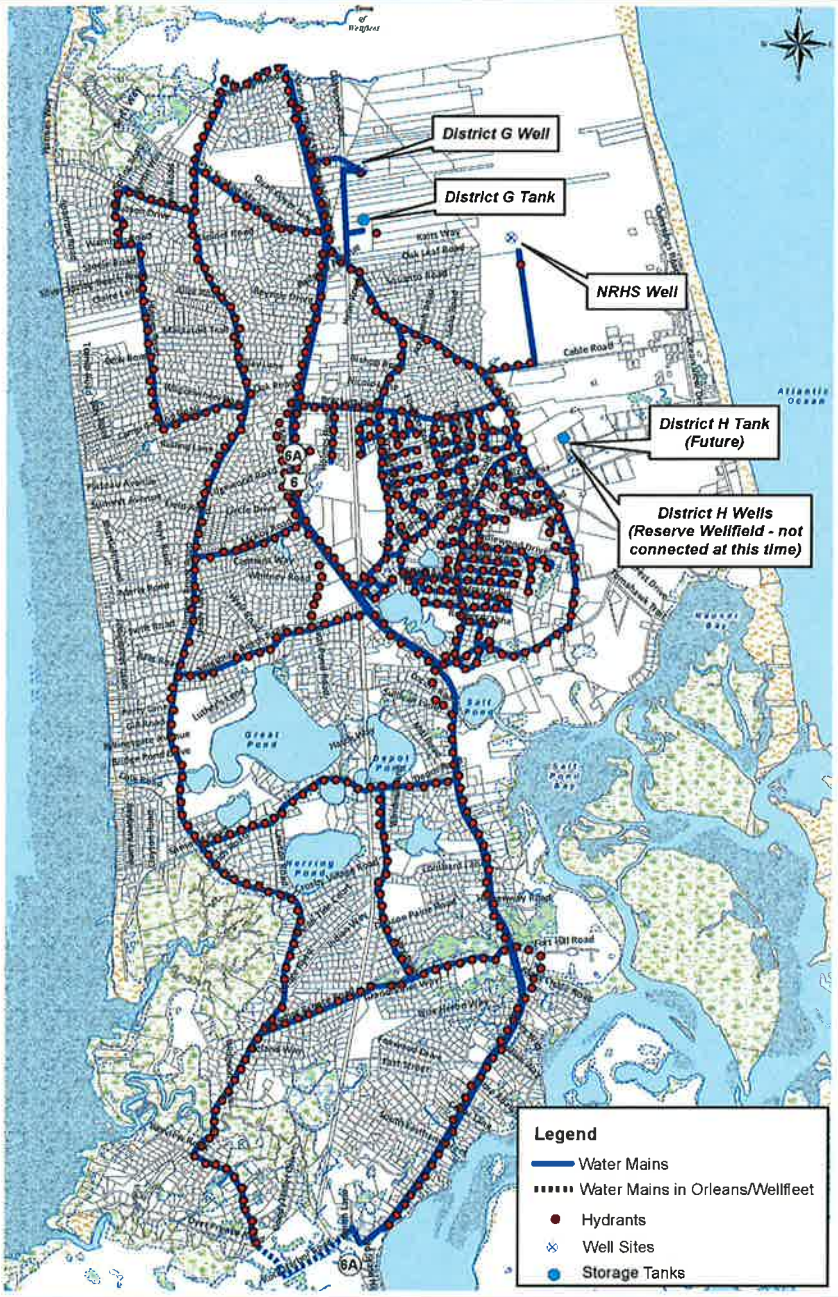
Eastham Water System

MEPA Single Environmental Impact Report

December 15, 2014



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December 15, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs
Att. MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02108

RE: Town of Eastham Water System
MEPA Single Environmental Impact Report
EEA Number: 15273

Dear Secretary Bartlett:

On behalf of the Town of Eastham, attached is the Environmental Impact Report (EIR) for the proposed Eastham water system, prepared pursuant to the Massachusetts Environmental Policy Act and Section 11.06 of the MEPA regulations (310 CMR 11.00).

Eastham filed an Expanded Environmental Notification Form (ENF) for the project that was noticed in the Environmental Monitor on October 20, 2014. Accompanying the ENF was a request by the Town that the Secretary allow a Single EIR be prepared for the project in lieu of a Draft and Final EIR in accordance with 301 CMR 11.06(8). The Secretary's Certificate on the Expanded ENF, issued on November 26, 2014, approved this request. This Single EIR therefore provides a complete and detailed description and analysis of the project and its alternatives, an assessment of its potential environmental impacts, proposed Section 61 mitigation measures sufficient for the appropriate State agencies to fulfill their obligations in accordance with MGL c. 30, Section 61, and responses to all comments received on the Expanded ENF. Agencies and persons receiving copies of this Single EIR are listed in Appendix L.

Once again, we appreciate the guidance that your staff has provided the Town as this Single EIR was being prepared. Please feel free to contact me if you have any questions or need clarification with any of the information contained herein.

Very Truly Yours,
Environmental Partners Group, Inc.

Mark N. White

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Enclosure: MEPA Single EIR for Eastham Water System (2 copies)

Cc: Sheila Vanderhoef, Eastham Town Administrator
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DEP - Southeast Regional Office
Eastham Board of Selectmen
Massachusetts Department of Transportation - Public/Private Development Unit
Massachusetts Department of Transportation - District 5
Massachusetts Historical Commission
Cape Cod Commission
Eastham Board of Selectmen
Eastham Planning Board
Eastham Conservation Commission
Eastham Board of Health
Division of Marine Fisheries (South Shore)
Natural Heritage and Endangered Species Program
DCR
Division of Energy Resources

Eastham Water System

MEPA Environmental Impact Report

Project Municipality: Eastham, MA
Project Watershed: Cape Cod
EEA Number: 15273

December 15, 2014

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MEPA ENVIRONMENTAL IMPACT REPORT FOR EASTHAM WATER SYSTEM

This Environmental Impact Report (EIR) describes the proposed Eastham Water System project. This EIR has been prepared pursuant to the Massachusetts Environmental Policy Act and Section 11.06 of the MEPA regulations (310 CMR 11.00). The project meets the threshold for Environmental Impact Review because it proposes construction of water mains that are greater than ten miles in length (301 CMR 11.03(4)(a)3).

Eastham filed an Expanded Environmental Notification Form (ENF) for the project, which was noticed in the Environmental Monitor on October 20, 2014. The Expanded ENF was subject to an extended comment period and included a detailed description of the project, alternatives analysis, baseline environmental conditions, and identified mitigation measures.

Eastham requested that the Secretary of Energy and Environmental Affairs allow that a single EIR be prepared in lieu of a Draft and Final EIR in accordance with 301 CMR 11.06(8). The Secretary's Certificate on the Expanded ENF was issued on November 26, 2014 (provided in Appendix A) and states that "...comments from State and regional agencies were generally supportive of the project and did not identify any issues or analysis for review in a Draft EIR. Based on the review of the Expanded ENF and consultation with State Agencies, (Eastham) may submit a Single EIR..." This EIR includes a detailed description of the project and any changes to the project since the filing of the Expanded ENF.

1.0 Summary

1.1 Overview

Eastham currently does not have a municipal water system. The Town relies on individual private or community wells for water supply and onsite systems for wastewater disposal. The drinking water quality of these wells has been progressively declining because of their close proximity to onsite wastewater disposal systems. In addition, groundwater emanating from the Town's closed landfill has also impacted water quality in that area of the Town.

After many years of study and debate, Eastham overwhelmingly voted to establish a municipal water system at their May 2014 Annual Town Meeting with a vote of 86% in support of the Warrant Article. A copy of the Warrant Article and minutes from this May 2014 Annual Town Meeting is provided in Appendix B. This water system will provide service to approximately one third of the Town's properties (2,021 parcels). A plan showing this water system that was approved at the Town Meeting is shown on Figure 1. The water system is also shown on a USGS quad base map on Figure 2.

The system will involve construction of two well fields, a water storage tank and 45 miles of distribution system piping. The two wells fields, located at so called "District G" and the Nauset Regional High School (NRHS), have already been permitted by the Department of Environmental Protection (DEP) under their drinking water new water supply source approval program. Copies of the DEP New Source permit approvals for the District G and NRHS well fields are provided in Appendix C. The water storage tank is to be located at the Town's District G property, and will be located adjacent to an existing communications tower. The distribution system includes transmission mains located throughout the Town so as to provide what is referred to as the "backbone" of the distribution system that, should the Town decide to do so in the future, can serve a Town-wide water system by installing laterals to these transmission mains. The design of the distribution system is therefore being sized to accommodate a Town-wide system.

The water system is to be almost entirely constructed on previously disturbed land and existing roadway areas and rights of way. The overall land area where construction activities will occur is estimated to be 22.8 acres. 96% of the project area is associated with water main installations, which will occur predominantly within existing roadway areas. The storage tank and well fields are to be constructed in previously disturbed areas, of which only approximately 0.46 acres will occur in undisturbed area. New structures resulting from the project consist of a small pump house at each of the two well fields (26' x 11' (286 sf) in size) and a water storage tank. The water storage tank will have a foundation footprint of approximately 800 square feet (32' diameter) and will be approximately 135' tall.

The water system will replace the use of private water supply wells for drinking water, and therefore it is expected that there will be no net change on overall withdrawals from the aquifer. The current demand of the water system is estimated to be 378,000 gallons per day (gpd), increasing to 415,000 gpd as vacant properties are built out under current zoning. The DEP New Source permits, approved after completion of extensive hydreogologic testing, authorizes withdrawals of 995,000 gpd and 883,000 gpd, respectively, from District G and NRHS, for a total of 1,878,000 gpd. The water system demand is therefore only 22%

of this permitted volume. The Town currently has a DEP Water Withdrawal Permit application under review by DEP that authorizes the overall withdrawal volume from these two well fields.

The water system has an estimated construction cost of $45.8 Million. The Town is seeking funding support for the project from the State Drinking Water Revolving Fund program and from the USDA-Rural Development Program

1.2 Future Expansion of the System and District H

Should the Town choose to expand to a Town-wide system a second water storage tank and a third well field would be constructed. The second water storage tank is currently envisioned to be located at the area known as District H, shown on Figure 1, however alternative locations may be considered at that time.

The third well field would also be located at District H. Similar to the other well field, the hydrogeologic investigations of the District H well field have been completed and it has received New Source permit approval from DEP. Information on the District H well field, including DEP's permit approval letter, a description of the site, the hydrogeologic investigations that were performed and the groundwater modeling conducted to evaluate the effect of water withdrawals on wetland resource and surface water bodies is provided in Appendix D. This information is provided solely for planning purposes at this time.

If the system is to be expanded to become a Town-wide system, the Town recognizes that this will require additional permitting through MEPA, the Cape Cod Commission, DEP and local Boards as appropriate.

1.3 Need for the Project

The progressive deterioration in the quality of private drinking water supplies in Eastham have been documented over a period of greater than twenty years. The Town recognizes the importance of developing a municipal water system and has made it a top priority in their community planning, and at their May 2014 Annual Town Meeting voted overwhelmingly to authorize the limited system that is proposed. This water system will provide a high quality and reliable source of drinking water for approximately one-third of the community, including its main commercial corridor on Route 6. Should the Town choose to expand the system to include some or all of the other properties in the community, the distribution system transmission mains are sized to meet this need. The water system will also provide improved fire protection for the Town. Whereas the Town currently relies on pumper trucks supplied by ponds or small buried tanks for fire protection, or in severe emergencies on mutual aid from neighboring

communities, the water system will provide significantly improved fire protection and fighting capabilities to the Town.

2.0 Project Description

2.1 Description of the Project

The Eastham Water System, as authorized at the May 2014 Annual Town Meeting , is shown on Figure 1 and consists of two well fields at District G and NRHS, a storage tank and 45 miles of distribution system piping. The water system has been organized into eight Contract areas for the purposes of design and construction, shown on Table 1 and Figure 3, and is to be constructed continuously as a single construction effort between 2015 and 2017.

Table 1. Eastham Water System: Contract Areas for Storage Tank, Well Field and Distribution System Design and Construction.

Contract Area	*Description*
Contract 1	District G Storage Tank
Contract 2	Well Fields at District G and NRHS
Contract 3	Landfill Area – Main Roads
Contract 4	Landfill Area – Side Street Laterals
Contract 5	Distribution System: Route 6 – North
Contract 6	Distribution System: Route 6 – South
Contract 7	Distribution System: Northwest Eastham
Contract 8	Distribution System: Southwest Eastham

A description of the storage tank, well fields and distribution system according to these various Contract Areas is provided below.

District G Storage Tank

District G is located in the northeast area of the Town and is the designation of a series of properties that comprise the Water Resource Protection District G zoning district. The district consists of parcels owned by the Town of Eastham and the Eastham Conservation Trust, together with some privately owned properties (Figures 4). The storage tank is located in the southern area of the district on Town-owned property (Figure 5) on a parcel currently used by the Town's Department of Public Works for material stockpiling and leaf and yard waste composting. It is located adjacent to an adjoining parcel where the Town has erected a 190' tall communications tower. A description of the existing site conditions at the proposed location of the storage tank is provided in Section 5.

The tank will be elevated with a 750,000 gallon capacity. Preliminary design plans of the storage tank are provided in Appendix E (Contract 1). These plans show existing and proposed site conditions and an elevation view of the tank. The tank foundation will have a diameter of approximately 32' and the elevated bowl will have a diameter of 62'. The overall height of the storage tank is approximately 135'. The storage tank will be connected to the District G well field via a transmission main to be located on an easement to be granted by the Division of Conservation and Recreation (DCR).

Photo renderings of the tank from various perspectives surrounding District G were developed from balloon tests performed during August 2014, shown in Figure 6. During December 2014, when leaves were off of the trees, locations in the vicinity of the tank site were visited to determine the extent to which the tank is likely to be visible, shown on Figure 6. This area was determined on the basis of where the existing cell tower is visible, which has an elevation of approximately 190', whereas the maximum elevation of the storage tank will be approximately 135'. This view-shed area for the storage tank is therefore intended to be a conservative representation of its visibility.

Water Supply Well Fields

Eastham has three water supplies that have been permitted through the DEP New Source Approval process: District G, Nauset Regional High School (NRHS) and District H. All of these well fields are located on Town-owned land, and their locations are shown on Figure 1. District G and NRHS will be constructed as part of the water system that was authorized by Eastham's May 2014 Town Meeting. The third well field at District H will be constructed as part of a subsequent phase of the water system, should the Town choose to do so.

The DEP permit approval letters for District G and NRHS are provided in Appendix C. Preliminary design plans of the District G and NRHS well fields are provided in Appendix E (Contract 2). The DEP permit approval letter for District H is provided in Appendix D, together with a description of District H and the new source investigations performed at the site.

District G Well Field

The District G well field is located centrally in the Water Resources Protection District G (see Figure 5). A description of the existing site conditions at District G is provided in Section 5.

The test well at District G was installed in 2010 as part of the DEP New Source investigations for the well field. This test well will be converted into the production well by equipping it with a submersible pump. Development of the site into the well field will also consist of installing electrical service into the site, placing a small, prefabricated building (approximate dimensions of 11' wide by 26' long) adjacent to the well that will serve as a pump station building, and minor site grading. The pump station building will house pump controls and water conditioning chemicals for corrosion control, disinfection and pH adjustment. A small propane-fired generator will also be provided for power outages.

Nauset Regional High School Well Field

Nauset Regional High School (NRHS) is located off of Cable Road. The property lies within the boundaries of the Cape Cod National Seashore, hereinafter referred to as the National Seashore. NRHS currently has a small-volume water supply located at the northeast corner of the property that serves the high school. Similar to District G in every respect, a test well was installed in 2010 as part of the DEP New Source investigations at the site. The well field construction will consist of equipping the test well with a submersible pump, installing electrical service to the well, and installing a small, prefabricated building of similar dimensions. Like District G, the pump station building will house pump controls and water conditioning chemicals for corrosion control, pH adjustment and disinfection. Three phase electrical service will be installed to replace the existing single phase service for the existing well. A small propane-fired generator will also be provided for power outages.

Access to the well field will be via an existing access road to the well field, and the Nauset Regional School District has granted an easement to the Town that will provide permanent access to the well field and transmission main. The location of this easement is shown on Figure 8.

Distribution System

The distribution system consists of 45 miles of pipe with associated fire hydrants and valves that will serve 2,021 properties, representing approximately one-third of the community. Looped transmission mains are to be located throughout the Town so as to provide what is referred to as the "backbone" of the distribution system that, should the Town decide to do so in the future, serve a Town-wide water system. The transmission mains are therefore being sized such that they can accommodate the expanded system, and the expansion will consist of installing laterals from these mains on roads and side streets to the remaining properties in the Town (there are approximate total of 6,600 parcels overall in Eastham).

The proposed distribution system will provide service to properties in the vicinity of the landfill, referred to as the "landfill study area" because it has been the subject of investigations under the Massachusetts Contingency Plan due to groundwater impacts that are suspected of being associated with leachate releases from the landfill. The groundwater issues affecting the landfill study area are described in more detail in Section 5.

In addition to the water service provided by these mains, the distribution system will provide fire protection to approximately 80% of the community, being those properties that are located within ½ mile of the water main.

A description of the distribution system for each of the Contract areas shown in Table 1 is provided below. Preliminary design plans for all of the Contract areas (Contracts 3 – 8) are provided on the flash drive included with Appendix E. Appendix E also has hard copies of the cover sheet, layout plans and appurtenant details of each Contract area.

Landfill Area Distribution System (Main Roads – Contact 3; Side Street Laterals – Contract 4)

The Contract 3 and 4 areas of the distribution system will serve properties within the landfill study area, generally bounded by Bracket Road to the north Nauset Road to the east and south, and Route 6 on the west. Contract 3 consists of the main roads within this area, which are predominantly Town-owned and paved roadways. The majority of the water mains will be 12" diameter and serve both as transmission mains for the distribution system as well as service connections to all properties abutting the main. The mains will be located primarily within existing paved areas of the roadway, and fire hydrants will be installed at approximately 500 foot intervals. A curb box for service connections will be provided for each property at the edge of the roadway right-of-way.

Contract 4 consists of the side roads and subdivisions within the landfill study area. These roads are predominantly privately owned and many of them are dirt roads. The water mains on these roads will be either 8" or 6" diameter, will also include hydrants at 500 foot intervals, and curb boxes for services connections at each property.

Route 6 (Contract 5 – North; Contract 6 –South)

Properties along the full length of Route 6 from the Town's northern border at Wellfleet to the Orleans border at the south are to be served by the proposed water system. The water main will be 12" diameter main, installed by either conventional trenching techniques or, wherever feasible, by directional drilling methods. Because it is a State-owned roadway, a State Highway Access permit will be required from the

Massachusetts Department of Transportation (MassDOT). Consultation sessions have been held with MassDOT to discuss their requirements for construction activities within Route 6 and the likely conditions that will be associated with the State Highway Access Permit (discussed in more detail in Section 9). Similar to the other Contract areas, fire hydrants are to be installed at approximately 500 foot intervals and a curb box for service connections will be provided for each property abutting Route 6.

Transmission Mains East of Route 6 (Contract 7 – Northeast; Contract 8 – Southeast)

The distribution system associated with Contracts 7 and 8 consists of 12" diameter mains located on roads west of Route 6 and that create the backbone of the water system to which side street laterals can be connected in the event that the Town chooses to expand the system in the future. These mains are therefore sized to meet this possible future need.

The water main will complete a large loop that is connected to the Route 6 water mains of Contracts 5 and 6. In the southern area of this loop a portion of the water main is proposed to be located through the Town of Orleans to connect what would otherwise be the terminus of water mains on Bridge Road and Route 6. Eastham has also offered Orleans the opportunity to install an interconnection between the two water systems to be used for emergency purposes. This loop and interconnection is the subject of ongoing discussions between the two communities, the status of which is described in more detail in Section 11.8.

The roads comprising Contracts 7 and 8 are predominantly Town-owned and paved. Easements from subdivision groups or private property owners are to be sought wherever the main is to be located on private roads. Similar to the other Contract areas, fire hydrants are to be installed at approximately 500 foot intervals and a curb box for service connections will be provided for each property abutting the water mains.

2.2 Water System Demands

A detailed discussion of the methodology used for estimating the current and future demands of the proposed water system is described in the DEP Water Withdrawal (BRP WM 03) permit application, submitted to DEP in September 2014. Excerpts of the pertinent sections of this permit application (supporting information for Forms D1 and D2), are provided in Appendix F.

Estimates of the system demands were developed on the basis of current land uses for each of the 2,021 properties to be served by the proposed system. These land uses are designated by the Eastham Assessors Department using Massachusetts Department of Revenue State Class Code Classifications for 2014,

consisting of residential, commercial, industrial, and tax-exempt (government, religious and charity-owned) properties. The property classifications for the parcels to be served by the proposed water system are shown on Table 2.

Table 2. Parcels comprising the Eastham Water System, by Massachusetts DOR State Classification Codes.

Property Type	Total	% of Total	Developed Parcels	Vacant Parcels (Future Water Demands)	
				Developable	Undevelopable
Multiple Use	40	2.0%	40	0	0
Residential	1789	88.5%	1643	109	37
Commercial	60	3.0%	48	11	1
Industrial	18	0.9%	14	3	1
Recreational	2	0.1%	2	0	0
Tax-Exempt	112	5.5%	112	0	0
TOTAL	**2021**	**100%**	**1859**	**123**	**39**

The majority of the parcels to be served by the system are residential (88.5%). Commercial properties represent 3.0% of the system. Mixed use properties, being those that have both residential and commercial uses on them, comprise 2% of the parcels. Industrial, recreational and tax-exempt properties (Federal, State or Town owned properties, churches, etc.) comprise 0.9%, 0.1% and 5.5% of the system, respectively. The vacant parcels are those that represent a potential future increase in current water demands. Overall, there are 162 vacant parcels within the water system, of which 123 are potentially developable and most of which (109 properties) are residential.

The existing water demands of these properties were estimated using either per-capita water usage rates, Title 5 criteria for wastewater flows, or DEP reporting data from DEP community (transient and non-transient) systems where they are available. In addition to these property-specific demands, allowances have also been made for Confidently Estimated Municipal Water Use, Unaccounted for Water (UAW), and a contingency to allow for variations from the property-specific demand estimates. Confidently Estimated Municipal Water Use is unbilled and typically unmetered water that is generated by municipal activities such as fire protection, flushing of water mains and street cleaning. UAW is caused by circumstances such as meter malfunctions, minor leaks due to water main breaks or other similar circumstances, and is another category of water usage that DEP recognizes to occur in all water systems. Because the existing water demands are unable to be determined on the basis of metered water usage and

therefore have a degree of uncertainty associated with them, a contingency factor of 5% has been included in the overall estimate of the water system demands.

The overall current water system demand for Eastham that includes all of the categories described above is provided on Table 3 (next page). The current water system demand is estimated to be 378,000 gallons per day (gpd). The future water system demands, based on the development of vacant properties in accordance with their current land use designation, is estimated to be 415,000 gpd. The water system demand characteristics (average daily demand, annual basis; average daily demand during the summer season (July and August); peak day) for the proposed water system are provided in Table 4.

Table 4. Annual average day, seasonal (July, August) average day and peak day (gpd).

Demand Condition	Demand (gallons per day)	
	Current	Future
Average Day, Annual	378,000	415,000
Average Day, Seasonal (July, August)	734,000	806,000
Peak Day	1,068,000	1,172,000

Table 3. Water System Current and Future Average Daily Demand Estimates (gallons per day, annual basis)

Classification Code	Land Use	Category	Parcels	Water Demand (gpd, average day)				
				Existing	%	Future	Total Future	%
0	**Multiple-Use Property**							
		Mixed Residential/Commercial	14	1,745		-	1,745	
		Mixed Commercial/Residential	26	7,265		-	7,265	
			40	9,009	2.8%	-	9,009	2.6%
1	**Residential**							
		Single Family	1495	202,124		-	202,124	
		Condominium	30	4,056		-	4,056	
		Two- and Three-Family	49	13,655		-	13,655	
		Accessory Land with Improvement	6	-		135	135	
		Multiple Houses on One Parcel, Apartments, Group Homes	63	8,518		-	8,518	
		Developable Land	109	-		14,737	14,737	
		Undevelopable Land	37	-		-	-	
			1789	228,353	71.4%	14,872	243,225	69.2%
3	**Commercial**							
		Transient Group Quarters (Hotels, Motels)	9	25,850		-	25,850	
		Retail, Auto Service, Office Buildings, Recreation Facilities, Warehouse	39	36,620		-	36,620	
		Commercial Developable Land	11	-		9,806	9,806	
		Commercial Undevelopable Land	1	-		-	-	
			60	62,470	19.5%	9,806	72,276	20.6%
4	**Industrial**	Warehouse, Sand/Gravel, Electric Transmission	14	318	0.1%		318	0.1%
		Industrial Developable Land	3	-		411	411	
		Industrial Undevelopable Land	1	-		-	-	
			18	318		411	729	
8	**Recreational Land**		2	4,334	1.4%	-	4,334	1.2%
9	**Tax Exempt Property**							
		United States Government	26	1,604		-	1,604	
		Commonwealth of Massachusetts	7	-		-	-	
		Town-Owned	62	7,851		7,304	15,155	
		Charitable and Religious Groups, Housing Authorities	17	5,757		-	5,757	
			112	15,213	4.8%	7,304	22,517	6.4%
	Subtotal		**2021**	**319,696**	**100.0%**	**32,393**	**351,679**	**100.0%**
Additional Water Uses								
	Confidentaly Estimated Municipal Water Use (3%)			9,591		972	10,550	
	Unacounted for Water (10%)			31,970		3,239	35,168	
Buffer/Contingency (5%)				15,985		1,620	17,584	
TOTAL PARCELS			**2021**					
TOTAL WATER DEMAND, AVERAGE DAY (gpd)				**377,242**		**38,224**	**414,981**	
TOTAL WATER DEMAND, AVERAGE DAY (Rounded to nearest 1,000 gpd)				**378,000**		**39,000**	**415,000**	

2.3 Well field Permitting and Anticipated Usage

A detailed description of the hydrogeologic investigations performed of the District G and NRHS well fields as part of this permitting are provided in the *New Water Supply Source DEP Pumping Test Report, Water Resource Protection District G, Eastham, MA,* (Environmental Partners Group , April 2012) and the *New Water Supply Source DEP Pumping Test Report, Nauset Regional High School, Eastham, MA* (Environmental Partners Group , December 2011). The Executive Summaries of these reports are provided in Appendix G.

A description of the hydrogeologic investigations and related evaluations performed at District H that served as the basis of DEP's New Source Approval of that well field is provided in Appendix C. As described previously, District H is not being constructed as part of the proposed project, and is to be constructed if Eastham chooses to expand the water system into a Town-wide system. The information in on District H provided in Appendix C is therefore provided for planning purposes only.

In the previous section the estimated system demands for the water system were described (existing demand of 378,000 gpd, increasing to 415,000 gpd). This future demand represents approximately 22% of the combined permitted withdrawal rate for District G and NRHS under their New Source Approvals (995,000 gpd at District G and 883,000 gpd from NRHS, for a total of 1,878,000 gpd). It is anticipated that the system demands will be met by using District G and NRHS well fields on a 50-50 basis between the two well fields.

2.4 Timetable

The Town is currently preparing the design and technical specifications for each of the project Contract areas described above. Base plans of each area have been prepared, and to date the preliminary designs of the storage tank (Contract 1) and the well fields at District G and NRHS (Contract 2) are completed. Design of the distribution system is ongoing, and the preliminary design of the landfill area-main roads (Contract 3) has been completed. The water system design is being prepared by Environmental Partners Group and is scheduled to be completed by early spring 2015.

The Town, supported by Environmental Partners Group, is also in the process of seeking the State and local permit approvals for the project. A comprehensive listing of the permit requirements for the project and their status is provided in Section 8. The DEP Water Withdrawal Permit application was submitted to DEP during September 2014. In addition to the required MEPA permitting, the Town is also preparing permit submittals to DEP for the water system design, the Cape Cod Commission (Development of Regional Impact), Massachusetts Department of Transportation (State Highway Access Permit), Cape

Cod National Seashore (Special Use and Right of Way permits), the Eastham Conservation Commission (Notice of Intent) and the Eastham Zoning Board of Appeals (ZBA). The ZBA permit is required for the storage tank and its height, which exceeds the height restrictions under the zoning for District G, and a variance of use. The Town hopes to complete these permitting activities by early winter 2015 (January-February) such that the construction activities for the project can commence by late spring 2015. The construction activities are expected to occur continuously between Spring 2015 through 2017, with the first service connections being made during 2016.

2.5 Approximate Costs

The estimated cost of the proposed water system is $45.8 Million. A summary of the items comprising the costs estimate are shown in Table 5. Unit costs were collected from similar water system construction projects in Southeastern Massachusetts and Cape Cod that were performed during 2012 – 2014. To these unit costs have been added a contingency and engineering costs. The estimate was developed on the basis of February 2014 dollars with a CCI index of 9681, inflated to February 2015 (2.6%) to reflect the anticipated start of construction.

Table 5. Construction Cost Estimate for Eastham Water System.

Item	Backbone	Landfill Area	Total
Services	$2,519,763	$1,189,380	$3,709,143
Valves	$720,959.25	$175,877.00	$896,836.25
Hydrants	$1,775,900	$911,600	$2,687,500.00
8" (Paved), lf	$7,444,119	$5,246,099	$12,690,218.00
8" (Dirt), lf	$406,800	$1,532,250	$1,939,050.00
12" (Paved), lf	$9,422,016.90	$0.00	$9,422,016.90
12" (Dirt), lf	$696,094.00	$0.00	$696,094.00
Wells w/ Transmission Mains, Pump Station	$2,079,000	$0	$2,079,000.00
Storage Tank at District G	$2,005,500	$0	$2,005,500.00
Subtotal	$27,070,152	$9,055,206	$36,125,358.15
Contingency (10% - Backbone, 5% - Landfill Area)	$2,707,015	$452,760	$3,159,776
Engineering (15%)	$4,060,523	$1,358,281	$5,418,804
Total (Feb 2014 $)	**$33,837,690**	**$10,866,247**	**$44,703,937**
Inflation to Feb 2015 (2.6%)	$ 34,717,470	$ 11,148,770	$ 45,866,240
Estimated Cost (Rounded)	**$ 34,700,000**	**$ 11,100,000**	**$ 45,800,000**

3.0 Consistency with Planning

3.1 Eastham Comprehensive Plan

Eastham recently updated their Local Comprehensive Plan in 2010 after soliciting input through numerous public meetings and from the Town's Boards and Committees, Town Departments and local organizations. The Plan identifies a number of goals that are a priority to the community, the first of which is to "Protect/Improve water quality and supply". One of the central concerns expressed in the Plan is that the Town maintains an adequate supply of drinking water and preserving its good quality.

The proposed municipal water system is directly related to this goal, where private drinking water wells that have degraded water quality will be replaced with the municipal water system. This water system will ensure that those served by it will have an adequate supply of high quality water, both for their current needs as well as the future needs of the community.

3.2 Cape Cod Commission Regional Policy Plan

The Cape Cod Commission's Regional Policy Plan (RPP) was originally adopted in 1991 and has been updated and amended several times, the most recent of which is dated August 17, 2012. The RPP was reviewed with respect to the following goals and performance standards that are applicable to the proposed water system:

Economic Development Goal – Infrastructure Capacity (ED4): provide adequate capital facilities and infrastructure that meet community and regional needs, expand community access to services, and improve the reliability and quality of services.

> Eastham's water system will provide a water supply and distribution system infrastructure that will improve the availability, reliability and quality of water to the Town's residents, business sector and other property owners.

Water Resource Goal – General Aquifer Protection (WR1): maintain the hydrogeologic balance and quality of Cape Cod's aquifer, considering such factors as groundwater withdrawals, wastewater disposal, storm water recharge, and adequate surface water levels.

> The municipal water system will replace private drinking water supplies with public water supply wells, therefore there will be no net change on overall withdrawals from the aquifer. The Town has completed extensive hydrogeologic investigations of the proposed District G and NRHS well fields as part of the DEP New Source Approval Process (described in Section 2) to demonstrate

that withdrawals from these well fields will not have any adverse effects on the aquifer groundwater levels, wetland resource areas or adjacent surface waters. These studies address the Minimum Performance Standards for the Groundwater Study Requirement (WR!.3) and the Management of Water Withdrawals (WR1.6).

Water Resource Goal – Drinking Water Quality and Quantity (Wellhead Protection Areas and Potential Water Supply Areas) (WR2): To maintain the overall quality and quantity of Cape Cod's groundwater to ensure a sustainable supply of untreated high-quality drinking water.

Eastham currently has zoning that protects the District G well field (Water Resources Protection District G) that was implemented when the Town was anticipating that this area would be the location of a potential water supply for the Town. The zoning prohibits any activities that would result in contamination of the ground and surface water resources at District G. The NRHS well field is also protected by similar zoning because of its location in the Seashore District F. The definition, purpose and land use limitations of these zoning districts are described in Section 5.

The wellhead areas of District G and NRHS will be further protected by the Zone 1 and Zone 2 restrictions associated with public water supplies and the Massachusetts Drinking Water Regulations. These measures address the Minimum Performance Standards for prohibited uses under State regulations (WR2.4) and future well site restrictions (WR2.5).

Wetlands Protection Goal (WET1): to preserve and restore the quality and quantity of inland and coastal wetlands and their buffers on Cape Cod.

Construction of the water system will not be conducted in wetland areas. There are no wetlands in the vicinity of the water supply wells at District G and NRHS or the water storage tank. The majority of the water main installations for the distribution system will take place within roadway right-of-ways. There are a limited number of locations where the water main construction activities will occur within the 100-foot buffer zone of Vegetated Bordering Wetlands. These construction activities will be the subject of a Notice of Intent filing to the Eastham Conservation Commission, and will be performed in accordance with the Order of Conditions issued by the Conservation Commission. Appropriate erosion and sediment management measures will be implemented to ensure that wetland resource areas are not affected by the construction activities (further described in Section 9). These measures address the Minimum Performance Standards for wetland buffers (WET1.2) and utility line installations (WET1.3).

Wildlife and Plant Habitat Goal – Prevent Loss, Minimize Adverse Impact, and Maintain Diversity (WPH1): Prevent the loss or degradation of critical wildlife and plant habitat, to minimize the adverse impact of new development on wildlife and plant habitat, and to maintain existing populations and species diversity.

The construction of the water system well fields, storage tanks and distribution system will occur in previously disturbed areas and roadways. Minimal clearing and grading will be required at the well fields, only as required to place a small pump house at District G and NRHS and to improve their existing access roads. Because some of the construction activities will occur within areas mapped as critical species habitat, a project review has been requested under the Massachusetts Endangered Species Act (MESA) by the Natural Heritage and Endangered Species Program (NHESP). This project review request is provided in Appendix H. These actions address the Wildlife and Plant Habitat Minimum Performance Standards for clearing and grading (WPH1.2) and rare species (WPH1.4).

Traffic – Permits for Roadwork prior to Construction (TR0.3). All necessary approvals and permits from federal, state and local government agencies for transportation mitigation or DRI site access and egress shall be obtained and copies submitted to the Cape Cod Commission prior to the issuance of a preliminary Certificate of Compliance for the DRI.

The water main installations on Route 6 will require MassDOT State Highway Access permitting. Consultation and pre-application meetings regarding these construction activities have been held with MassDOT's District 5 office, and a permit application is to be submitted once the Route 6 water main designs (Contracts 5 and 6) have been substantially completed.

This review of performance goals associated with the Regional Policy Plan and the Eastham water system is intended to convey the consistency of the project with these goals, and that the Town's objectives for the project support these goals.

3.3 Eastham Wastewater Facilities Planning

Eastham has been engaged in comprehensive wastewater management and facilities planning since 2006 with the goal of developing a comprehensive strategy for wastewater treatment. The *Wastewater Management Planning, Plan Evaluation Report* (Stearns and Wheler, June 2009) describes the initial wastewater needs assessment and screens alternatives for addressing the Town's wastewater management-related human health and environmental concerns.

The report describes the Town's reliance on individual water supply wells that are frequently located on the same lot as individual septic systems, and the impact on these wells by septic tank effluent and other landscaping activities (fertilizers, pesticides, etc.). The report states "the contamination is indicated by elevated nitrate levels detected in the wells. Nitrate is a human health threat, but more importantly, it indicates the high probability that there is other contamination such as viruses, volatile organic carbons, pharmaceuticals, phosphorus, etc. within the drinking water." A more detailed discussion on the occurrences of nitrates in the town's private drinking water wells is provided in Section 4.2. The *Wastewater Management Planning, Plan Evaluation Report* concludes that *"the Town needs to protect the public health by providing a reliable public water supply from a protected source"*.

3.4 Cape Cod National Seashore Comprehensive Source Protection Plan

Land uses within the Cape Cod National Seashore are managed in accordance with the United States Department of Interior enabling legislation and National Park Service policies and plans. The *Comprehensive Source Protection Plan, Cape Cod National Seashore* (June, 2006) documents the regulatory and management controls that exist for the National Park Service and the National Seashore to ensure that water supplies are protected.

DEPs Zone I requirements for well head protection, the 400' protective radius around each well head, restricts land uses within the Zone I to only those that are related to the production of water, such as pump stations and access roads associated with the water supply wells. The Zone I at NRHS extends onto National Seashore property, and the land use and aquifer protection goals described in the *Comprehensive Source Protection Plan* is consistent with DEPs well head protection requirements.

4.0 Alternatives to the Project

The proposed public water system for Eastham is described in Section 2. This system, the preferred alternative for the Town, is compared against the no-action alternative of continuing to rely on private drinking water supplies.

4.1 Background on the Preferred Alternative

Eastham has several areas with dense residential development characterized by small quarter-acre and eighth-acre lots. Route 6, which runs north and south through the center of Eastham, is the major transportation corridor serving the outer Cape where many of the hotels, restaurants, stores and other establishments that support the community's commerce is located. With the exception of a few properties that are adjacent to the Town of Orleans and served by their municipal water system, all of the Town's properties rely on individual or non-community drinking water supplies and onsite wastewater disposal systems. There over 70 non-community public drinking water supplies serving condominiums, clustered housing developments and businesses. These drinking water wells and onsite septic systems are oftentimes in very close proximity to each other and the septic system discharges are degrading the quality of these private drinking water supplies. In addition, because there is no municipal water system, the Town's Fire Department has limited ability to provide fire protection.

These concerns have been the basis of a long standing debate within the community on the need for a public water system. The Town first evaluated construction of a limited water system in the late 1960's (*Report on Proposed Water System in Eastham, Massachusetts,* by Whitman and Howard, 1970), and then again in the late 1990s in response to the groundwater contamination emanating from the Town's closed landfill. The evaluation of a water system has been the subject of several Town Meeting articles since 2007, culminating in the approval at the Annual Town Meeting in May 2014 where an overwhelming majority (86%) of the Town authorized the construction of the limited water system that is being proposed. A discussion of the water quality and fire protection issues that led to this decision at the May 2014 Annual Town Meeting is provided below.

4.2 Water Quality Concerns of Private Wells

Nitrates and Septic System Discharges

The Towns wastewater facility planning (Stearns and Wheler, June 2009) highlights the impact of septic tank effluent and other landscaping activities on private drinking water supplies. These discharges are contaminating the drinking water quality, indicated by elevated levels of nitrates in these wells. In addition to being a contaminant of concern in drinking water because of its health impacts, it is also an

indicator that other compounds associated with septic system discharges may be present (volatile organic compounds, pharmaceuticals, viruses, etc.) that may be impacting drinking water quality. It is generally accepted that nitrate concentrations greater than 0.5 milligrams/Liter (mg/L) are due to anthropogenic (human-based) sources, as either septic system discharges or fertilizer runoff. The Environmental Protection Agency and Massachusetts DEP have established a Maximum Contaminant Level (MCL) for nitrate of 10 mg/L because it can cause adverse health effects at concentrations greater than this MCL. As a result, the Cape Cod Commission has set a groundwater planning limit of 5 mg/L total nitrogen to protect drinking water supplies and other water resources.

Eastham's Local Comprehensive Plan describes studies on nitrates in the Town's groundwater that have been ongoing since the 1990s. A study conducted by the Lower Cape Water Management Task Force, led by the Cape Cod Commission, measured nitrate concentrations of private wells in over 6,500 wells in Eastham, Wellfleet and Truro between 1985 and 1994 and documents a progressive increase in nitrate concentrations over this time that are degrading drinking water quality. Eastham has continued to monitor nitrate concentrations in private drinking water wells since that time and now has over twenty years of data that document nitrate conditions in groundwater.

Starting in the mid-1990s the Town offered residents the opportunity to have their well water tested on a voluntary basis. Beginning in 2002 a more structured program of nitrate testing was offered to residents, initiated by the Town's Water Resources Advisory Board and Board of Health. It consists of a program wherein the Town is divided into three geographic areas (north, central, south) and each year the properties in one of these areas is offered the opportunity to have their well water tested. In so doing the entire Town is tested over three-year intervals. The trends for each three-year private well sampling cycle between Fiscal Year 2003 through 2011 are shown on Figure 9. This graph shows that the number of private wells with nitrate concentrations greater than 2.0 ppm has been progressively increasing over with each successive three year cycle. The location of properties with nitrate concentrations greater than 2.0 ppm, based on the 2009 to 2011 sampling cycle, is shown on Figure 10. This figure demonstrates that the nitrate impacts in drinking water are a town-wide issue and not limited to a geographic area of the community.

Groundwater Impacts in the Vicinity of the Closed Landfill

The Town's landfill operated from the 1930's until 1992, and was closed in 1997. The closure consisted of the construction of a low permeability cap and implementation of a post-closure groundwater monitoring program. This monitoring program included routine collection and laboratory analysis of

groundwater samples from monitoring wells around the landfill and private drinking water wells in the neighborhood of the landfill.

In March 2004, vinyl chloride was detected in a water sample collected from a private drinking water in the neighborhood east and in the down gradient direction of the landfill well at a concentration of 2 micrograms per Liter (µg/L). Vinyl chloride is a Volatile Organic Compound (VOC) commonly found in groundwater where chlorinated solvents have been released, and is likely related to material buried at the landfill. Because the drinking water standard for vinyl chloride is 2 µg/L, the Town undertook response actions in coordination with DEP and in accordance with the Massachusetts Contingency Plan (MCP), the State's hazardous waste regulations. Bottled water was provided by the Town to the property owner and the vinyl chloride concentrations continued to be monitored. Over a five year period the vinyl chloride concentrations gradually diminished, indicating that this contaminant plume had dissipated. The Town's Licensed Site Professional at the time recommended that a municipal water system should be provided to address the groundwater concerns in this landfill area (Bennett & O'Reilly, 2005).

In August 2012 DEP's Division of Solid Waste revised the post-closure monitoring program for the landfill to include sampling and analysis of the compound 1,4-dioxane at both the landfill monitoring wells and private wells. 1,4-dioxane is an "emerging" contaminant of concern by EPA and DEP. DEP has published draft regulations that lower the MCP GW-1 drinking water standard for 1,4 dioxane from 3.0 µg/L to 0.3 µg/L. This drinking water standard is being lowered in response to studies that suggest that 1,4 dioxane is likely to be carcinogenic to humans.

The Town initiated this revised landfill monitoring program in 2012 and detected 1,4-dioxane in monitoring wells and private drinking water wells near and down gradient of the landfill. Since that time the Town has been conducting response actions in coordination with DEP and in accordance with the MCP. An extensive sampling program of private wells from over 300 properties in the vicinity of the landfill was conducted between February and August 2013 (Environmental Strategies & Management, September 2013). This private well sampling program has continued since 2013 and is now in its fifth phase. With each subsequent sampling phase the number of private wells with 1,4-dioxane concentrations that exceed the MCP GW-1 drinking water standard of 0.3 µg/L has increased. The results of this sampling program are shown in Figure 11. As of June 2014 the private wells at 43 properties, consisting of residences and a church, have been identified to have 1,4-dioxane concentrations that exceed this standard. All of these properties have been offered bottled water by the Town. In addition to these properties, the drinking water well at the Eastham Elementary School had detections of 1,4-dioxane, but

at concentrations below the MCP GW-1 drinking water standard. Nonetheless, the school is now using bottled water for drinking water and kitchen use.

The occurrence of 1,4-dioxane in other areas of the Town at locations not influenced by the landfill has also been evaluated as part of the MCP response actions. Detections in private well water have been recorded in areas south and west of the landfill, which demonstrates that this issue may be more regional in nature and not just associated with the landfill.

4.3 Limited Fire Protection

Because there is no municipal water system in Eastham, the Fire Department has limited ability to provide fire protection to the Town. During 2012 the Fire Department responded to 42 fire incidents, including building fires, brush fires and grass fires. The Fire Department has pumper trucks that are filled using either ponds or small buried storage tanks, which delays their response time to these incidents. A municipal water system that provides hydrant access through the distribution system piping would significantly improve the fire protection and emergency response capabilities of the Fire Department. The Town currently relies on mutual aid support from neighboring communities if additional support or water is required to respond to fire incidents.

The proximity of fire hydrants to properties, especially those within ½ mile of hydrants, will also provide an opportunity for homeowners to potentially receive a reduction in their dwelling insurance rates because of improved Insurance Services Office (ISO) ratings. Approximately 80% of the properties in Eastham are located within a ½ mile of the water system, as shown on Figure 12 and therefore will have improved fire protection as a result of the project.

4.4 The Proposed Project versus the No Action Alternative

Eastham previously considered implementation of a Town-wide water system at Town Meetings in 2007 and 2013, however the articles did not attain the required two-thirds vote. The proposed water system authorized at the May 2014 Annual Town Meeting is for a limited water system that will serve approximately one third of the Town's properties located in the vicinity of the landfill study area and properties abutting the looped transmission main throughout the Town. This transmission main has been sized so that it can serve as the backbone of a Town-wide system, should the Town choose to expand the system at a later date.

The No-Action alternative represents a continuation of the existing water supply situation in Eastham, where the Town does not have a municipal water system and only limited fire protection. As a result, private drinking water supplies will continue to be adversely affected by septic system discharges and other land uses and the quality of drinking water in private wells will continue to decline. Selection of the No Action alternative is not consistent with the Town's interests, as expressed at their May 2014 Annual Town Meeting, and is in contrast to one of the primary goals articulated in their *Local Comprehensive Plan.*

4.5 Alternative Design Considerations for the Water Supplies, Storage Tank and Distribution System

Alternative locations for the water supply and storage tank components of the water system have been considered, as well as for construction approaches for the installation of the distribution system. These are described below.

Water Supply Alternatives

In 2005 the Town was considering a municipal water system in the vicinity of the landfill study area and conducted evaluations of alternative water supply sources that could potentially serve this system (Environmental Partners Group, August 2005 and September 2005). Nine locations within the Town, shown on Figure 13, were evaluated in addition to a possible interconnection with Orleans. A summary of the sites that were considered are described in Table 6. These sites were screened against the following criteria: ownership, yield, water quality, ability to accommodate the DEP-required 400' Zone 1 protective radius around the well head and proximity to the service area of the water system. Of these, District G, NRHS and District H met these criteria and were retained for further evaluation. Copies of these studies are provided in Appendix I.

Beginning in 2009 the Town began the DEP New Source investigations on these three sites, which is a multi-step permitting process that consists of the following steps: site exam, initial hydrogeologic investigations, pump test scoping, detailed hydrogeologic investigations with a long-term pump test. The results of these investigations at the District G and NRHS well fields are described in Section 5.

Storage Tank Location Alternatives

During 2011 Environmental Partners Group developed a conceptual design of a Town-wide water system. As part of this effort several locations were considered as locations for the water storage tank. If a Town-wide system were to be constructed two storage tanks would be required. The location of the sites that were considered for the storage tank is shown on Figure 14.

Each of these parcels is Town-owned and has good proximity to the water supplies. District G was selected as the preferred location because it met these criteria, and also had a larger setback from residential properties than the other alternative sites.

Table 6. Location of alternative water supplies evaluated in study of limited water system (EPG, 2005).

Site ID	Well Location	Potential Yield	Expected Water Quality	Report Name
Well-field Protection Zoning District "H"	Test Well No. 1 – East of Nauset Rd. & South of Cable Rd.	400 gpm	Good	Report on Proposed Water System Eastham, MA by Whitman & Howard
	Test Well No. 2 – West of Nauset Rd. & South of Bracket Rd.	500 gpm	Good	
	Test Well No. 3 – East of Nauset Rd. & South of Cable Rd.	300 gpm	Good	
	Test Well No. 4 – East of Nauset Rd. & South of Cable Rd.	700 gpm	Good	
	North Eastham	0.65 mgd	Unknown	Water Resources of Outer Cape Cod by Lower Cape Water Management Task Force
	Marconi Beach (Wellfleet)	Unknown	Unknown	
Eastham Water Protection District "G"	Eastham Water Protection District (EWPD)	0.65 mgd	Unknown	
	Roach Property	0.22 mgd	Unknown	
	Little Creek (Nauset Road)	Unknown	Unknown	Water Resource Management Plan by Cape Cod National Seashore Massachusetts
	Eastham Elementary School	<70 gpm	Poor	–
	Nauset Regional High School	<70 gpm	Good	
	Eastham Senior Center	<70 gpm	Unknown	
	Nursery School/Day Care	<70 gpm	Unknown	
	Town of Orleans Water Supply System	Unknown	Good	

gpd – gallons per day
mgal – million gallons per day

Distribution System Alternatives

The concept plan of the distribution system as approved at the May 2014 Annual Town Meeting is shown on Figure 1. Two construction methods for installing the water main are being considered: conventional trenching and directional drilling. The water main is to be installed at a depth of five feet below grade surface, and therefore trenching will be the standard method to be used unless site access or other circumstances cause trenching to be difficult and in which case directional drilling techniques will be employed.

Installation of the water main on Route 6 will be challenging because it is the main transportation corridor serving the outer Cape, and the heavy congestion it experiences during the summer tourism season. The time periods within which construction activities are conducted on Route 6 will be limited in accordance with conditions associated with the MassDOT State Highway Access Permit, which are anticipated to include restrictions against work being performed between Memorial Day and Labor Day. Alternative routing paths of the water main are being considered by the Town as part of the distribution system design such that the water main is placed on roads paralleling Route 6 wherever feasible, thereby bypassing the need for construction within the highway in these areas. These alternative routings will only be acceptable to the Town if service can still be provided to each property abutting Route 6. Modifications to the concept plan authorized at the May 2014 meeting must be authorized by the Board of Selectmen.

5.0 Existing Environment

5.1 Physical Setting

Eastham is at the base of the outer Cape and is characterized by its coastlines to the east (the Atlantic Ocean) and west (Cape Cod Bay), both of which are approximately 4 ½ miles long. The Town consists of approximately 9,120 acres of uplands, nearly one-third of which (3,000 acres) is within the Cape Cond National Seashore located on the east side of the Town. Topography in this area of the Cape is relatively flat, with its highest elevation being 70 feet along its northeastern coastline.

Route 6, which runs north and south through Eastham, is the major transportation corridor for the outer Cape and is where the most of the Town's commercial businesses are located. Eastham has several areas with medium density residential development on small (1/8 acre and ¼ acre) lots, especially in the areas west of Route 6. Almost all of the Town's properties are served by individual or non-community drinking water supplies and individual wastewater disposal septic systems.

The District G well field is located in north Eastham (a half mile south of the Wellfleet town-line), east of the Cape Cod Rail Trail biking path and north of Oakleaf Road. The location of the District G well field site is shown on Figures 4 and 5. District G is situated approximately 50 feet above sea level and is comprised predominately of property owned by the Town of Eastham, with a few parcels owned by private entities or the Eastham Conservation Foundation. The parcel within District G on which the production well is located and its DEP Zone 1 is owned by the Town. The land to the north and east of the District G properties is owned by the Cape Cod National Seashore.

The NRHS well field site is at the northeast corner of property owned by the Nauset Regional School District, approximately 3,000 feet north-northeast of the intersection of Cable Road and Nauset Road. The location of the NRHS well field site is shown on Figure 8. The Zone I for the NRHS water supply well is located on the Nauset Regional School District and Cape Cod National Seashore properties.
The NRHS well field site has an existing water supply well that currently serves the High School. Use of this existing well for drinking water supply at the landfill will be discontinued once the municipal water system becomes available.

5.2 Geology and Soils

The glacial sediments of outer Cape Cod were deposited both by glaciers, glacial lakes and glacial melt-water processes that left a variety of deposits ranging from layers of low permeability clay to coarse sand

and gravel materials. Much of the aquifer deposits in the outer Cape are stratified outwash deposits, some of which extend to bedrock in many areas or are underlain by glacial lake deposits in other areas. The outwash deposits of outer Cape Cod have been divided into genetic units, the oldest being the Wellfleet Plain deposits, followed by the increasingly younger Truro Plain and Eastham Plain deposits. The northern area of Eastham is located in the Eastham Plain deposits are underlain by up to 300 feet of glacial lake deposits.

The area of Eastham where the geology and hydrogeology is of particular interest for the proposed water system is the northeast area of the Town where the District G and NRHS well fields are located. Figure 15 depicts the geology of this region, which consists of interbedded sand, gravel, silt and clay materials of the Eastham Plain glacial outwash deposits which overlie the predominantly silt and clay materials referred to as the Cape Cod Bay lake deposits (Oldale et al. 1971; Masterson 2004). Outwash deposits between District G and NRHS are approximately 110 feet thick and the lake deposits are up to 307 feet thick. The aquifer between District G and NRHS is approximately 60 to 80 feet thick. Beneath the lake deposits a 20-ft thick layer of coarse gravels (fill) overlies bedrock. Somewhere between NRHS and District H there is a transition from lake deposits to interbedded sand, silt, and clay deposits at depth. In the vicinity of District H, the lake deposits were either not deposited or were eroded from the area. As a result, the aquifer sands and gravels extend much deeper at District H than at the District G and NRHS well fields.

This finding is consistent with the conceptual depositional model described by Masterson (2004), in which the remnant of the South Channel lobe occupied the southeast portion of Eastham after retreat of the Cape Cod Bay lobe which occupied most of Lower Cape Cod in the past. The hummocky topography in the vicinity of District H is attributed to buried ice blocks left by the retreating South Channel lobe (Masterson 2004). The cross section shown on Figure 15 depicts that the transition between lake deposits to ice contact deposits occurs where the topography becomes hummocky to the southeast, although the actual location and nature of the subsurface transition cannot be determined with the information available.

5.3 Surface and Groundwater Hydrology and Quality

The groundwater flow system that occurs in the glacial sediments of the outer Cape consists of 1) freshwater lenses where recharge occurs, 2) surface water bodies such as streams and ponds where recharge and discharge occurs, 3) shoreline and near shore areas where discharge occurs, and 4) underlying saltwater. The source of fresh water in the aquifer and surface water bodies is entirely from

precipitation that recharges the sediments. The saltwater beneath is from intrusion of seawater from the Atlantic Ocean and Cape Cod Bay and is denser and heavier than the fresh water.

The system of groundwater flow on outer Cape Cod is the result of groundwater mounds that form along the central axis of the outer Cape, from which groundwater flows radially toward the coastlines (eastward and westward). Figure 16 depicts the freshwater aquifer lenses of the outer Cape with groundwater contour lines (Masterson, 2004). Outer Cape Cod contains five freshwater lenses; the freshwater lenses from north to south are the Pilgrim, Pamet, north and south Chequesset, and Nauset. The Nauset lens underlies Eastham.

The aquifers are called freshwater lenses because they consist of lens-shaped mounds of freshwater that overlie denser saltwater that occurs at depth. The zone where the freshwater and saltwater meet is gradational such that, at the top of the zone, groundwater is fresh, with salt concentrations increasing with depth through the zone until the salt concentration is near that of seawater. Therefore, the approximate center of the lens is where the freshwater thickness is greatest. The Nauset Lens has a maximum water table elevation of approximately 17 feet above mean sea level.

Recharge from precipitation on the outer Cape has been estimated to be approximately 45 – 55 % of annual rainfall based on an average annual precipitation rate of between 40 to 42 inches/year (Le Blanc et al. 1986; Masterson et al. 1998), which yields a recharge rate between 18 to 23 inches/year. The rate of recharge is smallest in the summer and fall months and greatest in the winter and spring months. Seasonally variable recharge has an effect on the water levels in Lower Cape Cod. Annual fluctuations in water levels in Nauset and south Chequesset lenses are up to 4 feet (LeBlanc et al. 1986).

On Cape Cod, streams or ponds occur in low areas or depressions in the ground surface that are low enough to intersect the water table. When the water table is higher than the stream or pond level, the ponds receive groundwater discharge. When the water table drops below these depressions, the streams and ponds will go dry. Therefore, surface water runoff does not contribute a sufficient amount of water to maintain stream and pond levels. Vernal pools (i.e. seasonal ponds) differ from ponds in that they are not necessarily fed by groundwater but are filled by runoff and by direct precipitation (Sobczak et al. 2003; Liebowitz and Brooks 2008) There are no vernal pools in the vicinity of the District G and NRHS well fields; there are several certified vernal pools in the vicinity of the District H well field. Major surface freshwater features in the Eastham area of the outer Cape include Blackfish Creek, Hatches Creek, Silver

Spring Brook, Fresh Brook, Herring Brook, Herring River, Great Pond, Depot Pond, Herring Pond, Minister Pond, Moll Pond, Muddy Pond, and Schoolhouse Pond.

The coastal areas of Lower Cape Cod which form the outer boundaries of the freshwater lenses are dominated by beach, lagoons, and estuarine environments. Near the shorelines, shallow groundwater may be fresh, brackish, or saline, depending upon the interaction between the near shore environment and the influx of fresh groundwater and/or surface water. Groundwater discharge occurs in these coastal, estuary and bay areas.

A detailed description of the hydrogeology of the District G and NRHS well fields is provided in the *New Water Supply Source DEP Pumping Test Report, Water Resource Protection District G, Eastham, MA,* (Environmental Partners Group , April 2012) and the *New Water Supply Source DEP Pumping Test Report, Nauset Regional High School, Eastham, MA (*Environmental Partners Group , December 2011). The Executive Summaries of these reports are provided in Appendix G. The District G well field is located in the northern region of the Nauset Lens aquifer, approximately 4,300 feet north-northeast of the high point of the freshwater mound. Groundwater elevation at the District G site is approximately 16 to 17 feet above sea level (NAVD 88) and the depth to the water table is approximately 30 feet below ground surface (bgs). The direction of groundwater flow at the site is towards the north-northeast. The NRHS well field site is located in the northern region of the Nauset Lens aquifer, approximately one mile east-northeast of the high point of the freshwater mound. Groundwater elevation at the NRHS site is approximately 13 feet NAVD 88 and the depth to the water table is approximately 50 feet bgs. The direction of groundwater flow at the site is towards the east and that aquifer material is present from approximately 50 to 100 feet bgs. From approximately 100 to 150 feet bgs, the subsurface stratigraphy is transitional from sands to silts and clays. From 150 to 400 feet bgs, the area is underlain by clay and silty clay. A saltwater interface is not identified at the site and if present is located within the low permeability clays or bedrock.

5.4 Wetland Resource Areas

Because of the low-lying topography of Eastham, wetland areas occur throughout the Town and in most cases are associated with freshwater surface water bodies and estuarine features. The location of wetland resource areas as identified in the Town's GIS mapping is shown on Figure 18. This figure also shows the location of land subject to flooding under 100-year storm events.

There are no mapped wetlands or vernal pools at the District G storage tank or in the vicinity of the District G and NRHS well fields (Contracts 1 and 2). For the distribution system, no construction activities are anticipated within Bordering Vegetated Wetlands and there are a limited number of locations where construction activities are anticipated within the 100' buffer zones of Bordering Vegetated Wetlands. Almost all of the proposed distribution system piping is to be installed within existing roadways or right-of way areas. At one location of Bridge Road (Contract 8) the water main will be installed on a bridge that crosses a wetland area, therefore no construction will occur in that wetland area. There are a few locations where water mains will be placed off of roadways in order to achieve looping of the distribution system. None of these cross-country connections are planned in wetlands areas or their buffer zones.

5.5 Plant and Animal Species and Habitat

Massachusetts Natural Heritage and Endangered Species program (NHESP) mapping of Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife is shown in Figure 18. In general, the east side of Eastham falls within this area, overlying the Cape Cod National Seashore boundaries and extending into some of the residential areas in the southern part of the Town. There is additional mapped area in the northwest corner of the Town abutting Wellfleet, and pockets of areas in the south area of the Town.

The District G storage tank and the District G, NRHS and District H well fields are located within these habitat areas. The roadways where the distribution system is to be installed either abut or cross these habitat areas at locations in the main roads of the landfill area (Contract 3), portions of Route 6 (Contracts 5 and 6), and the areas northwest and southwest of Route 6 (Contracts 7 and 8).

A review of the data found on the U.S. Fish and Wildlife Service's website for federally listed endangered and threatened species protected by the Endangered Species Act lists the Piping Plover and the Roseate Tern as being present in Eastham. Because the well fields, storage tank and distribution system are located away from these beach areas, it is not within the general habitat of these federally protected species and therefore no impact to these species is expected.

A Project Review Request was filed with the Massachusetts Endangered Species Act (MESA) unit of NHESP on September 30, 2014 as part of the MEPA Expanded Notification Form filing for this Eastham water system project. A copy of this request is provided in Appendix H, together with NHESP's response, dated December 4, 2014.

NHESP has confirmed that the distribution system construction within the paved roadway areas and within ten feet of these paved surfaces are exempt from MESA review, and this exemption applies to all of the distribution system construction activities that meet this criteria in Contracts 3 through Contract 8. NHESP also concluded that the distribution system construction located on the unpaved roads within Contract 4 will not result in a prohibited "take" of state listed rare species.

Portions of the project, specifically the District G area where the storage tank, well field and associated transmission mains, and the well field and transmission main at District H are located within the mapped priority habitat of the Eastern Box Turtle (*Terrapene Carolina*) and Common's Panic-grass (*Dichanthelium ovale* ssp *pseudopubescens*), state listed as "Species of Concern". Information on Common's Panic–grass is also provided in Appendix H. For these areas, NHESP is requiring:

1. In order to avoid a prohibited "take of the Eastern Box Turtle, a Turtle Protection Plan is to be submitted to NHESP for review and approval prior to the start of any construction activities. This Plan is to be prepared by a qualified biologist pre-approved by NHESP and will describe the procedures for protection these turtles during construction, with searches being conducted during the active turtle season of April 15 – October 15.

2. A botanical survey for Common's Panic-grass within all suitable habitat area for this species is to be performed to assess design approaches that will avoid and minimize impacts to this grass. The survey is to be performed by a qualified biologist pre-approved by NHESP and in accordance with a NHESP-approved scope of work. Botanical surveys for this species are typically performed between June 1 and October 1, but can potentially be performed earlier or later in the season with NHESP's approval. NHESP's review of this portion of the project is therefore ongoing.

Eastham will continue to coordinate with NHESP to ensure that these requirements are met prior to the start of any construction activities.

5.6 Areas of Critical Environmental Concern and Outstanding Resource Waters

Eastham has one Area of Critical Environmental Concern (ACED) within its borders, the Inner Cape Cod Bay. The boundaries of the Inner Cape Cod Bay ACEC, shown on Figure 18, lies within the Towns of Brewster (15%), Orleans (29%) and Eastham (56%) along the "inside corner" of Cape Cod Bay. It is 2,600 acres in size and includes 900 acres of salt marsh and extensive areas of shellfish beds and wildlife

habitat. Inner Cape Cod Bay is associated with the Namskaket Creek water shed. Its boundary generally follows the 10-foot contour line on the landward side and the mean low water line, and extends from First Encounter Beach to the Namskaket Creek. Additional information and mapping of the Inner Cape Cod Bay ACEC is provided in Appendix J. A research of the Massachusetts Department of Conservation Resources was performed, and a Resource Management Plan of the Inner Cape Cod Bay does not appear to be available.

Massachusetts GIS mapping of Outstanding Resource Waters shows that the Inner Cape Cod Bay and the Cape Cod National Seashore are designated Outstanding Resource Waters. These areas are shown on Figure 19, and coincide with the boundaries of both the ACEC and the Seashore.

5.7 Roadways and Traffic

The proposed water system is located in the primary and secondary roads of the Town, as well as on subdivision roads and side streets (Figure 1). This includes Route 6, the State-owned roadway and the main transportation corridor serving the Outer Cape. Eastham's *Local Comprehensive Plan* reports that the annual average daily traffic total volumes for Route 6 in 2001 ranged between 19,459 at the Eastham/Wellfleet town line to 26,864 just south of the Cape Cod National Seashore Visitor's Center.
The Cape Cod Commission has also collected traffic counts at locations on Route 6 and other significant roads in the Town. According to the *Local Comprehensive Plan*, there are no clear trends in traffic volumes in recent years

Current capacity throughout the Town-owned road network meets all but the summer travel demands. Peak travel demand on Route 6 during the summer results in severe congestion in South Eastham leading to the rotary at the Orleans border as well as congestion near the signalized intersections in town.

5.8 Scenic Qualities, Open Space and Recreational Resources

Eastham's most scenic resource is its coastline areas on the Atlantic Ocean and Cape Cod Bay. Its greatest open space and recreational resource is the Cape Cod National Seashore, comprising nearly one-third of the Town. As reported in the *Local Comprehensive Plan*, the Seashore is a national destination that provides miles of beaches, swimming, windsurfing, nature trails, bicycling, horseback riding, fishing and hunting. Having a municipal water system to support tourism that is attracted to the area because of these scenic qualities of the Town is a very high priority for the Town.

Eastham also owns over 485 acres of open space. This provides additional opportunities for passive and active recreation.

5.9 Historic Districts, Structures and Archeological Sites

Consultation with the Massachusetts Historic Commission (MHC) has been requested through a Project Notification Form that describes the proposed water system. A copy of this request to MHC and their response, dated October 14, 2014, is provided in Appendix K.

Eastham's *Local Comprehensive Plan* lists the following historic districts in the Town: Old Town Centre, Eastham Center, Collins Cottages, and Fort Hill. The Old Town Centre District was approved by the Eastham Town Meeting in 1986. There is no reference in the Local Comprehensive Plan to the other districts being approved by Town Meeting. In addition, there are several sites and structures in the Town that are listed in the National Register of Historic Places, including some that are within the boundaries of the Cape Cod National Seashore.

The Old Town Center District is shown on Figure 20. It consists of 25 properties located on the west side of Route 6 in the vicinity of Salt Pond Road, Locust Road to Mill Road, and the east side of Route 6 along Nauset Road to Schoolhouse Road. It includes the 1869 Schoolhouse Museum owned by the Eastham Historical Society. The Old Town Centre Historic District is now listed in the National Register as well as its listing in the State Register.

The Local Comprehensive Plan provides the following description of the other Districts:

> "The Eastham Center Historic District consists of 59 properties along the west side of Route 6, Samoset Road to Bridge Road, Depot Road to Samoset Road. Notable inclusions are the Windmill, Windmill-Green, Public Library, Chapel-in-the-Pines (Unitarian-Universalist), 1741 Swift-Daley House, owned by the Eastham Historical Society, and the Eastham Town Hall, the only property on the east side of Route 6.
>
> Collins Cottages Historic District, 13 properties, is sited on town Cove at the entrance to Eastham. Cove Burying Ground, Eastham's first cemetery, is on the East Side of Route 6 near Pine Woods Road. Bridge Road Cemetery, second oldest, is west of Route 6 and south of Samoset Road. Both cemeteries are listed individually in the National Register.
>
> The Fort Hill Rural Historic District consists of 33 properties and encompasses 100 acres of field, forest, and salt marsh within the boundaries of the Cape Cod National Seashore. Located east of Route 6 the district includes the Captain Edward Penniman House and Barn, Sylvanus Knowles House, and Seth Knowles House. "

The District G storage tank and the well fields at District G and NRHS are not located within or adjacent to the Historic District or structures. Water mains associated with the water system will be placed within paved roadway areas that run through the Old Towne Historic District, and will not have any adverse effects on the historic character of the District.

The Nauset Archeological District is located within the boundaries of the Cape Cod National Seashore and includes sites at the Salt Pond area, Fort Hill, Coast Guard Beach, the Nauset Light and Keeper's Hut, the Beacon and Twin Sisters of Nauset Lighthouses, and the French Cable Hut (Local Comprehensive Plan, 2011). Water mains are also to be installed in sections of Nauset and Cable Roads that are located within the National Seashore, and the Town has requested that the National Seashore review the project with respect to these areas.

The National Register of Historic Places lists the following locations within Eastham:

- Districts
  - Old Towne Center Historic District
  - Collins Cottages Historic District
  - Eastham Center Historic District
  - Fort Hill Rural Historic District
- Sites
  - Nauset Beach Site
  - French Cable Hut
  - The Beacon
  - Twin Sisters of Nauset Lighthouse
  - Captain Edward Pennimen House and Barn
  - Bridge Road Cemetery
  - Cove Burying Ground

The proposed activities associated with construction of the distribution system in each of these areas are to be reviewed by the Massachusetts Historical Commission, the Eastham Historic Commission, the Cape Cod National Seashore and the Mashpee Wompanoag Tribal Council, as appropriate, to confirm that these construction activities will avoid impacts to these sensitive archeological and historic resources.

5.10 Zoning

Eastham's zoning districts are shown on Figure 21. The Town has previously implemented land use protection controls at areas that the Town anticipated would be used for public water supplies. In 1989 the Eastham Town Meeting passed zoning bylaws that designated the District G and District H areas for watershed protection. The "Water Resources Protection District G" zone has the following description in the Eastham Zoning Bylaws (updated Sumer 2010):

> "An open space area or residential era of one or two family dwellings; the Water Resource Protection District is designed to protect the public health by preventing contamination of the ground and surface water resources providing a portion of the potential public water supply for the Town of Eastham."

The by-law restricts the use of pesticides in District G, and allows fuel storage for only residential domestic use and in limited quantities.

The NRHS property and well field are located within Eastham's Seashore District F zoning district. This District is defined as:

> "An area of one family dwellings located within the boundaries of the Cape Cod National Seashore Park to further the preservation and development of the Cape Cod National Seashore in accordance with the purposes of the Act of Congress of August 7, 1961 (75 Stat. 284, 291); to prohibit commercial and industrial uses therein, to preserve and increase the amenities of the Town; and to conserve natural conditions, wildlife and open spaces for the education, recreation and general welfare of the public."

Land uses within the National Seashore, and therefore within Seashore District F, are managed by the National Seashore in accordance with Department of Interior Regulations to protect and preserve their natural resources. These measures also provide protection of groundwater resources, and include the Zone I well head protection area for the NRHS well field that extends onto the National Seashore property. DEP's well head protection requirements are consistent with the land use and aquifer protection goals of the National Seashore. The DEP New Source Approval letter for the NRHS water supply includes a condition that the Town implement similar well head protection zoning controls for those areas that lie outside the National Seashore and not included within the Water Resource Protection District G. The Seashore District F provides this protection, and DEP will be consulted to confirm whether any additional zoning measures are required of the Town.

The Town has also implemented protective zoning for the District H well field, which is to be constructed in subsequent phases of the water system, should the Town vote to do so at future Town Meetings. District H has received a DEP New Source Approval permit, and is to be used as a future well field should the Town choose to expand the water system in the future. "Wellfield Protection District H" has the following definition in the zoning bylaws:

> "An area of open space area designated to protect the public health by preventing contamination of the ground and surface water resources in a test well area demonstrated to be capable of providing a portion of the potential public water supply for the Town of Eastham."

The zoning places restrictions and limitations on the use of pesticides, herbicides and fertilizers.

6.0 Assessment of Impacts

Eastham's proposed water system will have a positive benefit to the community because it will provide a reliable and high quality source of drinking water. The need for a public water system has been identified to be one of the Town's primary goals in their *Local Comprehensive Plan*. The Town's wastewater facilities planning studies also conclude that Eastham needs to protect the public health by providing a reliable public water supply. This is especially important for properties that have elevated nitrate concentrations in their private wells, indicative that other contaminants from septic system discharges may be present, and also for those properties that are in the vicinity of the landfill that are on bottled water because of 1,4-dioxane impacts to their wells.

