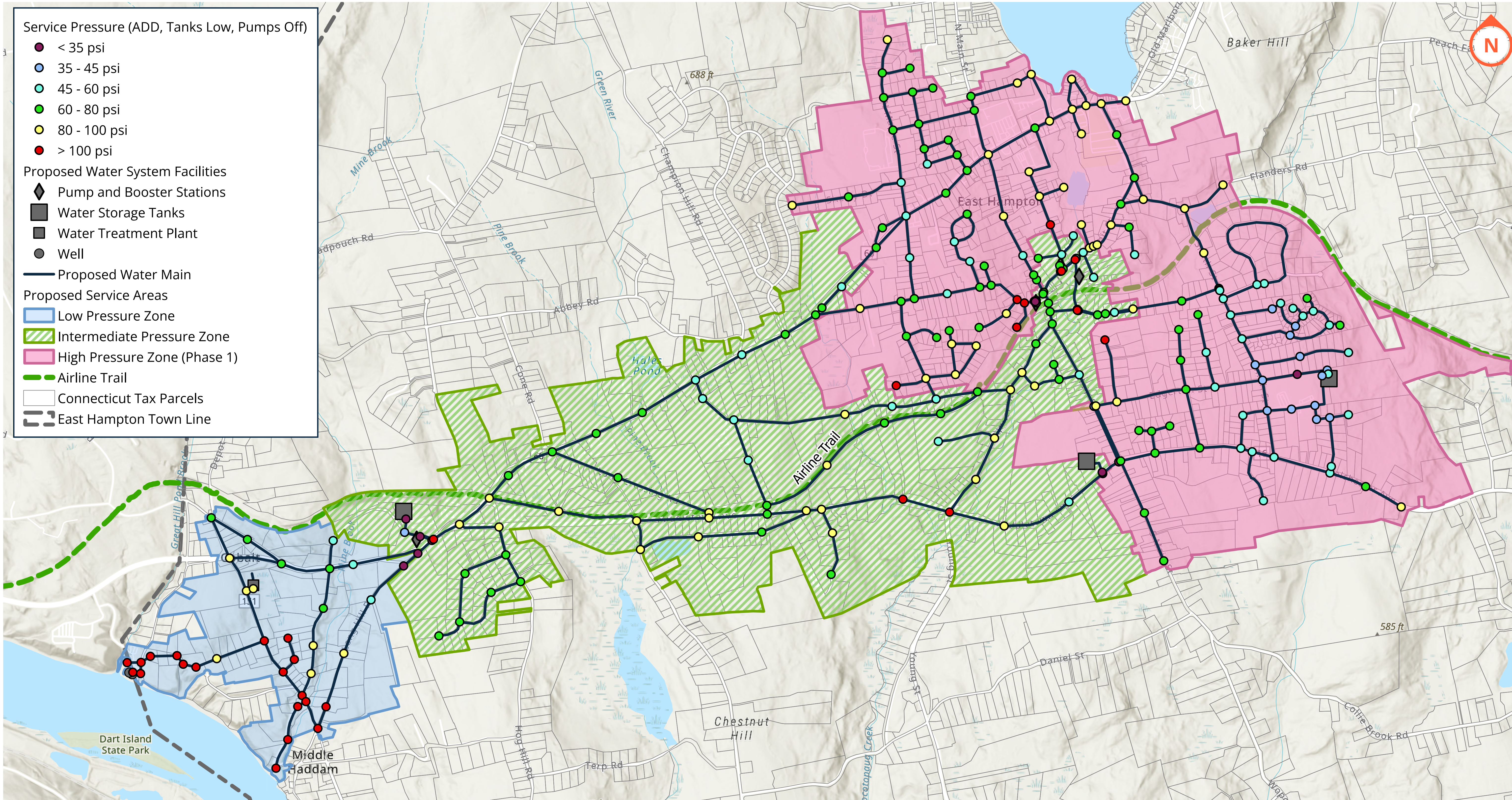
Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
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Figure 4-5
Service Pressures (ADD, Tanks Low, All Pumps Off)
Town of East Hampton, Connecticut
September 2023

0 2,500 5,000 10,000 Feet

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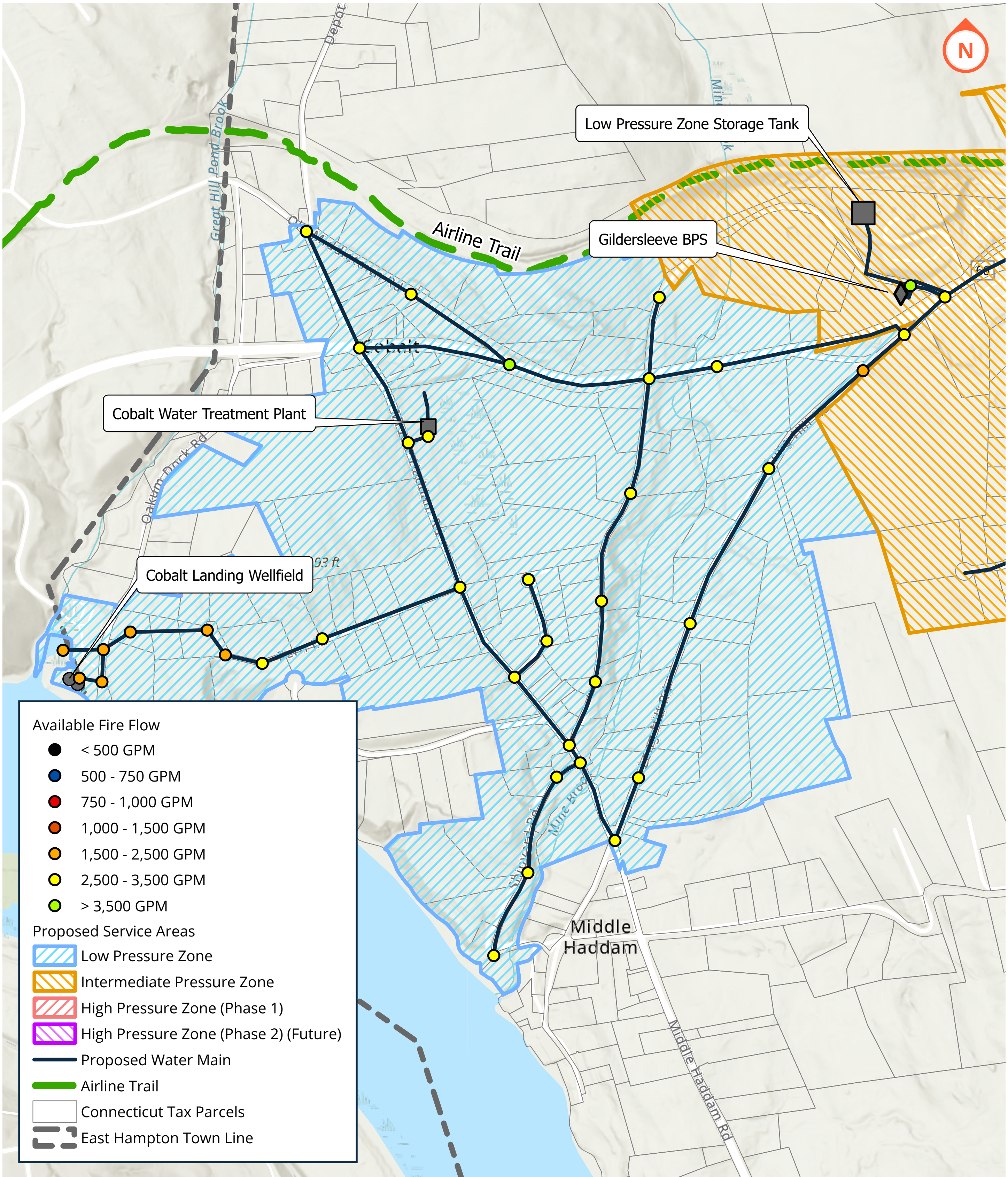


ENVIRONMENTAL PARTNERS

— An Apex Company —

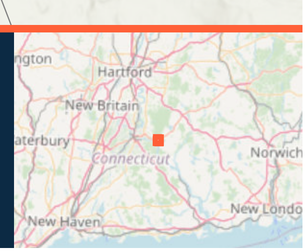
Figure 4-6

Low Pressure Zone Available Fire Flow

Town of East Hampton, Connecticut

September 2023

0 500 1,000 2,000 Feet



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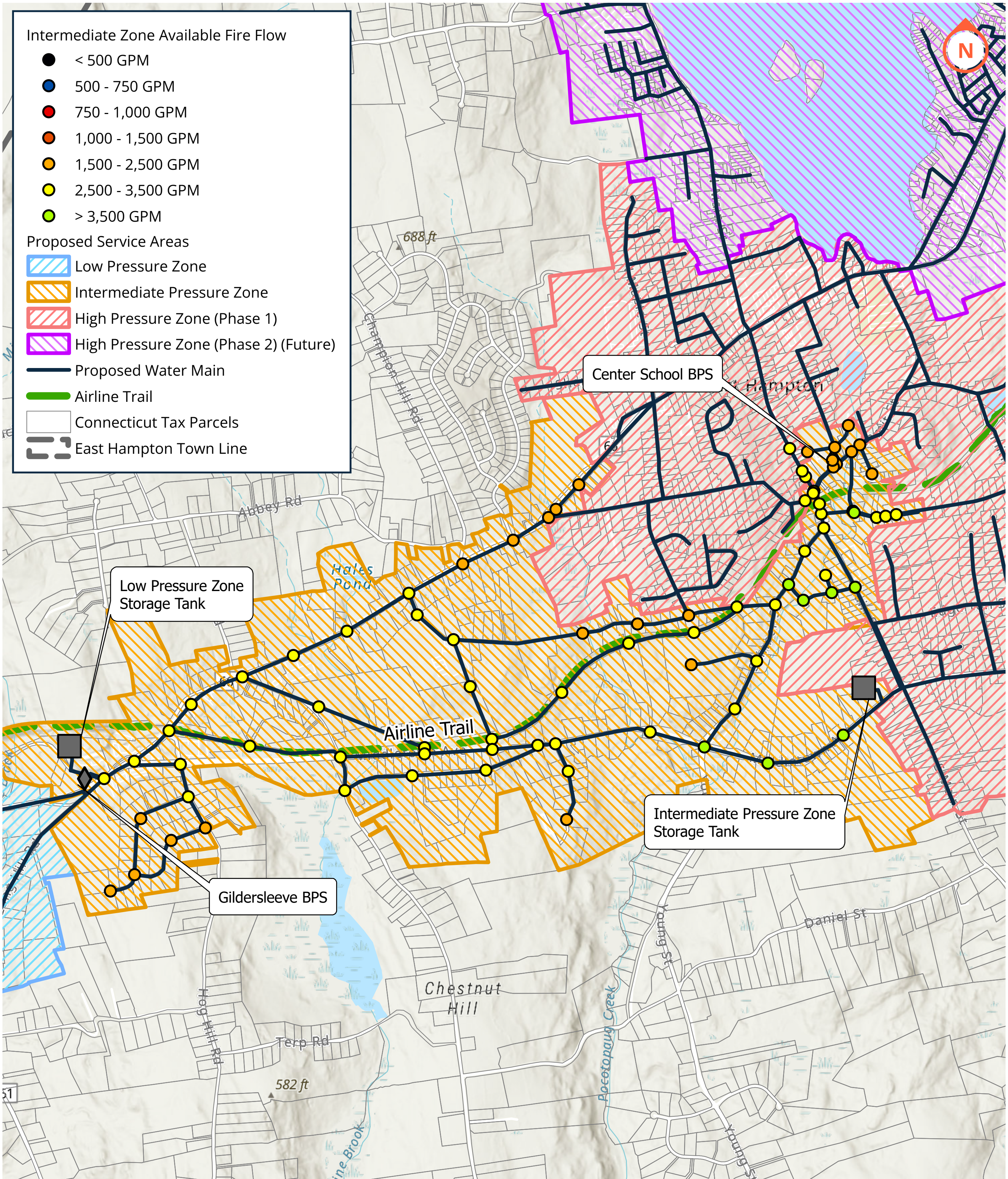
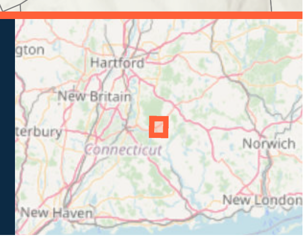
Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 4-7
Intermediate Pressure Zone Available Fire Flow
Town of East Hampton, Connecticut
September 2023

0 500 1,000 2,000
Feet
1:10,200



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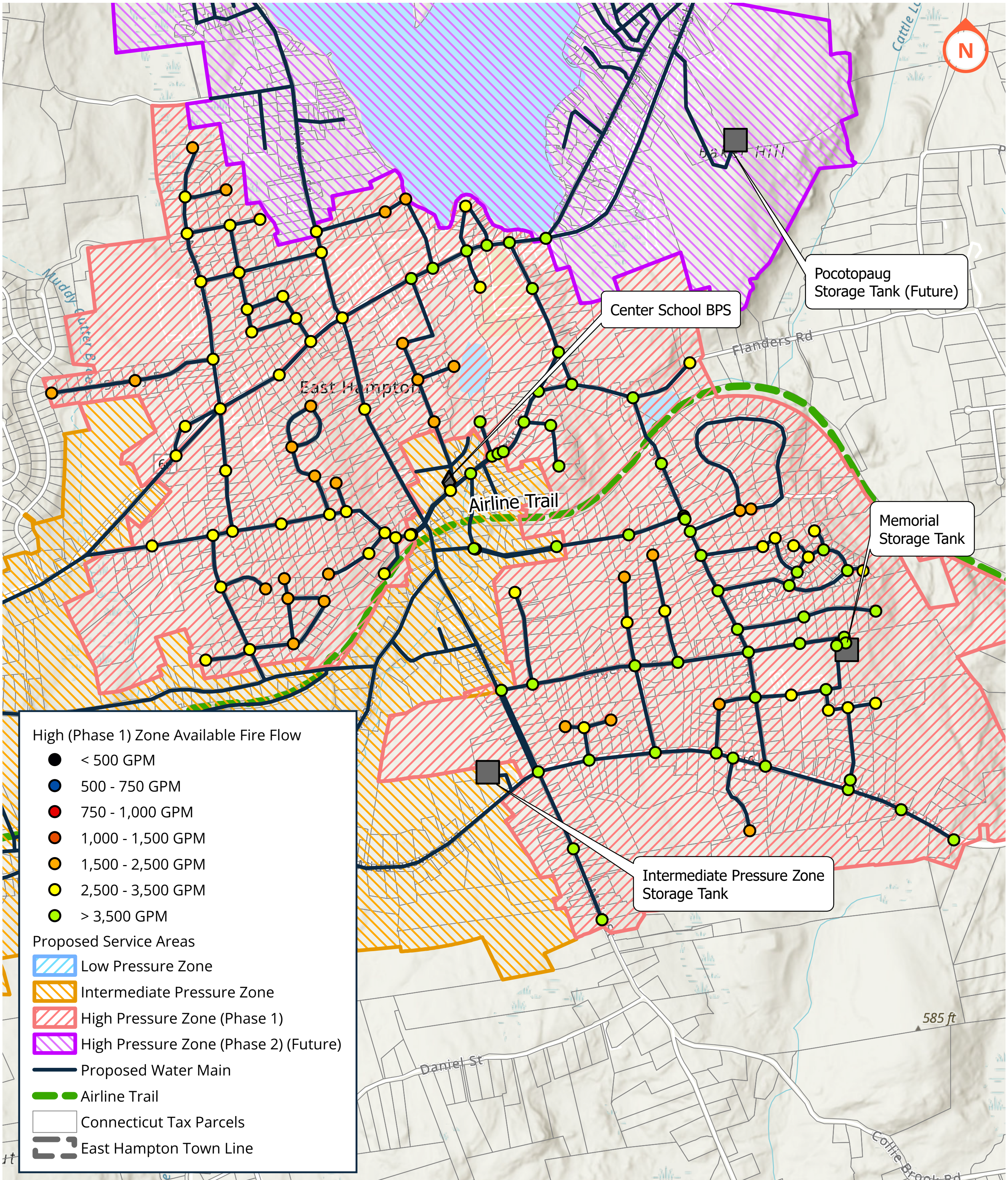
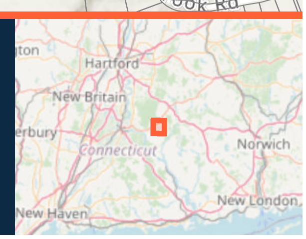
Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 4-8
High (Phase 1) Pressure Zone Available Fire Flow
Town of East Hampton, Connecticut
September 2023

0 500 1,000 2,000 Feet
1:10,200



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Disclaimer: This map is intended for planning purposes

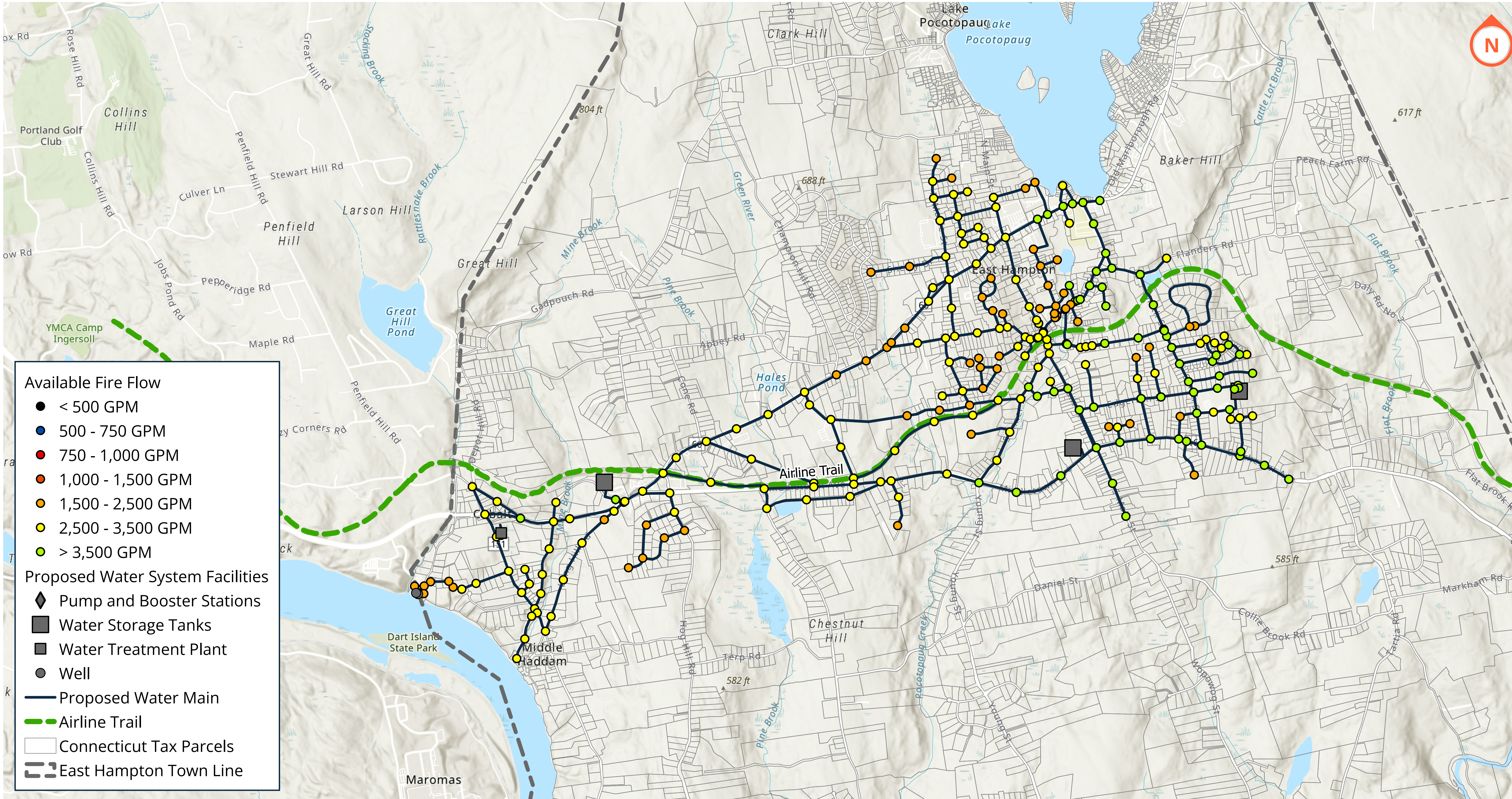


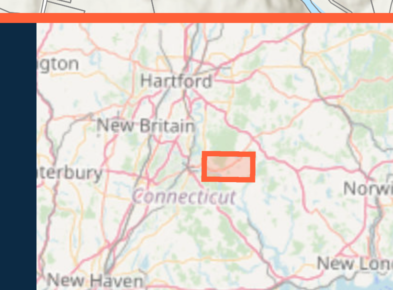
Figure 4-9

Systemwide Available Fire Flow (Initial Buildout)

Town of East Hampton, Connecticut

September 2023

0 2,500 5,000 10,000 Feet



ENVIRONMENTAL PARTNERS
— An Apex Company —

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Disclaimer: This map is intended for planning purposes

APPENDICES

APPENDIX A

Public Water Supply Evaluation Preliminary Engineering Report

PUBLIC WATER SUPPLY EVALUATION PRELIMINARY ENGINEERING REPORT

Town of East Hampton, Connecticut

June 2022

ENVIRONMENTAL PARTNERS

— An Apex Company —

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SECTION 1 PROJECT OVERVIEW

On behalf of the Town of East Hampton (the Town), Environmental Partners CT, LLC (EP) has prepared this Preliminary Engineering Report (PER) for the proposed water supply exploration for the Town's proposed water system expansion project. The Town is seeking funding for developing and expanding its existing water supply system through the Drinking Water State Revolving Fund (DWSRF) Program as administered by the Connecticut Department of Public Health (CTDPH).

The DWSRF Program requires that the Town prepare this PER as the initial stage of the funding process. As part of this program, the CTDPH has developed an Engineering Report Application Checklist and we have structured this report to address all items documented in the checklist. EP prepared this report using information obtained during discussions with the Town, during site visits, and from the following Town reports:

- Proposed Municipal Water System Preliminary Engineering Report – Dated January 2006
- Town of East Hampton Water Supply Plan – Dated September 2010
- East Hampton Municipal Water System Environmental Site Assessment – Dated July 2005
- The Need for and Feasibility of a Centralized Water System – Dated July 2006

SECTION 1.1 PROJECT DESCRIPTION

The Town is seeking to design and construct a municipal water system to serve the residents of the Town of East Hampton. The Town of East Hampton, in Middlesex County, is located in the geographic center of the state of Connecticut and has a population of about 12,700. Currently, most East Hampton residents rely on private groundwater wells for their potable water supply. Over the past several decades, there have been several groundwater contamination events, rendering private groundwater wells within the Town unsafe for public use.

Additionally, there are several small, isolated water systems in East Hampton. These private water systems were built to serve housing developments or businesses. Additionally, two Town-operated water systems, the Village Center System and the Royal Oaks System, serve a portion of the Town's residents. The Town's Water Pollution Control Authority (WPCA) operates the existing water systems and is also responsible for operation and maintenance of the Town's sanitary collection and treatment system.

The Town is looking to establish a centralized water system to serve more residents along with current and future businesses in East Hampton. During discussions with CTDPH and other State officials, the Town has explained that the extension of the existing water system and development of existing and future water supply sources is essential for public health and future development. The Town has initiated this project with the understanding that the selection and location of future water sources will inform and impact the configuration, cost, and available quantity of water for the proposed system. EP has encouraged the completion of this initial phase of the project before beginning final system design.

SECTION 1.2 HISTORY OF THE PROJECT

The Town has been studying the need for and feasibility of a public water system for over half of a century. For decades, East Hampton's Water Sub-Committee has supported the development of a centralized, municipally-owned and operated water system. With this goal, the Town has conducted various water supply studies which yielded no potential surface water sources but several possible groundwater sources.

Section 1.2.1 Water System Expansion

The Town attempted to introduce a municipal water system in a 1962 referendum for the first time, but this effort failed. In 1963, a water district was established for East Hampton by Special Act No. 216 of the Connecticut Legislature. Then, in 1983, the Village Center area experienced a groundwater contamination issue, which triggered CTDPH to order the Town to provide the affected residents with potable drinking water. Shortly thereafter, in 1988, the Village Center area experienced another contamination event with high levels of trichloroethylene (TCE) in the groundwater, further highlighting the need for the Town to establish a potable water system. In 1992, the Town brought the Village Center Water System online to serve customers and businesses in the Village Center area of East Hampton following groundwater water quality issues which plagued the private wells operating in the area.

In 2005, the Town constructed the Royal Oaks System, which currently supplies water to 113 service connections, including the Memorial School and Center School. The Royal Oaks System has two groundwater supplies with treatment systems: one located at the Memorial School and the second located east and north of the Royal Oaks subdivision.

The WPCA supply and distribution system currently includes six wells, three atmospheric and three hydropneumatic storage tanks, various water treatment systems, and approximately 2 miles of water mains. The Town currently holds an Exclusive Service Area that encompasses the majority of the Town. Aquarion Water Company and Connecticut Water Company also have small Exclusive Service Areas coincident with their water systems within the Town of East Hampton. EP has provided a complete description of the existing water facilities in East Hampton in Section 3.

Section 1.2.2 Past Water Supply Planning

In 2000, the Town funded an Engineering Study to determine the feasibility of establishing a municipal water system from a hydraulic and environmental permitting standpoint. This study evaluated three potential water supply aquifers including the Salmon River, Pine Brook, and Connecticut River as potential water supply sources for the Town. Ultimately, the report confirmed that the most viable option was the Connecticut River aquifer due to CTDPH Diversion Permit restrictions and the potential yield of the three aquifers.

In 2004, the State of Connecticut directed the Town to produce an Initial Water Supply Plan (IWSP), which was a significant step towards establishing a comprehensive water system. The IWSP explored possible siting options and retained the Town as the Exclusive Service Area provider for the Town of East Hampton. The Town updated its Water Supply Plan (WSP) most recently in September 2010 to discuss changes since the IWSP and its goals to expand its system to serve more of the Town's population.

Also in 2004, the Town developed and permitted the Cobalt Landing Wellfield. The well permitting process included performing a 5-day long pump test at the Cobalt Landing Wellfield, which established a pumping rate of 264 and 252 gallons per minute (gpm) for the two individual wells and an estimated safe yield of 743,000 gallons per day for the wellfield.

In 2006, the Town produced a Preliminary Engineering Report (PER) with Maguire Group, Inc., and this report documents the most recent attempt to establish a Town-wide water system. The PER recommended the most viable approach for constructing a Town-wide water system, which included a water supply source at the Cobalt Landing adjacent to the Connecticut River and Edgemere Wellfields. The report states that this supply option would provide ample water supply to a populous area of about six square miles of residences and businesses in the Town.

Additionally, the PER proposed one centralized water treatment plant, one wastewater pumping station, one water booster pump station, and two tanks. The 2006 PER divided the capital expenditures and facility construction into three phases. Phase I involved construction of water supply and treatment facilities as well as all associated distribution assets to serve an average daily demand of up to 0.75 million gallons per day (mgd). Phases II and III established the groundwork for constructing a water treatment and distribution system which could satisfy demands through the fifty year planning period.

Since the original PER, the planning period of fifty years has been shifted into the future. EP reviewed the original population and water demand projections and we believe that the 2006 projections are still valid due to limited population and business growth. Following discussions with the Town, EP believes that the limited growth is due to a lack of an expanded water supply and distribution system. With this project, the Town plans to build on the findings of the original PER to complete the current phase of its efforts to establish a municipal water system, which will be to establish safe and reliable water supply sources.

SECTION 1.3 PROJECT GOALS

The main goal of this project is for the Town to establish a centralized municipal water system and most importantly to provide the residents of East Hampton with reliable, safe drinking water. To do so, the Town has prepared this PER to present the alternatives considered and factors prioritized to select the most feasible and cost effective options for further exploration of supply sources for the proposed water system.

In order to establish a municipally-operated water system to serve the residents of East Hampton, the Town must first establish basic water system infrastructure to connect the Cobalt Landing

Wellfield to the Town center while also locating and constructing an additional water supply source to allow for and maintain consistent residential and commercial growth. After establishing viable water supply sources, the Town can better define, site, design and construct other water system components, including water supply, treatment, distribution, storage, pumping, and piping improvements. EP believes that the next crucial step for the Town is to establish its future viable water sources that are needed to supply growth through the 2070 planning year in advance of full system design. Therefore, we recommend that the Town establish future potential drinking water sources to better determine the general configuration of the water system, as well as establishing associated costs.

SECTION 1.4 REPORT ORGANIZATION

Section 1 provides a project description and project goals.

Section 2 describes existing environmental resources present in the project boundaries as well as population trends and community engagement approaches.

Section 3 details the Town's existing water system facilities.

Section 4 describes the need for constructing a centralized water system to serve the residents of East Hampton.

Section 5 discusses alternatives considered for establishing a water supply source.

Section 6 presents the preliminary project setup for the chosen water supply sources and associated permitting requirements, schedule, and cost estimates.

Section 7 presents a final conclusion and recommendations for the Town of East Hampton to pursue establishing a groundwater supply source.

SECTION 2 PROJECT PLANNING

SECTION 2.1 PROJECT LOCATION

The Town of East Hampton is 36.8 square miles in area. East Hampton is bordered by the Towns of Glastonbury, Marlborough, Colchester, East Haddam, Haddam, and Portland and the City of Middletown. East Hampton is bordered to the south west by the Connecticut River and contains multiple surface water bodies, the largest of which, Lake Pocotopaug, is located near the geographic center of town and in close proximity to East Hampton's Village Center area. Elevation within the Town of East Hampton ranges greatly from 10-feet to greater than 900-feet (NAVD) with lower elevations generally located in the southern portion of East Hampton, which progressively increase toward the north of town.

As of the 2020 US Census, the Town of East Hampton has 12,700 residents where the East Hampton Water Pollution Control Authority (WPCA) operates and maintains its public utilities. Currently, the WPCA provides the residents of East Hampton with sewer utility service. The WPCA maintains 113 water service connections through its Royal Oaks and Village Center water systems, while the remaining customers are served by private wells.

SECTION 2.2 ENVIRONMENTAL RESOURCES PRESENT

As previously mentioned, there are several surface water bodies within the borders of East Hampton. The WPCA's sole wastewater treatment plant discharges into the Connecticut River. The Town is planning to study the feasibility of establishing new water sources and intends to consider the environmental resources and potential impacts of establishing a groundwater water supply source at each potential site. The Town is also proposing to construct new water main and water system facilities within previously disturbed roadways and in undeveloped areas as a result of the future groundwater exploration and pumping studies.

The Town will take precautions to protect environmental resources in project areas during all construction activities. To mitigate potential disruption to the chosen project sites and surrounding areas, EP will include specifications for all necessary environmental protection and sedimentation/erosion control measures in the construction plans and documents. The Town also plans to provide construction observations to provide a greater degree of confidence that the contractor follows these requirements and provides protection for surface and groundwater systems in East Hampton. Finally, the Town will submit all required environmental permitting documents during the final design phase.

SECTION 2.3 POPULATION AND DEMAND PROJECTIONS

Section 2.3.1 Population Trends

EP utilized US Census data and the Town's 2010 Water Supply Plan (WSP) to project future population and water consumption for the Town of East Hampton. As previously mentioned and documented in the 2010 WSP, the WPCA currently serves 113 service connections, which equates to about 1,377 people being served in some capacity by the WPCA. As documented in the Town's 2010 WSP, the existing water system also supplies the Center and Memorial Schools. According to US Census data, as of 2020, the Town of East Hampton has a population of 12,709, which represents a decrease of approximately 300 people since 2010. As discussed previously, EP believes that the lack of an expanded public water supply has likely limited or stalled commercial and residential development.

The 2010 WSP projected the population of East Hampton through the year 2060 using data from the Connecticut State Data Center (CT SDC). US Census data reveals that the population recorded in 2020 was actually 12,709, as opposed to the 2010 WSP projection of 12,500. The 2010 projection was 1.6 percent lower than the actual population. While the population of East Hampton has trended downward over the past decade, EP believes that the establishment of a centralized water system will likely promote community growth, and therefore we have conservatively realigned population projections with the growth rate originally calculated in the 2004 and 2010 WSPs. In the 2010 WSP, a population trend line was approximated based on the number and zone classification of undeveloped parcels within the Town. EP used the growth rate calculated in the 2010 WSP to project the population of East Hampton over the fifty-year planning horizon. **Figure 2-1** shows historical population documented by CTDPH alongside the projected population of the Town of East Hampton based on the previously mentioned methodology.

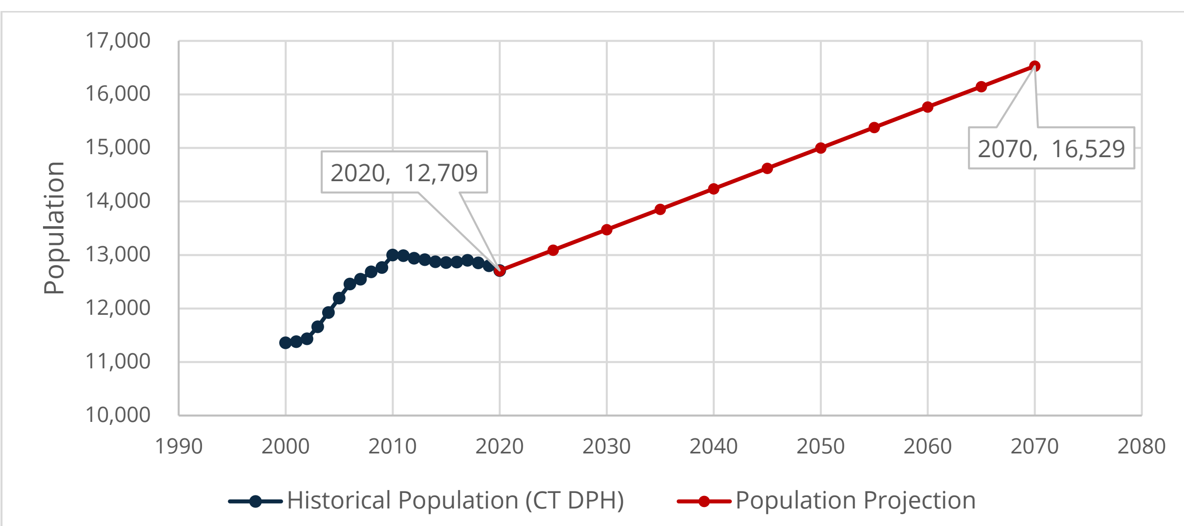


Figure 2-1: East Hampton Population Projection

EP projected the population of East Hampton to be approximately 16,529 in 2070, the end of the fifty-year planning horizon. Based on the data in **Figure 2-1**, the Town of East Hampton would benefit from establishing a centralized water system to promote community and economic growth. EP recommends that the Town establish a centralized water system that can meet the anticipated 2070 average daily demand (ADD) at a minimum. Under this scenario, the proposed water supply sources should provide supply in excess of all future anticipated demands through the 2070 planning period, which may depend on the service area boundaries to be established by the Town during the design process. **Section 2.3.2** documents detailed projected water demands.

Section 2.3.2 Water Demand Trends

EP utilized historical water consumption and population trends to analyze present and future water demands. According to the Town's 2010 WSP, the Town of East Hampton is primarily zoned as Residential Land with Town-wide, residential demands estimated at 75 gallons per capita per day (gpcd).

The WPCA currently serves about 2.2 percent of the Town's total population. Due to underutilized connections within the existing water systems, the Town estimates that the WPCA's existing systems are fully developed on the basis of water demand. According to WPCA production records, the WPCA produced a total of approximately 8.19 million gallons of water in 2021 between the Royal Oaks and Village Center Systems, amounting to an average daily demand of 22,425 gallons per day. The present water demand per capita of these systems is approximately 16.29 gallons per capita per day. This value is low when compared to standard residential demand per capita per day because some system users are encompassed in the institutional user category .

When the water system expands, EP projects that the system's ADD will be about 1.18 MGD at full buildout in 2070. The ADD projection is based on the increase in residential population, institutional and commercial growth, and the introduction of industrial demand to the system. With the limited water system expansion, EP believes that the 2010 WSP projected demands by service category were postponed and will begin to increase as shown in Table 2-1.

Table 2-1: Projected Demands by User Category

User Category	2021 (in gpd)	2025 (in gpd)	2040 (in gpd)	2070 (in gpd)
Residential	13,958	100,825	747,750	910,650
Institutional	2,000	2,200	35,000	43,300
Commercial	4,000	4,500	20,250	36,000
Industrial	-	-	24,750	45,000
Design Development	-	-	22,500	28,152
Public Authority	-	-	2,450	3,030
Total Revenue	19,958	107,525	852,700	1,066,105
Non-Revenue Water (%)	11%	10%	10%	10%
Non-Revenue	2,467	11,947	94,744	118,456
Total Consumption	**22,425**	**119,472**	**947,444**	**1,184,561**

To meet best industry practice and standards, the Town should size its water supply sources to meet peak demands. Typically, water systems experience maximum demands in the summer months, and without adequately sized supply and treatment facilities, the Town's authorities will need to exercise water curtailment restrictions. As established in the 2010 WSP, projected demands for the proposed municipal water system were calculated using a peaking factor of 1.21 for the maximum month demand and a peaking factor of 1.75 for the peak day demand. Based on this methodology, **Table 2-2** summarizes the projected water demands for East Hampton.

Table 2-2: Demand Projections through the Fifty-Year Planning Horizon

Year	Average Day Demand (gpd)	Maximum Month Demand (gpd)	Peak Day Demand (gpd)
2021	22,425	27,134	39,243
2025	119,472	144,561	209,076
2040	947,444	1,146,407	1,658,027
2070	1,184,561	1,433,319	2,072,982

Total water demand for the Town's proposed system will be dependent on the established service area boundaries; however, based on the Town's goal of providing water to the greatest number of residents in the most financially feasible approach, the maximum month and peak day demands for the Town are projected to be 1.43 and 2.07 MGD, respectively.

SECTION 2.4 COMMUNITY ENGAGEMENT

The Town and Water Sub-Committee plans to hold several Town Meetings about the project to inform their residents about the scope and intent of the project. To date, the Town Council and Water Sub-Committee have hosted several public meetings to discuss the Town's intentions to expand the WPCA's water system. The Town plans to schedule additional public meetings to present the project to the community and provide progress updates when appropriate and with assistance from EP.

SECTION 3 EXISTING FACILITIES

The Town issued Water Supply Plan documents in 2004 and 2010, which detailed the existing water system facilities within the Town of East Hampton. The East Hampton WPCA operates two separate water systems: the Royal Oaks System and the Village Center System. Additionally, there are multiple non-community water system facilities within the Town of East Hampton, mainly owned by private developments and water companies.

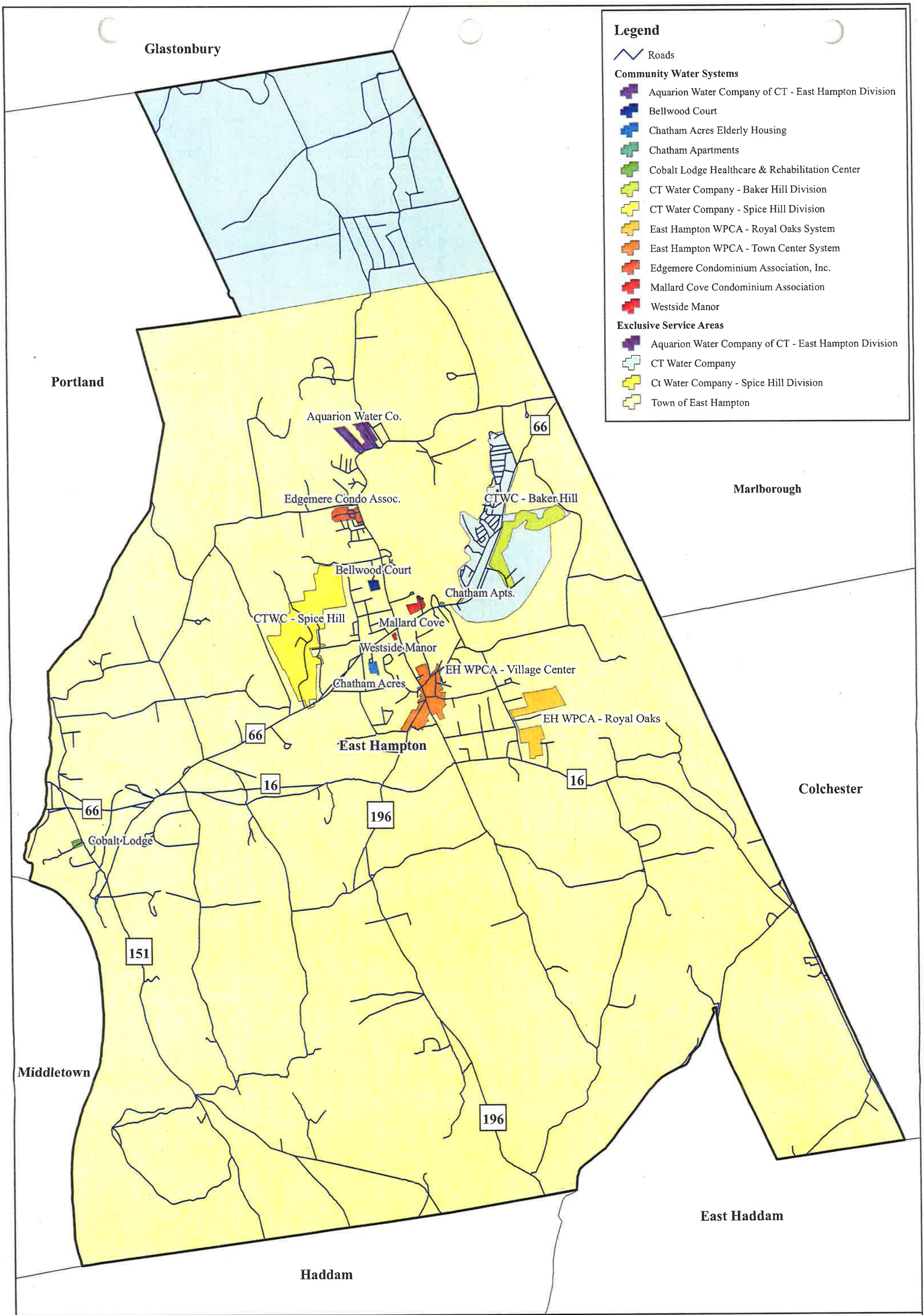
SECTION 3.1 COMMUNITY WATER SYSTEM FACILITIES

As previously mentioned, the East Hampton WPCA operates and maintains two water systems, the Village Center System and the Royal Oaks System. These systems serve 92 residential water service connections and 22 commercial and institutional water service connections. **Table 3-1** presents a breakdown of the customers served by the WPCA by category.

Table 3-1: WPCA Service Connections by User Category

Category	Village Center System	Royal Oaks System	Total
Residential	10	82	92
Commercial/Public	20	0	20
Institutional	1	1	2
Total	31	83	114

In addition to the two water systems owned by the WPCA, there are eleven public water systems within the Town of East Hampton, according to the CTDPH Community Water System list. **Figure 3-1** shows the existing community water system extents within the Town of East Hampton.



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Community Water Systems & Exclusive Service Areas

LOCATION: East Hampton, CT

MMI#: 3083-06
MXD: H:\AppFig1.mxd
SOURCE: CT DEP, CT DPH

N

Town of East Hampton Water Supply Plan

Map By: SJB
Date: 9/17/2010
Scale: 1:42,000

SHEET: Appended Figure 1

Section 3.1.1 Water Supply

WPCA-Owned Existing Water Supply

The Royal Oaks and Village Center Systems, owned and operated by the WPCA, utilizes groundwater wells to supply their respective systems. According to the 2010 WSP, the Royal Oaks System currently contains four groundwater wells: Well #1, Well #3, Well #4, and the Memorial School Well. Combined, these wells have a total safe yield of 39,852 gallons per day.

Photo 1: Royal Oaks Wellfield

The Village Center System currently contains two groundwater wells: Well #1 and Well #2, with a total safe yield of 55,080 gallons per day according to the 2010 WSP.

As previously mentioned, the Village Center and Royal Oaks Systems have ample present and future water supply capacities. **Table 3-2** details the specific physical characteristics for each well.

Table 3-2: WPCA-Owned Well Characteristics

	Royal Oaks System				Village Center System	
	Well 1	Well 3	Well 4	Memorial School	Well 1	Well 2
Location	Royal Oaks	Royal Oaks	Royal Oaks	Memorial School	Basement of Center School	Behind Baseball Backstop at Center School
Type	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled	Bedrock – drilled
Diameter	6-inch	6-inch	6-inch	8-inch	6-inch	8-inch
Depth	405 feet	405 feet	405 feet	N/A	160 feet	300 feet
Pumping Capacity	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm	9.9 gpm
Safe Yield	9.0 gpm	9.0 gpm	9.0 gpm	N/A	23 gpm	28 gpm

Pump capacity for each community water system not owned by the WPCA is variable by system. Section 5 presents information on available water supply for existing community systems

Cobalt Landing Wellfield

In addition to the six wells utilized by the WPCA for water supply, the WPCA owns two wells at the Cobalt Landing Wellfield, in close proximity to the Connecticut River. The WPCA drilled these two wells in 2004 to determine the available water supply at this location in case of future water system expansion. The wells at the Cobalt Landing Wellfield are permitted to supply up to 0.90 MGD, but are not currently operational or connected to any customers. EP discusses the Cobalt Landing Wellfield further in **Section 5**. **Figure 3-2** shows the existing conditions at the Cobalt Wellfield Site.

Photo 2: Cobalt Wellfield Existing Conditions

Section 3.1.2 Water Treatment Facilities

The WPCA operates three treatment facilities: one for the Village Center System and two for the Royal Oaks System. The unit processes at the Village Center System treatment facility include initial sodium hypochlorite addition for oxidation of metals, potassium carbonate addition for pH adjustment, alkalinity adjustment, and softening, Greensand filtration for removal of metals, granular activated carbon (GAC) adsorption for PFAS removal, and final sodium hypochlorite addition for residual disinfection. The treatment facility for the Village Center System is located in the Center School. Following treatment, water enters the distribution system.

Photo 3: Treatment Facility for the Village Center System

Similar treatment chemicals are used for treating the raw water supplied by Wells No. 1, 3, and 4 in the Royal Oaks System. The unit processes at the Village Center System treatment facility include initial sodium hypochlorite addition for oxidation of metals, potassium carbonate addition for pH adjustment, alkalinity adjustment, and softening, Greensand filtration for removal of metals, granular activated carbon (GAC) adsorption for PFAS removal, and final sodium hypochlorite addition for residual disinfection. The Memorial School Well pumps water into its own treatment facility within the Memorial School; the treatment process for this water is a dosage of soda ash and treatment via GAC for PFAS removal before being discharged to the school and distribution facility.

Photo 4: Treatment Facility for the Royal Oaks System

Photo 5: Treatment Facility at the Memorial School

Section 3.1.3 Storage Facilities

The WPCA operates three tanks between their two systems. The Village Center System utilizes one 40,000-gallon concrete atmospheric tank. The Royal Oaks System utilizes two steel atmospheric storage tanks, with a storage capacity of 15,000-gallons each. The Town cannot provide adequate fire protection with its current available storage facilities.

Section 3.1.4 Water Distribution System

The WPCA currently owns and maintains 10,575 feet, or 2.00 miles of water main. All water mains, with the exception of transmission main, are installed within the roadway right-of-ways and beneath roads. The WPCA finances, designs, and constructs all water main within their systems. System developers pay for water main installed for other community water systems, which are approved by the WPCA. **Table 3-3** details the existing water main characteristics within the WPCA's water systems.

Table 3-3: WPCA-Owned Distribution System Characteristics

	Street	Diameter (inches)	Material	Length (feet)
Royal Oaks System	Joseph Court	8	DI	180
	Julia Terrace	8	DI	540
	Mathieu Lane	8	DI	1860
	Nicholas Court	8	DI	180
	Rachael Drive	8	DI	250
	Ray Lane	8	DI	230
	Royal Oaks Avenue	8	DI	1700
	Smith Street	12	DI	840
Village Center System	Bevin Boulevard	12	DI	130
	Main Street	12	DI	1025
	Skinner Street	12	DI	1070
	Summit Street	12	DI	890
	Walnut Avenue	12	DI	720
	Waltrous Street	12	DI	960

Due to the location and higher elevations of the Royal Oaks and Village Center Systems, the hydraulic grade line is relatively high compared to the elevation range within the Town of East Hampton. The Village Center System serves customers at ground level elevations ranging from 360 feet to 420 feet. The Royal Oaks System serves customers at ground level elevations ranging from 505 feet to 600 feet.

Generally, the WPCA's distribution system can only provide limited fire protection. **Section 4** describes fire protection within the system.

SECTION 3.2 NON-COMMUNITY WATER SYSTEMS

In addition to the thirteen community water systems in the Town of East Hampton, there are 42 non-community water systems within the Town. By definition, these water systems are considered to be non-transient systems, which regularly serve at least 25 people over six months of the year, or transient systems, which serve customers who do not remain for long periods of time.

SECTION 4 NEED FOR THE PROJECT

The need for this project is well documented in past reports and studies of the system. Establishing a centralized water system for the residents of East Hampton would be mutually beneficial for its potential customers and for the WPCA. Both the community and non-community systems within the Town have experienced a history of deficiencies, which could be remedied by a centralized water system. By developing a centralized water system, the Town will enhance supply reliability, maintain public safety, promote community growth, and support the Town's overall health and well-being.

SECTION 4.1 BENEFITS TO PUBLIC HEALTH

Many areas within the Town of East Hampton have experienced a history of groundwater quality issues. As most of the Town is served by private wells on each resident's property, groundwater pollution is of great concern for East Hampton.

The Town has suffered from a history of widespread groundwater contamination originating near the Village Center and later in the WPCA's wells. As documented by the CTDPH, the Chatham Health District has also reported contamination in private wells regularly. When first establishing the Village Center System, the Town's primary goal was treating groundwater that was contaminated with volatile organic compounds, including hydrocarbons and methyl-tert-butyl-ether (MTBE), a gasoline additive. Even with the few satellite treatment systems online, the WPCA still faces water quality and quantity issues, including naturally occurring factors such as bacteria and iron and manganese presence in the raw water supply, as well as unreliable water supply during droughts.

As of 2006, most community water systems not operated by the WPCA are in violation of drinking water codes and regulations, as presented in the *Need and Feasibility of a Centralized Water System for East Hampton* report. These non-compliance events are magnified by the administrative burden placed on the CTDPH to monitor water quality data and issue violations. This issue is ongoing, as private well owners are rarely required to test their drinking water for regulated contaminants, if at all. By establishing a centralized water system, the WPCA can relieve residents of requirements to monitor and treat their water by delegating this task to trained operators.

Unreliability of potable water is a health concern. By expanding its existing water system, the WPCA will establish redundant water supply sources and improve fire protection for the residents of East Hampton. Additionally, by consolidating water system ownership to the WPCA, the Town can reduce cost per gallon of operation by optimizing system operations, instead of relying on the owners and operators of each private water system.