Implementation of a public water system has been long debated by the residents of Eastham and, after years of careful study and evaluation, emphasized the importance of this need with an overwhelming vote of support for the project at their 2014 Annual Town Meeting, where 86% of the residents voted in favor of the Article (see Appendix B).

6.1 District G and NRHS Well Fields

Effects Due to Water Withdrawals and Zone II Areas

The long term effects of water withdrawals from the District G and NRHS water supply wells were extensively studied as part of the hydrogeologic testing and groundwater modeling activities associated with the DEP New Source permitting performed between 2010 and 2012. Representatives of DEP, the Cape Cod Commission and the Cape Cod National Seashore participated in the scoping of the pump test program to ensure that all environmental issues of concern would be addressed. These pump test activities are described in detail in the *New Water Supply Source DEP Pumping Test Report, Water Resource Protection District G, Eastham, MA,* (Environmental Partners Group, April 2012) and the *New Water Supply Source DEP Pumping Test Report, Nauset Regional High School, Eastham, MA* (Environmental Partners Group, December 2011). The Executive Summaries of these DEP Pump Test Reports are provided in Appendix G.

After review of the investigations performed and evaluation of the water withdrawals effects on the Nauset aquifer, DEP approved these well fields for withdrawal rates of 995,000 gpd and 883,000 gpd, respectively, from District G and NRHS, for a total of 1,878,000 gpd. The demand of the proposed water system at future build out conditions for the 2,021 properties to be connected to the system is estimated to be 415,000 gallons per day, representing only 22% of the permitted withdrawal rate. It is anticipated that

these demands will be met by splitting the withdrawals from the District G and NRHS well fields on a 50:50 basis, thereby further reducing the withdrawal effects in any single location.

Neither the District G nor the NRHS well fields are located near a recreational river, stream, lake or pond. Hatches Creek is located approximately 2,300 feet north of the District G withdrawal point. Groundwater modeling performed as part of the District G hydrogeologic evaluations predicted that the reduction in discharge to Hatches Creek when pumping the District G well at the rate of 250,000 gpd over 100 year period is 0.06 cubic feet per second (cfs), and therefore will have no discernible impact. Actual pumping rates from the District G well will likely be approximately 200,000 gpd at future build-out conditions of the water system, and therefore will have less effect on Hatches Creek than that predicted by the model.

Withdrawals from the NRHS well, which is remotely located from any surface water body features, has no effect on any surface water bodies.

The Zone II was determined for the NRHS and District G wells using a groundwater modeling (MODFLOW and SEAWAT) for the Nauset Lens, updated with site specific data from these three study areas. The Zone 2 for the District G well is shown on Figure 21. A water budget analysis was performed for the District G withdrawal point that compares the recharge rate against the proposed volume of groundwater withdrawal to confirm that the annual recharge within the Zone II area exceeds the withdrawal volume for the well. This ratio was determined to be 1.00, indicating that the Zone II has adequate capacity for the approved pumping rate (955,000 gpd). The actual pumping rate at District G upon build-out of the water system is anticipated to be on the order of 250,000 gpd, approximately 25% of the maximum pumping rate, and therefore the aquifer capacity of the delineated Zone II is very protective.

The Zone II of the NRHS well is shown on Figure 22. A water budget analysis was performed using the same approach as used for the District G Zone II analysis. The ratio of annual recharge within the NRHS well Zone II to annual maximum pumping is 1.14. Therefore, at the maximum approvable pumping rate (833,000 gpd), more water will recharge the aquifer than will be withdrawn from pumping at the permitted rate. Similar to the District G well, the actual pumping rates at the NRHS well upon build-out of the water system is anticipated to on the order 200,000 to 250,000 gpd, approximately 25% of the maximum pumping rate, The aquifer capacity of the delineated Zone II of NRHS is also very protective.

Effects on Wetlands, Rare Species

There are no wetlands in the vicinity of either the District G or NRHS well fields, and therefore withdrawals from the well fields will not impact wetland resource areas.

Use of the public water supply wells at District G and NRHS will not have any effect on federally-listed rare species. The federally listed endangered and threatened species protected by the Endangered Species Act that are present in Eastham, as listed on the U.S. Fish and Wildlife Service's website, identifies only coastal species – the Piping Plover and the Roseate Tern – as being present in Eastham. Because the well fields are away from coastal beaches, no impact to these species is expected.

NHESP has determined that portions of the project in District G and District H are within the mapped priority habitat of the Eastern Box Turtle (*Terrapene Carolina*) and Common's Panic-grass (*Dichanthelium ovale* ssp *pseudopubescens*), state listed as "Species of Concern". As described in Section 5, a Turtle Protection Plan will be prepared and submitted to NHESP for review and approval prior to the start of any construction activities. In addition, a botanical survey for Common's Panic-grass will be performed within all suitable habitat area for this species to assess design approaches that will avoid and minimize impacts to this grass. NHESP's review of this portion of the project is therefore ongoing.

ACECs and Outstanding Resource Waters

The well fields are located outside and remotely from the Inner Cape Cod ACEC, and are not within the delineated Outstanding Resource Water areas of the Town. The presence of the District G and NRHS well fields will therefore not have any impacts on these features.

Historic and Archeological Impacts

There are no historic or archeological areas of concern in the vicinity of the District G and NRHS, therefore the well fields will have no impact on these resources.

Traffic

Vehicles to each of the well fields are expected to be approximately 1 – 2 trips/day. The operators of the water system will be performing daily inspections of the wells and pump stations, and very occasionally (less than one/month) there will be material deliveries to the well field, consisting propane gas or water conditioning chemicals. Overall, four to ten vehicle trips per month are anticipated, which is not expected to have any adverse impacts on current traffic conditions in Eastham.

Other Construction (Short-Term) Impacts

Short-term impacts due to construction activities are expected to be very minor and not permanent. The construction of the District G well field will require minor clearing and grading to improve the existing access road into the site and to install the pump station building. Because there is an existing access road into the site, the road improvement consists of removing a limited number of trees sufficient to allow small trucks to enter the site. The roadway is to be graded and finished with a porous material such as a gravel or T-base mix, and therefore is not expected to cause surface runoff or erosion issues. The existing test well that was used for the pump test program is to become the production well, and therefore no drilling activities are required.

The short-term impacts resulting from the construction of the NRHS well field are also expected to be minor and are similar to the District G well field. The well field is served by an existing access road that provides access to well currently operated by the High School. Only minor clearing will be required to install the pump station building. The existing test well will be used as the production well and therefore no drilling activities will be required.

6.2 Water Storage Tank at District G

The site of the District G storage tank does not contain any wetlands and therefore will not result in any impacts to these resources. The area of the site where the tank is to be located has been previously disturbed, now being used as a DPW stockpile area and leaf and yard waste composting site, and therefore the presence of the tank is not expected to have any adverse effects on rare species and wildlife.

As described in Section 6.1, Eastham is continuing to coordinate with NHESP regarding the protection of the Eastern Box Turtle (*Terrapene Carolina*) and Common's Panic-grass, species of concern in the District G area. A Turtle Protection Plan and botanical survey for Common's Panic-grass is to be performed.

Similar to the District G well field, the site of the storage tank is outside any designated ACEC or Outstanding Resource Areas and the storage tank will not have any impact on them.

The District G site was selected as the preferred location in the Town because it is removed from residential areas and therefore its visibility is screened by the surrounding forest areas, reducing the visual impact to residents. Figure 6 shows photo renderings of the tank from various perspectives and locations within the Town.

There will be no increase in traffic generation rates associated with the District G storage tank. It is anticipated that the water system operators will conduct daily inspections of the tank, resulting in one vehicle trip/day.

6.3 Distribution System

Wetlands

No impacts to wetlands are anticipated due to the distribution system. Almost all of the proposed water mains are to be installed within existing roadways or right-of way areas. There are a limited number of locations where roadways are located within the 100' buffer zones of Bordering Vegetated Wetland, and therefore work in these areas cannot be avoided. These locations are generally described in Section 5.4 and shown on Figure 18. At one location of Bridge Street (Contract 8) the water main will be installed on a bridge that crosses a wetland area and the Herring River, therefore no construction will occur in that wetland area or within the river. Areas where water mains are to be placed cross country, e.g., off of roadways, to create looped connections in the distribution system are not located within wetland areas.

The water main installations are to be the subject of either Request for Determination or Notice of Intent filings with the Eastham Conservation Commission, who will further review any potential impacts to wetland resource areas. The Order of Conditions associated with any Notice of Intent approvals will include required controls to mitigate impacts. The anticipated mitigation measures are described in Section 9.

ACECs and Outstanding Resource Waters

Portions of the distribution system will be located on roadways that cross the Inner Cape Cod ACEC and Outstanding Water Resource Waters. The distribution system piping will not have any long-term impacts on these areas. There are a limited number of situations where cross-country mains are to be installed to create distribution system loops, none of which are to occur within the ACEC or the Outstanding Resource Water areas.

Historic and Archeological Impacts

The distribution system construction is not anticipated to have any impacts on state and federal-listed historic districts and structures within the Town because the water mains are to be installed in the roadway areas of these districts, which are to be restored after construction. Ongoing coordination with the Massachusetts Historical Commission and reviews by the Eastham Historic Commission will occur to

ensure that the construction activities will not affect these historic and archeological resources. Consultation and project review is also being requested of the Mashpee Wompanoag Tribal Council.

The water main on the section of Nauset Road within the National Seashore is an area designated as being archeologically significant. Consultation has been requested of the National Seashore to determine whether this area of Nauset Road has already received an archeological assessment. If not, the appropriate investigations are to be performed under the guidance of the National Seashore.

Construction (Short-Term) Impacts

Short-term impacts due to construction of the water mains are associated with the excavation activities to install the water mains, hydrants and service connections. The Contractor will be required to manage these activities by implementing appropriate erosion and sediment control measures, discussed in Section 9.

The construction activities will also result in temporary traffic impacts in the vicinity of the work zones on Route 6. A Traffic Management Programs is to be prepared, also discussed in Section 9 that is to be reviewed and approved by MassDOT prior to the construction activities commencing. All of the construction Contractors will be required to perform their construction activities on Route 6 in accordance with the requirements of this plan to mitigate effects on traffic conditions and to ensure public safety.

7.0 Greenhouse Gas Emissions Analysis and Energy Efficiency

A Greenhouse Gas (GHG) emissions analysis was prepared in accordance with the GHG Policy and Protocol of the Executive Office of Environmental Affairs (final version May 2010), and as required under the MEPA regulations. The MEPA office was consulted to discuss the appropriate approach for preparing this GHG analysis.

The baseline GHG emissions, expressed as tons per year of carbon dioxide (CO_2), are compared against GHG calculations of the energy demands of the proposed Eastham water system to quantify the reduction in GHG emissions, e.g., the overall energy benefit, of the project. The baseline GHG condition consists of the electrical demands and equivalent annual CO_2 emissions of the well pumps used at each of the private wells serving the 2,021 properties that are to be served by the Eastham water system. The proposed water system will change this baseline condition by having centralized wells and pumping systems at District G and NRHS, which will replace the electrical demands of the individual private wells.

The water supplies serving the Eastham water system will consist of a single well at District G and NRHS, each equipped with a 75 Hp motor. Each well field has a small, prefabricated building (11' x 26') used to house electrical panels and chemical conditioning equipment for water conditioning (pH adjustment and corrosion control). The electrical demands of the building are minor, consisting of lighting and small chemical metering pumps. The water supplies do not require water treatment, and there is no water treatment plant associated with the project. The use of the centralized pumps is the only significant source of energy demands that will measurably change the greenhouse gas emissions from the baseline condition.

The approach and assumptions used in this GHG analysis are the following:

- The GHG Policy defines motors as "indirect emissions" for electrical usage, and references the most recent ISO document for a conversion factor of average annual pounds of CO_2 emissions per Mwh/yr (1 lb CO_2 = 719 Mwh/year, from *2012 ISO New England Electric Generator Air Emissions Report*; ISO New England, Inc., System Planning, January 2014).

- Existing Conditions (Baseline):
  - The number of properties served by the water system is 2021. Approximately 30 of these are served by community non-transient water supplies, therefore the remaining 1,991 properties are served by individual wells.
  - The power usage of private, residential wells is 900 watts per pump, which are assumed to operate an average of 1.43 hours per day. The annual pump run time is therefore assumed to be 500 hours/year (350 active days/year)
  - The community well systems are assumed to have 3 horsepower pumps with the same run time as the residential wells.

- Design Conditions (Proposed Alternative):
  - The water demand of the existing system is 378,000 gpd, increasing to 415,000 gpd at build out. Because of the negligible difference in overall water demand, the future build-out demand was assumed.
  - The proposed infrastructure consists of two wells, each equipped with 75 horsepower motors.
  - The maximum pumping rate at the District G well is 691 gpm and at NRHS is 613 gpm.
  - The well pumps will use total motor horsepower when operating.
  - Water withdrawals will be split between the two well fields to meet the demands, therefore each well is withdrawing 207,500 gpd.

The GHG analysis is summarized in Table 7. The existing (baseline) condition of individual pumping systems serving the 2,021 properties comprising the proposed Eastham water system has a calculated CO_2 emission rate of 323 tons per year. Use of two centralized wells to replace these individual wells generates 75 tons CO_2 per year. The proposed water system will therefore result in a net reduction in CO_2 emissions of 248 tons per year.

Table 7. GHG analysis summary: reduction in greenhouse gas emissions by proposed water system.

Condition	CO_2 Emissions	
	lb/yr	tpy
Baseline	645,398	323
Proposed Water System	149,840	75
Reduction	**495,559**	**248**

A sensitivity analysis was conducted to estimate the reduction of CO_2 that would occur if some portion of the private wells do not connect to the municipal water system and remain in use. This analysis is summarized in Table 8.

Table 8. Sensitivity analysis of GHG reduction (CO_2 Tons/Year) if private wells remain in use.

Properties Connected to Water System	*Total CO_2 (Tons/Year)*	*Reduction in CO2 from Baseline Condition (Tons/Year)*
Existing (Baseline - 0%)	**323**	**0**
50%	199	124
60%	174	149
70%	150	173
80%	125	198
90%	100	223
100%	**75**	**248**

This analysis calculates the electrical demands of the private wells, with the corresponding reduction in the use of the public water supply wells at District G and NRHS (and therefore the electrical demand at these wells), for various rates of property connections to the municipal water system. In summary, if no properties are connected to the system (the existing, baseline condition) the electrical demands of the private wells will produce 323 tons per year of CO_2. This CO_2 production progressively reduces as the number of properties connecting to the system increases. At a 50% connection rate, the CO_2 production is 199 tons/year, a reduction of 124 tons from the existing condition. With all properties connected, the overall CO_2 production is 75 tons/year, a reduction of 248 tons/year.

Additional mitigation measures for reducing the overall CO_2 emissions as a result of the project are discussed in Section 9, and reflect those recommended in the May 2010 policy. These include the use of variable frequency drives on the pump motors, motion sensors on lighting and climate controls for the pump station buildings, and implementing a water conservation plan for the water system that will reduce overall water withdrawals and the electrical demands of the well field pumps.

The electric motors loads at the well field pump stations are the only pieces of equipment associated with the water system that produce measurable quantities of GHG emissions, therefore calculations for GHG

building loads from the small pump station buildings (11' x 28') for light and heat, which are unoccupied, were not calculated. To maximize the energy efficiency of these buildings they will utilize high R-value insulation in the walls and ceilings and high-efficiency T5 fluorescent or LED lighting will be provided with occupancy sensors. Natural daylight will be used wherever possible. The HVAC system for these building will also be high efficiency demand-controlled ventilation based on occupancy or air quality.

Renewable energy generation alternatives using solar photovoltaic systems or wind energy to offset the limited energy needs of the water system are not being considered at this time due to economic and timing restrictions for implementing this phase of the water system, but will be re-considered if the Town chooses the expand the system in the future. Eastham is committed to the use of renewable energy sources and recently, during the fall of 2014, put into operation a solar farm at the closed landfill. This solar farm consists of 2,500 panels that will produce an estimated 700,000 kilowatt hours each year to offset the Town's electrical demands. The offset of CO_2 emissions from this project is estimated to be 537 tons of CO_2 per year.

8.0 Statutory and Regulatory Standards and Requirements

8.1 Agency Coordination and Permitting

Eastham has had extensive involvement with federal, state, regional and local regulatory bodies since the late 1990s regarding the Town's water supply needs and alternatives evaluation. Specifically:

- Related to the permitting of the new water supply sites (District G and NRHS) that will become the water sources for Eastham's municipal water system, the DEP Bureau of Resource Protection, Drinking Water Division. The well fields have successfully received permit approvals through the progressive, multi-phase DEP permitting process of Site Exam, Pump Test Scope of Work and Pump Test approvals. The DEP approvals of the Pump Test Reports for District G and NRHS are provided in Appendix C.

- The Cape Cod Commission has worked as a partner with Eastham since 2005 in evaluating water supply alternatives for the Town, and provided guidance on the scoping and evaluations of the District G and NRHS water supplies. Prior to this during the 1990s the Cape Cod Commission played a significant role in the Lower Cape Water Management Task Force, of which Eastham was a member, a group that performed some of the initial evaluations of alternative water supply sites that could serve the Town. There have also been a number of coordination meetings over the last four months with the Commission regarding the Development of Regional Impact permitting.

- The Town has actively engaged the Cape Cod National Seashore as the new water supplies at District G, NRHS and District H were investigated, and solicited their input on the scope of the hydrogeologic investigations being performed. The Town has regularly met with the National Seashore since 2009 when these new source investigations were started to apprise them of the status of these investigations, and to review and discuss these findings with their Natural Resource and Planning staff.

- With regard to groundwater impacts from the landfill, the Town has worked closely with the DEP Solid Waste Division and DEP Waste Site Cleanup Division as the MCP-related investigations have been ongoing since the early 2000s.

- The Environmental Protection Agency, who has provided guidance and field support for the private well sampling program related to the MCP response actions of the landfill groundwater investigations.

- Consultation with NHESP is ongoing, as described in Section 5.5, to ensure that a prohibited "take" of Eastern Box Turtle is avoided at District G and NRHS, and that impacts to Common's Panic-grass at District G are avoided and minimized.

- Consultation with Massachusetts Historic Commission, the Eastham Historic Commission and the Cape Cod National Seashore is also ongoing to ensure that archeological and historic resources within the project area are avoided. Consultation is also being requested of the Mashpee Wompanoag and the Gay Head/Aquinnah Wompanoag tribal historic preservation offices.

- The Barnstable County Health Department, who provided input on the Town's wastewater facilities planning and water supply evaluations, participated in public education sessions for the community, and also supported the Town in their landfill groundwater investigations.

- Numerous sessions over the last several years by the Eastham Board of Selectmen to discuss the Town's water quality issues, and public information and outreach sessions to discuss municipal water supply concepts and alternatives for the Town. Multiple information sessions were held prior to each Town Meeting that included Warrant Articles for the municipal water system.

8.2 Applicable Statutory and Regulatory Standards and Requirements

Implementation of the Eastham water system, as authorized at their May 2014 Town Meeting, will require various approvals from following state agencies: Massachusetts Department of Environmental Protection, the Executive Office of Environmental Affair MEPA Unit, Massachusetts Department of Fisheries and Wildlife Natural Heritage and Endangered Species Program, and the Massachusetts Department of Transportation. Federal level permitting will be required from the Environmental Protection Agency through the NPDES program and from the Cape Cod National Seashore. Regional permitting will be required through the Cape Cod Commission. The local permitting needs are with the Eastham Conservation Commission and the Eastham Zoning Board of Appeals.

Since the May 2014 Town Meeting the Town and Environmental Partners Group, the Towns engineer of record for the project, have held several coordination and pre-application meetings with these agencies. A listing of the specific permitting needs for the project and their status is provided in Table 9.

TABLE 9. PROJECT PERMIT REQUIREMENTS FOR EASTHAM WATER SYSTEM.

Permit	Status
1. State Permits	
Department of Environmental Protection	
Water Withdrawal Permit (BRP WM 03)	Submitted September 14, 2014
Approval to Construct Water Supply (BRP WS 20)	To be submitted January 2015
Drinking Water System (BRP WS 32)	To be submitted Winter - Spring 2015
Executive Office of Environmental Affairs – MEPA	
Expanded Environmental Notification Form	Submitted October 15, 2014. Secretary's Certificate received November 26, 2014 that allows a Single EIR.
Single Environmental Impact Report	Submitted December 15, 2014.
Massachusetts Department of Fisheries & Wildlife, NHESP	
MESA Project Review	Project Review Request submitted October 2014. NHESP issued response letters on November 18, 2014 and December 4, 2014. Most areas of the distribution system are exempted from MESA review. MESA coordination is ongoing for proposed activities at District G and NRHS.
Massachusetts Department of Transportation	
State Highway Access Permit	Pre-application meeting held Aug 2014. Design review meeting held November 2014. Permit application to be submitted February 2014.
2. Federal Permits and Notices	
Department of Interior, Cape Cod National Seashore	
Special Use Permit and Right of Way Permit	Permits are for construction maintenance access in portions of Nauset Rd and Cable Rd located in the Seashore. Consultation meetings held with Seashore.
Environmental Protection Agency	
NPDES	To be filed by Construction contractors
Federal Aviation Administration	
Notice of Proposed Construction - Off Airport	Notice filed with FAA on December 11, 2014 and assigned Aeronotical Study Number 2014-ANE-2365-OE.
3. Regional Permits	
Cape Cod Commission	
Development of Regional Impact (DRI)	Several Consultation/coordination meetings held between July – November 2014. Joint Review with MEPA EIR to be requested. Initial public meeting to be held in January 2015, and the DRI hearing to be held in early February 2015.
3. Regional Permits	
Eastham Conservation Commission	
Request for Determination of Applicability (RDA)	RDA for Contracts 3 and 4 approved Nov. 25, 2014.
Notice of Intent	NOIs to be submitted for Contracts 5, 6, 7 and 8
Eastham Zoning Board of Appeals	For water storage tank in District G. Hearing to be held early January 2015.

8.3 Requests for Funding Assistance

Eastham has or will be requesting funding assistance from the following government agencies:

- DEP Drinking Water State Revolving Fund (SRF). The Project Evaluation Form was submitted to DEP on August 14, 2014. The SRF-eligible costs for which funding assistance was requested is $45.5 Million. The project is listed as the #2 priority project on the draft Intended Use Plan for the Clean Water Program.

- USDA- Rural Development Program. Funding support is being requested for the non-SRF eligible costs.

8.4 Other Coordination Related to Distribution System Installation

Implementation of the Eastham Water System will also require coordination with the following parties:

- Orleans. Eastham is requesting that they be allowed to install a looped connection of their distribution system through Orleans that would connect the terminus of Eastham's system on Route 6 to the terminus on Bridge Road. The purpose of this loop is to provide redundancy to Eastham's system and would be independent of Orleans' water system. Should a water main break occur in the transmission mains serving the Eastham system that would otherwise be dead ends without the loop, the loop provides the ability to continue delivering water to those services that are on the "downstream side" of the break. This is a standard practice in all water systems where adjoining water systems exist.

  Eastham is also continuing to discuss an interconnection between the Orleans water system and the Eastham water system. Eastham has stated that the decision on whether to have an interconnection between the two water systems is a voluntary one by Orleans.

  These requests were considered by Orleans at a joint meeting of their Board of Selectmen and Sewer Commissioners during October. Following this, Orleans issued a letter dated October 27, 2014 to the Eastham Board of Selectmen requesting clarifying information on these requests. Eastham provided responses to these questions in a letter issued in early December 2014.

  These discussions with Orleans are therefore ongoing. If these requests are approved by Orleans then an appropriate arrangement between the two communities will be formalized.

- Wellfleet. The northernmost area of the distribution system consists of a transmission main that is proposed to be located through the Town of Wellfleet. The Eastham Board of Selectmen is considering alternative layouts that would avoid the need to locate the transmission main piping in Wellfleet. If the decision is to proceed with looping the system through Wellfleet, discussions are to be held between the Boards of Selectmen for each community. It is anticipated that Eastham will make a final decision on the routing of this area of the water main in October or November 2014.

- Nauset Regional School District. The transmission main connecting the NRHS well field to Cable Road is to be located within an easement running through NRHS property. This easement request has been approved by the Nauset Regional School District, and the easement documentation for this easement has been prepared.

- Department of Conservation and Recreation. A small portion (approximately 200 feet) of the transmission main from the District G storage tank to the District G well field is to be placed on Department of Conservation and Recreation (DCR) property. Eastham currently has an easement with DCR on the southern end of District G that provides access to the Town's property used for DPW storage, and that is the site of the proposed District G storage tank. Eastham is requesting an easement extension from DCR for this purpose.

- Easements within Subdivisions. Many of the roadways in Contract 4 of the distribution system (Landfill Area – Side Roads) are privately owned. There also are a limited number of private roads in Contract 7 and 8 (transmission mains west of Route 6) that are also private. The Board of Selectmen, in coordination with their legal counsel, will be implementing easement actions on these private roads that will provide permanent access to the Town for installing and maintaining these water mains.

- Easements with Individual Property Owners. Easements with individual property owners will be required at locations where the transmission mains are being routed cross-country to make looped connections with the distribution system or where pits for directional drilling for water mains are to be installed. The specific locations of these easement needs are being identified as part of the distribution system design.

9.0 Mitigation Measures

This Section provides a description of proposed management techniques that will either result in positive, long-term benefits as a result of the project, or that are planned to avoid, minimize or mitigate short-term (construction-related) impacts. Where applicable, alternatives to these mitigation measures are also discussed together with the reasons for selecting the proposed approach.

9.1 Positive, Long Term Impacts of the Water System

The Eastham water system will provide positive human health and environmental benefits to the community for several reasons:

- The previous sections of this report describe the progressive deterioration in the quality of private drinking water supplies in the Town that has been documented over a period of over twenty years. The Town recognizes the importance of developing a municipal water system and has made it a top priority in their community planning, and at their May 2014 Annual Town Meeting voted overwhelmingly to authorize the limited system that is proposed. This water system will provide a high quality and reliable source of drinking water for approximately one-third of the community, including its main commercial corridor on Route 6. Should the Town choose to expand the system to include some or all of the other properties in the community, the distribution system transmission mains are sized to meet this need.

- The water system will also provide improved fire protection for the Town. Whereas the Town currently relies on pumper trucks supplied by ponds or small buried tanks for fire protection, the water system will provide significantly improved fire protection and fighting capabilities. 80% of the Town's properties will be located within ½ mile of the distribution system hydrants as a result of the project.

- The water system will consistently provide high quality water. The system will be required to operate in accordance with the standards and guidelines of the DEP Drinking Water Regulations (310 CMR 22.00). These regulations "ensure that the drinking water delivered by public water systems in Massachusetts is fit and pure according to national and state standards." It requires that water supplies be routinely sampled and analyzed for a comprehensive list of public health and aesthetic water quality parameters, and the system operations and water quality are closely monitored by DEP.

- The Town will be implementing a comprehensive program of water conservation measures as part of the water system operations, and as part of requirements of the DEP Water Withdrawal Permit. The Water Withdrawal permit includes a Water Conservation Questionnaire for Public Water Suppliers (Massachusetts Water Resources Commission, Revised, March 2008), which uses the Massachusetts Water Conservation Standards issued by the Water Resources Commission as guidance. Because the Town does not yet have a municipal water system, most of the items requested in the Water Questionnaire, including various plans and systems targeted toward water conservation practices, have not yet been developed. The Town intends to have these Plans and programs developed prior to when the water system operations are to commence in 2016. These include:
    - A Drought Management Plan that follows AWWA guidance and includes a seasonal demand management strategy that is consistent with those of similar water systems on Cape Cod.
    - An Emergency Management Plan
    - A written Conservation Plan that addresses conditions associated with the Water Withdrawal permit the Town is to receive and the 2012 Water Conservation Standards and that includes a public education and outreach program to encourage water conservation.

In addition, the Town intends to take the following actions with respect to their water conservation practices:

- Regularly scheduled (annual or bi-annual) leak detection surveys.
- Metering of all water system connections
- Implementation of a water meter repair and replacement policy
- Programs for calibrating meters and sealing them for tamper protection
- Establishing a water pricing structure that includes the full cost of operating, maintaining and protecting the water system. A rate evaluation is expected to be conducted periodically, and at a minimum of every five years.
- Implementing a comprehensive residential water conservation program with the goal of achieving a 65 residential gallon per capita per day (rgpcd) use standard, consistent with DEP's goals under the Sustainable Water Management Initiative.
- Encourages the use of water-efficient plumbing fixtures.

- Manages municipal and industrial water usage, requiring compliance with plumbing codes and encourages the use of best available technologies for water conservation
- Implementation of a public education and outreach program that encourages water conservation.

- The two well fields serving the water system at District G and NRHS will replace the private drinking water supply wells for the properties connected to the system, resulting in an overall reduction in electrical demand and greenhouse gas emissions. These pumping systems will also be equipped with variable frequency drives (VFDs), and the pump stations will be equipped with automatic, motion-detection lighting. Both of these are additional measures intended to reduce the overall carbon footprint of the well fields

9.2 Long-Term Mitigation Measures

The following measures are to be undertaken to ensure the quality of the Town's natural resources for the long-term protection of the water supplies, and that operation of the water system does not adversely impact these resources.

Well Head Protection and Security

The District G and NRHS well fields have DEP-approved Zone I well head protection areas that are protected by existing zoning under the Eastham Zoning Bylaws (*Water Resource Protection District G* and *Seashore Protection District F*, respectively). This zoning will ensure the long-term protection of these well fields.

The District G and NRHS well fields will have security measures in place to further ensure their long-term protection. The access roads are to be gated and locked, and the production wells will have chain link enclosures. The well fields will also be continually monitored via an electronic SCADA system that will provide real time information on the status of the well field operations and pump station security.

Aquifer and Surface Water Monitoring

The DEP-permitted yield of the District G and NRHS well fields is based on withdrawal rates that are protective of the aquifer. Determination of the maximum sustainable withdrawal rates was based on predictive groundwater modeling simulations for a 100-year period of water withdrawals at those approved pumping rates. A detailed description of the hydrogeologic investigations and groundwater modeling performed to identify the appropriate yields for each well field are described in the *DEP Pumping Test Report, Nauset Regional High School* (December 2011) and *DEP Pumping Test Report,*

Water Resource Protection District G (April 2012). The Executive Summaries of these two reports are provided in Appendix G.

The actual average annual pumping rates for District G and NRHS are anticipated to be approximately 25% of the DEP-permitted pumping rate, and are therefore very protective of the aquifer. These hydrogeologic evaluations also concluded that water withdrawals at District G and NRHS had no discernible impact on wetland resource areas or Hatches Creek, located approximately 2,300 feet north of the District G water supply well.

In accordance with DEP's recommendation in their New Source Approval letter for District G, the Town will monitor water levels at Hatches Creek to determine whether operational conditions, e.g., modulating pumping activities at District G during low water periods, are warranted. The scope of this monitoring program will be coordinated with DEP and the Cape Cod Commission. Initial discussions on this monitoring program have been held with the staff of the Cape Cod Commission and the following general approach was developed:

- the objective of the monitoring program is to collect surface water and groundwater elevations in and the area in the vicinity of Hatches Creek.
- Existing monitoring wells, piezometers and staff gauges installed as part of the pump test activities for District G will be utilized to the extent possible. The following locations are targeted for this monitoring network:
    - Monitoring well OW-4, a shallow monitoring well located in the northern area of District G approximately 2,000 feet from the production well
    - A staff gauge/piezometer couplet in the upper reaches of Hatches Creek on the west side of the DCR rail trail ((HC-P2), located approximately 2,300 feet north of the test production well
    - A staff gauge/piezometer couplet in Hatches Creek immediately west of Route 6, approximately 2,600 feet northwest of the production well.
- Final selection of the monitoring network will be made after further consultation with the Cape Cod Commission.
- The monitoring wells, piezometers and staff gauges will be re-surveyed for top-of-casing elevation and equipped with data loggers that will continuously record water elevations. The data loggers are to be downloaded semi-annually and compiled into spreadsheets.
- The monitoring program is to commence a minimum of one year before the start of District G well field operations to provide a baseline condition of surface water and groundwater conditions.

After the one year of baseline monitoring data has been collected and compiled, this information will be reviewed with the Cape Cod Commission staff to refine the monitoring network and monitoring activities.

The final scope of work for this Hatches Creek monitoring program will be prepared with additional consultation from the Cape Cod Commission and is to be reviewed and by the Commission prior to it being implemented.

9.3 Short-term (Construction-Related) Mitigation Measures

Measures for minimizing or mitigating impacts associated with the construction activities associated with the project, and are therefore short-term impacts, are described below.

Wetland Resources

There are no wetland resource areas at the District G well field, District G storage tank, or the NRHS well field sites. None of the distribution system piping is to be located within bordering vegetated wetland areas, however there are a limited number of locations where water mains may be located within the 100-foot buffer zones of these vegetated wetland areas. No bordering vegetated wetlands will be altered due to construction activities associated with the water main replacement. At one location of Bridge Street (Contract 8) the water main will be installed on a bridge that crosses a wetland area, therefore no construction will occur in that wetland area. After water main installation the roadways will be restored to the existing drainage patterns.

Water main construction within the buffer zones of Bordering Vegetated Wetlands will be performed in accordance with the Notice of Intent Order of Conditions for the project by the Eastham Conservation Commission. Environmental protection measures for erosion and sediment control are to be installed and maintained by the construction contractor, and these controls will be inspected and maintained daily during the construction period by the Town's representative overseeing the construction. Details of these erosion and sediment control measures are shown on the detail sheets of the preliminary design for Contract 3 (Appendix E). These measures include:

- Erosion and sedimentation control devices (i.e. filter sock) will be installed along the road edge within the 100' Wetlands Buffer Zone. These filters sock will control sedimentation and erosion from the upland areas and also serve to define the upland limits of work.

- If during construction dewatering of a trench is required to install the water main, the pumped water will pass through silt socks before being discharged.

- Silt sacks will be installed in each catch basin to avoid transmission of sediment to downstream wetland resource areas.

- Stockpiles of aggregate materials (gravel, sand, and stone) will not be maintained at the construction work zone. Materials will be delivered on an as-needed basis. Any unsuitable material excavated will be stockpiled separately of all other construction materials and will be placed on a plastic liner with hay bales or filter sock surrounding the stockpile.

- During construction, disturbed areas will be kept to a minimum, and all disturbed areas adjacent to the Work will be stabilized restored to their pre-construction condition with pavement or loamed and seeded after construction.

- The Contract Documents for the project will require that Contractors use Ultra Low Sulfur Diesel Fuel (ULSD) for their motorized equipment in accordance with EPA's guidelines, and which is also a requirement for projects receiving funding through the Massachusetts State Revolving Fund. Contractors will also be required that their equipment comply with the anti-idling provisions of 310 CMR 7.11.

Endangered Species

NHESP's response to the MESA Project Review Request, dated December 4, 2014 and a copy of which is provided in Appendix H, concludes that the distribution system within 10' of paved roads are exempted from MESA review, and that work on unpaved roads for installation of the distribution system will not result in a prohibited "take" of state listed rare species.

Portions of the project, specifically the District G area where the storage tank, well field and associated transmission mains, and the well field and transmission main at District H are located within the mapped priority habitat of the Eastern Box Turtle (*Terrapene Carolina*) and Common's Panic-grass (*Dichanthelium ovale* ssp *pseudopubescens*), state listed as "Species of Concern". To avoid a prohibited take of the Eastern Box Turtle a Turtle Protection Plan is to be submitted to NHESP for review and approval prior to the start of any construction activities. A botanical survey for Common's Panic-grass within all suitable habitat area for this species is to be performed to identify where it is present and to develop design and construction approaches that will avoid and minimize impacts to this species. Eastham will therefore continue to coordinate with NHESP on these rare species issues. Eastham will continue to coordinate with NHESP to ensure that these requirements are met prior to the start of any construction activities.

Invasive Species

A plan for control of invasive species, where such species are present within the limits of the project, is to be prepared in accordance with the Cape Cod Commission's Development of Regional Impact requirement.

This plan will be prepared in accordance with the Cape Cod Commission's Technical Bulletin 01-001 – Development of Regional Impact Guidelines for Invasive Plant Species Management Plan for review and approval by the Commission prior to the start of any construction activities. This Plan will become part of the Contract Documents that construction contractors will be required to perform to.

It is anticipated that invasive species management practices will be required in those areas of the project where the construction activities are located off of paved areas, e.g., the District G well field and storage tank and the transmission mains in that area, and the NRHS well field. Coordination with the Cape Cod Commission will continue to identify the area where invasive species are present, the specific species of concern, and the appropriate Best Management Practices to be applied.

ACECs and Outstanding Resource Waters

The Inner Cape Cod Bay ACEC and the areas designated as Outstanding Resource Areas in Eastham, which consists of the Inner Cape Cod Bay ACEC and land within the boundaries of the National Seashore (see Figures 18 and 19, respectively), are recognized as being sensitive environmental areas. Additional oversight will be provided as construction activities are ongoing within these areas to ensure that no adverse impacts occur as a result of these activities.

Cultural and Historical Resources

The portions of the distribution system being installed in areas of archeological sensitivity and in the vicinity of historic resources are being reviewed with the Massachusetts Historic Commission, the Eastham Historic Commission and the Cape Cod National Seashore to ensure that impacts to these resources are avoided. Consultation is also being requested of the Mashpee Wompanoag and the Gay Head/Aquinnah Wompanoag tribal historic preservation offices.

Traffic Management

The District G and NRHS well field sites and the District G water storage tank are located remotely from roadways and therefore will not have any adverse short-term impacts on roadways and traffic.

The water main installation program will be taking place on Eastham's primary and secondary roads, and managing traffic conditions in the work zone of the construction activities will be a high priority, particularly on State Highway Route 6. Alternative construction methods for installing the water mains, consisting of open trenching or directional drilling techniques, are being considered as part of the water system design to select the method in each of the Contract areas that will allow for the greatest productivity rate by the Contractor and therefore minimizes the duration of the construction activities within the roadways.

Traffic management is to be closely coordinated with the Eastham Department of Public Works, Eastham Police Department, MassDOT, the Town's engineer and the construction Contractor. A Traffic Management Plan is to be prepared for each of the distribution system Contract Areas that is intended to allow for efficient flow of traffic through the work zone while maintaining the safety of the public and construction-related personnel. Environmental Partners Group, the Town's design engineer for the water system, will develop the minimum requirements of the traffic management plans that are to be included with the Contract Documents. The construction contractor for each Contract Area will be required to prepare the Traffic Management Plan for his work areas, and the Plan is to be reviewed and approved by the engineer prior to construction activities being initiated. The roadway construction activities and detour routes are to be closely coordinated with the Town to ensure that traffic conflicts are minimized and detour routes do not conflict with other construction work zones.

Construction within Route 6 will be performed in accordance with the conditions of the MassDOT State Highway Access Permit. Based on MassDOT permit approvals for similar water main construction in state highways, these conditions are expected to include:

- A Traffic Management Program be developed for each Contract Area, as described above.

- The contractor will be responsible for establishing and maintaining the traffic signage around the work zone each day.

- The requirement that trenches or excavations be securely plated or asphalt patched at the end of each construction day. For this reason, time restrictions will apply to when construction activities can occur only when asphalt batching plants are open and asphalt hot mix can be delivered to the construction site (generally between April 1st and November 15th. These time periods can be modified depending on actual weather conditions.

- Construction activities will not be allowed during the summer tourism season, being approximately Memorial Day to mid-September.

- There will be restrictions on the periods of the day that when work can be performed. These periods will be described in the State Highway Access permit approval.

Solid and Hazardous Waste

No hazardous waste is to be generated by the construction activities. Material excavated for the water main installations are to be returned to the trench if the material is suitable and meets the requirements of the technical specifications. Asphalt will be segregated and recycled. All other material not recycled will be disposed of in accordance with the Massachusetts. Solid Waste Regulations (310 CMR 19.00) and the waste ban plans described therein.

10. Proposed Section 61 Findings

As required by the Secretary's Certificate on the Expanded ENF, this Section provides a consolidated overview of the proposed mitigation and other environmental and community benefits proposed in order to minimize potential impacts from the proposed water system. A draft template for Section 61 Findings is also provided pursuant to the Secretary's Certificate and in accordance with MGL Chapter 30, Section 61 that states: "Any determination made by any agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all reasonable measures have been taken to avoid or minimize said impacts." Draft 61 Findings are provided for those issues that are within the scope of this Single EIR, including the following state agencies, actions and/or statutory requirements:

- Massachusetts Department of Environmental Protection
  - Water Withdrawal Permit (BRP WM03)
  - Approval to Construct Water Supply Source) > 70 gpm (BRP WS20)
  - Drinking Water Systems that Serve > 3,300 people (BRP WS32)
- Massachusetts Department of Transportation – State Highway Access Permit
- Massachusetts Division of Fish & Wildlife, Natural Heritage and Endangered Species Program (NHESP) Massachusetts Endangered Species Act (MESA) – "No Take" Determination.

A proposed mitigation plan is provided in Table 10 (next page) and draft Section 61 Findings are provided for each anticipated State agency permit.

Table 10. Summary of Proposed Mitigation Measures.

Category	Impact	Mitigation Measures
Water Management Act	Replacing private wells for water supply with the public water supply wells at District G and NRHS.	The mitigation requirements for water withdrawals from the Nauset lens will be determined as part of the DEP Water Management Act permit renewals , which for water systems within the Cape Cod Basin is scheduled for November 2015. Through consultation with DEP and as part of the renewal for Eastham's pending DEP Water Withdrawal Permit , the need for and the appproach forproviding offsetting measures to the Town's water withdrawals will be determined. If required, the alternative measures to be considered for meeting the mitgation =goals will include include water conservation programs, additional infiltration measures, and others.
Water Withdrawals	Water demands of the municipal water system.	In coordination with DEP and in accordance with DEP'sregulations, policies and guidelines, reduce water demands through conservation measures to include a drought management plan, emergency management plan, annual leak detection surveys, metering of all connections,use of water-efficient fixtures, and public education.
Aquifer Protection	Threats to contributing areas to the water supply wells (DEP Zone II) at District G and NRHS.	Implement wellhead protection zoning controls for those areas of the District G and NRHS sites that lie outside the Cape Cod National Seashore and not covered by the Town of Eastham's Water Resource Protection District G. Use best efforts to have the Town of Wellfleet institute appropriate wellhead protection zoning or non-zoning controls for those area of the District G site Zone II within the Town of Wellfleet that lie outside the Seashore.

Surface Water Elevation Monitoring	Water level drawdowns in response to groundwater withdrawals from the District G public water supply well.	With consultation of the Cape Cod Commission, implement a surface water elevation monitoring program at Hatches Creek to determine whether the well field operations are impacting water elevations in the Creek, and whether the well field operations (e.g., withdrawals at the District G and NRHS well fields) should be adjusted to mitigate water level drawdown effects in the Creek.
Wetlands and Wetland Buffer Zones	Temporary alteration of roads within the buffer zone of wetlands at a limited number of locations during construction of the distribution system.	Seek Eastham Conservation Commission Request for Determination of Applicablilty (RDA) or Notice of Intent (NOI) for all areas where construction activities occur within buffer zones. Restore the buffer zones in situ to pre-existing conditions. Work performed in these areas is to be performed in accordance with conditions associated with the RDA and NOI, and will include requirements for the installation and maintenance of erosion and sediment controls by the construction contractor.
Rare Species	Portions of District G and NRHS are within the mapped priority habitat of the Eastern Box Turtle (Terrapene Carolina) and Common's Panic-grass (Dichanthelium ovale ssp pseudopubescens), state listed as "Species of Concern".	To avoid a prohibited take of the Eastern Box Turtle a Turtle Protection Plan is to be submitted to NHESP for review and approval prior to the start of any construction activities. A botanical survey for Common's Panic-grass within all suitable habitat area for this species is to be performed to identify where it is present and to develop design and construction approaches that will avoid and minimize impacts to this species. In consultation with NHESP, develop and implement avoidance and minimization measures to avoid species impacts through contractor awareness programs and construction phase monitoring.
Invasive Species	Potential impacts to vegetated areas of invasive species are introduced or exhibit aggressive growth.	In coordination with the Cape Cod Commission, implement an Invasive Species Control and Management Plan.

Traffic Management	Traffic impacts at construction zones on Route 6.	Work period time restrictions on Route 6: construction activties will not be allowed to occur during peak summer tourism (Memorial Day through Labor Day) periods; during other periods of the year construction is to occur outside the peak traffic periods of the morning and evening. No work is to be performed during other periods of the year when asphalt is not available for temporary trench paving.
Roadway Restoration	Temporary disruption of roadway areas.	Construction trenches within roadway areas will be securely plated or backfilled at all times when construction is not occuring. Trench areas are to receive temporary asphalt paving before the start of each weekend. Final restoration of roadway areas is consist of milling existing paving to the width of the travel lane in which the trench was installed and returning the ashphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditons.
Traffic Management and Safety	Traffic movement and safety around construction work zones on Route 6.	The construction acitivities on Route 6 are to performed in accordance with a Traffic Management Plan, to be reviewed and approved by MassDOT prior to working within the roadway. The plan is to include information pertaining to signage, traffic ontrol device placement and police details. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress to all public and private roads and drives is to be provided 24 hours per day.
Historic and Cultural Resources	Potential impacts to significant historic and cultural resources	Through pre-construction coordination with Massachusetts Historical Commission, the Cape Cod National Seashore and the Eastham Conservation Commission, avoid impacts to identified sites.
Construction Equipment	Diesel emmissions from construction vehicles and equipment.	Construction contractors will be required to use Ultra Low Sulfer Diesel Fuel for their construction equipment.

Archeological Resources	Potential impacts to significant archeological resources	Coordinate with Massachusetts Historical Commission and the Cape Cod National Seashore to identify arecheologically sensitve areas. Avoid and minimize impacts to archeological resources by performing pre-construction surveys as appropriate, contractor awareness programs, and construction phase monitoring.
Greenhouse Gas Emissions	Electrical energy demands of the pumps for the private wells within the service area for the municipal water system.	Connnection of properties to the municipal water system, and reducing the number of private well operations and their related electrical demands with the two pumping systems at the District G and NRHS well fields, will provide an overall reduction in GHG emmission. The potenial reduction in GHG emmissions of up to 248 tons/year of CO_2 is estimated if all properties connect to the municipal water system.
Energy Efficiency	Electrical demands of the pumping system	The pumps and motors for the production wells at District G and NRHS will be premium efficiency and sized for their anticipated loads. The pumping systems will be equipped with variable frequency drives to enhance their efficiency.
ACEC - Inner Cape Cod Bay	Construction activities within the area designated as the Inner Cape Cod Bay ACEC.	Construction activities are to be limited to roadway areas and their rights-of-way within the ACEC. Provide oversight of construction activities to ensure that no adverse impacts occur as a result of the construction.
Hazardous Waste Managememt	Potential for encountering contaminated soils during the construction activities.	Manage the excavation and disposal of contaminated soils in accordance with the MCP and under the oversight of an Licensed Site Professional.

Executive Office of Energy and Environmental Affairs
Massachusetts Department of Environmental Protection
Division of Water Supply

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Eastham Water System
Project Location: Eastham, Massachusetts
Project Proponent: Town of Eastham
EEA Number: 15273

Permit: Water Withdrawal Permit (BRP WM03)
Approval to Construct Water Supply Source) > 70 gpm (BRP WS20)
Drinking Water Systems that Serve > 3,300 people (BRP WS32)

Project Description: The Eastham Water System project consists of the construction of a municipal water system. The project will provide water service to approximately one-third of the properties in the Town (2,021 properties) located in the vicinity of the former town landfill and to properties abutting transmission mains throughout the Town that are the "backbone" for a town-wide water system, should the Town choose to expand the system in the future. The water demand for the proposed system currently averages approximately 378,000 gallons per day (gpd). The water system will provide property owners with the opportunity to replace their private drinking water supplies, many of which have degraded water quality due to leachate discharges from the landfill or from septic system discharges. The water system is designed with sufficient capacity in the distribution system to support future expansion to the remainder of the town.

The project includes the following components:

- Two water supply wells (District G and Nauset Regional High School) that have previously received DEP New Source permit approvals and that have a combined permitted withdrawal rate of up to 1,878,00 gallons per day.
- A small (11' x 28') pump station building at each well field to house pump controls and water conditioning chemicals and equipment.
- A water storage tank with a 750,000 gallon capacity that is 130' high.
- 45 miles of distribution system piping
- Fire hydrants associated with the distribution system that will provide fire protection to approximately 80% of the Town.

MEPA History: The MEPA review was initiated on October 14, 2014 with the filing of an Expanded Environmental Notification Form (ENF) that was noticed in the October 20, 2014 edition of the Environmental Monitor. A Single Environmental Impact Report (EIR) was requested by the town of Eastham, and the Expanded ENF was allowed an extended comment period. The Secretary issued a Certificate on November 26, 2014 that allows the Single EIR. The Single EIR was submitted on December 16, 2014.

Project Impacts and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the well fields, storage tank and distribution system for the Project, and the water withdrawals at the two well fields that will serve the water system.

Table A. Summary of Water Withdrawal Mitigation.

Category	*Impact*	*Mitigation Measures*
Water Management Act	Replacing private wells for water supply with the public water supply wells at District G and NRHS.	The mitigation requirements for water withdrawals from the Nauset lens will be determined as part of the DEP Water Management Act permit renewals , which for water systems within the Cape Cod Basin is scheduled for November 2015. Through consultation with DEP and as part of the renewal for Eastham's pending DEP Water Withdrawal Permit , the need for and the appproach forproviding offsetting measures to the Town's water withdrawals will be determined. If required, the alternative measures to be considered for meeting the mitgation =goals will include include water conservation programs, additional infiltration measures, and others.
Water Withdrawals	Water demands of the municipal water system.	In coordination with DEP and in accordance with DEP'sregulations, policies and guidelines, reduce water demands through conservation measures to include a drought management plan, emergency management plan, annual leak detection surveys, metering of all connections,use of water-efficient fixtures, and public education.
Aquifer Protection	Threats to contributing areas to the water supply wells (DEP Zone II) at District G and NRHS.	Implement wellhead protection zoning controls for those areas of the District G and NRHS sites that lie outside the Cape Cod National Seashore and not covered by the Town of Eastham's Water Resource Protection District G. Use best efforts to have the Town of Wellfleet institute appropriate wellhead protection zoning or non-zoning controls for those area of the District G site Zone II within the Town of Wellfleet that lie outside the Seashore.
Surface Water Elevation Monitoring	Water level drawdowns in response to groundwater withdrawals from the District G public water supply well.	With consultation of the Cape Cod Commission, implement a surface water elevation monitoring program at Hatches Creek to determine whether the well field operations are impacting water elevations in the Creek, and whether the well field operations (e.g., withdrawals at the District G and NRHS well fields) should be adjusted to mitigate water level drawdown effects in the Creek.

Findings: Based in its review of the MEPA documents, the permit application, public comments, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. DEP will include appropriate conditions associated with this Section 61 Finding in the Water Withdrawal permit, the Approval to Construct a Water Source > 70 gpm permits for District G and NRHS well fields, and for the Drinking Water Systems that Serve > 3,300 people permit.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY **DATE**

Massachusetts Department of Transportation

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Eastham Water System
Project Location: Eastham, Massachusetts
Project Proponent: Town of Eastham
EEA Number: 15273

Permit: State Highway Access Permit

Project Description: The Eastham Water System project consists of the construction of a municipal water system. The project will provide water service to approximately one-third of the properties in the Town (2,021 properties) located in the vicinity of the former town landfill and to properties abutting transmission mains throughout the Town that are the "backbone" for a town-wide water system, should the Town choose to expand the system in the future. The water demand for the proposed system currently averages approximately 378,000 gallons per day (gpd). The water system will provide property owners with the opportunity to replace their private drinking water supplies, many of which have degraded water quality due to leachate discharges from the landfill or from septic system discharges. The water system is designed with sufficient capacity in the distribution system to support future expansion to the remainder of the town.

The project includes the following components:

- Two water supply wells (District G and Nauset Regional High School) that have previously received DEP New Source permit approvals and that have a combined permitted withdrawal rate of up to 1,878,00 gallons per day.
- A small (11' x 28') pump station building at each well field to house pump controls and water conditioning chemicals and equipment.
- A water storage tank with a 750,000 gallon capacity that is 130' high.
- 45 miles of distribution system piping
- Fire hydrants associated with the distribution system that will provide fire protection to approximately 80% of the Town.

MEPA History: The MEPA review was initiated on October 14, 2014 with the filing of an Expanded Environmental Notification Form (ENF) that was noticed in the October 20, 2014 edition of the Environmental Monitor. A Single Environmental Impact Report (EIR) was requested by the town of Eastham, and the Expanded ENF was allowed an extended comment period. The Secretary issued a Certificate on November 26, 2014 that allows the Single EIR. The Single EIR was submitted on December 16, 2014.

Project Impacts and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the distribution system for the Project that will be located within the right-of-way for State Highway Route 6.

Table A. Summary of Transportation- Related Mitigation Measures.

Category	Impact	Mitigation Measures
Traffic Management	Traffic impacts at construction zones on Route 6.	Work period time restrictions on Route 6: construction activties will not be allowed to occur during peak summer tourism (Memorial Day through Labor Day) periods; during other periods of the year construction is to occur outside the peak traffic periods of the morning and evening. No work is to be performed during other periods of the year when asphalt is not available for temporary trench paving.
Roadway Restoration	Temporary disruption of roadway areas.	Construction trenches within roadway areas will be securely plated or backfilled at all times when construction is not occuring. Trench areas are to receive temporary asphalt paving before the start of each weekend. Final restoration of roadway areas is consist of milling existing paving to the width of the travel lane in which the trench was installed and returning the ashphalt grades and roadway structures to existing grades. Traffic safety lines and pavement markings will be restored to existing conditons.
Traffic Management and Safety	Traffic movement and safety around construction work zones on Route 6.	The construction acitivities on Route 6 are to performed in accordance with a Traffic Management Plan, to be reviewed and approved by MassDOT prior to working within the roadway. The plan is to include information pertaining to signage, traffic ontrol device placement and police details. Two-way traffic is to be maintained at all times and managed so that motorists travel delay is minimized. A safe means of access and egress to all public and private roads and drives is to be provided 24 hours per day.

Findings: Based in its review of the MEPA documents, the permit application, public comments, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. The MassDOT will include appropriate conditions associated with this Section 61 Finding in the State Highway Access permit to be issued by the Department.

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

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BY **DATE**

Executive Office of Energy and Environmental Affairs
Division of Fisheries and Wildlife

Massachusetts Natural Heritage and Endangered Species Program

Draft Findings Pursuant to MGL Ch 30, Section 61

Project Name: Eastham Water System
Project Location: Eastham, Massachusetts
Project Proponent: Town of Eastham
EEA Number: 15273

Permit: Massachusetts Endangered Species Act Program (MGL c.131A; 321 CMR 10.00)

Project Description: The Eastham Water System project consists of the construction of a municipal water system. The project will provide water service to approximately one-third of the properties in the Town (2,021 properties) located in the vicinity of the former town landfill and to properties abutting transmission mains throughout the Town that are the "backbone" for a town-wide water system, should the Town choose to expand the system in the future. The water demand for the proposed system currently averages approximately 378,000 gallons per day (gpd). The water system will provide property owners with the opportunity to replace their private drinking water supplies, many of which have degraded water quality due to leachate discharges from the landfill or from septic system discharges. The water system is designed with sufficient capacity in the distribution system to support future expansion to the remainder of the town.

The project includes the following components:

- Two water supply wells (District G and Nauset Regional High School) that have previously received DEP New Source permit approvals and that have a combined permitted withdrawal rate of up to 1,878,00 gallons per day.
- A small (11' x 28') pump station building at each well field to house pump controls and water conditioning chemicals and equipment.
- A water storage tank with a 750,000 gallon capacity that is 130' high.
- 45 miles of distribution system piping
- Fire hydrants associated with the distribution system that will provide fire protection to approximately 80% of the Town.

MEPA History: The MEPA review was initiated on October 14, 2014 with the filing of an Expanded Environmental Notification Form (ENF) that was noticed in the October 20, 2014 edition of the Environmental Monitor. A Single Environmental Impact Report (EIR) was requested by the town of Eastham, and the Expanded ENF was allowed an extended comment period. The Secretary issued a Certificate on November 26, 2014 that allows the Single EIR. The Single EIR was submitted on December 16, 2014.

Project Impacts and Mitigation: Refer to Table A for a list of impacts and corresponding mitigation measures relative to the construction of the distribution system in those areas where state-listed rare species are present.

Table A. Summary of Rare Species Mitigation.

Category	Impact	Mitigation Measures
Rare Species	Portions of District G and NRHS are within the mapped priority habitat of the Eastern Box Turtle (Terrapene Carolina) and Common's Panic-grass (Dichanthelium ovale ssp pseudopubescens), state listed as "Species of Concern".	To avoid a prohibited take of the Eastern Box Turtle a Turtle Protection Plan is to be submitted to NHESP for review and approval prior to the start of any construction activities. A botanical survey for Common's Panic-grass within all suitable habitat area for this species is to be performed to identify where it is present and to develop design and construction approaches that will avoid and minimize impacts to this species. In consultation with NHESP, develop and implement avoidance and minimization measures to avoid species impacts through contractor awareness programs and construction phase monitoring.

Findings: Based in its review of the MEPA documents, the permit application, public comments, and with implementation by the Proponent of the mitigation measures described in the attached Table A, all practical means and measures will be taken to avoid or minimize the adverse impacts to the environment related to the Project. NHESP will include appropriate conditions associated with this Section 61 Finding and the "no take" determination issued by the Division of Fisheries & Wildlife – NHESP.

DIVISION OF FISHERIES AND WILDLIFE

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BY **DATE**

11.0 Response to Comments

The Expanded ENF for the proposed Eastham Water System was noticed in the Environmental Monitor on October 20, 2014 and the Secretary's Certificate on the Expanded ENF was issued on November 26, 2014. The comments received on the Expanded ENF are summarized in the Certificate and the comment letters received from State agencies accompanies the Certificate. The Certificate and comment letters are provided in Appendix A. The comments received and responses to these comments are provided below.

11.1 MEPA

Two corrections are noted in the Certificate's summary of the project:

- Under the description of the Alternatives Analysis (page 4), the summary states that future expansion of the water supply system will require a second water storage tank at either the Town Hall or in the Candlewood area. The water system project authorized at Eastham's May 2014 Town Meeting includes a second storage tank that is to be located at the District H well field (not Town Hall or the Candlewood area) that is to be constructed in later phases of the water system, should the Town choose to proceed with subsequent phases. At the time that the Town chooses to expand the water system, other locations for this second tank may be considered.

- Under the description for Water Supply and Groundwater (page 5), the water demand associated with the properties to be connected to the system is initially estimated to be 415,000 gpd, not 515,000 gpd as stated in the summary. This 415,000 is 22 percent of the annual average daily permitted volume of the District G and NRHS well fields.

The Certificate requests that the Expanded ENF provide the following additional information in the EIR:

- *Updated site plans for existing and proposed conditions.*
  Updated plans for the construction of the District G well fields (Contract 1), the water storage tank at District G (Contract 2) and the distribution system (Contracts 3 – 8) are provided in Appendix E. These plans provide the preliminary design status for each of these projects through early December 2014.

- *An updated description of applicable statutory and regulatory standards and requirement, and how the project will meet these standards.*
  A description of the applicable statutory and regulatory standards for the project and the status of the permitting for the project is provided in Section 8.

- *Provide a list of required State permits, financial assistance, or other State approvals and provide an update on the status of each of these pending actions.*

The status of the regulatory permitting activities for the project is provided in Section 8.3, and has been updated through early December 2014.

- *The Secretary encourages Eastham to provide information regarding the existing conditions at the District H well field and potential impacts associated with its use, because comments received from State agencies regarding the site could support the Town's long term planning efforts.*

  A description of the District H well field, the investigations performed as part of the DEP pump test program, the conclusions on yield and aquifer effects associated with water withdrawals at the well field, and the DEP New Source Approval for District H is provided in Appendix D.

- *System operations:*
  - *Discuss the Town's expectations with respect to the future use of the existing private wells once the water system is operational, and describe the process by which properties will be connected to the municipal system and any provisions that will be made for discontinuing the use of existing wells. Also, discuss whether decommissioning of the wells is necessary or preferable for managing the aquifer by removing potential sources of contamination and points of withdrawal that cannot be tracked.*

    The Town is not making connection to the municipal water system a mandatory requirement. An exception to this policy may be implemented for neighborhoods in the vicinity of the landfill, where the ongoing MCP-related investigations may conclude that some of the properties in that area need to connect to the water system due to human health risk concerns. These MCP studies are expected to continue into 2015, and the conclusions from these investigations will be reviewed with DEP, and the Town will implement the appropriate policy that meets the requirements of the MCP.

    If property owners elect to connect to the municipal water system, this connection will be inspected by the Town (likely through the Board of Health or a representative of the Water Commissioners) and registered once the connection is approved. The service connection will include the installation of a water service meter.

    At this time, the anticipated policy for the use of private wells after connection to the water system is that the existing, private wells at these properties will be allowed to be retained for outside non-potable purposes if the property owner chooses to do so, and there isn't an overriding public health concern at that property related to the landfill-area MCP issues that otherwise would prohibit continued use of the well. If the private well is to be used for outside non-potable purposes, the property owner will be required to disconnect the well and associated piping from the plumbing system of all structures at the property to ensure that no backflow can occur to the municipal system.

    The policies related to allowable uses of private wells after connection is made to the municipal water system will be defined in the Rules and Regulations for the Water System, to be developed by the Eastham Board of Selectmen/Water Commissioners. These regulations are to be developed over the next year and to be enacted prior to the start of the water system operations in 2016.

- *Provide additional details regarding the water conservation measures that the Town will implement when the water system becomes operational, including the metering, leak detection and public education components of a water conservation plan.*

  Additional details describing the water conservation measures to be implemented by the Town are described in Section 9.1.

- *Because DEP may require that mitigation be provided for a portion of the withdrawal, describe opportunities for the use of infiltration measures to increase groundwater discharge.*

  The need for mitigation measures related to the DEP Water Withdrawal permit and the Sustainable Water Management Initiative framework of the Water Management Act are described in Section 11.7, the response to DEP's comments. The extent of the mitigation that the Town will be required to perform will be determined as part of the permit renewal process for the Water Withdrawal permit, which will occur during 2015 prior to November 2015 when the permit renewals are scheduled for all water systems located within the Cape Cod Basin. The alternatives for achieving whatever mitigation goals are established for the Town will be identified at that time, and will include storm water infiltration basins, reducing the amount of impervious areas, and the conservation measures described in Section 9.1.

- *Greenhouse Gas (GHG) Emissions.*
  - *Provide additional information and analysis in relation to potential on-going use of private wells if it is likely that a significant number of wells will remain in use.*

    A sensitivity analysis that calculates the reduction in GHG emissions for various rates of private property connections to the water system is provided in Section 7. This analysis demonstrates that even with reduced rates of property connections, egg. if some percentage of the properties choose not to connect to the system and elect to continue using their private wells, the project still results in a reduction in GHG emissions.

  - *Evaluate alternative technology for pumps and other equipment to reduce energy use by the municipal water system and the related changes to the GHG analysis if these alternatives technologies are used.*

    See Section 7. The electric motors loads at the well field pump stations are the only pieces of equipment associated with the water system that produce measurable quantities of GHG emissions. These motors will be equipped with variable frequency drives to increase their efficiency and reduce electrical loads.

    The GHG loads from the small pump station buildings (11' x 28') at District G and NRHS, which are unoccupied, will be minimal. To maximize the energy efficiency of these buildings they will utilize high R-value insulation in the walls and ceilings and high-efficiency T5 fluorescent or LED lighting will be provided with occupancy sensors. Natural daylight will be used wherever possible. The HVAC system for these building will also be high efficiency demand-controlled ventilation based on occupancy or air quality.

  - *Review the feasibility of on-site renewable energy generation (solar photovoltaic systems or wind turbines) to meet all or a portion of the electrical demand of the water system.*

    Renewable energy generation alternatives using solar photovoltaic systems or wind energy to offset the limited energy needs of the water system are not being considered at this time due to economic and timing restrictions for implementing this phase of the water system, but will be re-considered if the Town chooses to the expand the system in

the future. Eastham is committed to the use of renewable energy sources and recently, during the fall of 2014, put into operation a solar farm at the closed landfill. This solar will produce an estimated 700,000 kilowatt hours each year to offset the Town's electrical demands. The offset of CO_2 emissions from this project is estimated to be 537 tons of CO_2 per year.

- *Rare Species – continue to consult with NHESP and provide additional information on rare species that could be impacted by the project, and any changes to avoid impacts and potential mitigation measures.*

  An update on the consultations that have occurred with NHESP and their findings on the MESA Project Review Request are provided in Section 5.5, Section 8 and Section 9.3. This section also provides the approach to evaluate the presence of endangered species at the locations within District G where construction activities will occur, and the need to develop a turtle protection plan for the construction activities at District G and NRHS.

- *Cultural Resources – provide an update on the ongoing coordination with the Cape Cod Commission and the Massachusetts Historical Commission with respect to avoiding and mitigating impacts to historic and archeological resources.*

  An update on the consultations that have occurred with the Massachusetts Historical Commission and the Cape Cod Commission is provided in Section 5.5

- *Construction – confirm that EPA's mandate that construction equipment use Ultra Low Sulfur Diesel Fuel (ULSD) be followed, and that the Town confirm that construction contractors for the project use ULSD. Compliance with anti-idling provision (310 CMR 7.11) is to also be addressed.*

  The Contract Documents for construction will include requirements that the contractor's construction vehicles use ULSD Fuel. This item has been included in Section 10, the description of Section 61 mitigation measures for the project.

- *Mitigation and Section 61 Findings – include a separate chapter summarizing the proposed mitigation measures, with a draft Section 61 Findings for each State Agency that will issue permits for the project. With respect to the GHG emission reduction measures, a self-certification will be required of the Town to the MEPA office indicating that the required mitigation measures have been completed.*

  The Section 61 proposed mitigation measures are provided in Section 10.

- *Responses to Comments/Circulation – Include a copy of the Secretary's Certificate on the Expanded ENF and a copy of each comment letter received. Include direct responses to the comments the extent that they are within MEPA jurisdiction. Circulate a hard copy of the Single EIR to each State and local Agency from with permits will be requested, and to all parties that submitted individual written comments.*

  The Secretary's Certificate and comment letters are provided in Appendix A. The distribution list for the Single EIR is provided in Appendix L.

11.2 Massachusetts Historical Commission

- *Provide any comments from the Cape Cod National Seashore regarding the project.*

  Additional information regarding the proposed water main installations on those portions of Nauset Road and Cable Road that are within the National Seashore boundary has been provided to them, including preliminary design plans showing the locations of the water mains and the construction methods for their installations. Two site walks were held with

the Seashore archeological resources and natural resources staff, on November 5th and November 10th, respectively.

The area of Nauset Road between Route 6 to Doane Road has previously been evaluated for archeological resources and that evaluation is sufficient to clear that roadway area from any additional Section 106 compliance. The remaining areas of Nauset Road and Cable Road are anticipated by the Seashore staff to be of low sensitivity for archeology, but that some level of archeological investigation or monitoring and the staff is reviewing what specific measures they will be requesting.

The Seashore staff are also requesting that the town consult with the Mashpee Wampanoag Tribe, the Wampanoag Tribe of Gay Head/Aquinnah, and the Eastham Historical Commission for any input they have on the project activities that are to take place within the Seashore.

- *Submit additional information as project planning proceeds, including scaled existing and proposed conditions plans, the results of geotechnical surveys, soil borings and information on the locations of existing utilities to assist MHC in providing comments on the need for any archeological surveys and for further consultation of avoid, minimize or mitigate any adverse effects to significant historic and archeological resources.*

  Consultation with MHC is ongoing. During the second week of December 2014 a package of design plans for each Contract area (Contracts 1 – 8) that shows existing and proposed conditions, including existing utility locations, and the results of geotechnical surveys and soil borings was forwarded to MHC.

11.3 Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP)

NHESP's review of the MESA and the Expanded ENF concluded that portions of the project are within the priority habitat for state-listed rare species. The majority of the proposed distribution system is exempt from MESA review because it is within 10 feet of existing paved roads (pursuant to 321 CMR 10.14). For non-exempt portions of the project, Eastham has been involved in ongoing consultation with NHESP, and NHESP anticipates that the District G and NRHS well fields and the District G storage tank may need to be conditioned to avoid a "take" of state-listed species. A small portion of the distribution system between the District G well field and storage tank may necessitate surveys for state-listed species. NHESP anticipates being able to resolve any outstanding issues related to state-listed species during the MESA permitting process.

Coordination with NHESP is ongoing. An update on the consultations that have occurred with NHESP and their findings on the MESA Project Review Request are provided in Section 5.5 and Section 8. This section also provides the approach to evaluate the presence of endangered species at the locations within District G where construction activities will occur, and the need to develop a turtle protection plan for the construction activities at District G and NRHS.

11.4 Massachusetts Division of Marine Fisheries

The Division of Marine Fisheries notes that some of the proposed distribution system would traverse coastal streams that support diadromous fish runs, and that if any in-water work is required that time-of year restrictions be implemented to minimize the impacts to diadromous fish passage.

No in-water work will be required for installation of the water main. The water main that crosses the Herring River on Bridge Street will be hung from the bridge, thereby avoiding any in-stream work.

11.5 Massachusetts Department of Transportation

The project will require a MassDOT Non-Vehicular Access Permit for work within the Route 6 right-of-way. MassDOT recommends that no further environmental review be required, provided that certain procedures are followed and safeguards are in place during the project construction.

- *Eastham and their Contractors should ensure that patching methods will result in pre-project surface conditions along Route 6 that are unchanged from existing conditions, and that patching should be conducted according to MassDOT requirements for materials and methodology.*

  This requirement will be included in the technical specifications of the Contract Documents for the project.

- *Eastham has already committed to some mitigation measures in conjunction with the work, including development of a traffic management plan, establishing and maintaining work zone traffic signage on a daily basis, plating or asphalt patching at the end of each construction day, not allowing construction activities during the summer tourism season (generally between Memorial Day and mid-September), and placing restrictions on times of day when the work can be performed.*

  A Traffic Management Plan is to be prepared and reviewed by MassDOT as part of the State Highway Access permit application. This Plan will provide a detailed description of the work zones, signage, the trench treatment at the end of each work day, and the work periods (seasonally and daily) that will be allowed. As part of the Contract Documents for construction, and in accordance with conditions that are anticipated to accompany the State Highway Permit, Contractors will be required to submit a Traffic Management Plan for review and approval by the Engineer that meets the requirements of the Contract Documents.

- *Continue to work with MassDOT's District 5 Office as well as with Traffic Operations to establish firm time periods when work can be conducted, both from a seasonal and daily perspective.*

  Eastham continues to work closely with the staff of MassDOT's District 5 Office and Traffic Operations. To date two design coordination meetings have been held, on August 11th and November 19th, to discuss the design approach and the management approach for the construction activities on Route 6. These meetings have included extensive discussions on the time periods during which work can be conducted.

- *The Traffic Management Plan should include: maintenance of adequate site lines for construction vehicles and through traffic, identification of the types and average number of construction vehicles that would be using the roadways on a daily and peak hour basis, identification of the expected hours of work and truck transport on a typical work day, identification of construction vehicles routing to and from the project area, identification of the location of advance warning signage for the work zone including detours, identification of proposed accommodations and safety measures for bicycles and pedestrians through the work area, and identification of the type, location and duration of any traffic control devices that would be used during construction. A Traffic Management Training program should be conducted for involved employees.*

  The content of the Traffic Management Plan for the project has been discussed in detail with MassDOT's District 5 staff. A proposed Plan that incorporates all of the

components described above will be prepared and submitted as part of the State Highway Permit application to MassDOT.