Finally, the WPCA currently faces fire flow deficiencies throughout the Town. The Town's firefighting ability is restricted to tanker-truck and some surface water sources. By developing and extending the existing water system, the WPCA will extend the distribution system with more hydrants and construct storage tanks with sufficient fire flow storage to enhance fire protection capabilities for the residents of East Hampton.

SECTION 4.2 COMMUNITY GROWTH

As discussed previously, the WPCA cannot expand its water customer base with the current water supply and treatment capabilities in the Village Center and Royal Oaks Systems. Therefore, EP does not anticipate increasing development and corresponding water demands over the next few decades within these existing systems. By establishing a centralized and expanded water system, East Hampton can prepare for and promote overall residential and commercial growth.

As mentioned in **Section 2**, the Town of East Hampton experienced a decline in population over the past decade. While population has declined, the Town anticipates future residential and commercial sector growth, if the water system is expanded. Without increasing its drinking water supply and extending the distribution system, the Town cannot rely on the existing water supply facilities and private wells with water quality issues while also encouraging future economic development within East Hampton. As discussed, the Town cannot develop future residential and commercial areas due to the lack of adequate water sources within the Town.

As the community continues to grow, the Town has expressed interest in retaining its Exclusive Service Area rights to the Town of East Hampton. To avoid forfeiting these rights, the Town must take action to provide its residents safe and reliable drinking water via its own system by developing existing and new water supply sources and expanding the distribution system.

SECTION 5 ALTERNATIVES CONSIDERED

In this section, EP describes the potential alternatives for water supply sources, which is the foundational step in developing a centralized municipal water system. The Town initially explored proposed water sources and assessed future growth and development while preparing the following planning evaluations:

- 2004 Initial Water Supply Plan,
- 2006 Preliminary Engineering Report, and
- 2010 Water Supply Plan.

EP has further described and modified these potential alternatives for future water supply sources in this report. EP is proposing the exploration of two additional sources of water to serve as many people as possible in the Town of East Hampton while remaining financially and geographically feasible.

EP evaluated several sources of water supply within the Town of East Hampton. Following discussions with the Town of East Hampton's Water Sub-Committee, EP examined the following considerations for establishing water supply sources:

- Land Ownership
- Redundancy of Supply
- Presence of Existing and Potential Contamination
- "Permitability" with Connecticut State Departments
- Adequacy of Water Supply Volume Available

EP completed a desktop groundwater evaluation of potential water sources within the Town of East Hampton using the aforementioned considerations. EP first limited potential sites to land owned by the Town or the State of Connecticut, including parcels which may be purchased by the Town for water supply. Next, EP evaluated the surficial geology and aquifer potential of the Town- and State-owned parcels within the Town of East Hampton. EP also sifted through the remaining viable sites to further analyze sites only with non-regulated groundwater and without contamination. Finally, EP chose sites for further exploration that were classified as open space and had little to no environmental impacts. The full methodology for the desktop groundwater evaluation is presented in Appendix A.

Following extensive research and discussions with the Town, EP presented the following water supply alternatives for further exploration:

1. Alternative 1 – No Action
2. Alternative 2 – Combine Existing Water Systems
3. Alternative 3 – Connect Cobalt Landing Wellfield
4. Alternative 4 – Develop Pine Brook Wellfield

5. Alternative 5 – Evaluate Water Supply Interconnections with Adjacent Water Suppliers

Figure 5-1 shows the location of each water supply alternative explored within the Town of East Hampton.

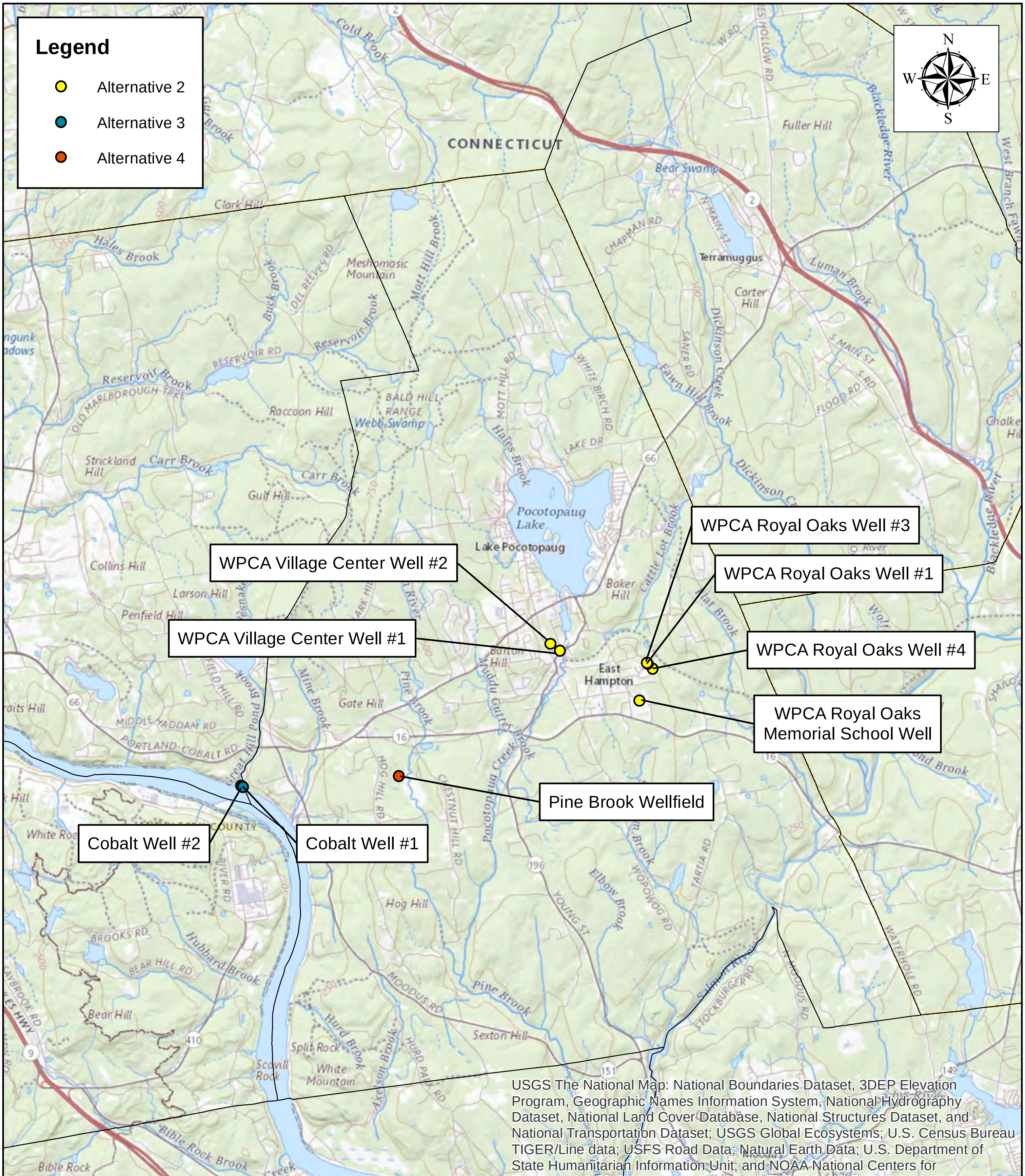

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FIGURE 5-1
WATER SUPPLY ALTERNATIVES
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

SECTION 5.1 ALTERNATIVE 1: NO ACTION

Section 5.1.1 Description

EP evaluated the “No Action” alternative, in which the WPCA would continue to operate its Royal Oaks and Village Center Systems, community systems would remain operationally separate, and customers without municipal water service would continue to utilize private wells.

Section 5.1.2 Advantages

For the “No Action” alternative, the Town would not incur any new capital costs or disrupt residents or traffic patterns in any of the proposed areas because there would be no construction. This approach eliminates any potential short-term construction-related and work force problems. Additionally, this alternative would not have any adverse side effects to ecological and natural factors because no construction would occur.

Section 5.1.3 Disadvantages

Without further developing the municipal water system, the residents and businesses of East Hampton continue to be susceptible to water quality and available fire flow concerns. This approach would perpetuate public safety concerns related to limited or no available potable drinking water supply within the Town for consumption if water quality issues arise as they have historically. The Town has been concerned with a resurgence of issues as contaminated groundwater plumes migrate towards established private and community groundwater supply sources.

SECTION 5.2 ALTERNATIVE 2 – COMBINE EXISTING WATER SYSTEMS

Section 5.2.1 Description

EP evaluated combing existing community water systems to centralize the Town’s water system and consolidate current water supply sources. As described in Section 3, the Town’s WPCA currently owns and operates six groundwater wells which currently serve the Village Center and Royal Oaks Systems. The combined safe yield available from the existing wells in the Royal Oaks System is 27.0 gpm, equivalent to 39,852 gallons per day. The combined safe yield available from the existing wells in the Village Center System is 51.0 gpm, equivalent to 55,080 gallons per day. Currently, the safe yield of the Village Center System wells is almost double that of the Royal Oaks System wells.

Location

The existing WPCA wells are located near the geographic center of East Hampton, near the village center area of Town. The existing Village Center Wells are located at 1 Community Drive on a Town-owned parcel. The existing Royal Oaks Wells 1, 3, and 4 are located in the parcel behind the residential properties on Matheiu Lane. The Royal Oaks Memorial School Well is located on the property of the Memorial School building. **Figure 5-2** provides the USGS map of the WPCA well locations and **Figure 5-3** presents the aerial map of the WPCA wells.

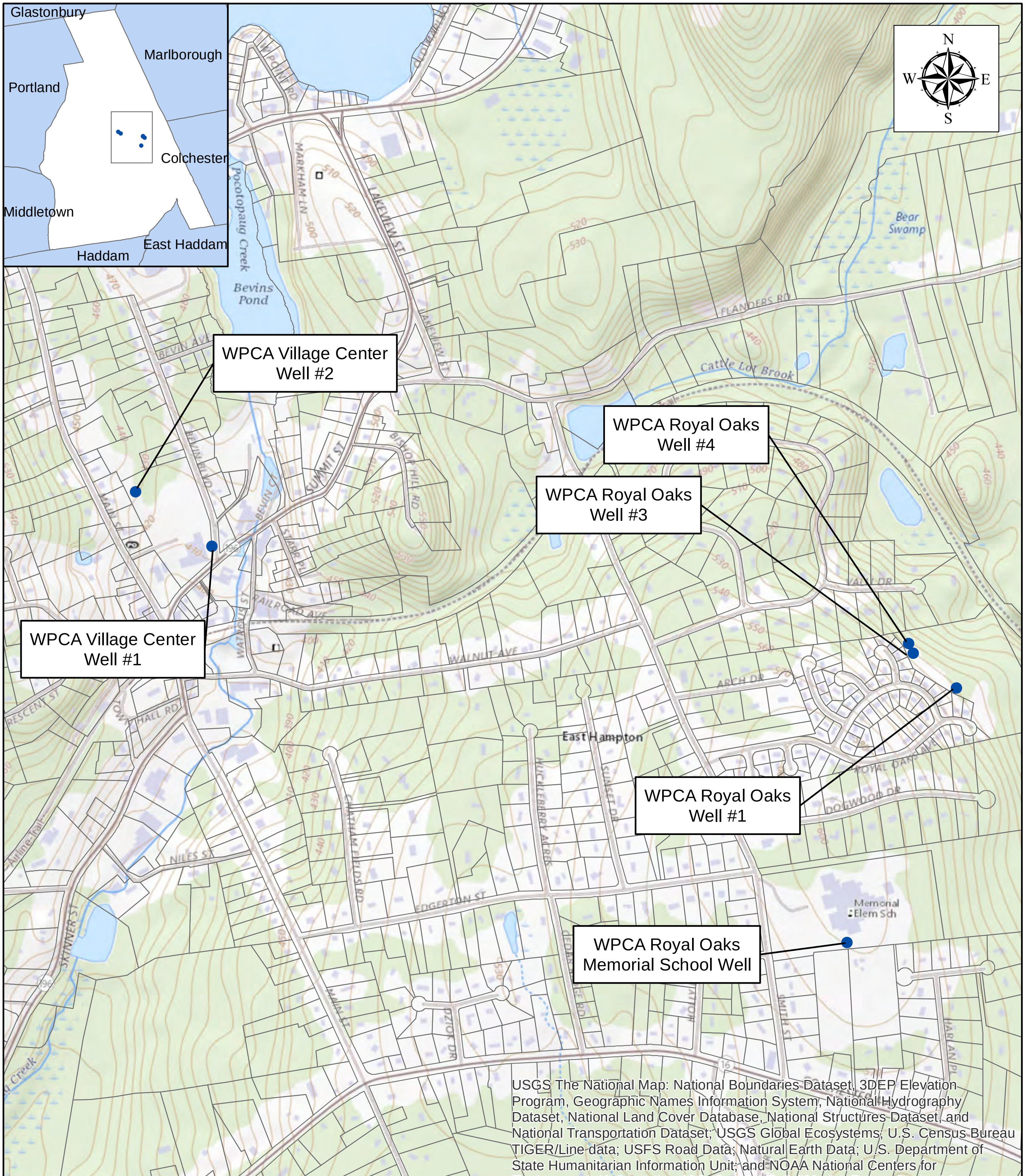

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FIGURE 5-2
EXISTING WPCA WATER SOURCES
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Town of East Hampton 1767 Connecticut

FIGURE 5-3
EXISTING WPCA WATER SOURCES AERIAL MAP
Town of East Hampton, Connecticut
Water System Evaluation
April 2022

Environmental Factors and Groundwater Evaluation

EP anticipates very minimal impact to environmental resources during the construction of this alternative, which will primarily include the installation of water mains to connect the existing water systems. All construction activities will occur within the roadway right-of-way and in previously disturbed areas. **Figure 5-4** shows the environmental resources located in the proposed project area based on the Connecticut Department of Energy and Environmental Protection (CTDEEP) GIS Open Data Layers. If the Town decides to carry out this alternative through construction, EP will assist the Town with filing all required environmental permitting as needed during the final design phase. The Town will also include detailed erosion and sediment control measures in the Contract Documents while observing all construction work with a Resident Project Representative (RPR).

Additionally, EP evaluated groundwater quality and aquifer material at the sites. While the existing WPCA wells have been functional for several years, evaluating proximity to contamination points and other groundwater quality concerns is important in determining the longevity of combining the existing WPCA systems as a solution for establishing a centralized water system. As shown in the following figure, the Village Center Wells are located in an impaired area. **Figure 5-4** shows the existing Royal Oaks and Village Center well site groundwater characteristics.

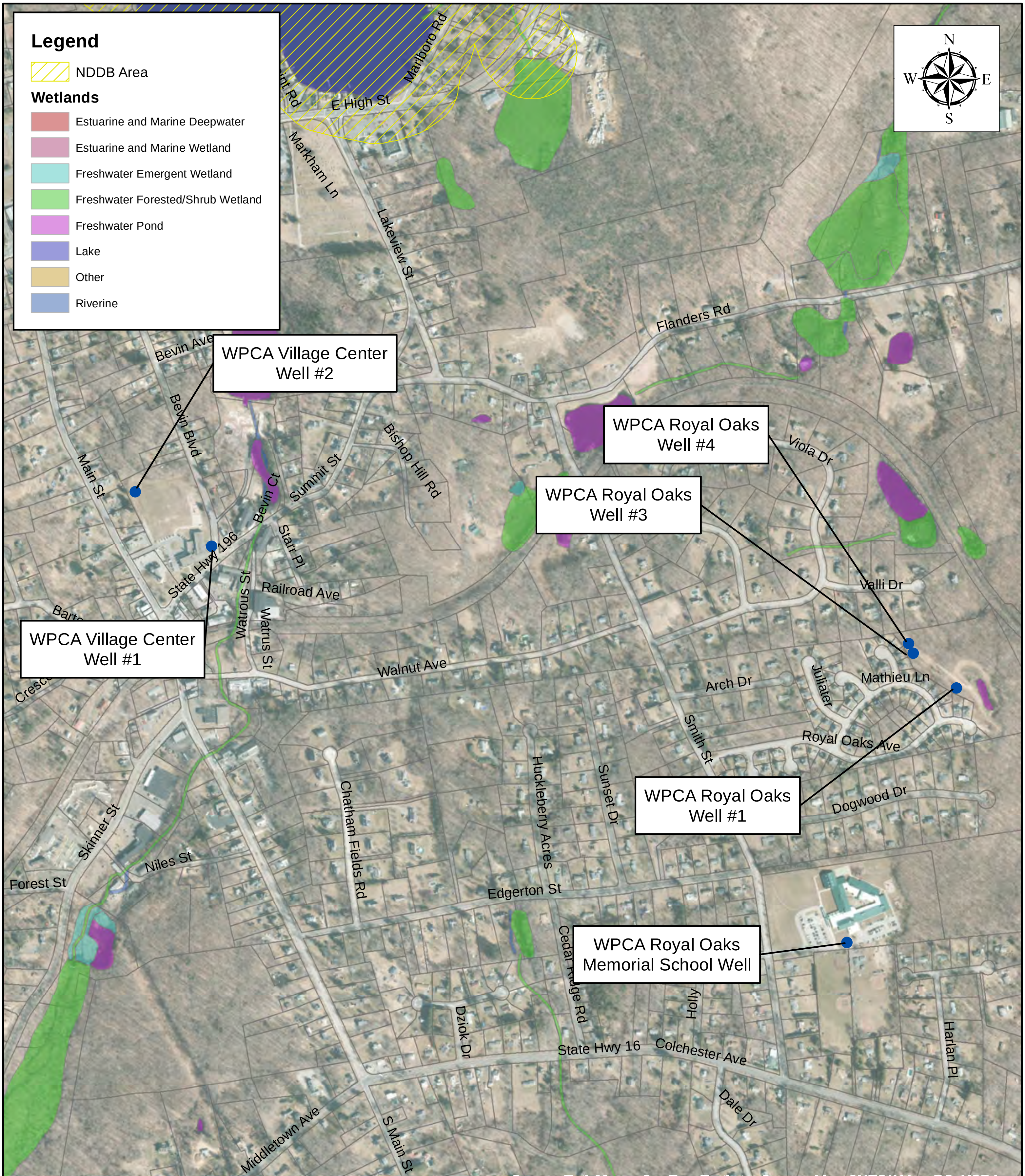

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FIGURE 5-4
EXISTING WPCA WATER SOURCES ENVIRONMENTAL FEATURES
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Existing WPCA Wells - Environmental.mxd

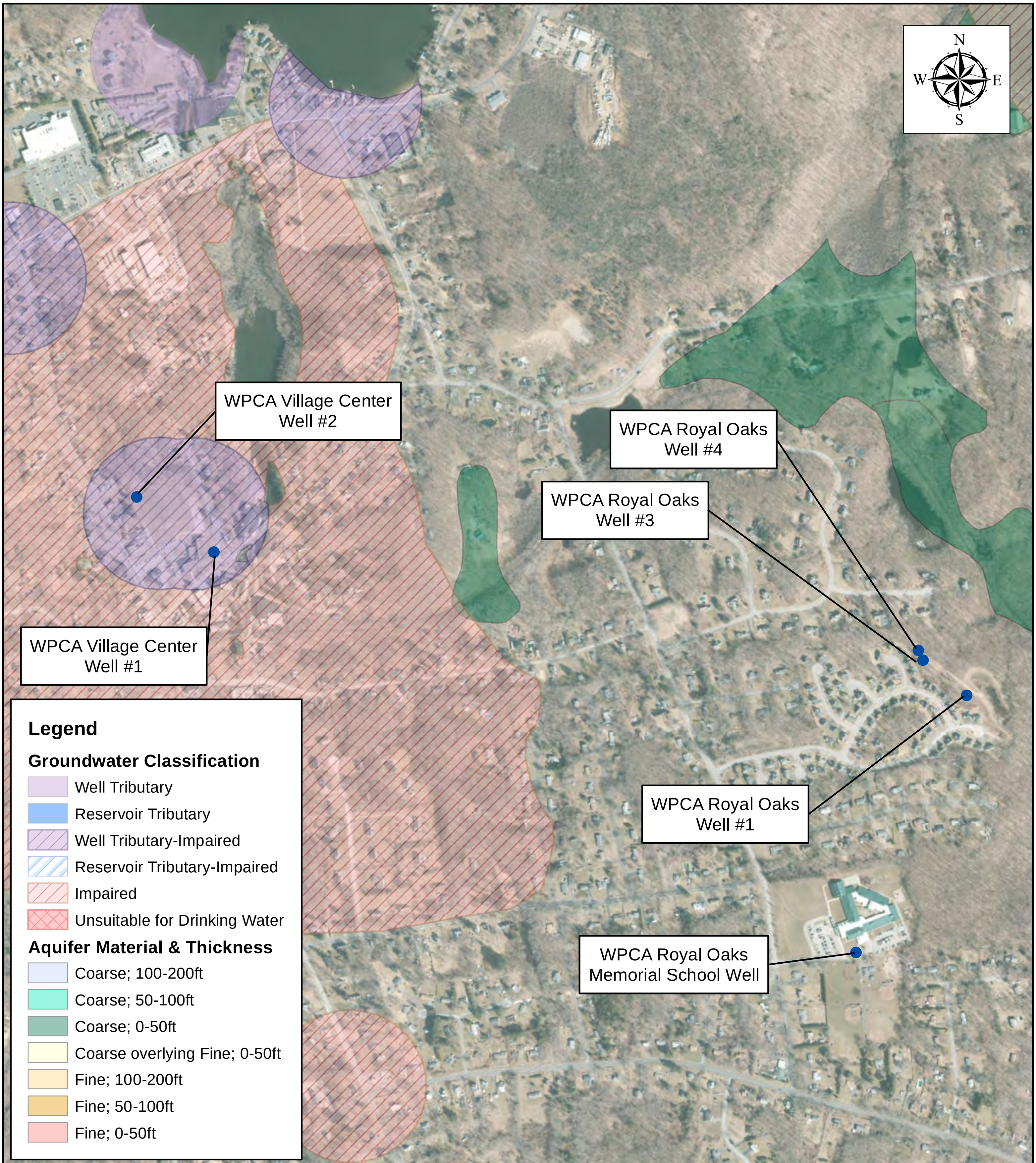

FIGURE 5-5
EXISTING WPCA WATER SOURCES
GROUNDWATER AND AQUIFER CHARACTERISTICS
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Existing WPCA Wells - Groundwater and Aq Char.mxd

Section 5.2.2 Advantages

If the existing water supply sources are maintained and the distribution system is expanded to connect these sources, the Town would avoid additional capital expenditures on the labor and material involved in completing pump tests, groundwater quality analysis, and well construction. Additionally, the Town would avoid the potential environmental impacts and permitting associated with establishing a new groundwater water supply source.

This alternative also allows the Town to establish redundant sources of supply for its centralized system. By utilizing the existing well sources, the Town would have six separate sources for use and could maintain service to its customers in the event of a point failure at one of the wells or within the system. Additionally, the existing wells for the Village Center and Royal Oaks Systems are already located near the most populous area of Town, minimizing the need for lengthy and large diameter transmission mains. The Town would also increase revenue with additional water customers connecting to the new water mains installed between the existing satellite systems.

Section 5.2.3 Disadvantages

To connect the WPCA's existing systems into one centralized system, the Town would need to construct several miles of water main, posing challenges with traffic control and environmental resource disruption. Additionally, this alternative would require a water quality evaluation to analyze potential outcomes of mixing potable treated water from separate supply sources. The hydraulic grade varies for each system, which complicates the sharing water between the systems, if connected.

Additionally, the existing well supplies have a combined safe yield of 0.112 MGD. While this supply volume is adequate for serving the current customers in the Royal Oaks and Village Center areas, this supply volume is not great enough to serve a centralized municipal water system with additional customers and anticipated community growth. Additionally, the well facilities at these locations are built out to house the current pumps and storage tanks used for these systems, so altering the physical configuration of the current well sources would pose logistical difficulties and capital expenditures associated with renovating the existing facilities. Finally, as shown in Figure 5-4, the Village Center wells are located in an area with impaired groundwater quality, which may impact the longevity of these wells as a water source.

SECTION 5.3 ALTERNATIVE 3 – COBALT LANDING WELLFIELD

Section 5.3.1 Description

The Cobalt Landing Wellfield is located adjacent to the Connecticut River at the end of Oakum Dock Road on a Town-owned easement near the East Hampton/Portland Town Line. In 2004, the Town installed two production wells at the site for potential source water production. A 5-day pump test was performed in accordance with the Connecticut Department of Environmental Protection (CTDEP, now recognized as CTDEEP) Level A Standards, established pumping rates of 264 and 252 gpm for the two wells. Following the diversion permitting process, the CTDEP established a safe yield for the wellfield of about 743,000 gallons per day following the pump test.

Location

The Cobalt Landing Wellfield is located at the end of Oakum Dock Road along the Connecticut River. The wellsite is located to the west of the Village Center area of Town and the well station improvements will occur within a Town-owned easement for this alternative. **Figure 5-6** provides the USGS map of the project area and **Figure 5-7** presents the aerial map of the proposed wellsite.

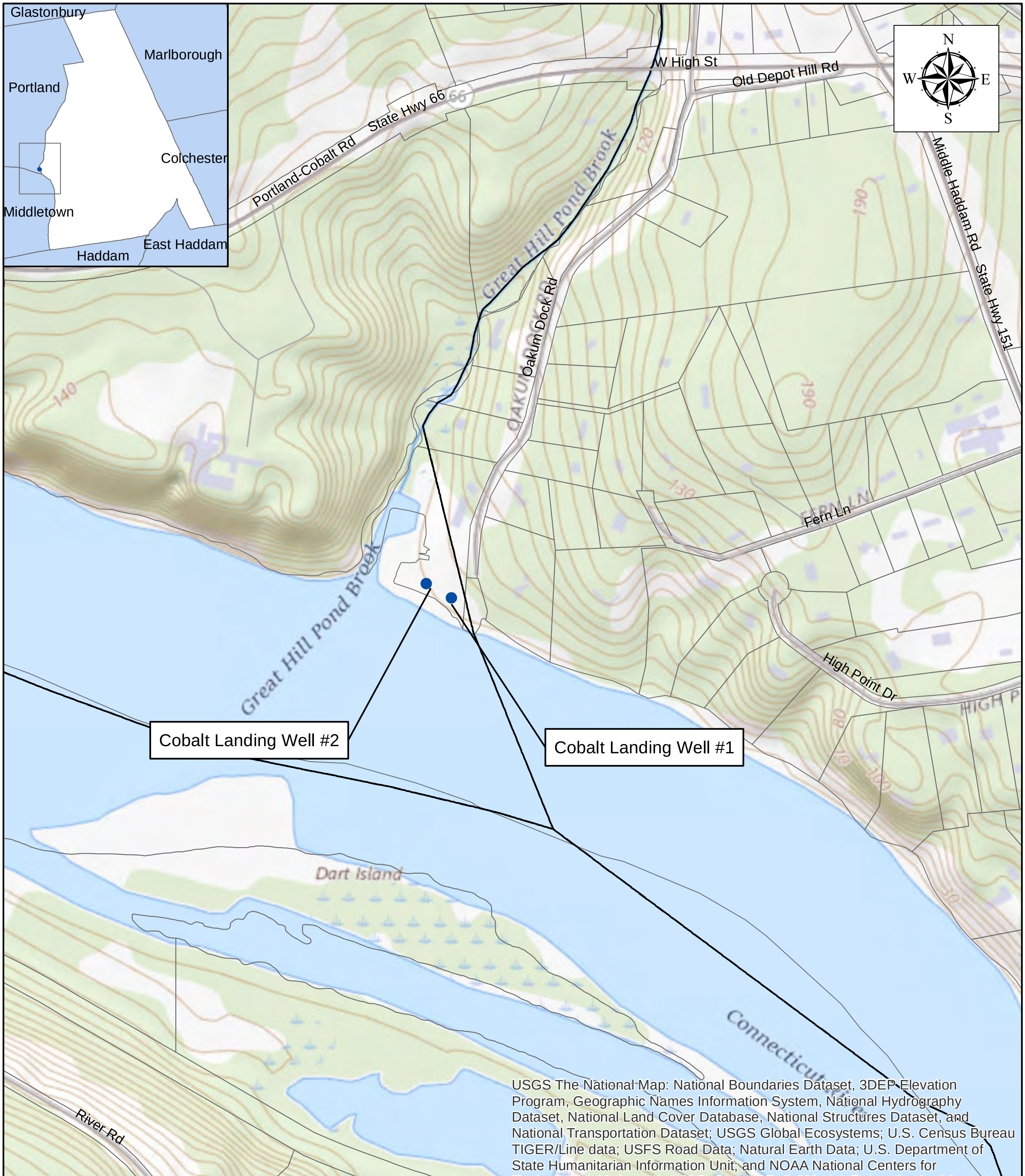

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FIGURE 5-6
COBALT LANDING WELLFIELD
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Cobalt Landing Site - USGS.mxd

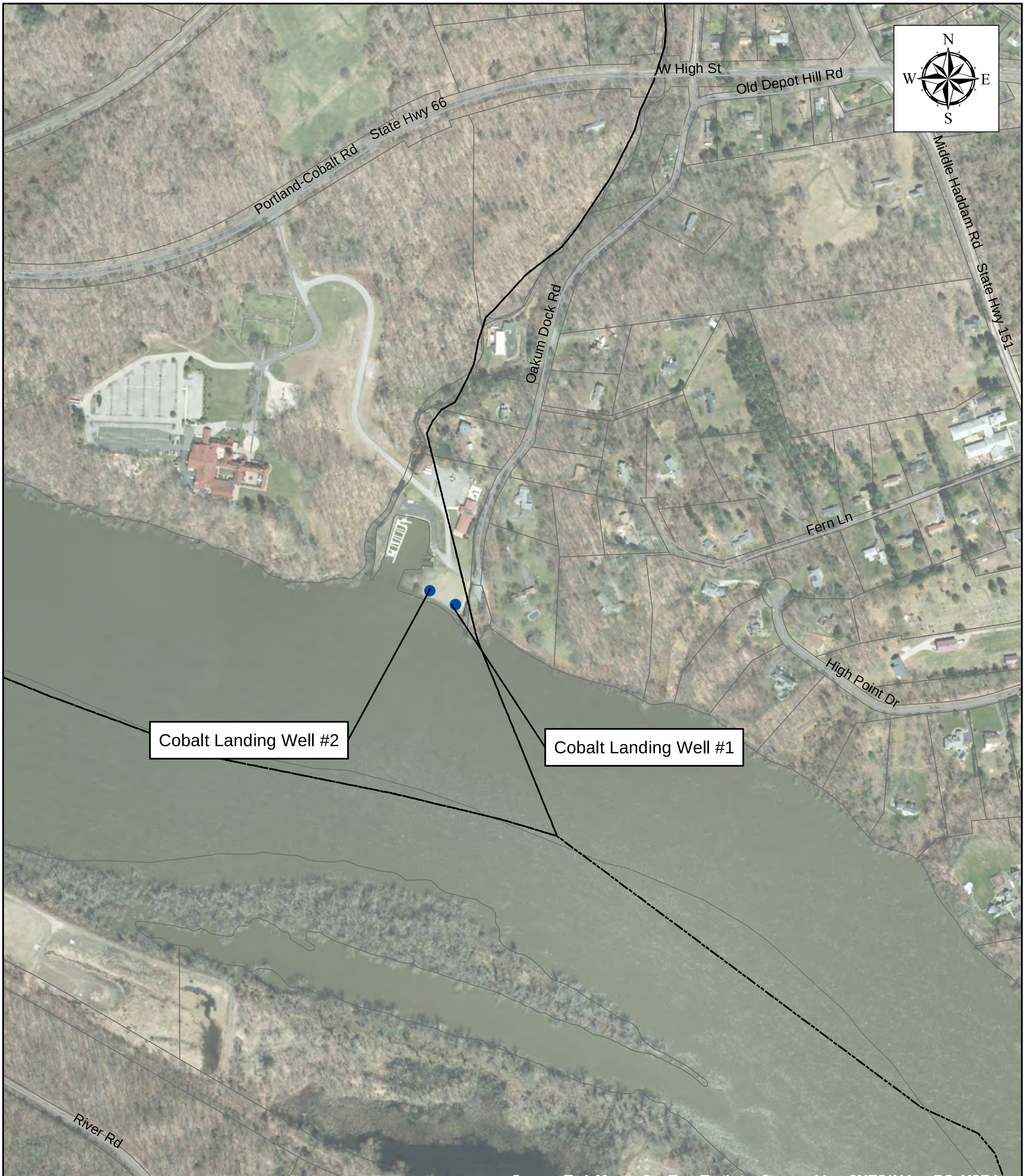

FIGURE 5-7
COBALT LANDING WELLFIELD AERIAL MAP
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Environmental Factors and Groundwater Evaluation

EP anticipates minimal impact to environmental resources during the additional construction of this wellfield, which will primarily include the installation of submersible pumps, pitless adapters, and connection water mains along with associated instrumentation/SCADA and electrical connections for the proposed wells. Water main construction will mainly occur in previously disturbed areas. Additional drilling will not be required, as the two wells at the site can be used for water supply.

There are some wetlands areas in the vicinity of the existing wells, including Freshwater Forester/Shrub Wetlands. CTDEEP delineated the wetland areas and produced GIS Open Data Layers as shown on **Figure 5-8.** The Cobalt Landing wells are not located within the area or buffer zone of any existing wetlands as shown by CT DEEP GIS Open Data layers. However, the Cobalt Landing Wellfield falls within a critical habitat, delineated as a Natural Diversity Database (NDDB) area. Also, the Cobalt Landing Wellfield is located within the 200-foot stream buffer of the Connecticut River.

EP's desktop groundwater evaluation revealed that the Cobalt Landing wellsite is rich with course aquifer material. Additionally, there are no areas of known contamination in close proximity to the proposed wellsite. The results of the groundwater evaluation are indicative that the wellsite has favorable conditions as a groundwater supply source. **Figure 5-9** shows the results of the groundwater study, including the existing easement and aquifer materials and thicknesses.

According to an analysis of the FEMA National Flood Hazard Layer (NFHL), the existing Cobalt Landing wellsite is located in FEMA Flood Zone A. Because the site is located in the 100-year flood plain, if the Town decides to construct wells at this site, the site will need to be graded to bring the elevation of the wells above the base flood elevation and flood proofing measures will need to be implemented. **Figure 5-10** shows the FEMA NFHL Flood Zones at the Cobalt Landing site.

During the final design phase, the Town will complete all necessary environmental permitting to minimize adverse impacts to wetlands and wildlife in the area, including an NDDB Request to CTDEEP and Notice of Intent for the abutment of the stream buffer zone. EP will also detail all erosion and sediment control measures in the Contract Documents while observing all construction work with an RPR.

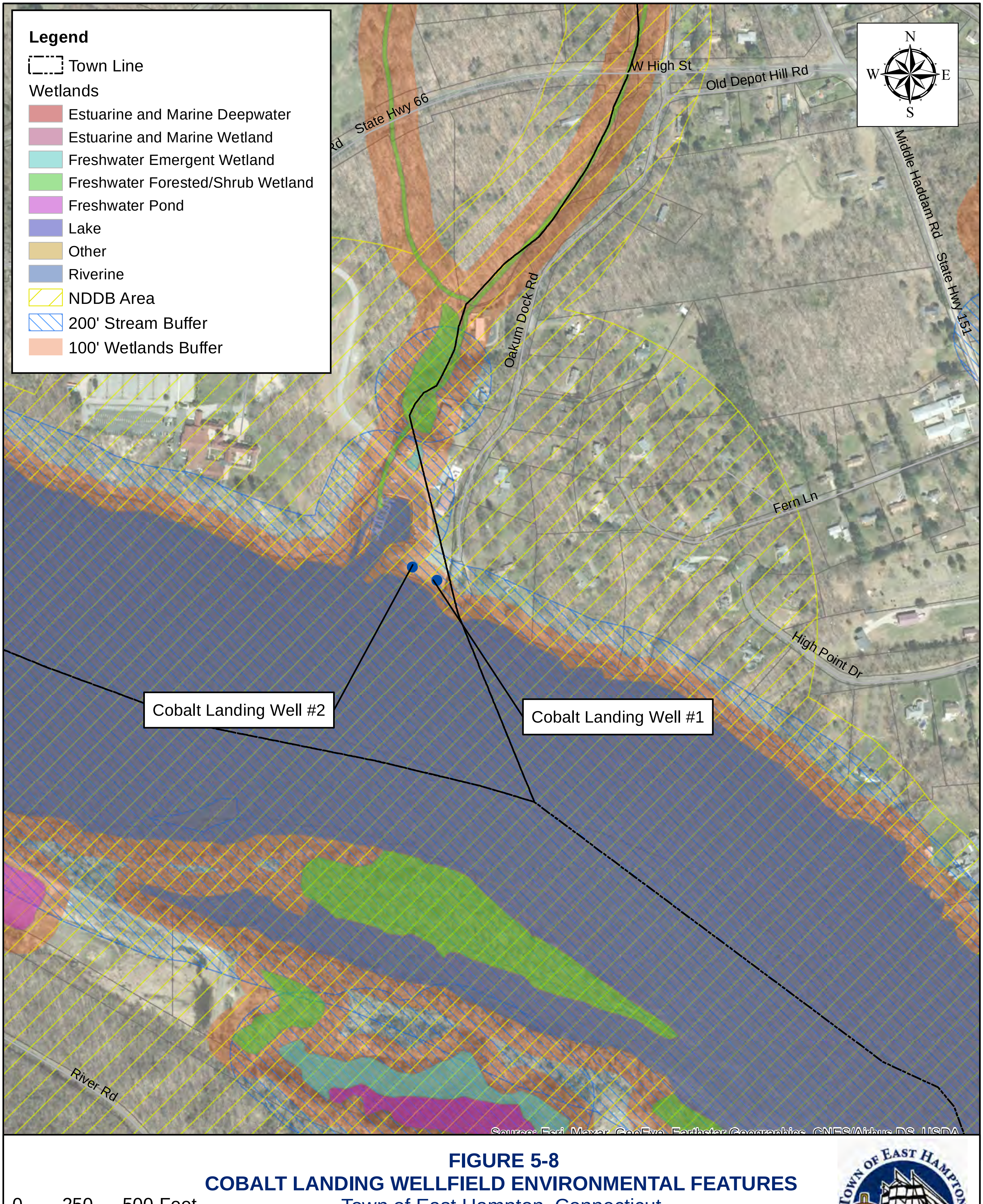

FIGURE 5-8
COBALT LANDING WELLFIELD ENVIRONMENTAL FEATURES
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

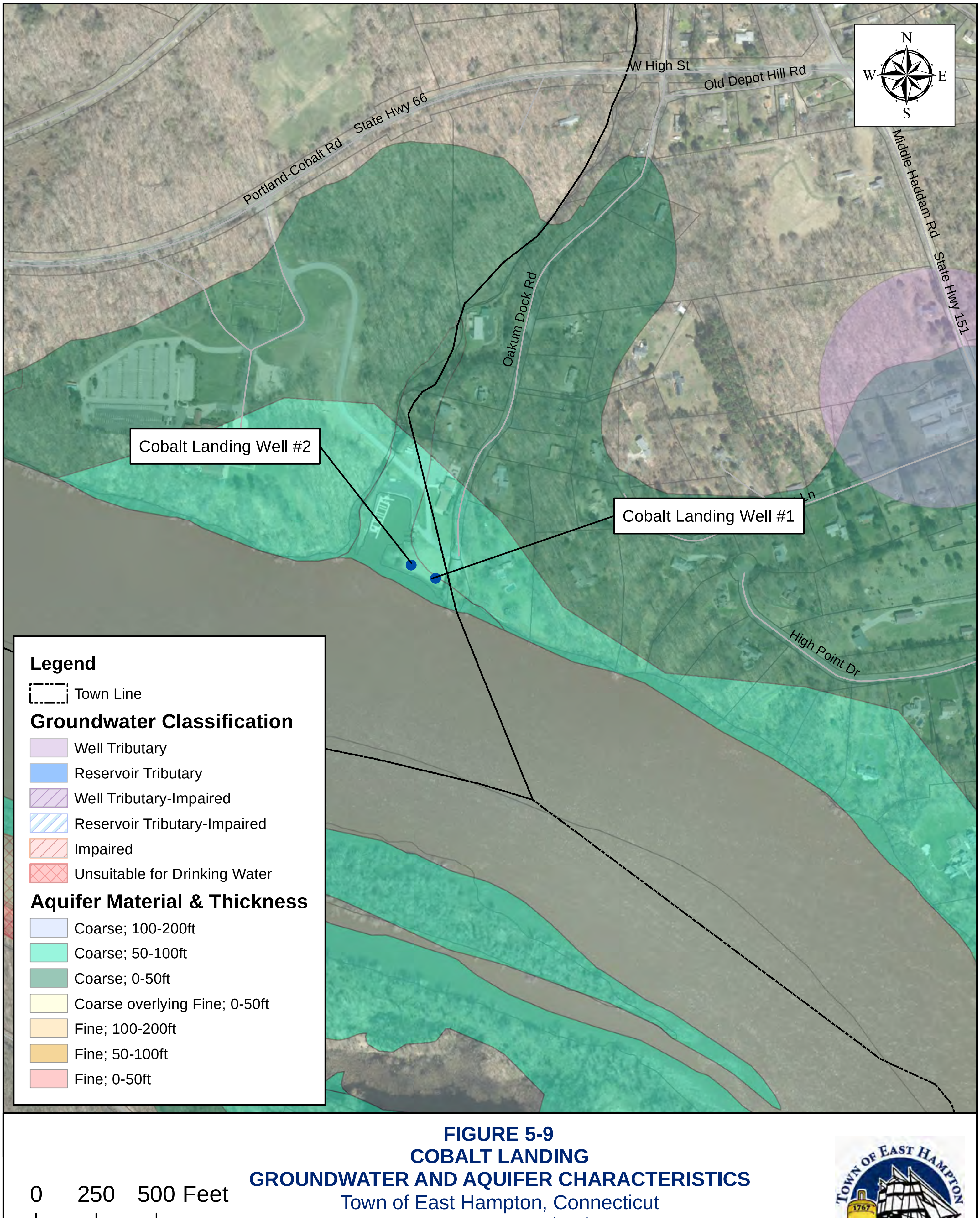

FIGURE 5-9
COBALT LANDING
GROUNDWATER AND AQUIFER CHARACTERISTICS
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Cobalt Landing Site - Groundwater and Aq.mxd

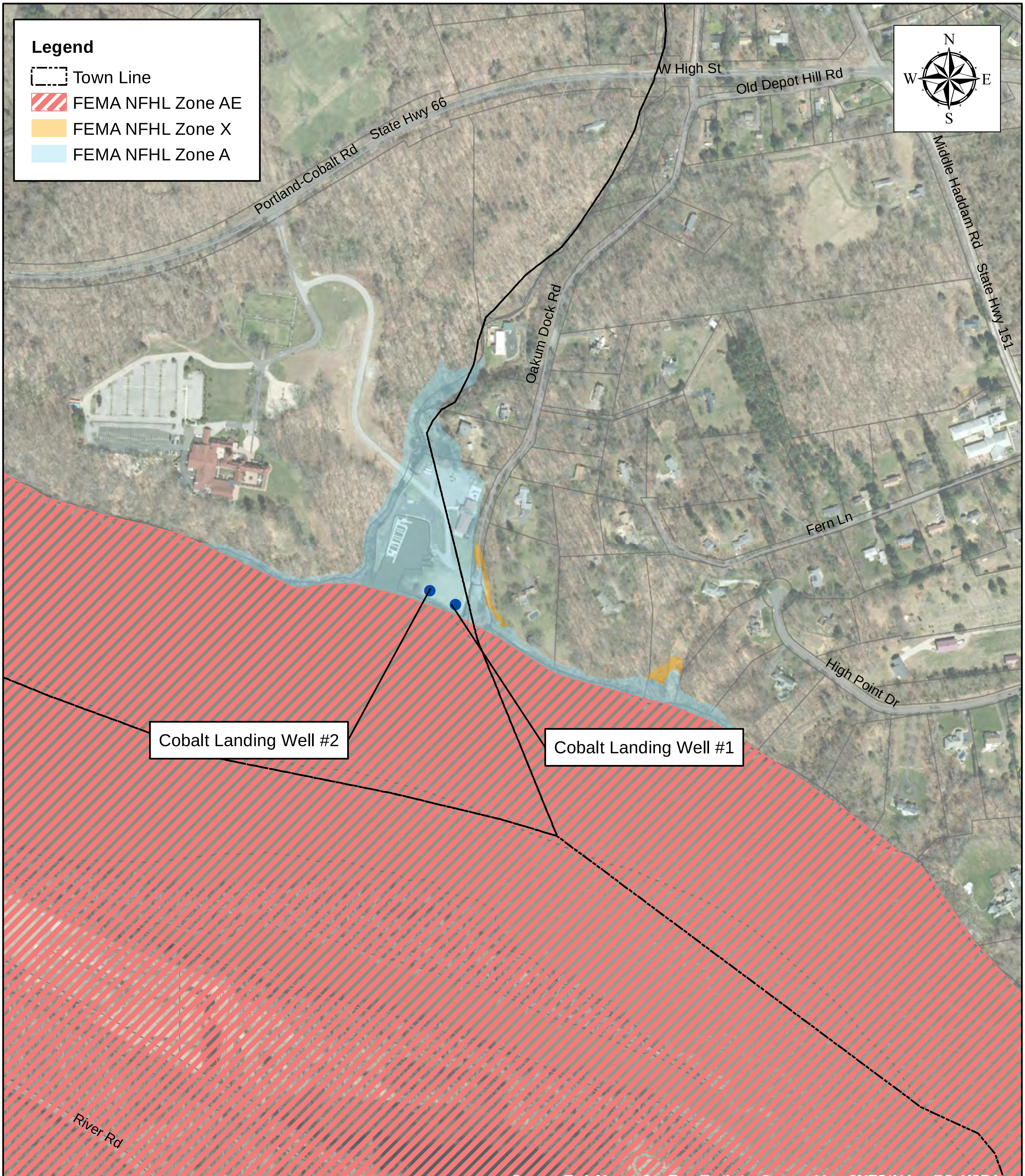

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FIGURE 5-10
FEMA NATIONAL FLOOD HAZARD LAYER MAP
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Cobalt Landing Site - Flood Zones.mxd

Section 5.3.2 Advantages

The Cobalt Landing Wellfield has the potential to be able serve the Town with potable water at a rate of almost 0.75 MGD, making this source feasible for satisfying a portion of predicted current and future demand conditions. Additionally, this site is both town-owned and consists of course aquifer material, which is ideal for groundwater production as documented EP's desktop groundwater evaluation.

Also, the Town already owns the wellsite, which avoids the difficulties associated with procuring easements. The Town has also permitted this wellsite for use through the CTDEEP Diversion Permit Authorization process, which authorizes the Town to withdraw up to 0.90 MGD from Cobalt Wells 1 and 2. This permit will expire on September 21, 2031.

Section 5.3.3 Disadvantages

The most populous area of Town is the Village Center area of Town, located in the geographic center of East Hampton. While the Cobalt Landing Wellfield boasts high groundwater quality and volume, it is located on the western edge of East Hampton and would require the installation of several miles of water mains to carry water from the west side of town to the targeted service area.

Additionally, the Cobalt Landing Wellfield is located in close proximity to a newly construction reception hall and marina at the end of Oakum Dock Road. By developing a wellfield at this location, the Town may experience resistance from the reception hall property owner due to concerns regarding aesthetics at this location. However, the Town is responsible for providing safe drinking water to the residents and businesses of East Hampton in an effort to maintain and enhance public health. Therefore, visual aesthetics of the wellfield may be placed at a lower importance than establishing a drinking water source. Also, the Town will need to provide flood mitigation measures at Cobalt Landing because the wellsite is located in FEMA Flood Zone A as discussed above.

Finally, the Cobalt Landing groundwater supply cannot supply sufficient drinking water volumes to satisfy East Hampton's needs through the recommended fifty years planning period. At a pumping rate of 0.75 MGD, and an assumed residential demand of 75 gallons per capita per day, this well source would be able to serve 10,000 residents, not including the water needed to supply businesses and maintain adequate fire protection.

SECTION 5.4 ALTERNATIVE 4 – PINE BROOK WELLFIELD

Section 5.4.1 Description

EP evaluated the possibility of establishing a wellfield at Pine Brook as Alternative 4. Alternative 4 includes constructing groundwater supply sources within a Town-owned parcel to the west of Pine Brook, which has a large area of course aquifer material. For this alternative, the Town would install groundwater supply wells at the Pine Brook site and construct water main to serve the system.

Location

The wellsite is located in the geographic west of East Hampton within Parcel No. 06-14A, west of Pine Brook. EP determined that this site may be promising as a future groundwater supply after performing our desktop groundwater exploration, which is attached in Appendix A.

Photo 6: Existing Conditions at Pine Brook Wellsite

This potential wellsite is relatively close to the populated Village Center area of East Hampton; **Figure 5-11** provides the USGS map of the project area and **Figure 5-12** presents the aerial map of the proposed wellsite.

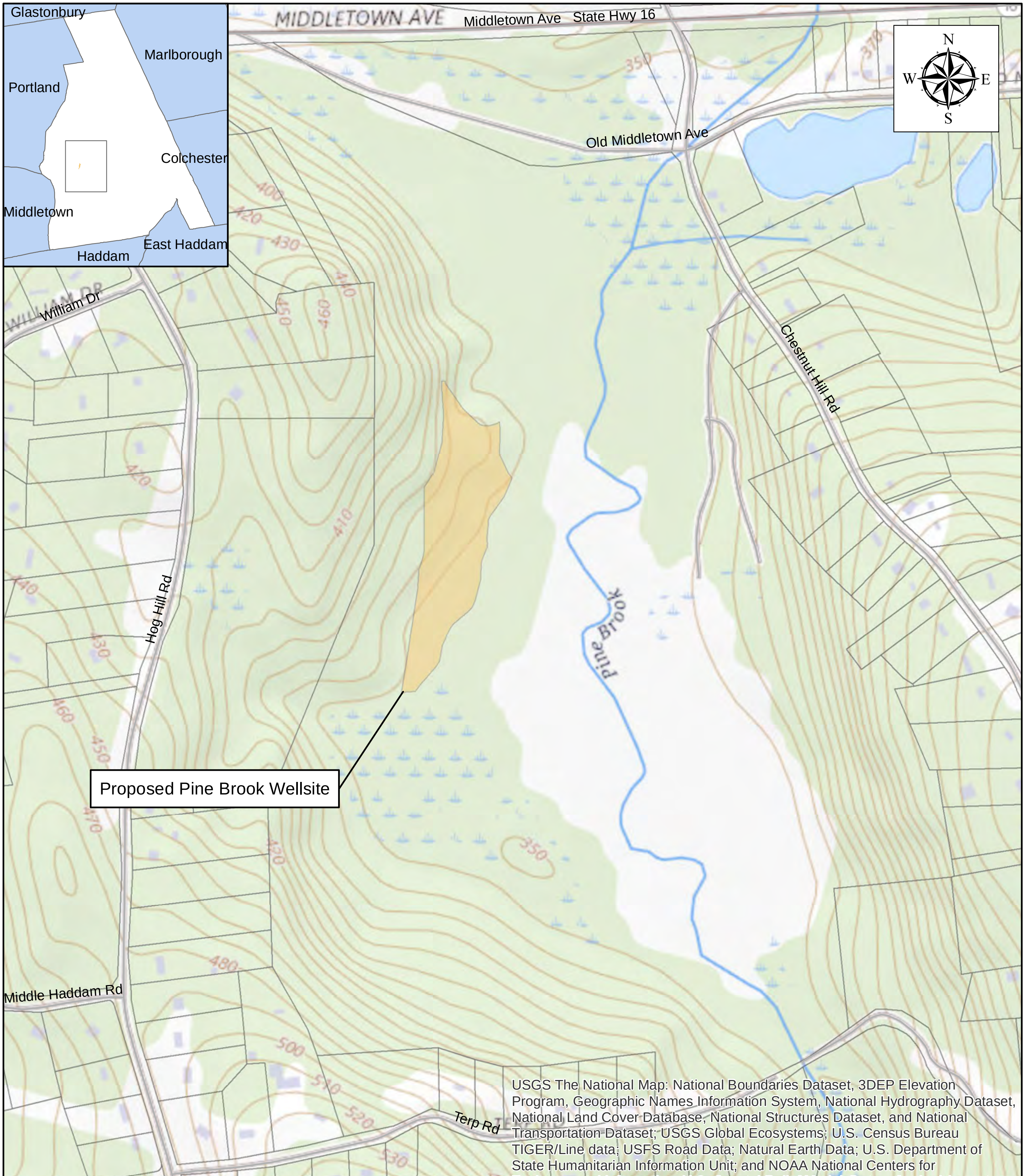

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FIGURE 5-11
PINE BROOK WELLSITE
Town of East Hampton, Connecticut
Water System Evaluation
April 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Pine Brook Site - USGS.mxd

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FIGURE 5-12
PINE BROOK WELLSITE AERIAL MAP
Town of East Hampton, Connecticut
Water System Evaluation
April 2022

Town of East Hampton 1767 Connecticut

Environmental Factors and Groundwater Evaluation

The Pine Brook Wellfield would involve disruption to previously undisturbed areas near the brook. However, EP carefully located the potential wellsite outside of environmental resource areas. In the surrounding area of the potential Pine Brook Wellfield, there are several wetland areas classified as Freshwater Forested/Shrub Wetlands, Freshwater Emergent Wetlands, and Lake Wetlands, according to CTDEEP GIS Open Data layers. There are no critical habitat areas in the vicinity of the wellfield. While the well would be situated in an undisturbed area, the associated water main piping would mostly be constructed within upland areas and previously disturbed and paved roadway. **Figure 5-13** shows the environmental resources present at the Pine Brook site based on CTDEEP GIS Open Data layers.

EP also evaluated the Pine Brook site for aquifer permeability during the desktop groundwater study and determined that the proposed Pine Brook site west of Pine Brook is rich in course aquifer material. The groundwater evaluation results indicate that the proposed wellsite has favorable conditions as a groundwater supply source. **Figure 5-14** presents the findings of the groundwater evaluation.

The Pine Brook site has areas which are within the FEMA 100-year flood plain according to FEMA NFHL analysis. If the final well locations are situated within the 100-year flood plain (Zone A), the Town will ensure that the immediate area surrounding the wells is above the flood plain and flood proofing measures are taken to reduce the risk of inundation. **Figure 5-15** shows the FEMA NHFL flood zones within the area of the Pine Brook wellsite.

According to CTDEEP GIS Open Data Layers, this proposed site falls within a CTDEEP Protected Open Space Area. The Pine Brook parcel is classified as Land Use Code 923. The Estate of Carl Terp deeded parcel to the Town in 1971 as protected open space. The Town researched the deed and land records and did not find any restrictions on developing a water supply source on the property. EP and the Town plan to meet with CTDEEP prior to any groundwater explorations to discuss the viability of this site as a public drinking water source with this land designation.

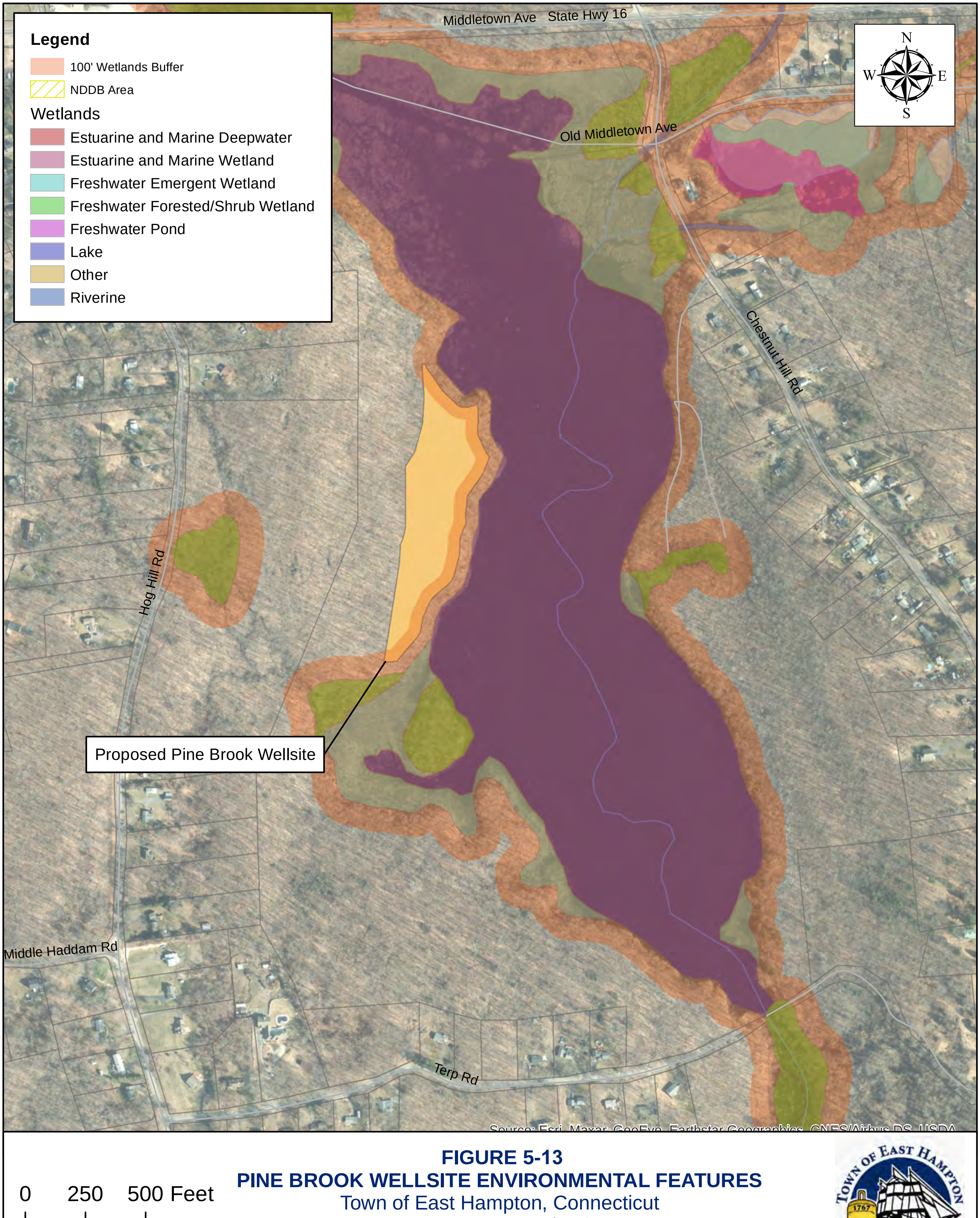

FIGURE 5-13
PINE BROOK WELLSITE ENVIRONMENTAL FEATURES
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Pine Brook Site - Environmental.mxd

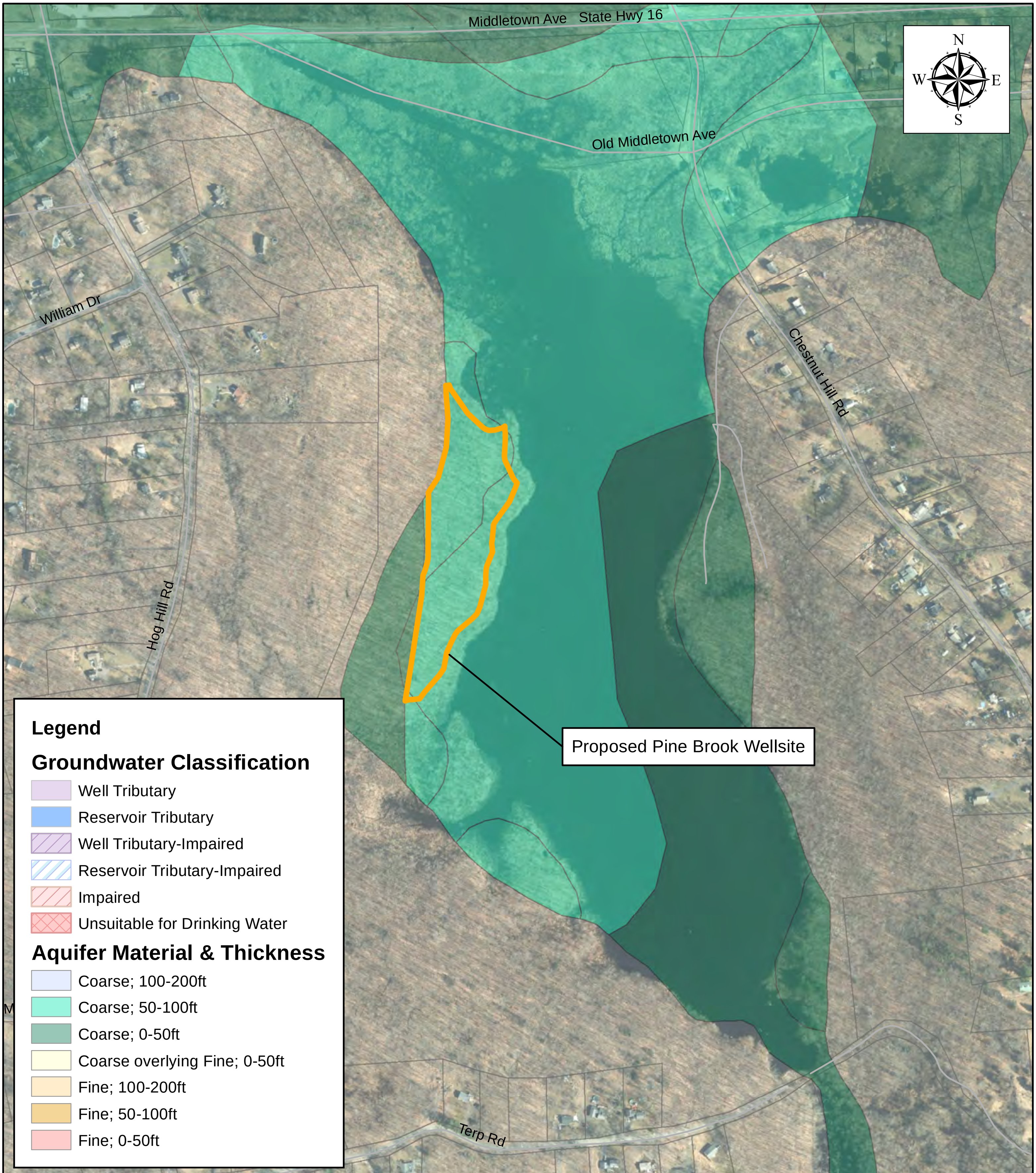

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FIGURE 5-14
PINE BROOK WELLSITE
GROUNDWATER AND AQUIFER CHARACTERISTICS
Town of East Hampton, Connecticut
Water System Evaluation
May 2022

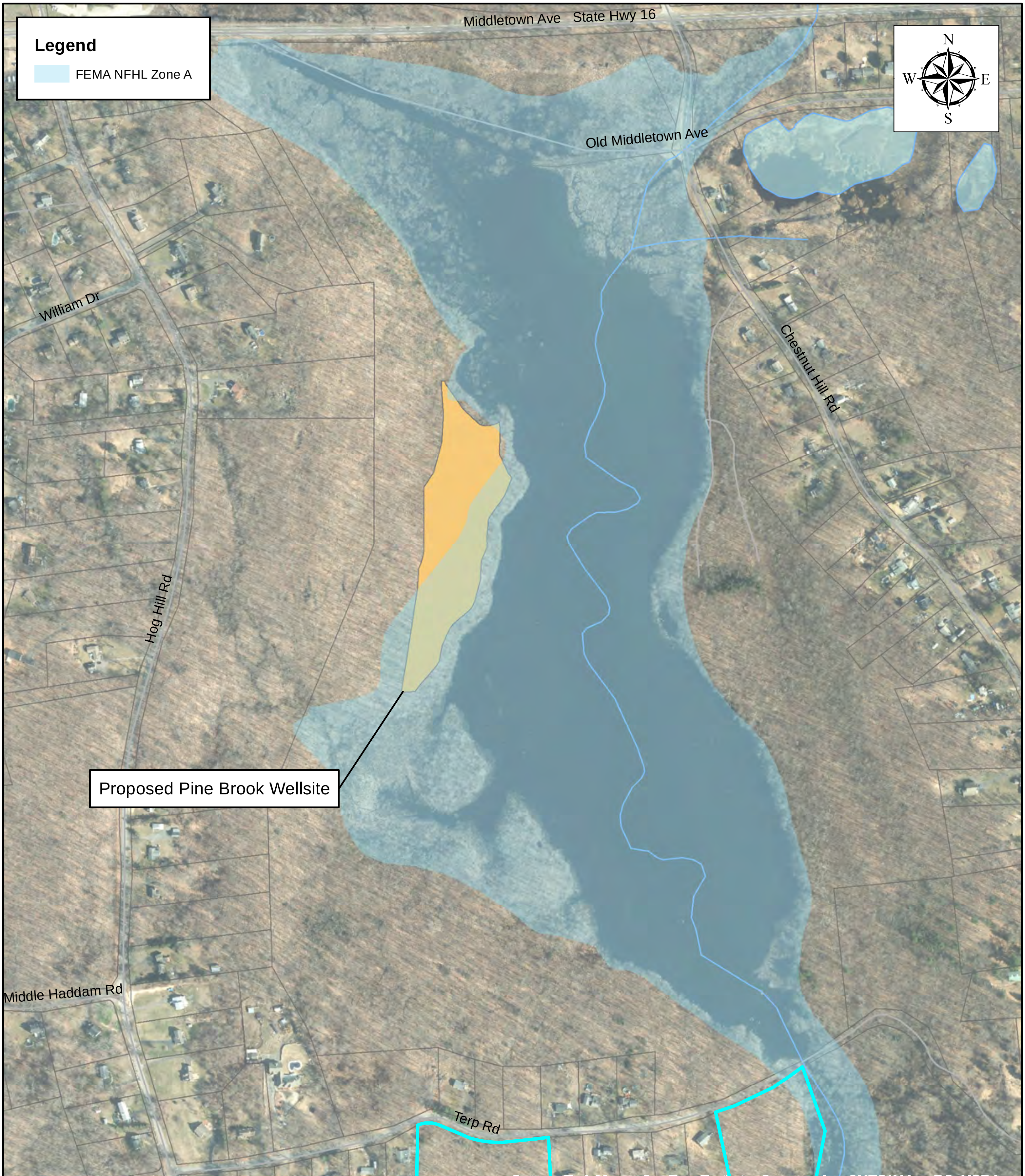

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FIGURE 5-15

FEMA NATIONAL FLOOD HAZARD LAYER MAP

Town of East Hampton, Connecticut

Water System Evaluation

May 2022

Document Path: \\A100AFSVPD1.apexcos.local\ma-qcy\Projects\East Hampton, CT.343\343-2101 Water System Evaluation\04 PER\01 Report\02 Figures\Figures - MXD\Pine Brook Site - Flood Zones.mxd

Section 5.4.2 Advantages

By establishing a water supply source at this location, the Town would achieve its goal of developing a more centralized water system. If the well site can provide adequate water volume and quality, the Town may utilize it to serve a greater portion of the Town through the 2070 planning period. Additionally, the Town benefits by locating the future groundwater sources at this site because the site is located in a Town-owned easement, thereby avoiding the potentially costly and long-term easement procurement process. The proposed Pine Brook site is also located relatively close to the most populated areas of Town, which may minimize the amount of transmission piping needed.

As documented in desktop groundwater evaluation (attached), EP determined that this site consists of course aquifer material, which is ideal for groundwater production. Finally, this site is not located in a relatively undeveloped area, minimizing the likelihood of spills and polluted soils and groundwater which can impair water quality.

Section 5.4.3 Disadvantages

While this site is promising due to its aquifer material characterization, the Town still needs to drill test wells to confirm the availability of groundwater in sufficient quantity and acceptable quality for a viable drinking water supply for East Hampton's current and future needs. Therefore, the Town will need to expend some of its capital budget on performing pumping tests prior to determining that the Pine Brook site is feasibility. Additionally, establishing a groundwater supply source at this site would require permitting through CTDEEP and CTDPH. This site may also require procurement of an easement for access to the site from Hog Hill Road due to the area's topographic conditions and environmental resources present. EP will confirm site access constraints and document any constructability concerns during the next phase of this project.

SECTION 5.6 ALTERNATIVE 5 – INTERCONNECTIONS WITH ADJACENT WATER SUPPLIERS

Section 5.6.1 Description

EP explored the viability of establishing interconnections with adjacent water suppliers as a source of water for the Town. The Town would construct interconnection stations and associated transmission main piping in order to purchase wholesale water from neighboring water suppliers under this alternative. Ultimately, this alternative would involve conversations between the Town and neighboring water systems to determine the viability of an interconnection based on water usage and availability of excess water. To determine the capacity of neighboring systems to serve East Hampton, site interconnections and confirm potential pumping requirements, the Town would need to conduct a hydraulic investigations.

Following discussions with the Town, EP understands that the Portland Water Department, Aquarion Water Company, and the Connecticut Water Company may be potential wholesale water suppliers.

Section 5.6.2 Advantages

Under this alternative, the Town would avoid the capital expenditures associated with groundwater exploration and well and water treatment facility construction. Also, because the water supplier's water supply is already active, the Town would avoid some difficulties with permitting a new water supply source.

Section 5.6.3 Disadvantages

While this alternative would allow the Town to forgo exploring a new water supply source for now, there are several disadvantages associated with relying on an adjacent water supplier for the majority of the Town's water. The Town would need to construct interconnection components and transmission main to deliver water from the neighboring water supplier to the areas of Town that they are interested in providing service to, which would be a large capital expenditure and potentially an inconvenient task due to hydraulic conditions. Additionally, this alternative would require permitting through the CTDEEP Diversion Permit program. Each water supplier would need to evaluate its capacity to provide the Town with water. The Town would likely need to pursue additional investigations in order to do so.

Ultimately, this alternative leaves the Town at the mercy of its outside water supplier. The potential water supplier may have the ability to suspend the transfer of water to the Town under emergency or drought conditions.

In order to determine the viability of this solution, the Town will need to analyze excess water capacities and pumping requirements for each potential interconnection. These investigations are discussed in more detail in Section 6.2.3: Water System Facility Siting and Hydraulic Evaluation.

SECTION 6 RECOMMENDATION

SECTION 6.1 INTRODUCTION

Although the Pine Brook wellfield site appears to be a very promising water supply option, EP recommends that the Town perform a groundwater exploration and testing program to confirm this assumption. As discussed in the desktop groundwater evaluation, the results suggest that the Town can site a new groundwater supply facility at this location, but the Town must first confirm the quantity and quality of the groundwater is acceptable for a municipal water supply source. If water production appears feasible, the Town will also have to confirm the required infrastructure improvements needed to convey water from the existing and proposed sources to supply the Town for at least the next 50 years.

EP also understands that the Town was recently approached by property owners in the Town of Marlborough about a potential public water supply site near the Marlborough - East Hampton town line. The property owner indicated that they may be willing to work with the Town to develop a water supply site for East Hampton at this location, if the site proves feasible. As such, this scope of services also includes evaluating this parcel in Marlborough.

In this section, EP has provided our recommendations for the next phase of this project, which will include the following two phases:

- Perform a groundwater exploration and testing program
- Develop a water system hydraulic model to document future needed water system facilities

EP has provided our anticipated scope of services and estimated project costs in the text below.

SECTION 6.2 PINE BROOK GROUNDWATER EXPLORATION PROGRAM

Section 6.2.1 Potential Available Water Supply

As described above, the Town will need to find other reliable and viable water supply options to satisfy potential drinking water needs through the 2070 planning period. EP is recommending that East Hampton investigate the Pine Brook aquifer to the east of Hog Hill Road between Middletown Avenue and Terp Road. As the Town expands its public water supply system, East Hampton will need an additional water supply source to combine with its existing water supply sources and the Cobalt Landing wellfield to provide adequate water supply volume for the service area during current average and maximum day demands, as well as maximum day demands in the fifty-year planning period. These demand projections are presented in Section 2.3 of this report.

To determine the volume of water supply available, the Town must assess the maximum pumping capacities of all existing permitted groundwater sources. For Alternative 4 (potential Pine Brook Wellfield), EP recommends that the Town perform a groundwater exploration program as the first task in the next phase of this water system expansion project. By performing this groundwater exploration program, the Town will confirm whether the Pine Brook aquifer is a viable and sufficiently productive source.

Table 6-1 shows the safe yield of each alternative explored. For Alternative 5 (Potential Water Supply Interconnections), EP recommends that the available water supply volumes be determined during the next phase of the project as discussed in Section 5 and later in this section.

Table 6-1: Available Water Supply at Potential Groundwater Supply Sources

Alternative	Source	Safe Yield (GPD)
2	WPCA Royal Oaks Wells	38,880
2	WPCA Village Center Wells	73,440
3	Cobalt Landing Wellfield	743,000
4	Pine Brook Wellfield	Unknown
5	Potential Water Supply Interconnections	Unknown

As documented earlier, EP has performed a desktop evaluation of potential future groundwater sources and determined that the area west of Pine Brook was the most promising site within the Town boundaries for a future groundwater supply source. Therefore, we have provided below our recommended scope of services for this proposed groundwater exploration program.

EP also learned that the Town was approached by a property owner in Marlborough, CT offering to sell land on the East Hampton border to serve as a potential site for a groundwater supply. EP became aware of the Marlborough site as a possibility at the end of this project and after completing the Alternatives Analysis. Our initial investigations indicate that this property may be a viable option for water supply to East Hampton; however, EP will need to perform a more extensive desktop analysis to determine whether further exploration is warranted for this site. Therefore, we have included this desktop evaluation as the first task in the Pine Brook groundwater exploration scope of services provided below.

Section 6.2.2 Groundwater Exploration Program

Based on the findings of the Pine Brook aquifer desktop evaluation, EP has provided our proposed scope of services, schedule, and estimated project costs below for the Groundwater Exploration program. As document above, we have also included a desktop evaluation of the potential site in Marlborough, which borders East Hampton.

Scope of Services

EP recommends the following scope of services to evaluate the water supply potential for the Pine Brook aquifer on the Town-owned property east of Hog Hill Road and the water supply potential of a property in Marlborough, CT on the East Hampton town line. We have listed our recommended tasks for this groundwater exploration below.

- Task 1: Conduct Desktop Evaluation of Potential Marlborough, CT Water Supply Site

- Task 2: Pine Brook Site Exploration
- Task 3: Prepare Letter Report
- Task 4 (Optional): Marlborough Site Exploration

Task 1: Conduct Desktop Evaluation of Potential Marlborough, CT Water Supply Site

Similar to the Pine Brook aquifer evaluation, EP will complete a site screening analysis of the Town of Marlborough, CT property, which is 109.30 acres in area, for potential water supply development and to identify potential areas for groundwater exploration.

For the initial screening of the Marlborough property, EP will perform the following:

1. Collect and review existing available information regarding the Marlborough property and nearby water supply well sites, including potential deed restrictions or conservation areas, engineering reports, test well boring logs, and pumping records, as available and/or collected and provided by the Town.

2. Prepare a map of the property that identifies potential water supply development areas:

    - Area of sufficient size to locate a circular 400-foot diameter area of land (200-foot sanitary radius for wellfield).
    - Groundwater favorability layers from Connecticut GIS, including

        - Aquifer Zones, Materials and Thickness
        - Groundwater Classifications
        - Surficial Geology and Overburden Thickness
        - Potential Environmental Impacts
        - Surrounding Land Use

The site screening will include the identification and location of the following potential environmental impacts on the development of a new public water supply well:

- Areas of Critical Environmental Concern
- Priority habitats for rare and endangered species
- Lakes and ponds
- Vernal pools
- Public and private water supplies
- National Pollution Discharge Elimination System (NPDES) permit sites
- Hazardous waste sites
- Stocked trout streams and cold-water fisheries
- Federal Emergency Management Agency (FEMA) flood zones
- Automobile graveyards and junkyards
- Petroleum and oil bulk stations and terminals
- Agricultural uses
- Industrial Parks
- CSOs and SSOs
- Landfills
- Wastewater treatment facilities
- Wellhead protection areas
- Parcel Conservation restrictions

EP will use CTDEEP GIS and USGS databases to identify these critical components. Upon completion of the desktop evaluation, EP will conduct a field reconnaissance site walkover to identify potential site conditions that could impact development of a public water supply well, both favorable and unfavorable, and to determine exploratory drill locations.
In this task, EP included the following:

- Attend up to one meeting with the Town to review the results of the desktop study
  - Discuss the groundwater exploration maps
  - Review tables and figures
  - Present EP's recommendations for future development of the Marlborough property
- Conduct a site reconnaissance walkover

At this meeting, EP will review the proposed locations for exploratory drilling on the Marlborough site to get concurrence from the Town and discuss coordination with the property owner and the Town of Marlborough before initiating Task 2. EP assumes that the Town will coordinate with the property owner to gain access to the property for the site reconnaissance and drilling and testing under Task 4.

Task 2: Pine Brook Site Exploration

Based on the results of the Pine Brook desktop study, EP recommends performing subsurface exploration and testing in the Pine Brook aquifer. While the Town still needs to assess the Marlborough property as described in Task 1, we have produced this scope of work to include exploration at the Pine Brook site and provided an optional task (Task 4) for exploration of the Marlborough site, if the results of Task 1 above are favorable for a viable groundwater supply source. Based on the results of the Marlborough site desktop study and the exploration results from the Pine Brook site, EP may recommend additional exploration at the Marlborough site. We have described the recommended field exploration and testing activities in detail below.

Exploratory Drilling

This task includes installation of two test wells and one offset well at the proposed exploration site(s) to provide lithologic and specific capacity data. EP will use this information and data to locate and evaluate a potential water supply well site.

EP will contract a driller to advance the borings and install the two, 2-inch test wells and one, 2-inch observation well. The two test wells and one offset well will be installed using a Geoprobe direct push drilling rig. In each of the test well borings, the well driller will collect continuous 5-foot cores from the ground surface to a depth of up to 50 feet below ground surface (bgs) or refusal, whichever is encountered first. By collecting these soil samples, EP can obtain and document detailed lithologic data to support the design of a production well. If favorable aquifer material is identified in the boring, the driller will install a 2-inch diameter well consisting of a 10-foot section of stainless-steel screen and PVC riser within the borehole.

The driller will allow the annular spacing around the well screen to collapse with native material. The spacing around the PVC riser will be backfilled with natural material to within three feet of the ground surface. The driller will install a protective steel casing and fill the top three feet of the annular spacing with a cement grout seal to complete the well installation.

The driller will install an offset well adjacent to the test well with the most favorable aquifer material, based on field observations and lithology. This well will be completed in the same stratigraphic interval as the test well but will be constructed with schedule 40 PVC screen and riser material. The offset observation well will be used to monitor water levels during the pump test. In the offset well, the well driller will not collect core samples until the objective screen zone is reached. Core samples will be collected from the screen zone and classified in the field for lithology.

Well Development and Testing
Under EP's supervision, the driller will develop the two test wells and one observation well by surging and/or pumping with a diaphragm pump. After development, EP will manage and coordinate with the driller to perform a two-hour constant-rate pumping test. Drawdown will be measured in the two-foot offset observation well and the other test well using an electronic water level probe. This data will be used to evaluate the specific capacity of the formation and potential well yield.

EP has estimated that up to four days will be required per site to complete the drilling, well installation, development, and pump test; however, adverse weather and/or subsurface conditions could result in an increased budget and schedule. EP included a separate line item for each additional day of drilling. EP will not perform additional drilling beyond 50 feet per well or three days per site without prior approval from the Town.

Water quality samples will be collected immediately prior to shut down of the pump test. EP will measure specific conductivity, pH, and temperature in the field. EP will also collect water samples for laboratory analysis of VOCs by Method 524.2, iron, manganese, nitrate, nitrite, and per- and polyfluoroalkyl substances (PFAS) by Method 537.1.

EP also recommend that similar water quality sampling be performed at the Cobalt Wellfield to confirm that the raw water quality at this permitted water supply source meets or exceeds current water quality requirements and standards. EP has included in this task one day of well pumping at Cobalt Wellfield and collection of groundwater samples for VOCs by Method 524.2, iron, manganese, nitrate, nitrite, and emerging contaminants PFAS by Method 537.1 and 1,4-dioxane by Method 522. This scope and budget assumes that pumping and testing of the Cobalt Wellfield is performed immediately after completion of the Pine Brook and/or Marlborough site so that a second mobilization is not required.

This scope of work does not include any permitting if required for the drilling and assumes that the Town will arrange for access to the drilling locations with the property owner, and the Town will perform any clearing necessary to access the drill locations. EP assumed that the subsurface geology (lithology and overburden thickness) is suitable for drilling with a Geoprobe direct push drilling rig and that depth to groundwater is suitable for pumping with a diaphragm pump. Geoprobe drilling is suitable for unconsolidated gravel, sand, silt, and clay to a total depth of 70 to 75 feet bgs. If overburden aquifer material is deeper than the limits of the Geoprobe or abundant cobbles or boulders are present, then an alternative drilling method and a modified schedule and budget will be required.

Task 3 – Prepare Letter Report

EP will compile data from the desktop study and subsurface exploration and testing, and EP will prepare a letter reporting which includes summary maps, boring and well construction logs, and a discussion of the results. A well specific capacity will be calculated from the pumping rate and drawdown during the pump tests and water quality sample results will be summarized.
In the report, EP will discuss the viability of developing potential future new source(s) water supply and recommended location for the Pine Brook and Marlborough sites.
EP has included in this task one meeting (either virtual or in person) to review the results of desktop study, exploration, and testing.

Task 4 (Optional) – Marlborough Site Exploration

EP has included as an optional task in this scope and budget exploration at the Marlborough, CT site, assuming favorable results from Task 1. Exploration at the Marlborough site would be conducted as described in Task 2. This scope and budget assume that the work is performed immediately after completion of the Pine Brook site so that a second mobilization is not required.

Schedule

EP anticipates approximately three months to complete the desktop study, water supply exploration at the proposed Pine Brook site, and preparation of a summary letter report. If the Marlborough site is tested, then the schedule would be extended by approximately two weeks. We may require additional time based on access to the sites, discussions with the Town and coordination with the Marlborough site property owner. Following is a summary of the estimated schedule by task.

Task Description	Duration
Task 1: Conduct Desktop Evaluation of Potential Marlborough, CT Water Supply Site	2 weeks
Task 2: Pine Brook Site Exploration	6 weeks
Task 3: Prepare Letter Report	4 weeks
Total Project Duration	**12 weeks**
Task 4 (Optional): Marlborough Site Exploration	2 weeks

Project Cost Estimate

Based on findings and information collected during the PER, EP proposes a lump sum fee of <u>Eighty-Three Thousand, Three Hundred Dollars ($83,300) for Tasks 1 through 3</u> of the groundwater exploration program. For Tasks 1 through 4, EP proposes a lump sum fee of <u>One Hundred and Forty</u>

Thousand, Seven Hundred Dollars ($140,700). If needed, additional drilling/testing costs per day will be billed on a time and material basis at Seven Thousand, Five Hundred Dollars ($7,500). We have presented a breakdown of the project cost estimate by project task in the table below.

Groundwater Exploration Task Description	Budget
Task 1: Conduct Desktop Study for Potential Marlborough Water Supply Site	$5,000
Task 2: Pine Brook Site Exploration	$60,500
Task 3: Prepare Letter Report	$17,800
Total	**$83,300**
Task 4 (Optional): Marlborough Site Exploration	$57,400
Total (with Optional Task 4):	**$140,700**
Additional Drilling/Testing Cost per Day	*$7,500*

As indicated above, this scope of work includes groundwater supply exploration at the Pine Brook site. EP has included exploration at the Marlborough site as an optional task (Task 4), which will only be performed if specifically approved by the Town. EP included a separate line item for each additional day of drilling or testing, if required. Additional drilling or testing will not be performed without prior approval from the Town.

Section 6.2.3 Water System Facility Siting and Hydraulic Evaluation

After completing the groundwater exploration program, EP and the Town will better understand the locations and available capacities of potential water supply sources. As discussed during recent meetings, the Town must confirm the location and capacity of future raw water supplies along with water quality before siting and sizing of the needed water treatment, storage, transmission, and distribution, including interconnection facilities if needed.

Additionally, as discussed in Section 5, if the additional field investigations do not produce a viable second well source, EP recommends that the Town evaluate potential interconnection capacities as a source of water through hydraulic field investigations and modeling potential flow volumes.

We have provided our anticipated scope of services, schedule, and fee for this evaluation below.

Scope of Services

After determining the potential viability of the proposed Pine Brook and Marlborough groundwater sources, EP recommends the following scope of services to evaluate the siting and sizing of future water system components. The tasks listed below will provide information on needed flows and pressures throughout the proposed expanded water supply system in East Hampton. Due to the significant fluctuations in elevations across the Town, EP anticipates that several service areas will be required to serve existing and future water customers with adequate water pressure, flow, and fire protection. The Town must develop a water system hydraulic model using current modeling software to size future water system facilities while also defining the extent of the proposed hydraulic pressure zones.

EP recommends the following list of tasks for the proposed water system facility siting and hydraulic evaluation.

Task 1 – Perform Field Program

- Gather and evaluate historical flow test data, if available. Sources of flow test data shall include the Fire Department, Insurance Services Office (ISO), previous reports, and any other available Town records. After review of the existing flow test data, develop and submit a hydrant flow testing plan to the Town for review.
- Determine whether finished water pump curves are available and, if not, plan pump tests to accurately confirm current pump operating conditions and curves.
- Attend a hydrant flow test planning meeting to review the field program and make required revisions based on historical system knowledge, and locations of recent water main improvements where previous hydrant flow test were performed.
- Develop and perform up to five hydrant fire flow tests throughout the Town's existing distribution system to verify hydraulic grade line (HGL) conditions and pressures within the existing systems. During field-testing, the Town's personnel will assist in operating hydrants, gate valves, and setting up equipment. To the extent possible, flow testing will be coordinated with the Town to minimize dirty water complaints. EP assumes all field testing will be completed in a single day.

Task 2 – Develop Hydraulic Model of the Current System and Potential Expanded Water System

- Develop hydraulic model using current software using the 2006 Preliminary Engineering Report (PER) as a guide for the expansion of the Town's water system.
- Revise pump characteristics with pump hydraulics information confirmed during the field program.
- Use 2010 Water Supply Plan projected water consumption data to calculate and systematically allocate water demands into the model. Distribute unaccounted for water evenly throughout the distribution system.
- Review recent available pump test and SCADA data from each of the Town's wells and Water Treatment Facilities to check existing pump data and controls to be used in the model.
- Calibrate model using data obtained from investigations and field-testing. Steady state calibration will be performed by adjusting Hazen-Williams "C" values. Calibrate model to within AWWA water system modeling standards for the difference between field-measured and predicted residual pressures during hydrant flow tests.
- Document all required simulations and hydraulic conditions with tables, figures and/or maps.
- Attend a meeting to discuss model updates and recalibration.

Task 3 – Recommend Capital Improvement Program

- Develop a prioritized program of recommended alternatives and improvements to address deficiencies identified in the previous tasks under existing and future demand conditions.
- Confirm needed water system improvements to expand and develop the Town's future water system to utilize available source water supply from the Cobalt wellfield along with the

Pine Brook and Marlborough groundwater sources, if they prove viable following the groundwater exploration program (defined earlier).

- Investigate potential interconnections with adjacent water systems. Viability of interconnections can be determined by determining the availability of excess water and performing preliminary hydraulic investigations for pumping facility sizing.
- Prepare a plan (map) showing recommended improvements for inclusion in the report. The recommended improvement plan shall be submitted on flash drive via a portable document format (pdf).
- Estimate total project conceptual, planning-level costs for each recommended system improvement. Prioritize all recommended water system improvements based on priority of need and schedule compatibility with other planned improvement programs (i.e., replacement of other utilities, ongoing street pavement improvements, etc.).
- Categorize the recommended improvements in order of importance (public health and safety, water quality, expansion of the water system, etc.).
- Prepare an implementation plan for the recommended improvements. The implementation plan will categorize the improvements into various groups (i.e. those recommended to be completed immediately, within the next 3-5 years, 6-10 years, and 11-20 years).

Task 4 – Prepare Water System Facility Site and Hydraulic Evaluation Report

- Prepare and submit five copies of a draft report for the Town's review and comments. The report shall include an executive summary, descriptions on each of the tasks outlined above, tables of any data used to support the conclusions and recommendations made in the report, and printed map of the water distribution system showing the recommended improvements highlighted in color. We will also append the results of the groundwater exploration program.
- Meet with the Town to review the draft report. Work closely with the Town on the accuracy of the report and validity of recommendations and conclusions before producing the final report.
- Deliver to the Town five copies of the final printed report, including all printed maps generated as part of the report.
- Attend up to two public meetings to present the findings and recommendations of the report to the residents of East Hampton and other special interest groups.

Schedule

EP anticipates approximately five months to complete the Water System Facilities Siting and Hydraulic Evaluation after the proposed Groundwater Exploration program is finalized.

Water System Facility Siting and Hydraulic Evaluation Budget

For the scope of services listed above, EP estimates a lump sum fee to be One Hundred Twenty Six Thousand, Three Hundred Dollars ($126,300). We have presented a breakdown of the project cost estimate by project task in the table below.

Water System Task Description	Budget
Task 1: Perform Field Program	$25,360
Task 2: Develop Hydraulic Model of the Current System and Potential Expanded Water System	$28,870
Task 3: Recommend Capital Improvement Program	$36,970
Task 4: Prepare Water System Facility Siting and Hydraulic Evaluation Report	$35,100
Total:	**$126,300**

SECTION 7 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the Town has demonstrated a long-standing need for establishing an expanded and centralized municipal water system. The first step in achieving this goal is the establishment of water supply sources. The Town has explored several alternatives for potential groundwater supply sources and has selected the most advantageous combination of these alternatives based on land ownership, availability of water, and aquifer and groundwater quality.

With our finding in this PER, EP recommends that the Town perform additional water quantity and quality investigations at the Cobalt Landing Wellfield along with performing a groundwater exploration program at Pine Brook Wellfield and potentially the available Marlborough parcel at the East Hampton town line.

After confirming the quantity and water quality at these potential raw water sources, we recommend that the Town evaluate the siting of future water supply facilities and assess hydraulic conditions needed to expand the water system throughout East Hampton. EP will document water treatment needs after confirming the raw water quality at the Cobalt Landing Wellfield and other potential future groundwater sources.

APPENDIX A

Groundwater Desktop Evaluation Technical Memorandum

ENVIRONMENTAL PARTNERS

— An Apex Company —

MEMORANDUM

Date:	May 18, 2022
To	Mr. David E. Cox, Town Manager, Town of East Hampton
From	Charles Adelsberger, P.E., BCEE, Environmental Partners
CC	Ann Marie Turbeville, Director of Geosciences, Environmental Partners
	Kevin Rathbun, Senior Project Engineer, Environmental Partners
	Hanna Schenkel, Engineer, Environmental Partners
Subject	Town of East Hampton Water Supply Source Groundwater Desktop Evaluation

Summary

The Town of East Hampton (the Town) is seeking to establish a centralized municipal water system. Currently, the residents of East Hampton obtain water from either private wells, smaller community water systems, or the East Hampton Water Pollution Control Authority (WCPA). However, in recent decades, the Town has experienced numerous instances of water quality issues at private wells and within community water systems. Additionally, the WPCA and community water systems are only able to serve a portion of the Town, leaving the unserved residents and businesses within the Town to use private wells, which may be located in contaminated areas. To promote public health, provide fire flow protection, and spark the community's economic growth, the Town is proposing to establish a municipal water system.

In order to determine the most effective and cost efficient course of action for designing and constructing the centralized municipal water system, the Town must explore potential water supply sources. To advance the Town towards this goal, Environmental Partners (EP) has performed a Groundwater Desktop Exploration, in which potential well sites were identified for further investigation. For the most part, this desktop study focused on Town- and State-owned parcels, but could be expanded to include potential private parcels of land for future acquisition. This desktop study included:

- Reviewing the 2010 East Hampton Water Supply Plan (Milone & Macbroom, Inc.)

- Reviewing the 2006 Preliminary Engineering Report (Maguire)
- Compiling Town- and State-owned parcels that can support a required sanitary radius
- Evaluating sites with respect to aquifer potential
- Evaluating sites with respect to receptors and potential sources of contamination
- Evaluate sites with respect to other criteria (i.e., geologic conditions, land use restrictions, etc.)

Figure 1 is a preliminary site screening map showing potential public water supply sites. The following is a summary of the desktop study results:

1. A total of 72 potential sites satisfied the land ownership requirement for potential public water supply sites. The 72 sites, of which 51 were State-owned and 21 were Town-owned, are shown on **Figure 1**.
2. The majority of potential water supply parcels were eliminated from further consideration because of no potential aquifer material. **Figure 2** shows the Town-owned sites where potential aquifer material may be present.
3. The following Town-owned sites were identified as potential water supply sites for further consideration and field evaluation:
    a. Site #1: Cobalt Landing Wellfield, shown on **Figure 7**
    b. Site #2: Pine Brook Site, shown on **Figure 8**

Based on the results of the Desktop Study, the next steps in the new water source process are to further evaluate the most favorable sites with a subsurface groundwater exploration test well drilling program and to explore groundwater quality.

In 2004, the Town conducted a subsurface exploration at the Cobalt Landing Wellfield that included the installation of a test well and observation well. The Town conducted a 5-day pump test in accordance with the Connecticut Department of Environmental Protection's Level A Standards at the time. Based on this investigation, the Cobalt Landing Wellfield safe yield was established at 743,000 gallons per day, based on pumping 24 hours a day. The Cobalt Landing Wellfield is already permitted through the CT Department of Energy and Environmental Protection (DEEP) Diversion Permit.

A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. in 2005 to evaluate the relative environmental risk associated with the current and former land uses of the Cobalt Landing Wellfield property and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including 1- Existing Above Ground Storage Tanks (ASTs); 2- Former Underground Storage Tank; 3- Existing Drywell; 4- Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5- Building 1 Septic System Area. Should the Town decide to proceed with development of the Cobalt Landing Wellfield, EP recommends that the existing wells be tested to determine groundwater quality. In particularly, the Cobalt Landing Wellfield groundwater should be tested for emerging contaminants, including 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFAS)

Following the Groundwater Desktop Evaluation, EP recommends that the Town further explores the groundwater characteristics at the Pine Brook Site as well, which shows promising results for groundwater quality and quantity.

The scope, methodology and results of the new source water supply desktop study and exploration results are discussed in more detail below.

Background

The Town's most recent Water Supply Plan update in 2010 recommended that the Town establish several new water supply wells. While the Town had explored establishing new water sources in their 2006 Preliminary Engineering Report, the Town has not connected any of the new sources that were explored to a centralized municipal water system.

Some areas within the Town of East Hampton have been plagued by poor groundwater quality. In recent decades, the Town has experienced several e. coli outbreaks among private well users, as well as in some of the WPCA's existing well supplies. Establishing a centralized municipal water system would benefit the Town greatly as the residents of East Hampton would be able to rely on a safer and less expensive source of potable water. In order to establish a municipal water system, the Town must find a safe and reliable source of water with ample water supply availability. While the previously permitted Cobalt Wellfield is a promising candidate for a future groundwater supply source, EP recommends that the Town explores establishing additional groundwater supply sites for supply redundancy and to meet the projected water demands outlined in the 2010 Water Supply.

Desktop Site Screening Methodology

Initial Screening

EP conducted a new source water supply screening desktop study for the Town. As an initial screening, Town and State owned parcels were compiled to determine if the Town or State owned and controlled the sanitary radius of the potential groundwater source, which is the CT DEEP required protective radius required around a public water supply well. In Connecticut, the sanitary radius of any well pumping greater than fifty gallons per minute is 200 feet. Full control of the sanitary radius is required for all new wells per Connecticut General Statutes Section 25-33(b), and current and/or future land uses within the sanitary radius must be limited to those directly related to the provision of public drinking water or will have no significant adverse impact on water quality. Town and State owned parcels were compiled on a map and a 200-foot buffer mapped on each parcel.

In addition, Connecticut State Regulations 19-13-B51d. requires that wells with a withdrawal rate of more than fifty gallons per minute must be located at least 200 feet from a system for disposal of sewage or other source of pollution and must be located at least 50 feet of the high water mark of any surface water body.

The open space area inside this 200-foot buffer and at least 50 feet from any surface water body is the area owned by the Town that could support a public water supply well. Town owned parcels with the 200-foot sanitary radius are shown on **Figure 1**. As shown on **Figure 1**, a total of 72 parcels were identified as potential water supply parcels and were evaluated further based on the following criteria:

- Potential Aquifer Material
- Proximity to Environmental Receptors
- Potential Sources of Contamination
- Other Additional Criteria (i.e., geologic conditions, land use restrictions, etc.)

Proximity to Environmental Receptors

The Town of East Hampton is located in the geographic center of the State of Connecticut and borders the Connecticut River. There are numerous surface water bodies, wetlands, and streams within the Town, as well as abundant shallow bedrock and thin till material (non-aquifer material). Potential presence of aquifer material was used as an initial screening criteria. Proximity to environmental receptors was then used to screen the parcels in which the Town or State owns and the Town controls a 200-foot sanitary radius to identify potential new source water supply sites. The CT DEEP GIS Open Data database was used to identify the following sensitive environmental receptors:

- Areas of Critical Environmental Concern (ACEC)
- Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Vernal Pools (Certified and Potential)
- Wetlands

Finally, potential water supply sites were limited to areas on streams and rivers which were not determined to be DEEP cold-water fisheries.

Geologic Conditions

Generally, courser aquifer materials are favorable for groundwater supply sources as they are less penetrable than finer materials. Aquifer material is considered one of the most accurate indicators for potentially favorable groundwater supply sites. EP utilized the Surficial Aquifer Potential Map of Connecticut to analyze the potential presence and thickness of surficial aquifer deposits. **Figure 2** displays aquifer material classifications within the Town of East Hampton.

CT DEEP aquifer maps and surficial geology maps were used to evaluate the potential presence or absence of aquifer material. The Surficial Aquifer Potential Map of Connecticut was prepared by the Connecticut Geological Survey for statewide resource protection, water management, non-point source pollution prevention, and land use planning. **Figure 3** displays the surficial geology throughout the Town of East Hampton. Analyzing surficial geology may inform the Town of landforms and unconsolidated sediments (potential aquifer material) throughout the Town, as well as areas of shallow bedrock and thin till (non-aquifer material). Generally, melt-out till and melt-out till - moderate to bedrock are considered potentially favorable for groundwater supply sites.

Potential Sources of Contamination

Land use maps were examined for potential water supply sites that passed initial screening to determine if any potential sources of contamination to groundwater are located nearby or within a 200-foot radius. In accordance with DPH Sec. 19-13-B51d,

> "No such well shall be located within two hundred feet of a system for disposal of sewage or other source of pollution. If conditions warrant, greater distance shall be required Sanitary conditions in the area within the radial distance required shall be under control of the well owner by ownership, easement, or other arrangement approved by the commissioner of health. If a sewer is constructed of extra heavy cast iron pipe with leaded joints or equal approved type of tight joint, a minimum separating distance of one hundred feet shall be maintained."

Potentially sources of pollution include active or abandoned sanitary landfills, major fuel storage and/or transmission facilities, automobile graveyards and junkyards, road salt stockpile areas lacking adequate containment structures, agricultural uses, hazardous substances storage areas, etc. Special groundwater classification within the Town of East Hampton can be divided into several categories, including Well Tributary, Reservoir Tributary, Well Tributary-Impaired, Impaired, and Unsuitable for Drinking Water. When choosing potential groundwater supply sites, EP omitted sites within the previously discussed categories from the potential list of sites. Additionally, EP omitted sites within EPA and Resource Conservation and Recovery Act (RCRA) regulated hazardous waste sites, as well as PCB contamination sites. **Figure 4** shows potential sites and groundwater classifications within the Town of East Hampton. **Figure 5** shows potential sites and environmental impacts within the Town.

Additional Site Screening

In additional to environmental receptors and sources of contamination, potential water supply sites were screened based on the following criteria:

1. *Land Use* – For potential water supply sites that passed the initial site screening, the CT DEEP GIS Open Data database land use maps were reviewed to identify land use classifications for potential sites. **Figure 6** displays current land uses within the Town of East Hampton.

2. *Hydraulic Benefit to the Water System* – The location of the existing water sources and the topology and geometry of the water system create a varied pressure profile. As a result, certain regions are more water-stressed than others, and the introduction of a water source offers varied benefits depending on location.

3. *Previous Investigations* – The Town of East Hampton has explored water supply sources in the past. EP reviewed the *Proposed Municipal Water System Preliminary Engineering Report* by Maguire Group Inc. dated January 3, 2006 to evaluate subsurface geology and potential aquifer conditions, as well as previous pump testing results.

4. *Proximity to Populated Areas* – The Town's most populated area is the village center area of Town, located south of Lake Pocotopaug. A large percentage of the Town's businesses, residences, and schools reside in this general area. The Town hopes to provide this area with water service following the construction of the water system. EP favored sites near this area of Town in order to conserve future costs and simplify water system design.

It should be noted that this basic level of screening is based on readily available online databases. In addition, this study included a preliminary evaluation of potential conservation or deed restrictions that may exist on these Town-owned properties that could exclude the use of this land for public water supply development. EP utilized CT DEEP GIS Protected Open Space data layers to evaluate potential restrictions to well development at each potential site. Additional research may be required for this purpose. Data from this desktop study may need to be updated if more than six months old.

Desktop Site Screening Results

As shown on the **Figure 1** through **Figure 6**, EP identified 71 potential parcels in which the Town or State owns and controls the sanitary radius. These 72 sites were evaluated based on potential presence of aquifer material, proximity to potential receptors, and potential sources of contamination.

In summary, many sites are considered unfavorable for obvious reasons and are not evaluated further, including:

- Located within an area with unfavorable aquifer conditions;
- Proximity to potential sources of contamination; and
- Proximity to the center of Town, where most of the Town's population resides.

The existing Royal Oaks and Village Center well sites are considered potential public water supply sites, but because these sites are already utilized in existing WPCA infrastructure, an additional desktop screening was not performed for these parcels, but could be performed at a later date. While the current wells at these sites cannot satisfy potential current and future demands for the Town, these parcels should be preserved for potential future water supply development.