- *The proponent and Contractor should coordinate the permitting, development of the Traffic Management Plan and all project-related work within the state highway layout with MassDOT's District 5 Office as well as with Traffic Operations.*

  This coordination with MassDOT's District 5 Office and Traffic Operations will continue through the design, permitting and construction phases of the project.

11.6 Association for the Preservation of Cape Cod (APCC)

APCC's comment letter states that "APPC has actively supported efforts to establish a municipal water supply in the town of Eastham... APPC commends the town on its proposal to construct the water system almost entirely on previously disturbed land, exiting roadway areas and rights of way."

APCC recommends that the EIR explore adoption by the town of a more thorough monitoring program for private wells in order to make a proper and timely assessment of the potential need for such an expansion.

Eastham has conducted an extensive Town-wide monitoring program for private wells over the last twenty years since the mid-1990s, as described in Section 4.2, which documents the presence of nitrates from onsite wastewater disposal systems in private drinking water supplies and the trend that the number of private wells with nitrate concentrations greater than 2.0 ppm is progressively increasing. This data base provides a sound basis for understanding the status of groundwater quality in the private wells located in Eastham.

Eastham has also been conducting extensive monitoring of private wells in the vicinity of the landfill for the presence of 1,4-dioxane, also described in Section 4.2. This monitoring is being performed as part of response actions associated with the Massachusetts Contingency Plan and will continue. One of the objective of these evaluations is to identify the extent of the 1,4-dioxane plume associated with groundwater discharges from the landfill, which is generally located to the east and southeast area down gradient of the landfill. This phase of the water system is providing water service to this area.

The Town has considered a town-wide water system at several of the previous Annual Town Meetings, and may reconsider it once again at either the 2015 or 2016 Annual Town Meeting.

APCC supports the approach of monitoring water levels at Hatches Creek to determine whether pumping activity at the District G well field needs to be adjusted during periods of low water.

A Hatches Creek water level monitoring program is to be implemented, and the Town is coordinating with the Cape Cod Commission on the scope and elements of this program. A concept-level description of this monitoring program, developed with the staff of the Cape Cod Commission, is provided in Section 9.2.

The EIR should provide information that will resolve any outstanding questions regarding potential impacts to rare species. APCC would like to see final clarification in the EIR regarding the rare species in question and a satisfactory determination that the project will not adversely impact state listed species.

A description of the rate species that are present at District G and the NRHS well field is provided in Section 5.5. NHESP's findings on the MESA Project Review is described in a letter to Eastham dated December 4, 2014 and is provided in Appendix G.

11.7 Massachusetts Department of Environmental Protection/ Southeast Regional Office

DEP's Drinking Water Program "strongly supports the proposed Eastham Water System as described in the Expanded ENF. The water system will provide Eastham residents and visitors a safe, reliable, professionally managed water supply.

Eastham acknowledges the support and assistance that DEP has provided the Town over the last ten years that a municipal water system has been considered and evaluated, and the active participation by DEP had in these efforts.

DEP is currently reviewing the Water Management Act permit application submitted by Eastham for the three water supply well fields that will serve the system (District G and NRHS to be constructed as part of the proposed project, and District H to be constructed in the future if the Town chooses to expand the system to serve the rest of the Town). As part of DEP's review of the Water Management Act permit they will:

- *evaluate the water demand projections,*
- *evaluate the impacts of water withdrawals on the aquifer from the three well fields including those at District H and the effect on vernal pools in that area,*
- *the need for mitigating some of the withdrawals (up to 15% of the withdrawals, to be determined once the system is on-line and actual pumping rates become available),*
- *the Town's proposed conservation efforts, and*
- *review the Town's aquifer protection bylaw for conformance with State standards.*

Water Management Act permits are authorized by DEP for twenty year periods, renewable on five-year cycles for each watershed. The next renewal period for water systems located within the Cape Cod Basin is November 2015. DEP therefore intends to approve the Water Withdrawal permit based on the September 2014 application, and to issue this approval in early 2015 after the MEPA process is completed. DEP has provided guidance to the Town that they will need to go through the renewal process at the same time as the other water systems within the Cape Cod Basin in the months preceding the November 2015 expiration date.

Revisions to the Water Management Act Regulations were implemented in November 2015 and include provisions for water conservation and mitigation described under the framework for the Sustainable Water Management Initiative (SWMI). DEP has also provided guidance to Eastham that they will determine the extent to which water withdrawals need to be mitigated under this SWMI framework as part of the permit renewal process. The mitigation needs will be based on an estimate of the increase in water use that has occurred since 2005 due to the construction of new buildings, playing fields, etc., and these mitigation needs will be offset by various conservation practices the Town has or intends to implement.

The project may require a NPDES Stormwater Permit for Construction Activities.

It has been assumed that an NPDES Stormwater Permit is required of the project.

Wells installations are to be by a Massachusetts Certified well driller. A well completion report is to be submitted to DEP and the BOH.

The test wells installed at the well fields as part of the DEP Pump Test activities are to be converted into production wells. The Pump Test Report for each well field included soil boring and construction logs for each of these test wells. No new wells will need to be installed as part of the water system construction.

The DEP comment letter provides a summary and status of disposal sites and release notifications within or near the project area listed in the Bureau of Waste Site Cleanup database, and advises that if oil and/or hazardous material are identified during implementation of the project notification must be made to DEP in accordance with the requirements of the Massachusetts Contingency Plan.

So noted.

11.8 Cape Cod Commission

The following comments were issued by the Cape Cod Commission:

Water Resources:

- *The EIR should describe the status of discussions with Orleans regarding the inter-town connection that Eastham has offered to the Orleans water system.*

  Eastham is continuing to discuss an interconnection between the Orleans water system and the Eastham water system. Eastham made this request to Orleans, as well as a request to install a water system loop for their proposed water system through Orleans from the terminus of Eastham's water system at Bridge Road to the Route 6 terminus. This request was considered by Orleans at a joint meeting of their Board of Selectmen and Sewer Commissioners during October and issued a letter to Eastham requesting clarifying information on October 27th. Eastham provided responses to these questions in a letter to the Orleans Board of Selectmen in early December 2014.

  Eastham has stated that the decision on whether to have an interconnection between the two water systems is a voluntary one by Orleans. Eastham would like to install the water system loop, which would be independent of Orleans' water system, to provide redundancy to the system. Should a water main break occur in the transmission mains serving the Eastham system that would otherwise be dead ends without the loop, the loop provides the ability to continue delivering water to those services that are on the "downstream side" of the break. This is a standard practice in all water systems where adjoining water systems exist.

- *Commission staff will provide further review of the monitoring requirements for Hatches Creek as part of the EIR comment and Development of Regional Impact review.*

  Eastham has continued to coordinate with the Cape Cod Commission staff on the groundwater elevation monitoring program for Hatches Creek. A concept-level description of this program, developed in consultation with the Commission staff, is described in Section 9.2 and consists of a series of piezometers and staff gauges located within or in the vicinity of Hatches Creek at various locations in the proximity of the District G well field. The piezometers and staff gauges are to be equipped with data loggers that will continuously collect ground water and surface water elevation information.

This monitoring program is to be implemented during the spring of 2015so that baseline information can be collected prior to the start of pumping operations at District G, targeted for the late spring of 2016.

Heritage Preservation/Community Character

- *The Commission requested that additional information be provided regarding where the District G storage tank would be visible along Route 6, the Cape Cod Rail Trail and residential streets. Additional photo renderings from Nauset Light and the Nauset Beach parking lot were requested, and that the figure showing the renderings of the tank from various perspectives that was provided with the Expanded ENF be provided at a larger scale.*

  Figure 6 provides photo renderings of the District G storage tank from various locations in the town. This figure has been updated in response to this request to provide views from the Nauset Light and Beach area, and also delineates the area where the storage tank is likely to be visible from Route 6 and the neighborhood areas in the vicinity of the tank. A large-scale version of Figure 6 has been provided.

- *The location of several National Historic Districts and properties should be identified to help with the planning of water main and hydrant installations.*

  The Cape Cod Commission has provided a listing of the National Historic districts and sites located in Eastham. A description of these locations is provided in Section 5.9.

- *Input from the Massachusetts Historical Commission and the Cape Cod National Seashore should continue as the final plans for the project are developed to ensure that sensitive historic and archeological resources that might be encountered are appropriately accommodated.*

  Consultation with the Massachusetts Historical Commission and the Cape Cod National Seashore are ongoing, as described above under the comment responses to Massachusetts Historical Commission (Section 11.2).

Natural Resources

- *Any work proposed within the buffer zones to wetlands should be designed to minimize disturbance and utilize Best Management Practices during construction. Where water mains are to be installed with the boundaries of the Inner Cape Cod Bay ACEC, efforts should be made to minimize impacts from storm water runoff and erosion.*

  All work activities within the buffer zones of wetlands is to be reviewed by the Eastham Conservation Commission, and will include requirements that Best Management Practices for storm water management be utilized by the Contractor for sediment and erosion control. These same storm water management practices will also be required for all construction activities within the Inner Cape Cod Bay ACEC.

- *The Town should continue to work closely with NHESP to minimize and mitigate, as necessary, impacts to rare species habitat.*

  Eastham is continuing to work closely with NHESP to determine the location and, if necessary, mitigation measures for construction activities within the mapped areas for State-listed rare and endangered species. The status of this coordination is described in Section 5.5 and Section 8.

- *The Town should incorporate Best Management Practices for invasive species management into construction plans in order to avoid the spread of invasive species due to the disturbance associated with construction.*

  Best Management Practices to avoid the spread of invasive species will be required of the construction contractor at all areas where the construction activities are located off of paved areas, e.g., the District G well field and storage tank and the transmission mains in that area, and the NRHS well field. A description of the Best Management Practices to be utilized is provided in Section 9.3.

Transportation - Copies of all necessary federal, state and local roadwork permits are to be provided to the Commission prior to the start of project construction.

Copies of these permits will be provided to the Commission as requested.

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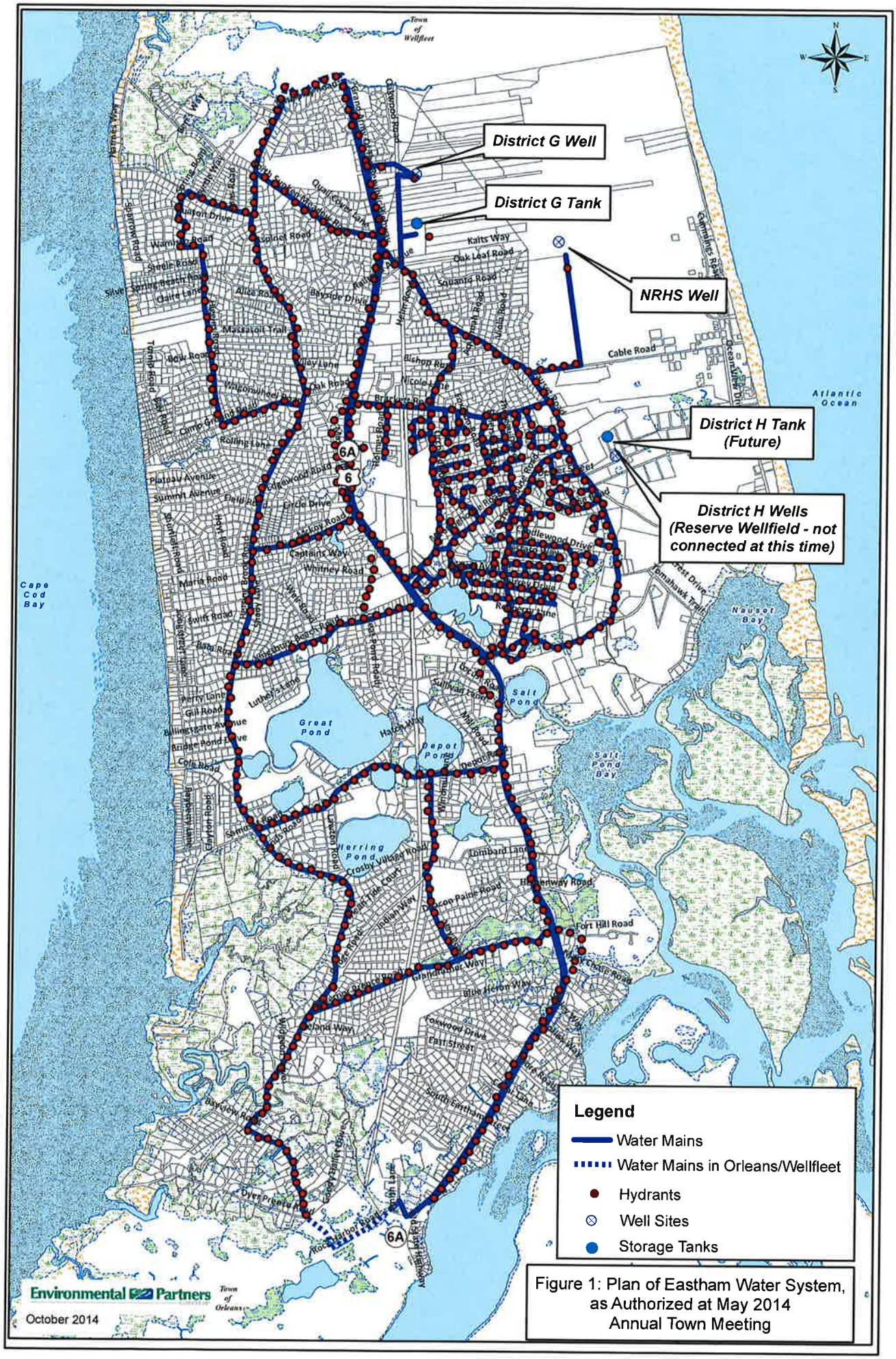


Figure 1: Plan of Eastham Water System, as Authorized at May 2014 Annual Town Meeting

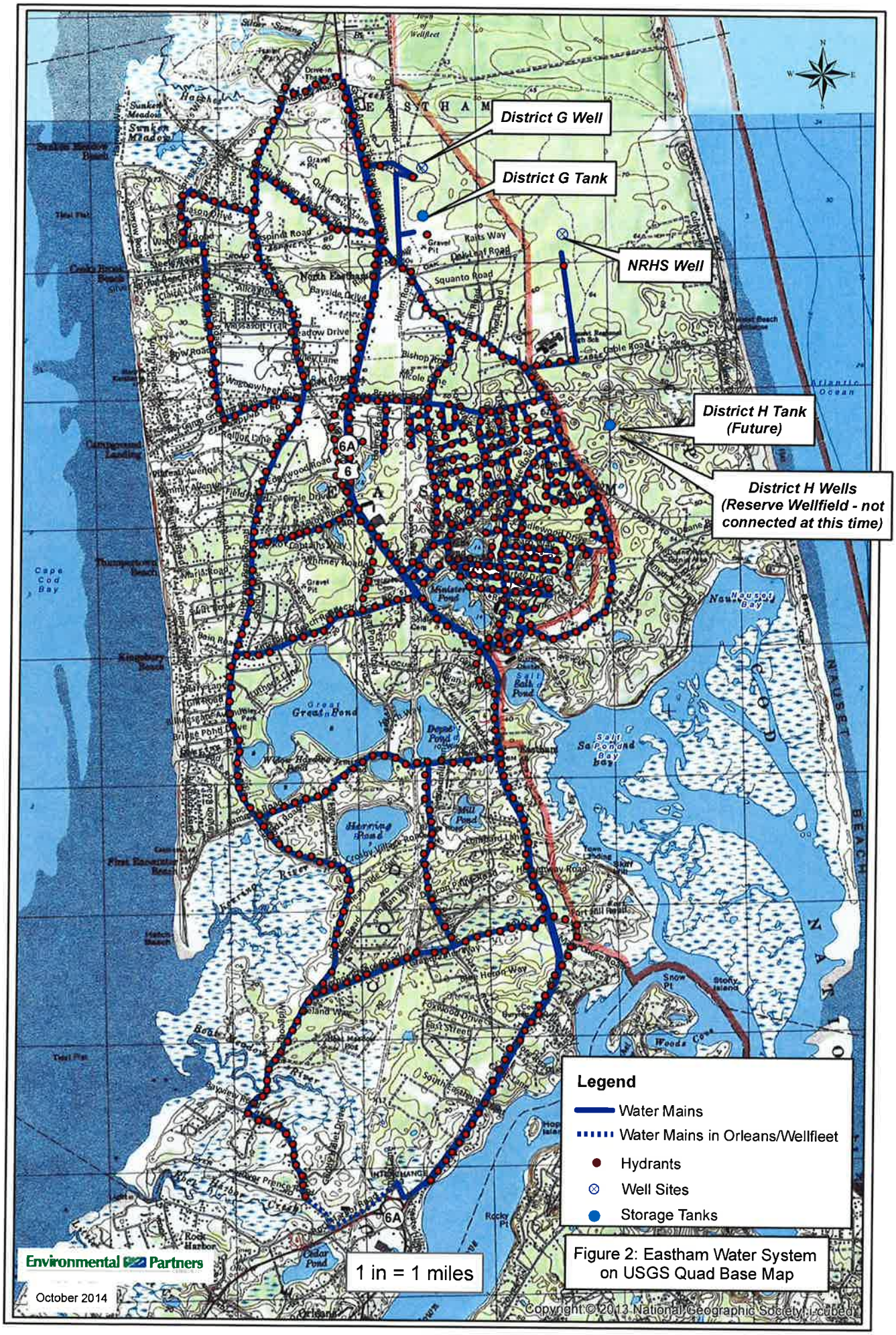


Figure 2: Eastham Water System on USGS Quad Base Map

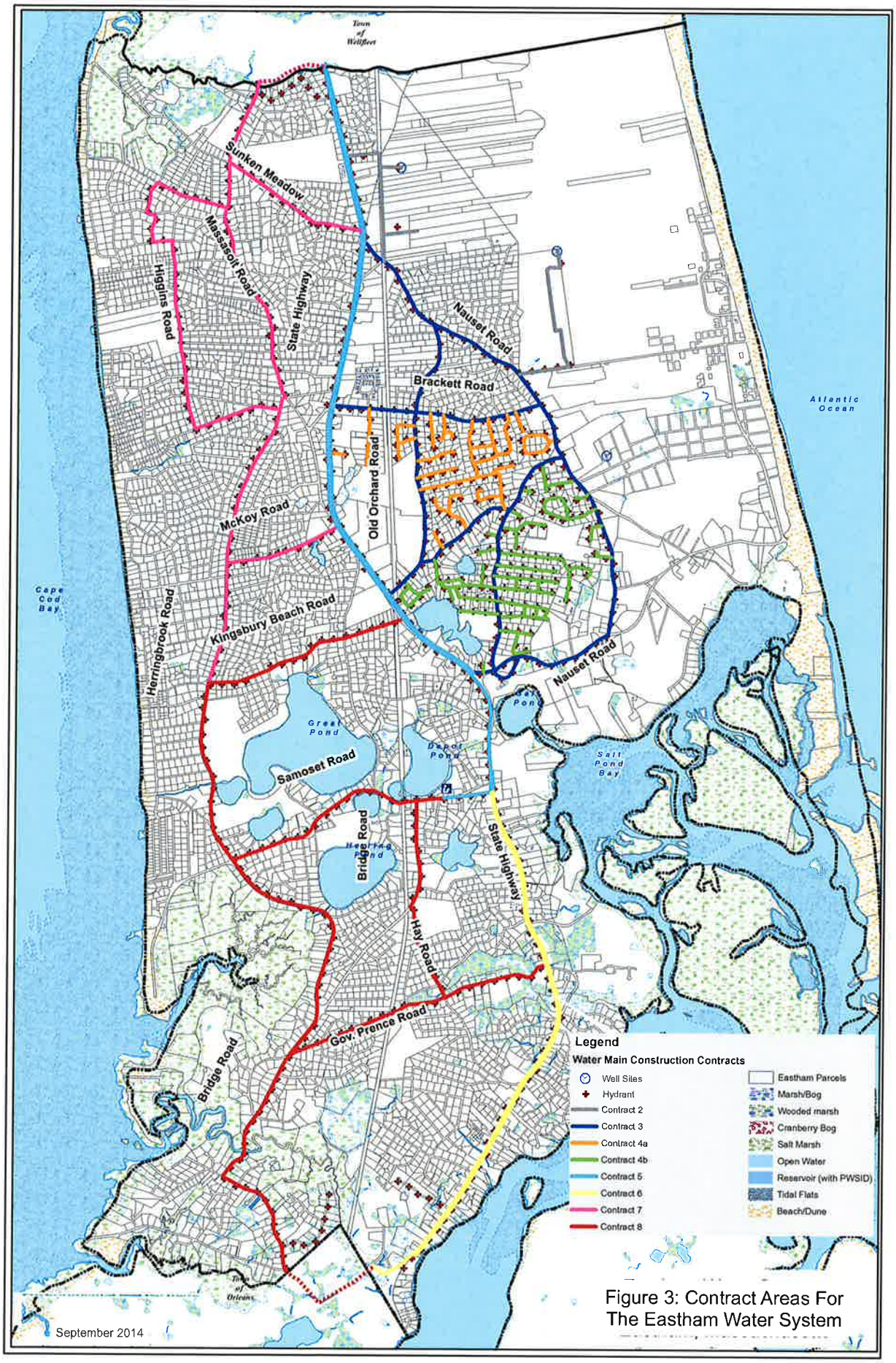


Figure 3: Contract Areas For The Eastham Water System

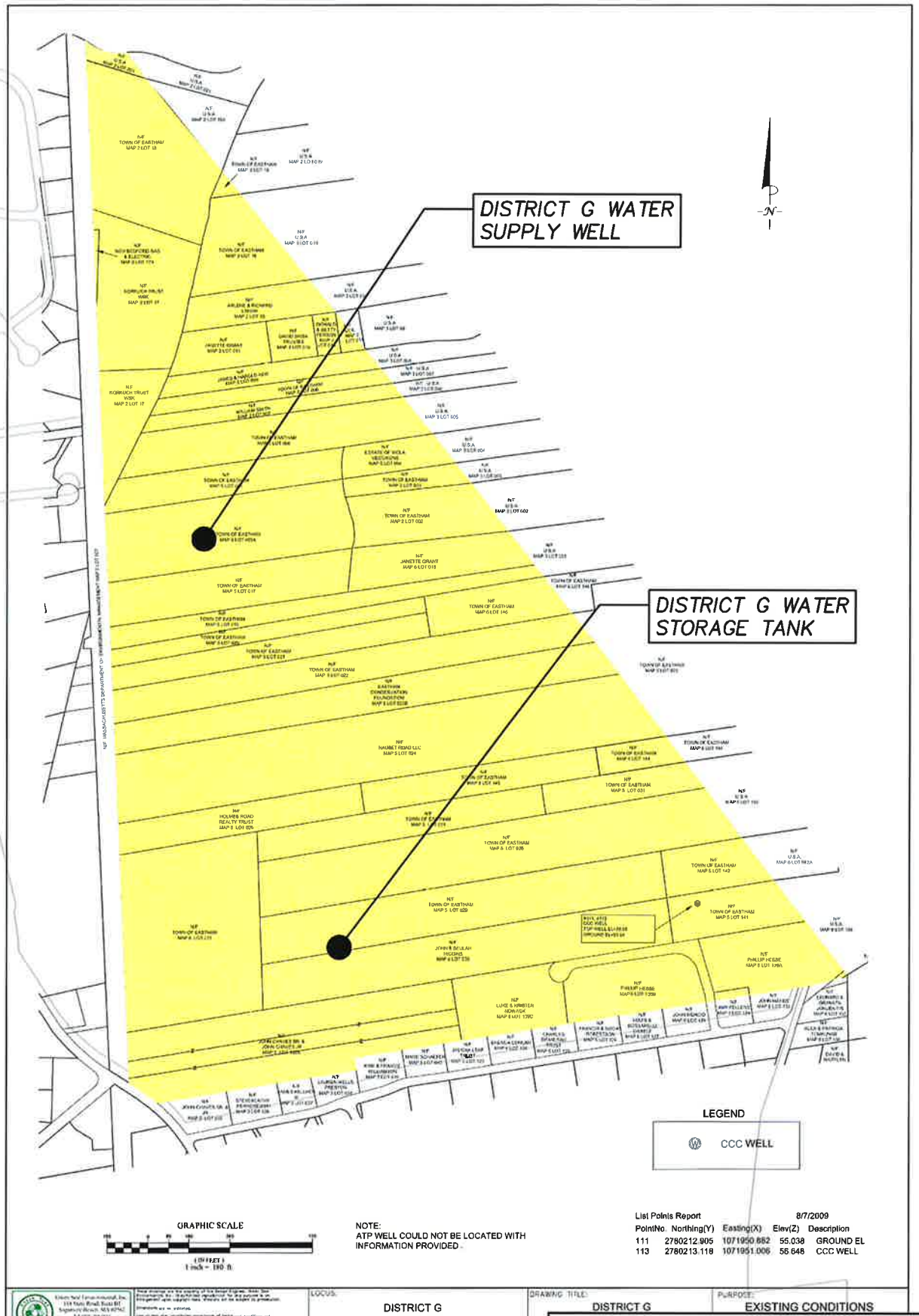
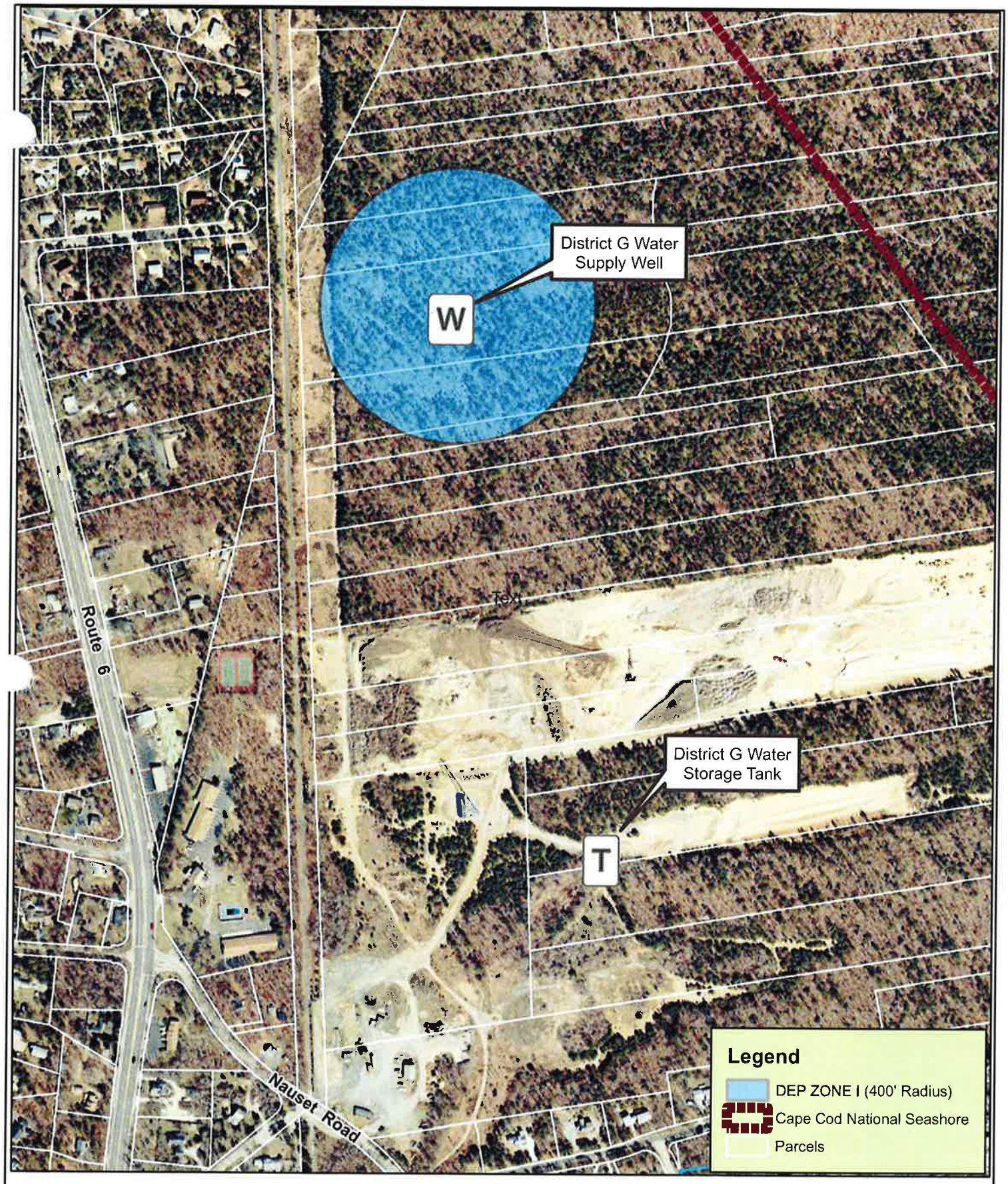


Figure 4: Water Resources Protection District G Parcels and Location of Storage Tank and Water Supply Well



0 175 350 700 Feet

1 inch = 350 feet

Figure 5: Orthophoto View of District G Storage Tank and Well Field

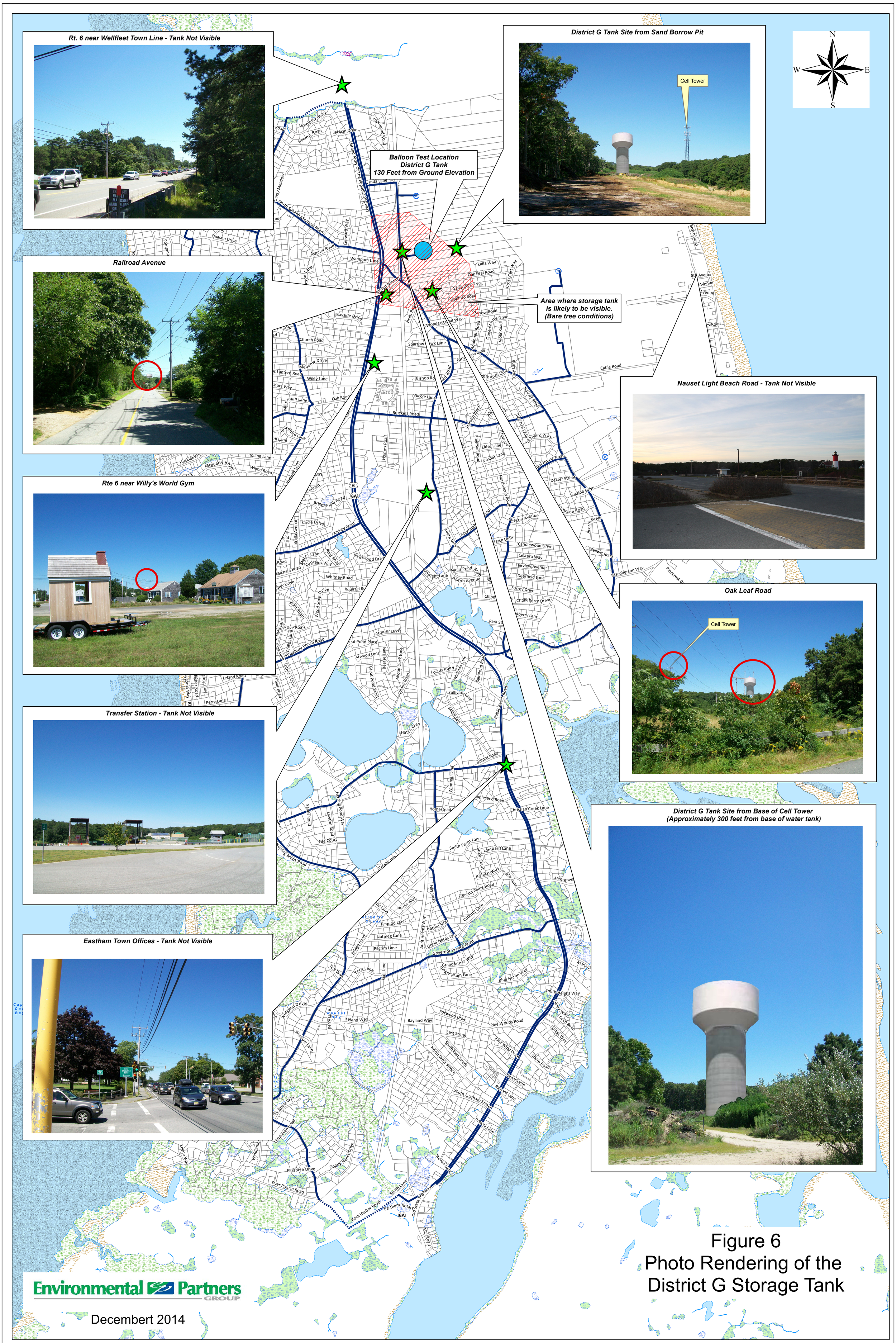
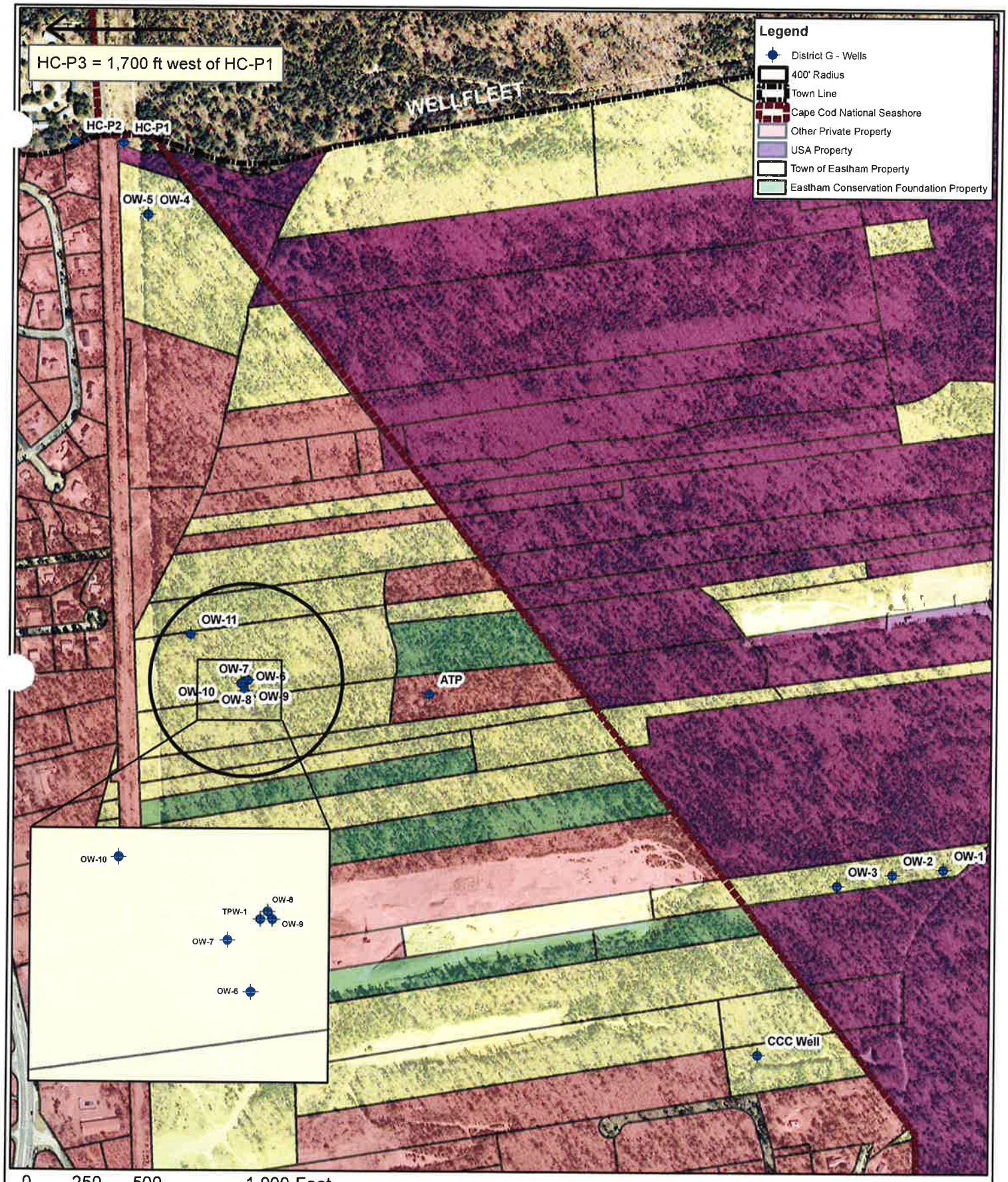


Figure 6
Photo Rendering of the
District G Storage Tank



0 250 500 1,000 Feet

1 inch = 500 feet

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N W E S

Figure 7: Site Plan of District G Well Field with Test Wells and Monitoring Wells

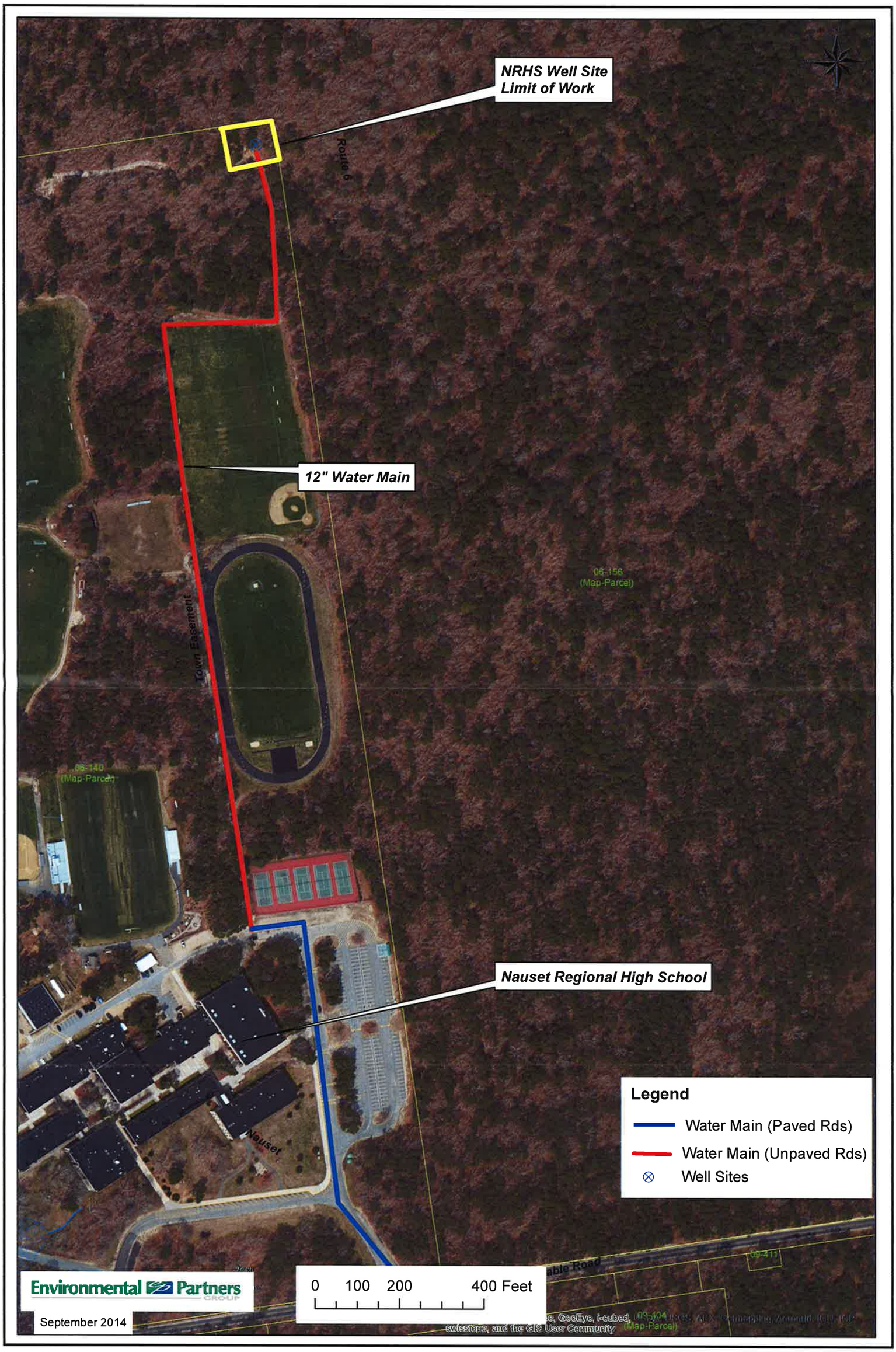


Figure 8: Site Plan of Nauset Regional High Schol Well Field

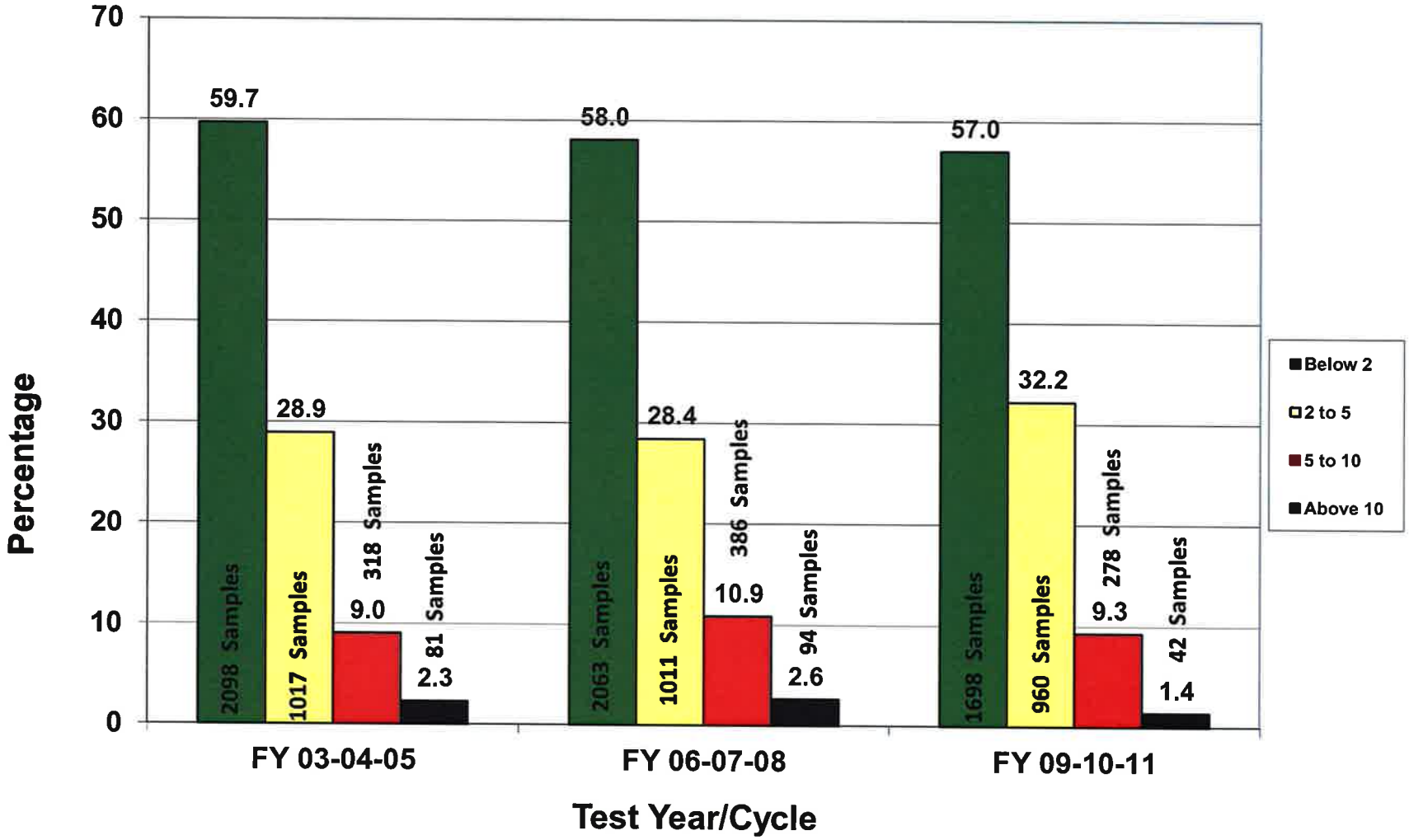


Figure 9: Nitrate Concentrations in Private Well Samples, FY 2003-2011

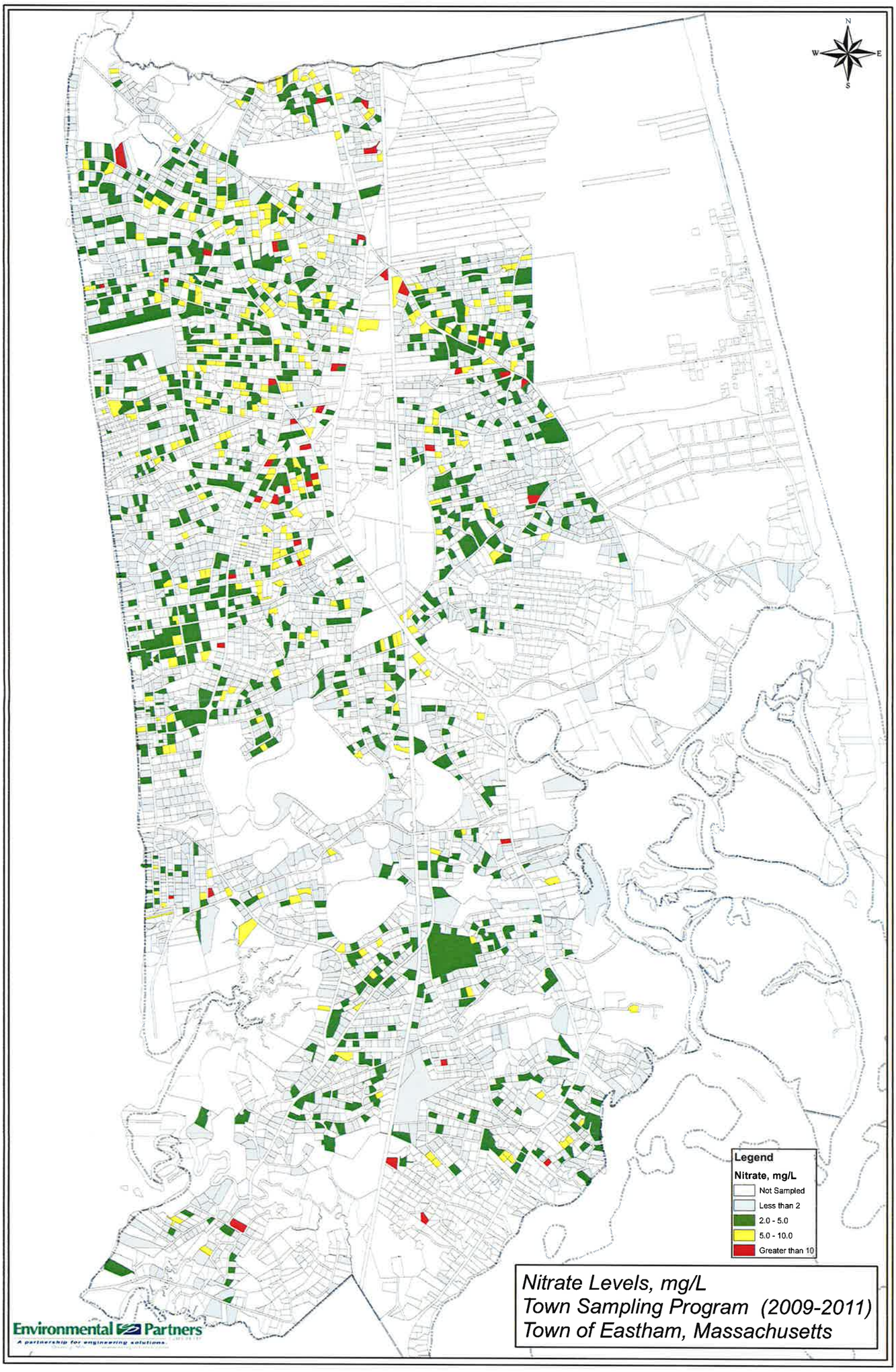


Figure 10: Nitrate Concentrations - 2009 to 2011

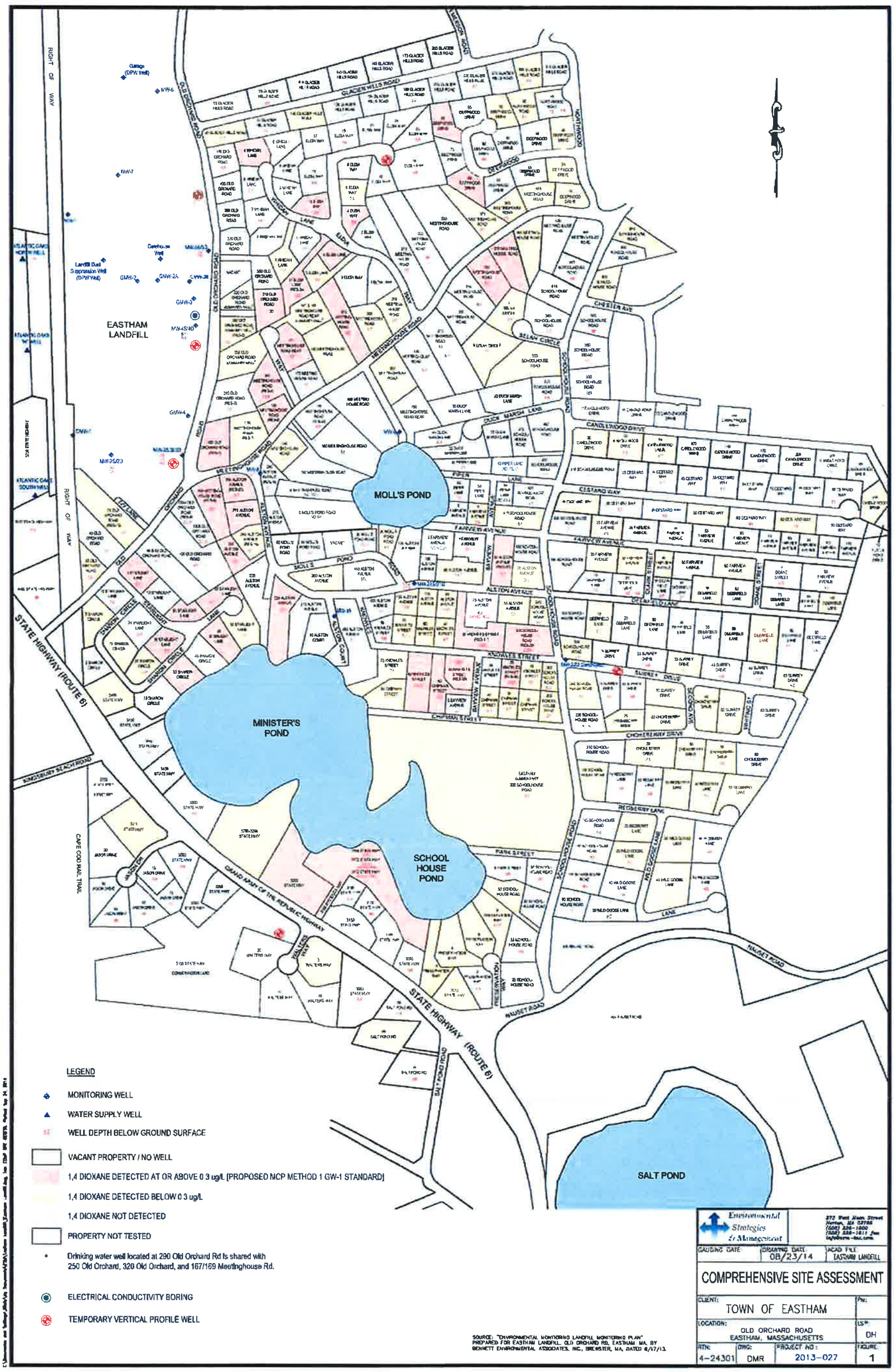


Figure 11: 1,4 Dioxane Sampling Results of Private Wells in the Landfill Strudy Area

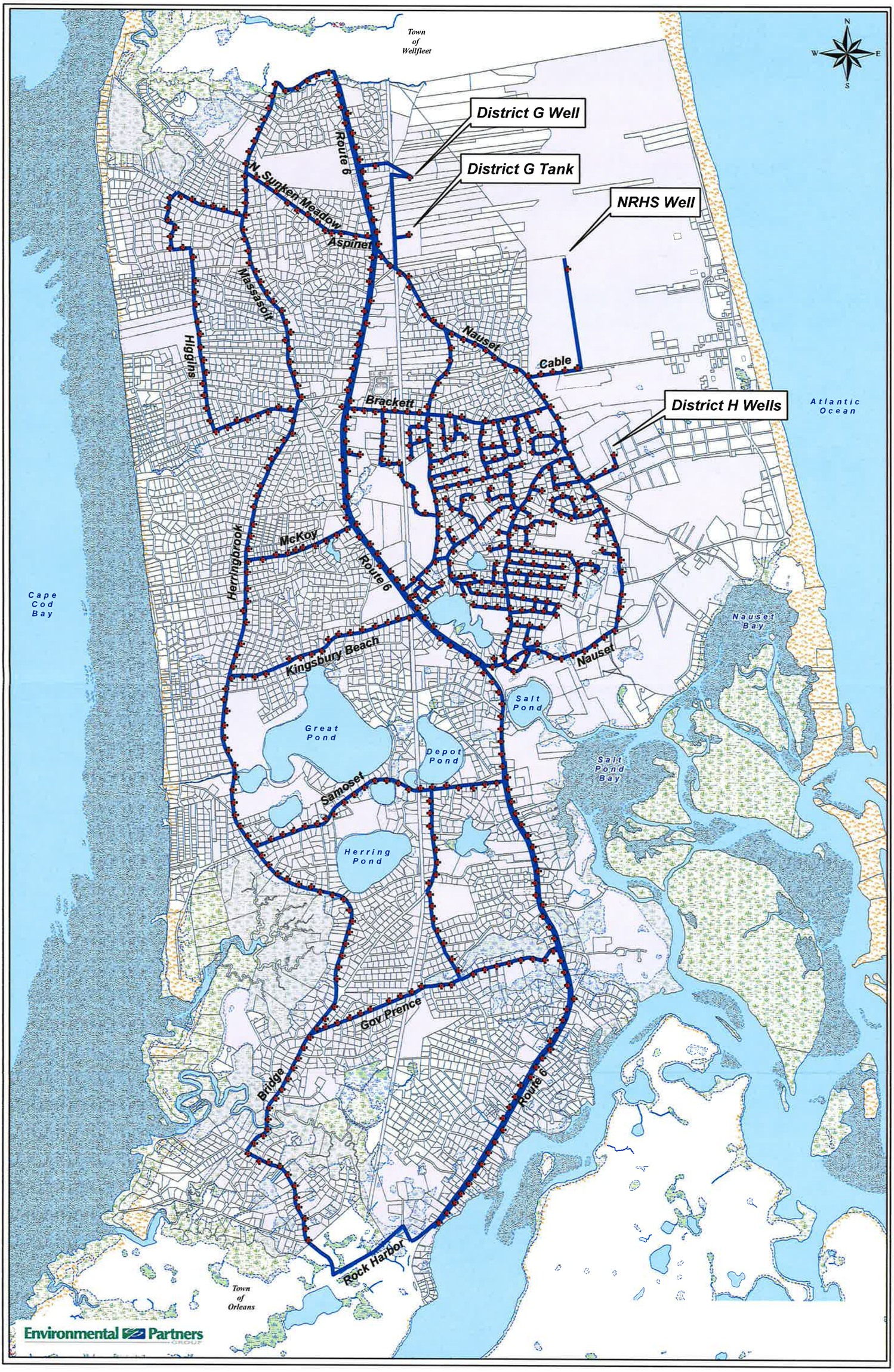


Figure 12: Properties With Fire Protection
(Within 1/2 Mile of Water System Hydrants)

Figure 13: Location of Alternative Water Supplies
Evaluated in Study of Limited Water System (EPG, 2005)

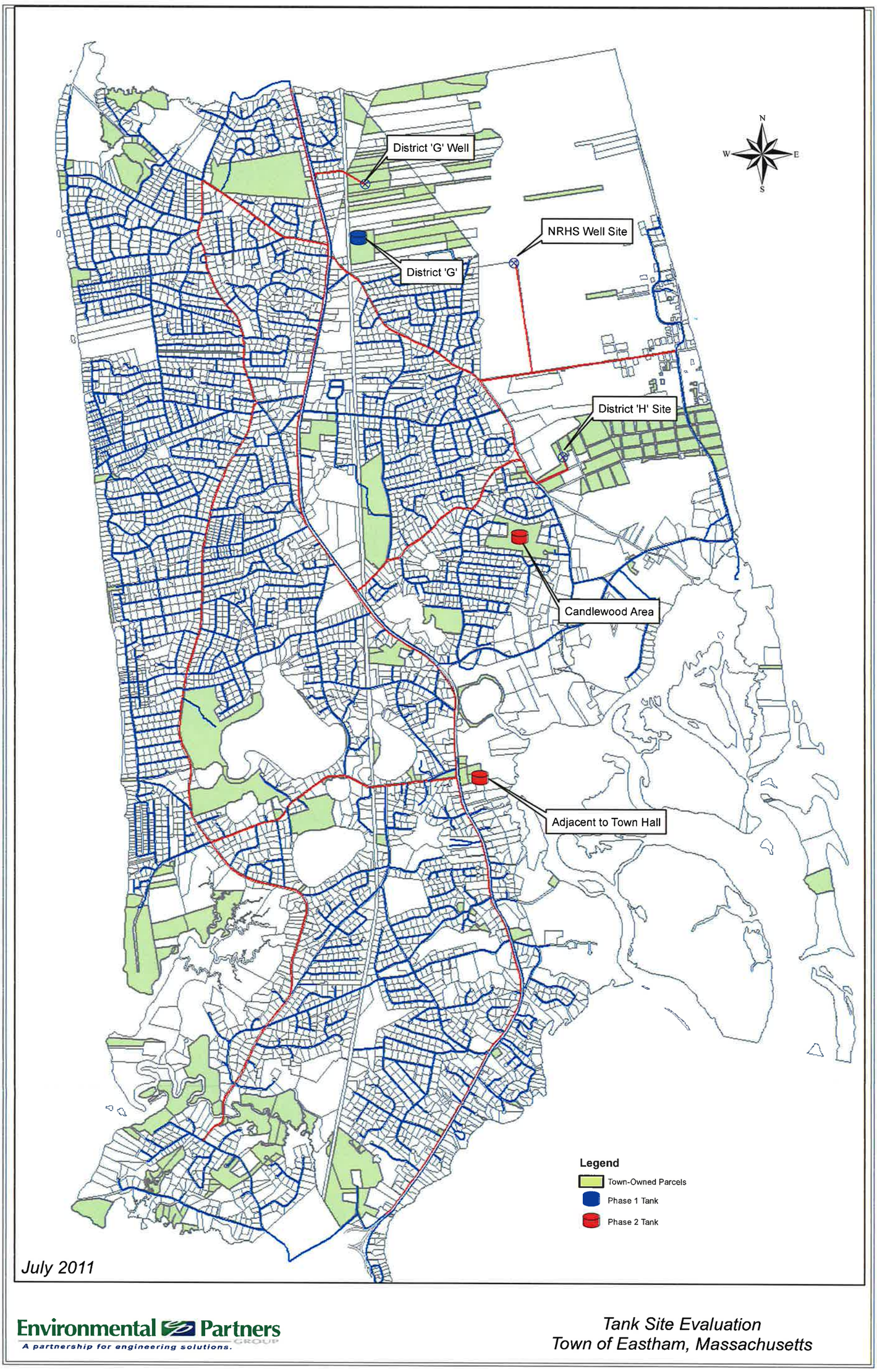
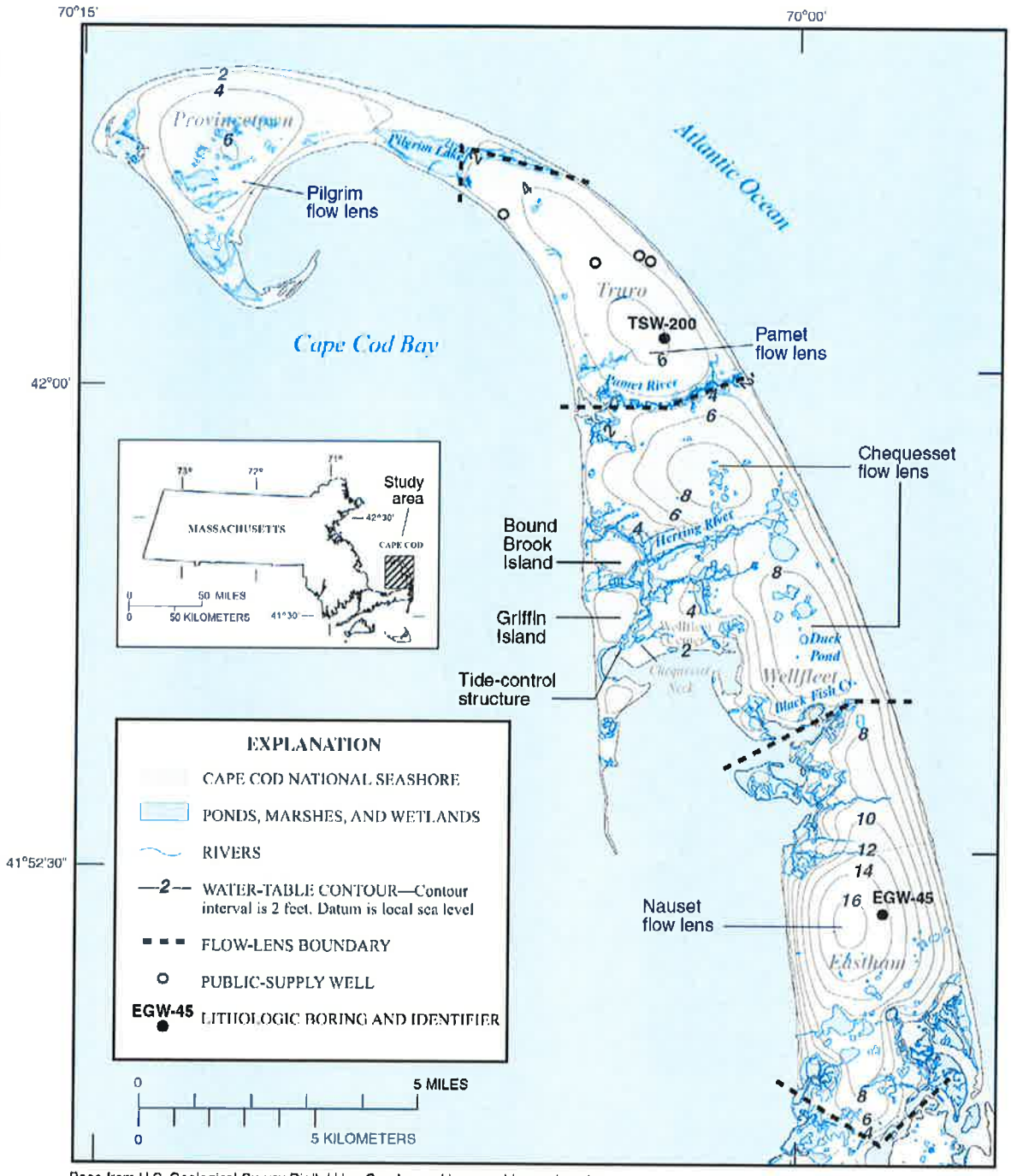


Figure 14: Alternative Storage Tank Locations



Base from U.S. Geological Survey Digital Line Graphs, and topographic quadrangles, Provincetown, Wellfleet, and Orleans, Massachusetts, 1:25,000, Polyconic projection, NAD 1927, Zone 19

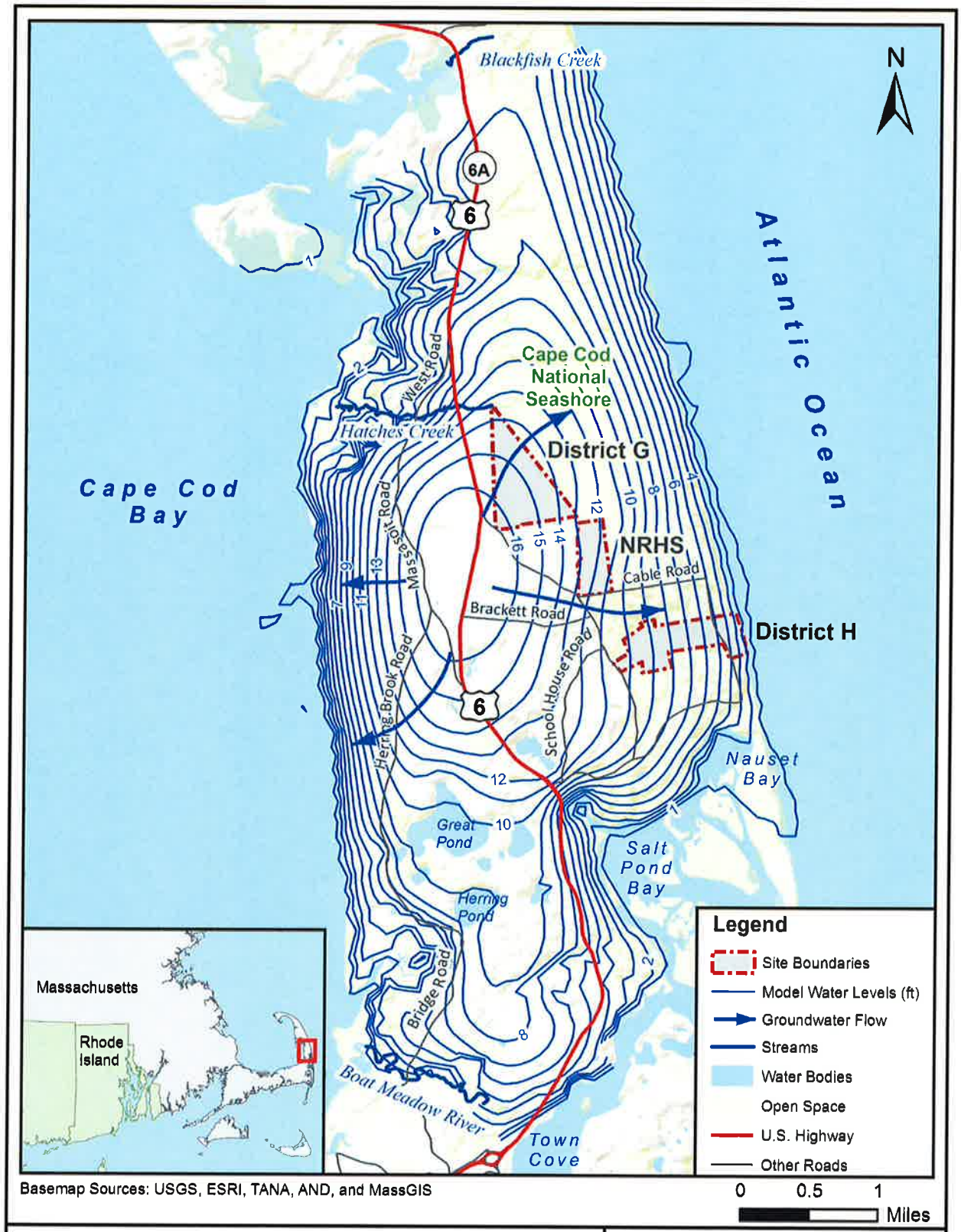
Source: Figure 1 from Masterson (2004)

Lower Cape Cod Freshwater Lens Aquifers

McLANE ENVIRONMENTAL, LLC

McLane Environmental, LLC, 707 Alexander Rd, Suite 206
Princeton, NJ 08540 | www.mclaneenv.com

Figure 15: Outer Cape Cod Freshwater Lens Aquifer



Nauset Lens Simulated Water Table Elevation Contours

McLANE ENVIRONMENTAL, LLC
McLane Environmental, LLC, 707 Alexander Rd, Suite 206
Princeton, NJ 08540 | www.mclaneenv.com

Figure 16: Nauset Lens Freshwater Aquifer

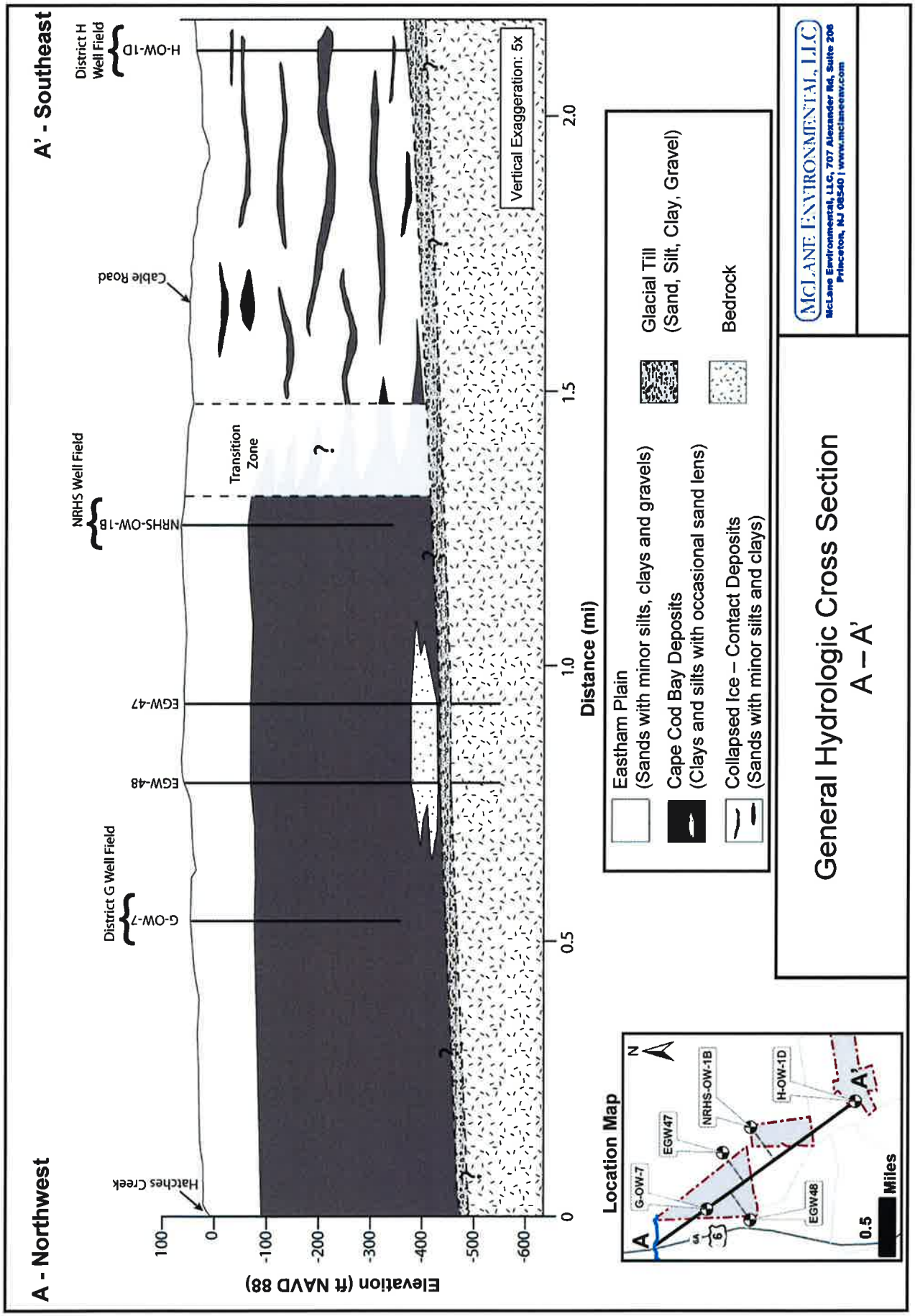
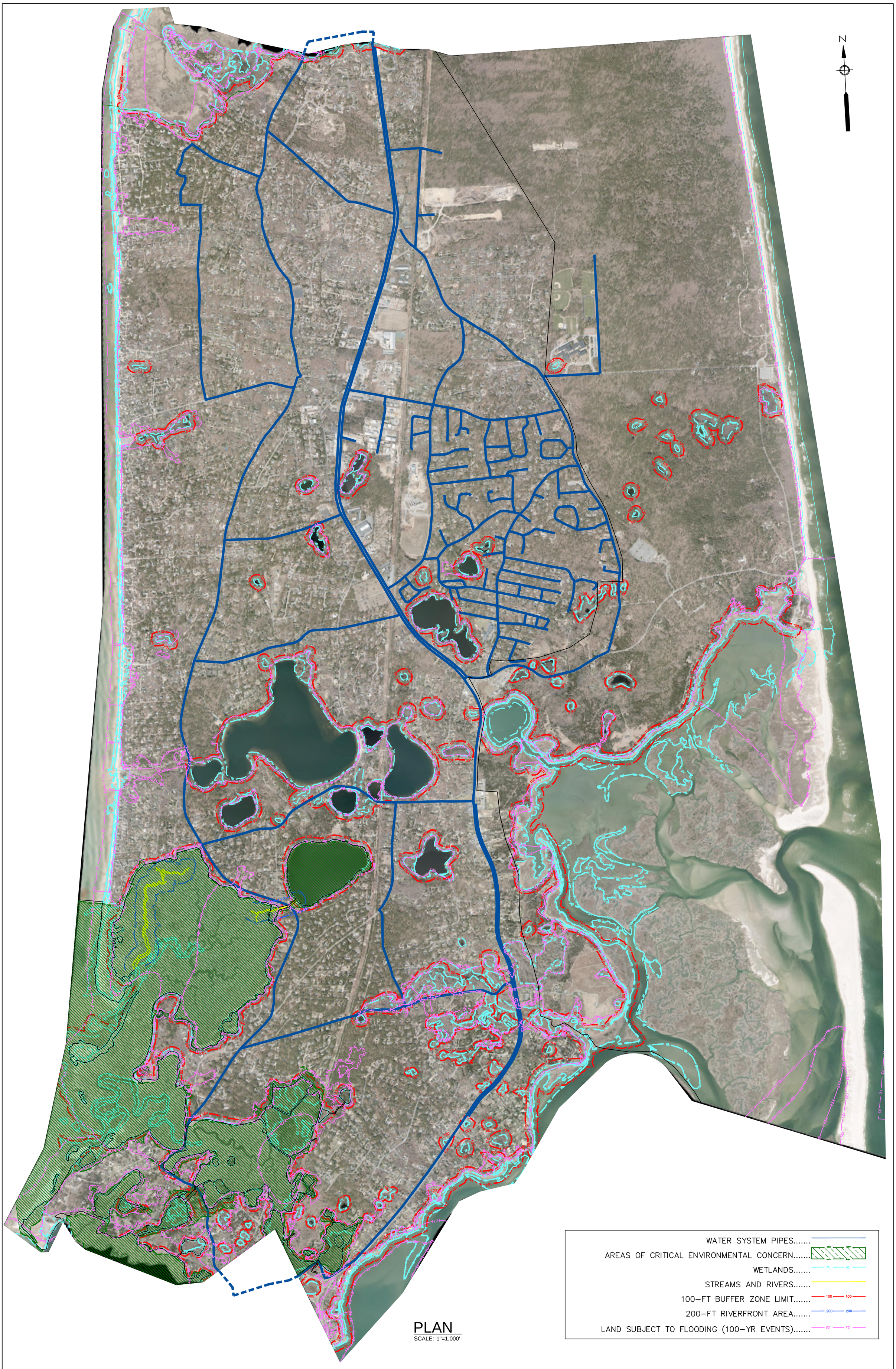


Figure 17: Groundwater Contour Map of Eastham



PLAN
SCALE: 1"=1,000'

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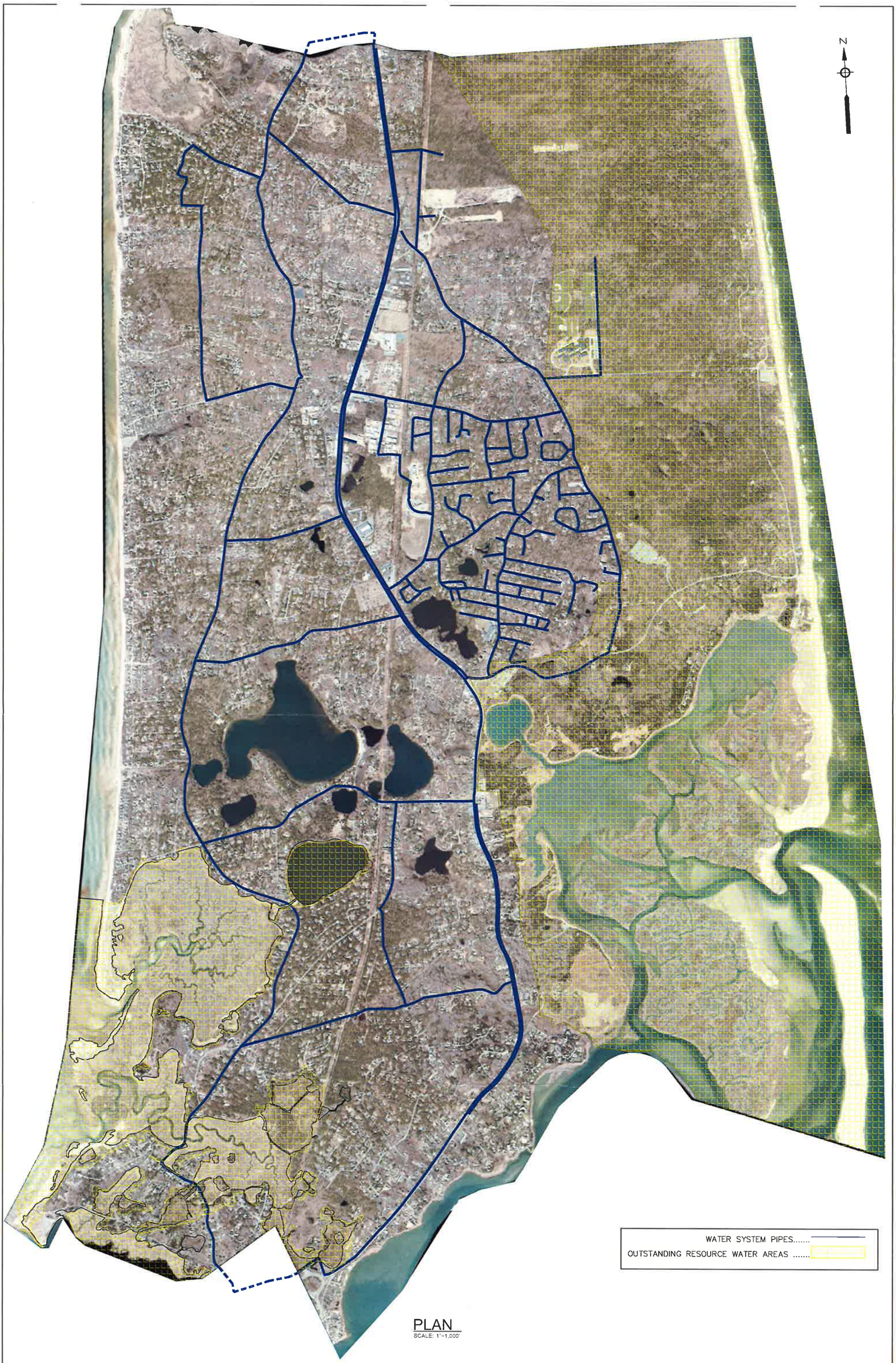
THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WATER SYSTEM CONCEPTUAL PLAN
EASTHAM, MASSACHUSETTS

FIGURE 18: AREAS OF ENVIRONMENTAL SIGNIFICANCE: WETLANDS, 100-YEAR FLOOD ZONES, ACEC

Drawing file: I:\Eastham.217\217-1401.00 Design and Permitting Activities\06. Notice of Intent\Figures\NOI WATER DESIGN.dwg Plot Date: Oct 14,2014-9:03am



Environmental Partners GROUP

A partnership for engineering solutions.

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

WATER SYSTEM CONCEPTUAL PLAN

EASTHAM, MASSACHUSETTS

FIGURE 19: OUTSTANDING RESOURCE WATER AREAS (INNER CAPE COD BAY AND CCNS)

Drawing file: I:\Eastham 217\217-1401.00 Design and Permitting Activities\06. Notice of Intent\Figures\NOI WATER DESIGN.dwg Plot Date: Oct 14,2014-7:48am

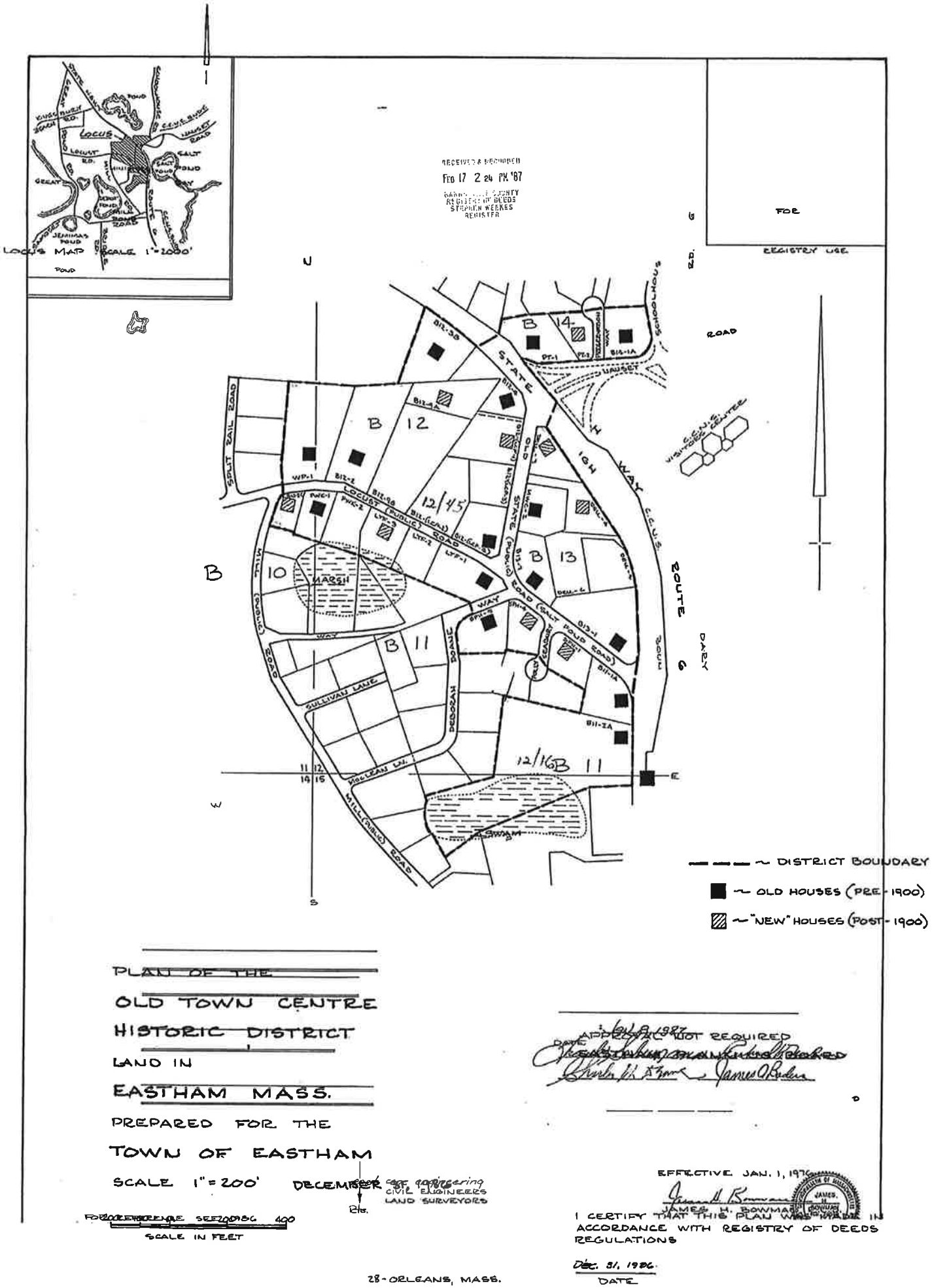


Figure 20: Old Towne District

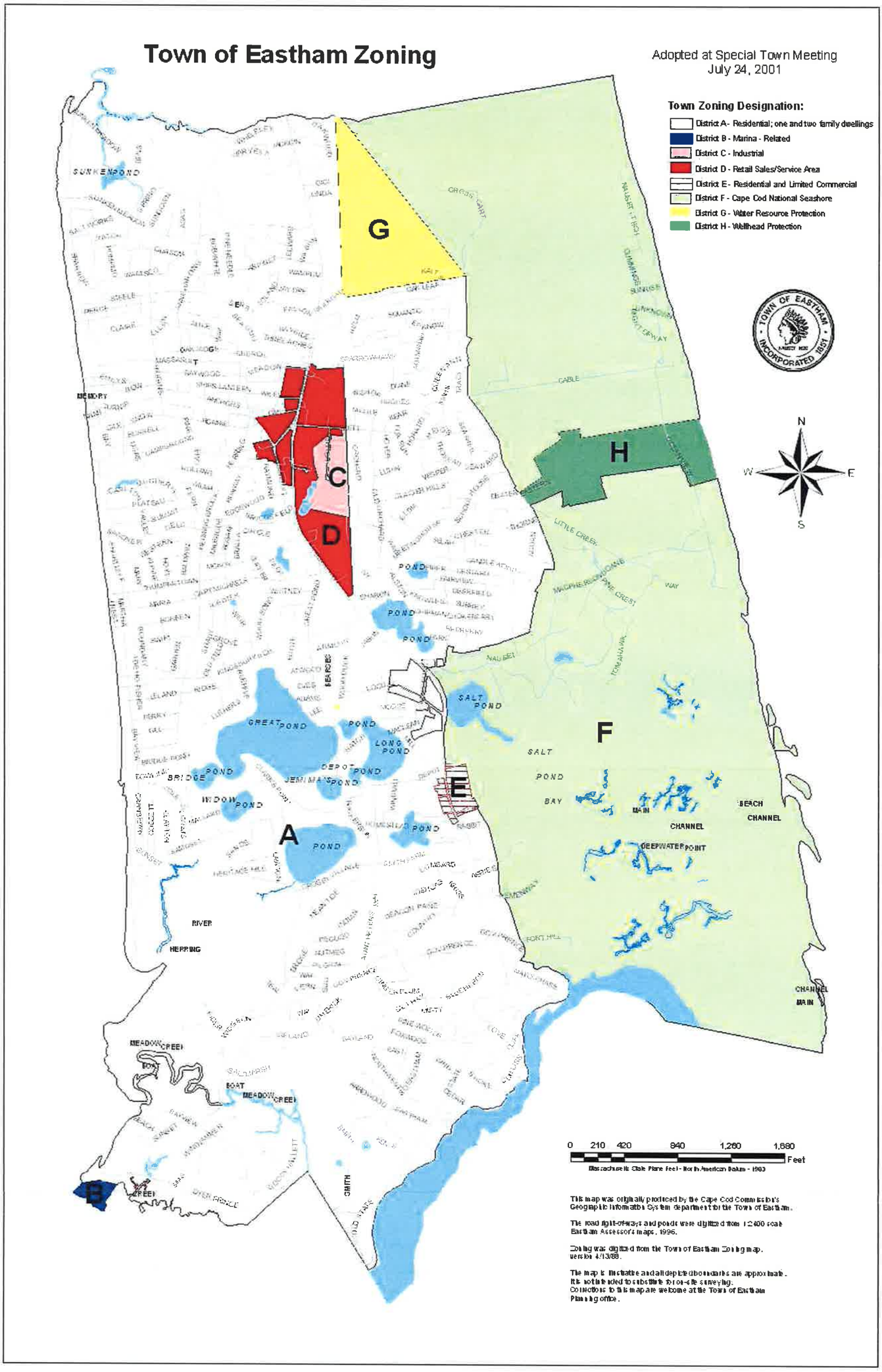
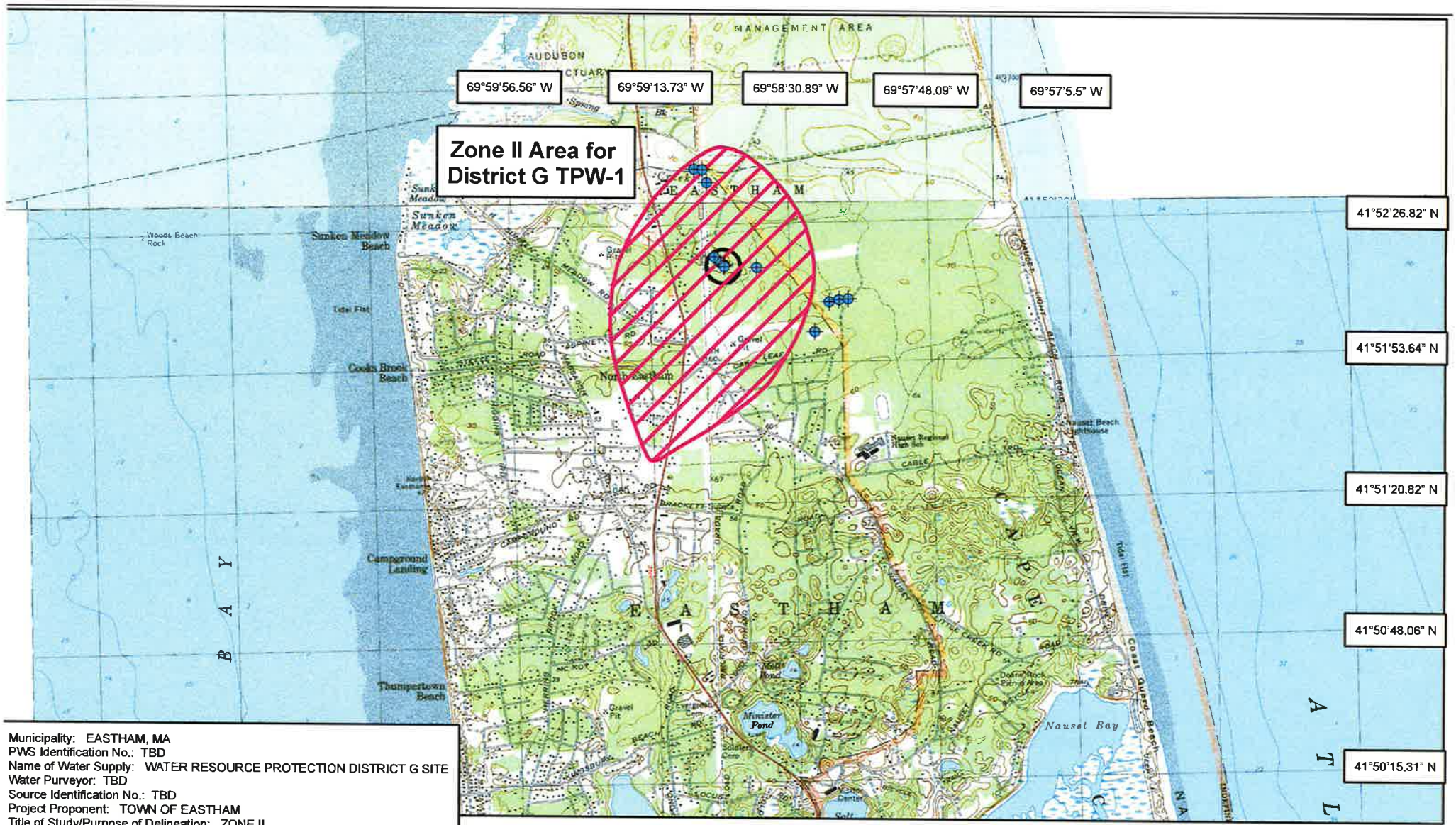


Figure 21: Eastham Zoning Districts

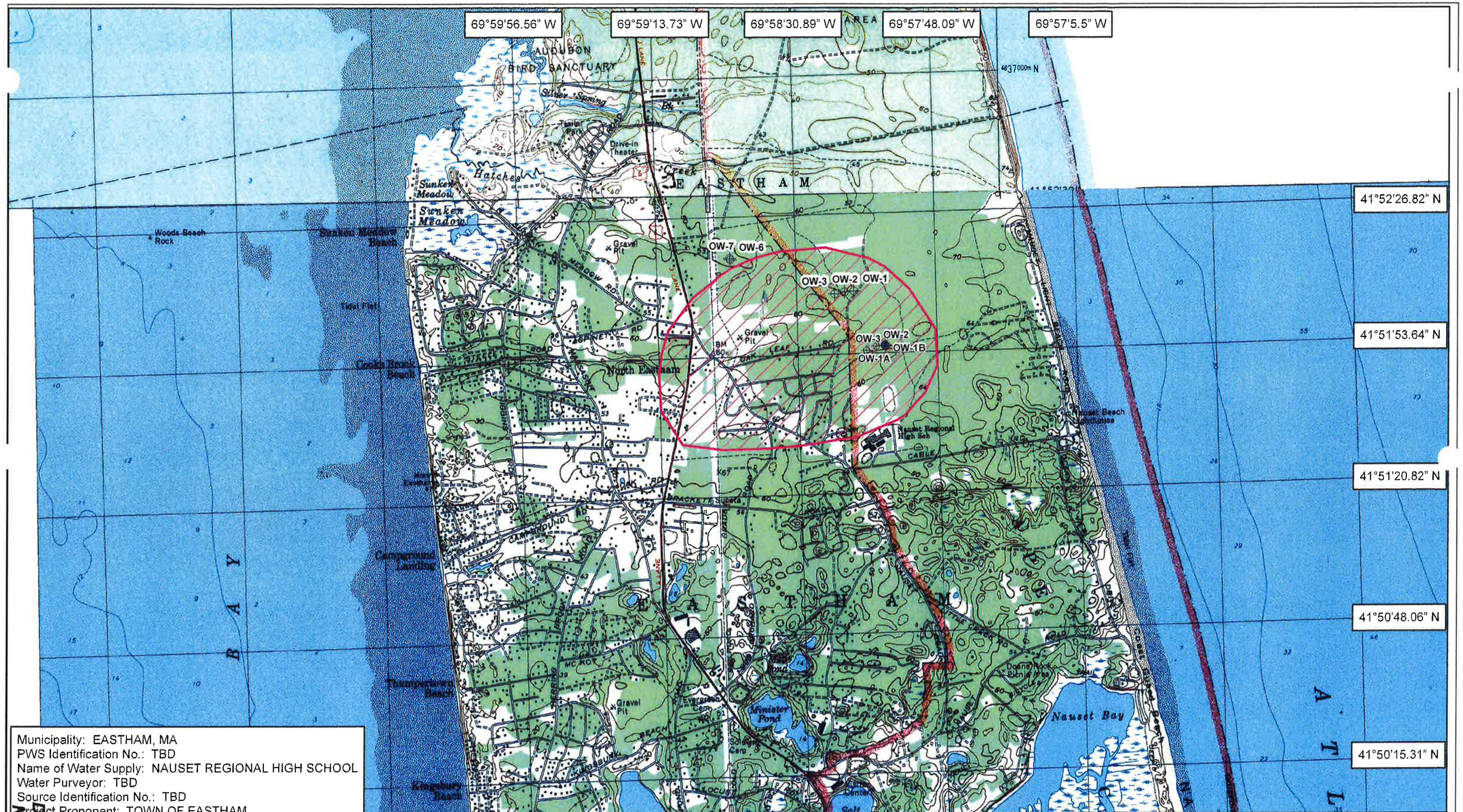


Municipality: EASTHAM, MA
PWS Identification No.: TBD
Name of Water Supply: WATER RESOURCE PROTECTION DISTRICT G SITE
Water Purveyor: TBD
Source Identification No.: TBD
Project Proponent: TOWN OF EASTHAM
Title of Study/Purpose of Delineation: ZONE II
Base Map Source: USGS
Date of Study Submittal: TBD

Latitude/Longitude of Source:

TPW-1: 41 52' 15.70" N, 69 58' 52.42" W

Figure 22: DEP-Approved Zone II for District G Well



Municipality: EASTHAM, MA
PWS Identification No.: TBD
Name of Water Supply: NAUSET REGIONAL HIGH SCHOOL
Water Purveyor: TBD
Source Identification No.: TBD
Project Proponent: TOWN OF EASTHAM
Title of Study/Purpose of Delineation: ZONE II
Base Map Source: USGS
Date of Study Submittal: TBD

Latitude/Longitude of Source:

TPW-1: 41 51' 54.00" N, 69 58' 4.80" W

0 0.25 0.5 1 Miles

Map Scale 1:25,000

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N W E S

Legend
NRHS Wells
TPW-1
Observation Wells
NRHS_ZoneII_2011Nov14_NAD27
NRHS 400ft Buffer

Figure 23: DEP-Approved Zone II for NRHS Well

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Deval L. Patrick
GOVERNOR

Maeve Vallely Bartlett
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181
http://www.mass.gov/envir

November 26, 2014

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
EXPANDED ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Eastham Water System
PROJECT MUNICIPALITY	: Eastham
PROJECT WATERSHED	: Cape Cod
EEA NUMBER	: 15273
PROJECT PROPONENT	: Town of Eastham
DATE NOTICED IN MONITOR	: October 20, 2014

Pursuant to the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project ***requires*** the preparation of an Environmental Impact Report (EIR). The Proponent submitted an Expanded Environmental Notification Form (EENF) with a request that I allow a Single EIR to be prepared in lieu of a Draft and Final EIR. Pursuant to 301 CMR 11.06(8), the Proponent may submit a Single EIR in accordance with the Scope below.

Project Description

As described in the EENF, the project consists of the construction of a municipal water system in the town of Eastham. The project will provide water service to approximately one-third of the properties in the town (2,021 properties) in the vicinity of the former town landfill. The water demand in this area currently averages 378,000 gallons per day (gpd). The groundwater in this area has been impacted by leachate from the landfill and nutrients from septic systems. The water system will replace the private drinking water wells that currently serve these properties. The project is designed with sufficient capacity in the distribution system to support future expansion to the remainder of the town.

The project includes the following components:

- Two wells with a combined volume of 1,878,000 gallons per day (gpd);
- Two pump station buildings, one for each well, with well pump controls and water conditioning chemicals;
- A 130-foot high water storage tank with a capacity of 750,000 gallons;
- 45 miles of distribution system piping; and
- Fire hydrants associated with the distribution system to add fire protection for 80 percent of the town.

The project will convert two existing test wells into production wells by equipping them with submersible pumps. The District G well and the Nauset Regional High School (NRHS) well are located on town-owned land in the northern part of Eastham. The EENF also identified a third well site, the District H well field, that could be used for expansion of the water system to the remainder of the town.

The storage tank will also be located on town-owned land in the vicinity of the District G well. The distribution system will include 12-inch diameter mains located primarily within the paved shoulders of Route 6 and the town's main roadways. These pipes will be constructed as looped transmission mains that will serve both as the backbone for an expanded town-wide system and service connections for abutting properties. The project will install eight-inch lateral pipes in secondary and subdivision roadways and in the landfill area to provide service connections to the municipal water system.

Project Site

Eastham is bordered to the east by Cape Cod Bay, to the west by the National Park Service's Cape Cod National Seashore (CCNS), to the south by the town of Orleans, and to the north by the town of Wellfleet. A portion of the Inner Cape Cod Bay Area of Critical Environmental Concern (ACEC) extends into the southern part of Eastham. The landfill area of the community that will be provided with water service is located within the northern half of the town, between Route 6 and the CCNS.

The District G site is located on Town-owned land about one-half mile south of the Eastham-Wellfleet town line, east of the Department of Conservation and Recreation's Cape Cod Rail Trail and north of Oakleaf Road. The 400-foot diameter Zone 1 wellhead protection area around the District G well is also located on Town-owned property. The land use within the Zone II wellhead protection area is predominately residential and forested with no potential sources of contamination.

The NRHS well is located in the northeast corner of property owned by the NRHS. It is located 3,000 feet north of the intersection of Cable Road and Nauset Road. The high school is currently served by a well at this site that will be discontinued once the municipal system becomes operational. The Zone 1 is located on land owned by the NRHS District and the CCNS. Land uses within the Zone II area are predominately forested and residential, with a small proportion of commercial and recreational uses. No potential sources of contamination have been identified within the Zone II.

Portions of the project will be located in or adjacent to historic districts or properties listed in the State and National Register of Historic Places, including the Cape Cod National Seashore, the Old Towne Center Historic District, and several cemeteries. In addition, the eastern and southern portions of the town are located within areas mapped as *Priority Habitat* for state-listed rare species by the Natural Heritage and Endangered Species Program (NHESP) in the Massachusetts Natural Heritage Atlas (13th Edition).

Environmental Impacts

The project will withdraw 415,000 gpd of water from two wells. However, there will be little to no increase in pumping from the aquifer because it already supplies water for the Town's residents through private drinking wells. The project will alter 21.8 acres of land, primarily due to the installation of the distribution system piping. Portions of the project are located within the CCNS, the Inner Cape Cod Bay ACEC, and within the buffer zone of wetlands resource areas.

Jurisdiction and Permitting

This project is subject to MEPA review and requires the preparation of a mandatory EIR pursuant to 301 CMR 11.03(4)(a)(3) because it requires a State Agency Action and will construct New water mains ten or more miles in length. The project will require a State Highway Access Permit from the Massachusetts Department of Transportation (MassDOT) and several permits from the Massachusetts Department of Environmental Protection (MassDEP), including a Water Withdrawal Permit, Approval to Construct Water Supply Source greater than 70 gallons per minute, and an approval for Drinking Water Systems that serve > 3,000 people. The project may require a Conservation and Management Permit (CMP) from the NHESP.

It requires an Order of Conditions from the Eastham Conservation Commission (and, if a local Order is appealed, a Superseding Order of Conditions (SOC) from MassDEP). The project will require a National Pollutant Discharge Elimination System Construction General Permit (NPDES CGP) from the United States Environmental Protection Agency (EPA). The project is subject to the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol.

Because the Proponent is seeking Financial Assistance from the Commonwealth for the project, MEPA jurisdiction extends to all aspects of the project that may cause Damage to the Environment as defined in the MEPA regulations

Review of the EENF

The EENF identified the need for the project, described existing conditions in the project area, provided a detailed description and plans of the project, and analyzed alternatives. The EENF included an analysis of existing and future water demand, a Feasibility Study, and a Pumping Test Report prepared as part of the application to MassDEP for a New Water Supply Source.

Most properties in Eastham rely on private drinking water wells that are commonly found in close proximity to on-site septic systems. Since the 1960's, the community has considered building a public water system to address water quality concerns and the limited ability of the

Town's Fire Department to provide fire protection due to the lack of fire hydrants. Planning studies and water quality sampling conducted in the 2000's confirmed elevated nitrate levels in private drinking wells throughout the Town due to on-site septic systems. In addition, groundwater contamination associated with leachate from the municipal landfill in the central part of the town affected some private wells since the late 1990's. Groundwater sampling conducted since the landfill was closed 1997 has detected vinyl chloride, a Volatile Organic Compound (VOC). More recently, the town has detected 1,4-dioxane, believed to be a carcinogen, in monitoring wells and drinking water wells. Forty-three wells have exceeded water quality standards for 1, 4-dioxane and have been provided with the use of bottled water to replace well water. The discovery of 1,4-dioxane in areas of the town where the groundwater is not influenced by the landfill suggests a more regional problem. The construction of a municipal water supply system serving one-third of the Town was approved by the residents of Eastham at the Annual Town Meeting in May 2014. MassDEP's comments indicate that the agency supports the project as a means of ensuring a safe and reliable water supply for the Town.

Alternatives Analysis

The Town evaluated nine potential drinking well sites within the Town according to the following screening criteria: ownership, yield, water quality, ability to accommodate a 400-foot Zone 1 radius around the well head, and proximity to the service area of the water system. The District G, District H, and NRHS sites met these criteria and were evaluated further as part of the MassDEP New Source investigation.

The Town also evaluated three town-owned alternative locations for siting the storage tank. The sites include the District G site, a location adjacent to Town Hall, and the Candlewood area. District G was selected because it is located in close proximity to the District G and NRHS wells, and provides the largest setback from residential properties. According to the EENF, future expansion of the water supply system will require a second water tower at either the Town Hall site or in the Candlewood area.

Water Supply and Groundwater

The project will provide a safe and reliable water supply to the residents of Eastham by supplying water withdrawn from a part of the aquifer that is not impacted by septic systems or landfill leachate. The project is not expected to have a significant effect on the aquifer because it will replace the use of the private wells, resulting in little, if any, net increase in water withdrawal.

The Town's current water demand cannot be measured because it is supplied by unmetered private wells. The EENF developed estimates of the water system demand based on an analysis of the current land uses of the properties to be provided with water service. The land uses are predominately residential (88 percent). Tax-exempt properties (state or local government uses, churches, or recreational uses), commercial uses, and multiple-use properties make up nearly all of the remaining land uses. A relatively small number of parcels (123 parcels out of the total of 2,021 properties) are currently undeveloped and represent the potential increase in demand. The EENF considered per capita water usage rates, Title 5 wastewater flow

criteria, and data from other community systems to estimate the water demand associated with the land uses in the Town. The annual average day current demand is estimated at 378,000 gpd, which could rise to 415,000 gpd in the future with the development of the remaining undeveloped parcels. The seasonal peak in water use during the summer months is estimated at 734,000 gpd, which could increase to 806,000 gpd under future conditions. The peak day usage is estimated at 1,068,000 gpd, which could increase to 1,172,000 gpd in the future.

The Town conducted hydrological testing and groundwater modeling to determine the effect of the District G and NRHS water withdrawals on the aquifer. Based on pumping tests that examine the effect of water withdrawals on groundwater levels, MassDEP approved a withdrawal of 995,000 gpd from the District G well and 883,000 gpd from the NRHS well. According to the EENF, the water demand associated with the properties that will be connected to the system initially is estimated at 515,000 gpd, or 22 percent of the annual average daily permitted volume. This volume will be equally withdrawn from both the District G and NRHS wells, which will further reduce the impact to the aquifer. In its comment letter, MassDEP concurs with the conclusion that impacts to the aquifer will be insignificant because the water system withdrawals will replace withdrawals associated with existing wells.

According to the EENF, the Town has adopted zoning to protect the MassDEP-approved Zone 1 areas around each well. Each well field will also be monitored with a system that will provide real time information on the status of its operations and security of the pump station. MassDEP indicated that more information and analysis will be required during the Water Management Act (WMA) permitting process to confirm the EENF's assessment of the current and future water demand. MassDEP also noted that, based on the Water Resources Management Program regulations (310 CMR 36.00), the project must mitigate approximately 15 percent of the withdrawal, with the actual amount to be determined once the wells are operational.

The EENF noted that the Town will be required to prepare system-wide water conservation plans in connection with its MassDEP Water Withdrawal permit. The required plans include a Drought Management Plan that will identify triggers for conservation measures such as limitations on outdoor water use, and a Conservation Plan that will describe public education and outreach measures encouraging water conservation efforts, leak detection audits, and other measures.

Traffic

The distribution system will be installed on Eastham's primary and secondary roadways, including State Highway Route 6. According to the EENF, the piping will be installed in a trench along the side of the roads and directional drilling will be used to avoid direct impacts to roadway operations. Traffic Management Plans will be developed for each construction contract developed for the project. Additional traffic mitigation measures proposed by the Town include:

- Establishing and maintaining appropriate traffic signage during construction;
- Trenches and excavations will be patched at the end of each construction day;
- Construction activities will not be allowed during the summer tourism season (Memorial Day to mid-September); and

- Restrictions on periods of the day when work can be performed.

MassDOT comments recommend that the following measures be included in the Traffic Management Plans:

- Maintenance of adequate sight lines for construction vehicles and through traffic;
- Identification of the number of construction vehicles that will use area roads daily and during peak hours;
- Identification of typical work hours;
- Identification of truck routes to and from the construction site;
- Identification of advance warning signs approaching the work zones;
- Clear identification of detours through the entire detour route;
- Identification of accommodations and safety measures for bicyclists and pedestrians;
- Identification of the type, duration ,and location of traffic control devices to be used during the construction period; and
- Training for construction personnel to ensure that the Traffic Management Plans are implemented correctly.

Rare Species

According to NHESP, the majority of the project is exempt from MESA review because it will take place within 10 feet of existing paved roads. Non-exempt portions of the project include the water storage tank and the District G and NRHS wells, as well as the adjacent portions of the distribution systems. These portions of the project may need to be conditioned during the MESA permitting process to ensure that the project does not result in a "take" of a rare species. According to NHESP, turtle protection measures may be required during construction of the storage tank and wells. As required in the Scope below, additional information regarding impacts to rare species habitat and mitigation should be included in the Single EIR.

Cultural Resources

According to the EENF, the project will not impact any historic districts because the distribution system passing through these areas will be installed within existing roadways. A portion of the distribution system on Nauset Road within the CCNS will pass through an archaeologically sensitive area. According to the EENF, the Town is consulting with the CCNS to determine whether any previous archaeological assessments have been performed within the project area.

The Massachusetts Historical Commission (MHC) provided a copy of a letter it sent to the Town. According to MHC, the alternative water storage tank locations at the Town Hall and Candlewood sites may also be archaeologically sensitive. In addition, the construction of the distribution system will be located in the vicinity of two significant burial grounds that are listed in the State Register of Historic Places, the Cove Burying Ground and the Bridge Road Cemetery. As noted by the Cape Cod Commission (CCC), the EENF did not identify several National Register Districts, including the Town Hall Center Historic District, Fort Hill Rural

Historic District, Collins Cottage Historic District, and other historic properties. The CCC recommended that these sites be mapped to aid in planning the installation of the water mains and fire hydrants.

The water storage tank will be constructed on land currently used by the town's Department of Public Works for material stockpiling and yard waste composting. The site is adjacent to an existing 190-foot high tower. The EENF provided photo renderings depicting views of the tower from various vantage points throughout the Town.

Greenhouse Gas (GHG) Emissions

This project is subject to review under the May 5, 2010 MEPA Greenhouse Gas Emission Policy and Protocol (GHG Policy). The GHG Policy is one element of a comprehensive effort to meet the Commonwealth's obligations under the Global Warming Solutions Act (GWSA) which include reducing carbon emissions by between 10% and 25% below 1990 emissions levels by the year 2020, and by 80% below 1990 emissions levels by the year 2050. Consistent with MEPA's overall purpose to evaluate alternatives that avoid, minimize and mitigate environmental impacts to the maximum extent practicable (301 CMR 11.01), the Policy requires that GHG impacts of projects have been carefully considered and that all feasible means and measures to reduce those impacts are adopted. The Policy requires that all projects that are subject to preparation of an EIR quantify GHG emissions, evaluate measures that could reduce GHG emissions and quantify potential reductions of mitigation measures. This is a case-by-case inquiry that allows project proponents to select mitigation measures that are determined to be feasible for the particular project being proposed, thereby providing project proponents with maximum flexibility to design their projects.

The EENF included a baseline analysis of GHG emissions based on the estimated electrical demands and associated GHG emissions of the existing well pumps at the 2,021 properties that currently have private wells. This baseline was compared the expected use of electricity and GHG emissions associated with the pumps at the two municipal water supply wells. The analysis used an emissions factor of 719 pounds (lbs) of carbon dioxide (CO_2) per Megawatt-hour of electricity per year (719 lbs/MWh/year).

The Baseline energy use was calculated assuming that private residential wells use 900 watt pumps for 1.43 hours per day or 500 hours per year. Community well systems were assumed to use a three horsepower pump for the same run time as the residential wells. This results in baseline emissions of 323 tons per year (tpy) of CO_2.

GHG emissions associated with the Preferred Alternative were derived from the energy use needed to meet the future water demand of 415,000 gpd using two wells with 75 horsepower pump motors running at the maximum pumping rate of each well. GHG emissions associated with the Preferred Alternative were calculated as 75 tpy of CO_2, for a reduction of 248 tpy of CO_2.

The EENF noted that additional mitigation measures will be used that may further reduce GHG emissions, including variable frequency drives on the pump motors, motion sensors on

lighting and climate controls for the pump station buildings, and implementation of a water conservation plan for the Town.

Construction

The project will not directly impact any wetlands resource areas. In several areas, installation of the distribution system in paved areas adjacent to roadways will occur within the 100-foot Buffer Zone of Bordering Vegetated Wetlands (BVW). In these areas, the project will employ sedimentation and erosion controls to prevent impacts to BVW and restore and stabilize the trench upon completion of construction.

Single EIR Request

The Proponent has requested that I allow a Single EIR pursuant to 301 CMR 11.06(8). Consistent with this request, an EENF was provided and subject to an extended comment period. The EENF included a detailed project description, an alternatives analysis, baseline environmental conditions, and identified mitigation measures to support the request for a Single EIR. Comments from state and regional agencies were generally supportive of the project and did not identify any issues or analysis for review in a Draft EIR. Based on the review of the EENF and consultation with State Agencies, the Proponent may submit a Single EIR in accordance with the Scope below.

SCOPE

General

The Single EIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this scope.

Project Description and Permitting

The Single EIR should include a detailed description of the proposed project and describe any changes to the project since the filing of the EENF. The Single EIR should include updated site plans for existing and proposed conditions at a legible scale for any changes to the project. The Single EIR should provide a brief description and analysis of applicable statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The Single EIR should include a list of required State permits, Financial Assistance, or other State approvals and provide an update on the status of each of these pending actions.

I encourage the Proponent to provide information regarding the existing conditions at the District H well field and potential impacts associated with its use. This information and comments from State Agencies regarding the site and potential issues could support the Town's long-term planning efforts.

Comments from state and regional agencies are generally supportive of the project. Comments did not identify any significant impacts that were not reviewed in the EENF, note deficiencies in the alternatives analysis, or identify additional alternatives for further review.

System Operations

The Single EIR should discuss the Town's expectation with respect to the future use of the existing private wells once the water system is operational. The Single EIR should describe the process by which properties will be connected to the municipal water system and any provisions that will be made for discontinuing the use of existing wells. I note that maintaining the wells will not necessarily increase demand for water unless development is expanded significantly in the Town. However, the Single EIR should discuss whether decommissioning of the wells is necessary or preferable for managing the aquifer by removing potential sources of contamination and points of withdrawal that cannot be tracked.

The Single EIR should provide additional details regarding the water conservation measures that the Town will implement when the water system becomes operational. At a minimum, the Single EIR should discuss metering, leak detection, and public education components of a water conservation plan.

As noted by MassDEP, the Town may be required to provide mitigation for a portion of the withdrawal. The Single EIR should explore opportunities for the use of infiltration measures to increase groundwater recharge. I recommend that the Town consult with MassDEP regarding any additional mitigation options that may be appropriate.

GHG Emissions

The GHG analysis assumed that the private wells would be discontinued once the municipal water system is operational. As requested above, the Single EIR should provide additional information and analysis in relation to potential on-going use of private wells. If it is likely that a significant number of wells will remain in use, the GHG analysis should be revised to reflect the on-going electricity use by well pumps. The Single EIR should also evaluate potential alternative technology for pumps and other equipment to reduce energy use by the municipal water system and provide an updated GHG analysis reflecting any changes. The Single EIR should review the feasibility of on-site renewable energy generation, such as solar photovoltaic systems or wind turbines, to meet all or a portion of the electrical demand of the water system.

Rare Species

According to NHESP, Priority Habitat of rare species may be impacted by construction of the water storage tank, the wells, and portions of the distribution system. The Town should continue to consult with NHESP and provide additional information in the Single EIR regarding rare species. It should describe rare species that could be impacted by the project, identify any changes to the project to avoid impacts, and identify potential mitigation measures.

Cultural Resources

The CCC and MHC identified historic resources within the project area that were not specifically addressed in the EENF. The Single EIR should provide an update on the Town's ongoing coordination with these agencies with respect to avoiding and mitigating impacts to historic and archaeological resources.

Construction

As noted in MassDEP's comment letter, the EPA has mandated that construction equipment must use Ultra Low Sulfur Diesel Fuel (ULSD) as of 2010. The Single EIR should confirm that the project will require its construction contractors to use ULSD, and should include this as a mitigation measure in the Section 61 findings. As requested by MassDEP, the SEIR should address how the project will ensure compliance with anti-idling provisions (310 CMR 7.11).

Mitigation and Section 61 Findings

The Single EIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each State Agency that will issue permits for the project. The Single EIR should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

In order to ensure that all GHG emissions reduction measures adopted by the Proponent as the preferred alternative are actually constructed or performed by the Proponent, the Secretary requires proponents to provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. Specifically, the Secretary will require, as a condition of a Certificate approving a Single EIR (or Supplemental Single EIR if necessary), that the Proponent provide a certification to the MEPA Office signed by an appropriate professional (e.g., engineer, architect, transportation planner, general contractor) indicating that the all of the mitigation measures adopted by the Proponent as the preferred alternative have been incorporated into the project. Alternatively, the Proponent may certify that equivalent emissions reduction measures that collectively are designed to reduce GHG emissions by the same percentage as the measures outlined in the Single EIR, based on the same modeling assumptions, have been adopted. The certification should be supported by plans that clearly illustrate where GHG mitigation measures have been incorporated. For those measures that are operational in nature (i.e. TDM, recycling, water conservation) the Proponent should provide an updated plan identifying the measures, the schedule for implementation and how progress towards achieving the measures will be obtained. The commitment to provide this self-certification in the manner outlined above should be incorporated into the draft Section 61 Findings included in the Single EIR.

Responses to Comments/Circulation

The Single EIR should contain a copy of this Certificate and a copy of each comment letter received. To ensure that the issues raised by commenters are addressed, the Single EIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the scope of the Single EIR beyond what has been expressly identified in this certificate. I recommend that the Proponent use either an indexed response to comments format, or a direct narrative response.

In accordance with Section 11.16 of the MEPA Regulations and as modified by this Certificate, the Proponent should circulate a hard copy of the Single EIR to each State and City Agency from which the Proponent will seek permits. The Proponent must circulate a copy of the Single EIR to all other parties that submitted individual written comments. Per 301 CMR 11.16(5), the Proponent may circulate copies of the Single EIR to these other parties in CD-ROM format or by directing commenters to a project website address. However, the Proponent should make available a reasonable number of hard copies and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A CD-ROM copy of the filing should also be provided to the MEPA Office. A copy of the Single EIR should be made available for review at the Eastham Public Library.

Conclusion

The Proponent may prepare and submit a Single EIR for review by the MEPA Office. The project, as proposed in the EENF, is limited to expansion of the water system to one-third of the properties in Eastham. The Town may expand the system to the remainder of the Town in the long-term. If the Town intends to proceed with expansion, it is likely that it would be required to file a Notice of Project Change (NPC) and the Town should consult with the MEPA Office regarding this potential change.

November 26, 2014
Date

Maeve Vallely Bartlett

Comments received:

11/18/2014	Natural Heritage and Endangered Species Program (NHESP)
11/18/2014	Division of Marine Fisheries (DMF)
11/18/2014	Massachusetts Department of Transportation (MassDOT)
11/18/2014	Association to Preserve Cape Cod (APCC)
11/19/2014	Massachusetts Department of Environmental Protection (MassDEP)/Southeast Regional Office (SERO)
11/19/2014	Cape Cod Commission

MVB/AJS/ajs

RECEIVED

NOV 06 2014

MEPA

AS

November 5, 2014

Sheila Vanderhoef
Town Administratio
Town of Eastham
2500 State Highway
Eastham, MA 02642

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

RE: Eastham Water System, Eastham, MA. MHC # RC.48184. **EEA #15273.**

Dear Ms. Vanderhoef:

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Expanded Environmental Notification Form (ENF) submitted by Environmental Partners Group, Inc., received October 22, 2014, for the project referenced above. The proposed project consists of the construction of water wells and associated infrastructure, including an elevated water storage tank and the installation of water distribution system within multiple roads in Eastham.

The ENF includes information that is responsive to the MHC's October 14, 2014 comments on the Project Notification Form (PNF). The MHC notes that portions of the project impact area are within the Cape Cod National Seashore (CACO), owned and administered by the National Park Service. Project information has been submitted to CACO. The MHC looks forward to receiving any comments from the CACO for the project.

The ENF includes preliminary project plans for multiple Contract elements within the overall project and indicates that the majority of wells, water lines and associate infrastructure are proposed primarily within existing paved roads. Other project impact areas are proposed within areas that may be archaeologically sensitive, including portions of CACO. Alternative water storage tank locations referenced in Figure 14, such as Phase 2 tank locations that may be proposed within the Candlewood Area and adjacent to Town Hall, may also be archaeologically sensitive. Preliminary project plans for Contract elements in the vicinity of significant historic burial grounds, including Contract 6 at the Cove Burying Ground (MHC # EAS.800) and Contract 8 adjacent to the Bridge Road Cemetery (EAS.803), were not included in MHC's copy of the ENF.

The MHC requests that additional information be submitted as project planning proceeds, including current scaled existing and proposed conditions project plans for all Contract elements, the results of geotechnical surveys, soil borings, and information on the locations of existing utilities, to assist MHC in providing comments regarding the need for any archaeological surveys and for further consultation to avoid, minimize or mitigate any adverse effects to significant historic and archaeological resources.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and M.G.L Chapter 9, Sections 26-27C (950 CMR 71). If you have any immediate questions or require additional information please contact Jonathan K. Patton, Archaeologist/Preservation Planner, at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: see attached

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

xc: John F. Knight, Eastham Water Commission Chairman
Neil Andres, Superintendant, Eastham Department of Public Works
Marty Mickle, Assistant Superintendant, Eastham DPW
John Felix, DEP-BRP
Secretary Maeve Vallely Bartlett, EEA, Attn: Alex Strysky, MEPA Unit
Bettina Washington, Wampanoag Tribe of Gay Head (Aquinnah)
Ramona Peters, Mashpee Wampanoag Tribe
Steve Chrabascz, USDA Rural Development
George E. Price, Jr. Superintendant, Cape Cod National Seashore, Attn: Bill Burke
DEP-SERO, Div. Water Pollution Control
Eastham Historical Commission
Mark N. White, Environmental Partners Group, Inc.

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

November 18, 2014

Maeve V. Bartlett, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Alex Strysky, EEA No. 15273
100 Cambridge St.
Boston, MA 02114

Project Name:	*Eastham Water System*
Project Description:	*Construction of Municipal Water System, Including Wells, Storage Tank and Distribution System*
Proponent:	*Town of Eastham*
Location:	*Eastham*
Document Reviewed:	*Environmental Notification Form*
EEA No.:	*15273*
NHESP No.:	*09-27553*

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") has reviewed the Environmental Notification Form (ENF) for the *Eastham Water System* and would like to offer the following comments regarding state-listed species and their habitats.

Portions of the project are located within *Priority Habitat* for state-listed rare species, as indicated in the MA Natural Heritage Atlas (13th Edition). Based on a review of the information that was submitted and the information that is contained in our database, the Division anticipates that portions of the proposed project will occur within the habitat of various state-listed invertebrate, vertebrate, and plant species. These species and their habitats are protected pursuant to the Massachusetts Endangered Species Act (MGL c.131A) and its implementing regulations (321 CMR 10.00) (MESA).

Portions of the project that will occur within the *Priority Habitat* for state-listed species, which are not otherwise exempt from MESA review pursuant to 321 CMR 10.14, require a direct filing with the Division for compliance with the MESA. The Proponent has submitted site plans and associated materials to the Division for review pursuant to the MESA, which is ongoing. The Division notes that the installation of utility systems within ten (10) feet of the edge of existing paved roads may be exempt from MESA review pursuant to 321 CMR 10.14, which states that "[t]he following Projects and Activities shall be exempt from the requirements of 321 CMR 10.18 through 10.23..."

> [10] installation, repair, replacement, and maintenance of utility lines (gas, water, sewer, phone, electrical) for which all associated work is within ten feet from the edge of existing paved roads, and the repair and maintenance of overhead utility lines (phone, electrical) for which all associated work is within ten feet from the edge of existing unpaved roads, provided, however,

Division of Fisheries and Wildlife
Field Headquarters, One Rabbit Hill Road, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

that unpaved utility access roads associated with exempt activities under 321 CMR 10.14(11) shall be addressed in and subject to the Division-approved operation and maintenance plan required thereunder;

The complete list of MESA filing exemptions may be found on the Division's website. Based on a review of the information that was submitted, we anticipate that the majority of the proposed distribution system will qualify as exempt from MESA review pursuant to 321 CMR 10.14.

For non-exempt portions of the project, the Proponent has been involved in ongoing consultations with the Division to avoid and minimize impacts to state-listed species and their habitats. The Division's review is currently ongoing. At this time, the Division anticipates that the proposed Water Supply Well Fields at District G and Nauset Regional High School, as well as the Water Storage Tank at District G, may need to be conditioned in order to avoid a "take" of state-listed species. Conditions may include, but may not be limited to, implementation of a Division-approved turtle protection plan during construction.

The Division also anticipates that a small, non-exempt portion of the distribution system associated with the proposed Water Supply Well Fields and Storage Tank at District G, as currently designed, may necessitate surveys for state-listed plant species. Survey information would be used by the Division to determine if there will be a "take" of state-listed plants associated with the proposed project. If the project is determined to result in a "take," it may be possible to redesign the project to avoid a "take." If redesign is not possible, the Proponent should note that projects resulting in a "take" of state-listed species may only be permitted if they meet the performance standards for a Conservation and Management Permit (321 CMR 10.23). Although it is currently unclear whether the project will result in a "take," the Division anticipates being able to resolve any outstanding issues related to state-listed species during the MESA permitting process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed. We appreciate the opportunity to comment on this project, and look forward to working with the Proponent to address outstanding rare species concerns. If you have any questions or need additional information, please contact Jesse Leddick, Endangered Species Review Biologist, at jesse.leddick@state.ma.us or (508) 389-6386.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark White, Environmental Partners Group
Eastham Conservation Commission
Eastham Board of Selectmen
Eastham Planning Board

Commonwealth of Massachusetts

Division of Marine Fisheries

251 Causeway Street, Suite 400
Boston, Massachusetts 02114
(617) 626-1520
fax (617) 626-1509

Paul J. Diodati
Director

Deval Patrick
Governor
Maeve Vallely Bartlett
Secretary
Mary B. Griffin
Commissioner

November 18, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Alexander Strysky, EEA No. 15273
100 Cambridge Street, Suite 900
Boston, MA 02114

Dear Secretary Bartlett:

The Division of Marine Fisheries (*MarineFisheries*) has reviewed the Environmental Notification Form by the Town of Eastham for the proposed Eastham water system. The proposed water system would include two well fields, a water storage tank, and 45 miles of distribution system piping. Existing marine fisheries resources within the overall project footprint and potential impacts to these resources are outlined in the following paragraphs.

Some of the proposed distribution system piping would traverse coastal streams supporting documented diadromous fish runs [1,2]. Diadromous fish species that use these systems for foraging, passage, nursery, and/or spawning habitat include alewife (*Alosa pseudoharengus*), American eel (*Anguilla rostrata*), Atlantic tomcod (*Microgadus tomcod*), and white perch (*Morone americana*). If any in-water work is required, *MarineFisheries* recommends the following time of year (TOY) restrictions to minimize impacts to diadromous fish passage at these sites:

Stream	Work Location	Diadromous Species Present	TOY Restriction
Herring Brook	Herring Brook Road	Alewife, American eel	3/15-6/30 9/1-11/15
Herring River	Herring Brook Road	Alewife, American eel, Atlantic tomcod	2/15-6/30 9/1-11/15
Rock Harbor Creek	Rock Harbor Road, Route 6	Alewife, American eel, White perch	3/15-6/30 9/1-11/15
Boat Meadow River	Bridge Road	Alewife, American eel, Atlantic tomcod	2/15-6/30 9/1-11/15

Questions regarding this review may be directed to John Logan in our New Bedford office at (508) 990-2860 ext. 141.

Sincerely,

Paul J. Diodati
Director

cc: Eastham Conservation Commission
Alison Verkade, Christopher Boelke, NMFS
Robert Boeri, CZM
Ed Reiner, EPA
Ken Chin, DEP
Richard Lehan, DFG
Kathryn Ford, John Sheppard, Christian Petitpas, DMF

References

1. Evans NT, Ford KH, Chase BC, Sheppard J (2011) Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts. Massachusetts Division of Marine Fisheries Technical Report, TR-47.
2. Reback KE, Brady PD, McLaughlin KD, Milliken CG (2004) A survey of anadromous fish passage in coastal Massachusetts: Part 2. Cape Cod and the Islands. Massachusetts Division of Marine Fisheries Technical Report TR-16.

PD/JL/sd

Deval L. Patrick, Governor
Frank DePaola, Acting Secretary & CEO

massDOT
Massachusetts Department of Transportation

November 18, 2014

Maeve Vallely-Bartlett, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Eastham – Eastham Water System – EENF
(EEA #15273)

ATTN: MEPA Unit
Alex Strysky

Dear Secretary Bartlett:

On behalf of the Massachusetts Department of Transportation, I am submitting comments on the Expanded Environmental Notification Form (EENF) for the proposed Eastham Water System project, as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please call J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655

cc: Frank DePaola, P.E., Acting Secretary
Patricia Leavenworth, P.E., Chief Engineer, Highway Division
Neil Boudreau, State Traffic Engineer
Mary-Joe Perry, P.E., District 5 Highway Director
Cape Cod Commission
Town of Eastham Planning Board
PPDU Files

Deval L. Patrick, Governor
Frank DePaola, Acting Secretary & CEO

massDOT
Massachusetts Department of Transportation

MEMORANDUM

TO: David J. Mohler, Executive Director

FROM: J. Lionel Lucien, P.E, Manager, Public/Private Development Unit
Office of Transportation Planning

DATE: November 18, 2014

RE: Eastham -- Eastham Water System – EENF Review
(EEA #15273)

The Public/Private Development Unit (PPDU) has reviewed the Expanded Environmental Notification Form (EENF) for the proposed Eastham Water System project in the Town of Eastham. The project entails the construction of a municipal water system including approximately 45 miles of water main that will serve 2,021 properties (approximately one-third of the town). The system will also provide fire protection to about 80 percent of the town, as estimated based on the number of properties that will be within not more than 0.5 miles of the water main. Pipes will be installed within the Route 6 (Grand Army of the Republic Highway) right-of-way along the full length of the roadway (approximately 6.5 miles) in Eastham, from its northern border at Wellfleet to its southern border at Orleans. Route 6 in the project area is a state highway.

The water main used for the Route 6 section of the project will be 12-inch diameter and installed by either conventional trenching techniques or, wherever feasible, by directional drilling methods. The latter procedure would result in less disruption to pavement and traffic flow conditions. Also, similar to other project areas, fire hydrants will be installed at about 500 foot intervals and a curb box provided to facilitate a service connection to each property.

The proposed project triggered the preparation of an Environmental Notification Form (ENF) and will require a Massachusetts Department of Transportation (MassDOT) Non-Vehicular Access Permit for work to be conducted in the Route 6 right-of-way. The activities associated with the construction/installation of the water main will require some disruption to traffic along Route 6, independent of the procedures used.

MassDOT recommends that no further environmental review be required based on transportation issues, provided that certain procedures are followed and safeguards in place during project construction. The Proponent and Contractor should ensure that patching methods will yield post-project surface conditions along Route 6 that will be unchanged from existing conditions. All patching should be conducted according to MassDOT requirements for materials and methodology.

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655

The Proponent has already committed to some mitigation measures in conjunction with the work. They are as follows:

- Development of a traffic management plan (TMP);
- Establishing and maintaining work zone traffic signage on a daily basis;
- Plating or asphalt patching of trenches at the conclusion of each construction day;
- Not allowing construction activities during the summer tourism season (generally between Memorial Day and mid-September); and
- Placing restrictions on times of the day when work can be performed (e.g., not during weekday peak commuter periods).

The Proponent and Contractor should work with MassDOT's District 5 Office as well as with Traffic Operations (Boston Headquarters Division) during the permitting process in order to establish firm time periods when work can be conducted, both from a seasonal and daily perspective.

The aforementioned TMP would be for the purpose of maintaining safe and efficient mobility along potentially affected sections of Route 6. The TMP should include, but not necessarily be limited to, the following elements:

- Maintenance of adequate sight lines both for construction vehicles and through traffic;
- Identification of the types and average number of construction vehicles that would be using area roadways on a daily and peak hour basis (for the project peak hour of generation as well as the AM and PM commuter peak hours);
- Identification of the expected hours of work and truck transport on a typical workday;
- Identification/illustration of construction vehicle routing to/from the project area;
- Identification/illustration of the location of advance warning signage for the work zone, including detours;
- Clear identification of detours throughout the entire detour route;
- Identification/illustration of proposed accommodations and safety measures for bicycles and pedestrians traveling through the work area; and
- Identification/illustration of the type, location, and duration of any traffic control devices that would be used during construction, inclusive of flagmen and police details.

The Proponent and Contractor should also conduct a TMP training program for involved employees. The purpose of the program should be to impart recognition of the need for such a plan as well as familiarization with methods for its proper implementation.

Where illustration is needed, the information should be provided on a large-scale plan (preferably at least one inch = 80 feet). To the degree possible, the selection of construction vehicle routes to/from the project area should avoid roadway sections and intersections that experience vehicle congestion and/or high pedestrian and bicycle volumes. To the extent possible, project-related vehicle traffic on public roadways should be limited to off-peak (non-commuter period) hours.

The Proponent and Contractor should coordinate the permitting, development of the TMP, and all project-related work within the state highway layout with MassDOT's District 5 Office as well as with Traffic Operations (Boston Headquarters Division).

If you have any questions regarding these comments, please contact me at (857) 368-8862 or Paul Hajec at (857) 368-8856.

APCC
Association to
Preserve Cape Cod

Ed DeWitt
Executive Director

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November 18, 2014

Maeve Vallely Bartlett, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Alex Strysky, EEA# 15273
100 Cambridge Street, Suite 900
Boston, MA 02108

RE: Town of Eastham Water System
Expanded Environmental Notification Form, EEA # 15273

Dear Secretary Bartlett:

The Association to Preserve Cape Cod (APCC) submits the following comments regarding the Expanded Environmental Notification Form (ENF) for the project known as the Town of Eastham Water System, EEA # 15273.

Founded in 1968, APCC is the largest regional non-profit environmental organization on Cape Cod. Representing more than 5,000 members, APCC's mission is to promote policies and programs that foster the preservation of the natural resources of Cape Cod. APCC focuses its efforts on the protection of groundwater, surface water, and wetland resources, preservation of open space, the promotion of responsible, planned growth and the achievement of an environmental ethic.

For many years, APCC has actively supported efforts to establish a municipal water supply in the town of Eastham. Town residents and businesses currently rely on individual private wells or non-municipal community wells for drinking water, and on-site septic systems for wastewater disposal. The close proximity between water supply wells and septic systems has resulted in increasingly degraded drinking water quality throughout the town. In one region of town, residents must also contend with groundwater that has become contaminated from the town's closed landfill.

At Eastham's 2014 spring town meeting, residents approved a plan to provide municipal water service to approximately one third of the town. The new water supply system will involve construction of two well fields, a water storage tank and approximately 45 miles of distribution piping. The two well fields have already been permitted by the Massachusetts Department of Environmental Protection (DEP).

APCC commends the town on its proposal to construct the water system almost entirely on previously disturbed land, existing roadway areas and rights of way. According to the

3010 Main Street | P.O. Box 398 | Barnstable, MA 02630-0398
Tel: 508-362-4226 | info@apcc.org | www.apcc.org
A NON-PROFIT ORGANIZATION. DUES AND CONTRIBUTIONS TAX DEDUCTIBLE AS PROVIDED BY LAW.

ENF, construction on currently undisturbed area is limited to .46 acres out of an estimated 21.8 total acres for the entire project.

According to the ENF, the plan includes a built-in capability to expand water service to the whole town if it is determined at some point in the future that there is a need for the expansion. APCC recommends that the Environmental Impact Report explore adoption by the town of a more thorough monitoring program for private wells in order to make a proper and timely assessment of the potential need for such an expansion.

The ENF states that anticipated water withdrawals will only reach 25 percent of the pumping rate permitted by DEP, and hydrogeologic evaluations show that water withdrawals at the two pumping sites will not adversely impact surface water bodies or wetlands. As a precaution, the town proposes to monitor water levels at Hatches Creek to determine whether pumping activity at the District G well field needs to be adjusted during periods of low water. APCC supports this prudent approach.

The ENF also describes measures the town proposes to take in order to ensure protection of nearby wetlands and other water resources during the construction phase of the water supply system. In APCC's review of the ENF, these protective measures appear to be adequate for protecting water resources.

APCC supports the town's request to the Secretary to allow submission of a single Environmental Impact Report (EIR) instead of a draft EIR and final EIR. However, the EIR should provide information that will resolve any outstanding questions regarding potential impacts to rare species.

In 2010, the state's Natural Heritage and Endangered Species Program (NHESP) concluded in the New Source Permit review for the well sites that the well site project would not result in a prohibitive take of state-listed rare species. Portions of the water system project proposed in the current ENF are also located in areas mapped as Priority Habitat. At the time of the ENF filing, the rare species type or types was unknown by the town. The town has requested further consultation with NHESP.

Although construction of the water supply system will take place mostly on previously disturbed land or within the footprint of existing roads, APCC would like to see final clarification in the EIR regarding the rare species in question and a satisfactory determination that the project will not adversely impact state listed species. In the event that further consultation with NHESP determines that state listed species may be impacted, the EIR should describe appropriate mitigation that is to be adopted in order to fully comply with Massachusetts Endangered Species Act regulations.

APCC thanks the Secretary for the opportunity to provide comments on this important project.

Sincerely,

Ed DeWitt
Executive Director

cc: Cape Cod Commission
Town of Eastham

MEMORANDUM

TO: Alex Strysky, Environmental Reviewer, MEPA Unit
THROUGH: Jonathan Hobill, Regional Engineer, Bureau of Resource Protection
Philip Weinberg, Regional Director
David Johnston, Deputy Regional Director, BRP
Maria Pinaud, Deputy Regional Director, BWP
Millie Garcia-Serrano, Deputy Regional Director, BWSC
Brenda Chabot, Deputy Regional Director, ADMIN
CC: Elizabeth Kouloheras, Chief, Wetlands and Waterways
Richard Rondeau, Chief, Water Supply
Kermit Studley, Water Supply
Pamela Truesdale, Municipal Facilities
David Burns, Chief, Municipal Facilities
Leonard Pinaud, Chief, Site Management
Gerard Martin, Chief, Compliance and Enforcement, BWSC
Angela Gallagher, Compliance and Enforcement
Allen Hemberger, Site Management
CC:
DEP Boston: Duane LeVangie, BRP-DMS
Richard Friend, BRP-DWM-DW

FROM: Sharon Stone, SERO MEPA Coordinator
DATE: November 19, 2014
RE: ENF EOEEA #15273 – EASTHAM – Eastham Water System
2500 State Highway

****

"For Use in Intra-Agency Policy Deliberations"

The Southeast Regional Office and the Boston Office of the Department of Environmental Protection (MassDEP) has reviewed the Environmental Notification Form (ENF) for the proposed Eastham Water System project to be located at 2500 State Highway, Eastham, Massachusetts (EOEEA #15273). The project proponent provides the following information for the project:

The Town of Eastham is proposing to construct a municipal water system. Currently the Town relies on individual private or community wells for water supply and onsite systems for wastewater disposal. The drinking water quality of these private wells has been progressively declining because of their close proximity to onsite wastewater disposal systems. In addition, groundwater emanating from the Town's closed landfill has also impacted water quality in that area of the Town.

After many years of study and debate, Eastham overwhelmingly voted to establish a municipal water system at their May 2014 Annual Town Meeting with a vote of 86% in support of the Warrant Article. This water system will provide service to approximately one third of the Town's properties (2,021 parcels). The system will involve construction of two well fields, a water storage tank and 45 miles of distribution system piping. The two wells fields, located at so called "District G" and the Nauset Regional High School (NRHS), have received New Source Permit approvals by the Department of Environmental Protection (DE The water storage tank is to be located at the Town's District G property, and will be located adjacent to an existing communications tower on the property. The distribution system includes transmission mains locat throughout the Town so as to provide what is referred to as the "backbone" of the distribution system that, should the Town decide to do so in the future, can serve a Town-wide water system by installing laterals to these transmission mains. The design of the distribution system is therefore being sized to accommodate a Town-wide system.

The water system is to be almost entirely constructed on previously disturbed land and existing roadway areas and rights of way. The overall land area where construction activities will occur is estimated to be 22.8 acres. 98% of the project area is associated with water main installations, which will occur predominantly within existing roadway areas. The storage tank and well fields are to be constructed in previously disturbed areas, of which approximately 0.46 acres will occur in undisturbed area. New structur resulting from the project consist of a small pump house at each of the two well fields (26' x 11' in size) anc a water storage tank. The water storage tank will have a foundation footprint of approximately 800 square feet (32' diameter) and will be approximately 130' tall.

The water system will replace the use of private water supply wells for drinking water, and therefore it is anticipated that there will be no net change on overall withdrawals from the aquifer. The current demand of the water system is estimated to be 378,000 gallons per day, increasing to 415,000 gpd as vacant properties are built out under current zoning. The DEP New Source permits authorize withdrawals of 995,000 gpd and 883,000 gpd, respectively, from District G and NRHS, for a total of 1,878,000 gpd. The water system demand is therefore only 22% of this permitted volume.

Which State Agency Permits will the project require?

DEP BRP WMO3 – Water Withdrawal Permit
DEP BRP WS20 – Approval to Construct Water Supply Source > 70 gpm
DEP BRP WS32 – Drinking Water Systems that serve > 3,300 people
Mass DOT State Highway Access Permit

Water Management Act

Eastham has submitted a Water Management Act permit application for 3 new public water supply wells. The wells will supply the new public water supply distribution system to be constructed in Eastham to replace private wells that now supply homes and businesses in the town.

The major aspects of the proposed withdrawals that the Department will be focusing on during the WMA permit application review include:

- Future water demands: There is no existing municipal water supply in Eastham, so water use demands projections could not be projected from existing pumping records. However, Eastham is nearly built-out, with existing properties supplied by on-site private supply wells in the same aquifer as the proposed municipal supply wells. We will evaluate the demand projections in the WMA application that were made based on analysis of property use and water use patterns experienced by nearby towns.

- We will evaluate the impacts of pumping the proposed public water supply wells on the aquifer. There may be little or no overall increase in pumping from the aquifer because increase pumping from the municipal supply is expected to be offset by the discontinuation of the private wells. Significant net increased pumping from the aquifer is not anticipated.

- Vernal pools have been identified in the vicinity of the District H proposed well. The results of the prolonged pumping test and groundwater modeling indicate that the threat to the vernal pools is low. DEP will evaluate the pumping test and modeling results to assess the threat to the vernal pools.

- Under the new WMA regulations, Eastham's entire volume pumped will be above baseline, since their baseline is zero. However, the entire town is served by on-site septic systems, so they will only need to mitigate at most 15% of their rate above baseline. The rate to be mitigated may be determined once the system is on-line and actual pumping rates become available.

- The review will examine Eastham's proposed water conservation efforts including drought management, metering, pricing, residential, commercial, industrial and public sector use, and public education. Eastham's permit will include seasonal nonessential outdoor water use restrictions triggered by groundwater levels. The permit will also include performance standards of 10% for unaccounted for water (UAW) and 65 for residential gallons per capita day (RGPCD).

- Eastham's aquifer protection bylaw will be reviewed for conformance to state standards.

If you have any questions regarding the Water Management Act Program's comments on this project, please call Richard Friend at 617.654.6522.