Based on the criteria evaluated, EP found two potential groundwater supply sites of the 72 possible sites. The following sites are considered potentially favorable and are evaluated further:

1. Cobalt Landing Wellfield (Site #1)
2. Pine Brook Wellfield (Site #2)

As part of the desktop study, the two sites that were considered potentially favorable public water supply sites were evaluated in more detail and the results of this analysis are discussed in the following sections. It is important to note that while the Groundwater Desktop Evaluation presents these sites as potentially favorable, additional field investigations will be required to determine the viability of these sites as groundwater supply sources.

Site #1 – Cobalt Landing Wellfield

As previously discussed, the Town currently owns an easement at the Cobalt Landing Wellfield, located at the end of Oakum Dock Road on the Connecticut River. A 5-day pump test was performed on two wellheads on the potential site in 2004, yielding a total safe yield of 743,000 gallons per day. EP evaluated this site further through the Groundwater Desktop Evaluation to analyze current characteristics of the site, which led to the conclusion that Site #1: Cobalt Landing Wellfield:

- Is located within a Town-owned easement;
- Is located within an area mapped as a potentially high yield aquifer;
- Is located within an area with favorable surficial geology;

- Is currently permitted for the diversion of water for consumptive purposes through the CT DEEP Diversion Permit through 2031.

The Cobalt Landing Wellfield Site was used as a Marina Facility consisting of three buildings, a loading platform, a boat basin, and grounds. Building 2 was used as a boat fabrication and repair shop. A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. to evaluate the relative environmental risk associated with the current and former land uses of the Site and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including: 1- Existing Above Ground Storage Tanks (ASTs); 2- Former Underground Storage Tank; 3- Existing Drywell; 4- Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5- Building 1 Septic System Area. Based on the results of the Phase I ESA, a Phase II ESA was performed to determine the absence or presence of release conditions at the site.

The results of the Phase II ESA indicated that:

1. Soil and groundwater sample test results from the ASTs, Drywell and Septic System Area did not indicate "releases" of hazardous or contaminated materials within these areas.
2. Low concentrations of VOCs and metals were detected in limited soil samples collected from the Exterior Vehicle Loading/Unloading and Boat Docking Area, which may be due to fill material.
3. A groundwater sample collected from within the Exterior Vehicle Loading/Unloading and Boat Docking Area contained elevated concentrations of metals which may indicate an upgradient off site source or be possibly a sampling anomaly.
4. A soil sample collected from a boring the end of Oakum Dock Road contained TPH at a concentration exceeding DEP standards, possibly due to a surficial release.
5. Soil and groundwater sample test results from the Former Underground Storage Tank area indicate that a "release" of gasoline from the historic UST has occurred within this area.

Figure 7 shows the Cobalt Wellfield Site, easement, Sanitary Radius and Potential Aquifer Material and Thickness. As shown, coarse aquifer material 50 to 100 feet thick is identified.

This site should be considered for further evaluation as a potential public water supply site. While the site is not near the village center area of Town and will require several miles of transmission piping as well as water booster pumps due to the low elevation of the site, the results of the Desktop Evaluation show this site is favorable as a public water supply source. Next steps for evaluation are expanded upon later in this analysis, and include additional groundwater quality tests.

Site #2 – Pine Brook Site

The Pine Brook site is located on the west side of Pine Brook. EP evaluated the current conditions at this site and found that Site #2, Pine Brook site:

- Is located on a parcel owned by the Town of East Hampton;
- Is located within an area mapped as a potentially high yield aquifer;
- Is located within an area with favorable surficial geology;

- Is close to the populated village center area of Town; and
- Is not located in proximity to any known EPA/RCRA hazardous waste areas, PCB-contaminated sites, or impaired groundwater areas.

The potential wellsite boundaries were chosen based on location of aquifer material, the 200-foot Sanitary Radius buffer, and 50-foot wetland buffer. The current conditions at the Pine Brook site and potential wellsite are highlighted in **Figure 8**.

It is important to note that this site is located within land listed as CT DEEP Protected Open Space. The property record card for this parcel indicates that the site is classified as Land Use Code 923. The Town and EP plan to meet with CT DEEP to confirm the viability of this site as a groundwater supply source before carrying out additional explorations.

In summary, the results of the Groundwater Desktop Evaluation show that the Pine Brook site may be favorable for establishing a groundwater supply source. EP highlights further recommendations for determining the viability of the site in the following section.

Conclusions and Recommendations

EP has worked with the Town to develop recommendations for potential groundwater supply sources. The Groundwater Desktop Evaluation is a systematic evaluation of site characteristics to identify potentially viable groundwater supply sites. A total of 72 sites were reviewed, and 70 sites were eliminated from further consideration due to proximity to lack of aquifer material, environmental receptors, and/or site location. EP believes that the Town will be better informed on the water system requirements for its proposed municipal water system after performing additional investigations at the Cobalt Landing Wellfield and the Pine Brook site.

As previously discussed, the Cobalt Landing and Pine Brook sites, shown respectively on **Figures 7** and **8**, are identified as the most viable potential groundwater supply sites. However, the Groundwater Desktop Evaluation does not analyze water quality and quantity available at each site, as field conditions may differ from the results of this study.

Cobalt Landing Site

As indicated from the Phase I and Phase II ESAs conducted at the Cobalt Landing Site, potential sources of contamination were identified based on site uses and impacts to soil and groundwater were identified. Soil and groundwater sampling and analyses were conducted in 2005 and analyzed for a limited suite of parameters (petroleum hydrocarbons, volatile organic compounds and copper, lead and zinc). EP recommends that the Town evaluate the water quality at the Cobalt Landing site for a wider suite of analyses, including emerging contaminants 1,4-dioxand and PFAS compounds. Based on the results of these additional analyses, EP recommends that the Town works with CT DPH to discuss the groundwater quality findings.

Pine Brook Site

Following a discussion with CT DEEP to confirm the viability of the Pine Brook site as a water supply site under the CT DEEP Open Space Program, EP recommends that the Town conduct exploration and testing at the Pine Brook Site to determine water quantity and quality. In order to better evaluate the site, EP recommends installation of at least two test wells to identify the best location for evaluating water quantity and quality. A minimum two-hour Pump Test should be performed at the best test well site to determine specific capacity (pumping capacity in gallons per minute per foot of drawdown) and potential wellfield yield. At the end of the two-hour Pump Test water quality samples should be collected and analyzed for preliminary screening parameters (most commonly associated with water quality issues), including VOCs, nitrate, nitrate, metals and PFAS compounds. The Pine Brook Site is large enough that, if the initial exploration results indicate a potentially viable water supply site, additional test wells may be installed at a later date to identify the best location for development of a public water supply well.

ATTACHMENT A

Groundwater Desktop Evaluation Figures

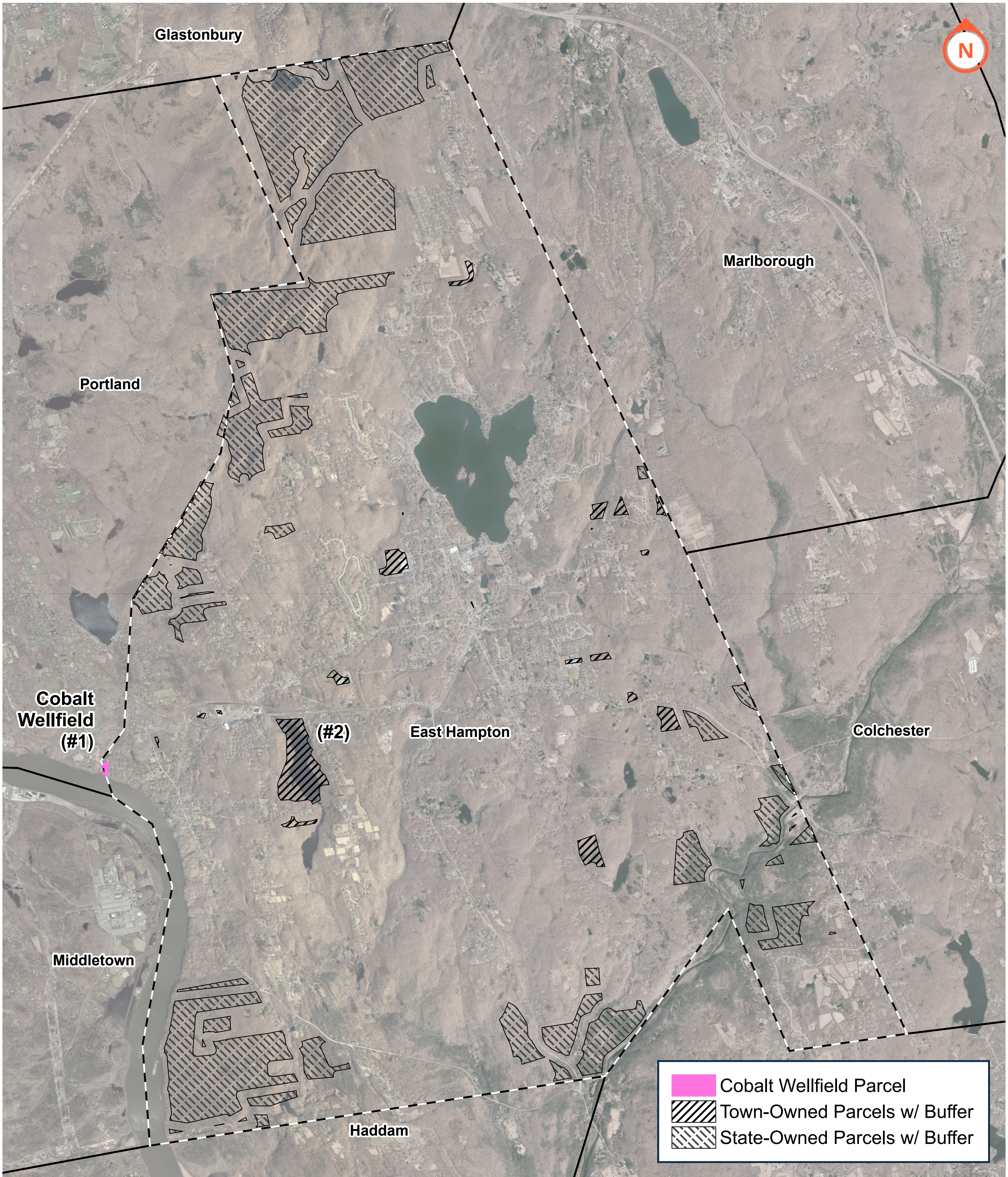

Figure 1 - Potential Supply Sites

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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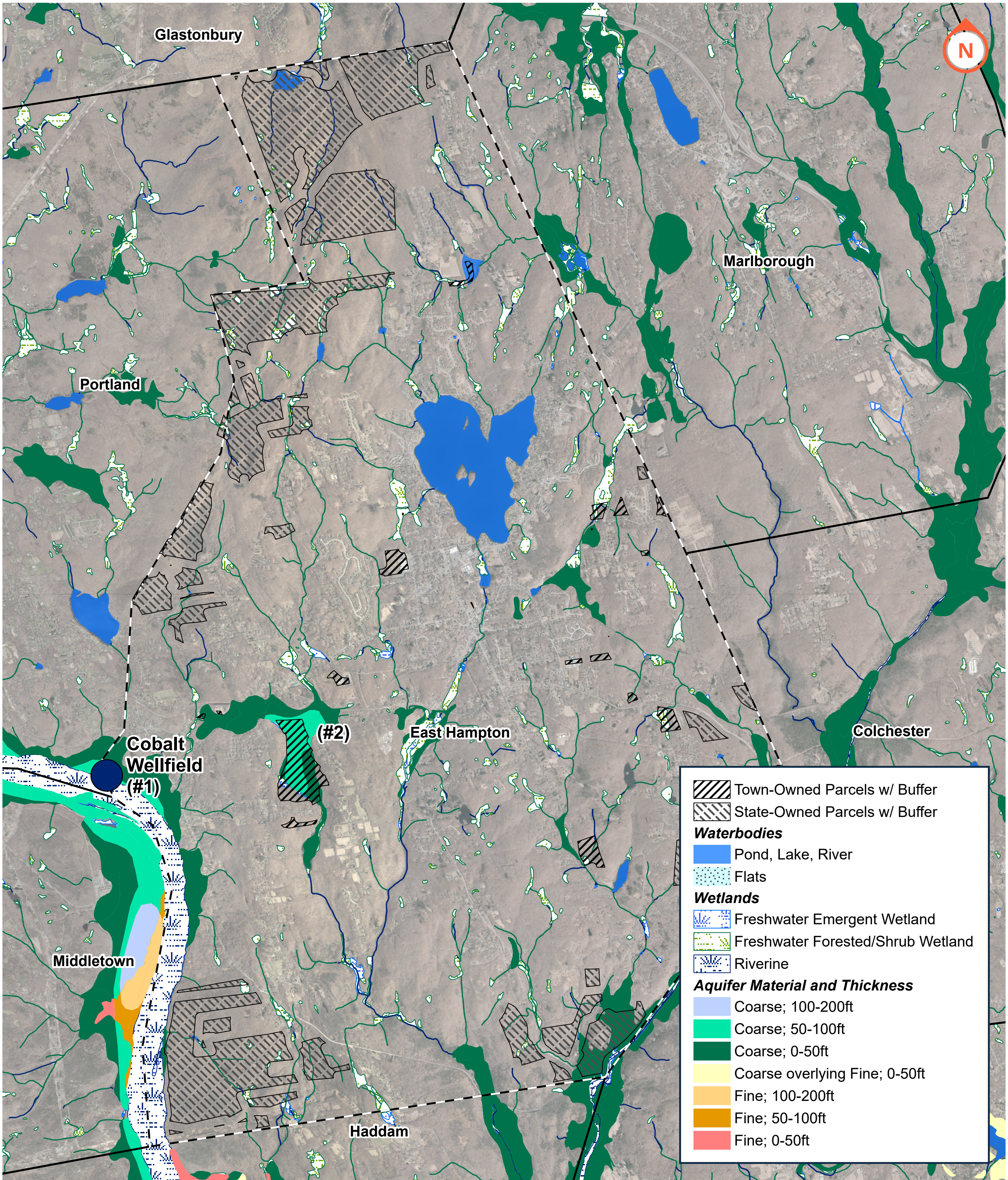

Figure 2 - Aquifer Material

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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Disclaimer: This map is intended for planning purposes

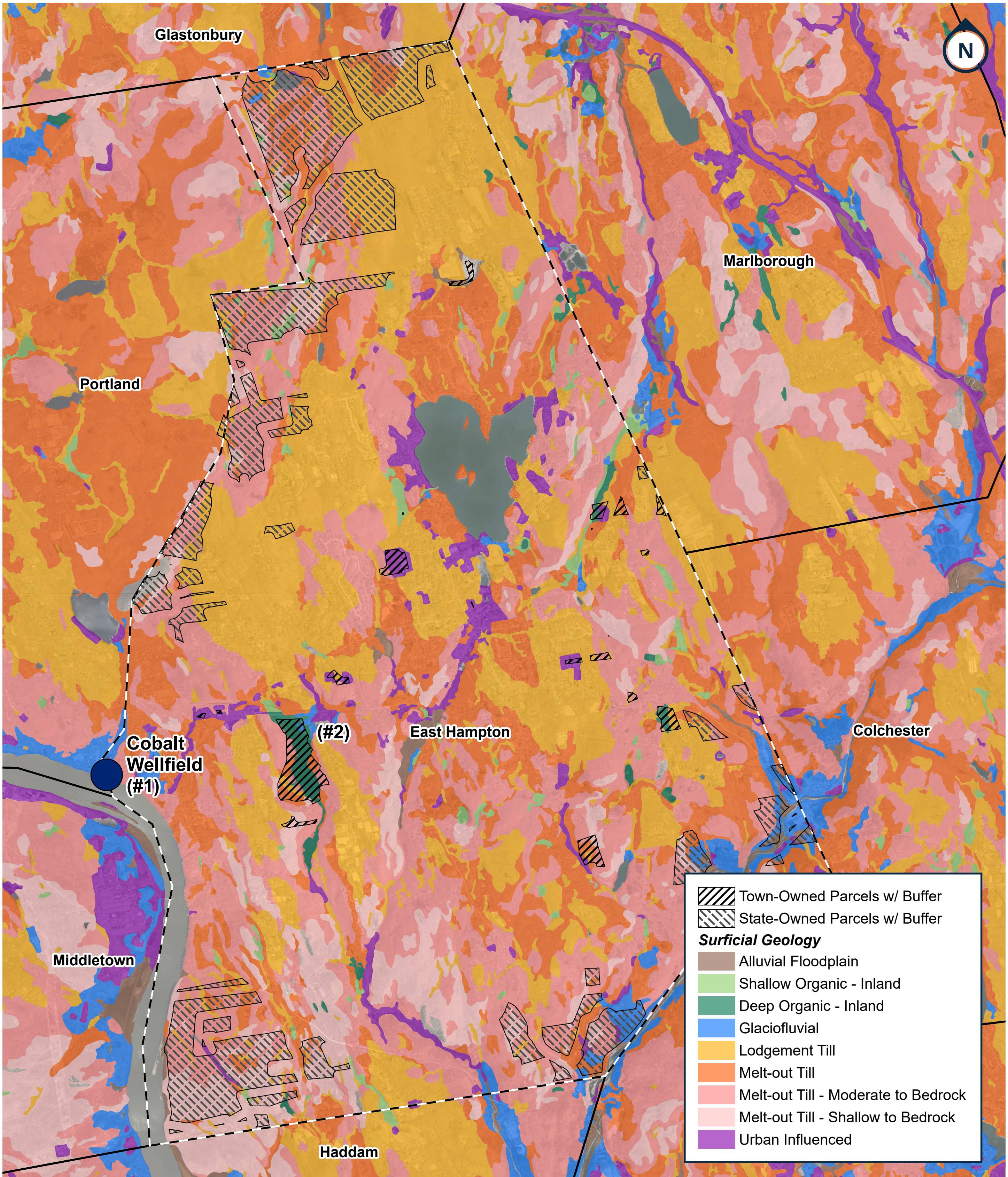

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Figure 3 - Surficial Geology

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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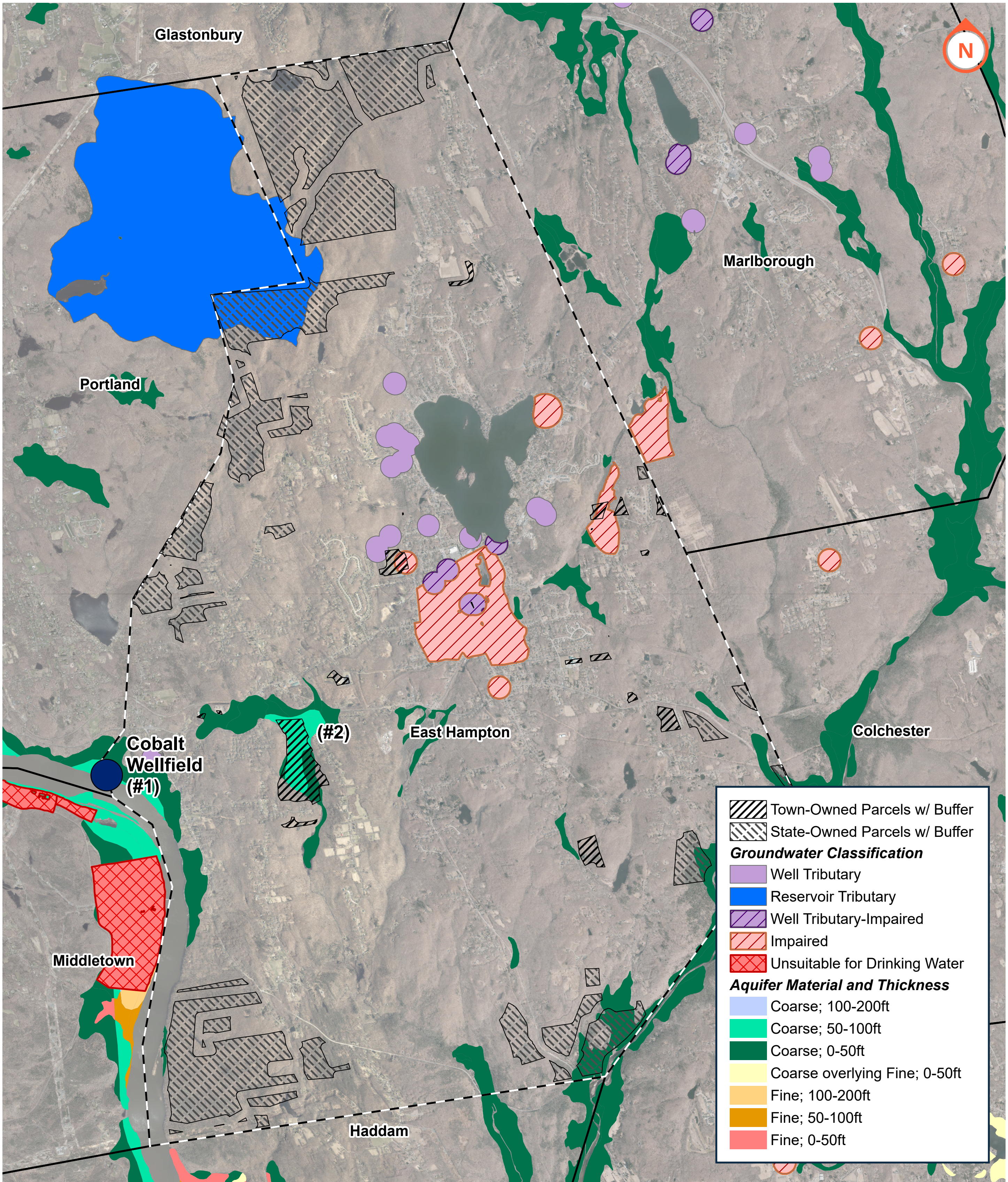

Figure 4 - Potential Sites and Groundwater Classifications

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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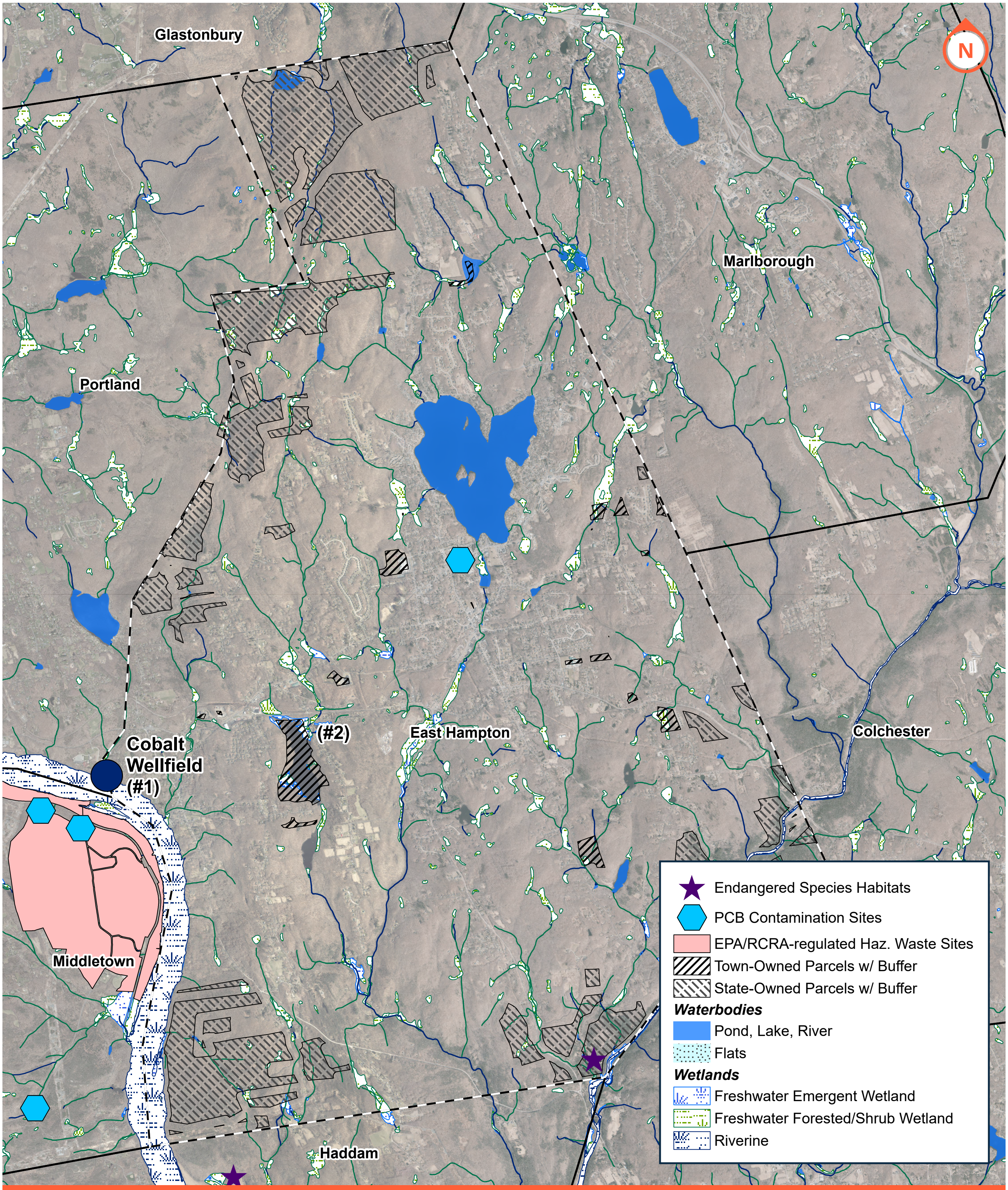

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Figure 5 - Potential Sites and Environmental Impacts

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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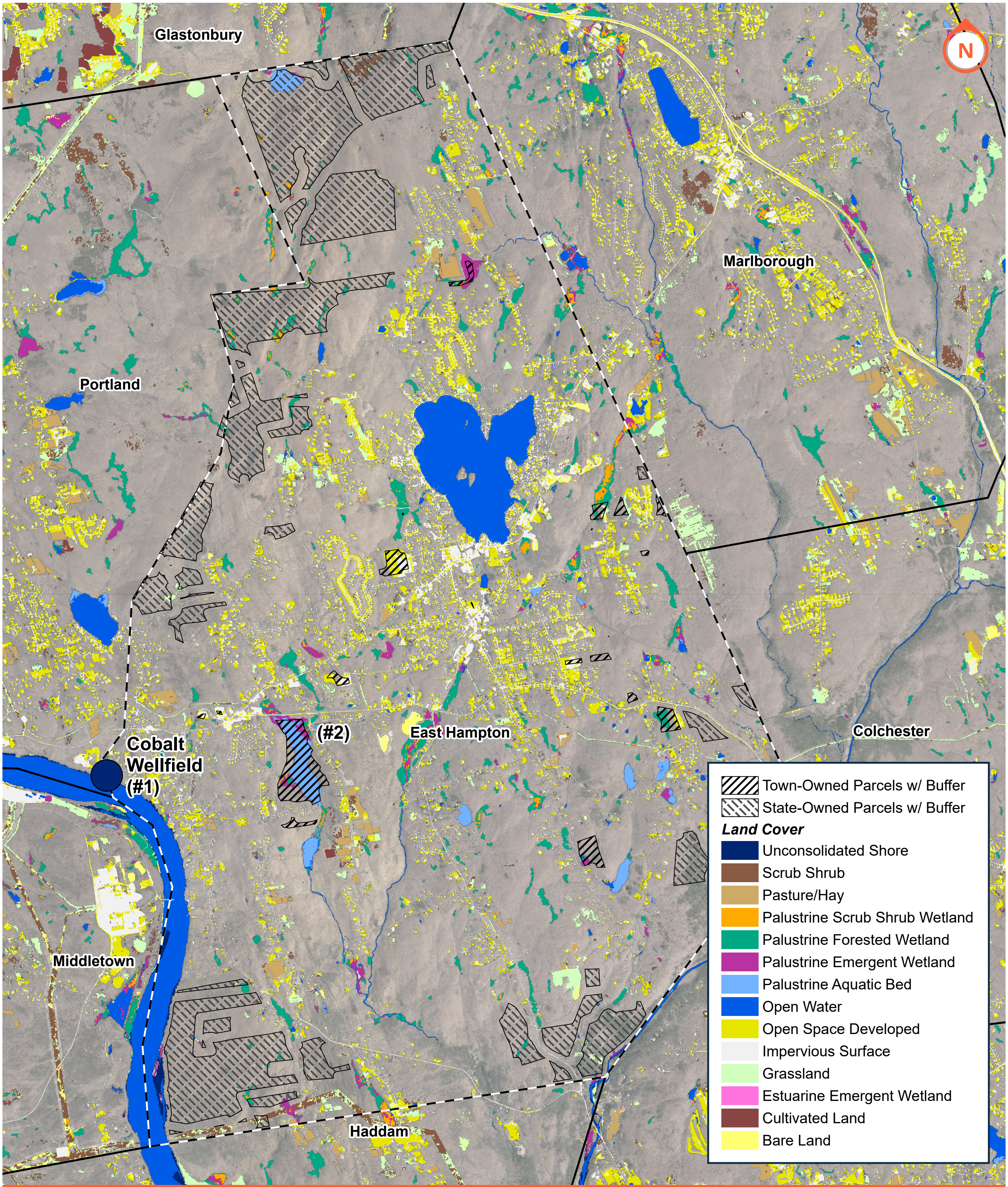

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Figure 6 - Potential Sites and Land Use

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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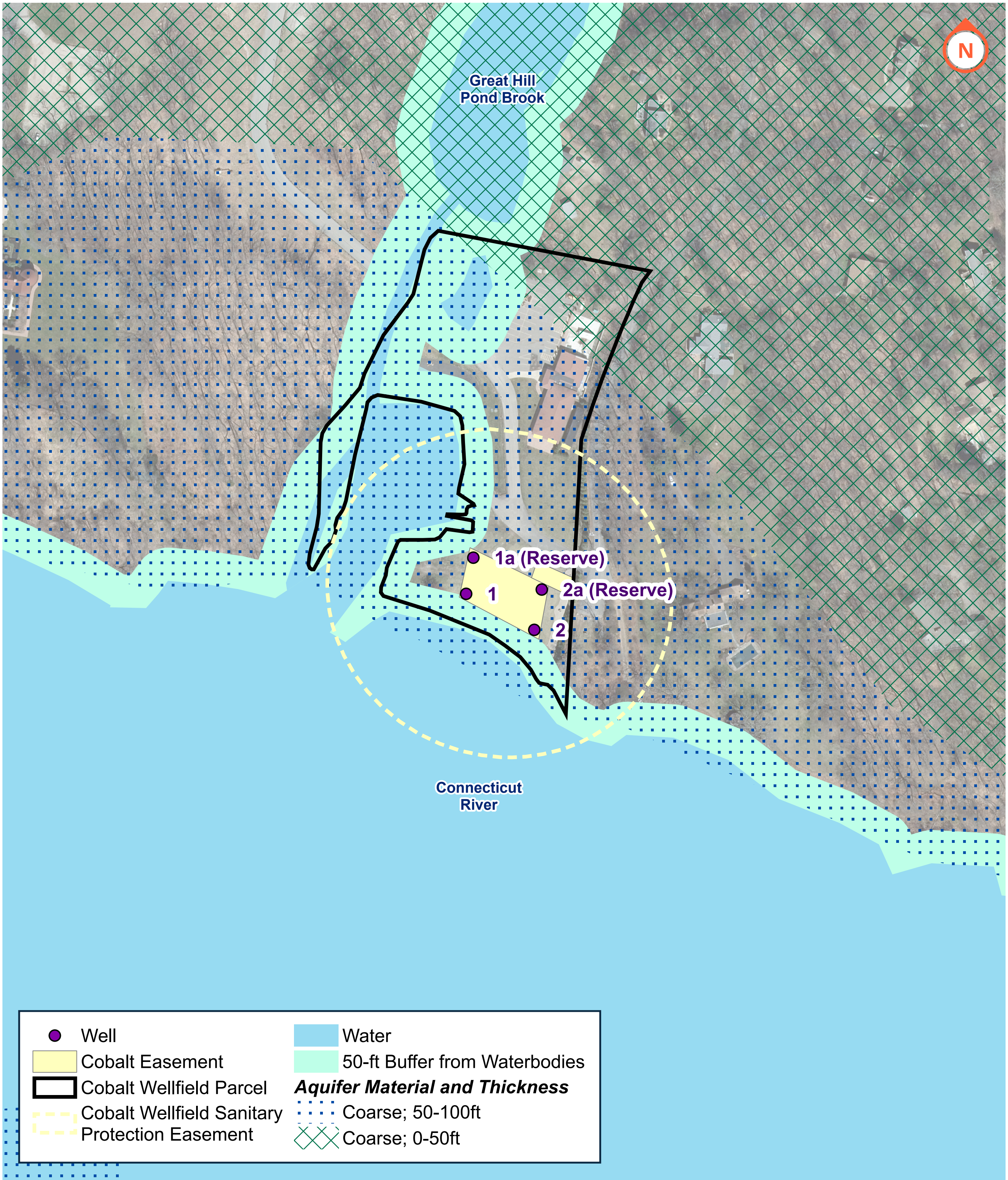

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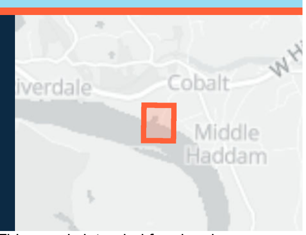
Figure 7 - Site 1 (Cobalt Wellfield)

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

0 100 200 400
1:200 Feet



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Disclaimer: This map is intended for planning purposes

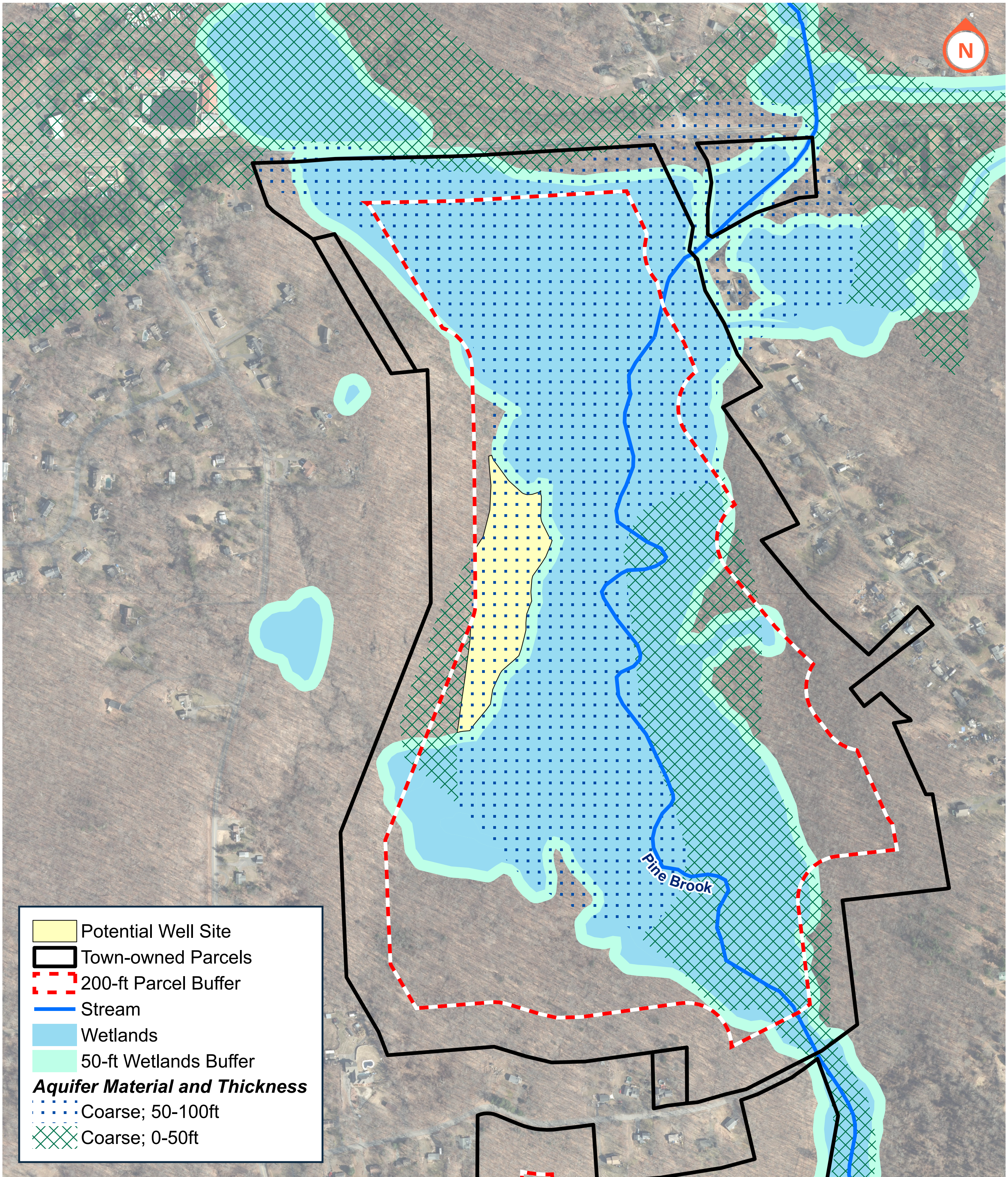

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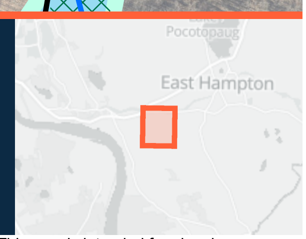
Figure 8 - Site 2
East Hampton Water Supply Evaluation
East Hampton, CT
May 2022

0 300 600 1,200
1:600
Feet



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— An Apex Company —

1900 Crown Colony Drive, Suite 402
Quincy, MA 02169
P: 617.657.0200 F: 617.657.0201

envpartners.com

APPENDIX B

Water System Demands and Proposed Service Area Boundaries Memorandum

ENVIRONMENTAL PARTNERS
— An Apex Company —

MEMORANDUM

Date: August 30, 2023

To David Cox, Town Manager, Town of East Hampton

From Chuck Adelsberger, Senior Project Manager, Environmental Partners

CC Brandon Goff, Town Council Member, Town of East Hampton
Pete Brown, Town Council Member, Town of East Hampton
Scott Clayton, Public Utilities Administrator, Town of East Hampton
Tim Feegel, Town Council Member, Town of East Hampton
Kevin Rathbun, Senior Project Engineer, Environmental Partners
Hanna Schenkel, Project Engineer, Environmental Partners

Subject **Water System Evaluation and Preliminary Design**
Water System Demands and Proposed Service Area Boundaries

Environmental Partners CT, Inc. (EP) has prepared this memorandum to document the evaluation of the Town of East Hampton's (the Town's) future water system demands and potential service areas.

Background

The Town of East Hampton is seeking to design and construct a centralized municipal water system to serve its residents. 12,700 residents currently reside in East Hampton, the majority of which rely on private groundwater wells for their potable water supply. Over the past several decades, groundwater contamination events have rendered a number of private wells unsafe for use. The Town has observed an increase in the number of contaminated private wells in recent years with instances of private well contamination have been documented for several decades. Since the early 2000s, the Town has documented coliform, methyl tert-butyl ether (MBTE), and hydrocarbon contamination around the Village Center and Lake Pocotopaug areas. In recent years, the Town has been informed of several instances of PFAS contamination at private wells, as well as within its own Water Pollution Control Authority (WPCA) wells. The Town aims to establish a centralized water system to serve a greater proportion of the Town's residential, commercial, and industrial properties and promote growth within the Town.

The Town first explored establishing new water sources in 2006, and the results are documented in the 2006 Preliminary Engineering Report, produced by Maguire Group, Inc. The Town's most recent Water Supply Plan (WSP) update in 2010, approved by the Connecticut Department of Public Health (CTDPH), recommended that the Town establish several new water supply wells; however, no new sources have been developed since the WSP was approved.

The Town contracted EP to produce a Preliminary Engineering Report (PER) in 2022, which produced several findings for potential water supply sources in the Town. As recommended in the PER, the Town contracted EP to expand on the PER by:

- Exploring the potential additional water supply sites,
- Determining the viability of the proposed water system sources,
- Developing a water system hydraulic model of the new system,
- Recommending new facilities, and
- Confirming the extend and gradients of the proposed service areas.

EP has presented the findings of this phase of the Town's water system expansion efforts in this memo.

Project History and Background

EP evaluated the Town's existing water systems and developed population and demand projections in the 2022 PER. Availability of water supply is a limiting factor for the Town of East Hampton; central Connecticut is known for its characteristically poor surficial geology for establishing groundwater supply sources. EP performed a groundwater desktop study to identify potential sites for future water supply sources based on geological conditions, environmental features, and land ownership. From this study, EP explored several alternatives for potential water supply sources within the Town. Ultimately, EP recommended developing the permitted Cobalt Wellfield on Oakum Dock Road and conducting geological investigations at the Pine Brook site near Hog Hill Road.

When Pine Brook groundwater exploration efforts determined that the site could not accommodate a public drinking water supply source, EP confirmed that the existing and permitted Cobalt Wellfield would be sole drinking water source for the Town.

Cobalt Wellfield

The Cobalt Wellfield is permitted via Diversion Permit through the Connecticut Department of Energy and Environmental Protection (CTDEEP) through 2031 to supply up to 0.90 million gallons per day (MGD). EP assigned anticipated projected water demands to East Hampton parcels and used the constraint of the current water supply from the Cobalt Wellfield to propose water system service areas, as detailed below.

The proposed water service area boundaries were influenced by both the topography of the Town and the available water supply quantity. To maintain pressures between 35 psi and 100 psi, EP must configure each pressure zone to have only 150 feet of elevation range between the highest and lowest water system customers. The Town has a unique topographic layout, with elevations ranging between 0 feet MSL to above 600 feet MSL. These conditions pose additional challenges, as the sole water supply source for the system is located at the lowest elevation in the town, and the most populated and vulnerable areas of the town are concentrated around the highest elevations. The available water supply is limited by the 0.90 MG of supply available from the Cobalt Wellfield. EP utilized a conservative peaking factor of 2.0 between average day demand (ADD) and maximum day demand (MDD) to estimate that the initial buildout of the water system must be capped at an ADD of 0.45 MGD.

As presented to the Town, EP's primary objective during this phase of the project is to perform a groundwater exploration program, site potential new water sources, and evaluate water system facility sites. Following these preliminary evaluation and siting tasks, we will provide a 20-year Capital Improvements Plan (CIP) with associated planning-level budgetary costs. The next phases will include a preliminary project design, where the preliminary design components and siting will be developed in more depth, including the design of water treatment facilities.

Estimated Water System Demands

EP utilized US Census data and the Town's 2010 Water Supply Plan (WSP) to estimate water consumption for the Town of East Hampton in the 2022 PER. EP refined these values during this phase of water system planning using projected demand guidelines from CTDPH and EP's experience with similar water systems. The demands presented in this section may be subject to change when the Town implements its water system; EP used conservative peaking factor estimates for this reason but recommends that the Town monitor customer water consumption as the system is brought online to refine the extents of the proposed service areas.

Demands by Parcel Zoning Designation

The Town has established twelve categories for land parcels as defined by the Land Use Department. We have listed these parcel categories in the table below. The Town provides full zoning descriptions in the East Hampton Zoning Regulations, amended in October 2022. **Table 1** presents parcel zoning descriptions, which were used to inform projected demand.

Table 1 – East Hampton Zoning Designations

Zoning Code	Description
C	Commercial
DD	Design Development
HOD	Housing Opportunity Development
I	Industrial
MUDD	Mixed-Use Development District
PO/R	Professional Offices/Residential
R-1	Lakeside and Village Residential
R-2	Single Family Residential
R-3	Residential (Resource)
R-4	Rural Residential
RL	Reserved Land
VC	Village Center

Residential Parcels

EP estimated the projected residential demand for parcels zoned as R-1, R-2, R-3, and R-4 using guidelines provided through the CTDPH Drinking Water Division's *Guidelines for the Design and Operation of Public Water System Treatment*. At a Census-estimated 2.5 persons per household and a design demand of 75 residential gallons per capita per day, EP estimated that each of the Town's residential service connections will require an average daily demand (ADD) of 0.13 gpm.

The WPCA provided EP with residential demand values for the Royal Oaks Water System residential customers. EP utilized these specific values when incorporating this development into the water system hydraulic model.

Reserved Land Parcels

Reserved Land is classified as public land within the Town of East Hampton that is owned by local, state, or federal government entities. Reserved land within the water system boundaries was mostly observed as open space. EP estimated the water usage of each Reserved Land parcel according to the land use of each parcel. We assumed that open, undeveloped space will not require drinking water supply.

Commercial Parcels

EP analyzed each commercial parcel by type of business to assign relative demands. Applying water usage estimates based on similarly sized water systems in the northeast, EP assigned approximate demands by parcel as presented in the table below.

Table 2 – Estimated Water Usage by Commercial User Type

Commercial User Type	Estimated Water Usage (gpd)
Coin Laundry	6,200
Country Club	1,900
Grocery	4,400
Restaurant	5,000
Senior Living	6,500
Detox/Health Center	4,300
Rehabilitation Center/Hospice	7,500
Electronics Plant	7,500
Hotel (about 100 rooms)	5,000
Hospital	19,000
Mobile Home/Trailer Park	26,200

Industrial Parcels

EP estimated the water demand of each industrial-zoned parcel based on parcel size. As a general guideline, we estimated a daily industrial user demands by multiplying the acreage of each industrial parcel by 12.4 gallons per day per acre, based on water usage estimates of comparably sized communities in the northeast.

Village Center Parcels

The Village Center parcel designation is specifically for the parcels in the Village Center area of town. These parcels carry multiple different uses and are mostly served by the WPCA's Village Center water system. EP utilized historic user billing data provided by the WPCA for the Village Center Water System to assign demands to the Village Center parcels that will be served by the proposed municipal water system.

Special Zoning Designation Parcels

EP assigned demands to "DD", "HOD", "MUDD", and "PO/R" parcels individually based on land use and building type using estimated demand data from similar regional water systems.

Maximum Day Demand and Peaking Factor

The estimates presented above reflect average demand periods. However, water systems typically experience elevated demands during summer months, partly due to elevated irrigation requirements during warmer weather. Standard waterworks practice dictates that water supply sources must be sized to supply maximum daily demands and EP recommends a maximum day peaking factor of 2.0 for planning purposes to supply maximum day demands (MDD) throughout the proposed service area. This implies maximum day demand is double the average day demand.

Beginning with the maximum supply capacity of 0.9 MGD, EP divided the peaking factor to extrapolate an average day demand target of 0.45 MGD. EP then established the approximate extent of the Town's water system service area that would be supplied by an average daily demand of 0.45 MGD as described below.

EP considers a peaking factor of 2.0 to be a conservative approach; peaking factors for communities of comparable composition tend to be between 1.6 and 1.8. However, because the available water supply capacity is finite, EP recommends a 2.0 peaking factor to avoid overextending the system. By using an elevated peaking factor, the Town will avoid a potential water supply shortage during the summer months following construction of the system.

With this approach, EP has established the MDD of the Intermediate and Phase 1 of the High Pressure Zones would be approximately 900,000 gallons per day, double the estimated ADD of 450,000 gallons per day. When considering the elevation range of the sparsely populated, highly residential Low Pressure Zone, EP recommends limiting the number of potential customers in this zone because the Town's intent is to supply the more populated areas in the Village Center area and more developed portions on the east side of East Hampton. Serving the customers in the Low Pressure Zone would add approximately 0.05 MGD of demand to the system. Considerations taken to site the Low Pressure Zone storage tank and potential zone hydraulics are discussed in further detail in the following section.

Table 3 presents the estimated demands of each pressure zone.

Table 3 – Estimated Demands by Pressure Zone

Pressure Zone	Estimated ADD (gpm)	Estimated ADD (mgd)	Estimated MDD (mgd)
Low Zone	32.29	0.046	0.093
Intermediate Zone	106.45	0.153	0.307
High Zone (Phase 1)	217.53	0.313	0.626
High Zone (Phase 2)	188.26	0.271	0.542
Total Estimated Demand (Int. and High (Phase 1 Zones)	323.98	0.467	0.933

The estimated ADD of the Low Pressure Zone includes all customers along the modeled transmission mains and the adjoining neighborhoods off of those mains; many of these customers would not be able to receive water from the Town without using pressure reducing devices at their services.

Proposed Water System Service Area

EP delineated a draft water system service area that could serve approximately 0.45 MGD of average day demand while serving the Town's priority service areas, including the Village Center area, Route 66 (south of Lake Pocotopaug), and East Hampton public schools. EP then reviewed the elevation range across the service areas while considering potential facility site locations to establish the required pressure zone boundaries.

The Connecticut Department of Public Health (CTDPH) recommends water suppliers maintain water service pressures above 35 pounds per square inch (psi) for all water system customers under normal operating conditions. However, prolonged pressures of 100 psi and above can increase the risk of leaks and breaks, particularly during surge events such as starting and stopping pumps and opening and closing valves and hydrants. Further, many indoor plumbing fixtures operate safely up to 100 psi. EP targeted an elevation range for each pressure zone that would allow for static pressures between 35 psi and 80 psi whenever possible.

Using these system pressure criteria, EP recommends the delineation of three pressure zones, as detailed below. We will document future water system facility design and proposed preliminary tank and booster pump sizing in further detail in the Water System Facility Siting and Hydraulics Evaluation Report. We are establishing the extent of the water services area in this memorandum to demonstrate the limits of the system to the Town when considering the available, permitted water supply from the Cobalt Wellfield.

Low Pressure Zone

The Town's proposed water system will require a water treatment plant upstream of the Cobalt Landing Wellfield to meet drinking water maximum contaminant levels and action levels. All water entering the Town's system will be treated at a singular treatment plant before distribution to customers. EP has sited the proposed water treatment plant at 8 Middle Haddam Road (Parcel No. 01C-10-3), which is situated at an elevation of approximately 146 feet. We ranked this parcel over all other potential properties in the Low Pressure Zone due to its proximity to the Cobalt Wellfield and the size of the undeveloped, Town-owned parcel at this location.

The Cobalt Water Treatment Plant is the starting point of all hydraulic considerations for the rest of the water system. Finished water enters the water distribution system at this location, and is conveyed through pump station at the desired hydraulic grade of each pressure zone. Several hydraulic factors impacted the tank and booster pumping station sites and preliminary sizing.

As previously discussed, water system pressures must be maintained between 35 psi and 100 psi during normal system operations. Additionally, each tank must be able to provide a minimum of 20 psi of pressure to all customers during a fire event. Therefore, EP recommends, and standard engineering practice dictates that water storage tanks be located at the highest elevation in the zone to maintain a minimum pressure of 20 psi throughout the services area. The elevation of the water treatment plant and subsequent tanks and pumps determined the maximum and minimum elevations that are serviceable in each pressure zone.