Drinking Water Program
The MassDEP Drinking Water Program strongly supports the proposed Eastham Water System as described in the expanded ENF. The water system will provide Eastham residents and visitors a safe, reliable, plentiful, and professionally managed water supply.

Construction Stormwater Permit
The project construction activities may disturb one or more acres of land and therefore, may require a NPDES Stormwater Permit for Construction Activities. The proponent can access information regarding the NPDES Stormwater requirements and an application for the Construction General Permit at the EPA website: http://cfpub.epa.gov/npdes/stormwater/cgp.cfm

Massachusetts Well Driller Requirements
Pursuant to 310 CMR 46.03 and 310 CMR 46.03, wells installed within the Commonwealth are required to be drilled by a Massachusetts Certified well driller who shall provide immediate field supervision as specified by the municipal Board of Health (BOH), and submit a well completion report to MassDEP and the BOH within 30 days of well completion. Boards of Health may have additional requirements.

Bureau of Waste Site Cleanup
Based upon the information provided, the Bureau of Waste Site Cleanup (BWSC) searched its databases for disposal sites and release notifications located within and near the proposed project area. A disposal site is a location where there has been a release to the environment of oil and/or hazardous material that is regulated under M.G. L. c. 21E, and the Massachusetts Contingency Plan [MCP – 310 CMR 40.0000].

There are fifteen listed disposal sites located at or within one-half mile of the proposed project area. Eleven of the listed disposal sites have been closed under the MCP and require no further response actions.

The four open MCP disposal sites located within one-half mile of the proposed project area are: Neighborhood Service Center (Release Tracking Number (RTN) 4-0000707) located on Route 6 within the southeastern edge of the proposed project area; former Charlie's Place Texaco, 2360 State Highway (Route 6) (RTN 4-0000750) located within the eastern edge of the proposed project area; National Seashore Ranger Station, 1050 Nauset Road (RTN 4-0011959) located within the northeastern edge of the proposed project area; and Nauset Rod & Gun Club, Cartwright Path (RTN 4-0019620) located 0.8-miles northeast of the proposed project area. These disposal sites require continued response actions under the MCP prior to site closure.

Three of the disposal sites listed as closed are associated with the capped Eastham Landfill located on Old Orchard Road. Two of the RTNs (4-0000062 and 4-0024838) are listed as Adequately Regulated and response actions are being conducted under the MassDEP Solid Waste Program. RTN 4-24838 has been closed with a Class A-2 Response Action Outcome on December 6, 2013, indicating that the contamination associated with the release has been demonstrated to be below a level of No Significant Risk. Even though the capped Eastham Landfill is Adequately Regulated under Solid Waste, pursuant to 310 CMR 40.0114 some response actions are being conducted in accordance with the MCP. Response actions to address the private water supply wells impacted with 1,4-dioxane downgradient of the landfill in Eastham are being conducted as an Immediate Response Action (IRA) pursuant to the MCP. BWSC assigned Release Tracking Number 4-0024301 to the 1,4-dioxane release impacting the private water supply wells. As part of the assessment of the 1,4-dioxane release it has been determined that septic systems in the area are also impacting the private water supply wells. The installation of the water system is being proposed, in part, to facilitate a permanent solution to the release of 1,4-dioxane and the impact to private water supply wells from area septic systems.

There are no other listed disposal sites located at or within one-half mile of the proposed project location. The MCP compliance status of these and other BWSC disposal sites may be viewed using the BWSC Waste Sites/Reportable Release Lookup at: http://public.dep.state.ma.us/SearchableSites2/Search.aspx

The Project Proponent is advised that if oil and/or hazardous material are identified during the implementation of this project, notification pursuant to the Massachusetts Contingency Plan (310 CMR 40.0000) must be made to MassDEP, if necessary. A Licensed Site Professional (LSP) should be retained to determine if notification is required and, if need be, to render appropriate opinions. The LSP may evaluate whether risk reduction measures are necessary or prudent if contamination is present. The BWSC may be contacted for guidance if questions arise regarding cleanup.

Proposed s.61 Findings

The "Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form" may indicate that this project requires further MEPA review and the preparation of an Environmental Impact Report. Pursuant to MEPA Regulations 301 CMR 11.12(5)(d), the Proponent will prepare Proposed Section 61 Findings to be included in the EIR in a separate chapter updating and summarizing proposed mitigation measures. In accordance with 301 CMR 11.07(6)(k), this chapter should also include separate updated draft Section 61 Findings for each State agency that will issue permits for the project. The draft Section 61 Findings should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

The MassDEP Southeast Regional Office appreciates the opportunity to comment on this proposed project. If you have any questions regarding these comments, please contact Sharon Stone at (508) 946-2846.

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD
COMMISSION

Sent via EMAIL

November 19, 2014

Maeve Vallely Bartlett, Secretary
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Alex Strysky, Project Analyst
100 Cambridge Street, Suite 900 (9th Floor)
Boston MA 02114

Re: ***Expanded Environmental Notification Form - EEA No. 15273***
Eastham Water System
Town of Eastham, Massachusetts

Dear Ms. Vallely Bartlett:

Thank you for the opportunity to provide the following Cape Cod Commission comments on the above-referenced Environmental Notification Form, which are arranged by the applicable issue areas from Barnstable County's Regional Policy Plan (RPP).

Commission staff is available to answer any questions about the comments.

Sincerely,

Patty Daley
Deputy Director

Cc: Project File

CAPE COD COMMISSION COMMENTS

Water Resources

The Town of Eastham Water System Expanded ENF is an important document that contains an excellent narrative of the need for, and a detailed description of, the project, and an explanation of the fundamental components of the project. The Town and its consultants have done an admirable job preparing the document. The project consists of the delivery of 345,000 gpd annual average flow of high quality drinking water to provide relief to residents in the down-gradient area of the municipal landfill and other residential and commercial users of private wells that have experienced decreased quality of their drinking water from private wells.

The project will provide for seasonal average demands of 415,000 gpd with capacity to provide for peak day demands exceeding 1,000,000 gpd. The project consists of developing two water supply sites in District G and the Nauset Regional High School with permitted capacities of 995,000 and 833,000 gpd respectively. The town has previously received new source approval and water withdrawal permits from DEP for the wells. These wells will supply water to a 130 ft. tall water supply tank with a 750,000 gallon capacity and approximately 45 miles of water distribution with fire hydrants located every 500 ft. resulting in the provision of fire protection for 80% of the Town. The project will be constructed over two years, divided into eight project segments.

A portion of the Zone I for well G is in the Cape Cod National Seashore, whose management goals for land use are consistent with the protective requirements of the DEP regulations. A supportive response from the National Park Service was submitted through the new source approval process. The ENF indicates that the town has offered to have an inter-town connection to the Orleans water supply system, which many other towns on the Cape have implemented. The FEIR should indicate the status of the discussions with Orleans.

The RPP addresses the potential impacts from water withdrawals on surface water dependent ecosystems. The ENF includes the results of the pump tests, groundwater modeling, and impact analysis which are requirements for projects with a water withdrawal exceeding 20,000 gpd. The ENF and its supplemental reports indicate the absence of surface water dependent ecosystems in proximity to the wells and the area of drawdown, as well as a barely measureable decrease in stream flow at Hatches Creek under average pumping conditions. The ENF indicates that the DEP new source permitting includes requirements for monitoring water levels at Hatches Creek. Commission staff will provide further review of the monitoring requirements at the time of FEIR comment and DRI review. Commission staff requests that the groundwater model used to document conditions in the Nauset Lens be made available for review.

DEP requires that the Town adopt a Wellhead Protection bylaw for the delineated Zone IIs. The prohibitions and performance standards of the bylaw once adopted will provide preventative measures, similar to the RPP, to protect the water quality.

Heritage Preservation/ Community Character

The photo renderings of the proposed District G storage tank provide views from several locations. In order to provide a fuller understanding of where the water tower will be visible, it would be helpful for the Town to give a sense of where along Route 6 one might have a clear view of the tower, as well as which areas of the Cape Cod Rail Trail and which residential streets will have clear views. Additional photo renderings, such as from Nauset Light and the Nauset

Light Beach parking lot, might also be helpful. The photo renderings included in the graphic submitted with the EENF should be available at a larger scale so they are easier to see and evaluate.

The report identifies the Old Town Center Historic District, a local historic district, but does not acknowledge several National Register Historic Districts in Eastham, including the Town Hall Center Historic District, Fort Hill Rural Historic District, Collins Cottage Historic District, and individual historic properties such as town cemeteries and buildings previously considered for an historic district in the Rock Harbor area. These areas and sites should be identified to help with planning the water main and hydrant installation.

The Massachusetts Historical Commission (MHC) has provided comments that focus on potential archaeological resources. More detailed plans will be needed as permitting proceeds to determine how sensitive historic and archaeological resources which may be encountered may be appropriately accommodated during installation. These final plans should be developed with input from MHC staff and from Cape Cod National Seashore staff especially where the project approaches National Seashore boundaries.

Land Use

As the Town of Eastham does not have a municipal water system, this project reaches the first goal of the town's Local Comprehensive Plan (LCP) of protecting and improving water quality and supply. The project is proposed to meet the applicable goals of the RPP's Land Use issue area, including efficient use of capital infrastructure (given the tailored footprint of the proposed system) and minimizing development impacts by protection of sensitive resources. Consistent with RPP Land Use Goals, the LCP Build-out analyses suggest that the water system is proposed to facilitate connection to existing developed properties rather than facilitating additional development outside the core development footprint of the town.

Natural Resources

The two well sites and water tank will be located on previously disturbed town owned properties and will require minimal additional clearing. These three sites are located within mapped habitat for rare species, but are not adjacent to wetlands or vernal pools. According to the EENF, the water main installations largely consist of redevelopment within existing road rights of way and will result in minimal clearing. Portions of the project will occur within the boundaries of the Inner Cape Cod Bay Area of Critical Environmental Concern (ACEC). The RPP prohibits new development within ACECs, but does not prohibit redevelopment. Commission staff suggests the project should not require "Other MEPA Review" based on the ACEC threshold.

Because so much of the work is proposed within existing disturbed areas, Commission staff has few concerns about the impacts of the project on wetlands, wildlife, or plant habitats. Any work proposed within the buffer zone to wetlands, including but not limited to water main installations, should be designed to minimize disturbance and utilize Best Management Practices (BMPs) during construction. The RPP allows for utility work within buffer zones so long as impacts are minimized and there are no other feasible alternatives. The work to install the wells and water tank, as well as some of the water main installations, will occur within rare species habitat; the Town should work closely with the Natural Heritage and Endangered Species Program to minimize impacts and mitigate, as necessary. Based on conversations with the Applicant, a "No Take" letter is anticipated. Where mains will be installed within the

boundaries of the ACEC, efforts should be made to minimize impacts from stormwater runoff and erosion.

The Town should incorporate BMPs for invasive species management into construction plans in order to avoid spread of invasive species due to the disturbance associated with construction.

Open space mitigation is not required, as this is a town project.

Transportation

As there are no new, proposed ongoing vehicle trips beyond the construction phase of the project, and no new access or egress points from Rte. 6 proposed, no associated permanent and sustained transportation impacts are expected.

MassDOT has jurisdiction over the work within the Rte. 6 right of way, and the town will work with MassDOT to manage transportation impacts during the construction phase of the project. The RPP requires that DRI projects obtain all necessary federal, state and local roadwork permits, and that the Commission be provided with a copy of such permits and approval prior to commencement of project construction.

Economic Development

The RPP states that new infrastructure projects "shall improve the availability, reliability, quality, and cost of services." Given that there is no existing municipal water service in the town; that private drinking water wells serve properties in the town; and that drinking water wells in some parts of the town have been compromised, this project is essential to ensure that safe drinking water is available throughout the Town of Eastham to serve present and future needs.

TOWN OF EASTHAM
ANNUAL TOWN MEETING WARRANT

AND FINANCE COMMITTEE REPORT AND RECOMMENDATIONS
7:00 P.M.

MAY 5, 2014

NAUSET REGIONAL HIGH SCHOOL GYMNASIUM

ANNUAL TOWN ELECTION
MAY 20, 2014

POLLS OPEN
7:00 A.M. - 8:00 P.M.

EASTHAM TOWN HALL
2500 STATE HIGHWAY
EASTHAM, MA

FOR COPIES OF THIS WARRANT IN LARGER PRINT OR ON TAPE, PLEASE CALL 508 240-5900.
Also available on the town website
www.eastham-ma.gov

Please bring this warrant to Town Meeting

ARTICLE 8

To see if the Town will vote to establish a municipal water supply and water distributing system shown on a plan entitled Water Distribution System Development Backbone and Landfill Area, March 2014, pursuant to Section 39A of Chapter 40 of the General Laws; and

to appropriate the sum of **$45.8 million** for establishing such a system for the Town, including, without limitation, the taking or purchase of water sources or water or flowage rights, the taking or purchase of land or easements for the water system or for the protection of the water system, the construction and development of wells, the construction of water towers, the construction of buildings for water treatment and pumping stations, the laying and relaying of water mains, the purchase and installation of water meters, fire hydrants and other water department equipment, and design and engineering and other costs incidental thereto, and including without limitation all costs thereof as defined in Section 1 of Chapter 29C of the General Laws; and

that to meet this appropriation the Treasurer with the approval of the Board of Selectmen is authorized to borrow $45.8 million and issue bonds or notes therefore under Chapter 44 of the General Laws and/or Chapter 29C of the General Laws; and

that the Treasurer with the approval of the Board of Selectmen is authorized to borrow all or a portion of such amount from the Massachusetts Water Pollution Abatement Trust established pursuant to Chapter 29C and in connection therewith to enter into a loan agreement and/or security agreement with the Trust and otherwise to contract with the Trust and the Department of Environmental Protection with respect to such loan and for any federal or state aid available for the project or for the financing thereof; and

that the Board of Selectmen is authorized to enter into a project regulatory agreement with the Department of Environmental Protection, to expend all funds available for the project and to take any other action necessary to carry out the project; and

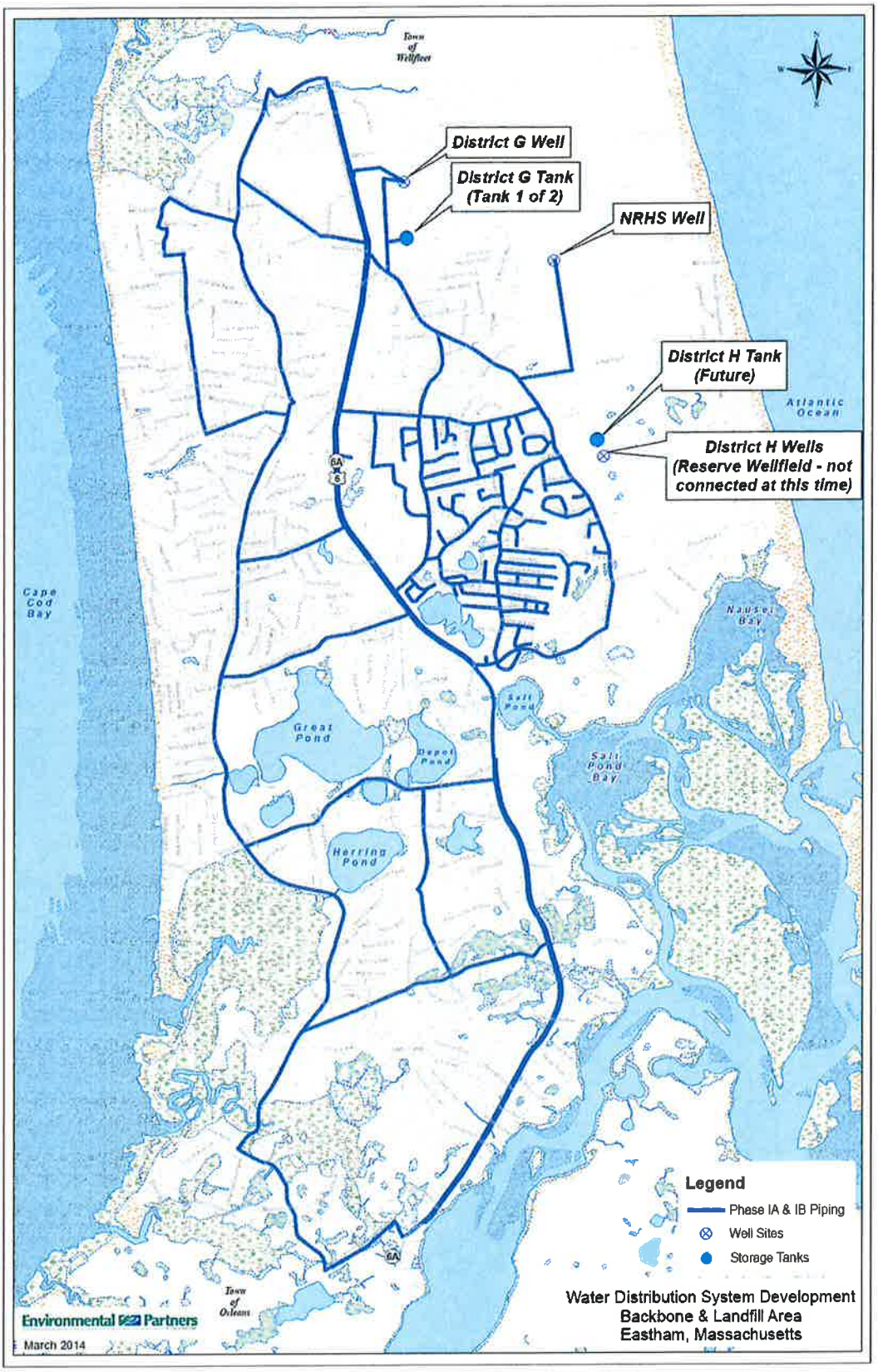
provided further that, pursuant to G.L. c.40, Section 39A, the Board of Selectmen is hereby authorized to act as Water Commissioners and to exercise all of the powers of Water Commissioners pursuant to General Laws Chapter 41, Section 69A and G.L. 40, Section 38-39I and 39L thru 42; and

provided further that the Town hereby accepts the provisions of General Laws Chapter 40, Sections 42A through 42F, and Section 42J to authorize the collection of water rates and to permit the deferral of payment of water use charges by certain homeowner/occupants; or take any action relative thereto.

By Board of Selectmen

Summary:
This Article will provide a system that includes all the basic elements to allow for expansion to all parts of town in the future. That is what is known as the "backbone with landfill study area service" and further included in this proposal are, a single water tower (two will be needed at system build out), hydrants, and service connections along all the ways shown on the map. This plan will provide service to the affected areas within the landfill study area as soon as possible. It will also provide hydrants within 1000' of 80% of the Eastham structures. This enhances the potential for fire insurance savings.

BOARD OF SELECTMEN RECOMMENDATION: 5-0
FINANCE COMMITTEE: RECOMMENDATION: 5-0
(*2/3rds* Majority *vote required*)


District G Well
District G Tank
(Tank 1 of 2)
NRHS Well
District H Tank
(Future)
District H Wells
(Reserve Wellfield - not connected at this time)
Town of Wellfleet
Atlantic Ocean
Cape Cod Bay
Nauset Bay
Salt Pond
Salt Pond Bay
Great Pond
Depot Pond
Herring Pond
Town of Orleans
6A
Legend
Phase IA & IB Piping
Well Sites
Storage Tanks
Environmental Partners
March 2014
Water Distribution System Development
Backbone & Landfill Area
Eastham, Massachusetts

ESTIMATED DEBT SCHEDULE FOR PHASE ONE BORROWING

ESTIMATE OF ANNUAL COST OF DEBT FOR TWENTY YEAR BORROWING
ENHANCED PHASE ONE MUNICPAL WATER

FISCAL YEAR	YEAR	PRINCIPAL	INTEREST	GROSS	TAX IMPACT PER $1,000	COST $400,000 HOUSE
17	1	$2,290,000.00	$916,000.00	$3,206,000.00	$1.15	$459.51
18	2	$2,290,000.00	$870,200.00	$3,160,200.00	$1.10	$441.90
19	3	$2,290,000.00	$824,400.00	$3,114,400.00	$1.06	$422.81
20	4	$2,290,000.00	$778,600.00	$3,068,600.00	$1.03	$412.47
21	5	$2,290,000.00	$732,800.00	$3,022,800.00	$1.00	$398.34
22	6	$2,290,000.00	$687,000.00	$2,977,000.00	$0.96	$384.62
23	7	$2,290,000.00	$641,200.00	$2,931,200.00	$0.93	$371.27
24	8	$2,290,000.00	$595,400.00	$2,885,400.00	$0.90	$358.31
25	9	$2,290,000.00	$549,600.00	$2,839,600.00	$0.86	$345.70
26	10	$2,290,000.00	$503,800.00	$2,793,800.00	$0.83	$333.46
27	11	$2,290,000.00	$458,000.00	$2,748,000.00	$0.80	$321.56
28	12	$2,290,000.00	$412,200.00	$2,702,200.00	$0.78	$310.00
29	13	$2,290,000.00	$366,400.00	$2,656,400.00	$0.75	$298.77
30	14	$2,290,000.00	$320,600.00	$2,610,600.00	$0.72	$287.86
31	15	$2,290,000.00	$274,800.00	$2,564,800.00	$0.69	$277.27
32	16	$2,290,000.00	$229,000.00	$2,519,000.00	$0.67	$266.98
33	17	$2,290,000.00	$183,200.00	$2,473,200.00	$0.64	$256.98
34	18	$2,290,000.00	$137,400.00	$2,427,400.00	$0.62	$247.28
35	19	$2,290,000.00	$91,600.00	$2,381,600.00	$0.59	$237.86
36	20	$2,290,000.00	$45,800.00	$2,335,800.00	$0.57	$228.71
		$45,800,000.00	**$9,618,000.00**	**$55,418,000.00**		**$6,661.66**
		TOTAL LOAN AMOUNT		**$45,800,000.00**		
		INTEREST RATE		**2.00%**		

Minutes for the Annual Town Meeting held May 5, 2014

Pursuant to the provisions of the foregoing warrant, the voters assembled at the Nauset Regional High School Gymnasium to vote on the following articles with actions as noted. The Moderator called the meeting to order at 7:15 p.m. with a quorum of 208 voters present. The Town Clerk read the call of Town Meeting. Selectman John Knight honored Lillian Lamperti, Town Clerk, for her 36 years of service as clerk by reading a tribute and presenting a beautiful bouquet of flowers. Town Meeting also acknowledged David Schropfer for his time of service as Moderator.

Article 1. A motion was made and seconded by the Board of Selectmen to raise and appropriate **$1,700** for Greenhead Fly Control as authorized by G.L. C.252 §24, and authorize the Town Treasurer to pay said appropriation into the State Treasury.

Passed – Declared majority voice vote by Moderator

Article 2. A motion was made and seconded by the Board of Selectmen to assume liability in the manner provided in Section 29 and 29A of Chapter 91 of the General laws as most recently amended for all damages that may be incurred by the Department of Environmental Protection of Massachusetts for the improvement, development, maintenance and protection of tidal and non-tidal rivers and streams, great ponds, harbors, tidewaters, foreshore and shores along a beach, in accordance with Section 11 of Chapter 91 of the General Laws, and authorize the Selectmen to execute and deliver a bond of indemnity therefore to the Commonwealth of Massachusetts.

Passed – Declared majority voice vote by Moderator

Article 3. A motion was made and seconded by the Board of Selectmen to reauthorize the following revolving accounts, through the Town Accountant's office, in accordance with Massachusetts General Laws, Chapter 44 Section 53E ½ for the fiscal year beginning July 1, 2014;

Recreation Bottles and Cans	$10,000
Home Composting Bin/Recycling	2,500
Vehicular Fuel Sales	57,000
Council on Aging/Lower Cape Adult Day Center	7,000

Revolving Fund	**Authorize to Spend Fund**	**Revenue Source**	**Use of Fund**	**FY15 Spending Limit**
Recreation – Bottles & Cans Account	Recreation Director	Collection & Redemption of Bottles & Cans	Beach & Recreation Programs	$ 10,000
Home Composting Bin/Recycling Account	BOS or designee	Sale of Compost Bins	Purchase additional bins & advertise their availability	$ 2,500

Vehicular Fuel Sales Revolving Account	BOS or designee	Sale of fuel to other government entities	Purchase additional fuel for sale to other government entities	$ 57,000
Council on Aging/Lower Cape Adult Day Center Revolving Account	COA Director	Funds from fees, charges for COA programs and performances	Pay for additional COA programs and performances	$ 7,000

Passed – Declared majority vote by Moderator

4. A motion was made and seconded by the Board of Selectmen to transfer from Free Cash $10,000 to the Visitors Service Board from Fiscal Year 13 Hotel Motel Excise Tax (free cash so called), in accordance with Annual Town Meeting Article 26, May 4, 1998, to the Eastham Promotions Fund to be expended by the Visitor Services Board on the following items: Landscaping, lighting, and holiday decorations and general improvement on Windmill Green $3,000, Flower Island support $500, Summer concerts, $6,500.

Passed – Declared majority vote by Moderator

5. A motion was made and seconded by the Board of Selectmen to reallocate the sum of member towns' funding obligation for the Nauset Regional School District in accordance with the Regional Agreement rather than the Education Reform Act Formula, so-called for fiscal year 2016.

Passed – Declared majority vote by Moderator

6. A motion was made and seconded by the Board of Selectmen to transfer from the Stabilization Fund $100,000 to the Tri Town Septage Disposal Capital Account to be used for capital maintenance and improvements as outlined in the facility evaluation cost estimate, developed by the engineering consultants to the plant.

Passed – Unanimous voice vote as declared by Moderator

7. A motion was made and seconded by the Board of Selectmen to accept the provisions of G.L. c 32B, Section 20 creating an "Other Post Employment Liability Trust Fund" to meet the Town's obligations under the Government Accounting Standards Board (GASB) Statement #45 to fund the Town's future obligations for the cost of other post employment benefits identified by the GASB 45 report and further to raise and appropriate $5,000 to said account.

Passed – Declared majority vote by Moderator

8. A motion was made and seconded by the Board of Selectmen to establish a municipal water supply and water distributing system pursuant to Chapter 40, Section 39A of the General Laws and as shown on a plan entitled Water Distribution System Development, Phase 1A & 1B, Eastham Mass, dated, February 2013.

That $45,800,000 (45.8 million) is appropriated to pay costs of establishing such water supply and distribution system, including, without limitation, the costs of taking or purchasing water sources or water or flowage rights, the taking or purchasing of land or easements for the water system or for the protection of the water system or water sources, the construction and development of wells, the construction of water towers, the construction of buildings for water treatment and pumping stations, the laying and relaying of water

mains, the purchase and installation of water meters, fire hydrants and other water department equipment, and design and engineering and other costs incidental thereto, and including without limitation all costs thereof as defined in Section 1 of Chapter 29C of the General Laws;

That to meet this appropriation the Treasurer with the approval of the Board of Selectmen is authorized to borrow $45,800,000 under and pursuant to Chapter 44 and/or Chapter 29C of the General Laws, or pursuant to any other enabling authority, and to issue bonds or notes of the Town therefore;

That the Treasurer with the approval of the Board of Selectmen is authorized to borrow all or a portion of such amount from the Massachusetts Water Pollution Abatement Trust (the "Trust") established pursuant to Chapter 29C of the General Laws, and in connection therewith to enter into one or more loan agreements and/or security agreements with the Trust and otherwise to contract with the Trust and the Department of Environmental Protection with respect to such loan or loans obtained through the Trust, and for any federal or state aid available for the project or for the financing thereof; and

That the Board of Selectmen is authorized to enter into a project regulatory agreement with the Department of Environmental Protection, to expend all funds available for the project and to take any other action necessary to carry out the project;

That, in accordance with Chapter.40, Section 39A of the General Laws, the Board of Selectmen is hereby authorized to act as water commissioners and to exercise all of the powers of Water Commissioners pursuant to Chapter 41, Section 69B of the General Laws; and

That the Town hereby accepts the provisions of Chapter 40, Sections 42A through 42F, and Section 42J, of the General Laws to authorize the collection of water rates and to permit the deferral of payment of water use charges by certain homeowner/occupants.

Motion passed necessary 2/3rds vote declared by Moderator
Count: 858 Yes 140 No

9. A motion was made and seconded by the Board of Selectmen to transfer from Free Cash $12,000 to be given to the Eastham Chamber of Commerce as a grant to help support operations of the Information Booth.

Passed – Declared majority vote by Moderator

10. A motion was made and seconded by the Board of Selectmen pursuant to Chapter 71 Section 16G ½ to approve establishment by Cape Cod Regional Technical High School of a stabilization fund for future facility capital costs.

Passed – Declared majority vote by Moderator

11. A motion was made and seconded by the Board of Selectmen to fix the salary and compensation of all elected officials of the Town as provided by Section 108, Chapter 41 of the General Laws as amended, and further to raise and appropriate $77,467 for the following sums of money for salaries:

Moderator	$ 150
Town Clerk	$67,317
Selectmen (5) $2,000 each	$10,000
Total	$77,467

Passed – Declared majority vote by Moderator

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

December 18, 2012

Ms. Sheila Vanderhoef
Town of Eastham
2500 State Highway
Eastham, Massachusetts 02642

RE: EASTHAM--Public Water Supply
Town of Eastham, BRP WS 19,
New Source Approval, Pumping
Test Report Approval, Water Resource
Protection District G Site,
Transmittal Number X241315

Dear Ms. Vanderhoef:

Please find attached the following information: Approval of the pumping test report for the proposed Water Resource Protection District G Site.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this matter, please contact Kermit Studley of this office at (508) 946-2803.

Sincerely,

Richard J. Rondeau, Chief
Drinking Water Program
Bureau of Resource Protection

R/KS/cb
kstudley/Eastham – Water Resource Protection District G - WS19 - X241315.doc
Y:\DWP Archive\SERO\Eastham-X241315-System Modification-2012-12-18

ecc: Mark N. White, Environmental Partners Group: mnw@envpartners.com
George E. Price, Jr., Cape Cod National Seashore: george price@nps.gov
Shelley Hall, Cape Cod National Seashore: shelley hall@nps.gov
Bruce Bouck, MassDEP-DWP: bruce.bouck@state.ma.us
Duane LeVangie, MassDEP-OWM: duane.levangie@state.ma.us
Leslie O'Shea, MassDEP-DWP: leslie.oshea@state.ma.us
Tom Cambareri, Cape Cod Commission: tcambareri@capecodcommission.org
Jane Crowley, Eastham Board of Health: jcrowley@eastham-ma.gov
Marielle Stone, DEP-Boston: marielle.stone@state.ma.us
Michael Quink, MassDEP-DWP: michael.quink@state.ma.us

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

BRP WS 19 APPROVAL OF PUMPING TEST REPORT
FOR SOURCE OF 70 GALLONS PER MINUTE OR GREATER
TOWN OF EASTHAM
EASTHAM, MASSACHUSETTS
WATER RESOURCE PROTECTION DISTRICT G SITE
TRANSMITTAL NUMBER X241315

On April 6, 2012, the Department of Environmental Protection (the "Department") received the permit application as referenced above. The application is a request for approval of a prolonged pumping test report, submitted by Environmental Partners Group, Inc. on behalf of the Town of Eastham. The subject document was submitted as part of the process of developing a new public water supply which meets the requirements of 310 CMR 22.00, the Massachusetts Drinking Water Regulations. The report details the results of the pumping test, data analysis and subsequent Zone II delineation. This site was previously approved for further testing in a letter from this office dated November 23, 2010.

PUMPING TEST RESULTS

The Water Resource Protection District G Site (District G Site) is located east of the Cape Cod Rail Trail biking path and approximately 2,600 feet north of the intersection of Oakleaf Road and Nauset Road in Eastham, Massachusetts. TPW-1 is a 12-inch diameter well installed to a depth of 94 feet and equipped with 10 feet of 0.060-inch slot stainless steel, wire wrapped Johnson Hi-Flow well screen and a 5 foot long bottom sump. The pumping test at TPW-1 started on October 21, 2010 and ended on October 28, 2010. The produced water was conveyed approximately 1,500 feet east of the District G Site and discharged onto the ground surface. Groundwater level measurements were recorded at numerous observation wells (see Table 3-3 and Appendix F of the pumping test report) during the antecedent, drawdown and recovery periods of the pumping test. In addition, drive points and staff gauges were each installed in the upper reach of Hatches Creek to evaluate the interaction between surface water and the aquifer. The pumping test was successful in that stabilization of drawdown was achieved at a pumping rate of 691 gallons per minute (gpm).

PUMPING TEST ANALYSES

Pumping test data were analyzed to determine aquifer characteristics and evaluate the groundwater flow regime. The derived values were properly quantified to establish an approvable yield and to delineate the Zone II wellhead protection area.

The relation between the drawdown observed at stabilization and the distance of the observation wells from TPW-1 indicates the cone of depression or the zone of influence extended radially outward approximately 700 feet from the 12-inch diameter production well. The distance-drawdown prediction for TPW-1 pumping at the approvable rate of 691 gpm (see below) for a period of 100 years indicates the cone of depression or zone of influence would extend 7,100 feet to the north, 6,700 feet to south, 7,000 feet to the east and 6,600 feet to the west of the District G Site. The pumping test had no discernible impact on Hatches Creek, which is located approximately 2,300 feet north of the 12-inch diameter production well. Based on the extent of the predicted zone of influence relative to Hatches Creek for the 12-inch diameter production well pumping at its approved yield, the Department recommends that water levels be monitored at the Hatches Creek to decide if operational conditions for the finished production well are warranted.

APPROVABLE YIELD

In accordance with the Department's Guidelines and Policies for Public Water Systems (revised 2008), if the pumping test is performed on the final production well, the approved pumping rate shall not exceed the rate at which the pumping test was conducted. Since TPW-1 will be the final production well, the approvable yield is 691 gpm, or 0.955 million gallons per day (MGD).

ZONE II DELINEATION

The Zone II delineation for the proposed District G Site was performed in accordance with the Department's Guidelines and Policies for Public Water systems, revised 2008. The groundwater model used for the Zone II delineation was originally developed and published by the United States Geological Survey in a report entitled "Simulated Interaction Between Freshwater and Saltwater and Effects of Ground-Water Pumping and Sea-Level Change, Lower Cape Cod Aquifer System, Massachusetts" (Masterson, 2004). The Zone II map for the proposed District G Site is shown on Figure 6-4 in the pumping test report. The latitude for the proposed production well TPW-1 is 41d 52m 15.70sN and the longitude is 69d 58m 52.42sW.

WATER QUALITY

Analytical testing was performed in accordance with the Department's Guidelines and Policies for Public Water Systems (revised 2008). The results of all water quality analyses indicate that, while somewhat corrosive (low pH and alkalinity), the water meets all recognized standards of purity for public water supply purposes. Treatment will likely involve pH adjustment for corrosion control.

GROUNDWATER MONITORING PROGRAM

Based on existing land uses and mapped potential contamination sources, the proposed production well at the District G Site does not appear to be vulnerable to wellhead contamination. Therefore, no additional groundwater quality monitoring will be required beyond the prescribed frequency to be determined once the proposed production well becomes a registered public water supply.

AQUIFER PROTECTION BYLAW

The Town of Eastham must implement appropriate wellhead protection zoning or non-zoning controls for those areas of the District G Site that lie outside the Cape Cod National Seashore and not covered by the Town of Eastham's Water Resource Protection District G (see 310 CMR 22.21(2)). Wellhead protection for that portion of the District G Site Zone II within the Cape Cod National Seashore is provided in accordance with the United States Department of the Interior regulations and policies documented in the "Comprehensive Source Protection Plan, Cape Cod National Seashore" dated 2006. In addition, the Town of Eastham must demonstrate to the Department's satisfaction that it has used its "best efforts" to have the Town of Wellfleet institute appropriate wellhead protection zoning or non-zoning controls for those areas of the District G Site Zone II within the Town of Wellfleet that lie outside the Cape Cod National Seashore (see 310 CMR 22.21(2)).

Also, in a letter dated March 18, 2011 to the Town of Eastham, the National Park Service confirmed its commitment for the "protection of those parts of the Zone I areas that extend from the proposed supply wells at the Nauset Regional School and District H Site onto Seashore property." The Zone I for the District G Site is not located on Seashore property. A resurvey at the District G Site confirmed the Zone I as being entirely under the ownership and control of the Town of Eastham.

WATER MANAGEMENT ACT PERMIT

The District G Site is one of three potential public water supply sources that will provide operational flexibility and meet future water demands for the Town of Eastham by and through a centralized municipal public water supply system. The Department understands that the Town of Eastham will file a Water Management Act (WMA) permit application to include the District G Site, the NRHS Site and the District H Site. The WMA permit will be filed once all three Sites have been approved as sources of public water supply. The review of this application will be conducted by Leslie O'Shea, who may be contacted at (508) 946-2837, or by email at leslie.oshea@state.ma.us.

In addition, the Department understands that the Town of Eastham will file an Environmental Notification Form (ENF) and Mandatory Environmental Impact Report (EIR) as it relates to the development of a town-wide water supply system. The ENF and Mandatory EIR will be filed at the same time as the WMA permit.

Based on review of the above, the Department hereby approves the pumping test report and the Zone II delineation for the District G Site with a maximum daily withdrawal not to exceed 0.955 MGD subject to the following provisions:

1. The Town of Eastham must obtain its Water Management Act permit prior to the use of this source for public water supply.

2. The Town of Eastham must obtain a permit (BRP WS20) from the Department prior to the start of construction for the well, the pumping station and appurtenant equipment.

This correspondence acknowledges that the Administrative Completeness Review and the Technical Review of this application submittal, BRP WS 19, Transmittal Number X241315, have been completed.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

April 3, 2012

Ms. Sheila Vanderhoef
Town of Eastham
2500 State Highway
Eastham, Massachusetts 02642

RE: EASTHAM--Public Water Supply
Town of Eastham, BRPWS19,
New Source Approval, Pumping
Test Report Approval, Transmittal
Number X240376

Dear Ms. Vanderhoef:

Please find attached the following information: Approval of the pumping test report for the proposed Nauset Regional High School Site.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this matter, please contact Kermit Studley of this office at (508) 946-2803.

Sincerely,

Richard J. Rondeau, Chief
Drinking Water Program
Bureau of Resource Protection

R/KS/cb
kstudley/Eastham – Nauset Regional High School - WS19 - X240376.doc
Y:\DWP Archive\SERO\Eastham-System Modification-2012-04-03

ecc: Mark N. White, Environmental Partners Group: mnw@envpartners.com
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Leslie O'Shea, MassDEP-DWP: leslie.oshea@state.ma.us
Tom Cambareri, Cape Cod Commission: tcambareri@capecodcommission.org
Jane Crowley, Eastham Board of Health: jcrowley@eastham-ma.gov
David Terry, DEP-Boston: David.Terry@state.ma.us
Michael Quink, MassDEP-DWP: michael.quink@state.ma.us

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

BRP WS 19 APPROVAL OF PUMPING PUMPING TEST REPORT
FOR SOURCE OF 70 GALLONS PER MINUTE OR GREATER
TOWN OF EASTHAM
EASTHAM, MASSACHUSETTS
NAUSET REGIONAL HIGH SCHOOL SITE
TRANSMITTAL NUMBER X240376

On December 6, 2011, the Department of Environmental Protection (the "Department") received the permit application as referenced above. The application is a request for approval of a prolonged pumping test report, submitted by Environmental Partners Group, Inc. on your behalf. The subject document was submitted as part of the process of developing a new water supply which meets the requirements of 310 CMR 22.00, the Massachusetts Drinking Water Regulations. The report details the results of the pumping test, data analysis and subsequent Zone II delineation. This site was previously approved for further testing in a letter from this office dated May 10, 2011.

PUMPING TEST RESULTS

The Nauset Regional High School Site (NRHS Site) is located approximately 3,000 feet north-northeast of the intersection of Cable Road and Nauset Road in Eastham, Massachusetts. Test production well TP-1 is located at the northeastern corner of the NRHS Site property. TPW-1 is a 12-inch diameter well installed to a depth of 99 feet and equipped with 10 feet of 0.060-inch slot stainless steel, wire wrapped Johnson Hi-Flow well screen and a 5 foot long bottom sump. The pumping test at TPW-1 started on August 25, 2010 and ended on August 30, 2010. The produced water was conveyed approximately 1,620 feet east of the NRHS Site and discharged onto the ground surface. Groundwater level measurements were recorded at numerous observation wells (see Table 3-3) during the antecedent, drawdown and recovery periods of the pumping test. The pumping test was successful in that stabilization of drawdown was achieved at a pumping rate of 613 gallons per minute (gpm).

PUMPING TEST ANALYSES

Pumping test data were analyzed to determine aquifer characteristics and evaluate the groundwater flow regime. The derived values were properly quantified to establish an approvable yield and to delineate the Zone II wellhead protection area.

APPROVABLE YIELD

If the pumping test is performed on the final production well, the approved pumping rate shall not exceed the rate at which the pumping test was conducted. Therefore, the approvable yield is 613 gpm, or 0.833 million gallons per day (MGD).

ZONE II DELINEATION

The Zone II delineation for the proposed NRHS Site was performed in accordance with the Department's Guidelines and Policies for Public Water systems, revised 2008. The groundwater model used for the Zone II delineation was originally developed and published by the United States Geological Survey in a report entitled "Simulated Interaction Between Freshwater and Saltwater and Effects of Ground-Water Pumping and Sea-Level Change, Lower Cape Cod Aquifer System, Massachusetts" (Masterson, 2004). The Zone II map for the proposed NRHS Site is shown on Figure 6.3 in the pumping test report. The latitude for the proposed production well TPW-1 is 41d 51m 54sN and the longitude is 69d 58m 4.8sW.

WATER QUALITY

Analytical testing was performed in accordance with the Department's Guidelines and Policies for Public Water Systems. The results of all water quality analyses indicate that, while somewhat corrosive (low pH and alkalinity), the water meets all recognized standards of purity for public water supply purposes. Treatment will likely involve pH adjustment for corrosion control.

GROUNDWATER MONITORING PROGRAM

Based on existing land uses and mapped potential contamination sources, the proposed production well at the NRHS Site does not appear to be vulnerable to wellhead contamination. Therefore, no additional groundwater quality monitoring will be required beyond the prescribed frequency to be determined once the proposed production well becomes a registered public water supply.

AQUIFER PROTECTION BYLAW

The Town of Eastham must implement appropriate wellhead protection zoning or non-zoning controls for those areas of the NRHS Site that lie outside the Cape Cod National Seashore and not covered by the Town of Eastham's Water Resource Protection District G (see 310 CMR 22.21(2)). Wellhead protection for that portion of the NRHS Site Zone II within the Cape Cod National Seashore is provided in accordance with the United States Department of the Interior regulations and policies documented in the "Comprehensive Source Protection Plan, Cape Cod National Seashore" dated 2006. Also, in a letter dated March 18, 2011 to the Town of Eastham, the National Park Service confirmed its commitment for the "protection of those parts of the Zone I areas that extend from the proposed supply wells at the Nauset Regional School and District H onto Seashore property."

WATER MANAGEMENT ACT PERMIT

The NRHS Site is one of three potential public water supply sources that will provide operational flexibility and meet future water demands for the Town of Eastham by and through a centralized municipal public water supply system. The Department understands that the Town of Eastham will file a Water Management Act (WMA) permit application to include the NRHS Site, the District H Site and the District G Site. The WMA permit will be filed once all three Sites have been approved as sources of public water supply. The review of this application will be conducted by Leslie O'Shea, who may be contacted at (508) 946-2837, or by email at leslie.oshea@state.ma.us.

In addition, the Department understands that the Town of Eastham will file an Environmental Notification Form (ENF) and Mandatory Environmental Impact Report (EIR) as it relates to the development of a town-wide water supply system. The EIR and Mandatory EIR will be filed at the same time as the WMA permit.

Based on review of the above, the Department hereby approves the NRHS Site for the installation of permanent pumping works with a maximum daily withdrawal not to exceed 0.833 MGD subject to the following provisions:

1. The Town of Eastham must obtain its Water Management Act permit prior to construction of this source.

2. The Town of Eastham must obtain a permit (BRP WS20) from the Department prior to the start of construction for the well, the pumping station and appurtenant equipment.

This correspondence acknowledges that the Administrative Completeness Review and the Technical Review of this application submittal, BRP WS 19, Transmittal Number X240376, have been completed.

APPENDIX D

District H Well Field
Summary of Hydrogeologic Investigations and Groundwater Modeling of Water Withdrawals

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2. Geology of District H
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6. Zone II Delineation
7. Monitoring Program for District H Well Field

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Figure D-2. Orthophoto Site Plan for District H
Figure D-3. Surveyed Site Plan of District H
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Figure D-5. DEP-Approved Zone II of District H

Attachments

Attachment 1. DEP New Source Approval for District H Well Field.

1.0 Introduction

Eastham has three well fields approved by DEP for use as water supplies for the Town's municipal water system: District G, Nauset Regional High School (NRHS) and District H. Only two of these well fields – District G and NRHS – are to be constructed as part of the water system authorized by Eastham at their 2014 Annual Town Meeting. The third well field, District H, will be constructed only if the Town chooses to expand the municipal water system into a Town-wide system. Eastham recognizes that if this expansion is authorized, additional permitting with MEPA, DEP, the Cape Cod Commission and other state and local regulatory bodies will be required.

The District H property is owned by the Town of Eastham and is located approximately 900 feet east of the intersection of Schoolhouse Road and Nauset Road (see Figure D-1 for a locus plan of the site). It is

located within the boundaries of the Cape Cod National Seashore, and is in a heavily wooded area that also includes a cluster of NHESP certified vernal pools that exist in the area between the Nauset Light Beach and the District H well field. A site plan for District H shown over and orthophoto of the site, and that also shows the location of the vernal pools, is provided as Figure D-2. A surveyed site plan is shown on Figure D-3.

District H was originally evaluated for water supply in the 1990s, and a test production well (TPW-1B) was permitted by DEP in 2007 as a public water supply for a source less than 100,000 gallons per day. As part of the recent hydrogeologic investigations that were conducted at the site in 2009 through 2012 two new, larger capacity test production wells were installed (TPW-3B and TPW-2C) and, following the required studies and procedures under DEP's New Water Source permitting program, received a New Source permit approval that authorizes withdrawals of up to 1.310 Million Gallons per Day (average day, annual basis) for these two wells TPW-3B and TPW-2C. This DEP New Source permit approval for District H was issued on September 12, 2013 and is provided as Attachment 1 to this Appendix D.

A detailed description of the District H site, the investigations performed as part of the DEP New Source permitting process is provided in the report *New Water Supply Source DEP Pumping Test Report, Well Field Protection Zoning District H, Eastham, Massachusetts (*Environmental Partners Group, April 2013*)*. The report provides the following: soil boring and well installation logs, a description of the aquifer testing activities; analyses of the collected hydrogeologic data to determine site-specific aquifer properties; groundwater modeling performed to determine the recommended yield (e.g., withdrawal rate) and Zone II areas; groundwater modeling to evaluate vernal pool response to groundwater pumping; evaluation of land uses and groundwater protection measures within the proposed Zone IIs; and the proposed monitoring program for the well field.

2.0 Geology of District H

The District H well field site is located on the eastern portion of the Nauset Lens aquifer, approximately 6,200 feet southeast of the high point of the freshwater mound that is located along the central axis of Lower Cape Cod, generally following the alignment of Route 6. The groundwater elevation at District H is between 16 to 17 feet NAVD88 (approximately 30 feet below grade surface (bgs)) under average groundwater regime conditions. The direction of groundwater flow at the site is toward the east.

The subsurface geology at District H consists of unconsolidated material, known as the Eastham Plain Deposits that extends from the ground surface to a depth of approximately 400 feet bgs and consists primarily of fine to coarse sand with some gravel interbedded with finer grained silt and clay deposits. The freshwater – saltwater transition zone and interface occurs at a depth below 360 feet bgs. To the north of District H, including the areas where the District G and NRHS well fields are located, these Eastham Plain deposits consist of fine to coarse sand with some gravel to a depth of approximately 110 feet bgs, underlain by up to 300 feet of glacial lake deposits that consist predominately of silts and clays. This thick section of fine grained glacial lake deposits was not present in the District H area and instead a series of aquifer units separated by aquitards (semi-confining clay and silt layers) exist.

Four glacial sand aquifers zones are present at the District H site, designated as Zone A, Zone B, Zone C, and Zone D, each separated by silty clay/clayey silt aquacludes (see Figure D-4). Zone A is unconfined and is not considered a potential source for public water supply because the presence of ponds and vernal pools located within this shallow aquifer zone. The Zone B aquifer is overlain by a single aquaclude and the Zone C aquifer has two overlying aquaclude layers. Production well TPW-3B is screened in the Zone B aquifer and TPW-2C in the Zone C. Zone D, the deepest aquifer zone, is also not considered a potential source for public water supply because of the potential for salt water intrusion that could result from groundwater withdrawals.

3.0 Aquifer Testing

The new test production wells were installed in the Zone B (TPW-3B) and Zone C (TWP-2C) aquifers. Additional observation wells were also installed in the Zone A, B, C, and D aquifers to monitor water level conditions in each of these aquifer zones during the pump test. Water levels were also monitored within and beneath three nearby vernal pools VP-E1, VP-E9 and VP-E11. These wells and piezometers were equipped with data loggers to record groundwater levels before, during and after the production well pumping tests.

Individual pumping tests were performed on the TPW-3B and TPW-2C test production wells in December 2010 and a combined pumping test where both wells were pumped simultaneously was performed in March 2011, pumping both TPW-3B and TPW-2C. The individual well pump tests were performed at a rate of 910 gpm (1.31 MGD) for TPW-3B and 916 gpm (1.31 MGD) for TPW-2C. The combined pump test was performed at the rate of 1.0 MGD per well for a combined pumping rate of 2.0 MGD. On the basis of this work an overall yield of 1.31 million gallons per day (MGD) was

recommended for the well field. The yield can be obtained from either the Zone B or Zone C production wells or any combination of the two wells, as long as the combined pumping rate does not exceed 1.3 MGD.

Water quality sampling was also performed each production well, and the laboratory analytical data indicate that the groundwater quality is excellent and suitable for public water supply. The pH levels in both TPW-3B and TPW-2C is slightly acidic, 6.26 and 6.15, respectively; which is consistent with other water supply wells in Eastham and the outer Cape. All other parameters are within DEP drinking water MCLs, secondary MCLs and guidelines.

4.0 Groundwater Modeling

Groundwater modeling was performed to determine appropriate pumping rates at each production well that a) are protective of the vernal pool and surface water resources of the area, and b) that did not result in adverse salt water upconing affects into the freshwater aquifer. The groundwater modeling activities consisted of the following elements:

1. Removing the diurnal tidal effects from the groundwater elevation data so that the model reflects "true" groundwater elevations.

2. Developing appropriate hydrologic properties of the four aquifers and intervening aquitards underlying District H. This was achieved through the use of a Mulit-Layer Unsteady (MLU) aquifer analysis.

3. Modeling of the vernal pools in the vicinity of the test production wells so that water elevations in the ponds and their response to pumping conditions could be evaluated.

4. Modeling of the salt water transition zone in response to pumping.

Groundwater modeling was performed using the SEAWAT numerical models developed by the U.S. Geological Survey to model freshwater lens conditions of outer Cape Cod. SEAWAT is a three-dimensional, variable-density, numerical model used to model groundwater flow and transport. The SEAWAT model was refined in the vicinities of the NRHS, District G, and District H sites based on site-specific data collected through field investigations.

The Nauset Lens SEAWAT model was used to model changes in TDS concentrations in the aquifer zone beneath the TPW-3B and TPW-2C wells with a constant pumping rate of 1.31 MGD in each well. TDS concentrations were modeled to simulate 100 years of pumping. The modeled TDS concentrations in TPW-3B and TPW-2C after 100 years of pumping each well at 1.31 MGD were 42 mg/L and 148 mg/L, respectively, well below the DEP drinking water guideline for TDS of 500 mg/L . These simulations do not represent actual anticipated pumping conditions, but demonstrate that pumping at the approvable yield rate for a very long time will not result in TDS concentrations above the DEP drinking water guideline for TDS.

These SEAWAT groundwater modeling analyses supports the recommended yield for the District H well field of 1.31 MGD obtained from the aquifer performance test.

5.0 Vernal Pool Study

Four of the Certified Vernal Pools at the District H well site (E1, E5a, E9, and E11) are located within approximately 1,000 feet from the withdrawal points TPW-3B and TPW-2C. Three of these (E1, E9, and E11) were monitored extensively prior to, during, and after the long-term pumping tests as reviewed and approved by DEP, and the vernal pool aquifer test data were analyzed to investigate the potential effects of future pumping in District H on water levels in the vernal pools. The data from the aquifer test and from previous investigations were used to form a predictive model of the vernal pool behavior in response to changes in groundwater levels that might be associated with water withdrawals from the District H wells. This study accompanied the DEP Pumping Test Report for District H (Environmental Partners, April 2013).

Vernal pools VP-E1 and VP-E9 exhibited no apparent responses during the District H aquifer tests. The conclusion on the modeling performed on VP-11 was that pumping TPW-3B at a rate of 0.5 MGD (the anticipated average pumping rate from this well field at complete system build-out) will result in a very small effect on the vernal pool stage (an average drop of 2.5 inches).

The vernal pool model focused on pumping from TPW-3B because this well is screened in the shallower (Zone B) semi-confined aquifer and therefore groundwater withdrawals from this well has a greater potential to effect the vernal pool. The effect of water withdrawals on water levels within vernal pools are mitigated by the character of the peat layer underlying the pools. This peat layer is thickest toward the center of the pool and thins toward the edges. The vernal pool model demonstrates that seepage is more

rapid when the pool stage (the water level in the pool) is high and inundation overlies the areas of thinner peat mat. The model also shows that vernal pool VP-E11 is fed by precipitation and that the vernal pool is most likely not replenished by groundwater. Therefore, a decline in water-table level due to pumping is not anticipated to transmit a similar decline to the vernal pool. As a corollary, while pumping and water level declines do not significantly affect pool water levels, a period with no rainfall would have a much larger effect on water levels within the pool, regardless of withdrawals from the water supply wells.

The vernal pool VP-E11 model results indicate that declines in groundwater level in the vicinity of the pool caused by future District H pumping will result in a very small effect on the vernal pool stage (an average drop of 2.5 inches when TPW-3B is pumped consistently at 0.5 MGD, a condition only representative of system build-out conditions for a Town-wide system). In addition, because vernal pools VP-E1 and VP-E9 exhibited no apparent responses during the District H aquifer test, it is anticipated that long term District H pumping will have less of an effect on these vernal pools than the very small long-term effect calculated for vernal pool VP-E11. These model and results were reviewed with the DEP, the Cape Cod National Seashore and the Cape Cod Commission prior to submittal of the District H Pumping Test Report to DEP.

6.0 Zone II Delineation

The Zone II delineation for the District H well field was determined using the SEAWAT groundwater model. The DEP criteria of evaluating the extent of drawdown during no-recharge conditions over a 180-day period and the resulting area of contribution to the wells served as the basis for the Zone IIs for TPW-3B and TPW-2C.

The Zone II for District H is shown on Figure D-5. This Zone II was approved by DEP as part of their permit review of the Pump Test Report.

7.0 Monitoring Program for District H Well Field

The District H Pumping Test Report includes three monitoring programs for the District H well field:

1. Monitoring to confirm the water quality conditions related to movement of the saltwater transition zone transition zone under actual operating conditions of the well field. The goal of the water quality monitoring plan is to ensure that behavior of the salt water transition zone is consistent with groundwater modeling predictions. This monitoring program includes long term

water level monitoring in the Zone B, C and D aquifers and water quality monitoring in the Zone C and Zone D aquifers.

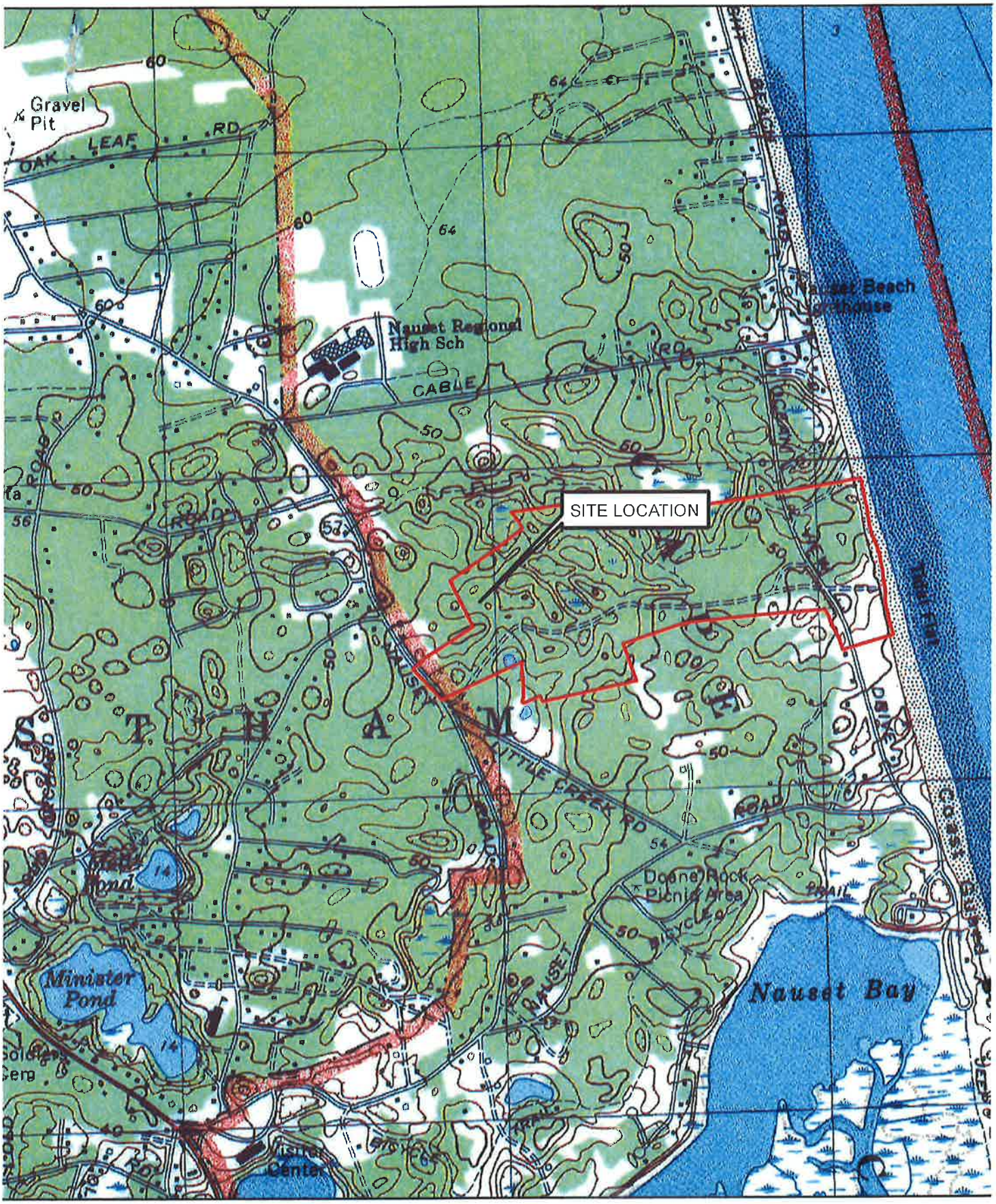
2. Monitoring of water levels in select vernal pools and monitoring wells within and beneath the four vernal pools located within 1,000 feet of the District H production wells to confirm that the effects of production well pumping on the vernal pool water levels are consistent with those predicted in the vernal pool model

3. Monitoring of water quality in sentinel wells located at the western perimeter of the District H property adjacent to the District H property. These wells will provide an early assessment of water quality conditions upgradient of the production wells. Water quality parameters of nitrate, volatile organic compounds and 1,4-dioxane, together with standard field parameters of pH, specific conductivity, and temperature will be monitored in the Zone B and Zone C aquifers.

This monitoring programs is to begin a half year before the production wells go on-line, with water quality samples collected quarterly during this period, and then continue as the well field is in operation with water quality samples being collected semi-annually in March and September of each year. This monitoring program has been approved by DEP, and received input from staff of the Cape Cod Commission and the Cape Cod National Seashore before it was approved by DEP.

Attachment 1

DEP New Source Approval for District H



0 0.125 0.25 0.5 Miles

Environmental Partners
A partnership for engineering solutions.

Figure D-1: ***Site Locus Map***
District H
Eastham, MA

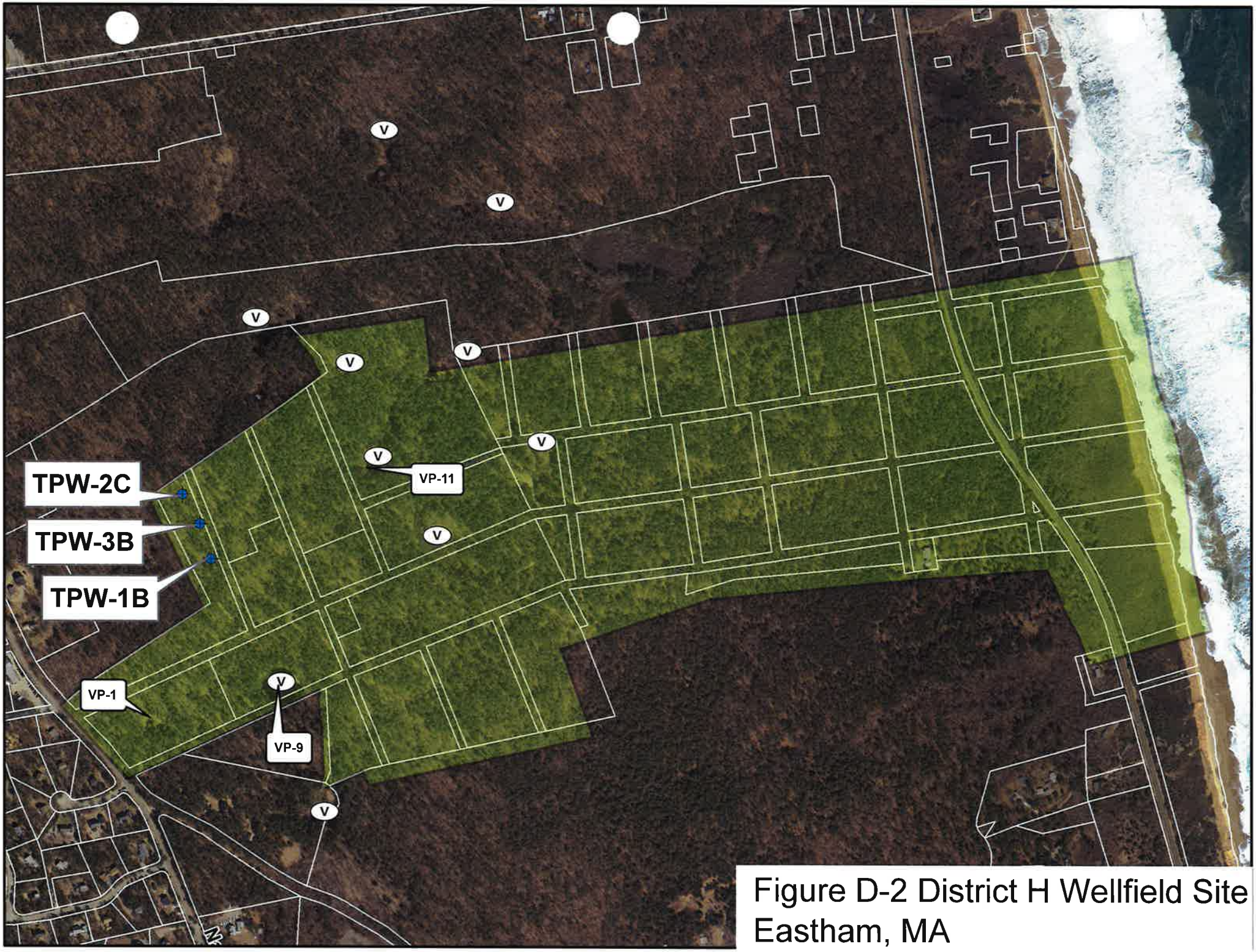
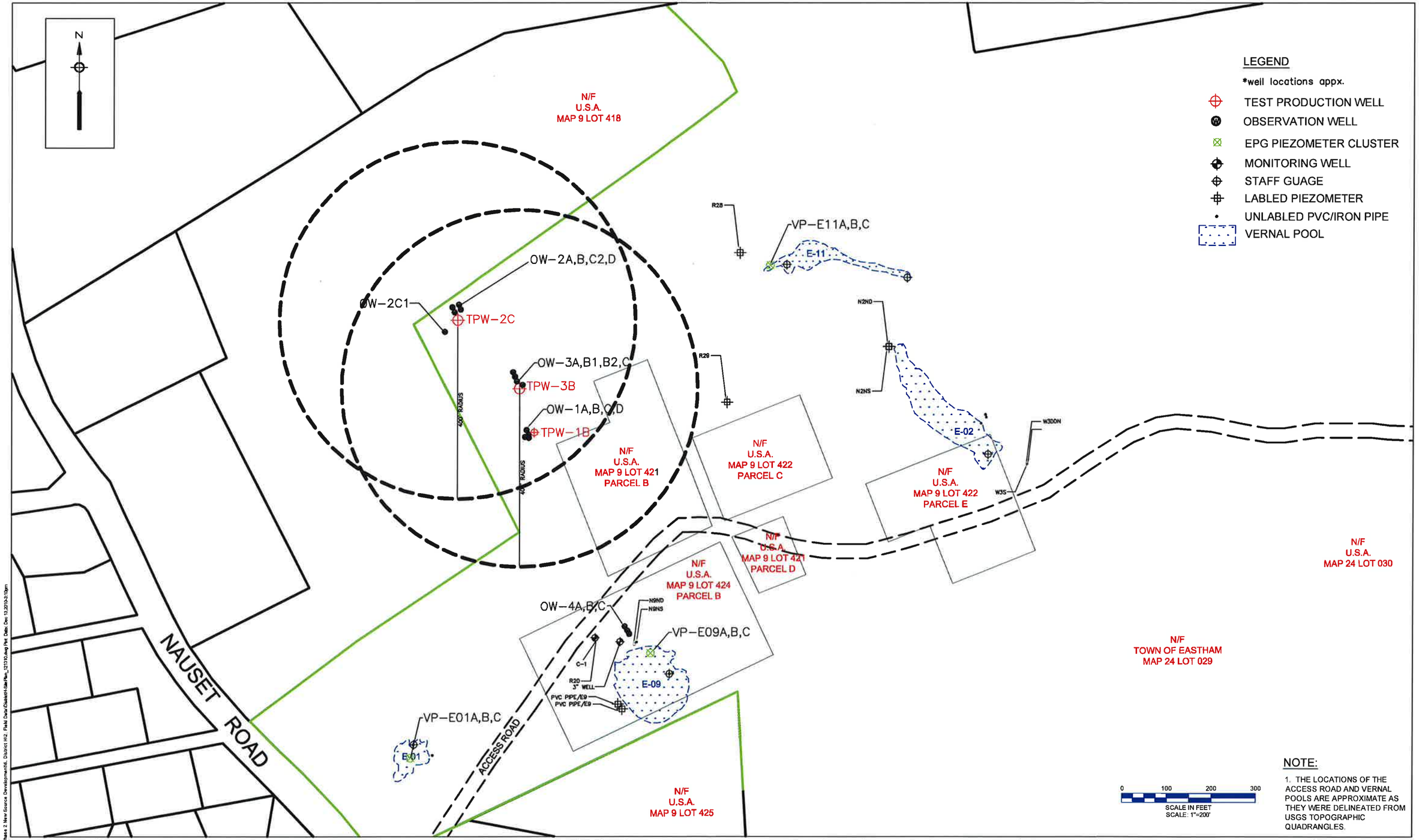


Figure D-2 District H Wellfield Site
Eastham, MA



NOTE:

1. THE LOCATIONS OF THE ACCESS ROAD AND VERNAL POOLS ARE APPROXIMATE AS THEY WERE DELINEATED FROM USGS TOPOGRAPHIC QUADRANGLES.

Drawing file: I:\Eastham.217\217-1001 Phase 2 New Source Development\6. District H\2. Field Data\District-Site\Plan_121310.dwg Plot Date: Dec 13,2010-3:10pm

Environmental Partners GROUP

A partnership for engineering solutions.

MARK	DATE	DESCRIPTION

Scale	1"=200' (11X17)
Date	
Job No.	
Designed by	NMA
Drawn by	NMA
Checked by	AMP
Approved by	MNW

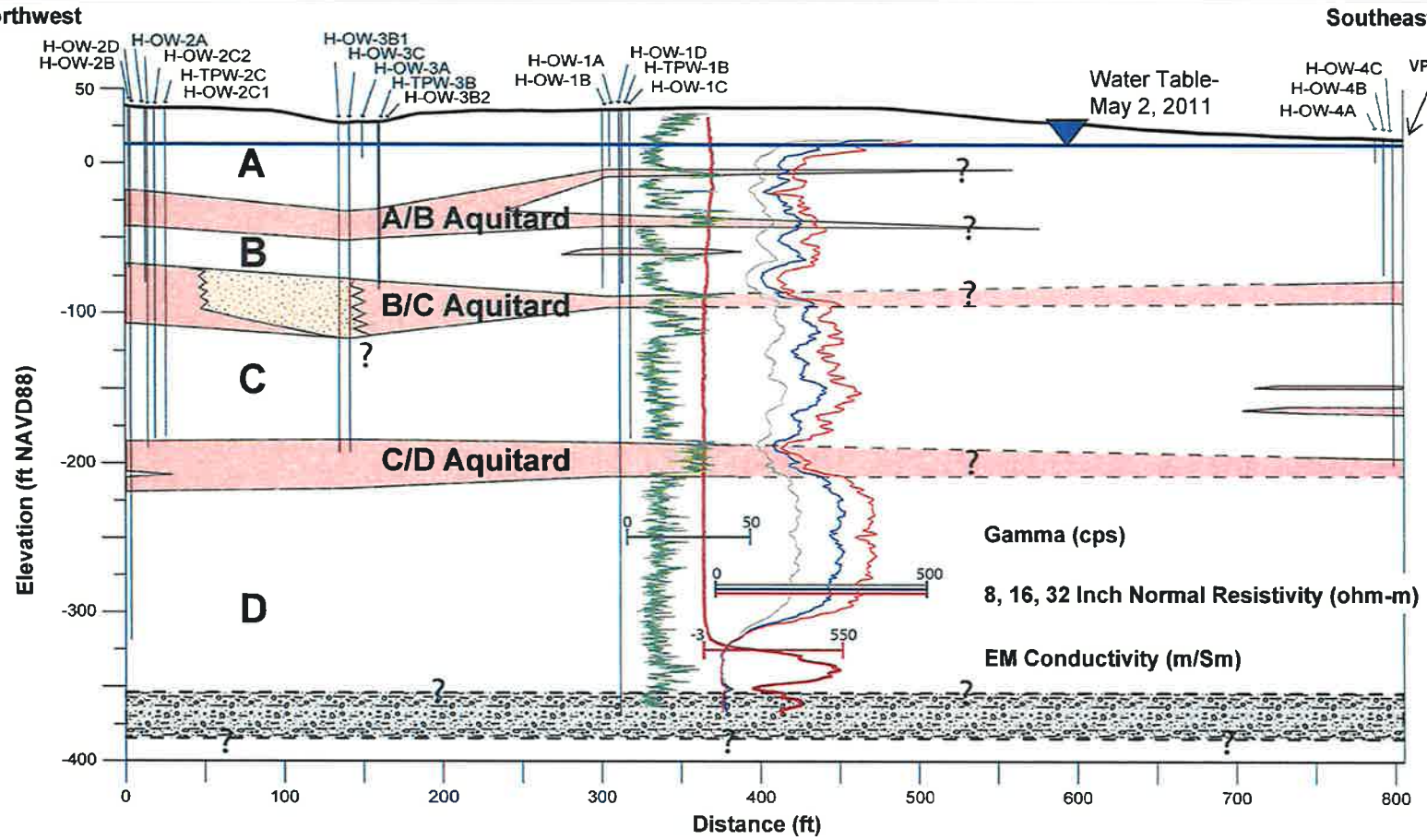
SITE PLAN OF DISTRICT H

DISTRICT H
NAUSET ROAD
EASTHAM, MA

NOT FOR CONSTRUCTION

Sheet No.

Figure D-3



Aquifer (Fine to medium sand with traces of coarser sand and gravel)

Aquitard (Silty clay and silt / Silty sand)

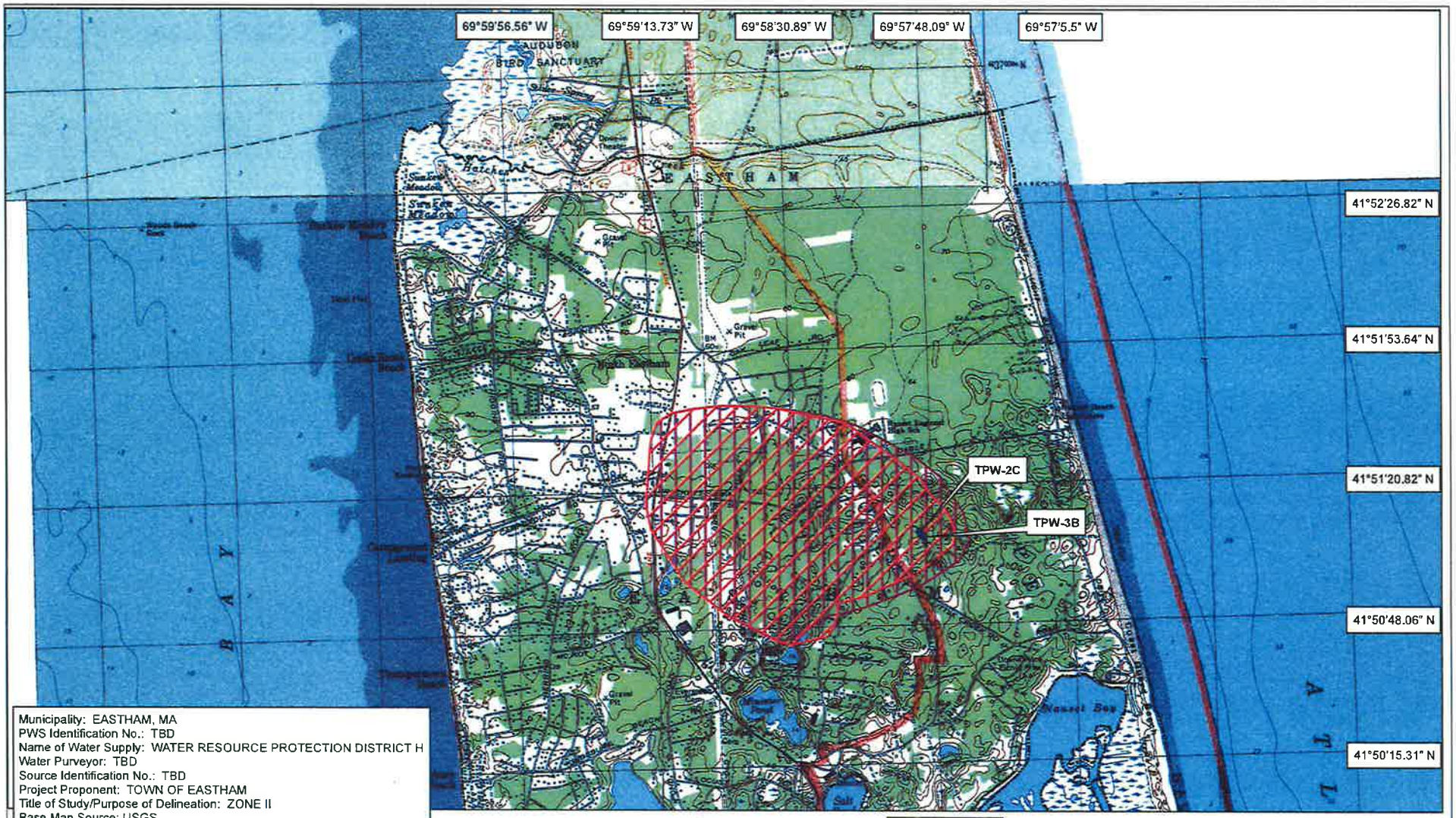
Till or weathered bedrock

District H Well Field Hydrologic Cross Section B–B'

McLane Environmental, LLC

McLane Environmental, LLC, 707 Alexander Rd, Suite 206
Princeton, NJ 08540 | www.mclaneenv.com

Figure D-4



Municipality: EASTHAM, MA
PWS Identification No.: TBD
Name of Water Supply: WATER RESOURCE PROTECTION DISTRICT H
Water Purveyor: TBD
Source Identification No.: TBD
Project Proponent: TOWN OF EASTHAM
Title of Study/Purpose of Delineation: ZONE II
Base Map Source: USGS
Date of Study Submittal: TBD

Latitude/Longitude of Source:

TPW-2C: 41 51' 10.292" N, 69 57' 51.419" W
TPW-3B: 41 51' 9.108" N, 69 57' 50.422" W

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Figure D-5:

District H Zone II Area - Pumping H
TPW-3B or TPW-2C at 1.31 MGD on USGS Map
Eastham, MA

Attachment 1

DEP New Source Approval for District H

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

DEVAL L. PATRICK
Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

September 12, 2013

Ms. Sheila Vanderhoef
Town of Eastham
2500 State Highway
Eastham, Massachusetts 02642

RE: EASTHAM--Public Water Supply
Town of Eastham, BRP WS 19,
New Source Approval, Pumping
Test Report Approval, Wellfield
Protection District H Site,
Transmittal Number X251003

Dear Ms. Vanderhoef:

Please find attached the following information: Approval of the pumping test report for the proposed Wellfield Protection District H Site.

Please note that the signature on this cover letter indicates formal issuance of the attached document. If you have any questions regarding this matter, please contact Kermit Studley of this office at (508) 946-2803.

Sincerely,

Richard J. Rondeau, Chief
Drinking Water Program
Bureau of Resource Protection

R/KS/cb
kstudley/Eastham – Wellfield Protection District H - WS19 - X251003.doc
Y:\DWP Archive\SERO\Eastham-X251003-System Modification-2013-09-12

ecc: Mark N. White, Environmental Partners Group: mnw@envpartners.com
George E. Price, Jr., Cape Cod National Seashore: george_price@nps.gov
Jason Taylor, Cape Cod National Seashore: jason_j_taylor@nps.gov
Bruce Bouck, MassDEP-DWP: bruce.bouck@state.ma.us
Duane LeVangie, MassDEP-OWM: duane.levangie@state.ma.us
Leslie O'Shea, MassDEP-DWP: leslie.oshea@state.ma.us
Tom Cambareri, Cape Cod Commission: tcambareri@capecodcommission.org
Jane Crowley, Eastham Board of Health: jcrowley@eastham-ma.gov
Yvette DePeiza, DEP-Boston: yvette.depeiza@state.ma.us

This information is available in alternate format. Call Michelle Waters-Ekanem, Diversity Director, at 617-292-5751. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

BRP WS 19 APPROVAL OF PUMPING TEST REPORT
FOR SOURCE OF 70 GALLONS PER MINUTE OR GREATER
TOWN OF EASTHAM
EASTHAM, MASSACHUSETTS
WELLFIELD PROTECTION DISTRICT H SITE
TRANSMITTAL NUMBER X251003

On April 23, 2013, the Department of Environmental Protection (the "Department") received the permit application as referenced above. The application is a request for approval of a prolonged pumping test report, titled "WELL FIELD PROTECTION ZONING DISTRICT H, NEW WATER SUPPLY SOURCE, DEP PUMPING TEST REPORT, BRP WS 19", and dated April 2013, submitted by Environmental Partners Group, Inc. on behalf of the Town of Eastham. The subject document was submitted as part of the process of developing a new public water supply which meets the requirements of 310 CMR 22.00, the Massachusetts Drinking Water Regulations. The report details the results of the pumping test, data analysis and subsequent Zone II delineation. This site was previously approved for further testing in a letter from this office dated April 8, 2011.

PUMPING TEST RESULTS

The Wellfield Protection District "H" (District H) Site is located in a heavily wooded area approximately 900 feet east of the intersection of Schoolhouse Road and Nauset Road in Eastham, Massachusetts. The District H well site consists of two 12-inch diameter gravel packed production wells designated TPW-3B and TPW-2C. TPW-3B was installed to a depth of 103 feet and completed with a 10-foot, 80-slot, stainless steel well screen. TPW-2C was installed to a depth of 205 feet and completed with a 20-foot, 50-slot, stainless steel well screen.

Prolonged pumping tests, individual as well as combined, were conducted on the two 12-inch diameter gravel packed production wells. The pumping test at TPW-3B started on December 6, 2010 and ended on December 11, 2010. The pumping test at TPW-2C started on December 16, 2010 and ended on December 21, 2010. The pumping period for the combined pumping test at the District H well site was performed between March 22, 2011 and March 28, 2011. The discharge site for the individual 5-day pumping tests was located in a slight depression located approximately 1,650 and 1,700 feet east-southeast and downgradient of production wells TPW-3B and TPW-2C, respectively. Discharge sites for the combined pumping test were located approximately 1,700 feet and 2,000 feet east-southeast of the two production wells. Groundwater level measurements were recorded at numerous observation wells (see Figure 1-5 and Tables 4-3, 4-4 and 4-5 in the submitted application material) during the antecedent, drawdown and recovery periods of each pumping test. In addition, drive points and staff gauges were each installed in vernal pools VP-01, VP-09 and VP-11 to evaluate the interaction between surface water and the aquifer during the antecedent, drawdown and recovery periods of each pumping test. The individual pumping tests were successful in that stabilization of drawdown was achieved at a pumping rate of 910 gallons per minute (gpm) at TPW-3B and at a pumping rate of 916 gpm at TPW-2C. Stabilization of drawdown was achieved during the combined pumping test with a pumping rate of 1.0 million gallons per day (MGD) at each production well for a combined pumping rate of 2.0 MGD.

PUMPING TEST ANALYSES

Pumping test data were analyzed to determine aquifer characteristics and evaluate the groundwater flow regime, in particular, the response (i.e., saltwater upconing) of the higher-density saltwater zone beneath the District H well site. The derived values were properly quantified to establish an approvable yield based on water quality considerations and to delineate the Zone II wellhead protection area.

The relation between the drawdown observed at stabilization and the distance of the observation wells from TPW-3B indicates the cone of depression or the zone of influence extended radially outward approximately 2,300 feet from the 12-inch diameter production well. Likewise, the cone of depression or zone of influence extended radially outward approximately 1,600 feet from TPW-2C. The distance-drawdown prediction for TPW-3B pumping at the approvable rate of 910 gpm (see below) for a period of 100 years indicates the zone of influence would extend 8,800 feet to the north, 6,900 feet to south, 4,400 feet to the east and 5,600 feet to the west of the District H Site. Likewise, the distance-drawdown prediction for TPW-2C pumping at the approvable rate of 910 gpm (see below) for a period of 100 years indicates the zone of influence would extend 7,700 feet to the north, 6,900 feet to south, 4,400 feet to the east and 4,600 feet to the west of the District H Site.

Water levels within and beneath three vernal pools (VP-01, VP-09 and VP-11) located within 1,000 feet of production wells TPW-3B and TPW-2C were monitored prior to, during and after the three pumping tests. Vernal pool VP-11 is the only vernal pool that showed a response to production well pumping. The maximum drawdown observed at VP-11 in the vernal pool, peat layer and water table was 0.09 feet, 0.19 feet and 0.53 feet, respectively. These drawdowns were observed during the combined test with a combined pumping rate of 2.0 MGD. A vernal pool model was developed to examine the potential response of pond water levels to declines in groundwater elevations that are anticipated to accompany normal pumping conditions at the District H site. The vernal pool model demonstrates that vernal pool VP-11 is replenished by precipitation and that a decline in the water table level due to pumping at the District H site is not anticipated to transmit a similar decline to the vernal pool.

APPROVABLE YIELD

In accordance with the Department's Guidelines and Policies for Public Water systems, revised 2008, if the pumping test is performed on the final production well, the approved pumping rate shall not exceed the rate at which the pumping test was conducted. The maximum approvable yield for TPW-3B is 910 gpm and for TPW-2C is 916 gpm. However, the long term approvable yield of the two wells (single or combined) was evaluated in terms of the water quality (Total Dissolved Solids and chloride concentrations) that results over a prolonged (minimum 100-year) pumping period. A numerical groundwater flow model was used to develop a recommended approvable yield for the District H Site. SEAWAT is a three-dimension numerical model, developed by the United States Geological Survey, that is capable of simulating density dependent groundwater flow and solute (dissolved salt) transport. The simulated Total Dissolved Solids and chloride concentrations in the produced water at a continuous pumping rate of 910 gpm for a period of 100 years were less than the secondary drinking water standards of 500 mg/l and 250 mg/l, respectively. Therefore, the approvable yield for the District H Site is 910 gpm (single or combined withdrawal from the two production wells) or 1.310 million gallons per day (MGD).

ZONE II DELINEATION

The Zone II delineation for the proposed District H well site was performed in accordance with the Department's Guidelines and Policies for Public Water systems, revised 2008. The groundwater model used for the Zone II delineation was originally developed and published by the United States Geological Survey in a report entitled "Simulated Interaction Between Freshwater and Saltwater and Effects of Ground-Water Pumping and Sea-Level Change, Lower Cape Cod Aquifer System, Massachusetts" (Masterson, 2004). The Zone II wellhead protection area was delineated for TPW-3B pumping at 910 gpm (see Figure 10-5) and for TPW-2C pumping at 910 gpm (see Figure 10-6). The Zone II map for the proposed District H well site (see Figure 10-7) shows both the TPW-3B and TPW-2C Zone II wellhead protection areas. The latitude for the proposed production well TPW-2C is 41d 51m 10.292sN and the longitude is 69d 57m 51.419sW. The latitude for the proposed production well TPW-3B is 41d 51m 9.108sN and the longitude is 69d 57m 50.422sW.

WATER QUALITY

Analytical testing was performed in accordance with the Department's Guidelines and Policies for Public Water Systems (revised 2008). The results of all water quality analyses indicate that, while somewhat corrosive (low pH and alkalinity), the water meets all recognized standards of purity for public water supply purposes. Treatment will likely involve pH adjustment for corrosion control.

In response to detections of 1,4-dioxane in groundwater in the vicinity of the Eastham Landfill, the public water supply wells proposed to be developed by the Town of Eastham, consisting of District G, Nauset Regional High School (NRHS) and District H, were sampled on January 17, 2013 and analyzed for 1,4-dioxane. The compound 1,4-dioxane was only detected at the District H Site and at a concentration an order of magnitude less than the Massachusetts Water Quality Guideline of 0.3 parts per billion.

GROUNDWATER MONITORING PROGRAM

The Department approves the proposed Groundwater Monitoring Program (see Section 8.0 and Figure 1-5 of the pumping test report). The groundwater monitoring program is designed to ensure the potability of the produced water by monitoring water quality in the shallow, intermediate and deep aquifer zones beneath the District H Site. The monitoring network will consist of observation well clusters OW-1, OW-2, OW-3, and OW-4 at the District H Site. Water quality data will be collected quarterly beginning approximately two quarters prior to the District H production wells going on-line. Once the production wells are on-line, water quality data from the production wells and the observation well clusters will be collected semi-annually in March and September. Field water quality parameters will include temperature, specific conductance and pH. Laboratory water quality parameters will include sodium, chloride, sulfate, Total Dissolved Solids, iron, and manganese. All laboratory analyses shall be performed at a Massachusetts certified laboratory.

Sentinel monitoring wells are proposed to be located at the western edge of the District H property adjacent to Nauset Road. These wells will provide early warning of impaired water quality conditions upgradient of the production wells. The sentinel wells will be sampled on a semi-annual basis for nitrate, volatile organic compounds and 1,4-dioxane together with standard field parameters of pH, specific conductivity, and temperature. Water quality data from the groundwater monitoring program shall be kept with the Town of Eastham and should only be reported to the Department when detections occur.

Water levels (i.e., vernal pool and water table) in select vernal pools (VP-01, VP-09, VP-11, VP-06, and VP-05 or Vp-05a, as shown on Figure 5-8) will be monitored to confirm the vernal pool modeling predictions under actual operating conditions at the District H Site. The monitoring will be initiated prior to pumping operations for the collection of background data and a semi-annual schedule of monitoring is proposed for the long-term monitoring plan. Water level data trends, along with other operational and hydrologic factors, will be evaluated periodically to decide if modifications to well field operation practices are warranted.

AQUIFER PROTECTION BYLAW

The Town of Eastham must implement appropriate wellhead protection zoning or non-zoning controls for those areas of the District H Site that lie outside the Cape Cod National Seashore and not covered by the Town of Eastham's Wellfield Protection Zoning District H (see 310 CMR 22.21(2)). Wellhead protection for that portion of the District H Site Zone II within the Cape Cod National Seashore is provided in accordance with the United States Department of the Interior regulations and policies documented in the "Comprehensive Source Protection Plan, Cape Cod National Seashore" dated 2006. Also, in a letter dated March 18, 2011 to the Town of Eastham, the National Park Service confirmed its commitment for the "protection of those parts of the Zone I areas that extend from the proposed supply wells at the Nauset Regional School and District H Site onto Seashore property."

WATER MANAGEMENT ACT PERMIT

The District H Site is one of three potential public water supply sources that will provide operational flexibility and meet future water demands for the Town of Eastham by and through a centralized municipal public water supply system. The Department understands that the Town of Eastham will file a Water Management Act (WMA) permit application to include the District H Site, the NRHS Site and the District G Site. The review of this application will be conducted by Leslie O'Shea, who may be contacted at (508) 946-2837, or by email at leslie.oshea@state.ma.us.

In addition, the Department understands that the Town of Eastham will file an Environmental Notification Form (ENF) and Mandatory Environmental Impact Report (EIR) as it relates to the development of a town-wide water supply system. The ENF and Mandatory EIR will be filed at the same time as the WMA permit.

Based on review of the above, the Department hereby approves the pumping test report and the Zone II delineation for the District H Site with a maximum daily withdrawal not to exceed 1.31 MGD subject to the following provisions:

1. The Town of Eastham must obtain its Water Management Act permit prior to the use of this source for public water supply.

2. The Town of Eastham must obtain a permit (BRP WS20) from the Department prior to the start of construction for the well, the pumping station and appurtenant equipment.

This correspondence acknowledges that the Administrative Completeness Review and the Technical Review of this application submittal, BRP WS 19, Transmittal Number X251003, have been completed.

All items must be sent by **Jan 31, 2015**.

Additional Instructions for mailing your package

- Ensure that there are no other tracking labels attached to your package.
- Affix the mailing label squarely onto the address side of the parcel, covering up any previous delivery address and barcode without overlapping any adjacent side.
- Take this package to a UPS location. To find your closest UPS location, visit the UPS Drop Off Locator or go to www.ups.com.

Return Mailing Label

Cut this label and affix to the outside of the return package

PAUL MILLETT
25 FAIRVIEW AVE
READING MA 01867-3418

3 LBS

1 of 1

RS

SHIP TO: RETURNS DEPARTMENT
CVG1 E1 AMAZON FULFILLMENT SERVICES
1105 WORLDWIDE BLVD
HEBRON KY 41058

OH 452 9-72

UPS GROUND

TRACKING #: 1Z 755 R1A 90 1882 4165

BILLING: P/P
DESC: Returned Merchandise
RETURN SERVICE
Reference No: DD5sJs JmRRMA

DD5sJs JmRRMA

E1

Return Authorization Label

Cut this and place inside the return package

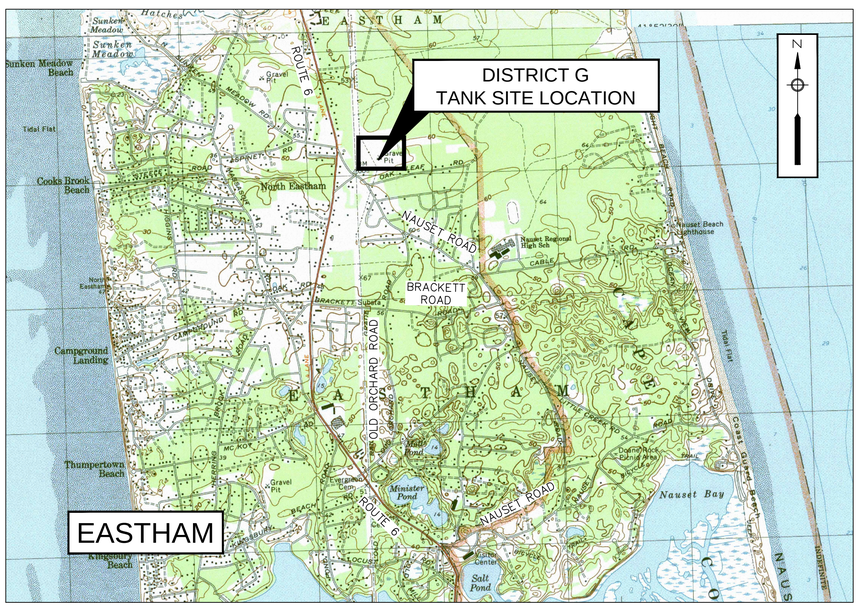
DD5sJsJmRRMA

Item Descriptions	Quantity
London Fog Men's Iconic Trench Coat, British Khaki, 40 Regular	1

CONTRACT 1
DISTRICT G WATER STORAGE TANK

EASTHAM, MASSACHUSETTS

DECEMBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G - 1	GENERAL NOTES AND LEGEND
C - 1	EXISTING CONDITIONS PLAN
C - 2	PROPOSED WATER STORAGE TANK SITE PLAN
CD - 1	CONSTRUCTION DETAILS I
CD - 2	CONSTRUCTION DETAILS II
CD - 3	CONSTRUCTION DETAILS III
M - 1	MECHANICAL DRAWINGS
M - 2	MECHANICAL DETAILS
E-1	ELECTRICAL SHEET I
E-2	ELECTRICAL SHEET II
I - 1	INSTRUMENTATION AND SCADA

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

BOARD OF SELECTMEN

LINDA BURT
JOHN KNIGHT
MARTIN McDONALD
WALLACE ADAMS, II
ELIZABETH GAWRON

PUBLIC WORKS SUPERINTENDENT

NEIL ANDRES, P.E.

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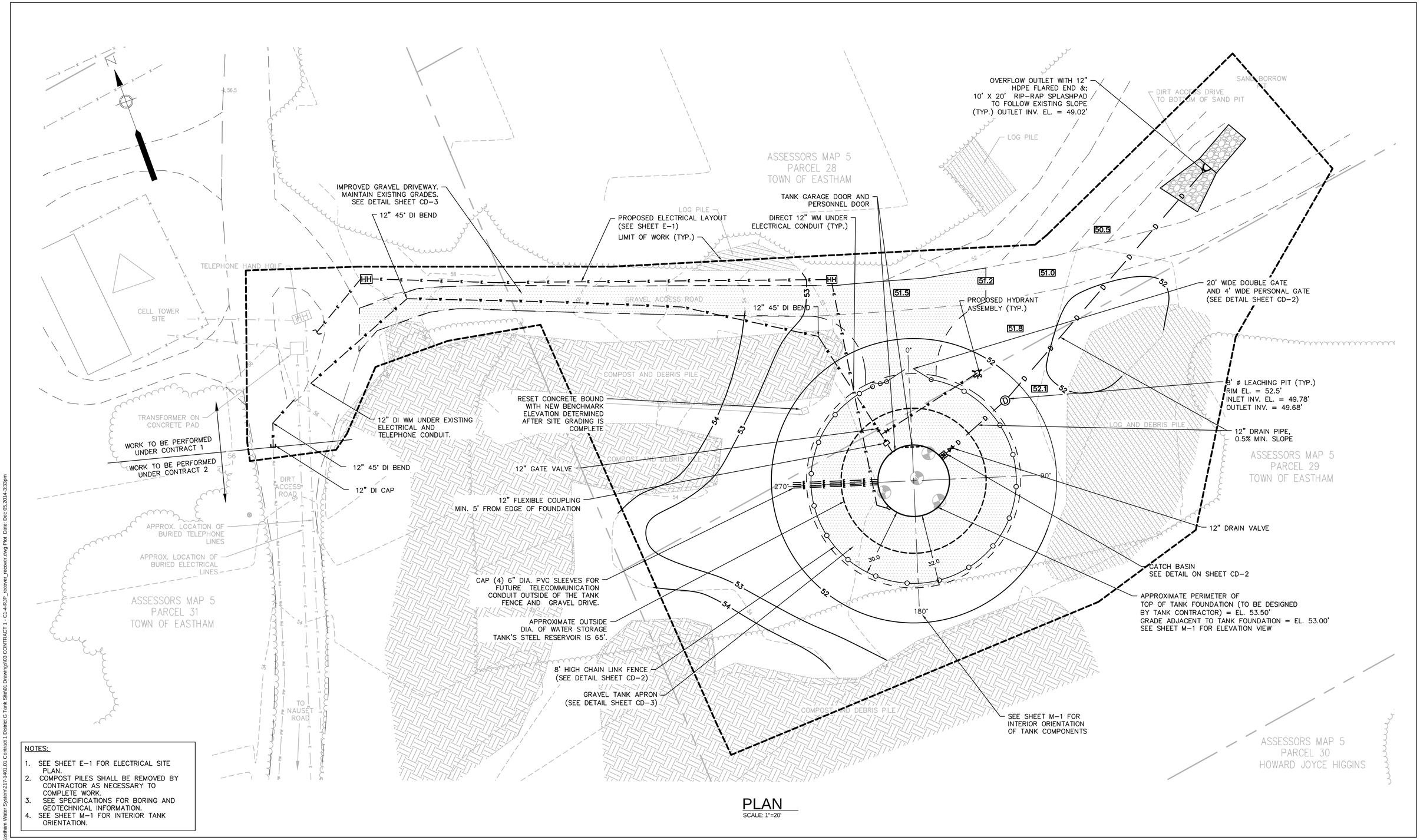

NOTES:

1. SEE SHEET E-1 FOR ELECTRICAL SITE PLAN.
2. COMPOST PILES SHALL BE REMOVED BY CONTRACTOR AS NECESSARY TO COMPLETE WORK.
3. SEE SPECIFICATIONS FOR BORING AND GEOTECHNICAL INFORMATION.
4. SEE SHEET M-1 FOR INTERIOR TANK ORIENTATION.

PLAN

SCALE: 1"=20'

TOWN OF EASTHAM INCORPORATED 1651

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FOR REVIEW ONLY

MARK	DATE	DESCRIPTION

Scale	1"=20'
Date	DECEMBER 2014
Job No.	217-1401.01
Designed by	RJP
Drawn by	RJP
Checked by	RJT
Approved by	PCM

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

CONTRACT 1
DISTRICT G WATER STORAGE TANK
EASTHAM, MASSACHUSETTS

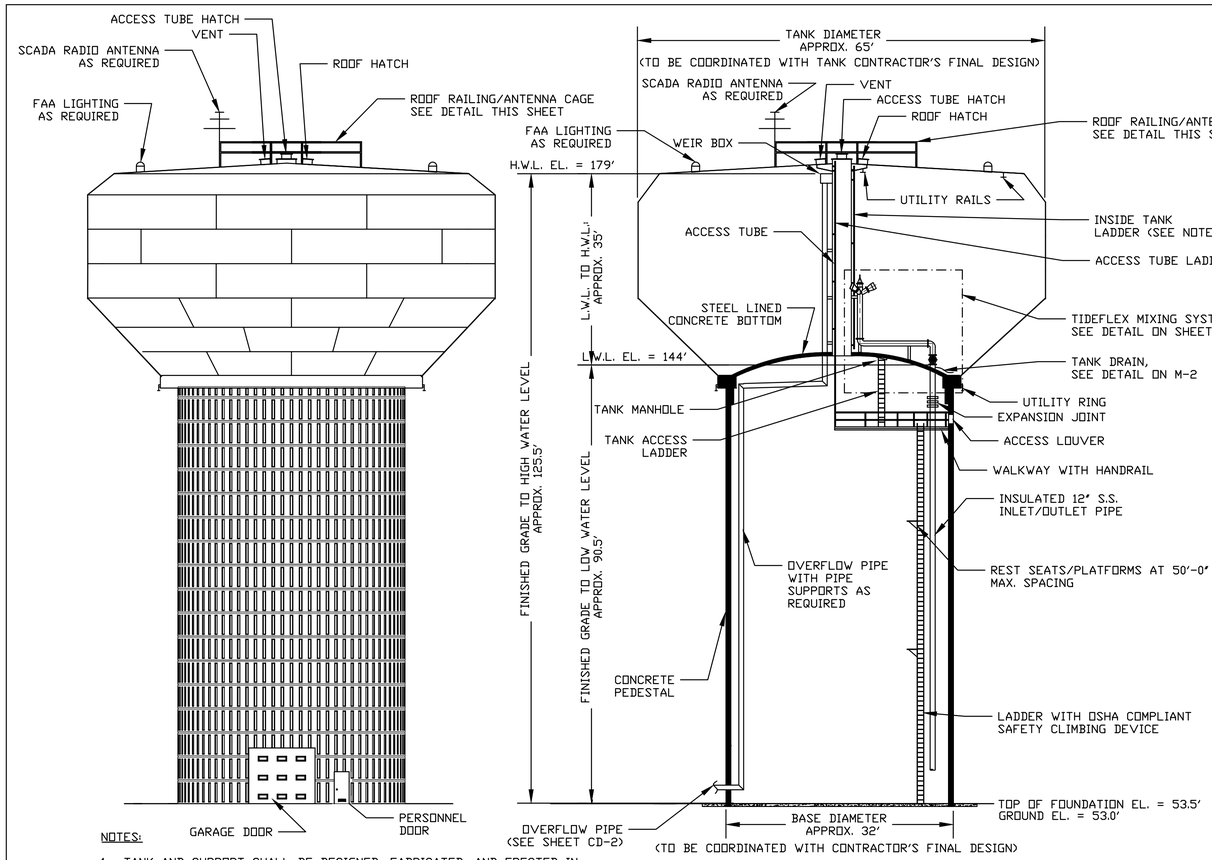
PROPOSED WATER
STORAGE TANK SITE PLAN

FOR REVIEW

Sheet No.

C-2

Drawing file: I:\Eastham.217\Phase 1 - Eastham Water System\217-1401.01 Contract 1 District G Tank Site\01 Drawings\03 CONTRACT 1 - C1-4-RJP_recover_recover.dwg Plot Date: Dec 05,2014-3:33pm

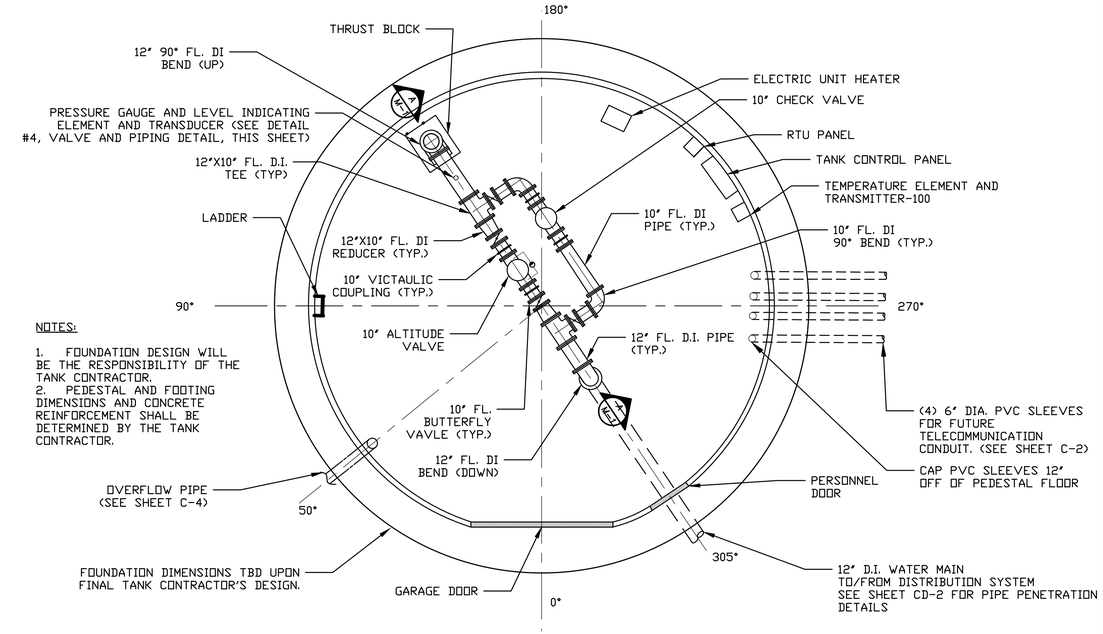


NOTES:

1. TANK AND SUPPORT SHALL BE DESIGNED, FABRICATED, AND ERECTED IN ACCORDANCE WITH AWWA D107 AND THE PROJECT SPECIFICATIONS.
2. ACCESSORIES SHOWN ON ELEVATION DRAWINGS ARE ROTATED FOR CLARITY.
3. TANK ELEVATION DETAIL IS FOR SCHEMATIC PURPOSES ONLY AND NOT TO SCALE.
4. ALL HANDRAILS, PLATFORM LANDINGS, WALKWAYS, LADDERS AND SAFETY CLIMB DEVICES SHALL CONFORM WITH CURRENT OSHA STANDARDS.
5. SEE PROJECT SPECIFICATIONS FOR SHOP AND FIELD PAINT REQUIREMENTS FOR THE STEEL TANK.
6. STERILIZE TANK IN ACCORDANCE WITH AWWA C652-02 AND PROJECT SPECIFICATIONS.
7. FINAL DIMENSIONS WILL BE RESPONSIBILITY OF THE TANK CONTRACTOR.

TANK PROFILE VIEW

SCALE: N.T.S.

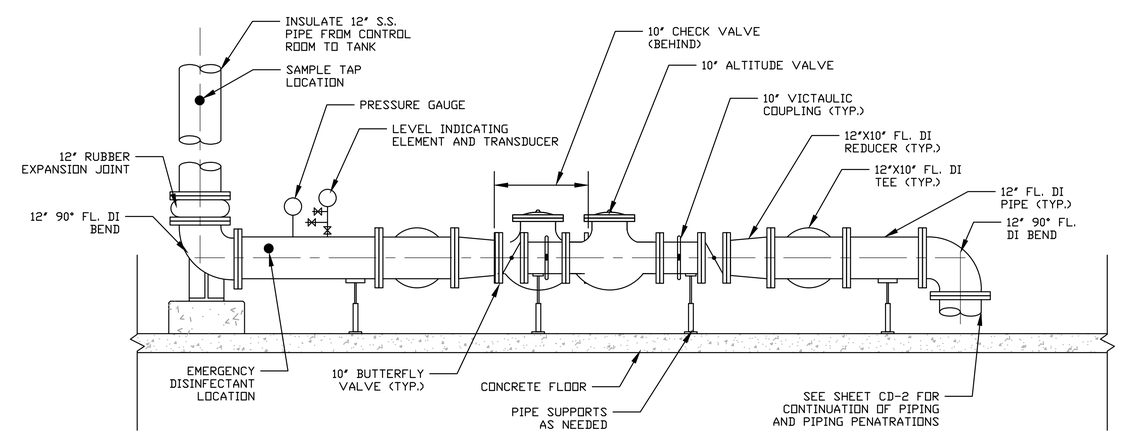


NOTES:

1. FOUNDATION DESIGN WILL BE THE RESPONSIBILITY OF THE TANK CONTRACTOR.
2. PEDESTAL AND FOOTING DIMENSIONS AND CONCRETE REINFORCEMENT SHALL BE DETERMINED BY THE TANK CONTRACTOR.

TANK FLOOR PLAN

SCALE: 3/16"=1'-0"

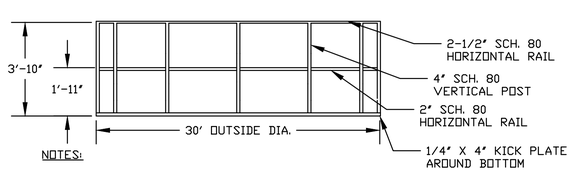


NOTES:

1. ALL FIELD TAPS TO BE COORDINATED WITH ENGINEER AND OWNER.
2. CONTRACTOR TO FIELD CONFIRM ALL PIPE LENGTHS PRIOR TO FABRICATION.
3. ALL PIPING AND TUBING SHALL BE INSULATED TO PREVENT FREEZING. MIN. THICKNESS OF INSULATION IS 2".
4. FURNISH AND INSTALL REMOVABLE INSULATION COVER FOR PRESSURE GAUGE AND SAMPLE TAP TO PREVENT FREEZING. COVER SHALL BE CONSTRUCTED TO BE EASILY REMOVED AND RE-INSULATED WITHOUT DAMAGE.

PIPING CROSS SECTION A-A

SCALE: 1/2"=1'-0"



NOTES:

1. ALL RAILING/CAGE COMPONENTS SHALL BE HOT-DIPPED GALVANIZED STEEL.
2. VERTICAL POSTS ARE SPACED AT 30 DEGREE INTERVALS AROUND CIRCUMFERENCE (12 POSTS).

ROOF RAILING/ANTENNA CAGE DETAIL

SCALE: 1/8"=1'-0"

TOWN OF EASTHAM INCORPORATED 1651

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FOR REVIEW ONLY

MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	DECEMBER 2014
Job No.	217-1401.01
Designed by	RJP
Drawn by	RJP
Checked by	RJT
Approved by	PCM

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

CONTRACT 1
DISTRICT G WATER STORAGE TANK
EASTHAM, MASSACHUSETTS

MECHANICAL DRAWINGS

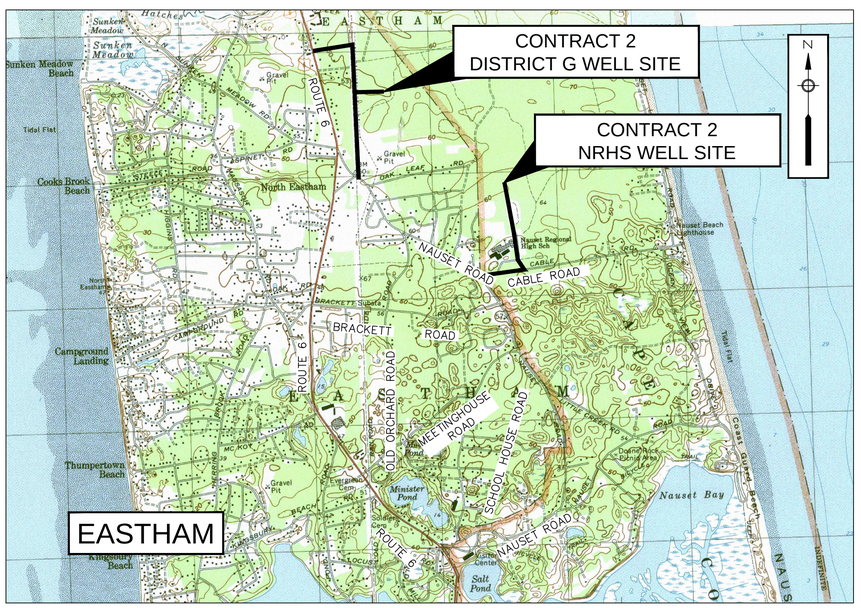
FOR REVIEW

Sheet No.
M-1

Drawing file: C:\temp\AcPublish_9924\04 CONTRACT 1 - M1-2.dwg Plot Date: Dec 05,2014-2:52pm

CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

DECEMBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1 GENERAL NOTES & LEGEND

C-1 NRHS WELL STATION & ACCESS ROAD SITE PLAN

C-2 NRHS WATER MAIN

C-3 NRHS & CABLE ROAD WATER MAIN

C-4 DISTRICT G WELL STATION & ACCESS ROAD SITE PLAN

C-5 DISTRICT G ACCESS ROAD WATER MAIN

C-6 DISTRICT G TANK SITE CONNECTION & LINDA LANE WATER MAIN

CD-1 CONSTRUCTION DETAILS I

CD-2 CONSTRUCTION DETAILS II

CD-3 CONSTRUCTION DETAILS III

CD-4 CONSTRUCTION DETAILS IV

A-1 NRHS & DISTRICT G PRECAST BUILDING FLOOR PLAN AND SECTIONS

M-1 NRHS & DISTRICT G WELL STATION LAYOUT

M-2 MECHANICAL DETAILS

E-1 ELECTRICAL SHEET I

E-2 ELECTRICAL SHEET II

E-3 ELECTRICAL SHEET III

I-1 NRHS & DISTRICT G WELL STATION INSTRUMENTATION & SCADA PLAN I

I-2 NRHS & DISTRICT G WELL STATION INSTRUMENTATION & SCADA PLAN II

TOWN ADMINISTRATOR

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GENERAL NOTES:

1. BASE MAP INFORMATION FOUND ON THE DESIGN SHEETS ARE TAKEN FROM A SURVEY CONDUCTED BY COASTAL ENGINEERING, INC. IN SEPTEMBER 2014. HORIZONTAL DATUMN: NAD83 (FEET) AND VERTICAL DATUMN: NAVD88 (FEET). ADDITIONAL UTILITY PIPES AND STRUCTURES MAY EXIST.
2. IN AREAS WHERE CONSTRUCTION ACTIVITIES ARE ANTICIPATED TO OCCUR WITHIN PRIVATE PROPERTY, PROPERTY LINE LOCATIONS ARE TO BE REVIEWED WITH THE TOWN PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.
3. THE CONTRACTOR SHALL NOT STORE ANY APPARATUS, MATERIALS, SUPPLIES, OR EQUIPMENT ON DRAINAGE STRUCTURES, PRIVATE PROPERTY OR WITHIN 100 FEET OF WETLANDS, UNLESS DIRECTED TO DO SO BY THE CONTRACT DOCUMENTS.
4. NORTH DIRECTION SHOWN IS APPROXIMATE.
5. ALL EXISTING UTILITIES SHOWN ARE APPROXIMATE, THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES. CONTRACTOR SHALL NOTIFY DIG SAFE AT LEAST 72 HOURS IN ADVANCE, EXCLUDING WEEKENDS AND HOLIDAYS, PRIOR TO ANY EXCAVATION.
6. DO NOT SCALE DRAWINGS UNLESS OTHERWISE NOTED. WRITTEN DIMENSIONS AND STATIONING SHALL PREVAIL. REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY.
7. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).
8. THE CONTRACTOR SHALL RESTORE ALL PUBLIC AND PRIVATE PROPERTY TO ITS PRE-CONSTRUCTION CONDITION AT NO ADDITIONAL COST TO THE OWNER.
9. ALL EXISTING UTILITIES LINES ENCOUNTERED DURING CONSTRUCTION ARE TO REMAIN IN SERVICE. THE CONTRACTOR SHALL, AT NO ADDITIONAL COST TO THE TOWN, REPAIR ANY EXISTING SEWERS, STORM DRAIN LINES OR CULVERTS DAMAGED DURING CONSTRUCTION.
10. IN THOSE INSTANCES WHERE POWER OR TELEPHONE POLE SUPPORT IS REQUIRED, THE CONTRACTOR SHALL PROVIDE A MINIMUM 48-HOUR NOTIFICATION TO THE RESPECTIVE UTILITY COMPANY. NO ADDITIONAL PAYMENT WILL BE PROVIDED FOR TEMPORARY BRACING OF UTILITIES.
11. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO THE TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE TRENCH IS BACKFILLED. INJURY TO ANY SUCH STRUCTURE CAUSED BY, OR RESULTING FROM, THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE RESPECTIVE UTILITY AND THE TOWN.
12. THE CONTRACTOR IS TO TAKE SPECIAL CARE NOT TO DAMAGE TREES, BUSHES, PLANTS, FLOWERS, STONEWALLS, FENCES, ETC. WITHIN THE CONSTRUCTION AREA UNLESS THEY ARE NOTED TO BE REMOVED. CONTRACTOR SHALL REPLACE AT NO COST TO OWNER, ALL DAMAGED ITEMS.
13. CONTRACTOR SHALL REMOVE AND REPLACE, OR REPAIR, ALL CURBS, SIDEWALKS, BERMS, PAVEMENT AND OTHER ITEMS DAMAGED BY HIS CONSTRUCTION ACTIVITIES TO AT LEAST THEIR ORIGINAL CONDITION, AND TO THE SATISFACTION OF THE TOWN AND ENGINEER.
14. ANY TRAFFIC SIGNAL EQUIPMENT (LIGHTS, CONDUITS, LOOP DETECTORS) DISTURBED SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AS DIRECTED BY THE TOWN AT THE CONTRACTOR'S EXPENSE.
15. THE CONTRACTOR SHALL INSTALL AND MAINTAIN TRAFFIC CONTROL DEVICES AS NECESSARY AND IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
16. THE CONTRACTOR SHALL BE REQUIRED TO FURNISH AND MAINTAIN A TELEPHONE NUMBER WHERE THE CONTRACTOR CAN BE REACHED 24 HOURS A DAY, 7 DAYS A WEEK.
17. THE LOCATION AND LIMITS OF ALL ON-SITE WORK AND STORAGE AREAS SHALL BE REVIEWED/COORDINATED WITH, AND ACCEPTABLE TO, THE TOWN. THE CONTRACTOR SHALL LIMIT HIS ACTIVITIES TO THESE AREA.
18. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR WORK IN ROADWAYS AND FOR BLASTING. THE CONTRACTOR IS RESPONSIBLE FOR CONFORMING TO ALL PERMITS AS AN INTEGRAL PART OF HIS WORK.
19. THE CONTRACTOR SHALL HANDLE GROUNDWATER, WHERE ENCOUNTERED, IN AN APPROVED MANNER. DURING ANY DEWATERING, THE CONTRACTOR SHALL USE STONE AROUND THE SUCTION END TO MINIMIZE DISCHARGE OF TRENCH MATERIALS. THE DISCHARGED WATER SHALL PASS THROUGH FILTER FABRIC.
20. IF ENCOUNTERED, THE CONTRACTOR SHALL HANDLE, STORE, REMOVE, TRANSPORT AND LEGALLY DISPOSE OF ANY ASBESTOS-CEMENT IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS. ASBESTOS NOTIFICATION FORMS SHALL BE COMPLETED AND SUBMITTED TO THE APPROPRIATE AGENCY/AGENCIES.

WATER MAIN NOTES:

1. NEW WATER MAINS AND SERVICES SHALL BE INSTALLED AT THE MINIMUM DEPTH FROM FINISH GRADE TO TOP OF PIPE AS SHOWN ON THE DRAWINGS. WHERE NECESSARY, NEW WATER MAINS SHALL BE INSTALLED AT A GREATER DEPTH TO CLEAR OBSTACLES SHOWN ON THE DRAWINGS AT NO ADDITIONAL COST TO THE OWNER. MINIMUM CLEARANCES TO UTILITIES, AS SHOWN ON THE DRAWINGS SHALL BE MAINTAINED.
2. MINIMUM COVER OVER THE PROPOSED WATER MAIN AND APPURTENANCES SHALL BE 5'-0" UNLESS OTHERWISE NOTED OR DIRECTED BY ENGINEER. ANY PIPE WITHOUT 4'-0" COVER REQUIRES INSULATION.
3. TEST PITS TO LOCATE EXISTING UTILITIES MAY BE ORDERED BY THE ENGINEER TO DETERMINE WHETHER TO RAISE OR LOWER THE PROPOSED WATER MAIN TO CLEAR EXISTING UTILITIES OR MEET EXISTING WATER MAINS.
4. THE CONTRACTOR SHALL STAKE OUT ALL HYDRANT LOCATIONS AT LEAST 3 DAYS IN ADVANCE OF INSTALLATION. THE LOCATION OF ALL HYDRANTS SHALL BE VERIFIED BY THE FIRE DEPARTMENT, ENGINEER AND TOWN PRIOR TO EXCAVATION FOR INSTALLATION.
5. ALL HYDRANT BRANCHES SHALL HAVE VALVES AS SHOWN ON THE HYDRANT DETAIL.
6. ANY HYDRANT WHICH IS NOT IN SERVICE SHALL BE COVERED WITH A SECURELY FASTENED BURLAP BAG (OR EQUAL).
7. ALL WATER MAIN CAPS WHICH WILL BE REMOVED IN SUBSEQUENT CONTRACTS SHALL BE MARKED WITH A VERTICAL OAK POST (OR EQUAL) APPROXIMATELY 18" BELOW FINISHED GRADE AND MARKED WITH BLUE MARKING SPRAY PAINT.
8. CORPORATIONS SHALL NOT BE OPENED TO THE PROPOSED WATER MAIN UNTIL SATISFACTORY PRESSURE TEST AND DISINFECTION RESULTS.
9. WATER SERVICE SHALL NOT BE INTERRUPTED MORE THAN 4 HOURS WITHOUT PRIOR APPROVAL OF THE OWNER.
10. THE CONTRACTOR SHALL NOT OPEN OR CLOSE ANY VALVES OR HYDRANTS WHICH HOLD WATER IN THE SYSTEM. THE OWNER WILL, ON 24 HOURS NOTICE FROM THE CONTRACTOR, OPEN AND/OR CLOSE ANY VALVES OR HYDRANTS REQUIRED FOR DRAINING OR ADMITTING WATER TO THE VARIOUS SECTIONS OF THE WATER MAINS.
11. SOME WATER SERVICE CURB BOXES MAY NOT BE SHOWN ON THE DRAWINGS. THE ENGINEER WILL MARK THE LOCATION OF SUCH CURB BOXES, PROVIDED THE CONTRACTOR GIVES THE ENGINEER AT LEAST ONE WEEK ADVANCE NOTICE.
12. OPEN TRENCHES MUST BE BACKFILLED AT THE END OF THE WORKDAY OR COVERED AND SECURED WITH STEEL PLATES, RAMPED AS APPROVED BY THE TOWN.
13. THE CONTRACTOR IS REQUIRED TO NOTIFY AND COORDINATE WITH THE IMPACTED RESIDENTS ALL WATER MAIN SHUT DOWNS 24 HOURS IN ADVANCE.
14. THE CONTRACTOR SHALL STAKE OUT ALL CURB STOP LOCATIONS AT LEAST 3 DAYS IN ADVANCE OF INSTALLATION. THE LOCATIONS OF ALL CURB STOPS SHALL BE VERIFIED BY ENGINEER, TOWN, AND PROERTY OWNER PRIOR TO EXCAVATION FOR INSTALLATION.
15. CURB BOXES SHALL BE LOCATED AT THE PROPERTY LINE AND CONNECTED TO THE PROPOSED WATER MAIN AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. WATER SERVICE TUBING ON THE PRIVATE PROPERTY SIDE SHALL BE CAPPED AND STAKED 5'-0" FROM THE CURB BOX.
16. CONCRETE THRUST BLOCKS AND "MEGA-LUG" (OR APPROVED EQUAL) MECHANICAL RESTRAINTS ARE REQUIRED AT ALL TEES, BENDS, PLUGS AND HYDRANTS.
17. SLEEVES, NIPPLES, AND ACCESSORIES NECESSARY FOR CONNECTIONS BETWEEN EXISTING AND NEW PIPES MAY NOT BE SHOWN IN DETAIL. FURNISH AND INSTALL ITEMS NECESSARY FOR CONNECTING TO EXISTING MAINS AND AS INDICATED ON THE CONTRACT DOCUMENTS.
18. EXCEPT WHERE OTHERWISE DIRECTED, 12" MINIMUM CLEARANCE SHALL BE PROVIDED BETWEEN THE NEW MAIN AND OTHER UTILITIES WHERE THEY CROSS. WHERE NEW MAIN PASSES UNDER UTILITIES, IT SHALL CROSS WITHOUT THE USE OF BENDS UNLESS OTHERWISE NOTED ON THE PLANS.
19. ALL HYDRANT LATERALS SHALL CROSS UNDER EXISTING UTILITIES AND WATER MAINS. HYDRANT EXTENSIONS SHALL BE INSTALLED, AS NECESSARY, AT NO ADDITIONAL COST TO THE OWNER.

LEGEND:

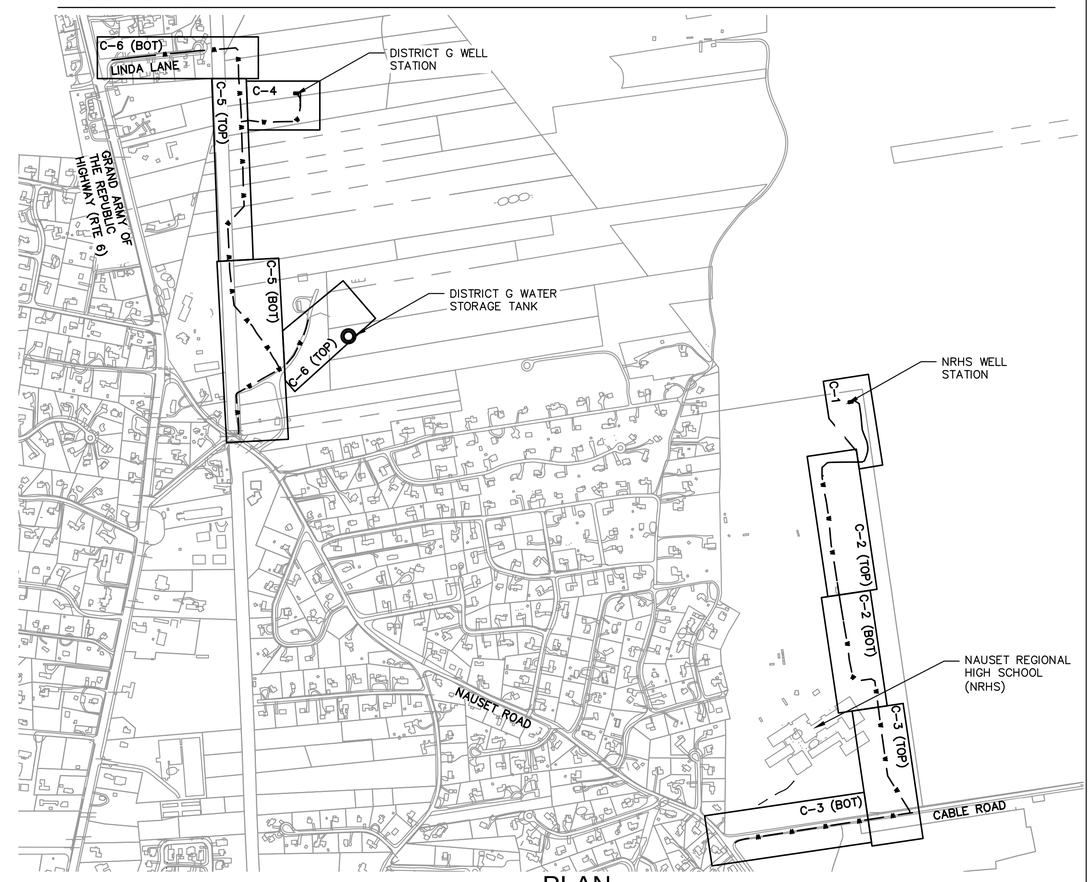
EXISTING

- D — DRAIN LINE
- E — ELECTRIC LINE
- G — GAS LINE
- T — COMMUNICATIONS LINE
- W — WATER MAIN
- STONEWALL
- OH — OVERHEAD WIRE
- DECIDUOUS TREE
- MAILBOX (MB)
- SIGN
- VEGETATION
- PROPERTY CORNER
- LIGHT POLE
- LANDSCAPED AREA
- GUARD RAIL
- GRANITE BLOCK
- RIPRAP
- WL — WETLAND
- WETLAND FLAG
- CONCRETE BOLLARD
- TELEPHONE PEDESTAL
- TRAFFIC SIGNAL LIGHT SUPPORT
- HYDRANT
- DI CAP
- REDUCER
- WATER VALVE
- WATER SHUTOFF
- CATCH BASIN (CB)
- DRAIN MANHOLE (DMH)
- EDGE OF DIRT/GRAVEL DRIVE
- CURB/BERM
- EDGE OF PAVEMENT (EP)
- PROPERTY LINE
- FENCE
- UTILITY POLE (UP#)
- GUY WIRE / GUY POLE
- TELECOMMUNICATION MANHOLE
- ELECTRIC TRANSFORMER
- SEWER MANHOLE COVER
- SIGN
- BUSH/HEDGES
- BOUND
- UTILITY POLE (UP#)
- GUY WIRE / GUY POLE

PROPOSED

- W — WATER MAIN
- HYDRANT
- GATE VALVE
- DI CAP
- COUPLING/SOLID SLEEVE
- REDUCER
- CURB STOP
- FILTER SOCK
- TEST PIT
- W — PRODUCTION WELL (TPW)
- E — ELECTRICAL CONDUIT
- PB — PULL BOX
- D — DRAIN PIPE
- D — DRAIN MAN HOLE
- 52 — ELEVATION CONTOUR
- 51.8 — SPOT ELEVATION
- RIPRAP
- GRAVEL
- CHAIN LINK FENCE

SHEET LAYOUT MAP



PLAN
SCALE: 1"=500'

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\02 CONTRACT 2 - GENERAL NOTES.dwg Plot Date: Dec 09,2014-12:19pm

TOWN OF EASTHAM INCORPORATED 1651

Environmental Partners GROUP
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FOR REVIEW ONLY

MARK	DATE	DESCRIPTION

Scale	AS SHOWN
Date	DECEMBER 2014
Job No.	217-1401.02
Designed by	TRG
Drawn by	TRG
Checked by	RJT
Approved by	PCM

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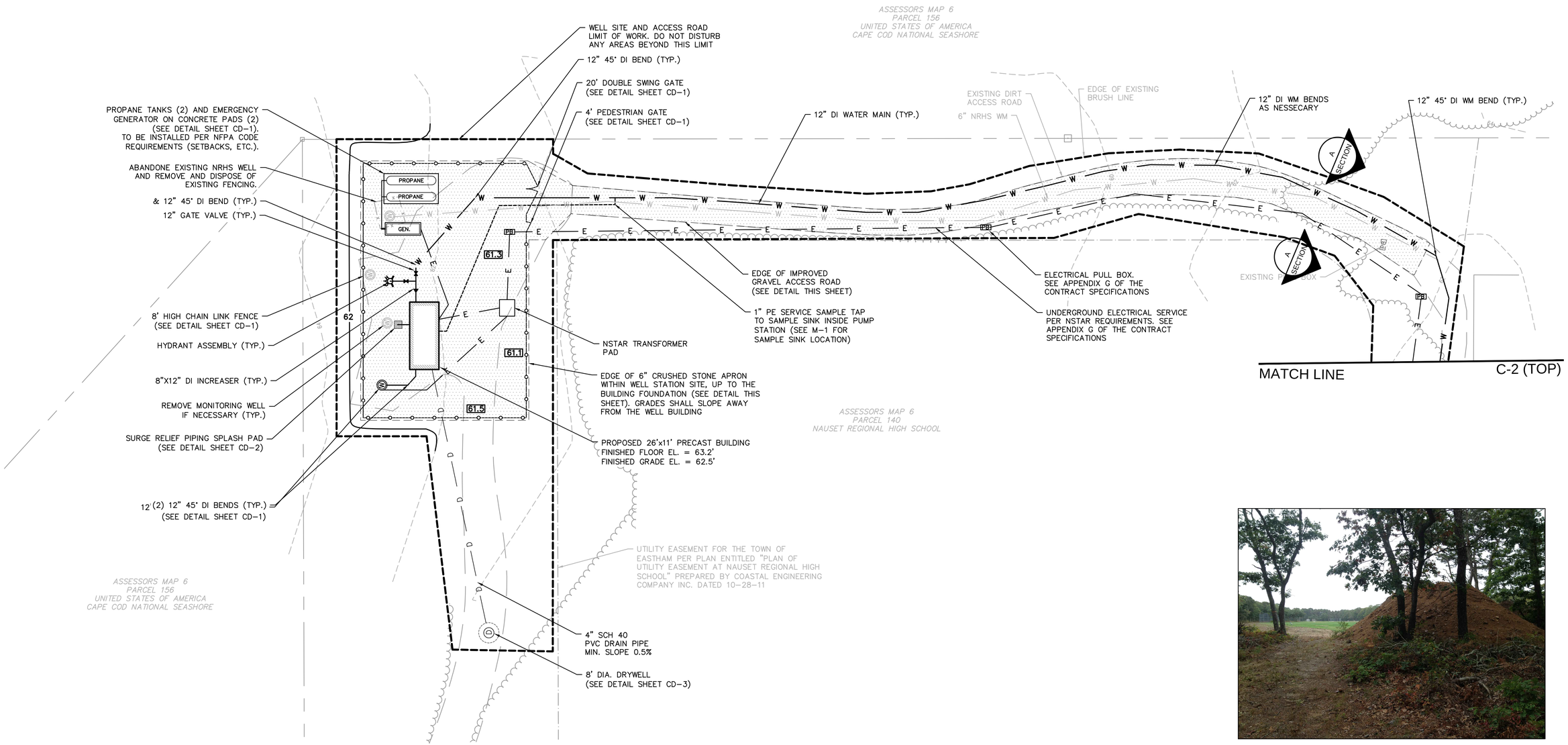
CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

GENERAL NOTES & LEGEND

FOR REVIEW

Sheet No.
G-1



NRHS WELL STATION AND ACCESS ROAD SITE PLAN

SCALE: 1"=20'

SECTION A-A
EXISTING NRHS SITE

SCALE: N.T.S.

SECTION B-B
EXISTING NRHS ACCESS ROAD

SCALE: N.T.S.

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CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

NRHS WELL STATION AND ACCESS ROAD SITE PLAN

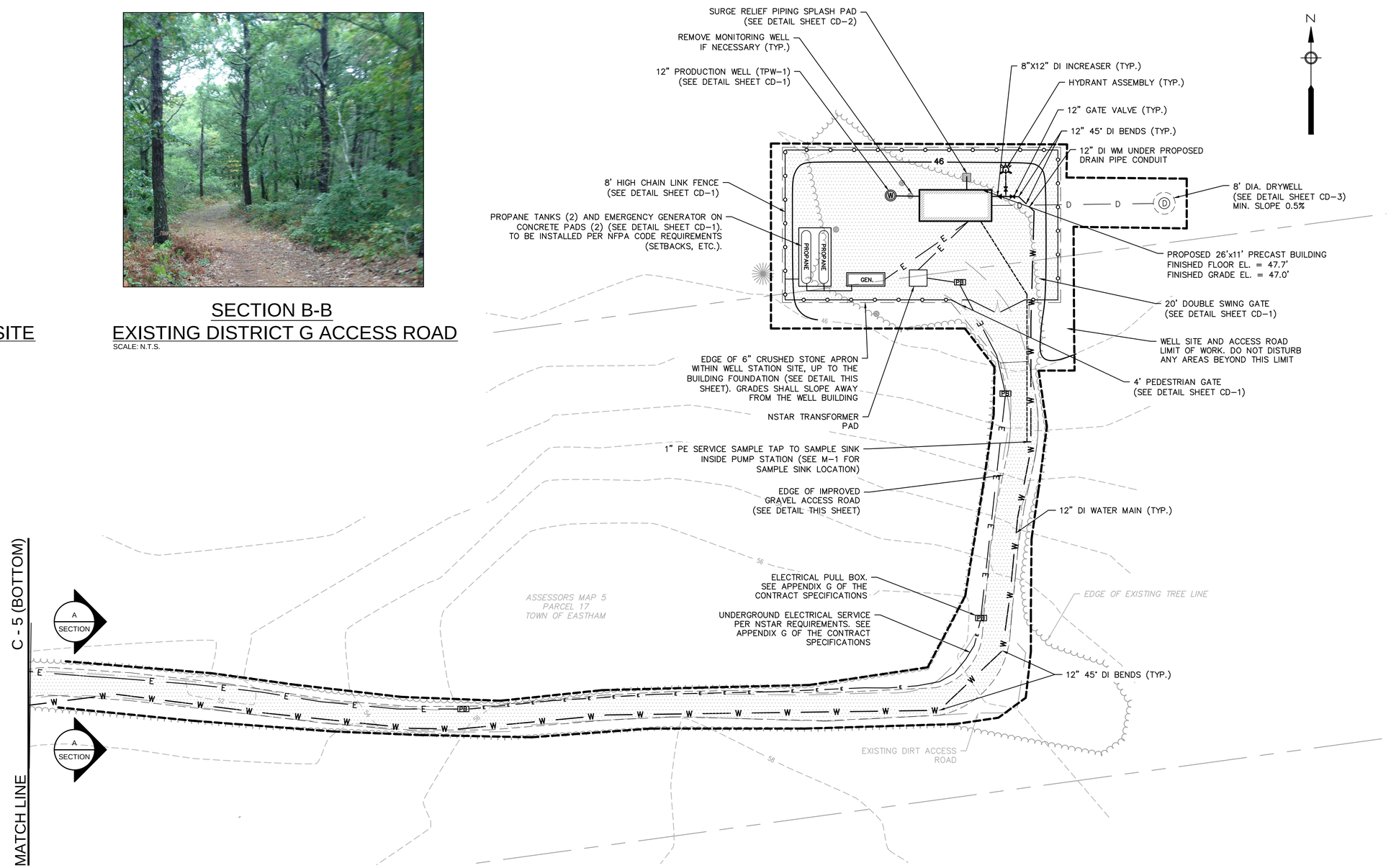
FOR REVIEW

Sheet No.
C-1

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\03 CONTRACT 2 - CIVIL 2014 12 03.dwg Plot Date: Dec 04,2014-6:01pm

SECTION A-A
EXISTING DISTRICT G SITE
SCALE: N.T.S.

SECTION B-B
EXISTING DISTRICT G ACCESS ROAD
SCALE: N.T.S.



DISTRICT G WELL STATION AND ACCESS ROAD SITE PLAN
SCALE: 1"=20'

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\03 CONTRACT 2 - CIVIL 2014 12 03.dwg Plot Date: Dec 04,2014-6:01pm

TOWN OF EASTHAM INCORPORATED 1651

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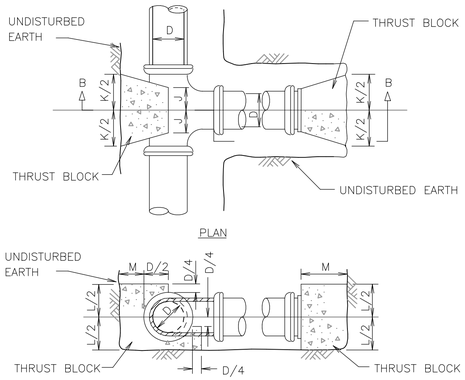
CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

DISTRICT G WELL STATION AND ACCESS ROAD SITE PLAN

FOR REVIEW

Sheet No.
C-4



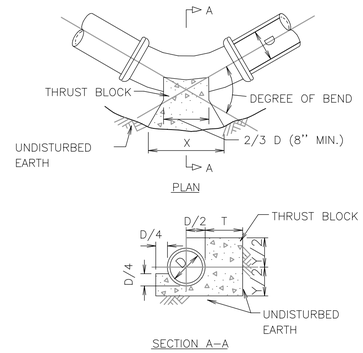
NOTES :

1. ALL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (CLASS 'A' CONCRETE).
2. DIMENSIONS SHOWN ARE MINIMUM AND ARE BASED UPON SOIL PRESSURE OF 1500 PSF AND TOTAL PRESSURE OF 250 PSI. TOTAL PRESSURE IS WORKING PRESSURE PLUS SURGE PRESSURE.
3. THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED EARTH.

TABLE OF DIMENSIONS							
D (in)	4	6	8	10	12	14	16
J (in)	6	6	7	9	10	12	22
K (in)	16	16	20	26	32	36	64
L (in)	16	16	21	24	29	34	61
M (in)	11	11	14	16	19	22	39

CONCRETE THRUST BLOCK DETAIL AT TEE / PLUG

SCALE: N.T.S.



NOTES:

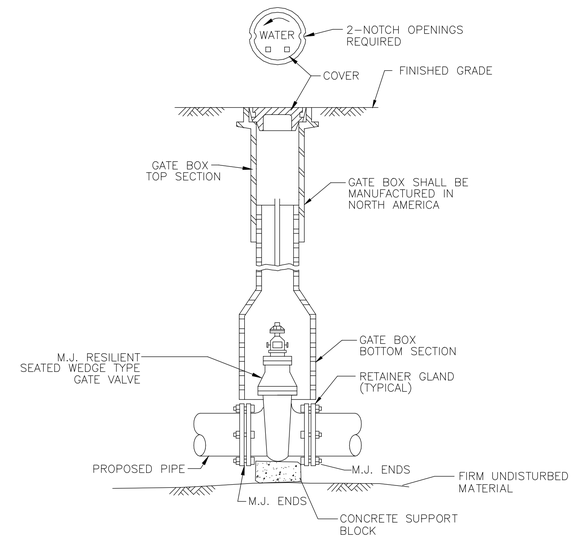
1. ALL CONCRETE SHALL BE 3000 P.S.I. @ 28 DAYS (CLASS "A" CONCRETE)
2. DIMENSIONS SHOWN ARE MINIMUM AND ARE BASED UPON SOIL PRESSURE OF 1500 P.S.F. AND TOTAL PRESSURE OF 250 P.S.I. TOTAL PRESSURE IS WORKING PRESSURE PLUS SURGE PRESSURE.
3. THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED EARTH.

TABLE OF DIMENSIONS

DIMENSION	90° BEND							45° BEND							22 1/2° BEND							11 1/4° BEND						
D (in.)	4	6	8	10	12	14	16	4	6	8	10	12	14	16	4	6	8	10	12	14	16	4	6	8	10	12	14	16
X (in.)	35	35	50	56	72	80	142	24	24	35	45	51	60	107	28	28	30	32	37	42	74	12	12	19	21	27	33	59
Y (in.)	20	20	24	32	35	40	71	16	16	19	21	27	33	59	13	13	13	16	19	22	39	8	8	9	12	13	16	28
T (in.)	11	11	14	16	19	22	39	11	11	14	16	19	22	39	11	11	13	16	19	22	39	11	11	13	16	19	22	39

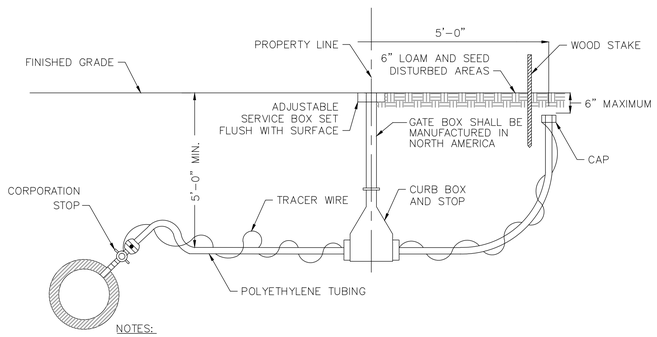
CONCRETE THRUST BLOCK DETAIL AT BEND

SCALE: N.T.S.



GATE VALVE AND VALVE BOX DETAIL

SCALE: N.T.S.