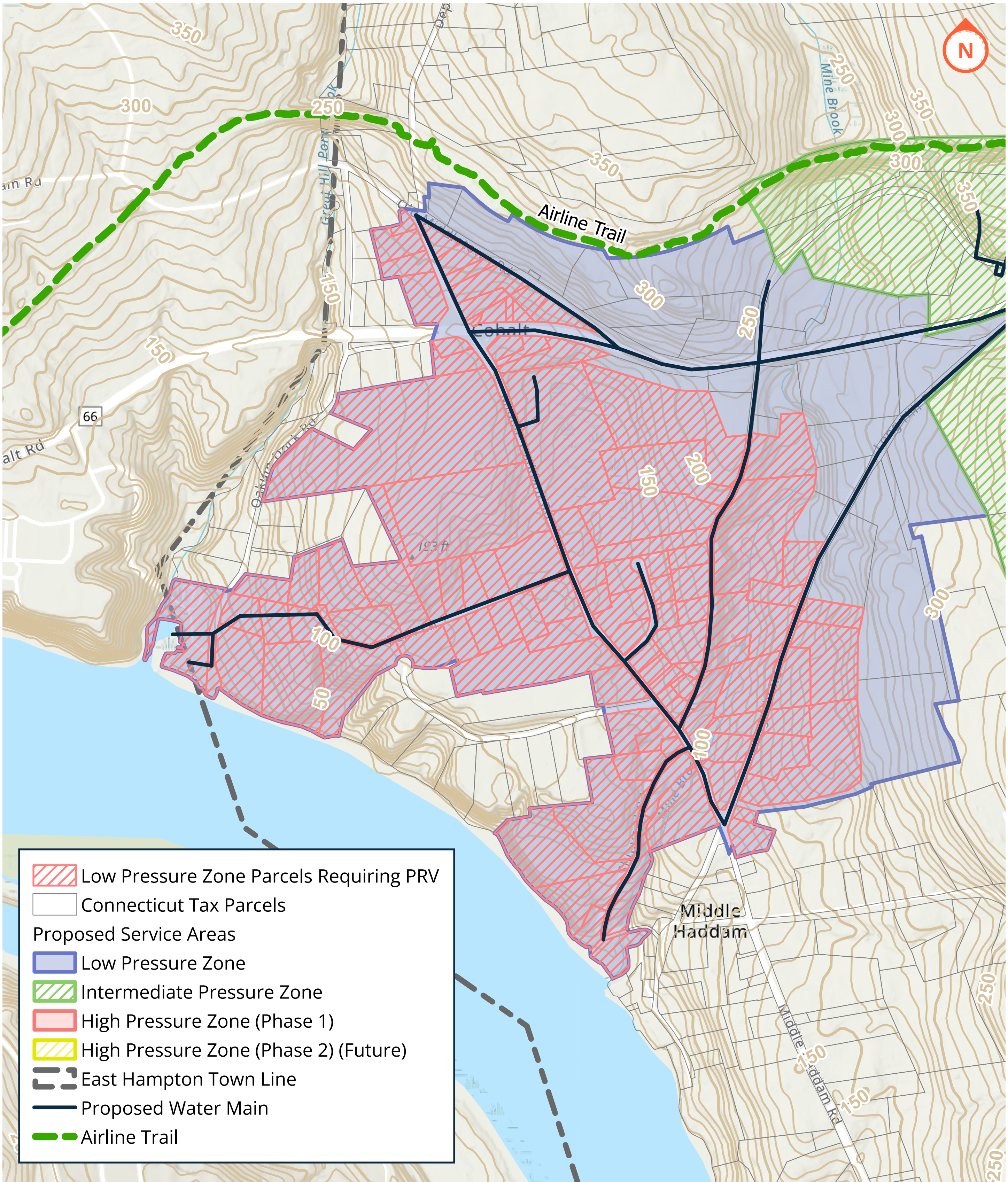
As discussed with the Town, the Low Pressure Zone would carry the smallest portion of system demand if served. Following communication with the Town, EP will determine which customers in the Low Pressure Zone will be served as the project evolves. The necessity for the Low Pressure Zone in general, and more specifically its tank, stems from the location of the Cobalt Wellfield. The Cobalt Wellfield will pump to a water treatment plant via transmission main. To minimize the length of raw water transmission main needed to treat the water from this water supply, siting the water treatment plant in the Low Pressure Zone is ideal. Additionally, the Town has expressed its goal to serve most of the Town; if the Town ever desires to serve any of the customers in the Low Pressure Zone area, the water treatment plant must be sited within this zone. As discussed in recent meetings, EP and the Town will carefully consider the prioritization of serving customers in this zone because the Town likely does not have enough water to supply this zone now while prioritizing the Village Center area, Route 66 (south of Lake Pocotopaug), and East Hampton public schools.

While EP does not recommend providing customer water service to this zone, this zone can still offer fire protection to the properties in this zone. EP recommends sizing the tank in this pressure zone to be capable of providing residential fire flow.

The hydraulic grade of the Low Pressure Zone is 439 feet. EP considered siting the Low Pressure Zone water storage tank at 1 Public Works Drive (Parcel No. 06-5A-8B) or 5 Gildersleeve Drive (Parcel No. 06-6-1). The final tank site will be contingent upon soil conditions, costs, and Town preference, though both sites are viable from a hydraulic standpoint. Following our hydraulic analysis, EP has set the minimum water elevation of this tank would be 388 feet and the overflow elevation would be 439 feet.

EP sited the Intermediate Booster Pumping Station at 5 Gildersleeve Drive, at elevation 293 feet. The Intermediate Booster Pumping Station would boost water to the hydraulic grade of the Intermediate Pressure Zone.

Under this configuration, if the Town would like to extend service to customers below elevation 200 feet MSL, EP recommends utilizing high-pressure ductile iron water main and installing pressure-reducing devices at property lines to maintain service pressures below 100 psi. **Figure 1** shows the parcels in the proposed Low Pressure Zone that would require pressure reducing devices for normal water service.



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 1
Low Pressure Zone Parcels Requiring PRV for Service
East Hampton, Connecticut
August 2023

0 200 400 800 Feet

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Disclaimer: This map is intended for planning purposes

Intermediate Pressure Zone

EP recommends setting elevations in the Intermediate Pressure Zone range from 309 to 451 MSL. The proposed hydraulic grade of the Intermediate Pressure Zone is 568 feet. EP sited the Intermediate Pressure Zone water storage tank at 4 Middletown Avenue (Parcel No. 20-50-17A), a Town-owned parcel home to the Ambulance Association building. There is a large, undeveloped area at the west of this site atop a hill that would be preferable for the tank. The proposed overflow of this tank is 569 feet, and the minimum water elevation of the tank is 531 feet.

EP has preliminarily sited the High Pressure Zone Booster Pump and its discharge piping to be able to serve the entirety of the High Pressure Zone at full buildout. EP sited the booster pump at the Center Elementary School at 7 Summit Street (Parcel No. 05A-62-31). This site is ideal for the booster pumping station, as the WPCA already operates a Village Center Water System facility out of the Center Elementary School and therefore can convert the space dedicated to the water system equipment for this use, reducing capital costs. This booster pump is situated at the border of the Intermediate Pressure Zone and the High Pressure Zone.

High Pressure Zone

Due to water supply restrictions, EP recommends taking a phased approach to constructing the High Pressure Zone. As previously discussed, most of the Town's residents and businesses are located in the High Pressure Zone. Additionally, the Town has documented the location of contaminated private residential wells and most are in this region of Town. EP determined the optimal elevations in this pressure zone to range from 415 to 599 MSL, with a proposed hydraulic gradeline of 683 feet.

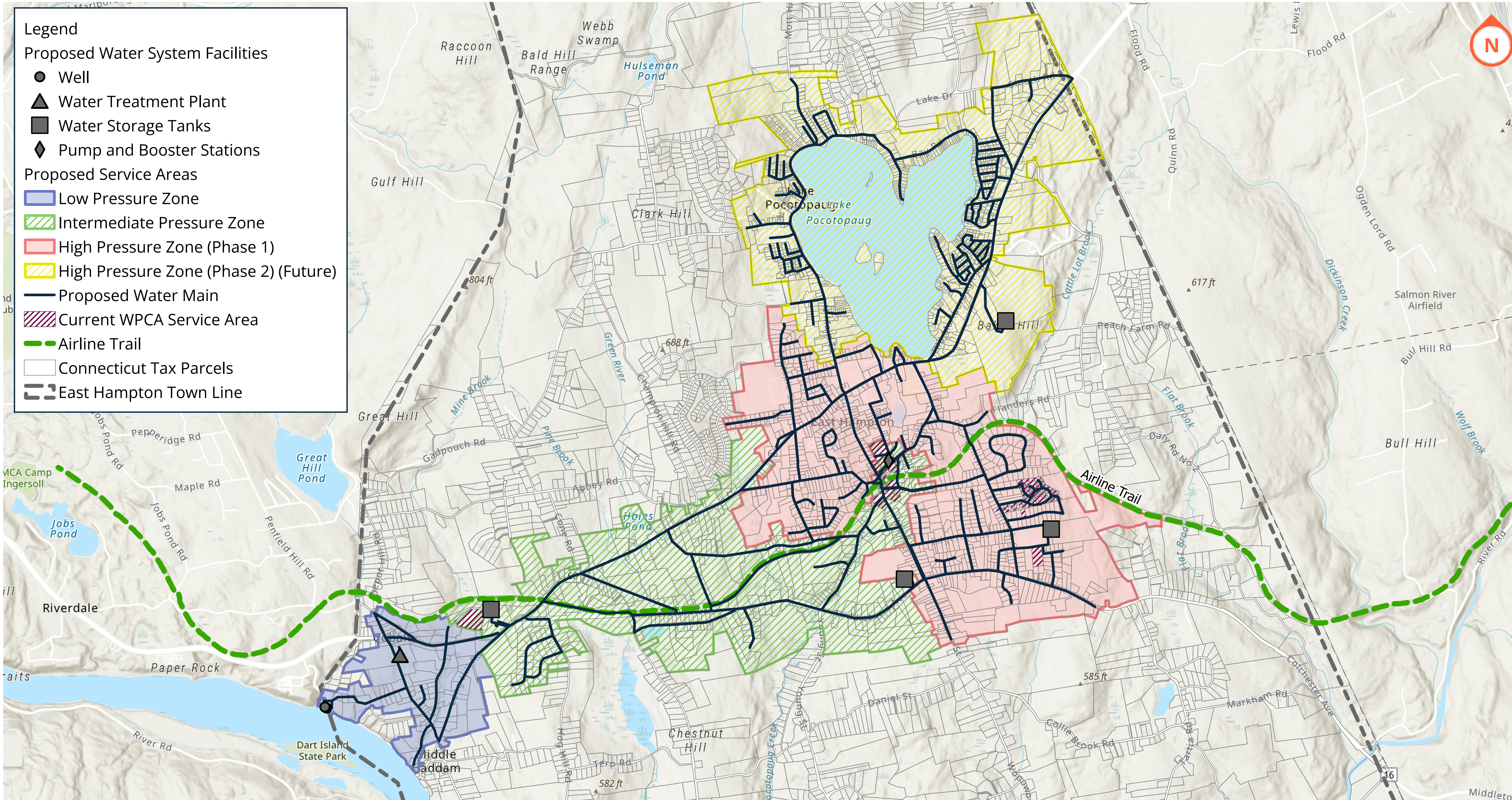
EP recommends siting a water storage tank for Phase 1 of the High Pressure Zone at the eastern, wooded area of the Memorial School parcel at 20 Smith Street (Parcel No. 26-87A-22). This Town-owned parcel extends to Smith Street and has ample space for siting a standpipe. Additionally, this parcel is located near the booster pumping station and populated Route 66 area, which is beneficial for fire flow and limit water age in these areas. The preliminary design of this tank includes a minimum water level elevation of 651 feet and an overflow elevation of 684 feet. Following our preliminary review of hydraulics and fire protection, EP recommends oversizing the Memorial School Tank slightly oversized to provide additional fire protection storage needed to back feed the Intermediate Pressure Zone during a fire flow event.

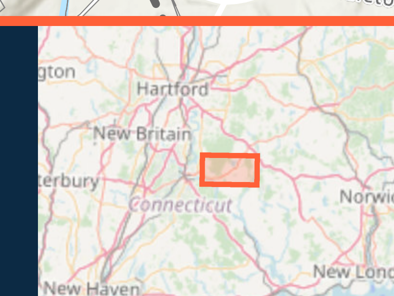
Table 4 presents a breakdown of the proposed hydraulic gradelines for each water system pressure zone.

Table 4 – Proposed Water System Pressure Zone Hydraulics Summary

Pressure Zone	Hydraulic Gradeline (Tank Overflow Elevation) (feet MSL)	Lowest Customer Ground Elevation (feet MSL)	Highest Customer Ground Elevation (feet MSL)
Low	439	200.0	295.9
Intermediate	568	309.5	451.0
High (Phase 1)	684	415.2	599.0
High (Phase 2)		466.0	585.7

Figure 2 displays the parcels included in the proposed water system service area.





ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 2
Proposed East Hampton Water System Preliminary Service Area (Full Buildout)
East Hampton, Connecticut
August 2023

0 1,500 3,000 6,000 Feet

Disclaimer: This map is intended for planning purposes

Conclusion and Recommendations

EP delineated a proposed service area based on system hydraulics and estimated water usage. While these factors impact the boundaries of the service area, the Town and EP must present the proposed water system boundaries to inform the public about our progress on this important project. Therefore, EP requests that the Town review the proposed service areas and parcels served to clearly understand EP's approach to locating the proposed service area. EP will include and emphasize the proposed boundaries of water supply service in the Water System Facilities and Hydraulic Evaluation Report.

As estimated now, the Town is projected to reach its maximum service potential of 0.9 MGD with the service areas delineated in this memo. However, if average customer consumption proves to be less than the State recommended projection of 75 gallons per day, or if the summer peaking factor proves to be lower than 2.0, it may be possible to extend the service area to include the Low Pressure Zone, as well as some additional customers around Lake Pocotopaug.

EP has delineated proposed service areas based on maintaining acceptable service pressures and providing adequate fire flow throughout the Town's varied topography. Because the customers in Phase 2 of the High Pressure Zone are located at comparable elevations to those of Phase 1 of the High Pressure Zone, the Town would not need to add additional booster pumps to accommodate these customers, but would likely need an additional water storage tank. EP will provide further detail in the draft Water System Facilities and Hydraulic Evaluation Report.

EP appreciates the opportunity to assist the Town on this important and necessary project. If you have any questions regarding this memorandum or require additional information, please do not hesitate to contact us.

APPENDIX C

Town of East Hampton Water Supply Source Groundwater Desktop Evaluation Memorandum

ENVIRONMENTAL PARTNERS
— An Apex Company —

MEMORANDUM

Date: February 16, 2023

To Mr. David E. Cox, Town Manager, Town of East Hampton

From Charles Adelsberger, P.E., BCEE, Senior Project Manager, Environmental Partners

CC Ann Marie Turbeville, Director of Geosciences, Environmental Partners

Kevin Rathbun, Senior Project Engineer, Environmental Partners

Hanna Schenkel, Engineer, Environmental Partners

Subject Town of East Hampton Water Supply Source Groundwater Desktop Evaluation

Summary

The Town of East Hampton (the Town) is seeking to establish a centralized municipal water system. Currently, the residents of East Hampton obtain water from either private wells, smaller community water systems, or the East Hampton Water Pollution Control Authority (WCPA). However, in recent decades, the Town has experienced numerous instances of water quality issues at private wells and within community water systems. Additionally, the WPCA and community water systems are only able to serve a portion of the Town, leaving the unserved residents and businesses within the Town to use private wells, which may be located in contaminated areas. To promote public health, provide fire flow protection, and spark the community's economic growth, the Town is proposing to establish a municipal water system.

In order to determine the most effective and cost efficient course of action for designing and constructing the centralized municipal water system, the Town must explore potential water supply sources. To advance the Town towards this goal, Environmental Partners (EP) has performed a Groundwater Desktop Exploration, in which potential well sites were identified for further investigation. For the most part, this desktop study focused on Town- and State-owned parcels, but could be expanded to include potential private parcels of land for future acquisition. This desktop study included:

- Reviewing the 2010 East Hampton Water Supply Plan (Milone & Macbroom, Inc.)

- Reviewing the 2006 Preliminary Engineering Report (Maguire)
- Compiling Town- and State-owned parcels that can support a required sanitary radius
- Evaluating sites with respect to aquifer potential
- Evaluating sites with respect to receptors and potential sources of contamination
- Evaluate sites with respect to other criteria (i.e., geologic conditions, land use restrictions, etc.)

Figure 1 is a preliminary site screening map showing potential public water supply sites. The following is a summary of the desktop study results:

1. A total of 72 potential sites satisfied the land ownership requirement for potential public water supply sites. The 72 sites, of which 51 were State-owned and 21 were Town-owned, are shown on **Figure 1**.
2. The majority of potential water supply parcels were eliminated from further consideration because of no potential aquifer material. **Figure 2** shows the Town-owned sites where potential aquifer material may be present.
3. The following Town-owned sites were identified as potential water supply sites for further consideration and field evaluation:
    a. Site #1: Cobalt Landing Wellfield, shown on **Figure 7**
    b. Site #2: Pine Brook Site, shown on **Figure 8**

Based on the results of the Desktop Study, the next steps in the new water source process are to further evaluate the most favorable sites with a subsurface groundwater exploration test well drilling program and to explore groundwater quality.

In 2004, the Town conducted a subsurface exploration at the Cobalt Landing Wellfield that included the installation of a test well and observation well. The Town conducted a 5-day pump test in accordance with the Connecticut Department of Environmental Protection's Level A Standards at the time. Based on this investigation, the Cobalt Landing Wellfield safe yield was established at 743,000 gallons per day, based on pumping 24 hours a day. The Cobalt Landing Wellfield is already permitted through the CT Department of Energy and Environmental Protection (DEEP) Diversion Permit.

A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. in 2005 to evaluate the relative environmental risk associated with the current and former land uses of the Cobalt Landing Wellfield property and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including 1 – Existing Above Ground Storage Tanks (ASTs); 2 – Former Underground Storage Tank; 3 –Existing Drywell; 4 – Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5 – Building 1 Septic System Area. Should the Town decide to proceed with development of the Cobalt Landing Wellfield, EP recommends that the existing wells be tested to determine groundwater quality. In particularly, the Cobalt Landing Wellfield groundwater should be tested for emerging contaminants, including 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFAS).

Following the Groundwater Desktop Evaluation, EP recommends that the Town further explore the groundwater characteristics at the Pine Brook Site as well, which shows promising results for groundwater quality and quantity.

The scope, methodology and results of the new source water supply desktop study and exploration results are discussed in more detail below.

Background

The Town's most recent Water Supply Plan update in 2010 recommended that the Town establish several new water supply wells. While the Town had explored establishing new water sources in their 2006 Preliminary Engineering Report, the Town has not connected any of the new sources that were explored to a centralized municipal water system.

Some areas within the Town of East Hampton have been plagued by poor groundwater quality. In recent decades, the Town has experienced several e. coli outbreaks among private well users, as well as in some of the WPCA's existing well supplies. Establishing a centralized municipal water system would benefit the Town greatly as the residents of East Hampton would be able to rely on a safer and less expensive source of potable water. In order to establish a municipal water system, the Town must find a safe and reliable source of water with ample water supply availability. While the previously permitted Cobalt Wellfield is a promising candidate for a future groundwater supply source, EP recommends that the Town explores establishing additional groundwater supply sites for supply redundancy and to meet the projected water demands outlined in the 2010 Water Supply Plan.

Desktop Site Screening Methodology

Initial Screening

EP conducted a new source water supply screening desktop study for the Town. As an initial screening, Town and State owned parcels were compiled to determine if the Town or State owned and controlled the sanitary radius of the potential groundwater source, which is the CT DEEP required protective radius required around a public water supply well. In Connecticut, the sanitary radius of any well pumping greater than fifty gallons per minute is 200 feet. Full control of the sanitary radius is required for all new wells per Connecticut General Statutes Section 25-33(b), and current and/or future land uses within the sanitary radius must be limited to those directly related to the provision of public drinking water or will have no significant adverse impact on water quality. Town and State owned parcels were compiled on a map and a 200-foot buffer mapped on each parcel.

In addition, Connecticut State Regulations 19-13-B51d. requires that wells with a withdrawal rate of more than fifty gallons per minute must be located at least 200 feet from a system for disposal of sewage or other source of pollution and must be located at least 50 feet of the high water mark of any surface water body.

The open space area inside this 200-foot buffer and at least 50 feet from any surface water body is the area owned by the Town that could support a public water supply well. Town owned parcels with the 200-foot sanitary radius are shown on **Figure 1**. As shown on **Figure 1**, a total of 72 parcels were identified as potential water supply parcels and were evaluated further based on the following criteria:

- Potential Aquifer Material
- Proximity to Environmental Receptors
- Potential Sources of Contamination
- Other Additional Criteria (i.e., geologic conditions, land use restrictions, etc.)

Proximity to Environmental Receptors

The Town of East Hampton is located in the geographic center of the State of Connecticut and borders the Connecticut River. There are numerous surface water bodies, wetlands, and streams within the Town, as well as abundant shallow bedrock and thin till material (non-aquifer material). Potential presence of aquifer material was used as an initial screening criteria. Proximity to environmental receptors was then used to screen the parcels in which the Town or State owns and the Town controls a 200-foot sanitary radius to identify potential new source water supply sites. The CT DEEP GIS Open Data database was used to identify the following sensitive environmental receptors:

- Areas of Critical Environmental Concern (ACEC)
- Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Vernal Pools (Certified and Potential)
- Wetlands

Finally, potential water supply sites were limited to areas on streams and rivers which were not determined to be DEEP cold-water fisheries.

Geologic Conditions

Generally, courser aquifer materials are favorable for groundwater supply sources as they are less penetrable than finer materials. Aquifer material is considered one of the most accurate indicators for potentially favorable groundwater supply sites. EP utilized the Surficial Aquifer Potential Map of Connecticut to analyze the potential presence and thickness of surficial aquifer deposits. **Figure 2** displays aquifer material classifications within the Town of East Hampton.

CT DEEP aquifer maps and surficial geology maps were used to evaluate the potential presence or absence of aquifer material. The Surficial Aquifer Potential Map of Connecticut was prepared by the Connecticut Geological Survey for statewide resource protection, water management, non-point source pollution prevention, and land use planning. **Figure 3** displays the surficial geology throughout the Town of East Hampton. Analyzing surficial geology may inform the Town of landforms and unconsolidated sediments (potential aquifer material) throughout the Town, as well as areas of shallow bedrock and thin till (non-aquifer material). Generally, melt-out till and melt-out till - moderate to bedrock are considered potentially favorable for groundwater supply sites.

Potential Sources of Contamination

Land use maps were examined for potential water supply sites that passed initial screening to determine if any potential sources of contamination to groundwater are located nearby or within a 200-foot radius. In accordance with DPH Sec. 19-13-B51d,

> "No such well shall be located within two hundred feet of a system for disposal of sewage or other source of pollution. If conditions warrant, greater distance shall be required Sanitary conditions in the area within the radial distance required shall be under control of the well owner by ownership, easement, or other arrangement approved by the commissioner of health. If a sewer is constructed of extra heavy cast iron pipe with leaded joints or equal approved type of tight joint, a minimum separating distance of one hundred feet shall be maintained."

Potentially sources of pollution include active or abandoned sanitary landfills, major fuel storage and/or transmission facilities, automobile graveyards and junkyards, road salt stockpile areas lacking adequate containment structures, agricultural uses, hazardous substances storage areas, etc. Special groundwater classification within the Town of East Hampton can be divided into several categories, including Well Tributary, Reservoir Tributary, Well Tributary-Impaired, Impaired, and Unsuitable for Drinking Water. When choosing potential groundwater supply sites, EP omitted sites within the previously discussed categories from the potential list of sites. Additionally, EP omitted sites within EPA and Resource Conservation and Recovery Act (RCRA) regulated hazardous waste sites, as well as PCB contamination sites. **Figure 4** shows potential sites and groundwater classifications within the Town of East Hampton. **Figure 5** shows potential sites and environmental impacts within the Town.

Additional Site Screening

In additional to environmental receptors and sources of contamination, potential water supply sites were screened based on the following criteria:

1. *Land Use* – For potential water supply sites that passed the initial site screening, the CT DEEP GIS Open Data database land use maps were reviewed to identify land use classifications for potential sites. **Figure 6** displays current land uses within the Town of East Hampton.
2. *Hydraulic Benefit to the Water System* – The location of the existing water sources and the topology and geometry of the water system create a varied pressure profile. As a result, certain regions are more water-stressed than others, and the introduction of a water source offers varied benefits depending on location.
3. *Previous Investigations* – The Town of East Hampton has explored water supply sources in the past. EP reviewed the *Proposed Municipal Water System Preliminary Engineering Report* by Maguire Group Inc. dated January 3, 2006 to evaluate subsurface geology and potential aquifer conditions, as well as previous pump testing results.
4. *Proximity to Populated Areas* – The Town's most populated area is the village center area of Town, located south of Lake Pocotopaug. A large percentage of the Town's businesses, residences, and schools reside in this general area. The Town hopes to provide this area with

water service following the construction of the water system. EP favored sites near this area of Town in order to conserve future costs and simplify water system design.

It should be noted that this basic level of screening is based on readily available online databases. In addition, this study included a preliminary evaluation of potential conservation or deed restrictions that may exist on these Town-owned properties that could exclude the use of this land for public water supply development. EP utilized CT DEEP GIS Protected Open Space data layers to evaluate potential restrictions to well development at each potential site. Additional research may be required for this purpose. Data from this desktop study may need to be updated if more than six months old.

Desktop Site Screening Results

As shown on the **Figure 1** through **Figure 6**, EP identified 72 potential parcels in which the Town or State owns and controls the sanitary radius. These 72 sites were evaluated based on potential presence of aquifer material, proximity to potential receptors, and potential sources of contamination.

In summary, many sites are considered unfavorable for obvious reasons and are not evaluated further, including:

- Located within an area with unfavorable aquifer conditions;
- Proximity to potential sources of contamination; and
- Proximity to the center of Town, where most of the Town's population resides.

The existing Royal Oaks and Village Center well sites are considered potential public water supply sites, but because these sites are already utilized in existing WPCA infrastructure, an additional desktop screening was not performed for these parcels, but could be performed at a later date. While the current wells at these sites cannot satisfy potential current and future demands for the Town, these parcels should be preserved for potential future water supply development.

Based on the criteria evaluated, EP found two potential groundwater supply sites of the 72 possible sites. The following sites are considered potentially favorable and are evaluated further:

1. Cobalt Landing Wellfield (Site #1)
2. Pine Brook Wellfield (Site #2)

As part of the desktop study, the two sites that were considered potentially favorable public water supply sites were evaluated in more detail and the results of this analysis are discussed in the following sections. It is important to note that while the Groundwater Desktop Evaluation presents these sites as potentially favorable, additional field investigations will be required to determine the viability of these sites as groundwater supply sources.

Site #1 – Cobalt Landing Wellfield

As previously discussed, the Town currently owns an easement at the Cobalt Landing Wellfield, located at the end of Oakum Dock Road on the Connecticut River. A 5-day pump test was performed on two wellheads on the potential site in 2004, yielding a total safe yield of 743,000 gallons per day. EP evaluated this site further through the Groundwater Desktop Evaluation to analyze current characteristics of the site, which led to the conclusion that Site #1: Cobalt Landing Wellfield:

- Is located within a Town-owned easement;
- Is located within an area mapped as a potentially high yield aquifer;
- Is located within an area with favorable surficial geology;
- Is currently permitted for the diversion of water for consumptive purposes through the CT DEEP Diversion Permit through 2031.

The Cobalt Landing Wellfield Site was used as a Marina Facility consisting of three buildings, a loading platform, a boat basin, and grounds. Building 2 was used as a boat fabrication and repair shop. A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. to evaluate the relative environmental risk associated with the current and former land uses of the Site and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including: 1 – Existing Above Ground Storage Tanks (ASTs); 2 – Former Underground Storage Tank; 3 – Existing Drywell; 4 – Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5 – Building 1 Septic System Area. Based on the results of the Phase I ESA, a Phase II ESA was performed to determine the absence or presence of release conditions at the site.

The results of the Phase II ESA indicated that:

1. Soil and groundwater sample test results from the ASTs, Drywell and Septic System Area did <u>not</u> indicate "releases" of hazardous or contaminated materials within these areas.
2. Low concentrations of VOCs and metals were detected in limited soil samples collected from the Exterior Vehicle Loading/Unloading and Boat Docking Area, which may be due to fill material.
3. A groundwater sample collected from within the Exterior Vehicle Loading/Unloading and Boat Docking Area contained elevated concentrations of metals which may indicate an upgradient off site source or be possibly a sampling anomaly.
4. A soil sample collected from a boring the end of Oakum Dock Road contained TPH at a concentration exceeding DEP standards, possibly due to a surficial release.
5. Soil and groundwater sample test results from the Former Underground Storage Tank area indicate that a "release" of gasoline from the historic UST has occurred within this area.

Figure 7 shows the Cobalt Wellfield Site, easement, Sanitary Radius and Potential Aquifer Material and Thickness. As shown, coarse aquifer material 50 to 100 feet thick is identified.

This site should be considered for further evaluation as a potential public water supply site. While the site is not near the village center area of Town and will require several miles of transmission piping as well as water booster pumps due to the low elevation of the site, the results of the Desktop Evaluation show this site is favorable as a public water supply source. Next steps for evaluation are expanded upon later in this analysis, and include additional groundwater quality tests.

Site #2 – Pine Brook Site

The Pine Brook site is located on the west side of Pine Brook. EP evaluated the current conditions at this site and found that Site #2, Pine Brook site:

- Is located on a parcel owned by the Town of East Hampton;
- Is located within an area mapped as a potentially high yield aquifer;

- Is located within an area with favorable surficial geology;
- Is close to the populated village center area of Town; and
- Is not located in proximity to any known EPA/RCRA hazardous waste areas, PCB-contaminated sites, or impaired groundwater areas.

The potential wellsite boundaries were chosen based on location of aquifer material, the 200-foot Sanitary Radius buffer, and 50-foot wetland buffer. The current conditions at the Pine Brook site and potential wellsite are highlighted in **Figure 8**.

It is important to note that this site is located within land listed as CT DEEP Protected Open Space. The property record card for this parcel indicates that the site is classified as Land Use Code 923. The Town and EP plan to meet with CT DEEP to confirm the viability of this site as a groundwater supply source before carrying out additional explorations.

In summary, the results of the Groundwater Desktop Evaluation show that the Pine Brook site may be favorable for establishing a groundwater supply source. EP highlights further recommendations for determining the viability of the site in the following section.

Conclusions and Recommendations

EP has worked with the Town to develop recommendations for potential groundwater supply sources. The Groundwater Desktop Evaluation is a systematic evaluation of site characteristics to identify potentially viable groundwater supply sites. A total of 72 sites were reviewed, and 70 sites were eliminated from further consideration due to proximity to lack of aquifer material, environmental receptors, and/or site location. EP believes that the Town will be better informed on the water system requirements for its proposed municipal water system after performing additional investigations at the Cobalt Landing Wellfield and the Pine Brook site.

As previously discussed, the Cobalt Landing and Pine Brook sites, shown respectively on **Figures 7** and **8**, are identified as the most viable potential groundwater supply sites. However, the Groundwater Desktop Evaluation does not analyze water quality and quantity available at each site, as field conditions may differ from the results of this study.

Cobalt Landing Site

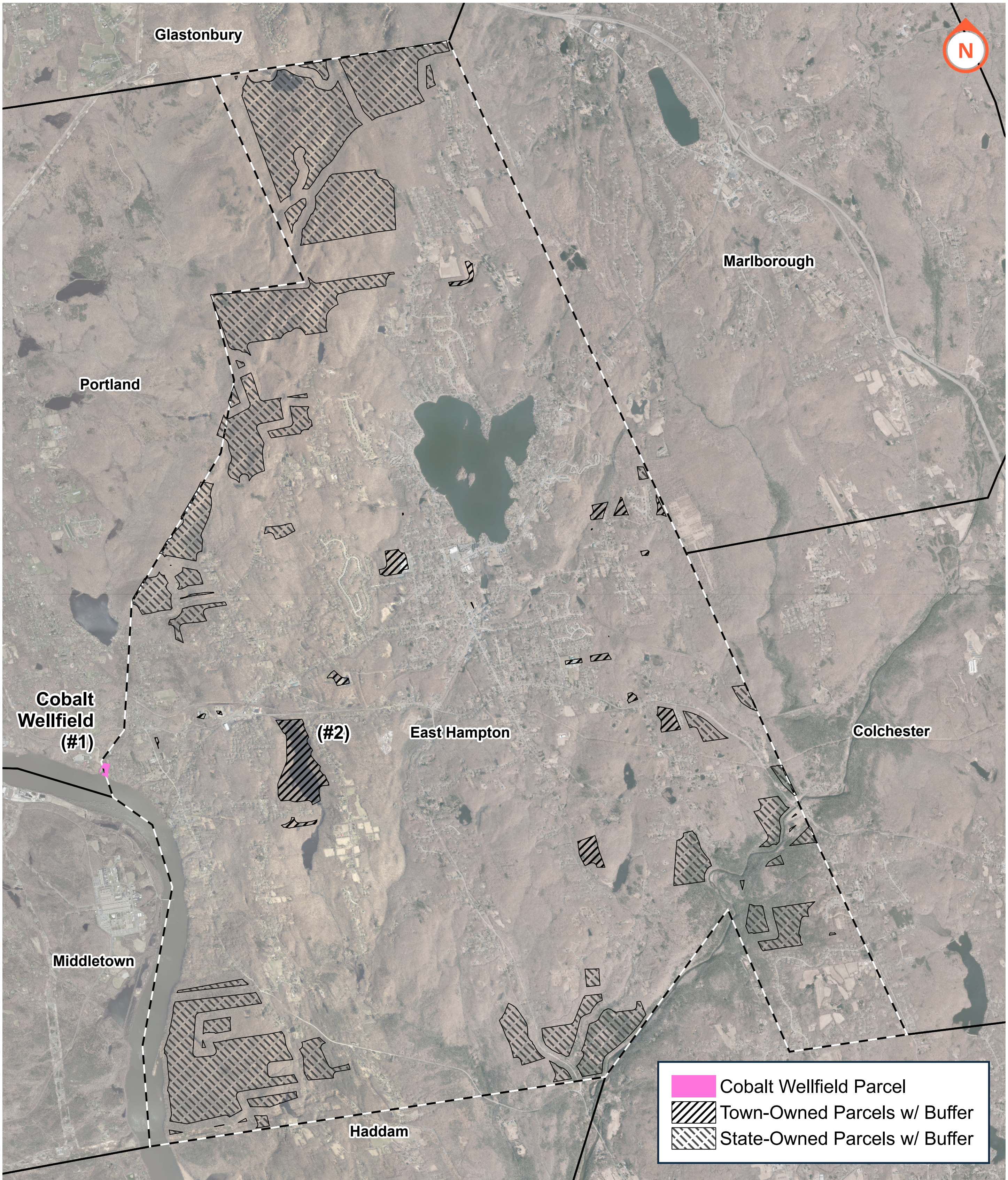
As indicated from the Phase I and Phase II ESAs conducted at the Cobalt Landing Site, potential sources of contamination were identified based on site uses and impacts to soil and groundwater were identified. Soil and groundwater sampling and analyses were conducted in 2005 and analyzed for a limited suite of parameters (petroleum hydrocarbons, volatile organic compounds and copper, lead and zinc). EP recommends that the Town evaluate the water quality at the Cobalt Landing site for a wider suite of analyses, including emerging contaminants 1,4-dioxane and PFAS compounds. Based on the results of these additional analyses, EP recommends that the Town works with CT DPH to discuss the groundwater quality findings.

Pine Brook Site

Following a discussion with CT DEEP to confirm the viability of the Pine Brook site as a water supply site under the CT DEEP Open Space Program, EP recommends that the Town conduct exploration and testing at the Pine Brook Site to determine water quantity and quality. In order to better evaluate the site, EP recommends installation of at least two test wells to identify the best location for evaluating water quantity and quality. A minimum two-hour Pump Test should be performed at the best test well site to determine specific capacity (pumping capacity in gallons per minute per foot of drawdown) and potential wellfield yield. At the end of the two-hour Pump Test, water quality samples should be collected and analyzed for preliminary screening parameters (most commonly associated with water quality issues), including VOCs, nitrate, nitrate, metals and PFAS compounds. The Pine Brook Site is large enough that, if the initial exploration results indicate a potentially viable water supply site, additional test wells may be installed at a later date to identify the best location for development of a public water supply well.

ATTACHMENT A

Groundwater Desktop Evaluation Figures



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 1 - Potential Supply Sites

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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Disclaimer: This map is intended for planning purposes

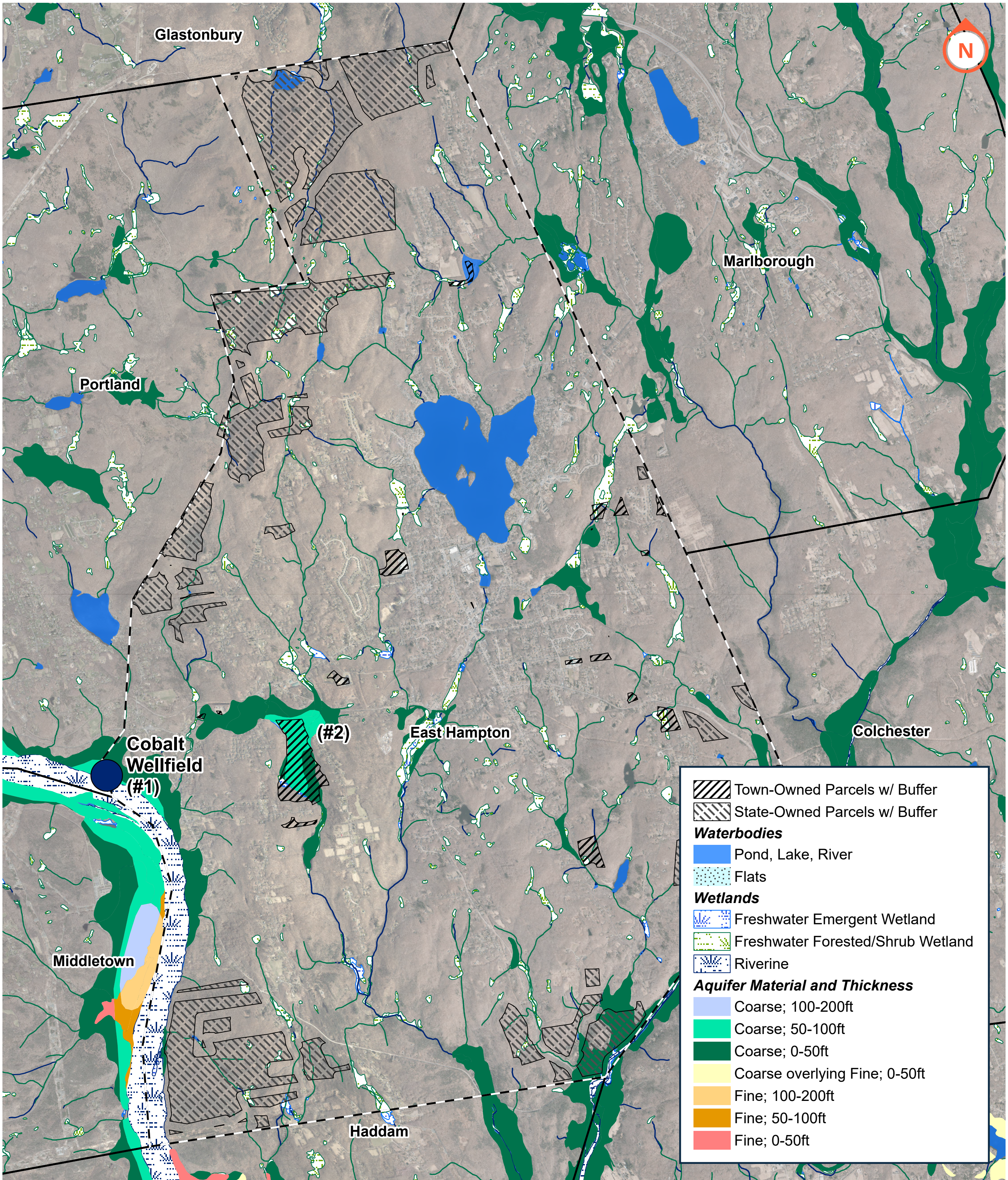

Figure 2 - Aquifer Material

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

ENVIRONMENTAL PARTNERS — An Apex Company —

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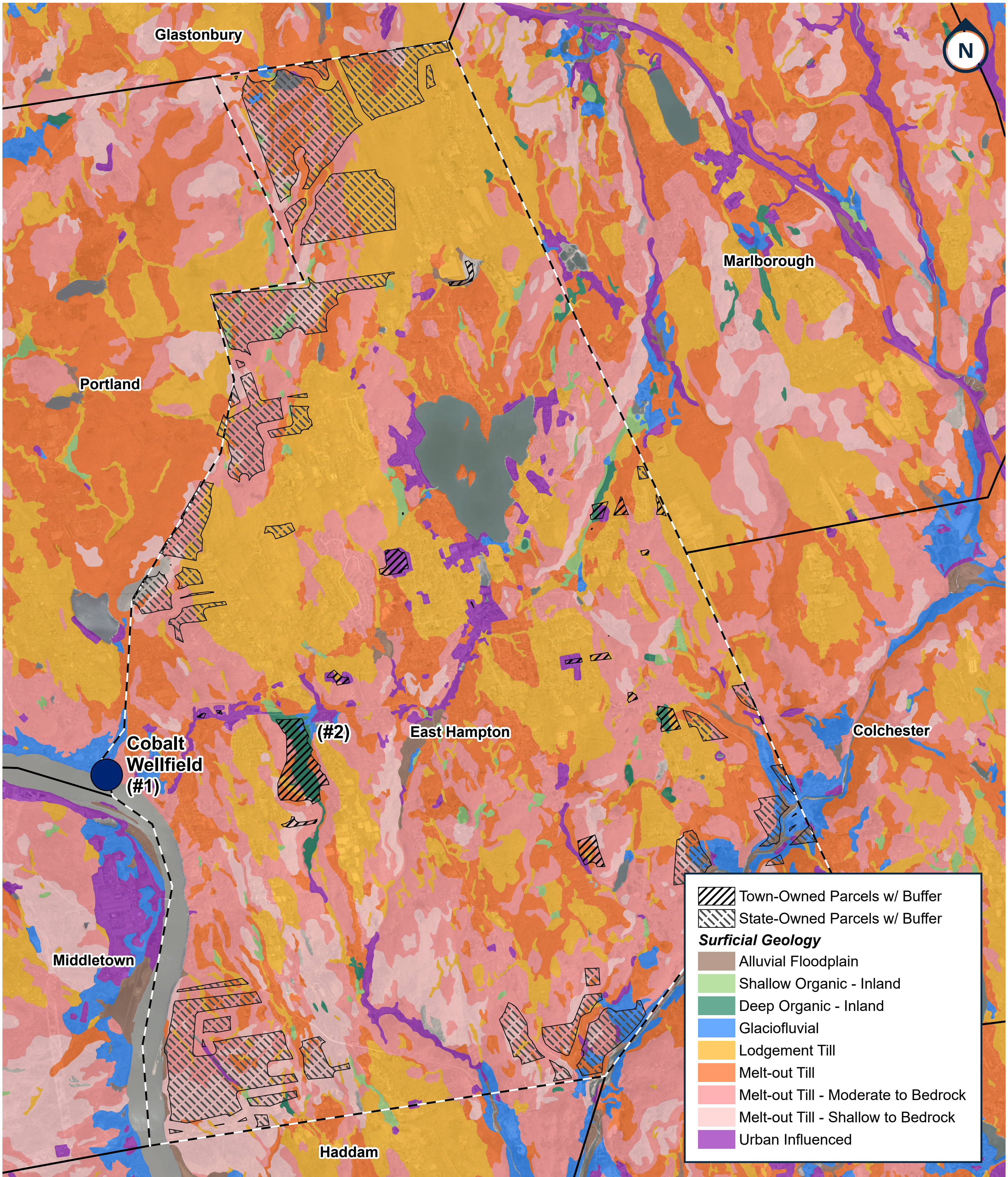

Figure 3 - Surficial Geology

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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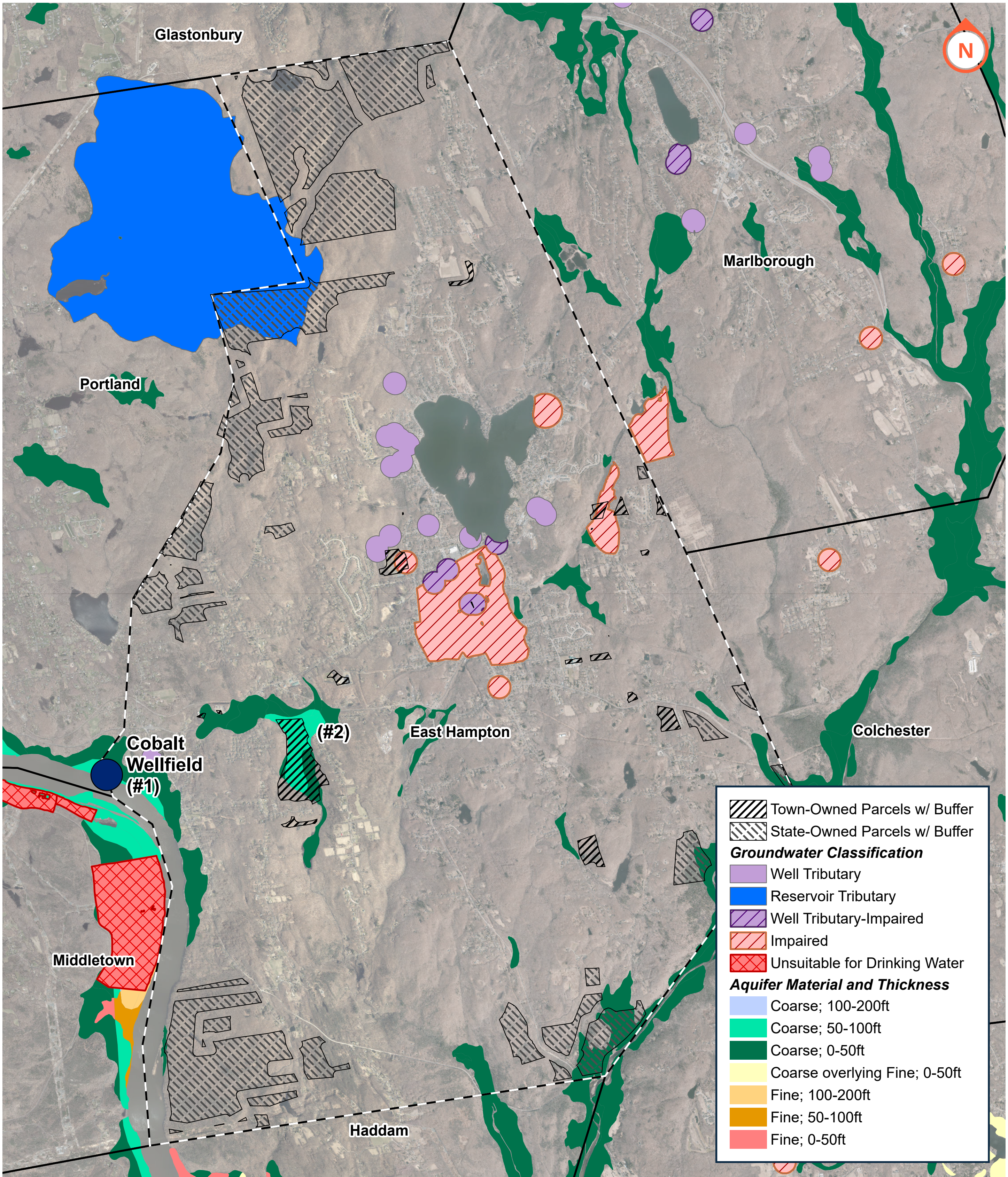

Figure 4 - Potential Sites and Groundwater Classifications

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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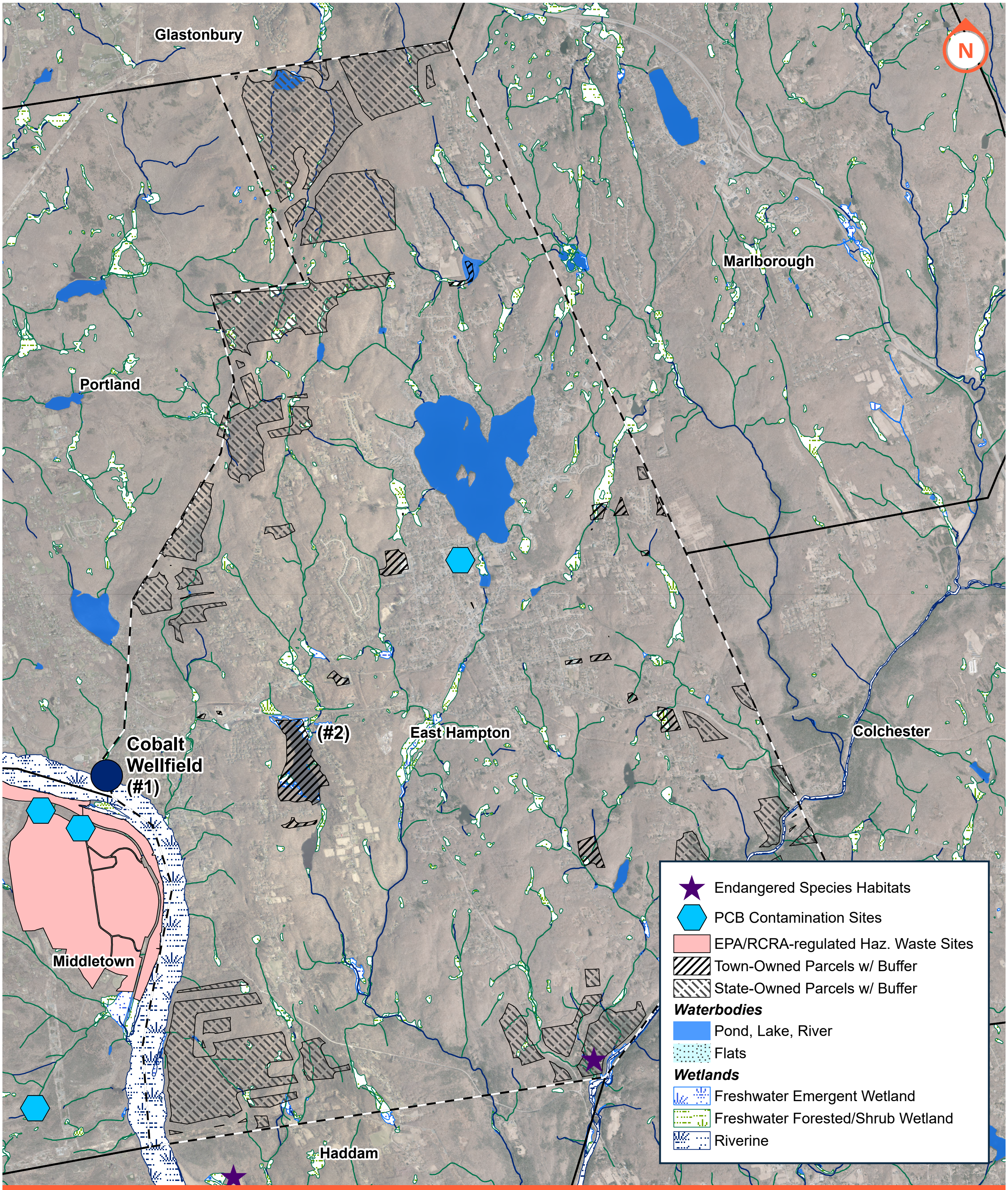

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Figure 5 - Potential Sites and Environmental Impacts

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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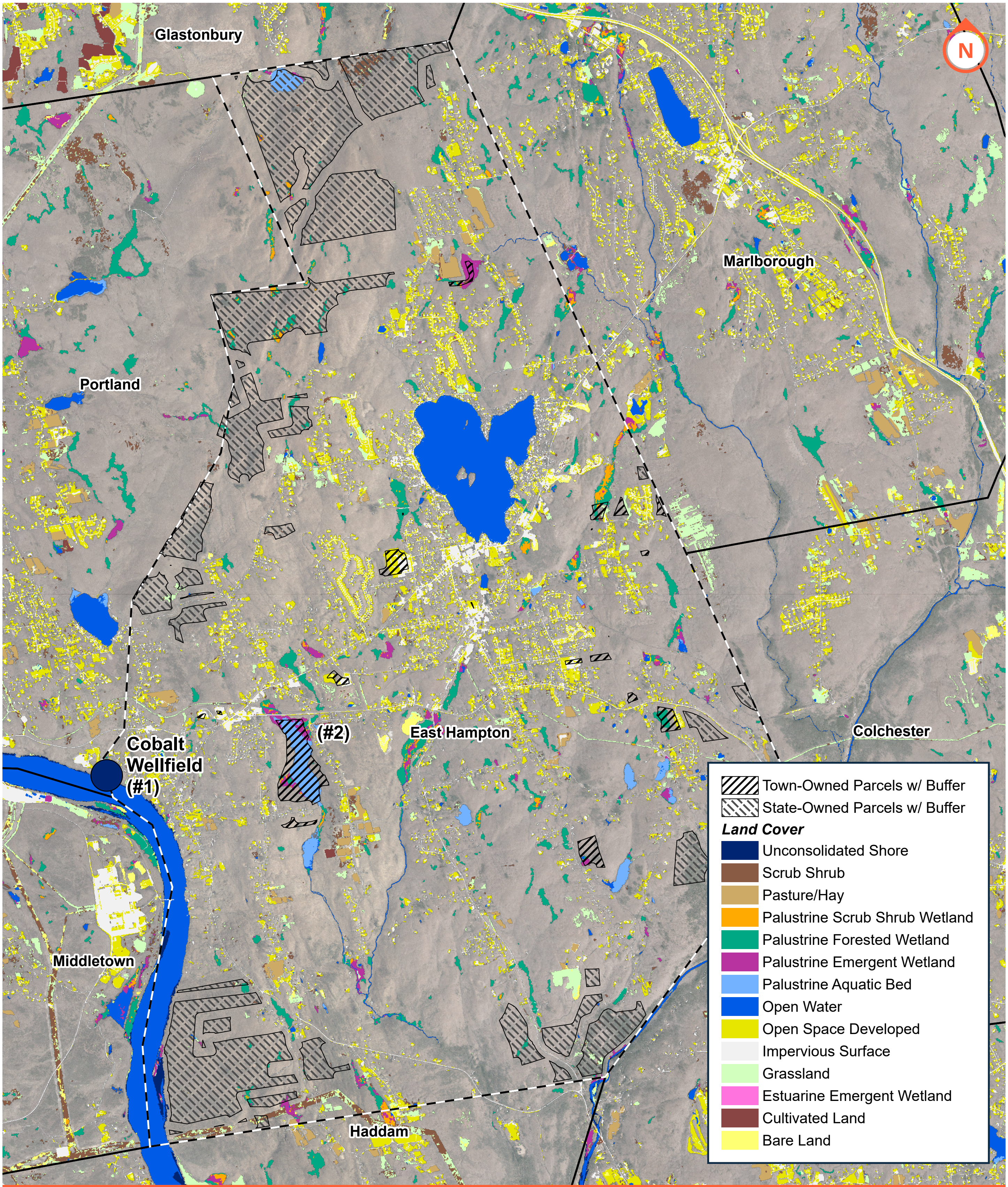

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Figure 6 - Potential Sites and Land Use

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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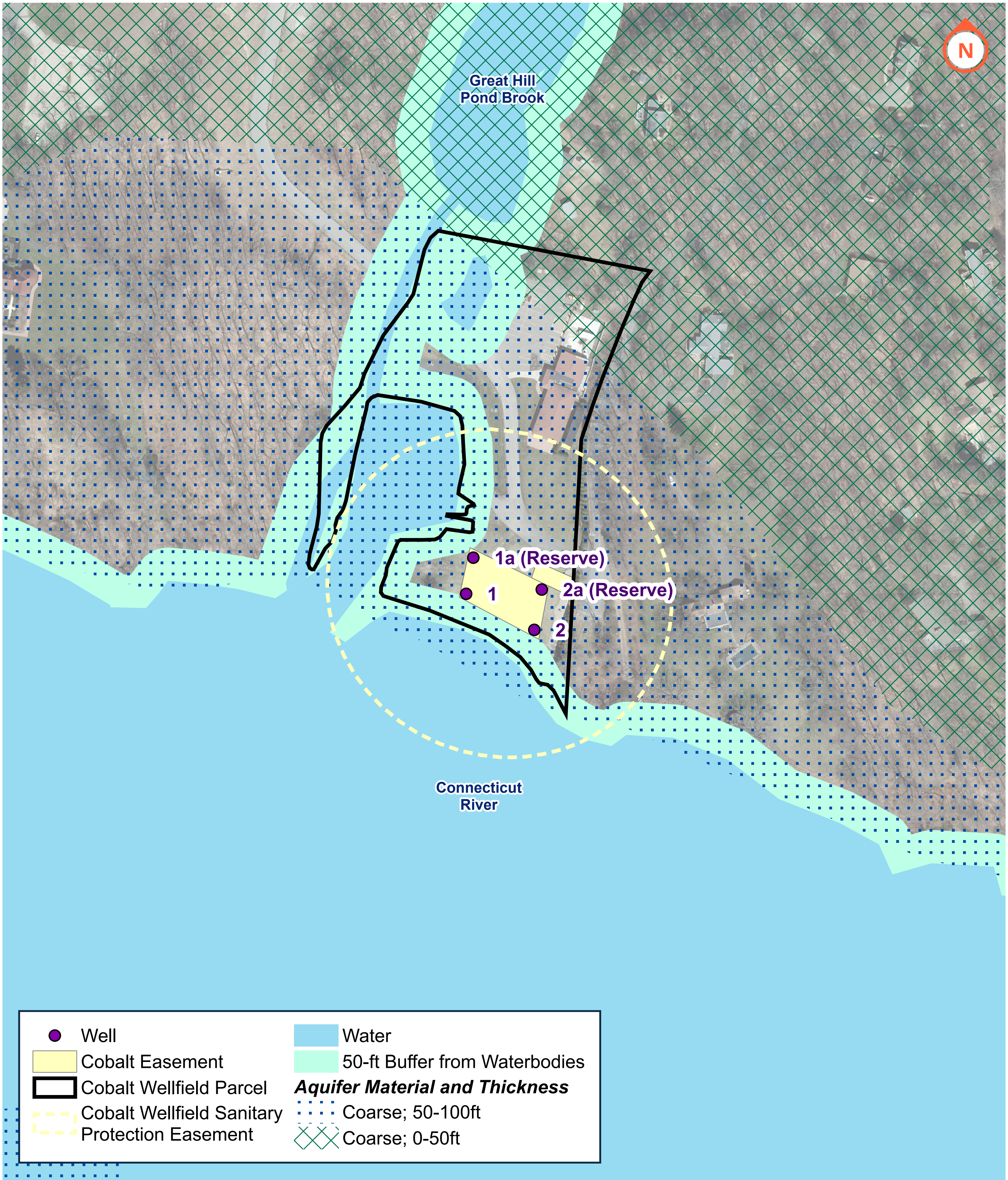

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Figure 7 - Site 1 (Cobalt Wellfield)

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

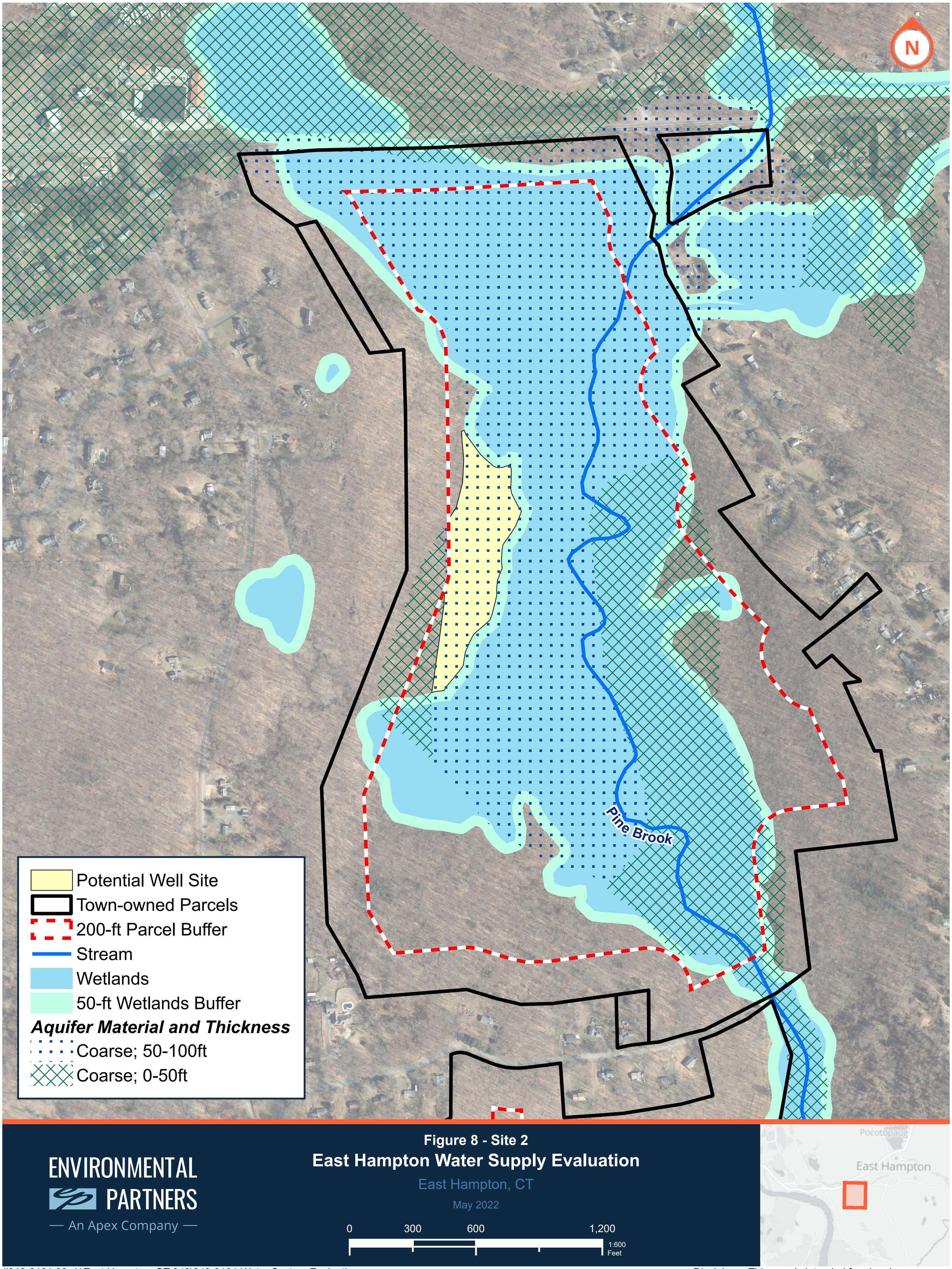

Figure 8 - Site 2

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

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Disclaimer: This map is intended for planning purposes

APPENDIX D

Water Supply Exploration and Wellfield Testing
Pine Brook Site and Cobalt Wellfield

WATER SUPPLY EXPLORATION AND WELLFIELD TESTING

Pine Brook Site and Cobalt Wellfield

Town of East Hampton, CT

February 2023

ENVIRONMENTAL PARTNERS

— An Apex Company —

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SECTION 1 PROJECT BACKGROUND

The Town of East Hampton (the Town) is seeking to establish a centralized municipal water system. Currently, the residents of East Hampton obtain water from either private wells, smaller community water systems, or the East Hampton Water Pollution Control Authority (WCPA). However, in recent decades, the Town has experienced numerous instances of water quality issues at private wells and within community water systems. Additionally, the WPCA and community water systems are only able to serve a portion of the Town, leaving the unserved residents and businesses within the Town to use private wells, which may draw groundwater from contaminated areas. To promote public health, provide fire flow protection, and spark community economic growth, the Town is proposing to establish a municipal water system.

To determine the most effective and cost-efficient course of action for designing and constructing the centralized municipal water system, the Town must explore potential water supply sources. To advance the Town towards this goal, Environmental Partners (EP) performed a Water Supply Source Groundwater Desktop Evaluation in May 2022 (attached in **Appendix A**), in which potential well sites were identified for further investigation. For the most part, this desktop study focused on Town- and State-owned parcels. The desktop study, included the following tasks:

- Review the 2010 East Hampton Water Supply Plan (Milone & MacBroom, Inc.)
- Review the 2006 Preliminary Engineering Report (Maguire)
- Compile and prepare a figure with Town- and State-owned parcels that are large enough to support a State required sanitary radius
- Evaluate sites with respect to aquifer potential
- Assess sites with respect to receptors and potential sources of contamination
- Evaluate sites with respect to other criteria (i.e., geologic conditions, land use restrictions, etc.)

SECTION 1.1 PROJECT HISTORY

As discussed, some areas within the Town of East Hampton have been plagued by poor groundwater quality. In recent decades, the Town has experienced several e. coli outbreaks among private well users, as well as in some of the WPCA's existing well supplies. Establishing a centralized municipal water system would benefit the Town greatly as the residents of East Hampton would have a safer and less expensive source of potable water. To establish a municipal water system, the Town must develop a safe and reliable source of water with ample water supply availability.

The Town explored establishing new water sources and the results are documented in their 2006 Preliminary Engineering Report. The Town's most recent Water Supply Plan (WSP) update in 2010 and approved by the Connecticut Department of Public Health (CTDPH) recommended that the Town establish several new water supply wells; however, no new sources have been established since the WSP was approved.

In September 2006, the Town received a Diversion Permit for the Cobalt Wellfield. The Cobalt Wellfield is located in the Town of Portland, CT adjacent to the Connecticut River. The wellfield

Diversion Permit is for 0.9 million gallons per day (MGD) and the Diversion Permit expires in September 2031. The Cobalt Wellfield is a promising candidate for a future groundwater supply and EP recommended that the Town re-evaluate the wellfield to confirm quality and quantity.

EP also recommended that the Town explore additional groundwater sites for redundancy and to meet the projected water demands outlined in the 2010 WSP. EP conducted a desktop study to identify and screen potential public water supply sources. The results of the Water Supply Source Groundwater Desktop Evaluation are documented in a May 2022 report included in **Appendix A**, and the evaluation is summarized below.

SECTION 1.2 GROUNDWATER DESKTOP EVALUATION

Section 1.2.1 Methodology

EP performed a Water Supply Source Groundwater Desktop Evaluation to screen promising sites for potential water supply sources. The first step of the desktop study is to identify potential parcels that are large enough to support development of a public water supply source (i.e., large enough to support the State required sanitary radius of 200 feet for wells with a pumping rate greater than 50 gallons per minute (gpm)). We evaluated Town- or State-owned parcels and select privately owned parcels. During the site screening process, we reviewed the following information and data:

- Potential Aquifer Material
- Proximity to Environmental Receptors
- Geologic Conditions
- Potential Sources of Contamination
- Land Use
- Hydraulic Benefits to Existing Water System Facilities and Customers
- Previous Investigations
- Proximity to Populated Areas

In the evaluation, we noted that this preliminary level of screening is based on readily available online databases. In addition, the study included a limited evaluation of potential conservation or deed restrictions that may exist on these Town-owned properties that could exclude the use of this land for public water supply development. EP also utilized the Connecticut Department of Energy and Environmental Protection's (CTDEEP) Geographic Information System (GIS) Protected Open Space data layers to evaluate potential restrictions to well development at each potential site.

Section 1.2.2 Desktop Site Screening Results

EP identified 72 potential parcels in which the Town or State owns and controls a 200-foot sanitary radius. These 72 sites were evaluated based on potential presence of aquifer material, proximity to potential receptors, and potential sources of contamination.

In summary, most sites were considered <u>unfavorable</u> for one of the following reasons and are not evaluated further, including:

- Located within an area with unfavorable aquifer conditions,
- Proximity to potential sources of contamination, and
- Proximity to the center of Town, where most of the Town's population resides.

The existing Royal Oaks and Village Center well sites are considered potential public water supply sites. Since these sites are already utilized in existing WPCA infrastructure, EP did not perform additional desktop screening for these two parcels. While these existing wells cannot satisfy potential current and future demands for the Town, these parcels should be preserved for potential future water supply development.

Based on the evaluation criteria, EP identified two potential groundwater supply sources of the potential 72 sites assessed during the desktop study. The following sites are considered potentially favorable and are evaluated further:

1. Cobalt Landing Wellfield Existing Permitted Site (Site #1)
2. Pine Brook Site (Site #2)

As part of the desktop study, EP evaluated these two sites in more detail as potentially favorable public water supply sites and the results of this analysis are discussed in the Groundwater Desktop Evaluation Report dated May 18, 2022 and included in **Appendix A**. Based on the Groundwater Desktop Evaluation, EP recommended that the Town perform additional field investigations and groundwater exploration to determine the viability of these two sites as groundwater supply sources.

Following this desktop study, EP contracted with the Town to perform a groundwater exploration program at the Pine Brook site and water quality testing at the Town's permitted Cobalt Landing wellfield. The scope of work for additional evaluation at these two sites is presented in Section 2.0.

SECTION 2 SCOPE OF WORK

SECTION 2.1 PINE BROOK GROUNDWATER EXPLORATION

Based on the findings of the Pine Brook aquifer desktop evaluation, EP provided the proposed scope of services listed below for the Groundwater Exploration program.

For this task, EP planned to install two test wells and one offset well on the Town-owned parcel at Pine Brook to provide lithologic and specific capacity data. EP used the desktop study information and data to identify suitable locations to evaluate a potential water supply well site, Criteria used to locate the test wells included within an area of mapped potential aquifer material, outside the state required 50-foot wetland buffer, and located such that the 200-foot sanitary radius is completely on Town-owned property.

EP contracted with Geologic Earth Explorations, Inc. (Geologic) from Norfolk, Massachusetts to drill the borings and install 2-inch test wells and one 2-inch observation well. Continuous 5-foot cores were collected at each boring from the ground surface to refusal. By collecting these soil samples, EP can obtain, and document detailed lithologic data to support the design of a production well. If favorable aquifer material is identified in the boring, a 2-inch diameter well consisting of a 10-foot section of stainless-steel screen and PVC riser would be installed within the borehole and a two-hour pumping test performed to evaluate potential well yield and water quality.

SECTION 2.2 COBALT LANDING WELLFIELD TESTING

The Cobalt Landing Wellfield is located in the Town of Portland, CT. The wellfield was permitted in 2006 for a withdrawal volume 0.9 MGD, with the Diversion Permit valid through 2031. The goal of the Cobalt Landing wellfield testing was to evaluate the overall condition of the two production wells (designated Well 1 and Well 2) and confirm water quality, particularly for emerging contaminants that were not required when the wells were permitted in 2006. EP coordinated with LaFramboise Well Drilling (LaFromboise) of Thompson, CT to conduct well testing at the Cobalt Wellfield. LaFramboise provided pumps, meters, and all required equipment and appurtenances to pump and purge both wells prior to collecting water quality samples. EP estimated two days to complete the well pumping and sampling program.

Following the Cobalt Wellfield testing, LaFramboise conducted a camera survey of Well 1 and Well 2 to evaluate the condition of the well screens and casing.

SECTION 3 EXPLORATION AND TESTING RESULTS

In this section, EP has documented our observations, findings and results for the Pine Brook area exploration program and the Cobalt Landing Wellfield pumping and testing program.

SECTION 3.1 PINE BROOK EXPLORATION FIELD PROGRAM

On August 2nd, 2022, EP and the Town performed a site walk to confirm potential vegetation clearing and identify potential locations for test wells for conducting the exploration drilling program. While on site, we also located the existing path and the flagged test well locations with a global positioning system (GPS) device. **Figure 1** illustrates the approximate location of the trail on Town property and the targeted area for potential test wells. Desktop study, online aquifer database maps show this area to be underlain by 50 to 100 feet of coarse aquifer material, with the thickest aquifer mapped near Pine Brook. The aquifer material thinned to the east and the west, where surficial geology is mapped as bedrock (non-aquifer material). During the site walkover, EP flagged locations for the Town to perform clearing for proper access of Geologic's Geoprobe drilling rig. The test wells were located as close to Pine Brook as feasible without drilling within wetlands or the 50-foot wetland buffer.

Geologic mobilized to East Hampton on Monday, September 19, 2022 for the proposed three day drilling and exploration program. Geologic mobilized equipment and materials to the site on the first day and drilling started on Tuesday, September 20, 2022. Geologic used the Geoprobe direct push drilling method to collect continuous, 5-foot samples to refusal and provide lithologic information to determine if the Pine Brook site may be suitable for public water supply development. **Appendix B** includes copies of the boring logs.

Figure 2 shows the approximate locations of the subsurface exploration borings. Geologic drilled three borings and two probes while on site. **Appendix B** includes lithologic logs for the three completed borings. **Table 1** below summarizes EP's observations on the boring and probes including total depth, depth to groundwater, and lithology.

Table 1: Description of Subsurface Exploration

Boring/Probe	Total Depth (feet)	Depth to Groundwater (feet)	Boring Lithology
B-1	12.5	DRY	TILL- silty SAND with gravel
B-2	14.0	6.5	Till – sandy SILT and fine SAND with gravel
B-3	22.0	16.0	Till – silty SAND with gravel and cobbles
Probe No. 1	16.5	Not measured.	No Samples collected.
Probe No. 2	8.0	Not measured.	No Samples collected.

As shown in **Table 1**, exploration borings encountered refusal at depths less than 22 feet below ground surface (bgs). Overburden material above bedrock consisted primarily of ablation glacial till deposits, which are not potential aquifer material. Groundwater was encountered in two of the borings at depths of 6.5 to 16 feet bgs. B-1 had a total depth of 12.5 feet and was dry.

In the effort to identify a potential location for water source exploration and based on the shallow refusal, two probes were also drilled to determine depth to refusal. The probes consisted of driving a pipe to identify depth to refusal and were much quicker to install than a boring. Based on the total depth of the probes, if the depth to refusal was deeper and a thicker section of overburden material identified, then a boring would be drilled and sampled adjacent to the probe. Refusal was identified at the two probe locations at 8 and 16.5 feet bgs; therefore, no borings were drilled.

No locations were identified for installation and testing of a potential water supply well and, therefore, Geologic did not install any test wells pumping testing or water quality testing.

In summary, the overburden lithology and thickness of saturated overburden at the Pine Brook site were not suitable for development of a public water supply source.

SECTION 4 COBALT LANDING WELLFIELD TESTING

In this section, EP has documented our observations, findings and results for the Cobalt Landing Wellfield pumping and testing program.

SECTION 4.1 COBALT LANDING FIELD PROGRAM

On November 3rd and 4th, 2022, LaFramboise performed pumping/flushing of Cobalt Landing Well 1 and Well 2, to support water quality testing on the two wells.

EP observed LaFramboise six-hour pumping of each of the Cobalt Wells, while recording static water levels, water levels at the end of pumping, total water level drawdown, and pumping rate. With this data, EP calculated an approximate current specific capacity of each well and potential well yield. These data are summarized in the following **Table 2**.

Table 2: Cobalt Wellfield Pumping Results

PUMPING DATA		Well #1	Well #2
Static WL (TOC)	feet TOC	12.60	13.80
End of Test WL (TOC)	feet TOC	28.00	23.40
Drawdown	feet TOC	15.40	9.60
Pumping Rate	GPM	100	100.00
Specific Capacity	GPM/foot	6.49	10.42
2004 Specific Capacity	GPM/foot	5.64	6.49

As shown in the above table, both current specific capacities are higher than the results determined in 2004. Based on the results of the six hours of pumping, EP calculated a potential individual well yield, as summarized in **Table 3** below.

Table 3: Cobalt Wellfield Estimate of Potential Individual Well Yield

POTENTIAL INDIVIDUAL WELL YIELD		Well #1	Well #2
Static WL (TOC)	feet TOC	12.60	13.80
Top Well Screen	feet TOC	46.00	37.00
Bottom Wellscreen	feet TOC	71.00	62.00
Available Water Above Well Screen w/5-foot Buffer	feet TOC	28.40	23.20
Specific Capacity	GPM/foot	6.49	10.42
Potential Individual Well Yield	GPM	184.32	241.74
Potential Individual Well Yield	MGD	0.38	0.50

It should be noted that these results are based on six hours of pumping each well individually. When Well 1 and Well 2 are pumping together, well pumping drawdown interference will likely result in a total wellfield yield that is less than the individual wells combined. A longer term pumping test with both wells pumping would be needed to determine the potential wellfield yield. The diversion permit for the Cobalt Wellfield is for a pumping rate of 0.9 MGD.

Following the pumping of each of the Cobalt wells, EP collected water quality samples for field analysis of temperature, specific conductance, dissolved oxygen, pH, and turbidity (shaken and not shaken). EP also collected samples for laboratory analysis of Volatile Organic Compounds (VOCs), 1,4-Dioxane, Total Metals, Per- and Polyfluoroalkyl Substances (PFAS), Extractable Petroleum Hydrocarbons (EPH), Volatile Petroleum Hydrocarbons (VPH), Microbiological, Bacteria Analyses, and Secondary Contaminants. The PFAS, 1,4-Dioxane, Microbiological and Bacteria samples were submitted to Alpha Analytical of Westborough, MA. All other analyses were performed by ESS Laboratory of Cranston, RI. Laboratory analytical reports are included in **Appendix C** and summarized in the following **Table 4**.

Table 4: Cobalt Wellfield Groundwater Quality Results

Sample Identification: Date Sampled:	CT Action Level	Well 1 11/3/2022	Well 2 11/4/2022
Field Parameters			
Temperature (^{o}C)	NSA	12.5	13.3
pH (su units)	NSA	6.08	6.16
Dissolved Oxygen (mg/L)	NSA	6.26	7.78
Specific Conductance (μs/cm ^{o}C)	NSA	309.9	516
Tubidity	NSA	0.55	1.05
524.2 Volatile Organic Compounds (VOCs)(ug/l)		None Detected	None Detected
Semi-Volatile Organic Compounds (SVOCs)(ug/l)			
1,4-Dioxane	3	-	-
Total Metals (mg/L)			
Aluminum	NSA	-	-
Antimony	NSA	-	-
Barium	2	0.043	0.102
Beryllium	NSA	-	-
Cadmium	NSA	-	-
Calcium	NSA	24.4	29.7
Copper	NSA	-	-
Hardness	NSA	86	102
Iron	NSA	0.352	0.0827
Lead	0.015	-	-
Magnesium	NSA	6.07	6.83
Manganese	0.3	0.0948	-
Mercury	0.002	-	-
Nickel	NSA	-	-
Potassium	NSA	3.87	3.84
Selenium	0.05	-	-
Silver	NSA	-	-
Sodium	NSA	20.4	55.8
Thallium	NSA	-	-
Zinc	NSA	-	-
Perfluorinated Alkyl Acids(ng/l)			
Perfluorobutanesulfonic Acid (PFBS)	NSA	2.71	10.9
Perfluorohexanoic Acid (PFHxA)	NSA	-	4.58
Perfluorooctanesulfonic Acid (PFOS)	10	-	-
Perfluorononanoic Acid (PFNA)	12	-	-
Perfluorooctanoic Acid (PFOA)	16	-	5.8
Perfluorohexanesulfonic Acid (PFHxS)	49	-	-
PFAS, Total (6)		-	5.8
MADPH-EPH Extractable Petroleum Hydrocarbons(ug/l)		None Detected	None Detected
MADEP-VPH Volatile Petroleum Hydrocarbon(ug/l)		None Detected	None Detected
Microbiological Analysis(CFU/ml)			
Heterotrophic Plate Count	-	-	-
Bacteria in Water(col/100ml)			
Coliform, Total	NSA	-	-
Escherichia Coli	NSA	-	-
Other			
Total Alkalinity (mg CaCO3/l)	NSA	51	34
Chloride (mg/l)	NSA	50.2	116
Fluoride (mg/l)	NSA	-	-
Nitrates (mg/l)	10	1.62	3.04
Nitrites (mg/l)	1	-	-
Sulfates (mg/l)	NSA	12.6	16
Total Dissolved Solids (mg/l)	NSA	200	310
Cyanide (mg/l)	NSA	-	-

Notes: "-" = Not Detected Above Method Detection Limits

As shown in the above **Table 4**, water quality at the site is excellent. All analytes detected were below the CTDPH Action Levels for Drinking Water. The pH levels in groundwater at Well 1 and Well 2 were 6.08 and 6.16, which is slightly low, indicating that the water will likely need adjustment for pH. A lower pH is typical of groundwater in New England.

Following the wellfield pumping, LaFramboise conducted a borehole camera survey of Well 1 and Well 2 to determine the general condition of the well screens and casing. According to LaFramboise summary, both wells appear to be in good condition. The casing and welds look to be in good condition; however, with the wells sitting for the past 15 plus years there is some mineral build up on portions of the casing and screen. There is also approximately a foot of sediment build-up on the bottom of each well.

LaFramboise recommends that the wells should be brushed/bleached to remove the mineral buildup. Additional sediment would likely accumulate after a thorough brushing/cleaning of the well and screen. As such, after the brushing, the wells should be purged using air lift at each well to remove that sediment from the bottom. This would give them a fresh start prior to installing pumps.

Upon completion of the camera surveys, both well caps were welded back shut.

SECTION 5 SUMMARY AND CONCLUSIONS

Pine Brook Site Exploration

Exploratory boring results at the Pine Brook site indicate that subsurface conditions are not favorable for development of a potable public water supply well due to the presence of poor aquifer material (glacial till) over shallow bedrock. No wells were installed at the site.

Cobalt Landing Wellfield Testing

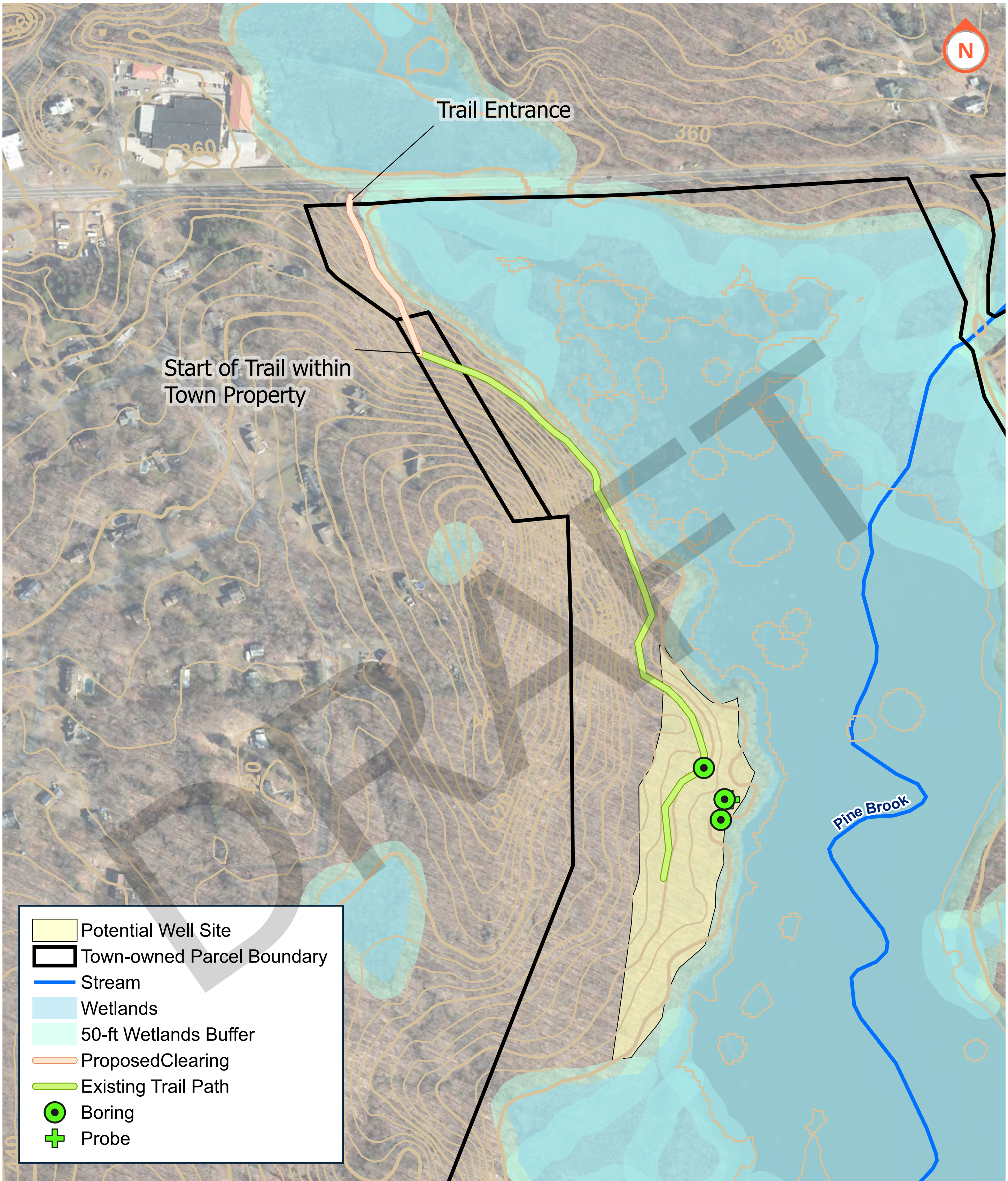
The Cobalt Landing Wellfield consists of two public water supply wells designated as Well 1 and Well 2. The wellfield was tested in 2004 and permitted as a water supply in 2006. The wellfield has a Diversion Permit for 0.9 MGD that is valid through 2031. Water quality sampling in 2004 did not include several emerging contaminants that are required for current public water supplies, including 1,4-doxane and Per- and Polyfluoroalkyl Substances (PFAS).

The two wells were each pumped for six hours prior to collection of water quality samples. The individual well drawdown and pumping rates were recorded during the six hours of pumping in order to determine a preliminary well specific capacity and well yield. The calculated individual well specific capacities and potential well yield were consistent with measurements from 2004.

Water quality samples at both Well 1 and Well 2 indicate that water quality at the Cobalt Wellfield is excellent. All parameters were within CTDPH Action Levels for Drinking Water. Measured pH of the groundwater was slightly low (6.08 and 6.16) indicating that the water supply will likely require pH adjustment.

A borehole camera survey was performed after the six hours of pumping. In summary, the wells appear to be in good conditions, with some mineral buildup on portions of the screen and casing and some sediment build up in the bottom of the wells. Both wells should be brushed/bleached to remove the mineral buildup and pumped with air lift to remove the sediment buildup, prior to installing permanent well pumps.

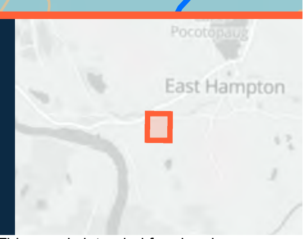
FIGURES



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 1
Pine Brook Site
East Hampton, CT
September 2022

0 200 400 800 Feet



#343-2101.00 *I:\East Hampton, CT.343\343-2101 Water System Evaluation*

Disclaimer: This map is intended for planning purposes

ENVIRONMENTAL PARTNERS

— An Apex Company —

Figure 2

Pine Brook Site Exploration Activities

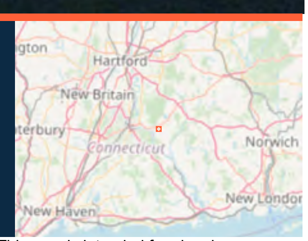
East Hampton, CT

1/31/2023

0 25 50 100

Feet

1 inch = 50 feet



Disclaimer: This map is intended for planning purposes

APPENDIX A

East Hampton Water Supply Source Groundwater Desktop Evaluation

ENVIRONMENTAL PARTNERS
— An Apex Company —

MEMORANDUM

Date: February 16, 2023

To Mr. David E. Cox, Town Manager, Town of East Hampton

From Charles Adelsberger, P.E., BCEE, Senior Project Manager, Environmental Partners

CC Ann Marie Turbeville, Director of Geosciences, Environmental Partners

Kevin Rathbun, Senior Project Engineer, Environmental Partners

Hanna Schenkel, Engineer, Environmental Partners

Subject Town of East Hampton Water Supply Source Groundwater Desktop Evaluation

Summary

The Town of East Hampton (the Town) is seeking to establish a centralized municipal water system. Currently, the residents of East Hampton obtain water from either private wells, smaller community water systems, or the East Hampton Water Pollution Control Authority (WCPA). However, in recent decades, the Town has experienced numerous instances of water quality issues at private wells and within community water systems. Additionally, the WPCA and community water systems are only able to serve a portion of the Town, leaving the unserved residents and businesses within the Town to use private wells, which may be located in contaminated areas. To promote public health, provide fire flow protection, and spark the community's economic growth, the Town is proposing to establish a municipal water system.

In order to determine the most effective and cost efficient course of action for designing and constructing the centralized municipal water system, the Town must explore potential water supply sources. To advance the Town towards this goal, Environmental Partners (EP) has performed a Groundwater Desktop Exploration, in which potential well sites were identified for further investigation. For the most part, this desktop study focused on Town- and State-owned parcels, but could be expanded to include potential private parcels of land for future acquisition. This desktop study included:

- Reviewing the 2010 East Hampton Water Supply Plan (Milone & Macbroom, Inc.)

- Reviewing the 2006 Preliminary Engineering Report (Maguire)
- Compiling Town- and State-owned parcels that can support a required sanitary radius
- Evaluating sites with respect to aquifer potential
- Evaluating sites with respect to receptors and potential sources of contamination
- Evaluate sites with respect to other criteria (i.e., geologic conditions, land use restrictions, etc.)

Figure 1 is a preliminary site screening map showing potential public water supply sites. The following is a summary of the desktop study results:

1. A total of 72 potential sites satisfied the land ownership requirement for potential public water supply sites. The 72 sites, of which 51 were State-owned and 21 were Town-owned, are shown on **Figure 1**.
2. The majority of potential water supply parcels were eliminated from further consideration because of no potential aquifer material. **Figure 2** shows the Town-owned sites where potential aquifer material may be present.
3. The following Town-owned sites were identified as potential water supply sites for further consideration and field evaluation:
    a. Site #1: Cobalt Landing Wellfield, shown on **Figure 7**
    b. Site #2: Pine Brook Site, shown on **Figure 8**

Based on the results of the Desktop Study, the next steps in the new water source process are to further evaluate the most favorable sites with a subsurface groundwater exploration test well drilling program and to explore groundwater quality.

In 2004, the Town conducted a subsurface exploration at the Cobalt Landing Wellfield that included the installation of a test well and observation well. The Town conducted a 5-day pump test in accordance with the Connecticut Department of Environmental Protection's Level A Standards at the time. Based on this investigation, the Cobalt Landing Wellfield safe yield was established at 743,000 gallons per day, based on pumping 24 hours a day. The Cobalt Landing Wellfield is already permitted through the CT Department of Energy and Environmental Protection (DEEP) Diversion Permit.

A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. in 2005 to evaluate the relative environmental risk associated with the current and former land uses of the Cobalt Landing Wellfield property and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including 1 – Existing Above Ground Storage Tanks (ASTs); 2 – Former Underground Storage Tank; 3 –Existing Drywell; 4 – Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5 – Building 1 Septic System Area. Should the Town decide to proceed with development of the Cobalt Landing Wellfield, EP recommends that the existing wells be tested to determine groundwater quality. In particularly, the Cobalt Landing Wellfield groundwater should be tested for emerging contaminants, including 1,4-dioxane and Per- and Polyfluoroalkyl Substances (PFAS).

Following the Groundwater Desktop Evaluation, EP recommends that the Town further explore the groundwater characteristics at the Pine Brook Site as well, which shows promising results for groundwater quality and quantity.

The scope, methodology and results of the new source water supply desktop study and exploration results are discussed in more detail below.

Background

The Town's most recent Water Supply Plan update in 2010 recommended that the Town establish several new water supply wells. While the Town had explored establishing new water sources in their 2006 Preliminary Engineering Report, the Town has not connected any of the new sources that were explored to a centralized municipal water system.

Some areas within the Town of East Hampton have been plagued by poor groundwater quality. In recent decades, the Town has experienced several e. coli outbreaks among private well users, as well as in some of the WPCA's existing well supplies. Establishing a centralized municipal water system would benefit the Town greatly as the residents of East Hampton would be able to rely on a safer and less expensive source of potable water. In order to establish a municipal water system, the Town must find a safe and reliable source of water with ample water supply availability. While the previously permitted Cobalt Wellfield is a promising candidate for a future groundwater supply source, EP recommends that the Town explores establishing additional groundwater supply sites for supply redundancy and to meet the projected water demands outlined in the 2010 Water Supply Plan.

Desktop Site Screening Methodology

Initial Screening

EP conducted a new source water supply screening desktop study for the Town. As an initial screening, Town and State owned parcels were compiled to determine if the Town or State owned and controlled the sanitary radius of the potential groundwater source, which is the CT DEEP required protective radius required around a public water supply well. In Connecticut, the sanitary radius of any well pumping greater than fifty gallons per minute is 200 feet. Full control of the sanitary radius is required for all new wells per Connecticut General Statutes Section 25-33(b), and current and/or future land uses within the sanitary radius must be limited to those directly related to the provision of public drinking water or will have no significant adverse impact on water quality. Town and State owned parcels were compiled on a map and a 200-foot buffer mapped on each parcel.

In addition, Connecticut State Regulations 19-13-B51d. requires that wells with a withdrawal rate of more than fifty gallons per minute must be located at least 200 feet from a system for disposal of sewage or other source of pollution and must be located at least 50 feet of the high water mark of any surface water body.

The open space area inside this 200-foot buffer and at least 50 feet from any surface water body is the area owned by the Town that could support a public water supply well. Town owned parcels with the 200-foot sanitary radius are shown on **Figure 1**. As shown on **Figure 1**, a total of 72 parcels were identified as potential water supply parcels and were evaluated further based on the following criteria:

- Potential Aquifer Material
- Proximity to Environmental Receptors
- Potential Sources of Contamination
- Other Additional Criteria (i.e., geologic conditions, land use restrictions, etc.)

Proximity to Environmental Receptors

The Town of East Hampton is located in the geographic center of the State of Connecticut and borders the Connecticut River. There are numerous surface water bodies, wetlands, and streams within the Town, as well as abundant shallow bedrock and thin till material (non-aquifer material). Potential presence of aquifer material was used as an initial screening criteria. Proximity to environmental receptors was then used to screen the parcels in which the Town or State owns and the Town controls a 200-foot sanitary radius to identify potential new source water supply sites. The CT DEEP GIS Open Data database was used to identify the following sensitive environmental receptors:

- Areas of Critical Environmental Concern (ACEC)
- Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Vernal Pools (Certified and Potential)
- Wetlands

Finally, potential water supply sites were limited to areas on streams and rivers which were not determined to be DEEP cold-water fisheries.

Geologic Conditions

Generally, courser aquifer materials are favorable for groundwater supply sources as they are less penetrable than finer materials. Aquifer material is considered one of the most accurate indicators for potentially favorable groundwater supply sites. EP utilized the Surficial Aquifer Potential Map of Connecticut to analyze the potential presence and thickness of surficial aquifer deposits. **Figure 2** displays aquifer material classifications within the Town of East Hampton.

CT DEEP aquifer maps and surficial geology maps were used to evaluate the potential presence or absence of aquifer material. The Surficial Aquifer Potential Map of Connecticut was prepared by the Connecticut Geological Survey for statewide resource protection, water management, non-point source pollution prevention, and land use planning. **Figure 3** displays the surficial geology throughout the Town of East Hampton. Analyzing surficial geology may inform the Town of landforms and unconsolidated sediments (potential aquifer material) throughout the Town, as well as areas of shallow bedrock and thin till (non-aquifer material). Generally, melt-out till and melt-out till - moderate to bedrock are considered potentially favorable for groundwater supply sites.

Potential Sources of Contamination

Land use maps were examined for potential water supply sites that passed initial screening to determine if any potential sources of contamination to groundwater are located nearby or within a 200-foot radius. In accordance with DPH Sec. 19-13-B51d,

> "No such well shall be located within two hundred feet of a system for disposal of sewage or other source of pollution. If conditions warrant, greater distance shall be required Sanitary conditions in the area within the radial distance required shall be under control of the well owner by ownership, easement, or other arrangement approved by the commissioner of health. If a sewer is constructed of extra heavy cast iron pipe with leaded joints or equal approved type of tight joint, a minimum separating distance of one hundred feet shall be maintained."

Potentially sources of pollution include active or abandoned sanitary landfills, major fuel storage and/or transmission facilities, automobile graveyards and junkyards, road salt stockpile areas lacking adequate containment structures, agricultural uses, hazardous substances storage areas, etc. Special groundwater classification within the Town of East Hampton can be divided into several categories, including Well Tributary, Reservoir Tributary, Well Tributary-Impaired, Impaired, and Unsuitable for Drinking Water. When choosing potential groundwater supply sites, EP omitted sites within the previously discussed categories from the potential list of sites. Additionally, EP omitted sites within EPA and Resource Conservation and Recovery Act (RCRA) regulated hazardous waste sites, as well as PCB contamination sites. **Figure 4** shows potential sites and groundwater classifications within the Town of East Hampton. **Figure 5** shows potential sites and environmental impacts within the Town.

Additional Site Screening

In additional to environmental receptors and sources of contamination, potential water supply sites were screened based on the following criteria:

1. *Land Use* – For potential water supply sites that passed the initial site screening, the CT DEEP GIS Open Data database land use maps were reviewed to identify land use classifications for potential sites. **Figure 6** displays current land uses within the Town of East Hampton.

2. *Hydraulic Benefit to the Water System* – The location of the existing water sources and the topology and geometry of the water system create a varied pressure profile. As a result, certain regions are more water-stressed than others, and the introduction of a water source offers varied benefits depending on location.

3. *Previous Investigations* – The Town of East Hampton has explored water supply sources in the past. EP reviewed the *Proposed Municipal Water System Preliminary Engineering Report* by Maguire Group Inc. dated January 3, 2006 to evaluate subsurface geology and potential aquifer conditions, as well as previous pump testing results.

4. *Proximity to Populated Areas* – The Town's most populated area is the village center area of Town, located south of Lake Pocotopaug. A large percentage of the Town's businesses, residences, and schools reside in this general area. The Town hopes to provide this area with

water service following the construction of the water system. EP favored sites near this area of Town in order to conserve future costs and simplify water system design.

It should be noted that this basic level of screening is based on readily available online databases. In addition, this study included a preliminary evaluation of potential conservation or deed restrictions that may exist on these Town-owned properties that could exclude the use of this land for public water supply development. EP utilized CT DEEP GIS Protected Open Space data layers to evaluate potential restrictions to well development at each potential site. Additional research may be required for this purpose. Data from this desktop study may need to be updated if more than six months old.

Desktop Site Screening Results

As shown on the **Figure 1** through **Figure 6**, EP identified 72 potential parcels in which the Town or State owns and controls the sanitary radius. These 72 sites were evaluated based on potential presence of aquifer material, proximity to potential receptors, and potential sources of contamination.

In summary, many sites are considered unfavorable for obvious reasons and are not evaluated further, including:

- Located within an area with unfavorable aquifer conditions;
- Proximity to potential sources of contamination; and
- Proximity to the center of Town, where most of the Town's population resides.

The existing Royal Oaks and Village Center well sites are considered potential public water supply sites, but because these sites are already utilized in existing WPCA infrastructure, an additional desktop screening was not performed for these parcels, but could be performed at a later date. While the current wells at these sites cannot satisfy potential current and future demands for the Town, these parcels should be preserved for potential future water supply development.

Based on the criteria evaluated, EP found two potential groundwater supply sites of the 72 possible sites. The following sites are considered potentially favorable and are evaluated further:

1. Cobalt Landing Wellfield (Site #1)
2. Pine Brook Wellfield (Site #2)

As part of the desktop study, the two sites that were considered potentially favorable public water supply sites were evaluated in more detail and the results of this analysis are discussed in the following sections. It is important to note that while the Groundwater Desktop Evaluation presents these sites as potentially favorable, additional field investigations will be required to determine the viability of these sites as groundwater supply sources.

Site #1 – Cobalt Landing Wellfield

As previously discussed, the Town currently owns an easement at the Cobalt Landing Wellfield, located at the end of Oakum Dock Road on the Connecticut River. A 5-day pump test was performed on two wellheads on the potential site in 2004, yielding a total safe yield of 743,000 gallons per day. EP evaluated this site further through the Groundwater Desktop Evaluation to analyze current characteristics of the site, which led to the conclusion that Site #1: Cobalt Landing Wellfield:

- Is located within a Town-owned easement;
- Is located within an area mapped as a potentially high yield aquifer;
- Is located within an area with favorable surficial geology;
- Is currently permitted for the diversion of water for consumptive purposes through the CT DEEP Diversion Permit through 2031.

The Cobalt Landing Wellfield Site was used as a Marina Facility consisting of three buildings, a loading platform, a boat basin, and grounds. Building 2 was used as a boat fabrication and repair shop. A Phase I Environmental Site Assessment (ESA) was conducted by Maguire Group Inc. to evaluate the relative environmental risk associated with the current and former land uses of the Site and to determine the likelihood that a "release" of oil or hazardous materials has occurred. The Phase I ESA identified five (5) Potential Release Areas at the site, including: 1 – Existing Above Ground Storage Tanks (ASTs); 2 – Former Underground Storage Tank; 3 – Existing Drywell; 4 – Exterior Vehicle Loading/Unloading and Boat Docking Area; and 5 – Building 1 Septic System Area. Based on the results of the Phase I ESA, a Phase II ESA was performed to determine the absence or presence of release conditions at the site.

The results of the Phase II ESA indicated that:

1. Soil and groundwater sample test results from the ASTs, Drywell and Septic System Area did not indicate "releases" of hazardous or contaminated materials within these areas.
2. Low concentrations of VOCs and metals were detected in limited soil samples collected from the Exterior Vehicle Loading/Unloading and Boat Docking Area, which may be due to fill material.
3. A groundwater sample collected from within the Exterior Vehicle Loading/Unloading and Boat Docking Area contained elevated concentrations of metals which may indicate an upgradient off site source or be possibly a sampling anomaly.
4. A soil sample collected from a boring the end of Oakum Dock Road contained TPH at a concentration exceeding DEP standards, possibly due to a surficial release.
5. Soil and groundwater sample test results from the Former Underground Storage Tank area indicate that a "release" of gasoline from the historic UST has occurred within this area.

Figure 7 shows the Cobalt Wellfield Site, easement, Sanitary Radius and Potential Aquifer Material and Thickness. As shown, coarse aquifer material 50 to 100 feet thick is identified.