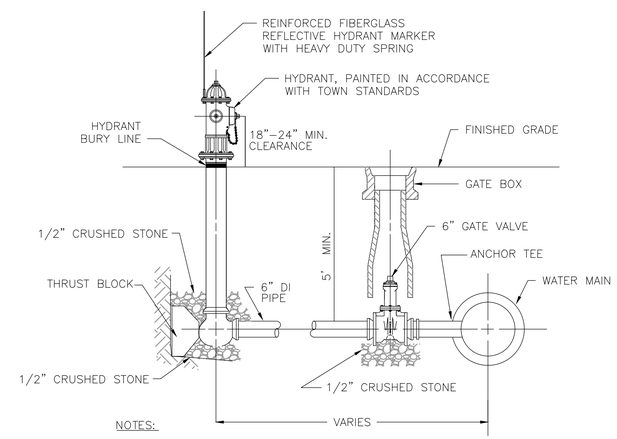


NOTES:

1. ALL JOINTS SHALL BE COMPRESSION TYPE.
2. POLYETHYLENE TUBING SHALL BE BACKFILLED WITH SAND BY HAND TO 1–FOOT ABOVE TUBING.
3. CORPORATION STOPS LARGER THAN ONE INCH SHALL HAVE A SADDLE.
4. WATER SERVICES SHALL BE INSULATED IN AREAS WHERE CONNECTION TO EXISTING WATER SERVICE IS LESS THAN 4 FEET.
5. ALL WATER SERVICE PLUMBING MATERIALS SHALL BE "LEAD FREE" IN ACCORDANCE WITH SECTION 1417 OF THE SAFE DRINKING WATER ACT AND SECTION 9 OF NSF STANDARD 61.

TYPICAL SERVICE CONNECTION DUCTILE IRON WATER MAINS

SCALE: N.T.S.



NOTES:

1. ALL HYDRANT, VALVE AND TEE JOINTS TO BE RESTRAINED MECHANICAL JOINTS.
2. DEPTH OF HYDRANT BURY SHALL SUIT INSTALLED DEPTH OF COVER OVER WATER MAIN. INSTALL RISERS AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

FIRE HYDRANT ASSEMBLY DETAIL

SCALE: N.T.S.

Drawing file: I:\Eastham\217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\03 CONTRACT 2 - CIVIL 2014 12 03.dwg Plot Date: Dec 04,2014-6:02pm

TOWN OF EASTHAM — INCORPORATED 1651

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Designed by	TRG/RJP
Drawn by	TRG/RJP
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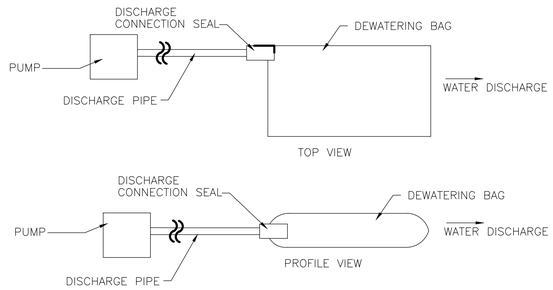
CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

CONSTRUCTION DETAILS III

FOR REVIEW

Sheet No.
CD-3

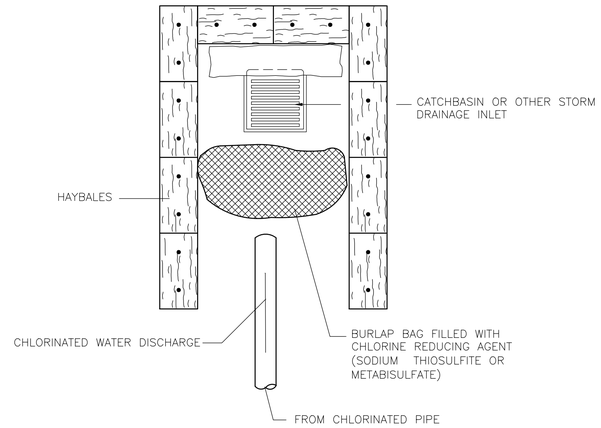


NOTES:

1. DEWATERING BAG SIZE AND QUANTITY SHALL BE AS NEEDED TO ADEQUATELY FILTER ALL PUMP EFFLUENT FROM DEWATERING ACTIVITIES. CONTRACTOR SHALL PROVIDE A REDUNDANT BAG ON SITE AT ALL TIMES.
2. EACH BAG SHALL HANDLE A 2", 3", OR 4" DISCHARGE HOSE.
3. DISCHARGE HOSES CAN BE PLACED ALONG ANY EDGE BY MAKING A SMALL INCISION INTO THE FABRIC, INSERTING THE HOSE, AND THEN CLAMPING THE FABRIC TO THE HOSE VIA WIRE, TIES, CLAMP, ROPE OR SIMILAR TO CREATE A GOOD SEAL.
4. CONTRACTOR SHALL AVOID DISCHARGING MULTIPLE PIPES INTO ONE BAG.

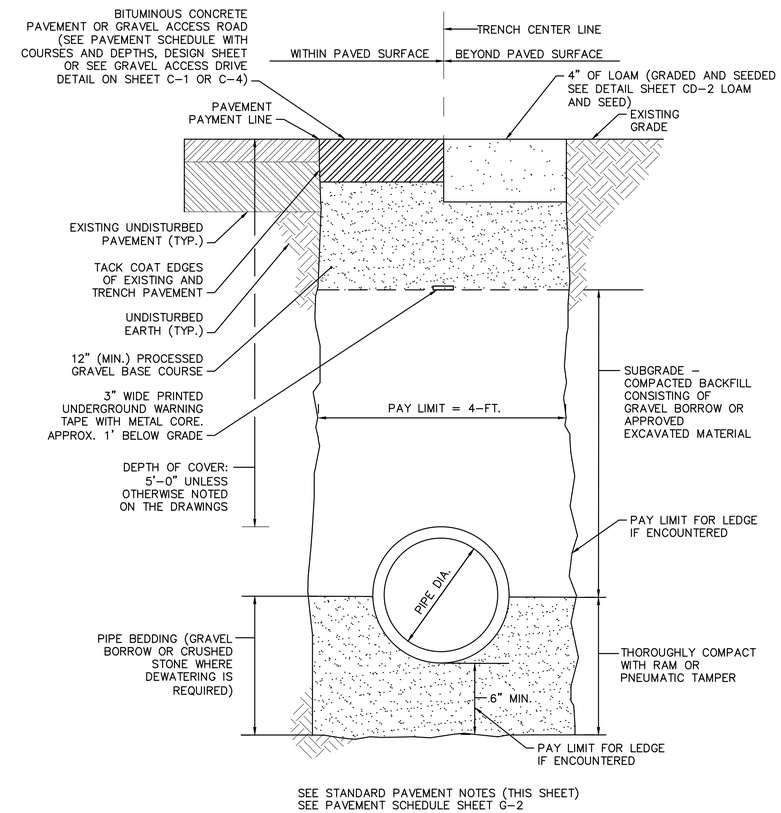
DEWATERING BAGS

SCALE: N.T.S.



DECHLORINATION DETAIL

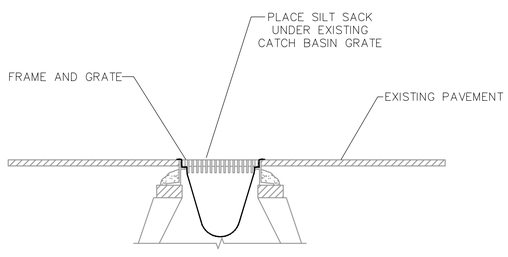
SCALE: N.T.S.



SEE STANDARD PAVEMENT NOTES (THIS SHEET)
SEE PAVEMENT SCHEDULE SHEET G-2

WATER MAIN TRENCH DETAIL

SCALE: N.T.S.

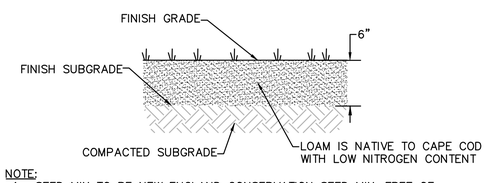


NOTES:

1. SILT SACKS SHALL BE INSPECTED WEEKLY AND ACCUMULATED SILT REMOVED TO ALLOW CATCH BASIN TO FUNCTION PROPERLY.
2. SILT SACK AS MANUFACTURED BY ACF ENVIRONMENTAL (800-448-3636) OR APPROVED EQUAL.

SEDIMENTATION CONTROL AT CATCH BASINS SILT SACKS

SCALE: N.T.S.



NOTE:

1. SEED MIX TO BE NEW ENGLAND CONSERVATION SEED MIX, FREE OF FERTILIZERS.
2. INSTALL CURLEX CL EROSION CONTROL BLANKET AS MANUFACTURED BY AMERICAN EXCELSIOR COMPANY (OR APPROVED EQUAL) ON ALL LOAM AND SEEDED SLOPES 3:1 OR STEEPER.

TYPICAL LOAM AND SEED

SCALE: N.T.S.

Drawing file: I:\Eastham.217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\03 CONTRACT 2 - CIVIL 2014 12 03.dwg Plot Date: Dec 04,2014-6:02pm

TOWN OF EASTHAM INCORPORATED 1651 PLANTED 1620

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Checked by	RJP
Approved by	PCM

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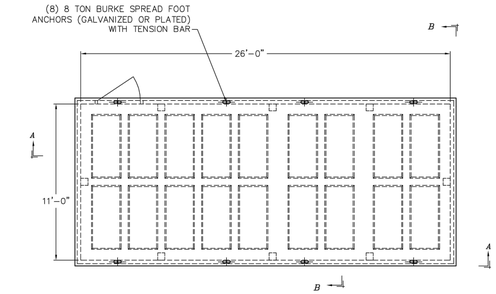
CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

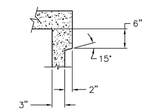
CONSTRUCTION DETAILS IV

FOR REVIEW

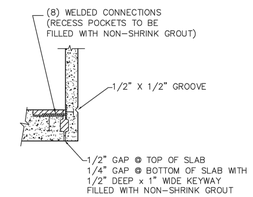
Sheet No.
CD-4



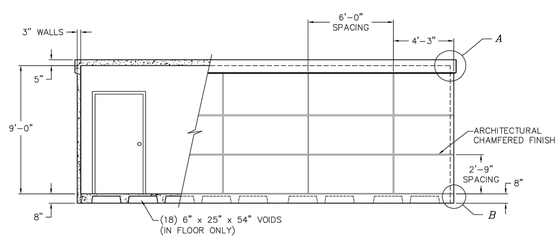
PLAN VIEW



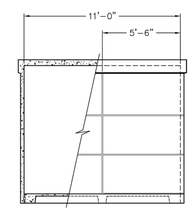
DETAIL 'A'
NTS



DETAIL 'B'
NTS



SECTION A-A



SECTION B-B

DESIGN NOTES:
CONCRETE MINIMUM STRENGTH – 5,000 PSI @ 28 DAYS
STEEL REINFORCEMENT – ASTM A-185 WELDED WIRE
ASTM A-615 GRADE 60 REBAR
COVER TO STEEL – 1" MINIMUM

DESIGN LOADS:
FLOOR – LIVE LOAD = 150 PSF
ROOF – LIVE LOAD = 60 PSF
SIDEWALLS – WIND LOAD = 45 PSF (130 MPH)

APPROX. WEIGHT:
COMPLETE BUILDING – 33 TONS
(WALLS AND ROOF – 23 TONS)
(FLOOR – 10 TONS)

REVISIONS	
NO	DATE
△	
△	
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PRECAST CONCRETE BUILDING
MODEL #PB11-26-9

Rotondo Precast Oldcastle
155 OLD FARMS ROAD
AVON, CONNECTICUT 06001
TELEPHONE (860) 673-3291

DATE: 12/1/00
SCALE: 3/16"=1'-0"
DRAWN BY: DH
SHEET: 2 of 2
DRAWING NUMBER: PB11-26-9

Drawing file: I:\Eastham.217\Phase 1 - Eastham Water System\217-1401.02 Contract 2 Well Sites\01 Drawings\A-1-Prefabricated Building.dwg Plot Date: Dec 04,2014-4:34pm

TOWN OF EASTHAM INCORPORATED 1651

Environmental Partners GROUP
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MARK	DATE	DESCRIPTION

Scale	AS SHOWN
Date	DECEMBER 2014
Job No.	217-1401.02
Designed by	RJP
Drawn by	RJP
Checked by	RJT
Approved by	PCM

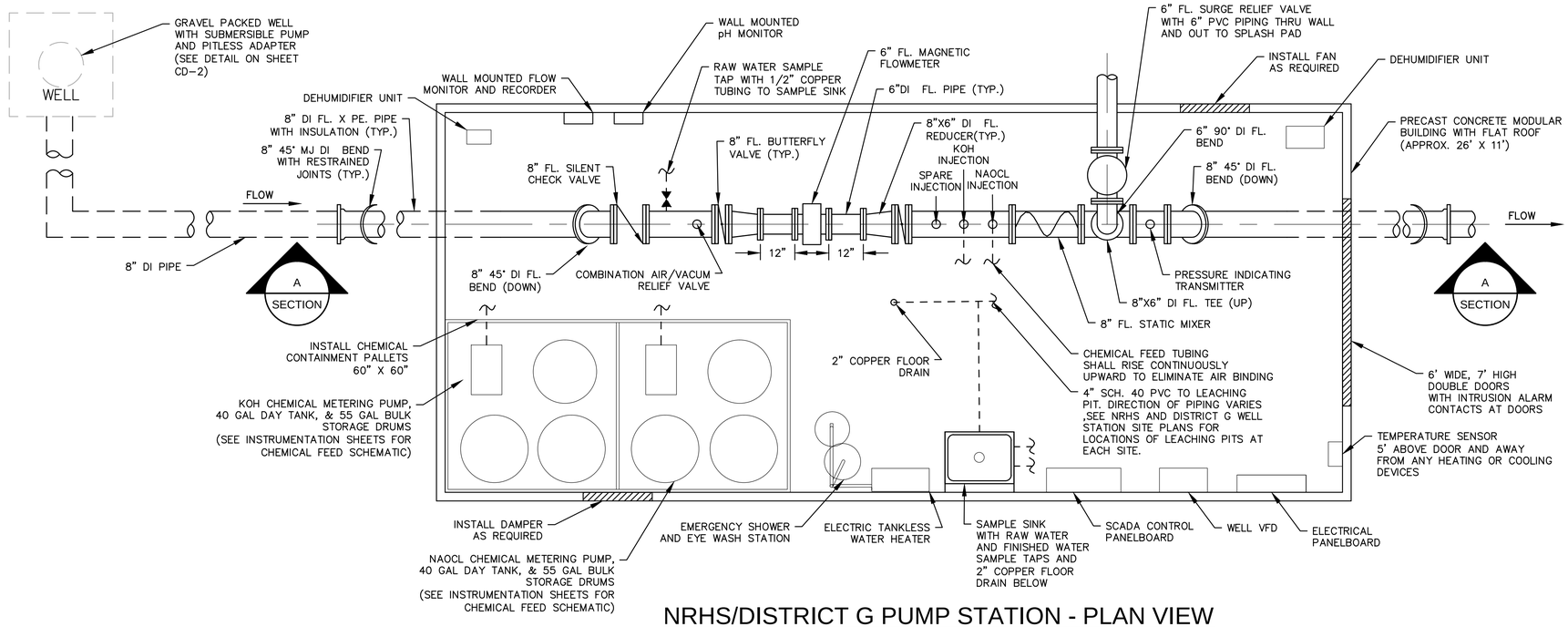
THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

GENERAL NOTES AND LEGEND

FOR REVIEW

Sheet No.
A-1

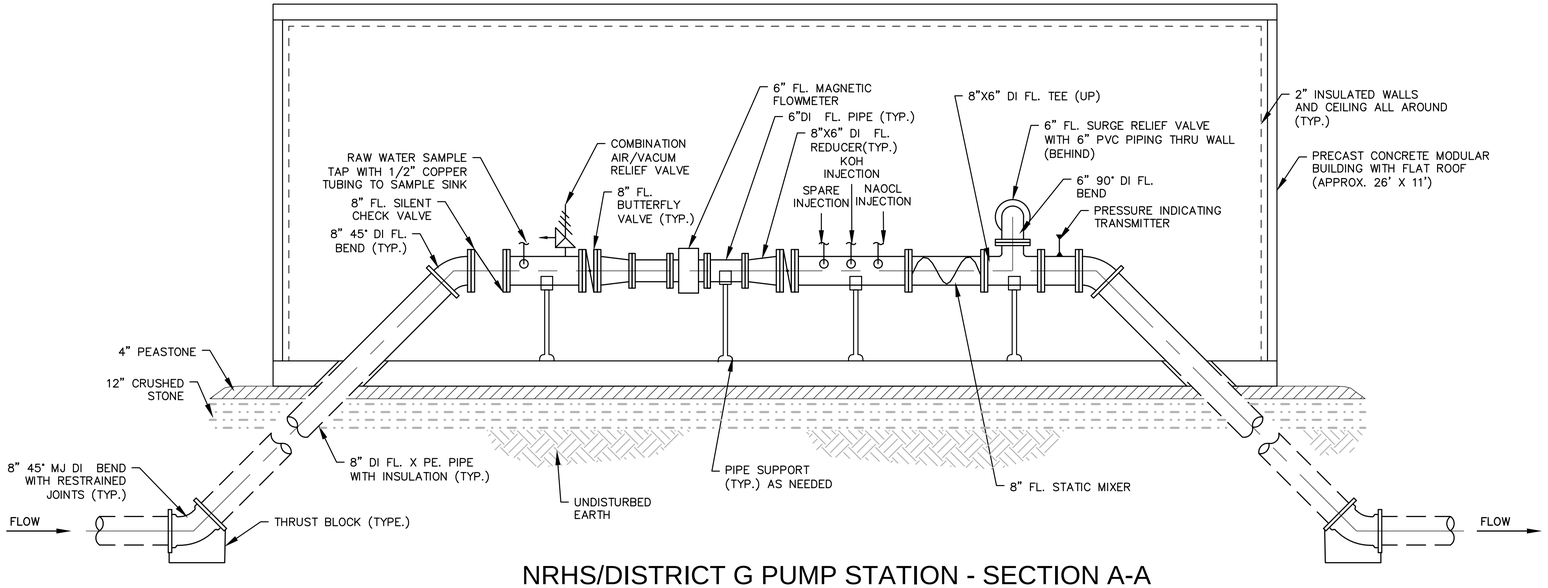


NRHS/DISTRICT G PUMP STATION - PLAN VIEW

1/2" = 1'-0"

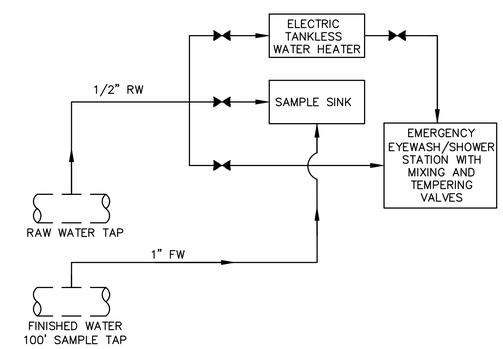
NOTES:

1. DRAWINGS ARE DIAGRAMMATIC AND DO NOT ATTEMPT TO SHOW EACH AND EVERY OFFSET OR ALL FITTINGS. ALL CHANGES AND ADJUSTMENTS TO THE DRAWING LAYOUTS AS REQUIRED FOR CONFORMITY OF THE WORK TO THE STRUCTURES AS CONSTRUCTED, TO EQUIPMENT, TO APPROVED SHOP DRAWINGS, OR TO FIT WORK OF OTHER TRADES SHALL BE AS APPROVED BY THE OWNER, AND SHALL BE INCLUDED AS PART OF THE WORK UNDER THIS SECTION OF THE SPECIFICATIONS AT NO ADDITIONAL EXPENSE TO THE OWNER.
2. FOUNDATION REQUIREMENTS AND SUBGRADE PREPARATION IN ACCORDANCE WITH PRE-FABRICATED BUILDING MANUFACTURER'S REQUIREMENTS, MASS. STATE BUILDING CODE, AND THE TOWN OF EASTHAM REQUIREMENTS.
3. FURNISH BALL VALVES WITH DOUBLE UNION ENDS TO PERMIT REMOVAL OF VALVE WITHOUT DISCONNECTING PIPELINE. BALL VALVES WHICH LEAK WHEN DOWNSTREAM UNION END IS DISCONNECTED ARE NOT ACCEPTABLE. USE VITON "O" RING SEALS WITH TEFLON SEATS. INSTALL BALL VALVES WITH FLOW ARROW POINTED IN DIRECTION OF FLOW TO PERMIT DISCONNECTION OF DOWNSTREAM PIPING. DURING INSTALLATION, ORIENT VALVE HANDLE FOR EASE OF OPERATION BY ROTATING VALVE BODY ABOUT ITS AXIS PRIOR TO TIGHTENING ENDS.
4. FURNISH PVC CHECK VALVES OF DOUBLE UNION TYPE WITH PVC BALL AND VITON "O" RING SEALS.
5. POLYETHYLENE TUBING SHALL BE RATED AT 150 PSI, 80° F.
6. FITTINGS USED IN CHEMICAL FEED SYSTEMS SHALL CONTAIN NO VITON PARTS OR COMPONENTS.
7. PIPE FITTINGS SHALL BE OF THE SAME MATERIAL AND SHALL BE OF THE PROPER CLASSIFICATION AND WALL THICKNESS FOR USE WITH SCHEDULE 80 PIPE OR POLYETHYLENE TUBING. PVC JOINTS IN PIPING SHALL BE SOLVENT WELD CONNECTIONS. TUBING CONNECTORS/ADAPTORS FOR POLYETHYLENE TUBING SHALL BE PVC. A SUFFICIENT NUMBER OF UNIONS AND TUBING CONNECTORS/ADAPTORS SHALL BE PROVIDED TO ALLOW FOR CONVENIENT REMOVAL OF PIPING.
8. CONNECTIONS TO PIPE OF OTHER MATERIALS, CONNECTIONS TO EQUIPMENT, AND CONNECTIONS AT SUCH OTHER LOCATIONS, AS INDICATED OR DIRECTED, SHALL BE MADE WITH FLANGES. ALL FLANGES SHALL BE 150 POUND PIPE FLANGES AND FLANGED CONNECTIONS SHALL BE MADE USING 1/16-INCH THICK NEOPRENE RUBBER GASKETS AND TYPE 316 STAINLESS STEEL BOLTS AND NUTS. FLANGES SHALL BE FACED AND DRILLED TO AMERICAN 125 STANDARD AND AS REQUIRED TO MATCH THE FACING AND DRILLING OF THE FLANGES TO WHICH THEY ARE TO BE CONNECTED.
9. PLUMBING FOR EMERGENCY SHOWER AND EYE WASH TO BE $\frac{1}{2}$" TYPE 'K' COPPER WITH SHUTOFF BALL VALVES. PROVIDE MIXING/TEMPERING VALVE FOR COLD AND HOT WATER SUPPLIES..
10. FLOW SWITCH FS-102 SHALL ACTIVATE SHOWER ALARM. SCADA SYSTEM SHALL BE CAPABLE OF DIALING UP TO 3 TELEPHONE NUMBERS BASED ON SHOWER ALARM AND INTRUSION ALARM.
11. COMMUNICATION SYSTEM SHALL BE PROPERLY GROUNDED AS PER SPECIFICATION SECTION 16196.
12. PROVIDE TANKLESS ELECTRIC HOT WATER HEATER (EEMAX SP2412, OR EQUAL) WITH $\frac{3}{8}$" CONNECTIONS, INLET AND OUTLET VALVES AND BACKFLOW PREVENTER ON INLET. CONNECT TO MIXING/TEMPERING VALVE BEFORE EMERGENCY SHOWER/EYEWASH UNIT.



NRHS/DISTRICT G PUMP STATION - SECTION A-A

1/2" = 1'-0"



SMALL PIPING SCHEMATIC

N.T.S.

Drawing file: C:\temp\AcPublish_9664\04 CONTRACT 2 - MECHANICAL_recover_recover.dwg Plot Date: Dec 04,2014-6:03pm

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MARK	DATE	DESCRIPTION

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Checked by	RJT
Approved by	PCM

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CONTRACT 2
WATER SUPPLY WELLS, CONTROL BUILDING, & PIPING
EASTHAM, MASSACHUSETTS

NRHS & DISTRICT G
WELL STATION LAYOUT

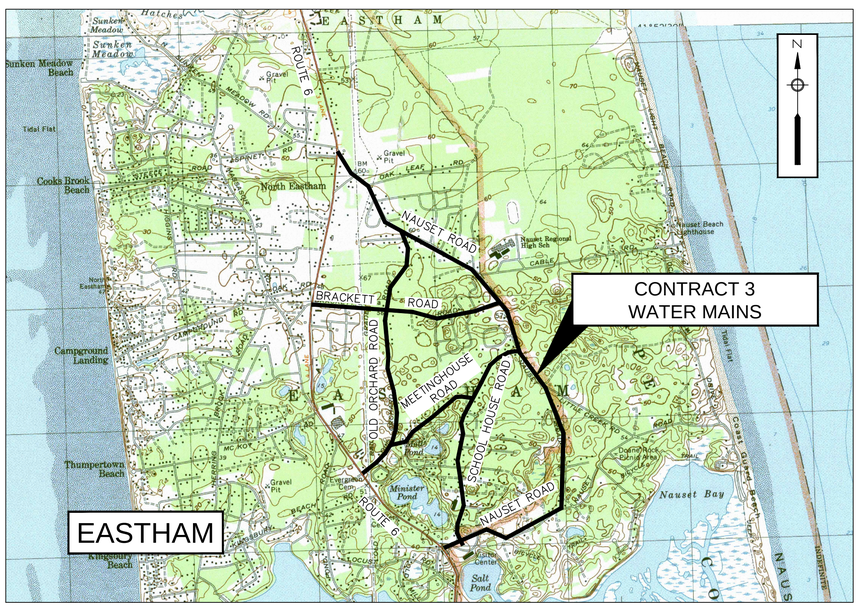
FOR REVIEW

Sheet No.

M-1

CONTRACT 3
WATER MAINS - LANDFILL AREA, TOWN OWNED
WATER SYSTEM CONSTRUCTION
EASTHAM, MASSACHUSETTS

OCTOBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1	GENERAL NOTES AND LEGEND	C-13	BRACKETT ROAD I
G-2	PAVEMENT SCHEDULE AND KEY PLAN	C-14	BRACKETT ROAD II
C-1	NAUSET ROAD I	C-15	BRACKET ROAD III
C-2	NAUSET ROAD II	C-16	SCHOOL HOUSE ROAD I
C-3	NAUSET ROAD III	C-17	SCHOOL HOUSE ROAD II
C-4	NAUSET ROAD IV	C-18	SCHOOL HOUSE ROAD III
C-5	NAUSET ROAD V	C-19	MEETINGHOUSE ROAD I
C-6	NAUSET ROAD VI	C-20	MEETINGHOUSE ROAD II
C-7	NAUSET ROAD VII	CD-1	CONSTRUCTION DETAILS I
C-8	NAUSET ROAD VIII	CD-2	CONSTRUCTION DETAILS II
C-9	OLD ORCHARD I		
C-10	OLD ORCHARD II		
C-11	OLD ORCHARD III		
C-12	OLD ORCHARD IV		

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

BOARD OF SELECTMEN

LINDA BURT
JOHN KNIGHT
MARTIN McDONALD
WALLACE ADAMS, II
ELIZABETH GAWRON

PUBLIC WORKS SUPERINTENDENT

NEIL ANDRES, P.E.

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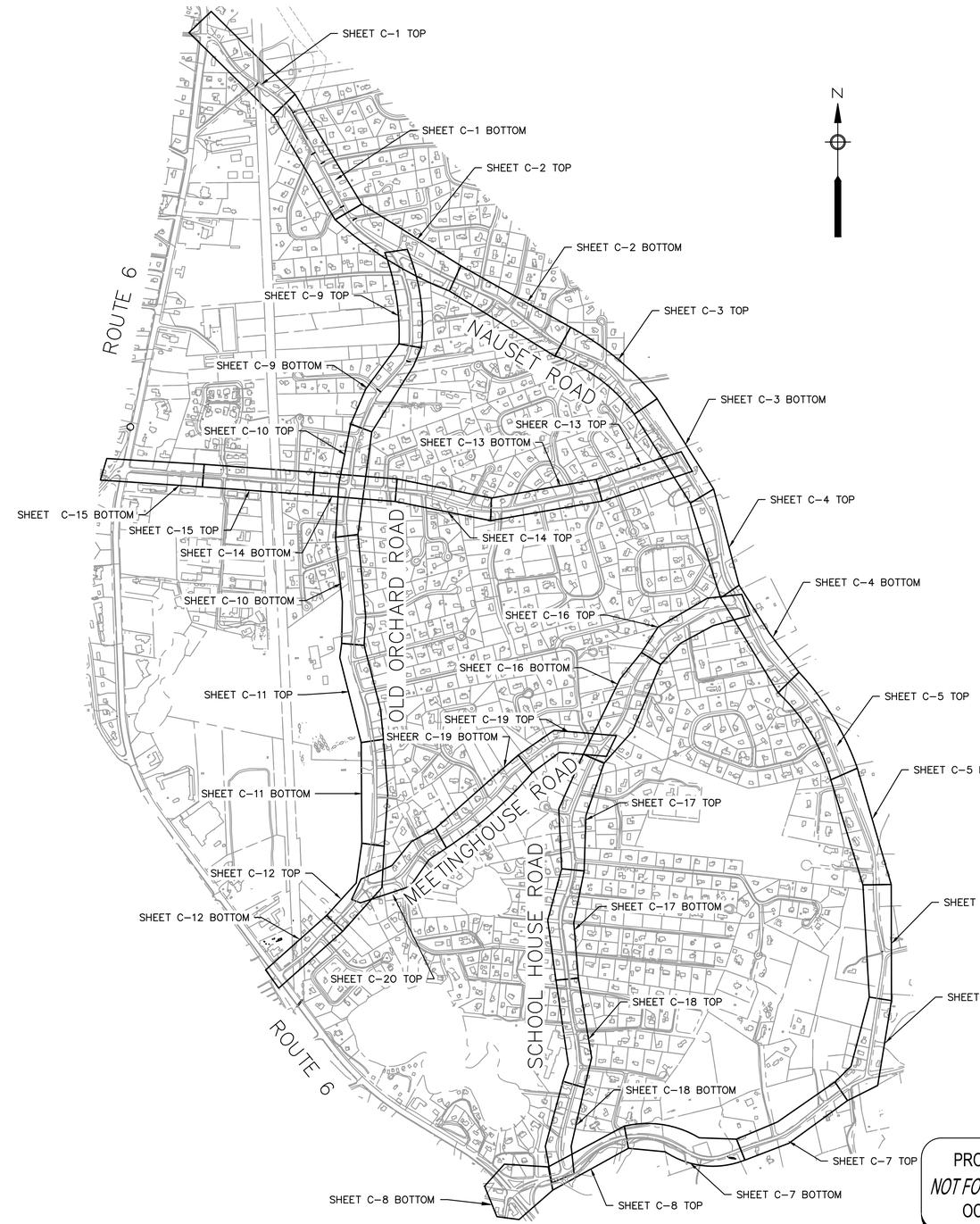
TEMPORARY AND PERMANENT PAVEMENT SCHEDULE			
SHEET	STREET	TEMPORARY PAVEMENT	PERMANENT PAVEMENT
C-1 – C-8	NAUSET ROAD		
C-9 – C-12	OLD ORCHARD ROAD		
C-13 – C-15	BRACKETT ROAD		
C-16 – C-18	SCHOOL HOUSE ROAD		
C-19 – C-20	MEETINGHOUSE ROAD		



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TOWN OF EASTHAM INCORPORATED 1651

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MARK	DATE	DESCRIPTION

Scale	1"=40'
Date	OCTOBER 2014
Job No.	217.1401.03
Designed by	GCS
Drawn by	TRG
Checked by	RJT
Approved by	PCM

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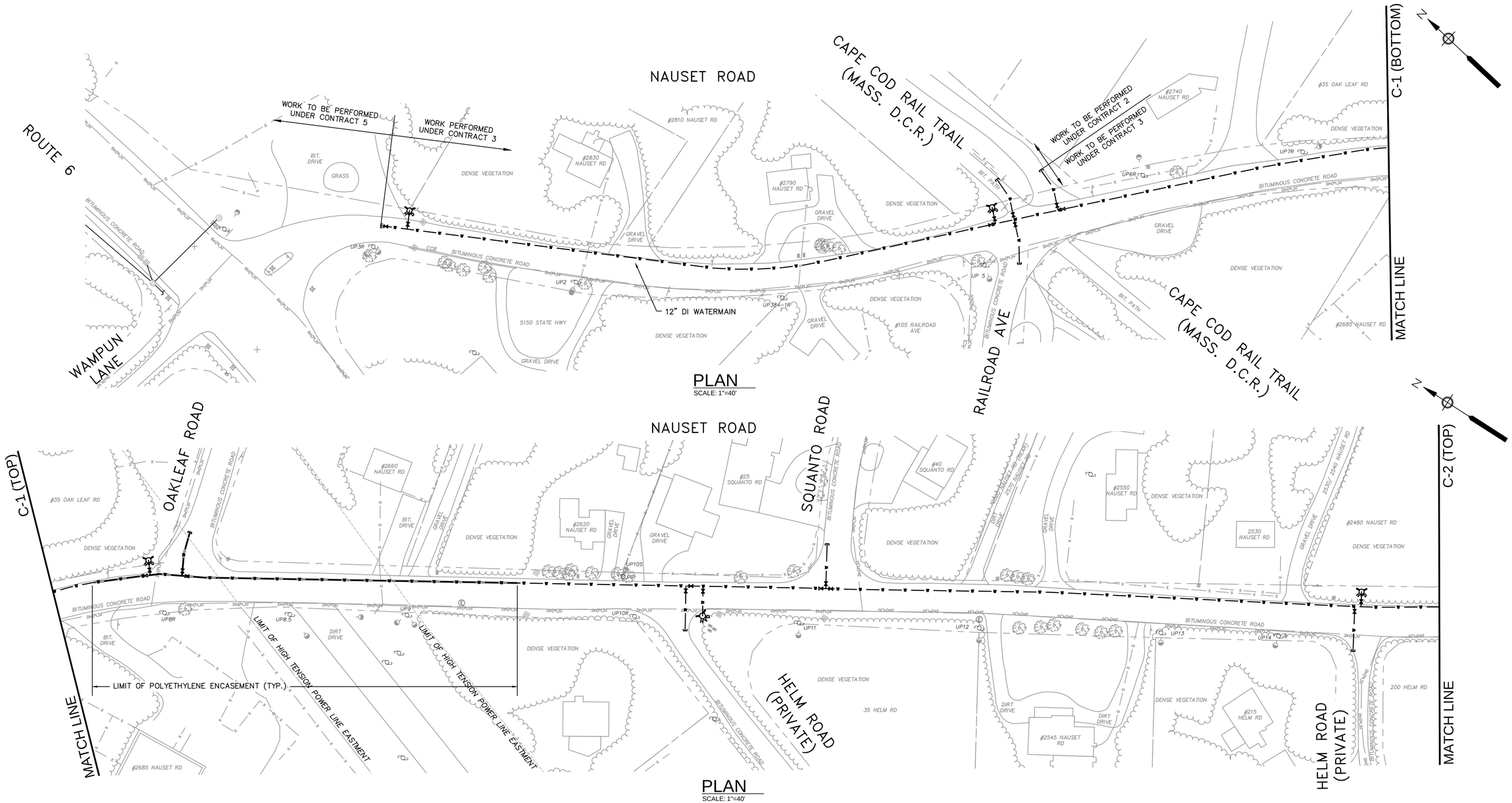
CONTRACT 3
WATER MAINS
EASTHAM, MASSACHUSETTS

PAVEMENT SCHEDULE AND KEY PLAN

FOR REVIEW

Sheet No.
G-2

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217.1401.03 Contract 3 Phase I WM\02 Design\01 CAD\03 CONTRACT WATER DESIGN.dwg Plot Date: Oct 14,2014-11:06am



PLAN
SCALE: 1"=40'

PLAN
SCALE: 1"=40'

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OCTOBER 2014

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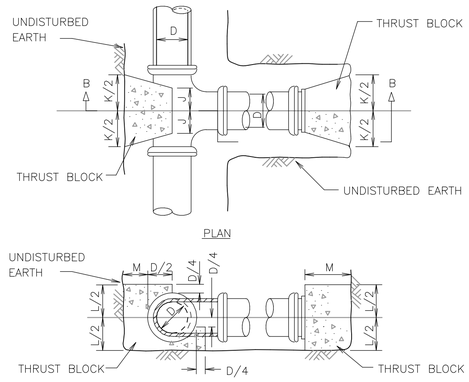
CONTRACT 3
WATER MAINS
EASTHAM, MASSACHUSETTS

NAUSET ROAD I

FOR REVIEW

Sheet No.
C-1

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217.1401.03 Contract 3 Phase I WM\02 Design\01 CAD\03 CONTRACT WATER DESIGN.dwg Plot Date: Oct 23,2014-10:46am



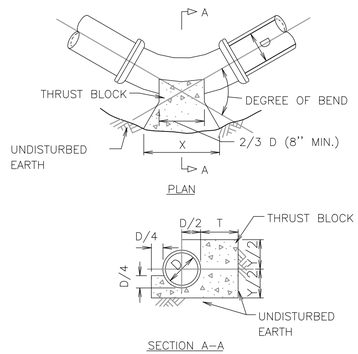
NOTES :

1. ALL CONCRETE SHALL BE 3000 PSI @ 28 DAYS (CLASS 'A' CONCRETE).
2. DIMENSIONS SHOWN ARE MINIMUM AND ARE BASED UPON SOIL PRESSURE OF 1500 PSF AND TOTAL PRESSURE OF 250 PSI. TOTAL PRESSURE IS WORKING PRESSURE PLUS SURGE PRESSURE.
3. THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED EARTH.

TABLE OF DIMENSIONS							
D (in)	4	6	8	10	12	14	16
J (in)	6	6	7	9	10	12	22
K (in)	16	16	20	26	32	36	64
L (in)	16	16	21	24	29	34	61
M (in)	11	11	14	16	19	22	39

CONCRETE THRUST BLOCK DETAIL AT TEE / PLUG

SCALE: N.T.S.



NOTES:

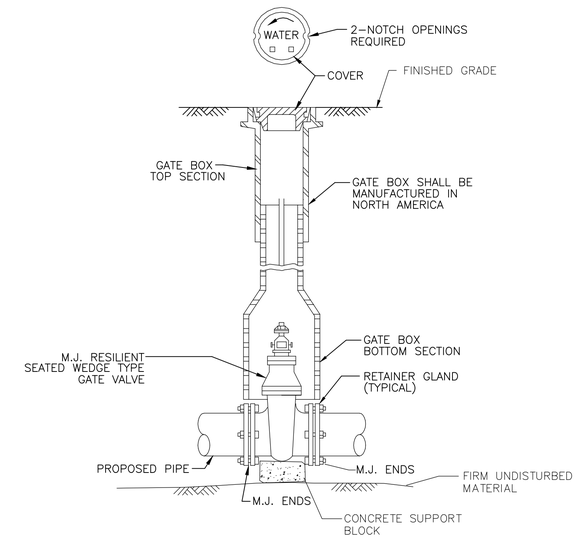
1. ALL CONCRETE SHALL BE 3000 P.S.I. @ 28 DAYS (CLASS "A" CONCRETE)
2. DIMENSIONS SHOWN ARE MINIMUM AND ARE BASED UPON SOIL PRESSURE OF 1500 P.S.F. AND TOTAL PRESSURE OF 250 P.S.I. TOTAL PRESSURE IS WORKING PRESSURE PLUS SURGE PRESSURE.
3. THRUST BLOCKS SHALL BEAR AGAINST UNDISTURBED EARTH.

TABLE OF DIMENSIONS

DIMENSION	90° BEND							45° BEND							22 1/2° BEND							11 1/4° BEND						
D (in.)	4	6	8	10	12	14	16	4	6	8	10	12	14	16	4	6	8	10	12	14	16	4	6	8	10	12	14	16
X (in.)	35	35	50	56	72	80	142	24	24	35	45	51	60	107	28	28	30	32	37	42	74	12	12	19	21	27	33	59
Y (in.)	20	20	24	32	35	40	71	16	16	19	21	27	33	59	13	13	13	16	19	22	39	8	8	9	12	13	16	28
T (in.)	11	11	14	16	19	22	39	11	11	14	16	19	22	39	11	11	13	16	19	22	39	11	11	13	16	19	22	39

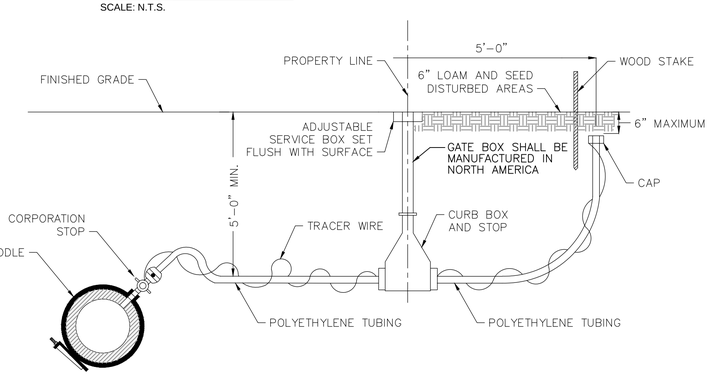
CONCRETE THRUST BLOCK DETAIL AT BEND

SCALE: N.T.S.



GATE VALVE AND VALVE BOX DETAIL

SCALE: N.T.S.

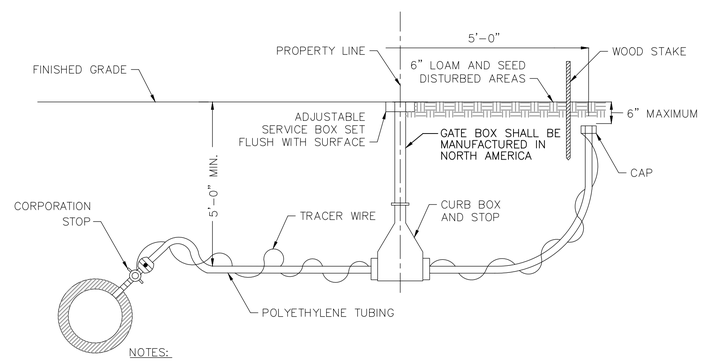


NOTES:

1. ALL JOINTS SHALL BE COMPRESSION TYPE.
2. POLYETHYLENE TUBING SHALL BE BACKFILLED WITH SAND BY HAND TO 1–FOOT ABOVE TUBING.
3. CORPORATION STOPS SHALL HAVE A SADDLE.
4. WATER SERVICES SHALL BE INSULATED IN AREAS WHERE CONNECTION TO EXISTING WATER SERVICE IS LESS THAN 4 FEET.
5. ALL WATER SERVICE PLUMBING MATERIALS SHALL BE "LEAD FREE" IN ACCORDANCE WITH SECTION 1417 OF THE SAFE DRINKING WATER ACT AND SECTION 9 OF NSF STANDARD 61.

TYPICAL SERVICE CONNECTION HDPE WATER MAINS

SCALE: N.T.S.

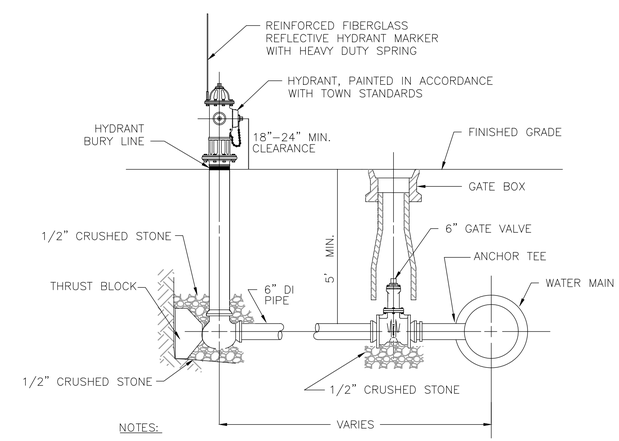


NOTES:

1. ALL JOINTS SHALL BE COMPRESSION TYPE.
2. POLYETHYLENE TUBING SHALL BE BACKFILLED WITH SAND BY HAND TO 1–FOOT ABOVE TUBING.
3. CORPORATION STOPS LARGER THAN ONE INCH SHALL HAVE A SADDLE.
4. WATER SERVICES SHALL BE INSULATED IN AREAS WHERE CONNECTION TO EXISTING WATER SERVICE IS LESS THAN 4 FEET.
5. ALL WATER SERVICE PLUMBING MATERIALS SHALL BE "LEAD FREE" IN ACCORDANCE WITH SECTION 1417 OF THE SAFE DRINKING WATER ACT AND SECTION 9 OF NSF STANDARD 61.

TYPICAL SERVICE CONNECTION DUCTILE IRON WATER MAINS

SCALE: N.T.S.



NOTES:

1. ALL HYDRANT, VALVE AND TEE JOINTS TO BE RESTRAINED MECHANICAL JOINTS.
2. DEPTH OF HYDRANT BURY SHALL SUIT INSTALLED DEPTH OF COVER OVER WATER MAIN. INSTALL RISERS AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

FIRE HYDRANT ASSEMBLY DETAIL

SCALE: N.T.S.

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MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	OCTOBER 2014
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Designed by	GCS
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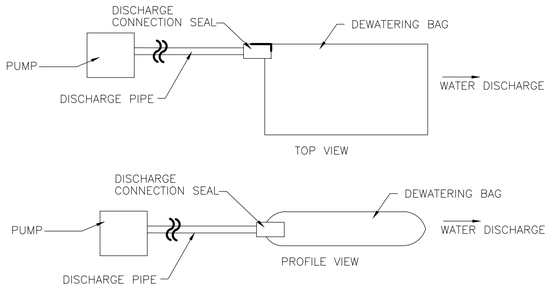
CONTRACT 3
WATER MAINS
EASTHAM, MASSACHUSETTS

CONSTRUCTION DETAILS I

FOR REVIEW

Sheet No.
CD-1

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.03 Contract 3 Phase I WM\02 Design\01 CAD\03 CONTRACT WATER DESIGN.dwg Plot Date: Oct 14,2014-2:13pm

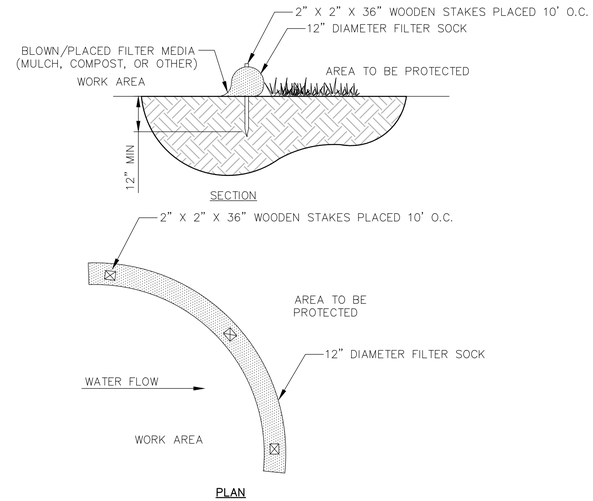


NOTES:

1. DEWATERING BAG SIZE AND QUANTITY SHALL BE AS NEEDED TO ADEQUATELY FILTER ALL PUMP EFFLUENT FROM DEWATERING ACTIVITIES. CONTRACTOR SHALL PROVIDE A REDUNDANT BAG ON SITE AT ALL TIMES.
2. EACH BAG SHALL HANDLE A 2", 3", OR 4" DISCHARGE HOSE.
3. DISCHARGE HOSES CAN BE PLACED ALONG ANY EDGE BY MAKING A SMALL INCISION INTO THE FABRIC, INSERTING THE HOSE, AND THEN CLAMPING THE FABRIC TO THE HOSE VIA WIRE, TIES, CLAMP, ROPE OR SIMILAR TO CREATE A GOOD SEAL.
4. CONTRACTOR SHALL AVOID DISCHARGING MULTIPLE PIPES INTO ONE BAG.

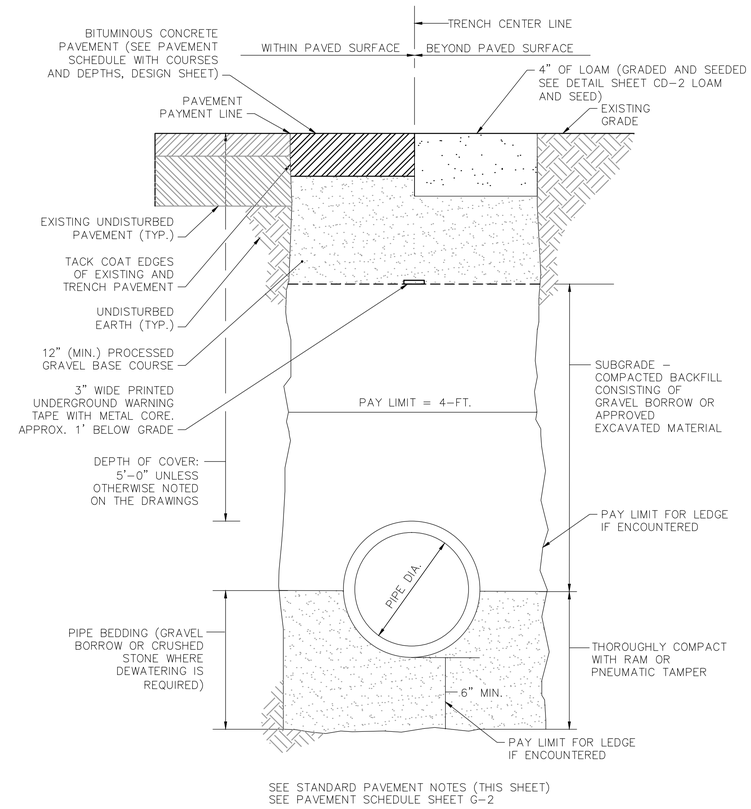
DEWATERING BAGS

SCALE: N.T.S.



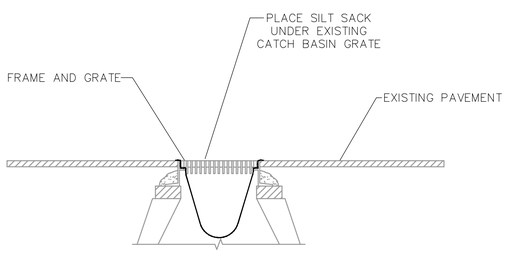
12" DIAMETER FILTER SOCK

SCALE: N.T.S.



TRENCH DETAIL 1 - TOWN RIGHT-OF-WAY AND PRIVATE WAYS

SCALE: N.T.S.

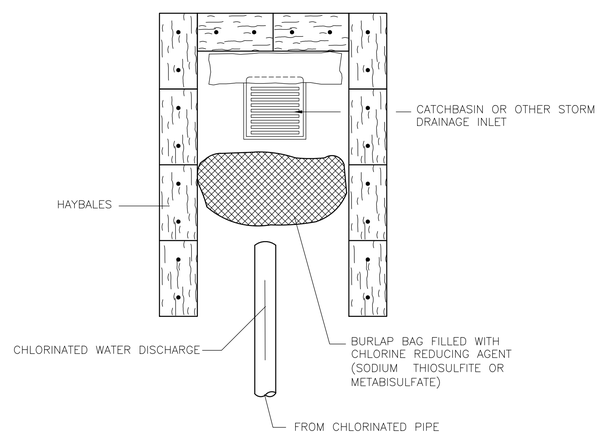


NOTES:

1. SILT SACKS SHALL BE INSPECTED WEEKLY AND ACCUMULATED SILT REMOVED TO ALLOW CATCH BASIN TO FUNCTION PROPERLY.
2. SILT SACK AS MANUFACTURED BY ACF ENVIRONMENTAL (800-448-3636) OR APPROVED EQUAL.

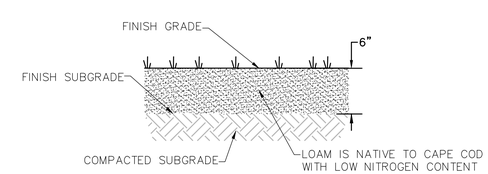
SEDIMENTATION CONTROL AT CATCH BASINS SILT SACKS

SCALE: N.T.S.



DECHLORINATION DETAIL

SCALE: N.T.S.



NOTE:

1. SEED MIX TO BE NEW ENGLAND CONSERVATION SEED MIX, FREE OF FERTILIZERS.
2. INSTALL CURLEX CL EROSION CONTROL BLANKET AS MANUFACTURED BY AMERICAN EXCELSIOR COMPANY (OR APPROVED EQUAL) ON ALL LOAM AND SEEDED SLOPES 3:1 OR STEEPER.

LOAM AND SEED (DISTURBED AREAS)

SCALE: N.T.S.

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OCTOBER 2014

TOWN OF EASTHAM — INCORPORATED 1651

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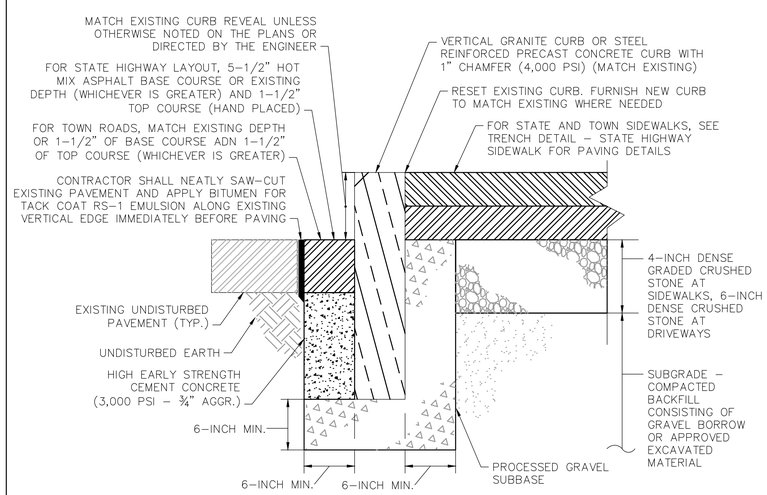
CONTRACT 3
WATER MAINS
EASTHAM, MASSACHUSETTS

CONSTRUCTION DETAILS II

FOR REVIEW

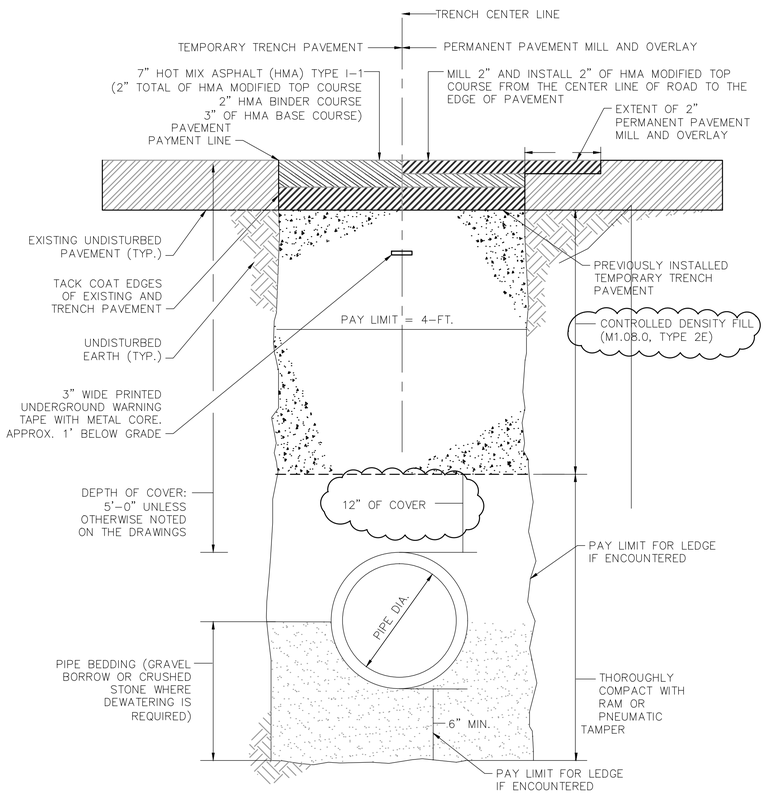
Sheet No.
CD-2

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.03 Contract 3 Phase I WM\02 Design\01 CAD\03 CONTRACT WATER DESIGN.dwg Plot Date: Oct 23,2014-11:34am



SETTING VERTICAL GRANITE CURB DETAIL

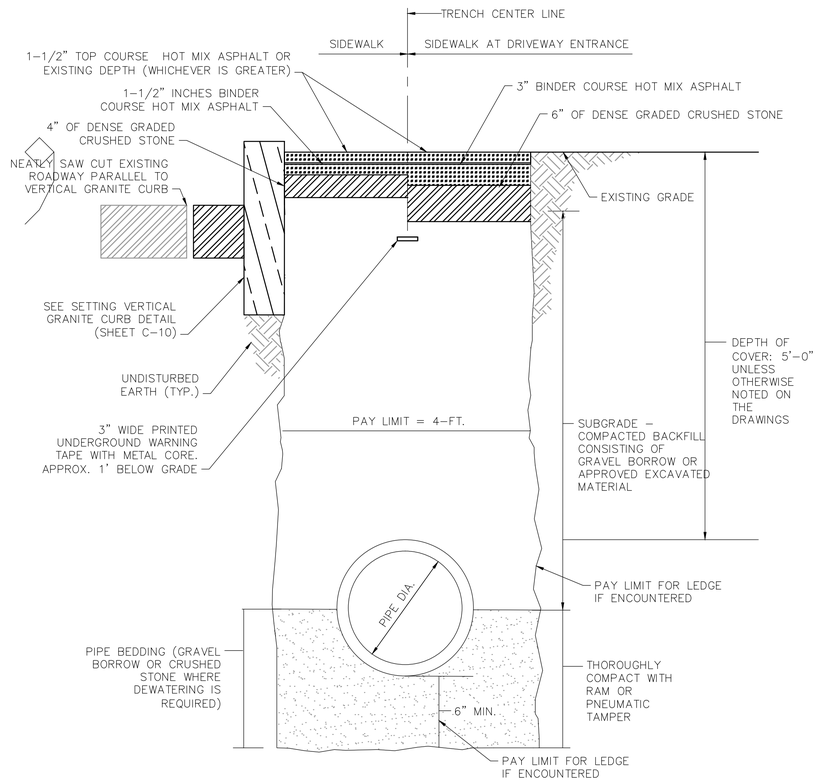
SCALE: NTS



SEE STANDARD PAVEMENT NOTES (THIS SHEET)
SEE PAVEMENT SCHEDULE SHEET G-2

TRENCH DETAIL 2 - STATE HIGHWAY LAYOUT (WITHIN TRAVEL LANE)

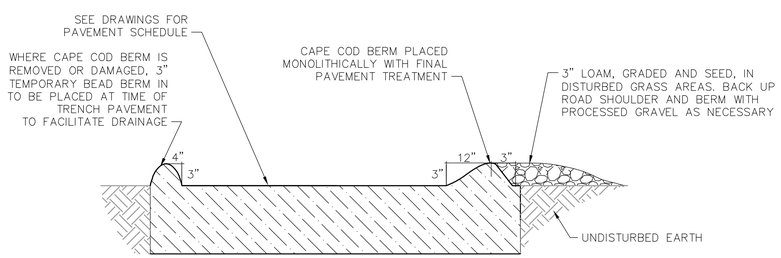
SCALE: N.T.S.



SEE STANDARD PAVEMENT NOTES (THIS SHEET)
SEE PAVEMENT SCHEDULE SHEET G-2

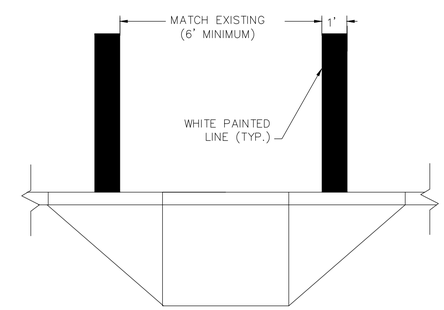
TRENCH DETAIL 3 - STATE HIGHWAY LAYOUT (WITHIN SIDEWALK)

SCALE: N.T.S.



BITUMINOUS CONCRETE CAPE COD BERM AND TEMPORARY BEAD BERM

SCALE: NTS



CROSSWALK DETAIL

SCALE: NTS

STANDARD PAVEMENT CONSTRUCTION NOTES:

1. PAVEMENT INSTALLED BEYOND PAYMENT LINE MUST BE PRE-APPROVED BY THE ENGINEER.
2. THE FINISHED SURFACE OF THE MIXTURE, AFTER COMPACTION, SHALL BE TRUE TO THE ESTABLISHED LINE AND GRADE OF THE EXISTING PAVEMENT.
3. THE BINDER COURSE SHALL BE PLACED BY NORMAL CONSTRUCTION PRACTICES. THE TOP COURSE SHALL BE MACHINE LAID UTILIZING A SIDEWALK BOX SPREADER OR EQUAL; NO HAND WORK IS ALLOWED.

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OCTOBER 2014

TOWN OF EASTHAM INCORPORATED 1651

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MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	OCTOBER 2014
Job No.	217.1401.03
Designed by	GCS
Drawn by	CSC
Checked by	RJT
Approved by	PCM

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CONTRACT 3
WATER MAINS
EASTHAM, MASSACHUSETTS

CONSTRUCTION DETAILS III

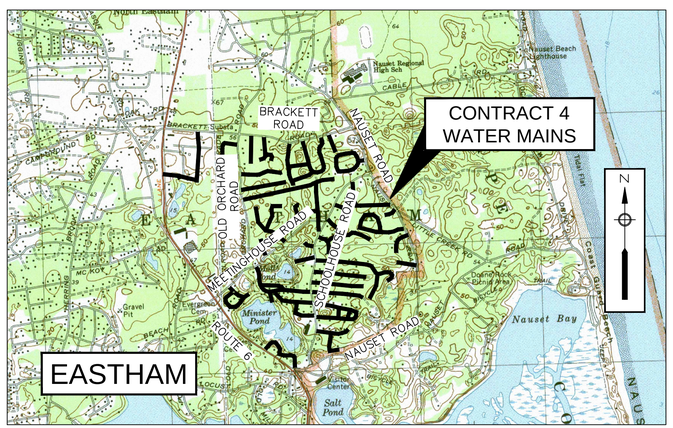
FOR REVIEW

Sheet No.
CD-3

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.03 Contract 3 Phase I WM\02 Design\01 CAD\03 CONTRACT WATER DESIGN.dwg Plot Date: Oct 14,2014-2:10pm

CONTRACT 4
WATER MAINS - LANDFILL AREA, PRIVATELY OWNED
EASTHAM, MASSACHUSETTS

NOVEMBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1 GENERAL NOTES AND LEGEND

G-2 ROAD RESTORATION SCHEDULE AND KEY PLAN

C-1 SEAWARD WAY

C-2 DEXTER STREET AND CHATHAM WAY

C-3 SEASIDE DRIVE, CHESTER AVENUE, ACORN ROAD, AND BALLWIC ROAD

C-4 THORNE ROAD

C-5 THOREAU DRIVE

C-6 ELDER ROAD, VESPER LANE, AND EMERSON ROAD

C-7 FOX RUN ROAD, FOX RUN LANE, AND HOYER LANE

C-8 HOLMES ROAD

C-9 SEASHELL LANE AND MAIN STREET

C-10 ORCHARD DRIVE AND APPLE WAY

C-11 LUPIN WAY AND KETTLE HOLE ROAD

C-12 GLACIER HILLS ROAD

C-13 GLACIER HILLS ROAD, NORTHWOOD ROAD, AND DEEPWOOD DRIVE

C-14 ELDIA WAY AND WIDAH LANE

C-15 SPINNAKER WAY, SELAH CIRCLE, AND DUCK MARSH LANE

C-16 CHESTER AVENUE AND FORREST AVENUE

C-17 CANDLEWOOD DRIVE

C-18 CANDLEWOOD DRIVE AND TURTLE POND ROAD

C-19 CESTARO WAY

C-20 FAIRVIEW AVENUE AND DOANE STREET

C-21 DEERFIELD LANE AND DOANE STREET

C-22 ALSTON AVENUE, MOLLS POND ROAD, AND BAYVIEW AVENUE

C-23 ALSTON AVENUE AND MOLLS POND ROAD

C-24 KNOWLES STREET, BAYVIEW AVENUE, AND CHIPMAN STREET

C-25 SURREY DRIVE, SECOND AVENUE, OAK STREET, AND CHOKEBERRY DRIVE

C-26 REDBERRY LANE AND WILD GOOSE LANE

C-27 STRARLIGHT LANE AND SHARON CIRCLE

C-28 PRESERVATION WAY AND LAURA LANE

CD-1 CONSTRUCTION DETAIL I

CD-2 CONTRUCTION DETAIL II

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

BOARD OF SELECTMEN

LINDA BURT
JOHN KNIGHT
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NEIL ANDRES, P.E.

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TEMPORARY AND PERMANENT PAVEMENT SCHEDULE

SHEET	STREET	EXISTING ROAD SURFACE MATERIAL	PROPOSED ROAD SURFACE RESTORATION MATERIAL
C-1	SEAWARD WAY	BITUMINOUS CONCRETE	
C-2	DEXTER STREET (PRIVATE)	DIRT	
C-2	CHATHAM WAY (PRIVATE)	DIRT	
C-3	SEASIDE DRIVE	BITUMINOUS CONCRETE	
C-3	BALLWIC ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-3	CHESTER AVENUE (PRIVATE)	BITUMINOUS CONCRETE	
C-3	ACORN ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-4	THORNE ROAD	BITUMINOUS CONCRETE	
C-5	THOREAU DRIVE	BITUMINOUS CONCRETE	
C-5, 6	ELDER ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-5, 6	VESPER LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-6	EMERSON ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-7	FOX RUN ROAD (PRIVATE)	DIRT	
C-7	FOX RUN LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-7	HOYE LANE (PRIVATE)	DIRT	
C-8	HOLMES ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-9	SEASHELL LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-9	MAIN STREET	BITUMINOUS CONCRETE	
C-10	ORCHARD DRIVE (PRIVATE)	BITUMINOUS CONCRETE	
C-10	APPLE WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-11	LUPIN WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-11	KETTLE HOLE ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-12, 13	GLACIER HILLS ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-13	DEEPWOOD DRIVE (PRIVATE)	BITUMINOUS CONCRETE	
C-13	NORTHWOOD ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-14	ELDIA WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-14	WHIDAH LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-15	SPINNAKER WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-15	SELAH CIRCLE (PRIVATE)	BITUMINOUS CONCRETE	
C-15	DUCK MARSH LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-16	CHESTER AVENUE (PRIVATE)	BITUMINOUS CONCRETE	
C-16	FORREST AVENUE (PRIVATE)	DIRT	
C-17, 18	CANDLEWOOD DRIVE	BITUMINOUS CONCRETE	
C-17, 18	TURTLE POND ROAD (PRIVATE)	BITUMINOUS CONCRETE	
C-19	CESTARO WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-20	FAIRVIEW AVENUE (PRIVATE)	DIRT	
C-20, 21	DOANE STREET (PRIVATE)	DIRT	
C-21	DEERFIELD LANE (PRIVATE)	DIRT	
C-22, 24	BAYVIEW AVENUE (PRIVATE)	DIRT	
C-22, 23	ALSTON AVENUE	BITUMINOUS CONCRETE	
C-22, 23	MOLLS POND ROAD (PRIVATE)	BITUMINOUS CONCRETE/ DIRT	
C-22, 23	KNOWLES STREET (PRIVATE)	DIRT	
C-24	CHIPMAN STREET (PRIVATE)	DIRT	
C-25	SURREY DRIVE (PRIVATE)	DIRT	
C-25	SECOND AVENUE (PRIVATE)	DIRT	
C-25	OAK STREET (PRIVATE)	DIRT	
C-25	CHOKEBERRY DRIVE (PRIVATE)	DIRT	
C-26	REDBERRY LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-26	WILD GOOSE LANE (PRIVATE)	DIRT	
C-27	STARLIGHT LANE (PRIVATE)	BITUMINOUS CONCRETE	
C-27	SHARON CIRCLE (PRIVATE)	BITUMINOUS CONCRETE/ DIRT	
C-28	PRESERVATION WAY (PRIVATE)	BITUMINOUS CONCRETE	
C-28	LAURA LANE (PRIVATE)	DIRT	

KEY PLAN

SCALE: N.T.S.