This site should be considered for further evaluation as a potential public water supply site. While the site is not near the village center area of Town and will require several miles of transmission piping as well as water booster pumps due to the low elevation of the site, the results of the Desktop Evaluation show this site is favorable as a public water supply source. Next steps for evaluation are expanded upon later in this analysis, and include additional groundwater quality tests.

Site #2 – Pine Brook Site

The Pine Brook site is located on the west side of Pine Brook. EP evaluated the current conditions at this site and found that Site #2, Pine Brook site:

- Is located on a parcel owned by the Town of East Hampton;
- Is located within an area mapped as a potentially high yield aquifer;

- Is located within an area with favorable surficial geology;
- Is close to the populated village center area of Town; and
- Is not located in proximity to any known EPA/RCRA hazardous waste areas, PCB-contaminated sites, or impaired groundwater areas.

The potential wellsite boundaries were chosen based on location of aquifer material, the 200-foot Sanitary Radius buffer, and 50-foot wetland buffer. The current conditions at the Pine Brook site and potential wellsite are highlighted in **Figure 8**.

It is important to note that this site is located within land listed as CT DEEP Protected Open Space. The property record card for this parcel indicates that the site is classified as Land Use Code 923. The Town and EP plan to meet with CT DEEP to confirm the viability of this site as a groundwater supply source before carrying out additional explorations.

In summary, the results of the Groundwater Desktop Evaluation show that the Pine Brook site may be favorable for establishing a groundwater supply source. EP highlights further recommendations for determining the viability of the site in the following section.

Conclusions and Recommendations

EP has worked with the Town to develop recommendations for potential groundwater supply sources. The Groundwater Desktop Evaluation is a systematic evaluation of site characteristics to identify potentially viable groundwater supply sites. A total of 72 sites were reviewed, and 70 sites were eliminated from further consideration due to proximity to lack of aquifer material, environmental receptors, and/or site location. EP believes that the Town will be better informed on the water system requirements for its proposed municipal water system after performing additional investigations at the Cobalt Landing Wellfield and the Pine Brook site.

As previously discussed, the Cobalt Landing and Pine Brook sites, shown respectively on **Figures 7** and **8**, are identified as the most viable potential groundwater supply sites. However, the Groundwater Desktop Evaluation does not analyze water quality and quantity available at each site, as field conditions may differ from the results of this study.

Cobalt Landing Site

As indicated from the Phase I and Phase II ESAs conducted at the Cobalt Landing Site, potential sources of contamination were identified based on site uses and impacts to soil and groundwater were identified. Soil and groundwater sampling and analyses were conducted in 2005 and analyzed for a limited suite of parameters (petroleum hydrocarbons, volatile organic compounds and copper, lead and zinc). EP recommends that the Town evaluate the water quality at the Cobalt Landing site for a wider suite of analyses, including emerging contaminants 1,4-dioxane and PFAS compounds. Based on the results of these additional analyses, EP recommends that the Town works with CT DPH to discuss the groundwater quality findings.

Pine Brook Site

Following a discussion with CT DEEP to confirm the viability of the Pine Brook site as a water supply site under the CT DEEP Open Space Program, EP recommends that the Town conduct exploration and testing at the Pine Brook Site to determine water quantity and quality. In order to better evaluate the site, EP recommends installation of at least two test wells to identify the best location for evaluating water quantity and quality. A minimum two-hour Pump Test should be performed at the best test well site to determine specific capacity (pumping capacity in gallons per minute per foot of drawdown) and potential wellfield yield. At the end of the two-hour Pump Test, water quality samples should be collected and analyzed for preliminary screening parameters (most commonly associated with water quality issues), including VOCs, nitrate, nitrate, metals and PFAS compounds. The Pine Brook Site is large enough that, if the initial exploration results indicate a potentially viable water supply site, additional test wells may be installed at a later date to identify the best location for development of a public water supply well.

ATTACHMENT A

Groundwater Desktop Evaluation Figures

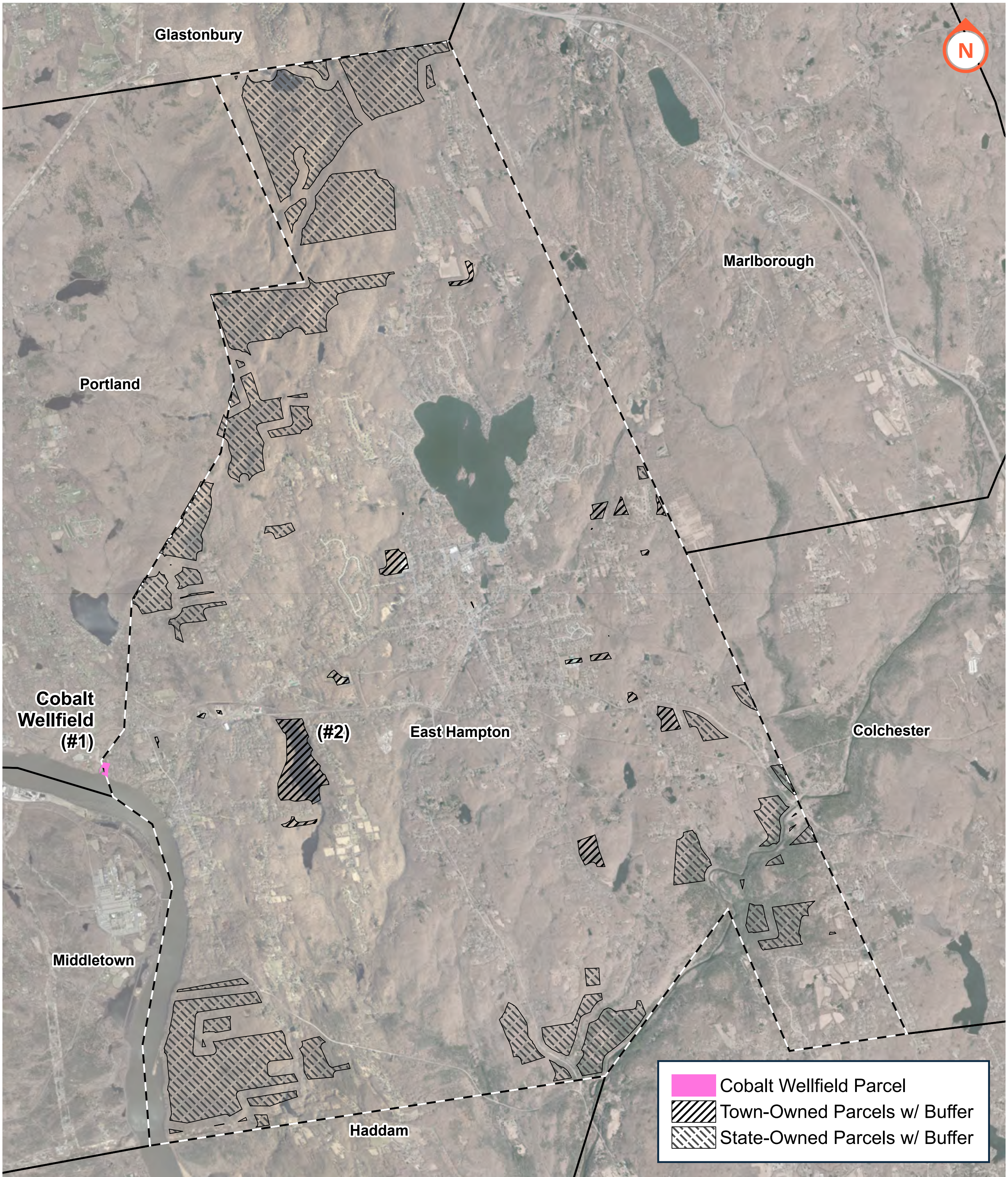


Figure 1 - Potential Supply Sites

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

0 3,000 6,000 12,000

1:6,000 Feet

ENVIRONMENTAL PARTNERS
— An Apex Company —

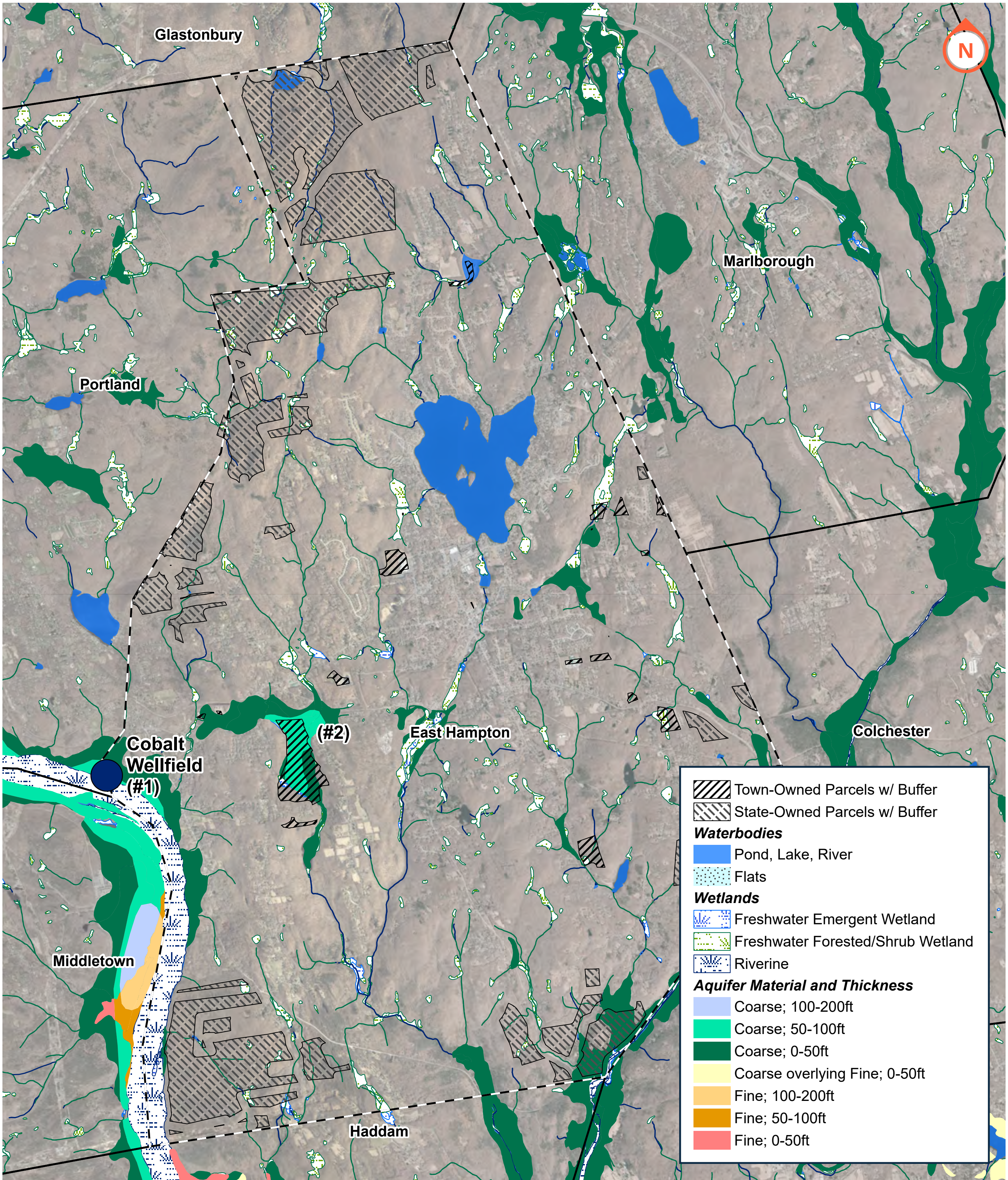


Figure 2 - Aquifer Material

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

ENVIRONMENTAL PARTNERS

— An Apex Company —

0 3,000 6,000 12,000

1:6,000 Feet

#343-2101.00 *I:\East Hampton, CT.343\343-2101 Water System Evaluation*

Disclaimer: This map is intended for planning purposes

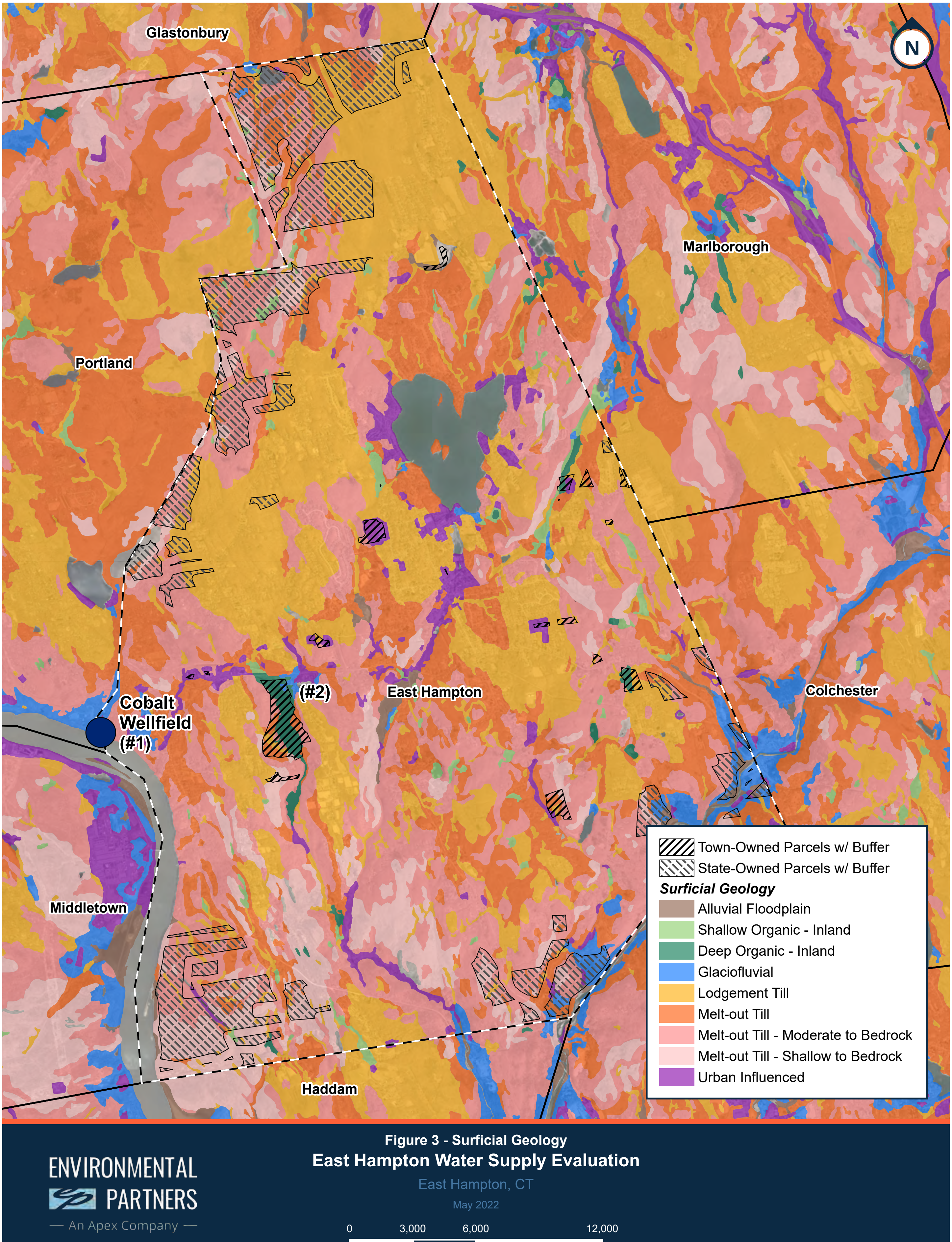


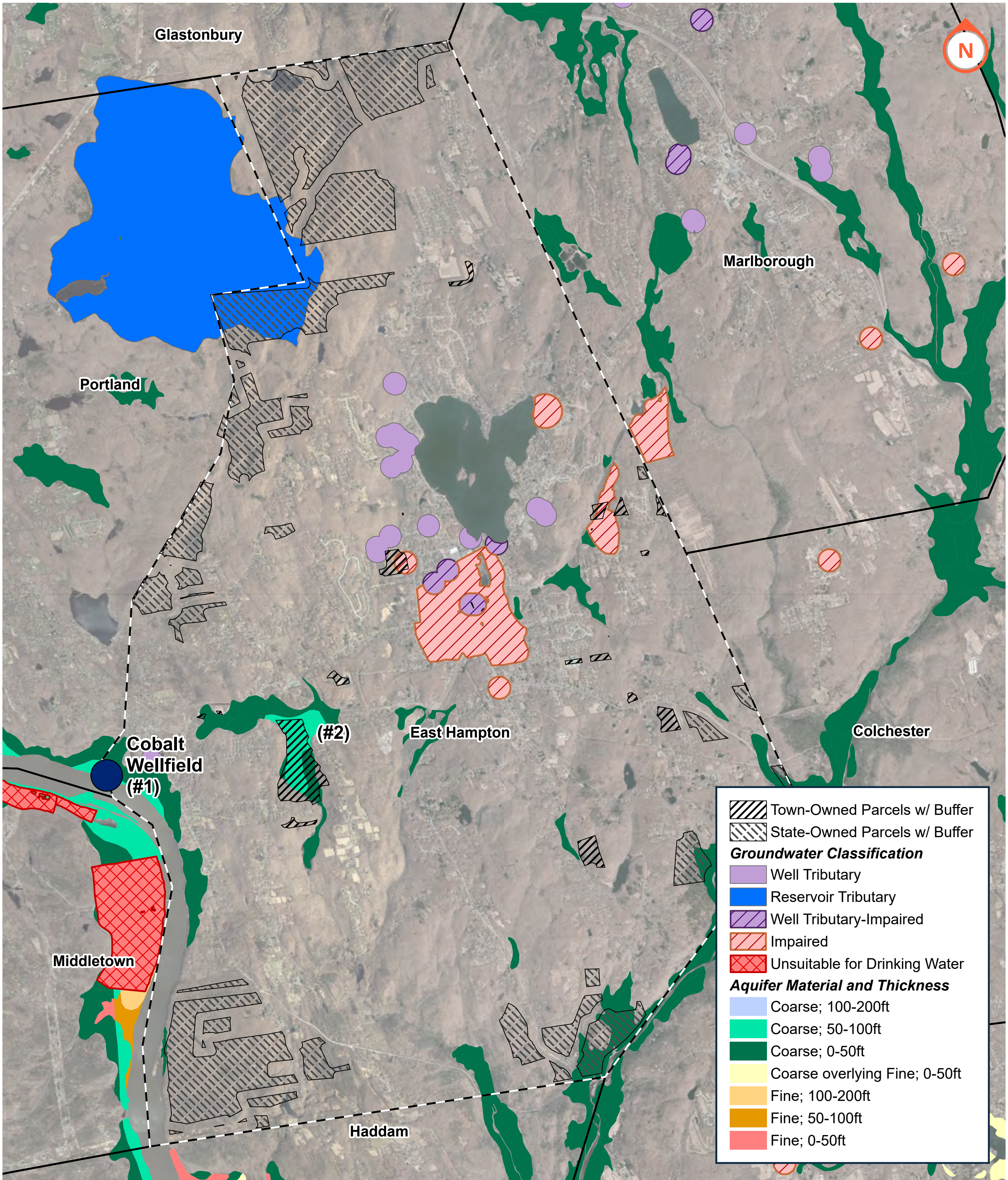
Figure 3 - Surficial Geology

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

ENVIRONMENTAL PARTNERS
— An Apex Company —



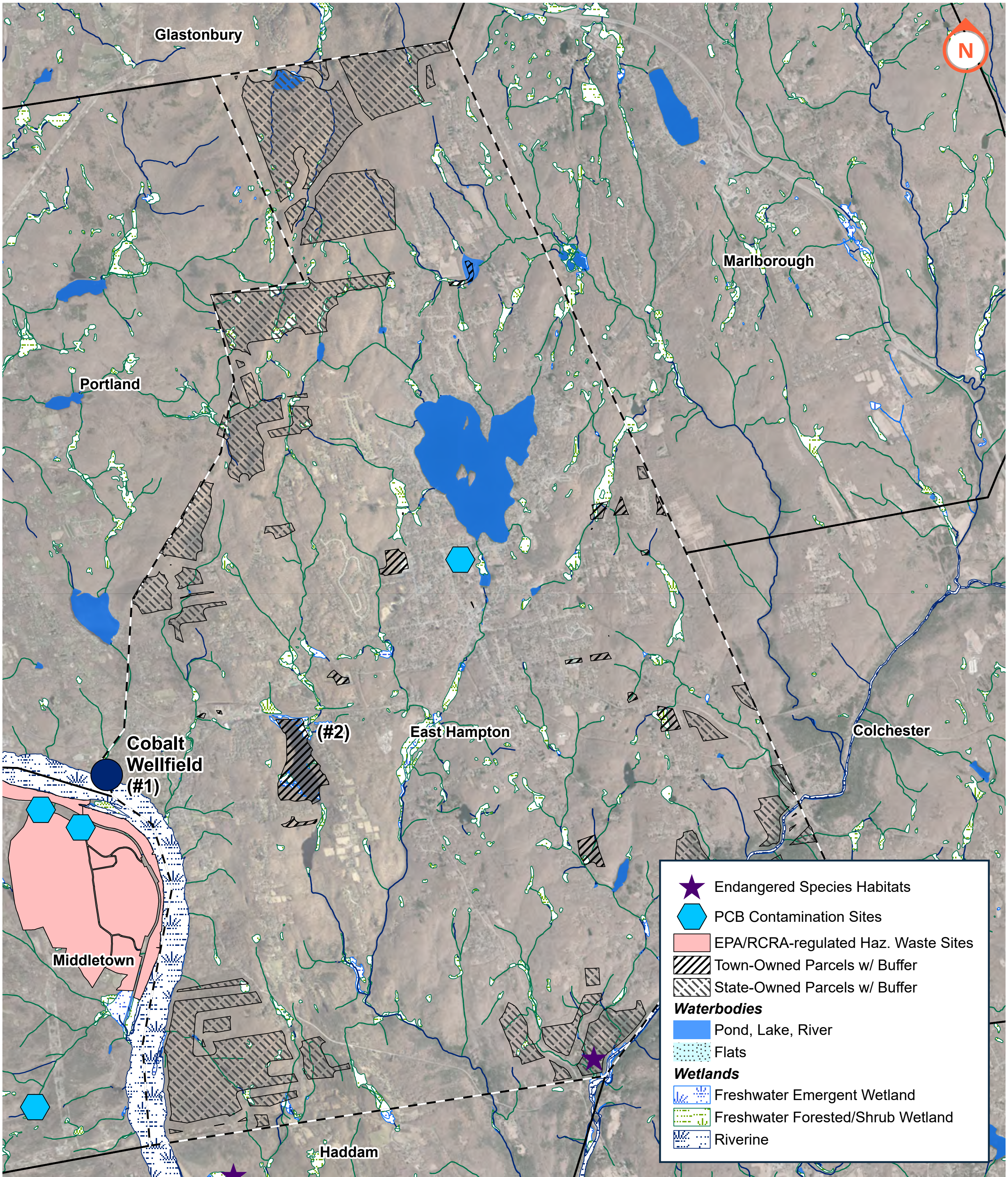
ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 4 - Potential Sites and Groundwater Classifications

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022



ENVIRONMENTAL PARTNERS
— An Apex Company —

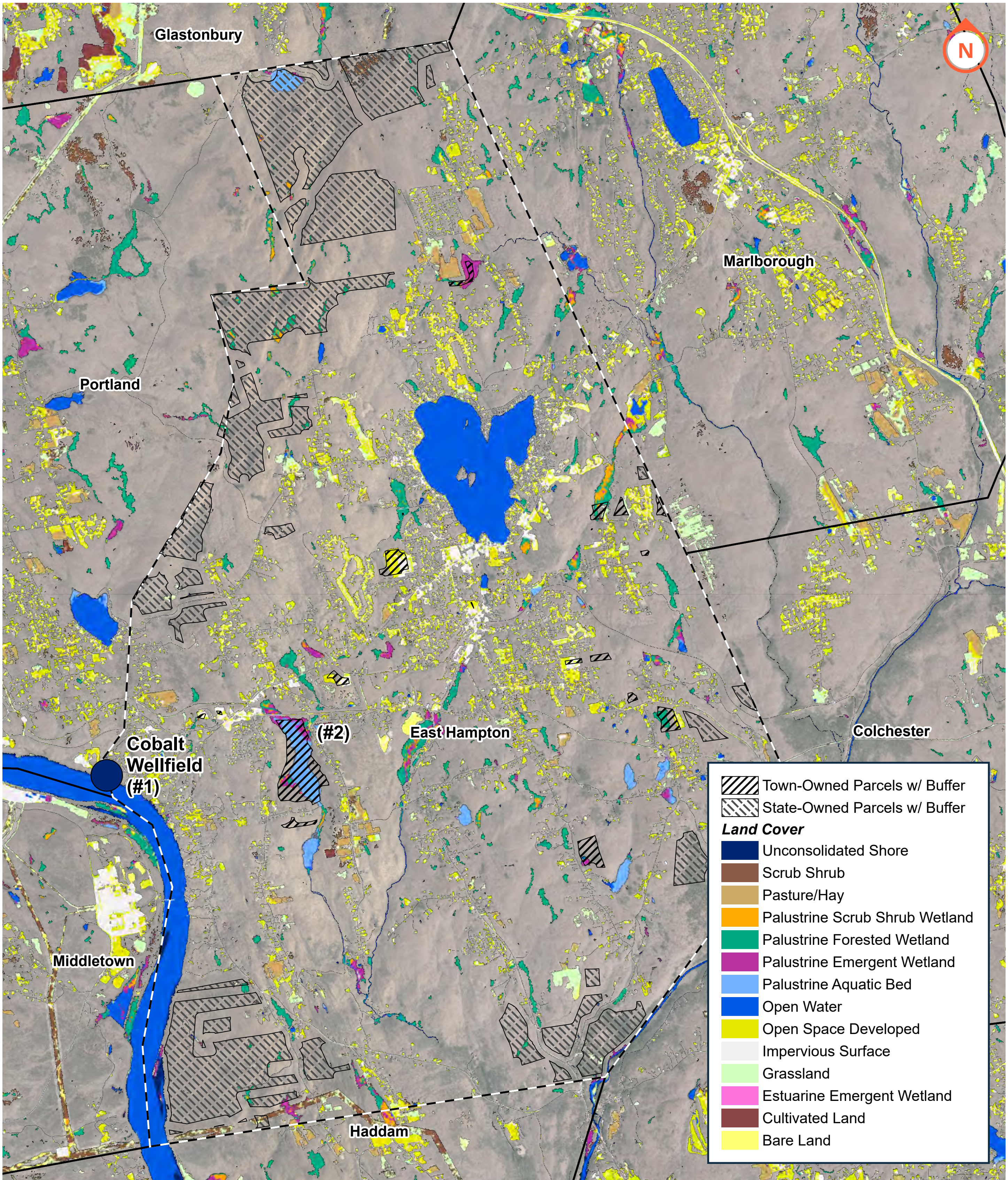
Figure 5 - Potential Sites and Environmental Impacts

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

0 3,000 6,000 12,000
1:6,000 Feet



ENVIRONMENTAL PARTNERS
— An Apex Company —

Figure 6 - Potential Sites and Land Use

East Hampton Water Supply Evaluation

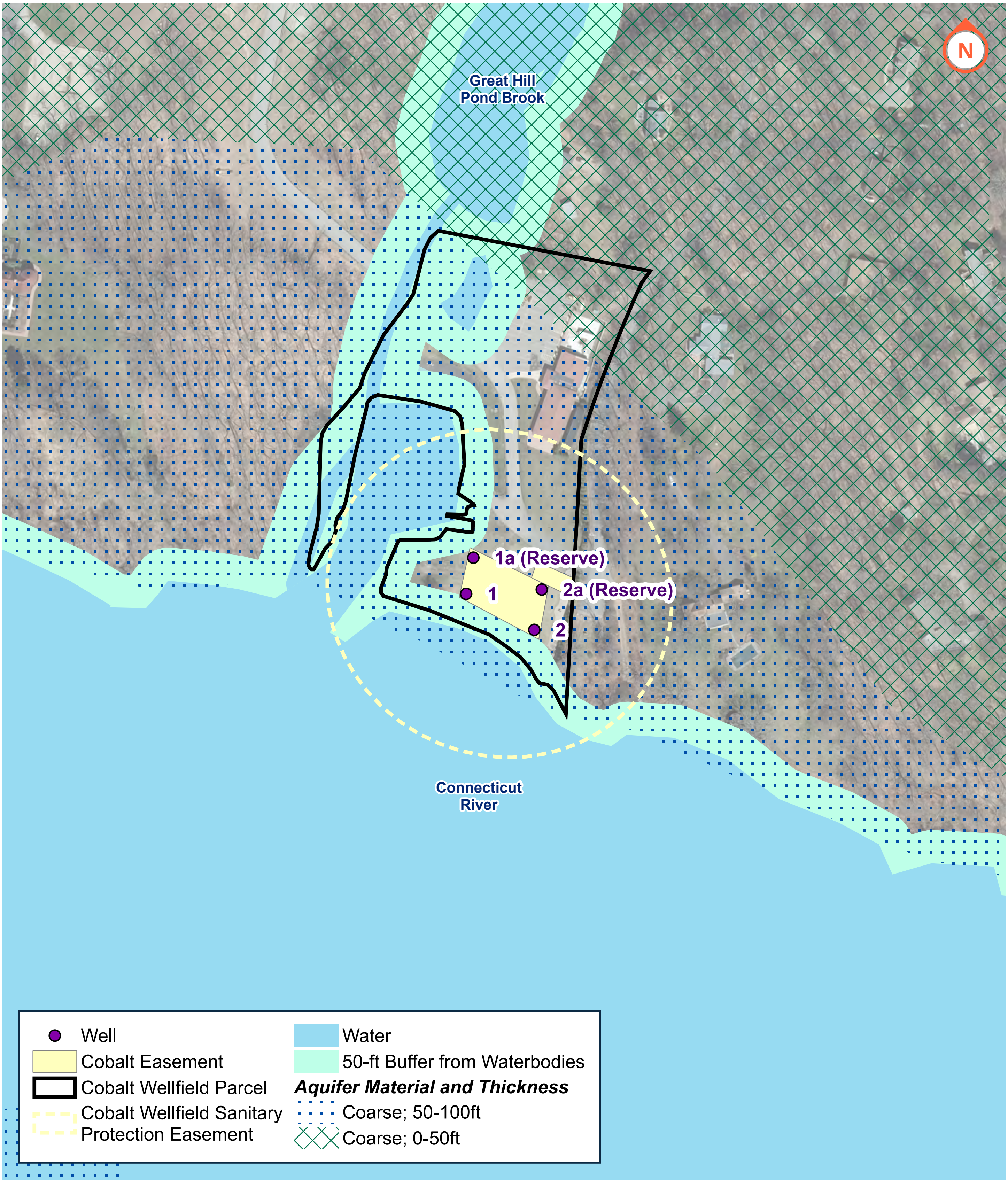
East Hampton, CT

May 2022

0 3,000 6,000 12,000 Feet
1:6,000

#343-2101.00 *I:\East Hampton, CT.343\343-2101 Water System Evaluation*

Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

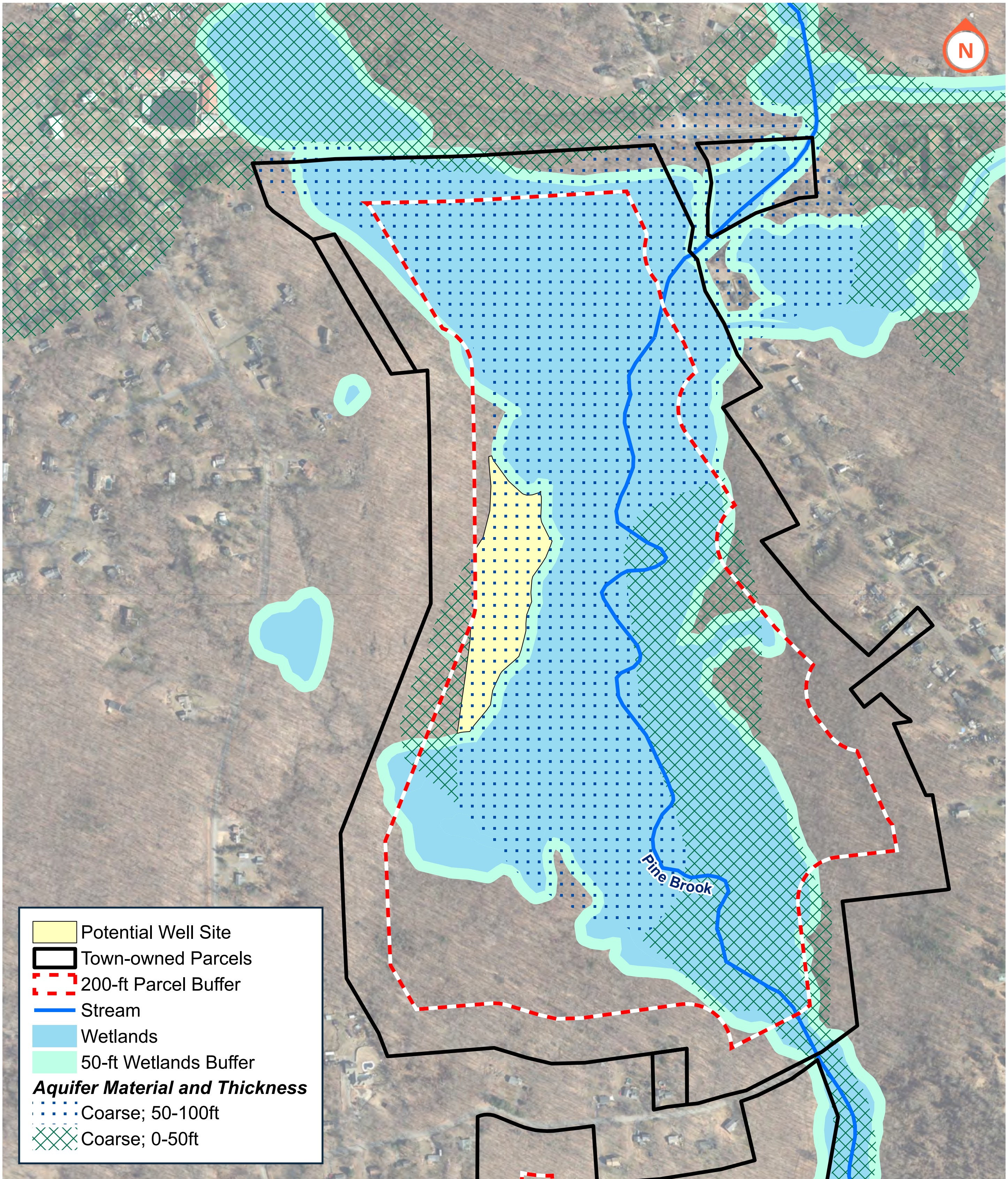
Figure 7 - Site 1 (Cobalt Wellfield)

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

Disclaimer: This map is intended for planning purposes



ENVIRONMENTAL PARTNERS
— An Apex Company —

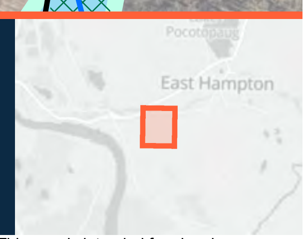
Figure 8 - Site 2

East Hampton Water Supply Evaluation

East Hampton, CT

May 2022

0 300 600 1,200
1:600
Feet



#343-2101.00 *I:\East Hampton, CT.343\343-2101 Water System Evaluation*

Disclaimer: This map is intended for planning purposes

APPENDIX B
East Hampton Pine Brook Boring Logs

East Hampton Water Department
B-1
Drilling Method: Geoprobe
Geologist: Stephen Gabriel
Depth is in feet below ground surface

Lithologic Log
Date Drilled: September 20, 2022
Hole Diameter: 2-inch
Driller: Geo Logic Earth Exploration Inc.
Norfolk, MA

Depth	Description
0 – 5	TOPSOIL, tan Fine silty sand, some gravel, dry
5 – 10	SAND, tan Fine silty sand, some gravel, dry
10 – 12.5	SAND, tan Fine silty sand, some gravel and rock fragments, dry
12.5	BOTTOM OF BORING AT REFUSAL

East Hampton Water Department
B-2
Drilling Method: Geoprobe
Geologist: Stephen Gabriel
Depth is in feet below ground surface

Lithologic Log
Date Drilled: September 20, 2022
Hole Diameter: 2-inch, 4-inch
Driller: Geo Logic Earth Exploration Inc.
Norfolk, MA

Depth	Description
0 – 5	TOPSOIL, brown Fine silty SAND with gravel, dry
5 – 10	5' – 6.5' Poorly graded SAND with gravel, dry 6.5' – 7' Sandy SILT, wet 7' – 7.5' 6-inch COBBLE, wet 7.5' – 10' Sandy SILT, wet
Switched to 4-inch Casing	
10 – 12	SILT, brown Sandy SILT with a cobble, wet
12 – 14	SILT, brown Sandy SILT, wet
14	BOTTOM OF BORING AT REFUSAL

East Hampton Water Department
B-3
Drilling Method: Geoprobe
Geologist: Stephen Gabriel
Depth is in feet below ground surface

Lithologic Log
Date Drilled: September 21-22, 2022
Hole Diameter: 4-inch
Driller: Geo Logic Earth Exploration Inc.
Norfolk, MA

Depth	Description
0 – 4	Fine, silty SAND with gravel, dry
4 – 8	4' – 5.5' Silty SAND with gravel, dry 5.5' – 8' Medium to fine SAND, moist
8 – 12	8' – 9.5' Brown, silty SAND, dry 9.5' – 10' 6-inch COBBLE, dry 10' – 11.5' Fine, silty SAND with trace gravel, dry 11.5' – 12' 6-inch COBBLE, dry
12 – 16	12' – 14' Fine, silty SAND, moist 14' – 14.5' 6-inch COBBLE, dry 14.5' – 16' Medium to fine silty SAND with gravel, rock fragments, moist
16 – 20	16' – 18.5' Fine, silty SAND with gravel, wet 18.5' – 19.5' Fine, silty SAND, wet 19.5' – 20' 6-inch COBBLE
20 – 22	Fine, Silty SAND with trace gravel, wet
22	BOTTOM OF BORING AT REFUSAL

APPENDIX C
Cobalt Wellfield Water Quality Results

CERTIFICATE OF ANALYSIS

Anne Marie Petricca
Environmental Partners Group, LLC
1900 Crown Colony Drive, Suite 402
Quincy, MA 02169

RE: Cobalt Wellfield Portland CT (N/A)
ESS Laboratory Work Order Number: 22K0165

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 8:44 am, Nov 29, 2022

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT

ESS Laboratory Work Order: 22K0165

SAMPLE RECEIPT

The following samples were received on November 04, 2022 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
22K0165-01	W-1	Aqueous	200.7, 200.8, 2320B, 245.1, 2540C, 300.0, 353.2, 4500 CN CE, 524.2, EPH8270, MADEP-EPH, MA-VPH-2.1
22K0165-02	W-2	Aqueous	200.7, 200.8, 2320B, 245.1, 2540C, 300.0, 353.2, 4500 CN CE, 524.2, EPH8270, MADEP-EPH, MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT

ESS Laboratory Work Order: 22K0165

PROJECT NARRATIVE

524.2 Volatile Organic Compounds

D2K0169-CCV1	**Continuing Calibration %Diff/Drift is above control limit (CD+).**
	Chloromethane (34% @ 30%), Dichlorodifluoromethane (31% @ 30%)
DK20828-BS1	**Blank Spike recovery is above upper control limit (B+).**
	Chloromethane (155% @ 70-130%), Vinyl Chloride (141% @ 70-130%)
DK20828-BSD1	**Blank Spike recovery is above upper control limit (B+).**
	Chloromethane (148% @ 70-130%), Vinyl Chloride (137% @ 70-130%)

Total Metals

DK20736-BS2	**Blank Spike recovery is above upper control limit (B+).**
	Cadmium (118% @ 85-115%), Selenium (117% @ 85-115%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: mg/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Aluminum	ND (0.025)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Antimony	ND (0.0025)		200.8		5	NAR	11/09/22 23:17	50	25	DK20736
Barium	**0.043** (0.010)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Beryllium	ND (0.0005)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Cadmium	ND (0.0025)		200.8		5	NAR	11/09/22 23:17	50	25	DK20736
Calcium	**24.4** (0.250)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Copper	ND (0.010)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Hardness	**86.0** (1.04)		200.7		1	CEV	11/07/22 18:38	1	1	[CALC]
Iron	**0.352** (0.0500)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Lead	ND (0.0025)		200.8		5	NAR	11/09/22 23:17	50	25	DK20736
Magnesium	**6.07** (0.100)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Manganese	**0.0948** (0.0100)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Mercury	ND (0.00020)		245.1		1	BJV	11/08/22 16:34	20	40	DK20725
Nickel	ND (0.010)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Potassium	**3.87** (0.500)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Selenium	ND (0.0125)		200.8		5	NAR	11/09/22 23:17	50	25	DK20736
Silver	ND (0.005)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Sodium	**20.4** (0.500)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736
Thallium	ND (0.0010)		200.8		5	NAR	11/09/22 23:17	50	25	DK20736
Zinc	ND (0.0250)		200.7		1	CEV	11/07/22 18:38	50	25	DK20736

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1,1-Trichloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1,2,2-Tetrachloroethane	ND (0.4)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1,2-Trichloro-1,2,2-trifluoroethane	ND (1.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1,2-Trichloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1-Dichloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,1-Dichloropropene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2,3-Trichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2,3-Trichloropropane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2,4-Trichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2,4-Trimethylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2-Dichloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,2-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,3,5-Trimethylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,3-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,3-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,4-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
1,4-Dioxane - Screen	ND (500)		524.2		1	11/08/22 17:10	D2K0169	DK20828
2,2-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
2-Butanone	ND (5.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
2-Chlorotoluene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
2-Hexanone	ND (5.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
4-Chlorotoluene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
4-Isopropyltoluene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
4-Methyl-2-Pentanone	ND (5.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Acetone	ND (5.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Acrylonitrile	ND (1.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Benzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Bromobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Bromochloromethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Bromoform	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Bromomethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Carbon Disulfide	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Carbon Tetrachloride	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Chlorobenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Chloroethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Chloroform	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Chloromethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
cis-1,2-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
cis-1,3-Dichloropropene	ND (0.3)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Dibromochloromethane	ND (0.4)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Dibromomethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Dichlorodifluoromethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Ethylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Hexachlorobutadiene	ND (0.4)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Hexachloroethane	ND (1.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Isopropylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Methyl tert-Butyl Ether	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Methylene Chloride	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Naphthalene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
n-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
n-Propylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
sec-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Styrene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
tert-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Tetrachloroethene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Tetrahydrofuran	ND (2.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Toluene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
trans-1,2-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
trans-1,3-Dichloropropene	ND (0.3)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Trans-1,4-Dichloro-2-Butene	ND (2.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Trichloroethene	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Trichlorofluoromethane	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Vinyl Chloride	ND (0.2)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Xylene O	ND (0.5)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Xylene P,M	ND (1.0)		524.2		1	11/08/22 17:10	D2K0169	DK20828
Xylenes (Total)	ND (1.00)		524.2		1	11/08/22 17:10		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*94 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*95 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Alkalinity as CaCO3	**51** (10)		2320B		1	EAM	11/11/22 17:15	mg/L	DK21128
Chloride	**50.2** (5.0)		300.0		10	EEM	11/10/22 21:55	mg/L	DK21016
Fluoride	ND (0.100)		300.0		1	EEM	11/10/22 21:38	mg/L	DK21016
Nitrate as N	**1.62** (0.110)		353.2		5	JLK	11/04/22 22:08	mg/L	[CALC]
Nitrite as N	ND (0.010)		353.2		1	JLK	11/04/22 19:49	mg/L	DK20450
Sulfate	**12.6** (0.5)		300.0		1	EEM	11/10/22 21:38	mg/L	DK21016
Total Cyanide	ND (0.0050)		4500 CN CE		1	EEM	11/11/22 12:20	mg/L	DK21113
Total Dissolved Solids	**200** (10)		2540C		1	CCP	11/10/22 17:45	mg/L	DK21036

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A
Initial Volume: 1040ml
Final Volume: 1ml
Extraction Method: 3510C

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: ug/L

Prepared: 11/16/22 12:24

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (96)		MADEP-EPH		1	MJV	11/17/22 18:54	D2K0349	DK21606
C19-C36 Aliphatics1	ND (96)		MADEP-EPH		1	MJV	11/17/22 18:54	D2K0349	DK21606
C11-C22 Unadjusted Aromatics1	ND (96.2)		EPH8270		1	MJV	11/17/22 18:25	D2K0351	DK21606
C11-C22 Aromatics1,2	ND (96.2)		EPH8270			MJV	11/17/22 18:25		[CALC]
Preservative:	**pH <= 2**		MADEP-EPH			MJV			DK21606

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*71 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*107 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*92 %*		*40-140*
Surrogate: O-Terphenyl	*96 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-1
Date Sampled: 11/03/22 19:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-01
Sample Matrix: Aqueous
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (100)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
C5-C8 Aliphatics1,2	ND (158)		MA-VPH-2.1		1	11/07/22 17:09		[CALC]
C9-C12 Aliphatics2,3	ND (270)		MA-VPH-2.1		1	11/07/22 17:09		[CALC]
Benzene	ND (1.5)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Ethylbenzene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Naphthalene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Toluene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Xylene O	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Xylene P,M	ND (10.0)		MA-VPH-2.1		1	11/07/22 17:09	D2K0133	DK20733
Preservative:	**pH <= 2**		MA-VPH-2.1					DK20733

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*97 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*91 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: mg/L

Extraction Method: 3005A/200.7

Total Metals

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	I/V	F/V	Batch
Aluminum	ND (0.025)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Antimony	ND (0.0025)		200.8		5	NAR	11/09/22 23:34	50	25	DK20736
Barium	**0.102** (0.010)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Beryllium	ND (0.0005)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Cadmium	ND (0.0025)		200.8		5	NAR	11/09/22 23:34	50	25	DK20736
Calcium	**29.7** (0.250)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Copper	ND (0.010)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Hardness	**102** (1.04)		200.7		1	CEV	11/07/22 18:40	1	1	[CALC]
Iron	**0.0827** (0.0500)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Lead	ND (0.0025)		200.8		5	NAR	11/09/22 23:34	50	25	DK20736
Magnesium	**6.83** (0.100)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Manganese	ND (0.0100)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Mercury	ND (0.00020)		245.1		1	BJV	11/08/22 16:36	20	40	DK20725
Nickel	ND (0.010)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Potassium	**3.84** (0.500)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Selenium	ND (0.0125)		200.8		5	NAR	11/09/22 23:34	50	25	DK20736
Silver	ND (0.005)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Sodium	**55.8** (0.500)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736
Thallium	ND (0.0010)		200.8		5	NAR	11/09/22 23:34	50	25	DK20736
Zinc	ND (0.0250)		200.7		1	CEV	11/07/22 18:40	50	25	DK20736

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1,1-Trichloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1,2,2-Tetrachloroethane	ND (0.4)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1,2-Trichloro-1,2,2-trifluoroethane	ND (1.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1,2-Trichloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1-Dichloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,1-Dichloropropene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2,3-Trichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2,3-Trichloropropane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2,4-Trichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2,4-Trimethylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2-Dichloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,2-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,3,5-Trimethylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,3-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,3-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,4-Dichlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
1,4-Dioxane - Screen	ND (500)		524.2		1	11/08/22 17:44	D2K0169	DK20828
2,2-Dichloropropane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
2-Butanone	ND (5.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
2-Chlorotoluene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
2-Hexanone	ND (5.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
4-Chlorotoluene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
4-Isopropyltoluene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
4-Methyl-2-Pentanone	ND (5.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Acetone	ND (5.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Acrylonitrile	ND (1.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Benzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Bromobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Bromochloromethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Bromoform	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Bromomethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Carbon Disulfide	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Carbon Tetrachloride	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Chlorobenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Chloroethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Chloroform	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Chloromethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
cis-1,2-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
cis-1,3-Dichloropropene	ND (0.3)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Dibromochloromethane	ND (0.4)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Dibromomethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Dichlorodifluoromethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Ethylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Hexachlorobutadiene	ND (0.4)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Hexachloroethane	ND (1.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Isopropylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Methyl tert-Butyl Ether	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Methylene Chloride	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Naphthalene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
n-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
n-Propylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
sec-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Styrene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
tert-Butylbenzene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Tetrachloroethene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Tetrahydrofuran	ND (2.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Toluene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
trans-1,2-Dichloroethene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
trans-1,3-Dichloropropene	ND (0.3)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Trans-1,4-Dichloro-2-Butene	ND (2.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A
Initial Volume: 25ml
Final Volume: 25ml
Extraction Method: 524.2

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: ug/L
Analyst: MD

524.2 Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Trichloroethene	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Trichlorofluoromethane	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Vinyl Chloride	ND (0.2)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Xylene O	ND (0.5)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Xylene P,M	ND (1.0)		524.2		1	11/08/22 17:44	D2K0169	DK20828
Xylenes (Total)	ND (1.00)		524.2		1	11/08/22 17:44		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*89 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*88 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous

Classical Chemistry

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Alkalinity as CaCO3	**34** (10)		2320B		1	EAM	11/11/22 17:15	mg/L	DK21128
Chloride	**116** (10.0)		300.0		20	EEM	11/10/22 23:02	mg/L	DK21016
Fluoride	ND (0.100)		300.0		1	EEM	11/10/22 22:12	mg/L	DK21016
Nitrate as N	**3.04** (0.110)		353.2		5	JLK	11/04/22 22:09	mg/L	[CALC]
Nitrite as N	ND (0.010)		353.2		1	JLK	11/04/22 19:50	mg/L	DK20450
Sulfate	**16.0** (0.5)		300.0		1	EEM	11/10/22 22:12	mg/L	DK21016
Total Cyanide	ND (0.0050)		4500 CN CE		1	EEM	11/11/22 12:20	mg/L	DK21113
Total Dissolved Solids	**310** (10)		2540C		1	CCP	11/10/22 17:45	mg/L	DK21036

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A
Initial Volume: 1070ml
Final Volume: 1ml
Extraction Method: 3510C

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: ug/L

Prepared: 11/16/22 12:24

MADEP-EPH Extractable Petroleum Hydrocarbons

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
C9-C18 Aliphatics1	ND (93)		MADEP-EPH		1	MJV	11/17/22 19:29	D2K0349	DK21606
C19-C36 Aliphatics1	ND (93)		MADEP-EPH		1	MJV	11/17/22 19:29	D2K0349	DK21606
C11-C22 Unadjusted Aromatics1	ND (93.5)		EPH8270		1	MJV	11/17/22 19:03	D2K0351	DK21606
C11-C22 Aromatics1,2	ND (93.5)		EPH8270			MJV	11/17/22 19:03		[CALC]
Preservative:	**pH <= 2**		MADEP-EPH			MJV			DK21606

	%Recovery	Qualifier	Limits
Surrogate: 1-Chlorooctadecane	*82 %*		*40-140*
Surrogate: 2-Bromonaphthalene	*104 %*		*40-140*
Surrogate: 2-Fluorobiphenyl	*91 %*		*40-140*
Surrogate: O-Terphenyl	*99 %*		*40-140*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
Client Sample ID: W-2
Date Sampled: 11/04/22 14:05
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 22K0165
ESS Laboratory Sample ID: 22K0165-02
Sample Matrix: Aqueous
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (100)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
C5-C8 Aliphatics1,2	ND (158)		MA-VPH-2.1		1	11/07/22 17:43		[CALC]
C9-C12 Aliphatics2,3	ND (270)		MA-VPH-2.1		1	11/07/22 17:43		[CALC]
Benzene	ND (1.5)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Ethylbenzene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Naphthalene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Toluene	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Xylene O	ND (5.0)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Xylene P,M	ND (10.0)		MA-VPH-2.1		1	11/07/22 17:43	D2K0133	DK20733
Preservative:	**pH <= 2**		MA-VPH-2.1					DK20733

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*91 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*87 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Total Metals						
Batch DK20725 - 245.1/7470A										
Blank										
Mercury	ND	0.00020	mg/L							
LCS										
Mercury	0.00659	0.00020	mg/L	0.006000		110	85-115			
LCS Dup										
Mercury	0.00657	0.00020	mg/L	0.006000		109	85-115	0.4	20	
Batch DK20736 - 3005A/200.7										
Blank										
Aluminum	ND	0.025	mg/L							
Barium	ND	0.010	mg/L							
Beryllium	ND	0.0005	mg/L							
Calcium	ND	0.250	mg/L							
Copper	ND	0.010	mg/L							
Iron	ND	0.0500	mg/L							
Magnesium	ND	0.100	mg/L							
Manganese	ND	0.0100	mg/L							
Nickel	ND	0.010	mg/L							
Potassium	ND	0.500	mg/L							
Silver	ND	0.005	mg/L							
Sodium	ND	0.500	mg/L							
Zinc	ND	0.0250	mg/L							
Blank										
Antimony	ND	0.0025	mg/L							
Cadmium	ND	0.0025	mg/L							
Lead	ND	0.0005	mg/L							
Selenium	ND	0.0025	mg/L							
Thallium	ND	0.0010	mg/L							
LCS										
Aluminum	1.28	0.025	mg/L	1.250		103	85-115			
Barium	0.257	0.010	mg/L	0.2500		103	85-115			
Beryllium	0.0258	0.0005	mg/L	0.02500		103	85-115			
Calcium	2.46	0.250	mg/L	2.500		99	85-115			
Copper	0.251	0.010	mg/L	0.2500		100	85-115			
Iron	1.21	0.0500	mg/L	1.250		97	85-115			
Magnesium	2.44	0.100	mg/L	2.500		98	85-115			
Manganese	0.259	0.0100	mg/L	0.2500		104	85-115			
Nickel	0.256	0.010	mg/L	0.2500		102	85-115			
Potassium	12.1	0.500	mg/L	12.50		97	85-115			
Silver	0.125	0.005	mg/L	0.1250		100	85-115			
Sodium	12.1	0.500	mg/L	12.50		96	85-115			
Zinc	0.250	0.0250	mg/L	0.2500		100	85-115			
LCS										
Antimony	0.288	0.0250	mg/L	0.2500		115	85-115			
Cadmium	0.148	0.0250	mg/L	0.1250		118	85-115			B+

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Total Metals										
Batch DK20736 - 3005A/200.7										
Lead	0.249	0.0250	mg/L	0.2500		100	85-115			
Selenium	0.585	0.125	mg/L	0.5000		117	85-115			B+
Thallium	0.241	0.0100	mg/L	0.2500		96	85-115			
524.2 Volatile Organic Compounds										
Batch DK20828 - 524.2										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L							
1,1,1-Trichloroethane	ND	0.5	ug/L							
1,1,2,2-Tetrachloroethane	ND	0.4	ug/L							
1,1,2-Trichloro-1,2,2-trifluoroethane	ND	1.0	ug/L							
1,1,2-Trichloroethane	ND	0.5	ug/L							
1,1-Dichloroethane	ND	0.5	ug/L							
1,1-Dichloroethene	ND	0.5	ug/L							
1,1-Dichloropropene	ND	0.5	ug/L							
1,2,3-Trichlorobenzene	ND	0.5	ug/L							
1,2,3-Trichloropropane	ND	0.5	ug/L							
1,2,4-Trichlorobenzene	ND	0.5	ug/L							
1,2,4-Trimethylbenzene	ND	0.5	ug/L							
1,2-Dichlorobenzene	ND	0.5	ug/L							
1,2-Dichloroethane	ND	0.5	ug/L							
1,2-Dichloropropane	ND	0.5	ug/L							
1,3,5-Trimethylbenzene	ND	0.5	ug/L							
1,3-Dichlorobenzene	ND	0.5	ug/L							
1,3-Dichloropropane	ND	0.5	ug/L							
1,4-Dichlorobenzene	ND	0.5	ug/L							
1,4-Dioxane - Screen	ND	500	ug/L							
2,2-Dichloropropane	ND	0.5	ug/L							
2-Butanone	ND	5.0	ug/L							
2-Chlorotoluene	ND	0.5	ug/L							
2-Hexanone	ND	5.0	ug/L							
4-Chlorotoluene	ND	0.5	ug/L							
4-Isopropyltoluene	ND	0.5	ug/L							
4-Methyl-2-Pentanone	ND	5.0	ug/L							
Acetone	ND	5.0	ug/L							
Acrylonitrile	ND	1.0	ug/L							
Benzene	ND	0.5	ug/L							
Bromobenzene	ND	0.5	ug/L							
Bromochloromethane	ND	0.5	ug/L							
Bromodichloromethane	ND	0.5	ug/L							
Bromoform	ND	0.5	ug/L							
Bromomethane	ND	0.5	ug/L							
Carbon Disulfide	ND	0.5	ug/L							
Carbon Tetrachloride	ND	0.5	ug/L							
Chlorobenzene	ND	0.5	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				524.2 Volatile Organic Compounds						
Batch DK20828 - 524.2										
Chloroethane	ND	0.5	ug/L							
Chloroform	ND	0.5	ug/L							
Chloromethane	ND	0.5	ug/L							
cis-1,2-Dichloroethene	ND	0.5	ug/L							
cis-1,3-Dichloropropene	ND	0.3	ug/L							
Dibromochloromethane	ND	0.4	ug/L							
Dibromomethane	ND	0.5	ug/L							
Dichlorodifluoromethane	ND	0.5	ug/L							
Ethylbenzene	ND	0.5	ug/L							
Hexachlorobutadiene	ND	0.4	ug/L							
Hexachloroethane	ND	1.0	ug/L							
Isopropylbenzene	ND	0.5	ug/L							
Methyl tert-Butyl Ether	ND	0.5	ug/L							
Methylene Chloride	ND	0.5	ug/L							
Naphthalene	ND	0.5	ug/L							
n-Butylbenzene	ND	0.5	ug/L							
n-Propylbenzene	ND	0.5	ug/L							
sec-Butylbenzene	ND	0.5	ug/L							
Styrene	ND	0.5	ug/L							
tert-Butylbenzene	ND	0.5	ug/L							
Tetrachloroethene	ND	0.5	ug/L							
Tetrahydrofuran	ND	2.0	ug/L							
Toluene	ND	0.5	ug/L							
trans-1,2-Dichloroethene	ND	0.5	ug/L							
trans-1,3-Dichloropropene	ND	0.3	ug/L							
Trans-1,4-Dichloro-2-Butene	ND	2.0	ug/L							
Trichloroethene	ND	0.5	ug/L							
Trichlorofluoromethane	ND	0.5	ug/L							
Vinyl Chloride	ND	0.2	ug/L							
Xylene O	ND	0.5	ug/L							
Xylene P,M	ND	1.0	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*4.51*		ug/L	*5.000*		*90*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*4.56*		ug/L	*5.000*		*91*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	10.8	0.5	ug/L	10.00		108	70-130			
1,1,1-Trichloroethane	11.0	0.5	ug/L	10.00		110	70-130			
1,1,2,2-Tetrachloroethane	10.9	0.4	ug/L	10.00		109	70-130			
1,1,2-Trichloro-1,2,2-trifluoroethane	11.4	1.0	ug/L	10.00		114	70-130			
1,1,2-Trichloroethane	10.9	0.5	ug/L	10.00		109	70-130			
1,1-Dichloroethane	11.2	0.5	ug/L	10.00		112	70-130			
1,1-Dichloroethene	10.9	0.5	ug/L	10.00		109	70-130			
1,1-Dichloropropene	10.2	0.5	ug/L	10.00		102	70-130			
1,2,3-Trichlorobenzene	9.6	0.5	ug/L	10.00		96	70-130			
1,2,3-Trichloropropane	11.2	0.5	ug/L	10.00		112	70-130			
1,2,4-Trichlorobenzene	9.9	0.5	ug/L	10.00		99	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				524.2 Volatile Organic Compounds						
Batch DK20828 - 524.2										
1,2,4-Trimethylbenzene	10.1	0.5	ug/L	10.00		101	70-130			
1,2-Dichlorobenzene	10.4	0.5	ug/L	10.00		104	70-130			
1,2-Dichloroethane	12.2	0.5	ug/L	10.00		122	70-130			
1,2-Dichloropropane	10.6	0.5	ug/L	10.00		106	70-130			
1,3,5-Trimethylbenzene	10.4	0.5	ug/L	10.00		104	70-130			
1,3-Dichlorobenzene	10.6	0.5	ug/L	10.00		106	70-130			
1,3-Dichloropropane	11.4	0.5	ug/L	10.00		114	70-130			
1,4-Dichlorobenzene	10.6	0.5	ug/L	10.00		106	70-130			
1,4-Dioxane - Screen	ND	500	ug/L	200.0		0	0-332			
2,2-Dichloropropane	9.8	0.5	ug/L	10.00		98	70-130			
2-Butanone	47.6	5.0	ug/L	50.00		95	70-130			
2-Chlorotoluene	10.3	0.5	ug/L	10.00		103	70-130			
2-Hexanone	55.5	5.0	ug/L	50.00		111	70-130			
4-Chlorotoluene	10.8	0.5	ug/L	10.00		108	70-130			
4-Isopropyltoluene	9.9	0.5	ug/L	10.00		99	70-130			
4-Methyl-2-Pentanone	52.9	5.0	ug/L	50.00		106	70-130			
Acetone	64.4	5.0	ug/L	50.00		129	70-130			
Acrylonitrile	10.6	1.0	ug/L	10.00		106	70-130			
Benzene	10.6	0.5	ug/L	10.00		106	70-130			
Bromobenzene	9.9	0.5	ug/L	10.00		99	70-130			
Bromochloromethane	10.5	0.5	ug/L	10.00		105	70-130			
Bromodichloromethane	12.2	0.5	ug/L	10.00		122	70-130			
Bromoform	12.6	0.5	ug/L	10.00		126	70-130			
Bromomethane	9.2	0.5	ug/L	10.00		92	70-130			
Carbon Disulfide	11.4	0.5	ug/L	10.00		114	70-130			
Carbon Tetrachloride	12.4	0.5	ug/L	10.00		124	70-130			
Chlorobenzene	10.3	0.5	ug/L	10.00		103	70-130			
Chloroethane	9.4	0.5	ug/L	10.00		94	70-130			
Chloroform	11.3	0.5	ug/L	10.00		113	70-130			
Chloromethane	15.5	0.5	ug/L	10.00		155	70-130			B+
cis-1,2-Dichloroethene	10.7	0.5	ug/L	10.00		107	70-130			
cis-1,3-Dichloropropene	9.3	0.3	ug/L	10.00		93	70-130			
Dibromochloromethane	12.0	0.4	ug/L	10.00		120	70-130			
Dibromomethane	11.2	0.5	ug/L	10.00		112	70-130			
Dichlorodifluoromethane	12.5	0.5	ug/L	10.00		125	70-130			
Ethylbenzene	9.9	0.5	ug/L	10.00		99	70-130			
Hexachlorobutadiene	9.7	0.4	ug/L	10.00		97	70-130			
Hexachloroethane	12.4	1.0	ug/L	10.00		124	70-130			
Isopropylbenzene	10.1	0.5	ug/L	10.00		101	70-130			
Methyl tert-Butyl Ether	9.6	0.5	ug/L	10.00		96	70-130			
Methylene Chloride	12.1	0.5	ug/L	10.00		121	70-130			
Naphthalene	9.2	0.5	ug/L	10.00		92	70-130			
n-Butylbenzene	10.7	0.5	ug/L	10.00		107	70-130			
n-Propylbenzene	10.2	0.5	ug/L	10.00		102	70-130			
sec-Butylbenzene	10.0	0.5	ug/L	10.00		100	70-130			

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				524.2 Volatile Organic Compounds						
Batch DK20828 - 524.2										
Styrene	9.9	0.5	ug/L	10.00		99	70-130			
tert-Butylbenzene	9.8	0.5	ug/L	10.00		98	70-130			
Tetrachloroethene	8.9	0.5	ug/L	10.00		89	70-130			
Tetrahydrofuran	10.6	2.0	ug/L	10.00		106	70-130			
Toluene	9.9	0.5	ug/L	10.00		99	70-130			
trans-1,2-Dichloroethene	10.9	0.5	ug/L	10.00		109	70-130			
trans-1,3-Dichloropropene	8.8	0.3	ug/L	10.00		88	70-130			
Trans-1,4-Dichloro-2-Butene	10.6	2.0	ug/L	10.00		106	70-130			
Trichloroethene	10.2	0.5	ug/L	10.00		102	70-130			
Trichlorofluoromethane	12.2	0.5	ug/L	10.00		122	70-130			
Vinyl Chloride	14.1	0.2	ug/L	10.00		141	70-130			B+
Xylene O	10.1	0.5	ug/L	10.00		101	70-130			
Xylene P,M	20.2	1.0	ug/L	20.00		101	70-130			
Surrogate: 1,2-Dichlorobenzene-d4	*5.48*		ug/L	*5.000*		*110*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*5.76*		ug/L	*5.000*		*115*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	10.5	0.5	ug/L	10.00		105	70-130	2	20	
1,1,1-Trichloroethane	10.8	0.5	ug/L	10.00		108	70-130	1	20	
1,1,2,2-Tetrachloroethane	10.2	0.4	ug/L	10.00		102	70-130	6	20	
1,1,2-Trichloro-1,2,2-trifluoroethane	11.2	1.0	ug/L	10.00		112	70-130	1	20	
1,1,2-Trichloroethane	10.6	0.5	ug/L	10.00		106	70-130	3	20	
1,1-Dichloroethane	11.0	0.5	ug/L	10.00		110	70-130	2	20	
1,1-Dichloroethene	11.0	0.5	ug/L	10.00		110	70-130	0.4	20	
1,1-Dichloropropene	10.1	0.5	ug/L	10.00		101	70-130	1	20	
1,2,3-Trichlorobenzene	9.2	0.5	ug/L	10.00		92	70-130	5	20	
1,2,3-Trichloropropane	11.1	0.5	ug/L	10.00		111	70-130	0.09	20	
1,2,4-Trichlorobenzene	9.6	0.5	ug/L	10.00		96	70-130	3	20	
1,2,4-Trimethylbenzene	10.2	0.5	ug/L	10.00		102	70-130	0.6	20	
1,2-Dichlorobenzene	10.2	0.5	ug/L	10.00		102	70-130	2	20	
1,2-Dichloroethane	12.0	0.5	ug/L	10.00		120	70-130	2	20	
1,2-Dichloropropane	10.5	0.5	ug/L	10.00		105	70-130	1	20	
1,3,5-Trimethylbenzene	10.5	0.5	ug/L	10.00		105	70-130	0.7	20	
1,3-Dichlorobenzene	10.4	0.5	ug/L	10.00		104	70-130	2	20	
1,3-Dichloropropane	11.4	0.5	ug/L	10.00		114	70-130	0.3	20	
1,4-Dichlorobenzene	10.4	0.5	ug/L	10.00		104	70-130	2	20	
1,4-Dioxane - Screen	ND	500	ug/L	200.0		0	0-332	200	200	
2,2-Dichloropropane	9.6	0.5	ug/L	10.00		96	70-130	2	20	
2-Butanone	54.0	5.0	ug/L	50.00		108	70-130	13	20	
2-Chlorotoluene	10.3	0.5	ug/L	10.00		103	70-130	0.4	20	
2-Hexanone	52.5	5.0	ug/L	50.00		105	70-130	6	20	
4-Chlorotoluene	10.5	0.5	ug/L	10.00		105	70-130	2	20	
4-Isopropyltoluene	9.8	0.5	ug/L	10.00		98	70-130	2	20	
4-Methyl-2-Pentanone	52.0	5.0	ug/L	50.00		104	70-130	2	20	
Acetone	59.7	5.0	ug/L	50.00		119	70-130	8	20	
Acrylonitrile	10.4	1.0	ug/L	10.00		104	70-130	2	20	

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				524.2 Volatile Organic Compounds						
Batch DK20828 - 524.2										
Benzene	10.4	0.5	ug/L	10.00		104	70-130	1	20	
Bromobenzene	9.7	0.5	ug/L	10.00		97	70-130	2	20	
Bromochloromethane	11.0	0.5	ug/L	10.00		110	70-130	4	20	
Bromodichloromethane	12.0	0.5	ug/L	10.00		120	70-130	1	20	
Bromoform	12.2	0.5	ug/L	10.00		122	70-130	3	20	
Bromomethane	9.0	0.5	ug/L	10.00		90	70-130	2	20	
Carbon Disulfide	10.7	0.5	ug/L	10.00		107	70-130	7	20	
Carbon Tetrachloride	12.2	0.5	ug/L	10.00		122	70-130	1	20	
Chlorobenzene	10.2	0.5	ug/L	10.00		102	70-130	1	20	
Chloroethane	9.3	0.5	ug/L	10.00		93	70-130	1	20	
Chloroform	11.1	0.5	ug/L	10.00		111	70-130	2	20	
Chloromethane	14.8	0.5	ug/L	10.00		148	70-130	4	20	B+
cis-1,2-Dichloroethene	10.6	0.5	ug/L	10.00		106	70-130	0.7	20	
cis-1,3-Dichloropropene	9.2	0.3	ug/L	10.00		92	70-130	2	20	
Dibromochloromethane	11.8	0.4	ug/L	10.00		118	70-130	2	20	
Dibromomethane	11.1	0.5	ug/L	10.00		111	70-130	0.8	20	
Dichlorodifluoromethane	12.5	0.5	ug/L	10.00		125	70-130	0.08	20	
Ethylbenzene	10.0	0.5	ug/L	10.00		100	70-130	0.4	20	
Hexachlorobutadiene	9.6	0.4	ug/L	10.00		96	70-130	0.7	20	
Hexachloroethane	12.0	1.0	ug/L	10.00		120	70-130	3	20	
Isopropylbenzene	10.1	0.5	ug/L	10.00		101	70-130	0	20	
Methyl tert-Butyl Ether	9.5	0.5	ug/L	10.00		95	70-130	0.4	20	
Methylene Chloride	11.9	0.5	ug/L	10.00		119	70-130	1	20	
Naphthalene	8.6	0.5	ug/L	10.00		86	70-130	6	20	
n-Butylbenzene	10.4	0.5	ug/L	10.00		104	70-130	3	20	
n-Propylbenzene	10.2	0.5	ug/L	10.00		102	70-130	0.2	20	
sec-Butylbenzene	9.9	0.5	ug/L	10.00		99	70-130	0.5	20	
Styrene	9.9	0.5	ug/L	10.00		99	70-130	0.6	20	
tert-Butylbenzene	9.8	0.5	ug/L	10.00		98	70-130	1	20	
Tetrachloroethene	9.0	0.5	ug/L	10.00		90	70-130	0.8	20	
Tetrahydrofuran	9.3	2.0	ug/L	10.00		93	70-130	13	20	
Toluene	9.7	0.5	ug/L	10.00		97	70-130	2	20	
trans-1,2-Dichloroethene	10.4	0.5	ug/L	10.00		104	70-130	5	20	
trans-1,3-Dichloropropene	8.7	0.3	ug/L	10.00		87	70-130	0.7	20	
Trans-1,4-Dichloro-2-Butene	9.8	2.0	ug/L	10.00		98	70-130	7	20	
Trichloroethene	10.0	0.5	ug/L	10.00		100	70-130	1	20	
Trichlorofluoromethane	12.1	0.5	ug/L	10.00		121	70-130	0.8	20	
Vinyl Chloride	13.7	0.2	ug/L	10.00		137	70-130	3	20	B+
Xylene O	10.1	0.5	ug/L	10.00		101	70-130	0.4	20	
Xylene P,M	20.2	1.0	ug/L	20.00		101	70-130	0.2	20	
Surrogate: 1,2-Dichlorobenzene-d4	*5.34*		ug/L	*5.000*		*107*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*5.74*		ug/L	*5.000*		*115*	*70-130*			
				Classical Chemistry						
Batch DK20450 - General Preparation										

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Classical Chemistry										
Batch DK20450 - General Preparation										
Blank										
Nitrite as N	ND	0.010	mg/L							
Nitrite as N	ND	0.010	mg/L							
LCS										
Nitrite as N	0.263		mg/L	0.2497		105	90-110			
Nitrite as N	0.263		mg/L	0.2497		105	90-110			
Batch DK20453 - General Preparation										
Blank										
Nitrate/Nitrite as N	ND	0.020	mg/L							
LCS										
Nitrate/Nitrite as N	0.487		mg/L	0.5000		97	90-110			
Batch DK21016 - General Preparation										
Blank										
Chloride	ND	0.5	mg/L							
Fluoride	ND	0.100	mg/L							
Sulfate	ND	0.5	mg/L							
LCS										
Chloride	9.8		mg/L	10.00		98	90-110			
Fluoride	1.95		mg/L	2.000		98	90-110			
Sulfate	9.8		mg/L	10.00		98	90-110			
Batch DK21036 - General Preparation										
Blank										
Total Dissolved Solids	ND	10	mg/L							
LCS										
Total Dissolved Solids	260		mg/L	258.0		101	80-120			
Batch DK21113 - TCN Prep										
Blank										
Total Cyanide	ND	0.0050	mg/L							
LCS										
Total Cyanide	0.0198	0.0050	mg/L	0.02006		99	90-110			
LCS										
Total Cyanide	0.149	0.0050	mg/L	0.1504		99	90-110			
LCS Dup										
Total Cyanide	0.148	0.0050	mg/L	0.1504		98	90-110	0.6	20	
Batch DK21128 - General Preparation										
Blank										
Alkalinity as CaCO3	ND	2	mg/L							
LCS										
Alkalinity as CaCO3	51		mg/L	50.90		101	85-115			

MADEP-EPH Extractable Petroleum Hydrocarbons

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK21606 - 3510C										
Blank										
C19-C36 Aliphatics1	ND	100	ug/L							
C9-C18 Aliphatics1	ND	100	ug/L							
Surrogate: 1-Chlorooctadecane	*42.0*		ug/L	*50.00*		*84*	*40-140*			
Blank										
2-Methylnaphthalene	ND	5.0	ug/L							
Acenaphthene	ND	5.0	ug/L							
Acenaphthylene	ND	5.0	ug/L							
Anthracene	ND	5.0	ug/L							
Benzo(a)anthracene	ND	5.0	ug/L							
Benzo(a)pyrene	ND	10.0	ug/L							
Benzo(b)fluoranthene	ND	5.0	ug/L							
Benzo(g,h,i)perylene	ND	10.0	ug/L							
Benzo(k)fluoranthene	ND	10.0	ug/L							
C11-C22 Unadjusted Aromatics1	ND	100	ug/L							
Chrysene	ND	10.0	ug/L							
Dibenzo(a,h)Anthracene	ND	5.0	ug/L							
Fluoranthene	ND	10.0	ug/L							
Fluorene	ND	5.0	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	5.0	ug/L							
Naphthalene	ND	10.0	ug/L							
Phenanthrene	ND	5.0	ug/L							
Pyrene	ND	5.0	ug/L							
Surrogate: 2-Bromonaphthalene	*50.4*		ug/L	*50.00*		*101*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*44.7*		ug/L	*50.00*		*89*	*40-140*			
Surrogate: O-Terphenyl	*44.3*		ug/L	*50.00*		*89*	*40-140*			
LCS										
C19-C36 Aliphatics1	381	100	ug/L	400.0		95	40-140			
C9-C18 Aliphatics1	203	100	ug/L	300.0		68	40-140			
Surrogate: 1-Chlorooctadecane	*43.9*		ug/L	*50.00*		*88*	*40-140*			
LCS										
2-Methylnaphthalene	35.4	5.0	ug/L	50.00		71	40-140			
Acenaphthene	41.2	5.0	ug/L	50.00		82	40-140			
Acenaphthylene	40.2	5.0	ug/L	50.00		80	40-140			
Anthracene	44.0	5.0	ug/L	50.00		88	40-140			
Benzo(a)anthracene	52.2	5.0	ug/L	50.00		104	40-140			
Benzo(a)pyrene	48.0	10.0	ug/L	50.00		96	40-140			
Benzo(b)fluoranthene	53.3	5.0	ug/L	50.00		107	40-140			
Benzo(g,h,i)perylene	45.4	10.0	ug/L	50.00		91	40-140			
Benzo(k)fluoranthene	47.3	10.0	ug/L	50.00		95	40-140			
C11-C22 Unadjusted Aromatics1	750	100	ug/L	850.0		88	40-140			
Chrysene	43.6	10.0	ug/L	50.00		87	40-140			
Dibenzo(a,h)Anthracene	49.2	5.0	ug/L	50.00		98	40-140			

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT

ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-EPH Extractable Petroleum Hydrocarbons										
Batch DK21606 - 3510C										
Fluoranthene	45.3	10.0	ug/L	50.00		91	40-140			
Fluorene	42.0	5.0	ug/L	50.00		84	40-140			
Indeno(1,2,3-cd)Pyrene	49.5	5.0	ug/L	50.00		99	40-140			
Naphthalene	34.0	10.0	ug/L	50.00		68	40-140			
Phenanthrene	44.7	5.0	ug/L	50.00		89	40-140			
Pyrene	39.7	5.0	ug/L	50.00		79	40-140			
Surrogate: 2-Bromonaphthalene	*58.4*		ug/L	*50.00*		*117*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*52.3*		ug/L	*50.00*		*105*	*40-140*			
Surrogate: O-Terphenyl	*48.9*		ug/L	*50.00*		*98*	*40-140*			
LCS										
2-Methylnaphthalene Breakthrough	0.0		%				0-5			
Naphthalene Breakthrough	0.0		%				0-5			
LCS Dup										
C19-C36 Aliphatics1	378	100	ug/L	400.0		95	40-140	0.6	25	
C9-C18 Aliphatics1	200	100	ug/L	300.0		67	40-140	2	25	
Surrogate: 1-Chlorooctadecane	*41.3*		ug/L	*50.00*		*83*	*40-140*			
LCS Dup										
2-Methylnaphthalene	33.5	5.0	ug/L	50.00		67	40-140	6	20	
Acenaphthene	39.0	5.0	ug/L	50.00		78	40-140	5	20	
Acenaphthylene	39.2	5.0	ug/L	50.00		78	40-140	2	20	
Anthracene	44.0	5.0	ug/L	50.00		88	40-140	0.02	20	
Benzo(a)anthracene	50.0	5.0	ug/L	50.00		100	40-140	5	20	
Benzo(a)pyrene	45.5	10.0	ug/L	50.00		91	40-140	5	20	
Benzo(b)fluoranthene	50.4	5.0	ug/L	50.00		101	40-140	5	20	
Benzo(g,h,i)perylene	42.7	10.0	ug/L	50.00		85	40-140	6	20	
Benzo(k)fluoranthene	43.2	10.0	ug/L	50.00		86	40-140	9	20	
C11-C22 Unadjusted Aromatics1	713	100	ug/L	850.0		84	40-140	5	25	
Chrysene	41.2	10.0	ug/L	50.00		82	40-140	6	20	
Dibenzo(a,h)Anthracene	46.9	5.0	ug/L	50.00		94	40-140	5	20	
Fluoranthene	42.6	10.0	ug/L	50.00		85	40-140	6	20	
Fluorene	41.6	5.0	ug/L	50.00		83	40-140	0.9	20	
Indeno(1,2,3-cd)Pyrene	46.0	5.0	ug/L	50.00		92	40-140	7	20	
Naphthalene	32.8	10.0	ug/L	50.00		66	40-140	3	20	
Phenanthrene	43.1	5.0	ug/L	50.00		86	40-140	4	20	
Pyrene	40.9	5.0	ug/L	50.00		82	40-140	3	20	
Surrogate: 2-Bromonaphthalene	*59.0*		ug/L	*50.00*		*118*	*40-140*			
Surrogate: 2-Fluorobiphenyl	*51.4*		ug/L	*50.00*		*103*	*40-140*			
Surrogate: O-Terphenyl	*46.0*		ug/L	*50.00*		*92*	*40-140*			
LCS Dup										
2-Methylnaphthalene Breakthrough	0.0		%				0-5		200	
Naphthalene Breakthrough	0.0		%				0-5		200	

MADEP-VPH Volatile Petroleum Hydrocarbon

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DK20733 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*45.9*		ug/L	*50.00*		*92*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*44.4*		ug/L	*50.00*		*89*	*70-130*			
LCS										
Benzene	51.3	1.5	ug/L	50.00		103	70-130			
C5-C8 Unadjusted Aliphatics	500	150	ug/L	400.0		125	70-130			
C9-C10 Aromatics	94.6	100	ug/L	100.0		95	70-130			
C9-C12 Unadjusted Aliphatics	283	150	ug/L	300.0		94	70-130			
Ethylbenzene	49.3	5.0	ug/L	50.00		99	70-130			
Methyl tert-Butyl Ether	141	1.5	ug/L	150.0		94	70-130			
Naphthalene	94.5	5.0	ug/L	100.0		95	70-130			
Toluene	144	5.0	ug/L	150.0		96	70-130			
Xylene O	96.6	5.0	ug/L	100.0		97	70-130			
Xylene P,M	198	10.0	ug/L	200.0		99	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*49.8*		ug/L	*50.00*		*100*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*46.3*		ug/L	*50.00*		*93*	*70-130*			
LCS Dup										
Benzene	52.4	1.5	ug/L	50.00		105	70-130	2	25	
C5-C8 Unadjusted Aliphatics	487	150	ug/L	400.0		122	70-130	3	25	
C9-C10 Aromatics	96.6	100	ug/L	100.0		97	70-130	2	25	
C9-C12 Unadjusted Aliphatics	313	150	ug/L	300.0		104	70-130	10	25	
Ethylbenzene	50.1	5.0	ug/L	50.00		100	70-130	2	25	
Methyl tert-Butyl Ether	150	1.5	ug/L	150.0		100	70-130	6	25	
Naphthalene	99.8	5.0	ug/L	100.0		100	70-130	5	25	
Toluene	147	5.0	ug/L	150.0		98	70-130	2	25	
Xylene O	98.8	5.0	ug/L	100.0		99	70-130	2	25	
Xylene P,M	202	10.0	ug/L	200.0		101	70-130	2	25	
Surrogate: 2,5-Dibromotoluene - FID	*49.5*		ug/L	*50.00*		*99*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*45.9*		ug/L	*50.00*		*92*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT
ESS Laboratory Work Order: 22K0165

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
B+	Blank Spike recovery is above upper control limit (B+).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: Environmental Partners Group, LLC
Client Project ID: Cobalt Wellfield Portland CT

ESS Laboratory Work Order: 22K0165

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: EPG - Environmental Partners Group - TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 22K0165
Date Received: 11/4/2022
Project Due Date: 11/11/2022
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3 Iced with: Ice
5. Was COC signed and dated by client? Yes

6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:

12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	361576	Yes	No	Yes	VOA Vial	HCl	
1	361577	Yes	No	Yes	VOA Vial	HCl	
1	361578	Yes	No	Yes	VOA Vial	HCl	
1	361579	Yes	No	Yes	VOA Vial	HCl	
1	361580	Yes	No	Yes	VOA Vial	HCl	
1	361581	Yes	No	Yes	VOA Vial	HCl	
1	361588	Yes	N/A	Yes	1L Amber	HCl	
1	361589	Yes	N/A	Yes	1L Amber	HCl	
1	361592	Yes	N/A	Yes	250 mL Poly	NP	
1	361594	Yes	N/A	Yes	250 mL Poly	HNO3	
1	361596	Yes	N/A	Yes	250 mL Poly	NaOH	pH > 12
1	361598	Yes	N/A	Yes	1L Poly	NP	
2	361582	Yes	No	Yes	VOA Vial	HCl	
2	361583	Yes	No	Yes	VOA Vial	HCl	
2	361584	Yes	No	Yes	VOA Vial	HCl	
2	361585	Yes	No	Yes	VOA Vial	HCl	
2	361586	Yes	No	Yes	VOA Vial	HCl	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: EPG - Environmental Partners Group - TB

ESS Project ID: 22K0165
Date Received: 11/4/2022

2	361587	Yes	No	Yes	VOA Vial	HCl	
2	361590	Yes	N/A	Yes	1L Amber	HCl	
2	361591	Yes	N/A	Yes	1L Amber	HCl	
2	361593	Yes	N/A	Yes	250 mL Poly	NP	
2	361595	Yes	N/A	Yes	250 mL Poly	HNO3	
2	361597	Yes	N/A	Yes	250 mL Poly	NaOH	pH > 12
2	361599	Yes	N/A	Yes	1L Poly	NP	

2nd Review

Were all containers scanned into storage/lab? Initials ___

Are barcode labels on correct containers? Yes / No

Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA

Are all Hex Chrome stickers attached? Yes / No / NA

Are all QC stickers attached? Yes / No / NA

Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: ___ Date & Time: 11/4/22 1620

Reviewed By: ___ Date & Time: 11/4/22 1632

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
Fax: 401-461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 22K0165 | Page of

Turn Time ☐ > 5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: CT Criteria: Drinking Water

Is this project for any of the following?: ☐ CT RCP ☐ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☐ EQuIS
☐ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: Environmental Partners
Address: 1900 crown colony Drive Suite 402, Quincy, MA
Phone: 860 830 3839
Email Distribution List: AMP@envpartners.com smb@envpartners.com

PROJECT INFORMATION

Project Name: Cobalt Wellfield
Project Location: Portland, CT
Project Number:
Project Manager: Ann Marie Petricca
Bill to: Environmental partners
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOC 524 non chlor	VPH ranges	EPH ranges	Metals * All	Hardness	cyanide	Alk	Cl	SO4	TDS	~~Turb~~	Floride	NO2	NO3	Total Number of Bottles
1	11/03	19:15	Grab	Water	W-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12
2	11/04	14:05	Grab	Water	W-2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12
Container Type:						V	V	AG	P	P	P	P	P	P	P	P	P	P	P	
Container Volume:						7	7	6	3	3	3	6	6	6	6	6	6	3	3	
Preservation Code:																				

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Sampled by :

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 3.0 Ice

Comments: * Please specify "Other" preservative and containers types in this space
*Al, Ca, Cu, Fe, Mn, Mg, K, Ag, Zn, Pb, Sb, As, Hg, Ba, Ni, Be, Se, Cd, Na, Cr, Tl
(hdm 11/8/22)

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
[signature]	11/4	14:05	[signature]	[signature]	11/4/22	15:50	[signature]
Relinquished by (Signature)	**Date**	**Time**	**Received by (Signature)**	**Relinquished by (Signature)**	**Date**	**Time**	**Received by (Signature)**

ANALYTICAL REPORT

Lab Number:	L2262192
Client:	Environmental Partners 1900 Crown Colony Drive Suite 402 4th Floor Quincy, MA 02169
ATTN:	Ann Marie Petricia
Phone:	(617) 657-0200
Project Name:	COBALT WELLFIELD
Project Number:	Not Specified
Report Date:	11/28/22

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2262192-01	W-1	DW	PORTLAND, CT	11/03/22 19:15	11/04/22
L2262192-02	W-2	DW	PORTLAND, CT	11/04/22 14:30	11/04/22
L2262192-03	FIELD BLANK W-1	DW	PORTLAND, CT	11/03/22 19:15	11/04/22
L2262192-04	FIELD BLANK W-2	DW	PORTLAND, CT	11/04/22 14:30	11/04/22

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Case Narrative (continued)

Sample Receipt

The analyses performed were specified by the client.

L2262192-03: A sample identified as "FIELD BLANK W-1" was received, but not listed on the Chain of Custody. At the client's request, this sample was analyzed.

L2262192-04: A sample identified as "FIELD BLANK W-2" was received, but not listed on the Chain of Custody. At the client's request, this sample was analyzed.

Heterotrophic Plate Count

L2262192-01 and -02: The sample was analyzed with the method required holding time exceeded.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 11/28/22

ORGANICS

SEMIVOLATILES

Project Name: COBALT WELLFIELD

Lab Number: L2262192

Project Number: Not Specified

Report Date: 11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-01	Date Collected:	11/03/22 19:15
Client ID:	W-1	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw	Extraction Method:	EPA 522
Analytical Method:	120,522	Extraction Date:	11/22/22 07:22
Analytical Date:	11/23/22 15:57		
Analyst:	AMV		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,4 Dioxane by EPA 522 - Mansfield Lab						
1,4-Dioxane	ND		ug/l	0.153	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,4-Dioxane-d8	82		70-130

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-01	Date Collected:	11/03/22 19:15
Client ID:	W-1	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw	Extraction Method:	EPA 537.1
Analytical Method:	133,537.1	Extraction Date:	11/16/22 12:45
Analytical Date:	11/16/22 22:34		
Analyst:	LV		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	2.71		ng/l	2.00	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--	1
PFAS, Total (6)	ND		ng/l	2.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	100		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	103		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	84		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	74		70-130

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-02	Date Collected:	11/04/22 14:30
Client ID:	W-2	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw	Extraction Method:	EPA 522
Analytical Method:	120,522	Extraction Date:	11/22/22 07:22
Analytical Date:	11/23/22 16:22		
Analyst:	AMV		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,4 Dioxane by EPA 522 - Mansfield Lab						
1,4-Dioxane	ND		ug/l	0.150	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,4-Dioxane-d8	84		70-130

Project Name: COBALT WELLFIELD **Lab Number:** L2262192
Project Number: Not Specified **Report Date:** 11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-02	Date Collected:	11/04/22 14:30
Client ID:	W-2	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw	Extraction Method:	EPA 537.1
Analytical Method:	133,537.1	Extraction Date:	11/16/22 12:45
Analytical Date:	11/16/22 22:43		
Analyst:	LV		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	10.9		ng/l	2.00	--	1
Perfluorohexanoic Acid (PFHxA)	4.58		ng/l	2.00	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	--	1
Perfluorooctanoic Acid (PFOA)	5.80		ng/l	2.00	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--	1
PFAS, Total (6)	5.80		ng/l	2.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	94		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	99		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	88		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	79		70-130

Project Name: COBALT WELLFIELD
Project Number: Not Specified
Lab Number: L2262192
Report Date: 11/28/22

SAMPLE RESULTS

Lab ID: L2262192-03
Client ID: FIELD BLANK W-1
Sample Location: PORTLAND, CT

Date Collected: 11/03/22 19:15
Date Received: 11/04/22
Field Prep: Not Specified

Sample Depth:
Matrix: Dw
Analytical Method: 133,537.1
Analytical Date: 11/16/22 22:51
Analyst: LV

Extraction Method: EPA 537.1
Extraction Date: 11/16/22 12:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--	1
PFAS, Total (6)	ND		ng/l	2.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	111		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	115		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	108		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	106		70-130

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-04	Date Collected:	11/04/22 14:30
Client ID:	FIELD BLANK W-2	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw	Extraction Method:	EPA 537.1
Analytical Method:	133,537.1	Extraction Date:	11/16/22 12:45
Analytical Date:	11/16/22 23:00		
Analyst:	LV		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab						
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--	1
PFAS, Total (6)	ND		ng/l	2.00	--	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	101		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	103		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	97		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	93		70-130

Project Name: COBALT WELLFIELD
Lab Number: L2262192
Project Number: Not Specified
Report Date: 11/28/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 133,537.1
Analytical Date: 11/16/22 21:16
Analyst: LV

Extraction Method: EPA 537.1
Extraction Date: 11/16/22 12:45

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab for sample(s): 01-04 Batch: WG1712921-1					
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	2.00	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	2.00	--
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	2.00	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	2.00	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	2.00	--
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	2.00	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	2.00	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	2.00	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	2.00	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	2.00	--
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	2.00	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	2.00	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	2.00	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	2.00	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	2.00	--
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	2.00	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	2.00	--
Perfluorotetradecanoic Acid (PFTA)	ND		ng/l	2.00	--
PFAS, Total (6)	ND		ng/l	2.00	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	102		70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	102		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	100		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	96		70-130

Project Name: COBALT WELLFIELD **Lab Number:** L2262192
Project Number: Not Specified **Report Date:** 11/28/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 120,522
Analytical Date: 11/23/22 11:12
Analyst: AMV

Extraction Method: EPA 522
Extraction Date: 11/22/22 07:22

Parameter	Result	Qualifier	Units	RL	MDL
1,4 Dioxane by EPA 522 - Mansfield Lab for sample(s): 01-02 Batch: WG1715369-1					
1,4-Dioxane	ND		ug/l	0.150	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,4-Dioxane-d8	85		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD **Lab Number:** L2262192
Project Number: Not Specified **Report Date:** 11/28/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 Batch: WG1712921-2								
Perfluorobutanesulfonic Acid (PFBS)	104		-		70-130	-		30
Perfluorohexanoic Acid (PFHxA)	101		-		70-130	-		30
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	104		-		70-130	-		30
Perfluoroheptanoic Acid (PFHpA)	103		-		70-130	-		30
Perfluorohexanesulfonic Acid (PFHxS)	104		-		70-130	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	102		-		70-130	-		30
Perfluorooctanoic Acid (PFOA)	105		-		70-130	-		30
Perfluorononanoic Acid (PFNA)	105		-		70-130	-		30
Perfluorooctanesulfonic Acid (PFOS)	100		-		70-130	-		30
Perfluorodecanoic Acid (PFDA)	105		-		70-130	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	108		-		70-130	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	101		-		70-130	-		30
Perfluoroundecanoic Acid (PFUnA)	111		-		70-130	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	102		-		70-130	-		30
Perfluorododecanoic Acid (PFDoA)	109		-		70-130	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	100		-		70-130	-		30
Perfluorotridecanoic Acid (PFTrDA)	116		-		70-130	-		30
Perfluorotetradecanoic Acid (PFTA)	124		-		70-130	-		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 Batch: WG1712921-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	99				70-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	105				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	101				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	96				70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
1,4 Dioxane by EPA 522 - Mansfield Lab Associated sample(s): 01-02 Batch: WG1715369-2 WG1715369-3								
1,4-Dioxane	86		84		70-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,4-Dioxane-d8	86		81		70-130

Matrix Spike Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1712921-3 QC Sample: L2262124-01 Client ID: MS Sample												
Perfluorobutanesulfonic Acid (PFBS)	ND	135	141	104		-	-		70-130	-		30
Perfluorohexanoic Acid (PFHxA)	ND	152	162	107		-	-		70-130	-		30
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND	152	168	111		-	-		70-130	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	152	164	108		-	-		70-130	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	139	155	112		-	-		70-130	-		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	143	152	106		-	-		70-130	-		30
Perfluorooctanoic Acid (PFOA)	ND	152	170	112		-	-		70-130	-		30
Perfluorononanoic Acid (PFNA)	ND	152	169	111		-	-		70-130	-		30
Perfluorooctanesulfonic Acid (PFOS)	ND	141	146	104		-	-		70-130	-		30
Perfluorodecanoic Acid (PFDA)	ND	152	168	111		-	-		70-130	-		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	142	161	114		-	-		70-130	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	152	164	108		-	-		70-130	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	152	175	115		-	-		70-130	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	152	162	107		-	-		70-130	-		30
Perfluorododecanoic Acid (PFDoA)	ND	152	177	116		-	-		70-130	-		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	143	155	108		-	-		70-130	-		30
Perfluorotridecanoic Acid (PFTrDA)	ND	152	184	121		-	-		70-130	-		30
Perfluorotetradecanoic Acid (PFTA)	ND	152	201	**132**	Q	-	-		70-130	-		30

Matrix Spike Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD | **Lab Number:** L2262192
Project Number: Not Specified | **Report Date:** 11/28/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1712921-3 QC Sample: L2262124-01 Client ID: MS Sample												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13C3-Propanoic Acid (M3HFPO-DA)	105				70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	98				70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	104				70-130
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	100				70-130

Lab Duplicate Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD
Project Number: Not Specified
Lab Number: L2262192
Report Date: 11/28/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1712921-4 QC Sample: L2262156-01 Client ID: DUP Sample						
Perfluorobutanesulfonic Acid (PFBS)	ND	ND	ng/l	NC		30
Perfluorohexanoic Acid (PFHxA)	ND	ND	ng/l	NC		30
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid (HFPO-DA)	ND	ND	ng/l	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/l	NC		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/l	NC		30
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND	ND	ng/l	NC		30
Perfluorooctanoic Acid (PFOA)	ND	ND	ng/l	NC		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/l	NC		30
Perfluorooctanesulfonic Acid (PFOS)	ND	ND	ng/l	NC		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/l	NC		30
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND	ND	ng/l	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/l	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/l	NC		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/l	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/l	NC		30
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND	ND	ng/l	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/l	NC		30
Perfluorotetradecanoic Acid (PFTA)	ND	ND	ng/l	NC		30

Lab Duplicate Analysis
Batch Quality Control

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 537.1 - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1712921-4 QC Sample: L2262156-01 Client ID: DUP Sample						

Surrogate	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[1,2-13C2]hexanoic Acid (13C-PFHxA)	111		96		70-130
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-13C3-Propanoic Acid (M3HFPO-DA)	114		100		70-130
Perfluoro-n-[1,2-13C2]decanoic Acid (13C-PFDA)	106		94		70-130
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	100		90		70-130

INORGANICS
&
MISCELLANEOUS

Project Name: COBALT WELLFIELD
Project Number: Not Specified

Lab Number: L2262192
Report Date: 11/28/22

SAMPLE RESULTS

Lab ID: L2262192-01
Client ID: W-1
Sample Location: PORTLAND, CT

Date Collected: 11/03/22 19:15
Date Received: 11/04/22
Field Prep: Not Specified

Sample Depth:
Matrix: Dw

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Heterotrophic Plate Count	ND		CFU/ml	1.0	NA	1	-	11/04/22 23:00	121,9215B	JT
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT
Escherichia Coli	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

SAMPLE RESULTS

Lab ID:	L2262192-02	Date Collected:	11/04/22 14:30
Client ID:	W-2	Date Received:	11/04/22
Sample Location:	PORTLAND, CT	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Dw		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
Heterotrophic Plate Count	1.0		CFU/ml	1.0	NA	1	-	11/04/22 23:00	121,9215B	JT
Bacteria in Water - Westborough Lab										
Coliform, Total	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT
Escherichia Coli	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT

Project Name: COBALT WELLFIELD **Lab Number:** L2262192
Project Number: Not Specified **Report Date:** 11/28/22

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Bacteria in Water - Westborough Lab for sample(s): 01-02 Batch: WG1708444-1										
Coliform, Total	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT
Escherichia Coli	Negative		col/100ml	-	NA	1	-	11/04/22 21:15	121,9223B	JT
Microbiological Analysis - Westborough Lab for sample(s): 01-02 Batch: WG1708448-1										
Heterotrophic Plate Count	ND		CFU/ml	1.0	NA	1	-	11/04/22 23:00	121,9215B	JT

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2262192-01A	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		PLATECT(.33)
L2262192-01B	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		PLATECT(.33)
L2262192-01C	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		T-COLI-C(1.25)
L2262192-01D	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		T-COLI-C(1.25)
L2262192-01E	Amber 500ml NaSulfite/NaHSO4 preserved	A	<4	<4	3.6	Y	Absent		A2-14DIOXANE-522(28)
L2262192-01F	Amber 500ml NaSulfite/NaHSO4 preserved	A	<4	<4	3.6	Y	Absent		A2-14DIOXANE-522(28)
L2262192-01G	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-01H	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-01I	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-01J	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-02A	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		PLATECT(.33)
L2262192-02B	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		PLATECT(.33)
L2262192-02C	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		T-COLI-C(1.25)
L2262192-02D	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		T-COLI-C(1.25)
L2262192-02E	Amber 500ml NaSulfite/NaHSO4 preserved	A	<4	<4	3.6	Y	Absent		A2-14DIOXANE-522(28)
L2262192-02F	Amber 500ml NaSulfite/NaHSO4 preserved	A	<4	<4	3.6	Y	Absent		A2-14DIOXANE-522(28)
L2262192-02G	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-02H	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-02I	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-02J	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-03A	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)
L2262192-04A	Plastic 250ml Trizma preserved	A	NA		3.6	Y	Absent		A2-MA-537.1(14)

*Values in parentheses indicate holding time in days

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA/PFTeDA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS/PFDoS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
Perfluoropropanesulfonic Acid	PFPrS	423-41-6
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA/PFOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
FLUOROTELOMER CARBOXYLIC ACIDS (FTCAs)		
3-Perfluoroheptyl Propanoic Acid	7:3FTCA	812-70-4
2H,2H,3H,3H-Perfluorooctanoic Acid	5:3FTCA	914637-49-3
3-Perfluoropropyl Propanoic Acid	3:3FTCA	356-02-5

Project Name:	COBALT WELLFIELD	**Lab Number:**	L2262192
Project Number:	Not Specified	**Report Date:**	11/28/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

Data Qualifiers

ND - Not detected at the reporting limit (RL) for the sample.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

120 Determination of 1,4-Dioxane in Drinking Water by Solid Phase Extraction (SPE) and Gas Chromatography/Mass Spectrometry (GC/MS) with Selected Ion Monitoring (SIM). EPA Method 522, EPA/600/R-08/101. Version 1.0, September 2008.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

133 Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). EPA Method 537.1, EPA/600/R-18/352. Version 1.0, November 2018.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF COUSTODY

PAGE ____ OF ____

Date Rec'd in Lab: 11/4/22

ALPHA Job #: L2262192

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Environmental Partners
Address: 1900 Crown colony Dr.
Quincy, Ma
Phone: 860 830 3839
Fax:
Email: SMB@env partners.com; AMP@env partners.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Cobalt Wellfield
Project Location: Portland, CT
Project #:
Project Manager: Ann Marie Petricca
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: 1,4 Dioxane EPA522; PFAAs EPA 537.1; E.coli; E.coli

SAMPLE HANDLING
Filtration ________
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	1,4 Dioxane EPA522	PFAAs EPA 537.1	E.coli	E.coli	Sample Specific Comments	TOTAL # BOTTLES
62192-01	W-1	1113	19:15	water	SMB	X	X	X	X	* 4 samples, 2 Dupe for PFAAs*	12
-02	W-2	1114	14:30	water	SMB	X	X	X	X		12

Container Type	AG	P	O	O
Preservative				

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	11/4 [illegible]	[signature]	11/4/22 15-
[signature] 1637	11/4/22 15:00	[signature]	11/4/22 ~~1500~~ 1637

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions.
See reverse side.
FSL 11/4/22

 FORM NO: 01-01 (rev. 14-OCT-07)

ENVIRONMENTAL PARTNERS

— An Apex Company —

1900 Crown Colony Drive, Suite 402
Quincy, MA 02169
P: 617.657.0200 F: 617.657.0201

envpartners.com