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TOWN OF EASTHAM · NAUSET TRIBE · INCORPORATED 1651

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MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	NOVEMBER 2014
Job No.	214-1401.04
Designed by	TRG
Drawn by	TRG
Checked by	RJT
Approved by	PCM

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CONTRACT 4
WATER MAIN CONSTRUCTION
EASTHAM, MASSACHUSETTS

ROAD RESTORATION SCHEDULE
AND KEY PLAN

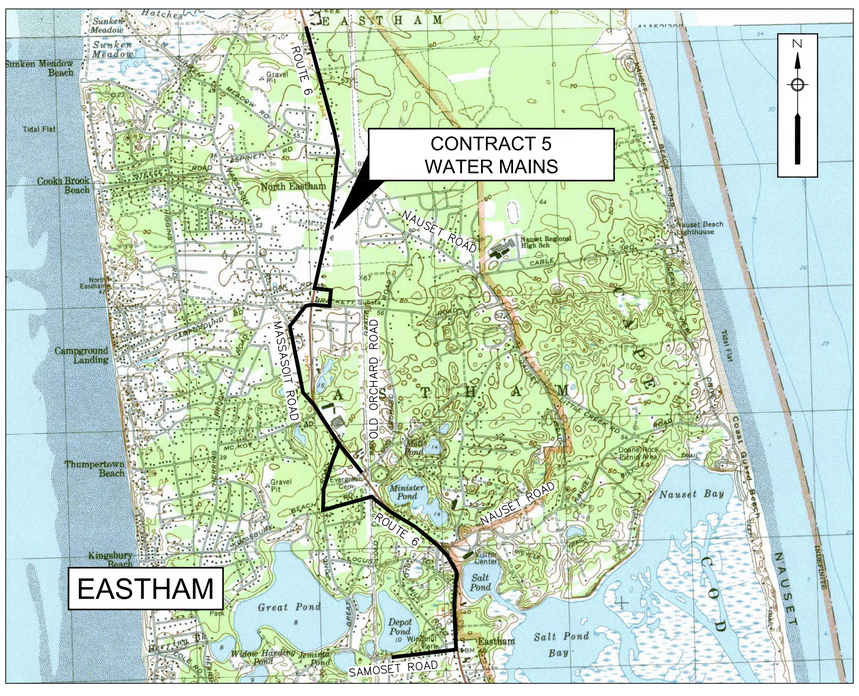
NOT FOR CONSTRUCTION

Sheet No.
G-2

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.04 Contract 4 Phase I WM\01 CAD\04a CONTRACT WATER DESIGN -trg.dwg Plot Date: Nov 04,2014-8:02pm

CONTRACT 5
WATER MAINS - ROUTE 6 NORTH
WATER SYSTEM CONSTRUCTION
EASTHAM, MASSACHUSETTS

NOVEMBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1	GENERAL NOTES AND LEGEND
G-2	PAVEMENT SCHEDULE AND SHEET LOCUS
C-1	ROUTE 6 I
C-2	ROUTE 6 II
C-3	ROUTE 6 III
C-4	ROUTE 6 IV AND BRACKETT ROAD
C-5	OLD COUNTY ROAD AND MASSASOIT ROAD
C-6	MASSASOIT ROAD AND ROUTE 6 V
C-7	GREAT POND ROAD AND KINGSBURY BEACH ROAD
C-8	KINGSBURY BEACH ROAD AND ROUTE 6 VI
C-9	ROUTE 6 VII
C-10	ROUTE 6 VIII
C-11	ROUTE 6 IX AND SAMOSET ROAD
C-12	ROUTE 6 X AND EXTENDED SERVICE I
C-13	EXTENDED SERVICE II AND III
CD-1	CONSTRUCTION DETAILS I
CD-2	CONSTRUCTION DETAILS II
CD-3	CONSTRUCTION DETAILS III
CD-4	CONSTRUCTION DETAILS IV
CD-5	CONSTRUCTION DETAILS V

TOWN ADMINISTRATOR

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NAUSET 1620
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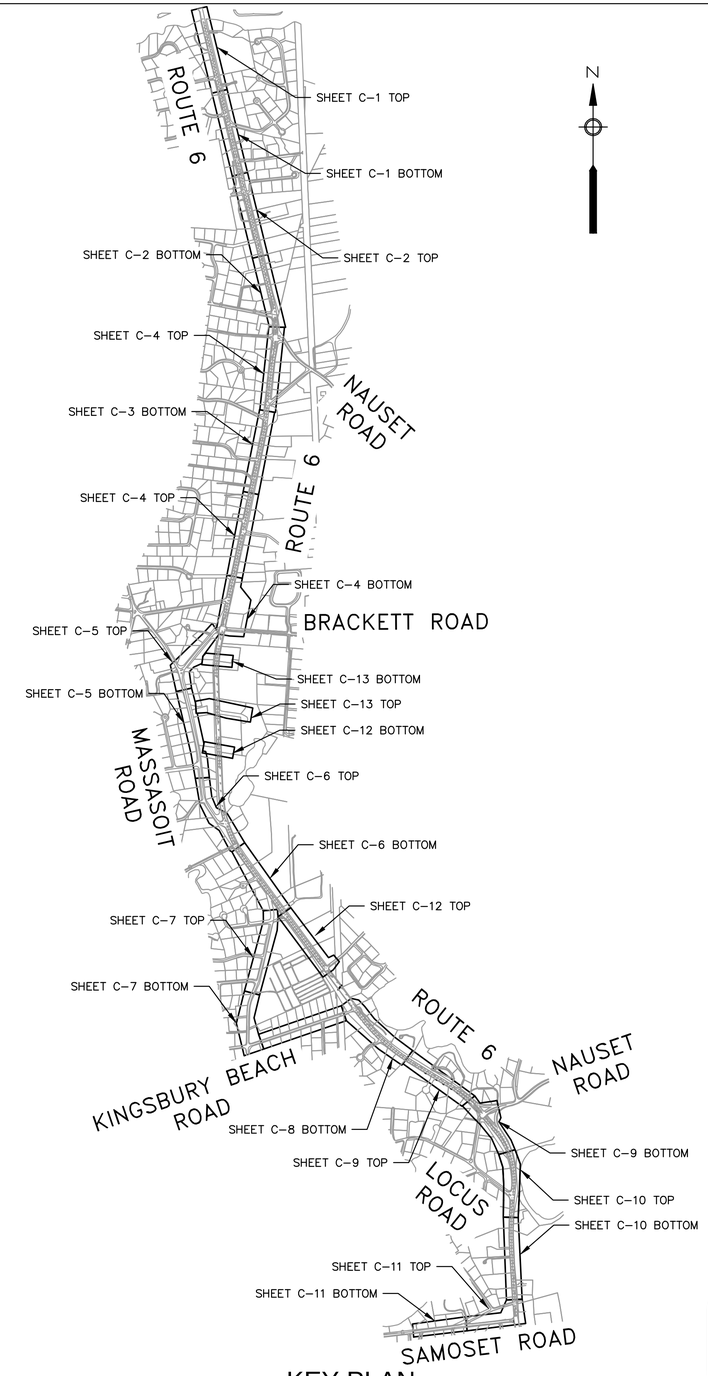
TEMPORARY AND PERMANENT PAVEMENT SCHEDULE

SHEET	STREET	TEMPORARY PAVEMENT	PERMANENT PAVEMENT
C–1 TOP	ROUTE 6 I	3–INCH TEMPORARY TRENCH PAVEMENT	
C–1 BOTTOM	ROUTE 6 II	3–INCH TEMPORARY TRENCH PAVEMENT	
C–2 TOP	ROUTE 6 III	3–INCH TEMPORARY TRENCH PAVEMENT	
C–2 BOTTOM	ROUTE 6 IV	3–INCH TEMPORARY TRENCH PAVEMENT	
C–3 TOP	ROUTE 6 V	3–INCH TEMPORARY TRENCH PAVEMENT	
C–3 BOTTOM	ROUTE 6 VI	3–INCH TEMPORARY TRENCH PAVEMENT	
C–4 TOP	ROUTE 6 VII	3–INCH TEMPORARY TRENCH PAVEMENT	
C–4 BOTTOM	ROUTE 6 VIII	3–INCH TEMPORARY TRENCH PAVEMENT	
C–5 TOP	OLD COUNTY ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–5 BOTTOM	MASSASOIT ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–6 TOP	MASSASOIT ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–6 BOTTOM	ROUTE 6 IX	3–INCH TEMPORARY TRENCH PAVEMENT	
C–7 TOP	GREAT POND ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–7 BOTTOM	KINGSBURY BEACH ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–8 TOP	KINGSBURY BEACH ROAD	NO PAVEMENT, ONLY PROCESSED GRAVEL	
C–8 BOTTOM	ROUTE 6 X	3–INCH TEMPORARY TRENCH PAVEMENT	
C–9 TOP	ROUTE 6 XI	3–INCH TEMPORARY TRENCH PAVEMENT	
C–9 BOTTOM	OLD STATE ROAD	OLD STATE ROAD	
C–10 TOP	LOCUS ROAD	LOCUS ROAD	
C–10 BOTTOM	ROUTE 6 XII	ROUTE 6 XII	
C–11 TOP	ROUTE 6 XIII	ROUTE 6 XIII	
C–11 BOTTOM	SAMOSET ROAD	SAMOSET ROAD	
C–12 TOP	ROUTE 6 X	ROUTE 6 X	
C–12 BOTTOM	EXTENDED SERVICE I	EXTENDED SERVICE I	
C–13 TOP	EXTENDED SERVICE II	EXTENDED SERVICE II	
C–13 BOTTOM	EXTENDED SERVICE III	EXTENDED SERVICE III	



KEY PLAN
SCALE: N.T.S.

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NOVEMBER 2014

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MARK	DATE	DESCRIPTION

Scale	AS NOTED
Date	NOVEMBER 2014
Job No.	217-1401.05
Designed by	GCS
Drawn by	CSC
Checked by	RJT
Approved by	PCM

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CONTRACT 5
WATER SYSTEM CONSTRUCTION
EASTHAM, MASSACHUSETTS

PAVEMENT SCHEDULE AND SHEET LOCUS

FOR REVIEW

Sheet No.
G-2

Drawing file: I:\Eastham.217\Phase 1 - Eastham Water System\217-1401.05 Contract 5 Phase I WM\01 CAD\05 CONTRACT WATER DESIGN I.dwg Plot Date: Dec 08,2014-8:11am

CONTRACT 6
WATER MAINS - ROUTE 6 SOUTH
WATER SYSTEM CONSTRUCTION
EASTHAM, MASSACHUSETTS

OCTOBER 2014

VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1	GENERAL NOTES AND LEGEND	CD-1	CONSTRUCTION DETAILS I
G-2	PAVEMENT SCHEDULE AND SHEET LOCUS	CD-2	CONSTRUCTION DETAILS II
C-1	ROUTE 6 I	CD-3	CONSTRUCTION DETAILS III
C-2	ROUTE 6 II	CD-4	CONSTRUCTION DETAILS IV
C-3	GOVERNOR PRENCE ROAD	CD-5	CONSTRUCTION DETAILS V
C-4	ROUTE 6 III		
C-5	ROUTE 6 IV		
C-6	ROUTE 6 V		
C-7	ROUTE 6 VI		
C-8	EXTENDED SERVICE		

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

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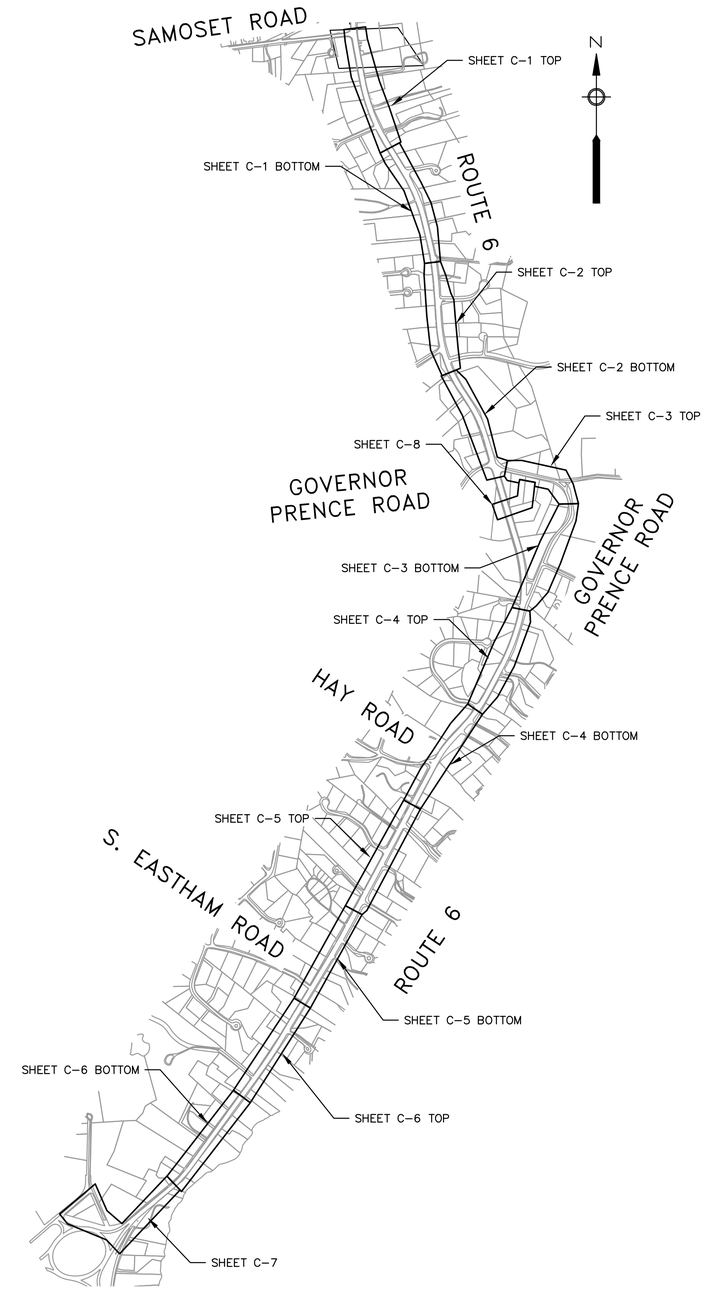
TEMPORARY AND PERMANENT PAVEMENT SCHEDULE

SHEET	STREET	TEMPORARY PAVEMENT	PERMANENT PAVEMENT
C-1	ROUTE 6 I		
C-2	ROUTE 6 II		
C-3	ROUTE 6 III		
C-4	GOVERNOR PRENCE ROAD		
C-5	ROUTE 6 IV		
C-6	ROUTE 6 V		
C-7	ROUTE 6 VI		
C-8	EXTENDED SERVICE		



KEY PLAN

SCALE: N.T.S.

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Date	OCTOBER 2014
Job No.	217-1403
Designed by	GCS
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Approved by	PCM

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CONTRACT 6
WATER SYSTEM CONSTRUCTION
EASTHAM, MASSACHUSETTS

PAVEMENT SCHEDULE AND SHEET LOCUS

FOR REVIEW

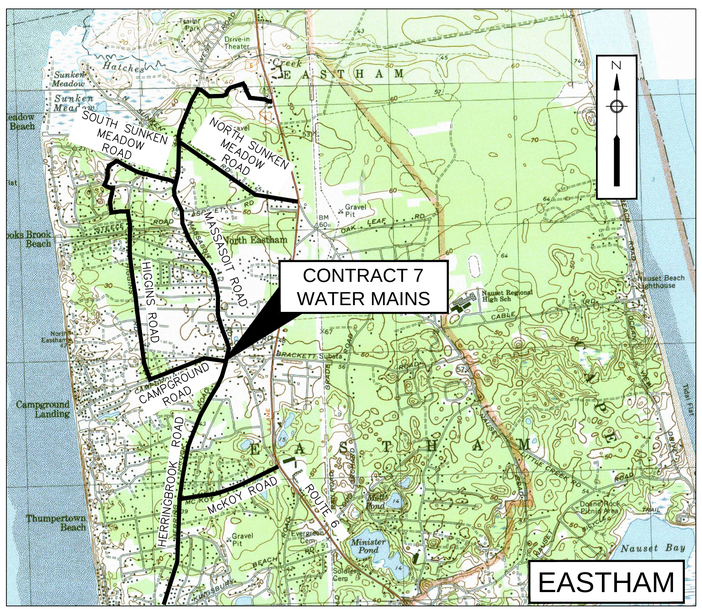
Sheet No.

G-2

Drawing file: I:\Eastham 217\Phase 1 - Eastham Water System\217-1401.06 Contract 6 Phase I WM\01 CAD\06 CONTRACT WATER DESIGN I.dwg Plot Date: Nov 13,2014-8:25am

CONTRACT 7
WATER MAINS - NORTHERN SYSTEM BACKBONE
EASTHAM, MASSACHUSETTS

DECEMBER 2014



VICINITY MAP

1"= 2,000'

LIST OF DRAWINGS

G-1	GENERAL NOTES AND LEGEND
G-2	ROAD RESTORATION SCHEDULE AND KEY PLAN
C-1	ASPINET ROAD AND NORTH SUNKEN MEADOW ROAD
C-2	NORTH SUNKEN MEADOW ROAD
C-3	MASSASOIT ROAD
C-4	MASSASOIT ROAD
C-5	MASSASOIT ROAD
C-6	HERRINGBROOK ROAD
C-7	HERRINGBROOK ROAD
C-8	HERRINGBROOK ROAD
C-9	HERRINGBROOK ROAD AND MCKOY ROAD
C-10	MCKOY ROAD
C-11	SOUTH SUNKEN MEADOW ROAD
C-12	TREAT ROAD AND QUASON ROAD
C-13	BANGS ROAD AND WAMISCO ROAD
C-14	OQUAMOSHOD ROAD AND HIGGINS ROAD
C-15	HIGGINS ROAD
C-16	CAMPGROUND ROAD
C-17	JACKCIN ROAD AND WHELPLEY ROAD
C-18	WHELPLEY ROAD
C-19	MASSASOIT ROAD
CD-1	CONSTRUCTION DETAIL I
CD-2	CONSTRUCTION DETAIL II
CD-3	CONSTRUCTION DETAIL III

TOWN OF EASTHAM · NAUSET 1620 · INCORPORATED 1651

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

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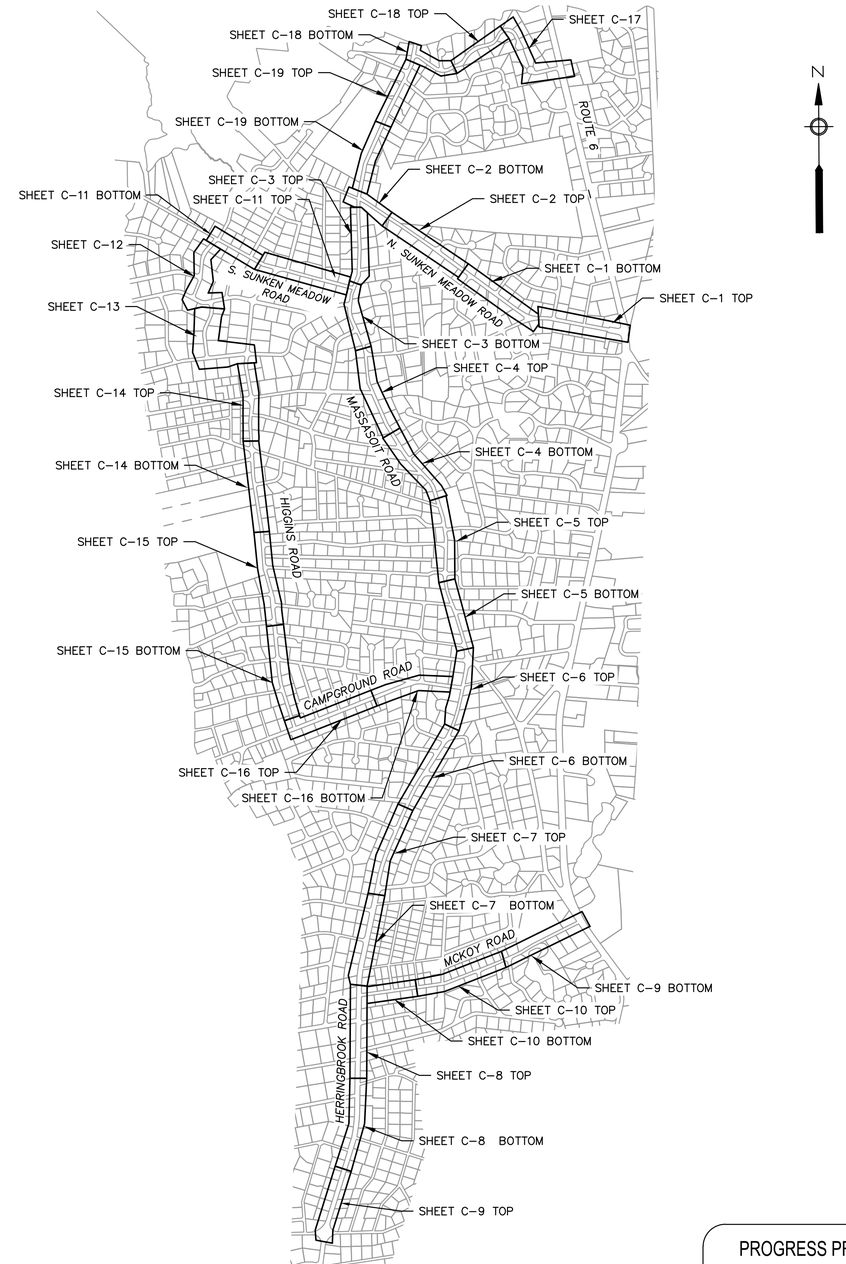
ROAD RESTORATION SCHEDULE

SHEET	STREET	EXISTING ROAD SURFACE MATERIAL	PROPOSED ROAD SURFACE RESTORATION MATERIAL
C–1	ASPINET ROAD	BITUMINOUS CONCRETE	
C–1, 2	NORTH SUNKEN MEADOW ROAD	BITUMINOUS CONCRETE	
C–3, 4, 5, 19	MASSASOIT ROAD	BITUMINOUS CONCRETE	
C–6, 7, 8, 9	HERRINGBROOK ROAD	BITUMINOUS CONCRETE	
C–9, 10	MCKOY ROAD	BITUMINOUS CONCRETE	
C–11	SOUTH SUNKEN MEADOW ROAD	BITUMINOUS CONCRETE	
C–12	TREAT ROAD (PRIVATE)	BITUMINOUS AND DIRT	
C–12	QUASON DRIVE (PRIVATE)	DIRT	
C–13	BANGS ROAD (PRIVATE)	SAND	
C–13	WAMISCO ROAD (PRIVATE)	DIRT	
C–14	OQUAMOSHOD ROAD (PRIVATE)	DIRT	
C–14, 15	HIGGINS ROAD	BITUMINOUS CONCRETE	
C–16	CAMPGROUND ROAD	BITUMINOUS CONCRETE	
C–17	JACKIN DRIVE (PRIVATE)	BITUMINOUS CONCRETE	
C–17, 18	WHELPLEY ROAD (PRIVATE)	DIRT	



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Date	DECEMBER 2014
Job No.	217-1401.07
Designed by	TRG
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Checked by	RJT
Approved by	PCM

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CONTRACT 7 - WATER MAINS
NORTHERN SYSTEM BACKBONE
EASTHAM, MASSACHUSETTS

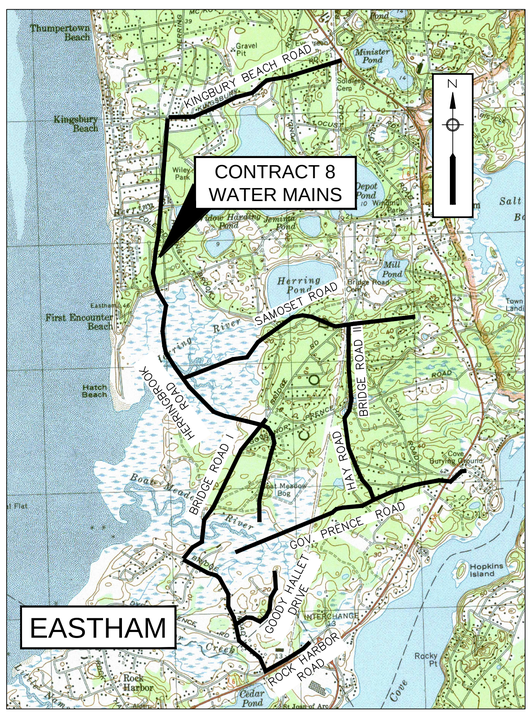
ROAD RESTORATION SCHEDULE
AND KEY PLAN

NOT FOR CONSTRUCTION

Sheet No.
G-2

CONTRACT 8
WATER MAINS- SOUTHERN SYSTEM BACKBONE
EASTHAM, MASSACHUSETTS

DECEMBER 2014



VICINITY MAP
1"= 2,000'

LIST OF DRAWINGS

G-1	GENERAL NOTES AND LEGEND
G-2	PAVEMENT SCHEDULE AND SHEEET LOCUS
C-1	KINGSBURY BEACH ROAD
C-2	KINGSBURY BEACH ROAD
C-3	KINGSBURY BEACH ROAD
C-4	HERRINGBROOK ROAD
C-5	HERRINGBROOK ROAD
C-6	HERRINGBROOK ROAD
C-7	HERRINGBROOK ROAD
C-8	HERRINGBROOK ROAD
C-9	BRIDGE ROAD AND GOVERNOR PRENCE ROAD
C-10	BRIDGE ROAD I
C-11	BRIDGE ROAD I
C-12	GOVERNOR PRENCE ROAD
C-13	GOVERNOR PRENCE ROAD
C-14	GOVERNOR PRENCE ROAD
C-15	SAMOSET ROAD
C-16	SAMOSET ROAD
C-17	SAMOSET ROAD
C-18	BRIDGE ROAD II
C-19	BRIDGE ROAD II AND HAY ROAD
C-20	HAY ROAD
C-21	ROCK HARBOR ROAD
C-22	BRIDGE ROAD I
C-23	BRIDGE ROAD I
C-24	BRIDGE ROAD 1
C-X	GOODY HALLET DRIVE
C-XX	GOODY HALLET DRIVE

TOWN OF EASTHAM
NAUSET 1620
INCORPORATED 1651

TOWN ADMINISTRATOR

SHEILA VANDERHOEF

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DECEMBER 2014

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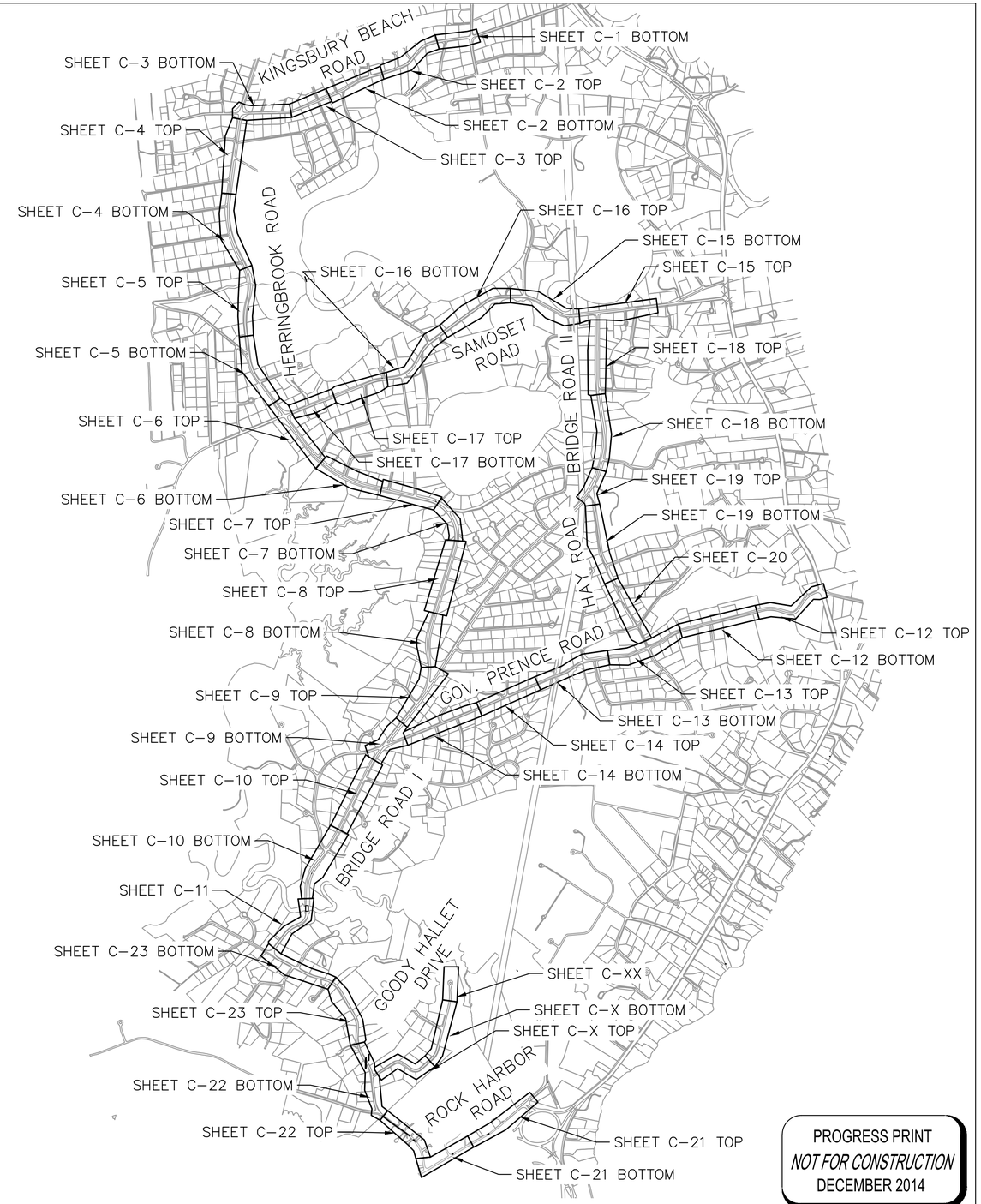
ROAD RESTORATION SCHEDULE

SHEET	STREET	EXISTING ROAD SURFACE MATERIAL	PROPOSED ROAD SURFACE RESTORATION MATERIAL
C–1, 2, 3	KINGSBURY BEACH ROAD	BITUMINOUS CONCRETE	
C–4, 5, 6, 7, 8	HERRINGBROOK ROAD	BITUMINOUS CONCRETE	
C–9, 10, 11	BRIDGE ROAD I	BITUMINOUS CONCRETE	
C–12, 13, 14	GOVERNOR PRENCE ROAD	BITUMINOUS CONCRETE	
C–15, 16, 17	SAMOSET ROAD	BITUMINOUS CONCRETE	
C–18, 19	BRIDGE ROAD II	BITUMINOUS CONCRETE	
C–19, 20	HAY ROAD	BITUMINOUS CONCRETE	
C–21	ROCK HARBOR ROAD	BITUMINOUS CONCRETE	
C–22, 23	BRIDGE ROAD I	BITUMINOUS CONCRETE	
C–X, XX	GOOD HALLET DRIVE	BITUMINOUS CONCRETE	



PROGRESS PRINT
NOT FOR CONSTRUCTION
DECEMBER 2014

TOWN OF EASTHAM — INCORPORATED 1651

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Date	DECEMBER 2014
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Drawn by	SJN
Checked by	RJT
Approved by	PCM

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

CONTRACT 8
WATER MAINS - SOUTHERN SYSTEM BACKBONE
EASTHAM, MASSACHUSETTS

GENERAL NOTES AND LEGEND

NOT FOR CONSTRUCTION

Sheet No.
G-2

Drawing file: I:\Eastham.217\Phase 1 - Eastham Water System\217-1401.08 Contract 8 Phase I WM\01 CAD\08 CONTRACT WATER DESIGN.dwg Plot Date: Dec 09,2014-2:51pm

Table D-1.2. Estimate of Existing and Future Average Daily Water Demands of the Eastham Water System.

Classification Code	Land Use	Category	Parcels	Water Demand (gpd, average day)				
				Existing	%	Future	Total Future	%
0	**Multiple-Use Property**							
		Mixed Residential/Commercial	14	1,745		-	1,745	
		Mixed Commercial/Residential	26	7,265		-	7,265	
			40	9,009	2.8%	-	9,009	2.6%
1	**Residential**							
		Single Family	1495	202,124		-	202,124	
		Condominium	30	4,056		-	4,056	
		Two- and Three-Family	49	13,655		-	13,655	
		Accessory Land with Improvement	6	-		135	135	
		Multiple Houses on One Parcel, Apartments, Group Homes	63	8,518		-	8,518	
		Developable Land	109	-		14,737	14,737	
		Undevelopable Land	37	-		-	-	
			1789	228,353	71.4%	14,872	243,225	69.2%
3	**Commercial**							
		Transient Group Quarters (Hotels, Motels)	9	25,850		-	25,850	
		Retail, Auto Service, Office Buildings, Recreation Facilities, Warehouse	39	36,620		-	36,620	
		Commercial Developable Land	11	-		9,806	9,806	
		Commercial Undevelopable Land	1	-		-	-	
			60	62,470	19.5%	9,806	72,276	20.6%
4	**Industrial**	Warehouse, Sand/Gravel, Electric Transmission	14	318	0.1%		318	0.1%
		Industrial Developable Land	3	-		411	411	
		Industrial Undevelopable Land	1	-		-	-	
			18	318		411	729	
8	**Recreational Land**		2	4,334	1.4%	-	4,334	1.2%
9	**Tax Exempt Property**							
		United States Government	26	1,604		-	1,604	
		Commonwealth of Massachusetts	7	-		-	-	
		Town-Owned	62	7,851		7,304	15,155	
		Charitable and Religious Groups, Housing Authorities	17	5,757		-	5,757	
			112	15,213	4.8%	7,304	22,517	6.4%
	Subtotal		**2021**	**319,696**	**100.0%**	**32,393**	**351,679**	**100.0%**
Additional Water Uses								
	Confidentaly Estimated Municipal Water Use (3%)			9,591		972	10,550	
	Unacounted for Water (10%)			31,970		3,239	35,168	
Buffer/Contingency (5%)				15,985		1,620	17,584	
TOTAL PARCELS			**2021**					
TOTAL WATER DEMAND, AVERAGE DAY (gpd)				**377,242**		**38,224**	**414,981**	
TOTAL WATER DEMAND, AVERAGE DAY (Rounded to nearest 1,000 gpd)				**378,000**		**39,000**	**415,000**	

Form D1 – Historic (Existing) Withdrawal Volumes

All of Eastham is on private or small community (transient and non-transient) water supplies. The Town does not have a municipal water system. The water system will replace these private or community water supplies.

Because there are very few records of water usage from these properties, the calculated water system demands were estimated on the basis of current land uses of individual properties (residential, commercial, industrial, recreational, government-owned, etc.) and accepted standards for usage rates of each property type. Wherever transient or non-transient community water supply records are available from annual reports submitted to the Department of Environmental Protection (DEP), these were also incorporated into the demand estimates.

In addition to these property-specific demands, allowances have also been made for Confidently Estimated Municipal Water Use and Unaccounted for Water, as well as a contingency to allow for variations from the property-specific demand estimates.

D1.A State Classification Code Categories.

Properties are classified by municipal Assessor Departments according to their land use category as defined by the Massachusetts Department of Revenue State Classification Code, and used as the basis of taxation for individual properties. This State Classification Code was revised in March 2014 and provides detailed descriptions of current land uses from which typical water demands for each property type can be identified. In particular, the recent version of these Classification Codes expands the designations for various residential and commercial properties.

The 2014 database of property classifications and descriptions used by the Eastham Assessors office was used to develop estimated water demands for those properties to be served by the water system. A summary of the properties to be served by the water system according to their Classification Code, together with the detailed description of these Classification Codes is provided in Appendix C, and are summarized below. Descriptions are provided for only those classes of properties that are to be served by the water system.

Code 0 Multiple-Use Properties

Properties used for more than one purpose. These properties are classified according to whether: 1) they are primarily residential mixed use (Class 013), such as a building with a retail store on the first floor and apartments on the second floor, or 2) properties that are primarily commercial use (Class 031), such as a building with retail use on the first floor and office space on the second floor.

Code 1 Residential Properties

Residential properties, including single family homes (Class 101) condominiums (Class 102), two-family homes (Class 104), three-family homes (Class 105), accessory land with

improvements such as a garage (Class 106), multiple houses on one parcel (Class 109), and apartments (four to eight units – Class 111, more than eight units – Class 112).

The State Class Code also identifies vacant land and their potential for future development (developable land – Class 130, potentially developable - Class 131, and undevelopable land – Class 132). These vacant land designations were used as the basis of identifying the potential water demands of these properties, discussed in Section D.1.C, below.

Code 3 Commercial

Commercial properties are classified into several descriptive categories: transient group quarters such as motels and inns (Class 301 and 302, respectively), storage warehouses (Class 316), small retail and service stores (Class 325), restaurants (Class 326), auto repair and service stations (Class 332 and 334, respectively), general office buildings (Class 340), banks (Class 341), medical office buildings (Class 342), public service properties such as post offices (Class 350) and fraternal organizations ((Cass 353),athletic clubs (Class 376), and outdoor recreational properties (Class 388).

Similar to the residential class codes, this category also identifies developable and undevelopable properties (Classes 390 and 392, respectively), which were used as the basis of identifying the potential future water system demands.

Code 4 Industrial

The industrial properties within the water system includes warehouses and sand and gravel operations (Class 401), and properties associated with electrical transmission (rights of way – Class 410, and electrical substation (Class 424). Potentially developable and undevelopable industrial properties are also identified (Class 440 and 442) and used to indentify potential future water system demands.

Code 8 Recreational Properties – Chapter 61B

These properties include camp areas used for overnight camping (Class 802) and nature study areas (Class 803). .

Code 9 Tax Exempt Properties

These properties are public properties exempt from taxation and include those owned by the United States Government (Class 900) and State agencies such as the Division of Fish & Wildlife and the Massachusetts Highway Department (Class 911 and 921). It also identifies Eastham-owned vacant and improved land (Class 930), conservation land (Class 932), schools (Class 934), public safety properties (Class 934).

This class of properties also includes cemeteries (Class 953), libraries (Class 956), places of worship (Class 960) and those owned by housing authorities (Class 970).

D.1.B Properties Comprising the Water System

The properties comprising the water system are summarized on Table D1-1. Overall, 2,021 properties are to be served by the water system. The large majority of the properties are residential, consisting of 88.5% of the services. The commercial properties represent 3.0% of

the system. Mixed use properties, being those that have both residential and commercial uses on them, comprise 2% of the parcels. Industrial, recreational and tax-exempt properties (Federal, State or Town owned properties, churches, etc.) comprise 0.9%, 0.1% and 5.5% of the system, respectively.

Table D1-1. Parcels comprising the Eastham Water System, by Massachusetts DOR State Classification Codes.

Property Type	Total	% of Total	Developed Parcels	Vacant Parcels (Future Water Demands)	
				Developable	Undevelopable
Multiple Use	40	2.0%	40	0	0
Residential	1789	88.5%	1643	109	37
Commercial	60	3.0%	48	11	1
Industrial	18	0.9%	14	3	1
Recreational	2	0.1%	2	0	0
Tax-Exempt	112	5.5%	112	0	0
TOTAL	**2021**	**100%**	**1859**	**123**	**39**

The vacant parcels are those that represent a potential future increase in current water demands. Overall, there are 162 vacant parcels within the water system, of which 123 are potentially developable. The large majority of these vacant and developable parcels are residential (109 properties).

D.1.C Existing Water System Demands

The existing water demands of the properties to be served by the water system were estimated using either per-capita water usage rates, Title 5 criteria for wastewater flows, or DEP reporting data from DEP community (transient and non-transient) systems where they are available. A description of the methodology used for characterizing the existing water demands for each class of property is provided below.

Residential Properties

The residential water demand is based on a residential per capita use calculation. DEP maintains a database of the average household size for Massachusetts communities, which for Eastham is 2.08 residents per household. The water demand was calculated on the basis of the equivalent residential population, multiplied by 65 residential gallons per capita per day (rgpcd), which is DEP's standard for residential water usage. Specific calculations for each class of residential property were based on the following:

Single-family residences. The number of single family resident parcels was multiplied by the resident/household factor of 2.08 to determine the equivalent population, to which was applied the water demand of 65 rgpcd.

Condominiums. The water demand of residential condominiums was determined on the basis of the number of condominium units (e.g., households), the equivalent population of these units (2.08 residents/household), and 65 rgpcd.

Multiple-use Properties. The water demands of multiple use properties that are primarily residential were calculated on the basis of the total number of bedrooms represented by this property class, the equivalent number of households (based on 3.1 bedrooms/household) and therefore population (2.08 residents per household), with an average daily water demand of 65 rgpcd.

Properties having Accessory Land with Improvements. It was assumed that these properties could be developed only if they are 1 acre in size or greater, which is the minimum building lot size under current zoning. There was only one property that met this criterion, and the future water demand for this property was based on the residential per capita water usage. Those properties less than one acre in size are assumed to be undevelopable for future residential use, and therefore do not have water demands associated with them.

Properties with Multiple Houses and Apartments. The water demand for this property class is based on the equivalent number of households (based on 3.1 bedrooms/household) and therefore population (2.08 residents per household), with an average daily water demand of 65 rgpcd.

Vacant, Developable Residential Properties. These properties were assumed to have a single family residence on each property. An equivalent residential population was calculated (3.1 residents/household), and the water demand is based on 65 rgpcd.

Vacant, Undevelopable Residential Properties. These properties are assumed to remain vacant and have no existing or future water demands associated with them.

The supporting calculations used to develop the water demands of each class of residential property are provided in Appendix D.

Commercial Properties

The water demands of commercial properties were determined using the following methods: 1) on the basis of Title 5 wastewater flow criteria, or 2) if available, transient and non-transient community water system data. The Title 5 wastewater flows, recognized to be representative of a peak daily flow condition, were translated to water demands by adjusting the Title 5 wastewater flows by a factor of 0.5 to estimate an average daily wastewater flow, and also using the assumption that wastewater flows are 85% of water demands. A description of the approach used for each class of commercial property is provided below.

Motels and Inns. Water demands are, for most properties, based on per bedroom flows using Title 5 criteria (110 gpd/bedroom), translated to water usage using the approach described

above. Where DEP community water system reports that provide water withdrawal information for specific properties were available, these area used instead of the Title 5 criteria.

Miscellaneous Commercial Enterprises (Retail Stores, Restaurants, Office Buildings, etc.). Title 5 criteria are used for each type of commercial business (small retail – 50 gallons/1000 square feet; restaurants – 35 gallons/seat; office buildings – 75 gallon/1000 square feet, etc.). The specific Title 5 criteria used for each property is provided in the calculation tables included in Appendix D. Where DEP community water system reports that provide water withdrawal information for specific properties are available, these area used instead of the Title 5 criteria.

Vacant, Developable Commercial Properties. The future water demand of vacant, developable properties was estimated on the basis of the average water usage per acre of existing commercial properties. This was calculated to be 675 gpd/acre.

Vacant, Undevelopable Commercial Properties. These properties are assumed to remain vacant and have no existing or future water demands associated with them.

The supporting calculations used to develop the water demands of each class of commercial property are provided in Appendix D.

Industrial Properties

The majority of the industrial properties are classified as warehouses (10 total), one sand and gravel operation and three properties related to electrical transmission (rights of ways and substation). Water demands are only associated with the warehouse and sand/gravel operation and were calculated on the basis of Title 5 criteria (15 gpd/person). The electrical transmission properties have no water usage.

Vacant, Developable Industrial Properties. The future water demand of vacant, developable properties was estimated on the basis of the average water usage per acre of the existing industrial properties. This was calculated to be 12.4 gpd/acre.

Vacant, Undevelopable Industrial Properties. These properties are assumed to remain vacant and have no existing or future water demands associated with them.

The supporting calculations used to develop the water demands of each class of industrial property are provided in Appendix D.

Recreational Properties

There are two recreational properties that are to be served by the water system: a campground (Atlantic Oaks Campground) and a nature study area. DEP community water system data is available for the Atlantic Oaks Campground, and was used to characterize their existing water demands. The water demand of the nature study area was estimated on the basis of the Title 5 criteria for campgrounds of 10 gpd/visitor. It was assumed that the nature study area has a

capacity of 100 people. The water demand calculations for these recreational properties are provided in Appendix D.

Tax-Exempt Properties

The water demands of the tax exempt properties were determined based on the specific use of each property. Of the federal and state-owned parcels (26 owned by the US Government, 7 owned by the Commonwealth of Massachusetts), all but two are open land and will not be developed. The two remaining properties consist of the Salt Pond Visitors Center and a residential home. The Visitor Center water demands were estimated on the basis of Title 5 flow criteria of a public park with toilets (gpd/person), with an average of 500 visitors/day. For the residential home owned by the National Seashore the conventional water demand criteria were applied (2.06 residents/home; 65 rgpcd).

There are 62 parcels owned by the Town of Eastham, most of which (53 properties) are vacant land. The developed properties consist of schools (the Nauset Regional High School and the Eastham Elementary School), and municipal buildings (Town Hall, Town Library, Police Department, Fire Department, Department of Public Works, Department of Natural Resources and the Council on Aging). DEP community water system data is available for the High School, Elementary School and Town Hall, and these were used to characterize their existing water demands. The library demand is based on volume allowed under DEP's approval for the well on this property. For the remaining Town-owned properties Title 5 criteria were used (day care center, function hall, and office buildings). The specific Title 5 criteria for each property are provided in Appendix D.

The remaining tax-exempt properties consist of parcels owned by the Eastham Housing Authority, the Eastham Historical Society and churches. Several of these properties consist of residences, and their water demands are based on the residential demand criteria. The water demands of the remaining properties were determined on the basis of Title 5 criteria, which are listed for each specific property in Appendix D.

Vacant Developable Properties. There are three vacant properties that are Town-owned and potentially developable (the Roach property and two Purcell properties). Future water demands of these properties were estimated using existing zoning criteria for residences with single-family homes (1 acre zoning; 2.06 residents/household; 65 rgpcd). On the basis of these assumptions, these three parcels can support 55 single-family homes, and the water demands were calculated accordingly.

Estimate of Current Water System Demands

Estimates of the current and future water system demands were determined using the methodology described above, and are summarized in Table D-1.2. Detailed parcel counts and water demand calculations for each class of property are provided in Appendix D.

Property Water Demands

The current average daily water system demand generated by the 2,021 parcels to be served by the system is estimated to be 319,696 gallons per day. The large majority of this demand is from residential properties (71%). Commercial businesses comprise 19.5% of these demands, and the remaining demands are from mixed use, industrial, recreational and tax-exempt properties.

Confidently Estimated Municipal Water Use and UAW

In addition to these water demands from properties, two additional categories of water usage has been included in the overall water system demand: Confidently Estimated Municipal Water Use and Unaccounted for Water (UAW). Confidently Estimated Municipal Water Use is unbilled and typically unmetered water that is generated by municipal activities such as fire protection, flushing of water mains and street cleaning. UAW is caused by circumstances such as meter malfunctions or mis-registration, minor leaks, and theft, and is another category of water usage that DEP recognizes to occur in all water systems. DEP recognizes that both of these categories of water use is a typical aspect water system operations, and requests information on these categories as part of the Annual Statistical Report (ASR) prepared by water suppliers each year. The 2013 ASRs for the outer Cape communities of neighboring Orleans, Brewster and Provincetown were reviewed to the quantity; of water used in these two categories, expressed as a percent of the total withdrawal. These are summarized in Table D-1.3 below.

Table D-1.3. Percent of Confidently Estimated Municipal Use and Unaccounted for Water in Orleans, Brewster and Provincetown, as reported in 2013 DEP Annual Statistical Reports.

2013 ASR	***% of Overall Withdrawal***	
	Confidently Estimated Municipal Use	***Unaccounted for Water***
Orleans	2%	6%
Brewster	3%	8%
Provincetown	3%	17%
Average	*3%*	*11%*
Included in Eastham Demand Estimate	**3%**	**10%**

For the purposes of the estimating the current demand of the water system, a 3% factor for Confidently Estimated Water Use has been included. This percentage is consistent with what has been experienced by the water systems on outer Cape Cod (evaluated above) and in water systems in general. An allowance of 10% UAW has been included, because this is the rate that DEP allows as a maximum in water systems.

Contingency

Because these existing water demands are unable to be determined on the basis of metered water usage and therefore have a degree of uncertainty associated with them, a contingency factor of 5% has

been included in the overall estimate of the water system demands. This contingency can be eliminated in future years as metered water usage records of the system become available.

Overall Existing Water Demand

The overall current water system demand for Eastham that includes all categories of uses is estimated to be 378,000 gallons per day, equivalent to 138 Million Gallons per year.

D.1.C.3 Future Water System Demands

The future water system demands are generated by properties that are currently vacant, and their future water demands were estimated under the assumption that they are developed in accordance with their current land use designation and their applicable land use bylaws. Development of these properties will create an additional demand of 32,393 gpd, an increase of approximately 10% over the demand of currently developed properties. The overall future average daily demand of the water system generated by properties is estimated to be 351,679 gpd.

The estimate of the future water system demands includes the corresponding increases in Confidently Estimated Water Use and UAW, and the 5% contingency. Overall, the future demand of Eastham's water system is estimated to be 415,000 gpd, or 151 Million Gallons per year.

Demand Characteristics: Average Day (Annual), Average Day (Peak Season) and Peak Day

In addition to the water system demands for the average gallons per day on a year-round basis, demands are also forecasted for the average day during the peak summer season (July and August) and for the peak day. Ratios of each of these demand conditions were determined based on the water withdrawals reported in the 2013 ASRs for Orleans, Brewster and Provincetown, shown in Table D-1.4.

Table D-1.4. Water demand characteristics for Orleans, Brewster and Provincetown, and estimated for current and future Eastham water system.

Water System	Daily and Seasonal Demand Characteristics				
	Ave Day, Annual (gpd)	Ave Day, Peak Season ((gpd)		Peak Day (gallons)	
		Volume	Ratio to Q_{ave}	Volume	Ratio to Q_{ave}
Orleans	892,904	1,745,775	2.0	2,372,800	2.7
Brewster	1,243,389	2,499,115	2.0	3,651,000	2.9
Provincetown	624,902	1,162,335	1.9	1,799,550	2.9
Average			*1.9*		*2.8*
Eastham, Current	**378,000**	**734,000**		**1,068,000**	
Eastham, Future	**415,000**	**806,000**		**1,172,000**	

Based on the demand characteristics experienced by these other outer Cape water system, the current average daily demand of the Eastham water system is expected to increase during the summer (July and

August) by a factor of 1.9 to an estimated 734,000 gpd. The peak day demand is expected to be approximately 1,068,000 gallons (a factor of 2.8 over the average daily demand). For the future water system, these demands are estimated to be 806,000 gpd and 1,172,000 gallons, respectively.

Form D2 – Projection of Withdrawal Volumes

The estimated current water withdrawals (378,000 gpd, or 138 Million Gallons annually) are anticipated to increase by 39,000 gpd, largely associated with the development of residential and commercial properties, as shown in Table D-1.2. Once this development has taken place the overall future withdrawals are estimated to be 415,000 gpd, or 151 MGY. For the purposes of this Water Witrhdrawal application it is assumed that Eastham will experience this future water demand after five years of the system operation, anticipated to be in 2021.

Seasonal Withdrawals

Eastham is typical of Cape Cod communities that are highly seasonal in nature. The year-round population of the Town is 4,956 (2010 census), which grows by approximately a factor of four during the summer.

The monthly variation in water withdrawals was estimated by reviewing the DEP Annual Statistical Reports (ASRs) for surrounding communities with municipal water systems: Orleans, Brewster and Provincetown. Monthly withdrawal rates reported in the 2013 and 2012 ASRs for Orleans and the 2013 ASRs for Brewster and Provincetown are summarized in Table D-2.1 and used to calculate the average withdrawal/month for these communities. These average withdrawal rates are the basis of the monthly rates provided in Section 7 of Form D2.

Table D-2.1 Monthly Water Withdrawals of Outer Cape Communities as % of Annual Total.

Month	***Orleans***	***Orleans***	***Brewster***	***Provincetown***	***AVERAGE***
ASR	***2013***	***2012***	***2012***	***2012***	
January	5%	4%	5%	4%	**5%**
February	4%	4%	4%	4%	**4%**
March	4%	4%	5%	4%	**4%**
April	5%	7%	6%	7%	**6%**
May	9%	8%	9%	8%	**8%**
June	11%	12%	10%	12%	**11%**
July	17%	19%	17%	19%	**18%**
August	16%	16%	16%	16%	**16%**
September	10%	10%	10%	10%	**10%**
October	8%	6%	8%	6%	**7%**
November	6%	5%	5%	5%	**5%**
December	5%	5%	5%	5%	**5%**

The pertinent sections of the Annual Statistical Reports used for this analysis are provided in Appendix E.

8. Projected Withdrawal from Each Withdrawal Point

During the initial years of operating the water system two well fields are to be connected and used for water withdrawals: District G and Nauset Regional High School. While these two well fields are in operation withdrawals are expected to be divided evenly between them, e.g., 50% from District G, 50% from Nauset Regional High School.

The two wells at District H (Zone B well, Zone C well) are planned to be connected to the system at a later date, which for planning purposes is targeted for five years from system startup (2016), and therefore in the year 2021. Once this well field is connected and all four withdrawal points are available to the system, the allocation of withdrawals is expected to be that shown below in Table D.2.2.

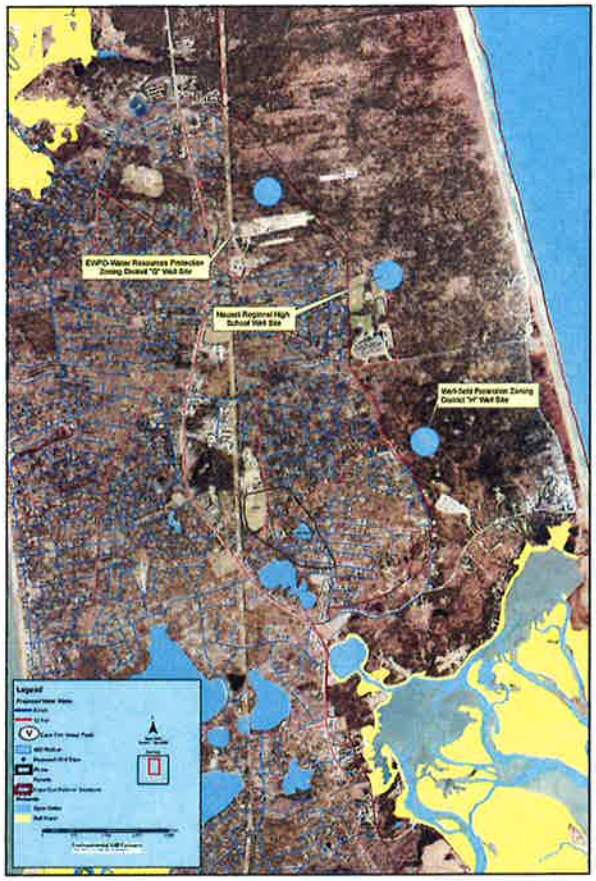
Table D-2.2 Anticipated Allocation of Withdrawals from Well Fields

Withdrawal Location	***%***
District G	25.0%
NRHS	50.0%
H - Zone B	12.5%
H- Zone C	12.5%
Total	100%

Permit Application # X241315

BRP WS 19
New Water Supply Source
DEP Pumping Test Report

Water Resource Protection District G, Eastham, MA



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Permit Application #X241315

Water Resource Protection District G Site New Water Supply Source

DEP Pumping Test Report BRP WS 19

Prepared for:
Town of Eastham, Massachusetts

April 2012

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EXECUTIVE SUMMARY

The Town of Eastham has been evaluating potential water resources, with the goal of identifying and permitting sufficient water supplies to serve a town-wide municipal water system. Water system feasibility studies concluded that a town-wide system would have the following estimated demands (in million gallons per day (MGD)):

Daily demand, annual average	1.0 MGD
Daily demand, seasonal average	1.8 MGD
Peak day demand	2.6 MGD

In 2005 ten sites that could potentially serve as public water supplies were evaluated and three were selected for further consideration (shown on Figure ES-1): Wellfield Protection Zoning District "H" (District H), Water Resource Protection District "G" (District G), and Nauset Regional High School (NRHS). In addition to these, an interconnection with the Town of Orleans was considered.

This report fulfills the requirements for the Massachusetts Department of Environmental Protection (DEP) Pumping Test Report for the District G new water supply source. This is submitted as permit application BRP WS 19 in accordance with the requirements of the Massachusetts Drinking Water Regulations. The report describes all soil boring, well installation and aquifer testing activities at District G, analyses of the collected hydrogeologic data to determine site-specific aquifer properties, groundwater modeling performed to determine the recommended yield and Zone II area, and an evaluation of land uses and groundwater protection measures within the proposed Zone II. On the basis of this work, a yield of 995,040 gallons per day (gpd) is recommended for the wellfield.

The District G wellfield is located in north Eastham (a half mile south of the Wellfleet town-line), east of the Cape Cod Rail Trail biking path and north of Oakleaf Road in Eastham, Massachusetts. District G is situated approximately 50 feet above sea level and is comprised predominately of property owned by the Town of Eastham, with a few parcels owned by private entities or the Eastham Conservation Foundation. The District G production well parcel is and has historically been owned by the Town. The land to the north and east of District G is owned by the National Park Service (NPS) Cape Cod National Seashore (CCNS).

The District G wellfield site is located in the northern region of the Nauset Lens aquifer, approximately 4,300 feet north-northeast of the high point of the freshwater mound. Groundwater elevation at the District G site is approximately 16 to 17 feet NAVD 88 and the depth to the water table is approximately

30 feet below ground surface (bgs). The direction of groundwater flow at the site is towards the north-northeast.

In August 2009, Environmental Partners Group installed a deep boring and two observation wells at the District G site. The deep boring was drilled to a total depth of 402 feet bgs. The upper zone of unconsolidated material, known as the Eastham Plain Deposits, extends from the ground surface to a depth of approximately 110 feet bgs (-48 feet NAVD 88) and consists primarily of fine to coarse sand with some gravel. The Eastham Plain deposits are underlain by up to 300 feet of glacial lake deposits, consisting predominately of silts and clays. The aquifer is approximately 80 feet thick and extends from the water table to interface of the Eastham Plain deposits and the glacial lake silts and clays at 110 feet bgs. The saltwater interface was not encountered and is likely located within the low permeability clays or bedrock.

Between June and October 2010 long term aquifer pumping test activities were performed at the District G wellfield site. A seven-day constant rate aquifer test was performed on the District G Test Production Well-1 (TPW-1). The observation well network was equipped with data loggers to record groundwater elevations before, during and after the pumping test. Water quality sampling was also performed on the production well.

The pump test was conducted on the District G TPW-1 well from October 21 through October 28, 2010 at a pump rate of 691 gallons per minute (gpm) or 995,040 gpd. Available water over the well screen was 50.2 feet. Total drawdown at the end of the seven-day test was 26.6 feet, leaving 23.6 feet above the well screen. As a check of the drawdown stabilization, data from the last 24-hours of the pump test was plotted on a semi-log plot extrapolation of the time drawdown curve (time on the logarithmic scale) over a 180-day period. Based on this plot, total drawdown after 180-days would be 29.8 feet, leaving 20.4 feet of water above the well screen. The calculated Approvable Yield for District G TPW-1 was 1,170 gpm (1.68 MGD); however, because the regulations limit the approvable yield to the rate at which the pump test was performed, the maximum approvable yield for District G TPW-1 is 691 gpm (995,040 gpd).

The data derived from the pumping test was used to develop piezometric maps of water level drawdown conditions resulting from water withdrawals during the aquifer performance test and to develop estimates of key aquifer parameters including, hydraulic conductivity, storativity, specific yield, vertical anisotropy, and aquifer thickness.

Groundwater modeling was performed using the SEAWAT numerical model developed by the U.S. Geological Survey (USGS). SEAWAT is a three-dimensional, variable-density, numerical model used to

model groundwater flow and transport. The SEAWAT model was refined in the vicinities of the District G, NRHS and District H sites based on site-specific data collected through field investigations.

The Zone II was defined by the SEAWAT model to simulate the conditions under no recharge (180 days) and a pumping rate of 995,040 gpd. The Zone II boundaries were determined using the particle tracking program MODPATH and takes into consideration natural hydrologic boundaries. Particles were placed at the water table and tracked for 300 years until the particles stopped at a model boundary. The Zone II and associated land use within the Zone II for the District G TPW-1 wellfield is shown on Figure ES-2. As shown on Figure ES-2, land use within the Zone II is comprised predominately of forested and residential use with some recreational and commercial uses. No potential sources of contamination were identified within the Zone II.

The nearest surface water body to the District G wellsite is Hatches Creek, located approximately 2,300 feet to the north. Preliminary groundwater modeling performed by the USGS in 2004 (Masterson 2004), indicated that pumping of public water supply wells at District G could reduce baseflow to Hatches Creek. A water table and production zone well couplet, three stream gauges, and two piezometers were installed near or within Hatches Creek to evaluate hydrogeologic conditions. These locations were monitored prior to, during, and after the seven day District G pump test. The SEAWAT model was refined in the vicinity of Hatches Creek based on field observations and monitoring. The model was then used to evaluate potential impacts to streamflow in Hatches Creek from pumping at the District G wellfield. Two 100-year simulations were performed to estimate the long-term average discharge at Hatches Creek; the first under non-pumping conditions and the second under pumping conditions. The anticipated annual average pumping rate for the District G wellsite is 0.25 MGD or 250,000 gpd. SEAWAT groundwater modeling results indicate that the discharge to the Hatches Creek drain cells under non-pumping conditions is 0.63 cubic feet per second (cfs) and the discharge is reduced to 0.57 cfs, or by 9.6 percent, when G-TPW-1 is operated continuously at 250,000 gpd on an annual basis over this 100-year period..

Permit Application # X240376

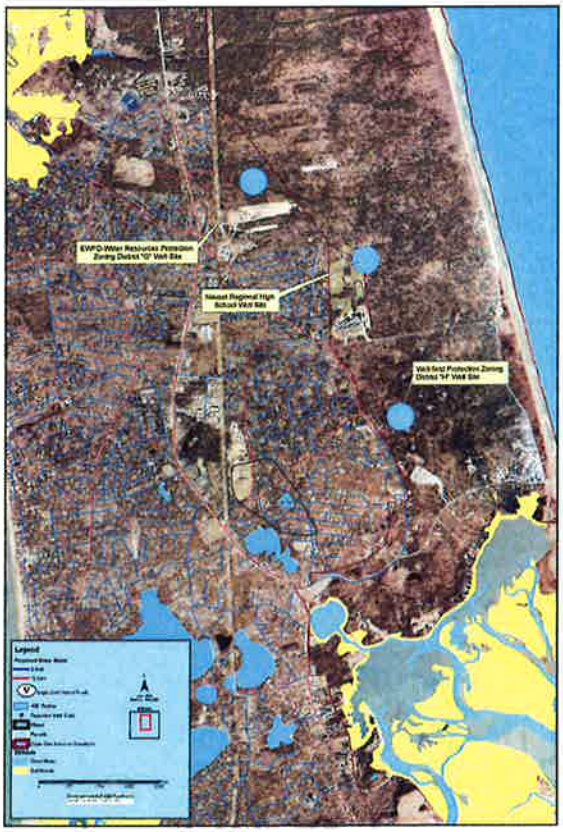
BRP WS 19

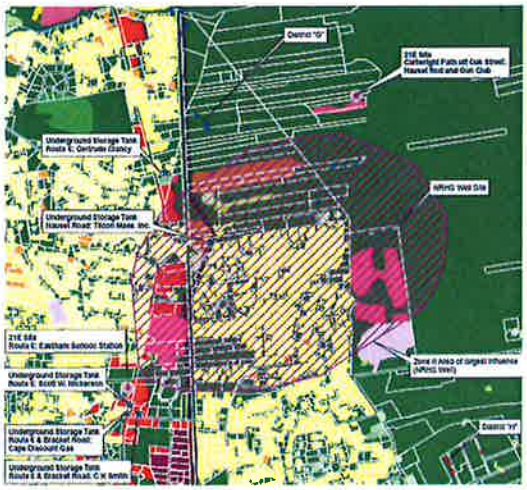
New Water Supply Source

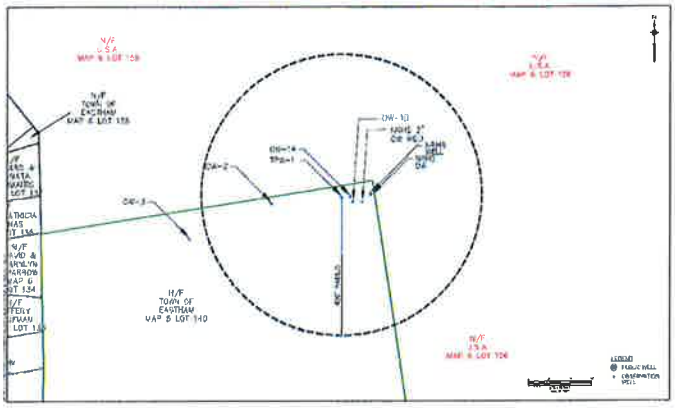
DEP Pumping Test Report

Nauset Regional High School, Eastham, MA

December 2011







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Permit Application #X240376

Nauset Regional High School New Water Supply Source

DEP Pumping Test Report BRP WS 19

Prepared for:
Town of Eastham, Massachusetts

December 2011

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EXECUTIVE SUMMARY

The Town of Eastham has been evaluating potential water resources, with the goal of identifying and permitting sufficient water supplies to serve a town-wide municipal water system. The goal of these efforts is to secure water supplies for a Town-wide water system that Eastham is considering and that would have the following estimated demands (in million gallons per day (MGD)):

Daily demand, annual average	1.0 MGD
Daily demand, seasonal average	1.8 MGD
Peak day demand	2.6 MGD

Over the past several years, several potential sites that could potentially serve as public water supplies were evaluated and three were selected for further consideration (shown on Figure ES-1): Wellfield Protection Zoning District "H" (District H), Water Resource Protection District "G" (District G), and Nauset Regional High School (NRHS). In addition to these, an interconnection with the Town of Orleans was considered.

This report fulfills the requirements for the Massachusetts Department of Environmental Protection (DEP) required Pumping Test Report for the NRHS new water supply source. This is submitted as permit application BRP WS 19 in accordance with the requirements of the Massachusetts Drinking Water Regulations. The report describes soil boring, well installation and aquifer testing activities at NRHS, analyses of the collected hydrogeologic data to determine site-specific aquifer properties, groundwater modeling performed to determine the recommended yield and Zone II area, and an evaluation of land uses and groundwater protection measures within the proposed Zone II. On the basis of this work, a yield of 882,000 gallons per day (gpd) is recommended for the well field.

The NRHS well field site has one existing water supply well that is permitted for up to 100,000 gpd and is the current water supply to the regional high school. The site is at the northeast corner of property owned by the Nauset Regional School District, approximately 3,000 feet north-northeast of the intersection of Cable Road and Nauset Road. The test production well (NRHS TPW-1) is 80 feet west of the school's existing water supply well. The Zone I for the NRHS TPW-1 well is located on Nauset Regional School District and National Park Service (NPS) owned property.

The NRHS well field site is located in the northern region of the Nauset Lens aquifer, approximately one mile east-northeast of the high point of the freshwater mound where ground surface elevation is approximately 63 feet NAVD 88. Groundwater elevation at the NRHS site is approximately 13 feet NAVD 88 and the depth to the water table is approximately 50 feet bgs. The direction of groundwater flow at the site is towards the east.

In August 2009, Environmental Partners installed a deep boring and two observation wells at the NRHS site. The deep boring was drilled to a total depth of 400 feet bgs. The upper zone of unconsolidated material, known as the Eastham Plain Deposits, extends from the ground surface to a depth of approximately 110 feet bgs (-48 feet NAVD 88) and consists primarily of fine to coarse sand with some gravel. The Eastham Plain deposits are underlain by up to 300 feet of glacial lake deposits, consisting predominately of silts and clays. The aquifer is approximately 60 feet thick and extends from the water table to interface of the Eastham Plain deposits and the glacial lake silts and clays at 110 feet bgs. The saltwater interface was not encountered and is located within the low permeability clays or bedrock.

Between June and October 2010 long term aquifer pumping test activities were performed at the NRHS well field site. A five-day constant rate aquifer test was performed on NRHS TPW-1, and a limited aquifer test was performed at each of the observation wells. The observation well network was equipped with data loggers to record groundwater elevations before, during and after the pumping tests. Water quality sampling was also performed on the production well and observation well clusters.

The pump test was conducted on the NRHS TPW-1 well from August 25-30, 2010 at a pump rate of 613 gallons per minute (gpm) or 883,000 gpd. Available water over the well screen was 34 feet; therefore, with the required five-foot buffer above the well screen available drawdown in the production well was 29 feet. Total drawdown at the end of the five-day test was 26 feet, leaving 8 feet above the well screen. As a check of the drawdown stabilization, data from the last 24-hours of the pump test was plotted on a semi-log plot extrapolation of the time drawdown curve (time on the logarithmic scale) over a 180-day period. Based on this plot, total drawdown after 180-days was 26.75 feet, leaving seven feet of water above the well screen. The calculated Approvable Yield for NRHS TPW-1 was 684 gpm (984,960 gpd), however, because the regulations limit the yield to the rate at which the pump test was performed the maximum approvable yield for NRHS TPW-1 is 613 gpm (883,000 gpd).

The data derived from the pumping test was used to develop piezometric maps of water level drawdown conditions resulting from water withdrawals during the aquifer performance test and to develop estimates

of key aquifer parameters including, hydraulic conductivity, storativity, specific yield, vertical anisotropy, and aquifer thickness.

Groundwater modeling was performed using the SEAWAT numerical model developed by the U.S. Geological Survey (USGS). SEAWAT is a three-dimensional, variable-density, numerical model used to model groundwater flow and transport. The SEAWAT model was refined in the vicinities of the NRHS, District G, and District H sites based on site-specific data collected through field investigations.

The Zone II was defined by the SEAWAT model to simulate the conditions under no recharge (180 days) and a pumping rate of 883,000 gpd. The Zone II boundaries were determined using the particle tracking program MODPATH and takes into consideration natural hydrologic boundaries. Particles were placed at the water table and tracked for 200 years until the particles stopped at a model boundary. The Zone II and associated land use within the Zone II for the NRHS TPW-1 well field is shown on Figure ES-2. As shown on Figure ES-2, land use within the Zone II is comprised predominately of forested and residential use with some recreational and commercial uses. No potential sources of contamination were identified within the Zone II. An ongoing groundwater monitoring program is not proposed for the NRHS TPW-1 well field, because none of the land uses identified within the Zone II require the placement of monitoring wells.

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

December 4, 2014

Sheila Vanderhoef
Town of Eastham
2500 State Highway
Eastham MA 02642

RE: Applicant: Sheila Vanderhoef, Town of Eastham
Project Location: Various Locations, EASTHAM
Project Description: Construction of Wells, Storage Tank, and Water Distribution System
NHESP File No.: 09-27553
Documents Referenced:

- Figure 1 Water Distribution System and NHESP Priority Habitat of Rare Species Eastham, Massachusetts (dated September 2014; prepared by Environmental Partners Group, Inc.)
- Figure 2 District G Well and Tank Site Eastham, Massachusetts (dated September 2014; prepared by Environmental Partners Group, Inc.)
- Figure 3 NRHS Well Site Eastham, Massachusetts (dated September 2014; prepared by Environmental Partners Group, Inc.)

Dear Applicant:

The Massachusetts Division of Fisheries & Wildlife's Natural Heritage & Endangered Species Program (the "Division") received the MESA Project Review Checklist, site plans, and other required materials for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

Portions of the proposed project – including construction of a water supply well field and storage tank at District G, a water supply well field at Nauset Regional High School, and a water distribution system with approximately forty-five (45) miles of pipe and associated fire hydrants/valves – are located within the mapped *Priority Habitat* of the Eastern Box Turtle (*Terrapene carolina*) and Common's Panic-grass (*Dichanthelium ovale* ssp. *pseudopubescens*), state-listed as species of "Species Concern," pursuant to the MA Natural Heritage Atlas (13th Edition) These species and their habitats are protected pursuant to the MESA. Fact Sheets for these species can be found on our website, www.mass.gov/nhesp.

Water Supply Well Fields and Storage Tank at District G (Figure 2), Water Supply Well Field and Water Distribution System (Figure 3, Unpaved Roads) at Nauset Regional High School:

Based on the information provided and the information contained in our database, the Division has determined that these portions of the project, as currently proposed, **must be conditioned in order to avoid a prohibited "take" of the Eastern Box Turtle (321 CMR 10.18(2)(a))**. The project must adhere to the following condition:

- Turtle Protection Plan: Prior to the start of Work, the Applicant shall submit an Eastern Box Turtle Protection Plan to the Division for review and written approval. Said plan shall detail procedures for protecting state-listed turtles during construction, and be prepared and

> implemented by a qualified biologist pre-approved by the Division. Please note that any searches for state-listed turtles associated with the Turtle Protection Plan must occur during the turtle active season (April 15 – October 15), unless otherwise approved by the Division.

Provided the above-noted condition is fully implemented and there are no changes to the site plans, this portion of the project will not result in a "take" of state-listed species. This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18 for this portion of the proposed project. Any changes to this portion of the proposed project within *Priority Habitat* or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This portion of the proposed project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Water Distribution System (Figure 2, Unpaved Roads and Other Areas Associated with Water Supply Well Field and Storage Tank at District G):

The Division has been involved in ongoing consultations with the Applicant and their representatives regarding portions of the water distribution system proposed within unpaved roads and other areas associated with the water supply well field and storage tank at District G (labeled as "Water Main (Unpaved Rds)" on Figure 2). The Applicant suspended the 30-day MESA review timeline on October 31, 2014, in order to conduct surveys for Common's Panic-grass within all suitable habitat for this species and to assess design alternatives that avoid and minimize impacts to state-listed plant species based on survey results. Therefore, **the Division's review of this portion of the proposed project pursuant to the MESA is ongoing**. Based on a review of the information that has been provided, it also appears that this portion of the proposed project may need to be conditioned in order to avoid a prohibited "take" of the Eastern Box Turtle. Conditions will likely include, but may not be limited to, implementation of a Division-approved Turtle Protection Plan to protect state-listed turtles during construction. **No soil or vegetation disturbance, work, clearing, grading or other activities may occur related to this portion of the water distribution system until the Division has completed its review.** The Division will issue an additional determination letter once its review of this portion of the proposed project is complete.

Water Distribution System (Figure 1, Unpaved Roads South of Brackett Road):

Based on a review of the information that was provided and the information that is currently contained in our database, the Division has determined that the portions of the water distribution system proposed within existing unpaved roads (labeled as "Water Main (Unpaved Rds)" on Figure 1) south of Brackett Road, as currently proposed, **will not result in a prohibited "take"** of state-listed rare species. This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18 for this portion of the proposed project. Any changes to this portion of the proposed project within *Priority Habitat* or any additional work beyond that shown on the site plans may require an additional filing with the Division pursuant to the MESA. This portion of the proposed project may be subject to further review if no physical work is commenced within five years from the date of issuance of this determination, or if there is a change to the project.

Water Distribution System (Figure 1, Paved Roads):

Based on the information provided and the information contained in our database, the Division has determined that the portions of the water distribution system proposed within existing paved roads (labeled as "Water Main (Paved Rds)" on Figure 1), as currently proposed, **appear to be exempt from MESA review** pursuant to 321 CMR 10.14, which states: "[t]he following Projects and Activities shall be exempt from the requirements of 321 CMR 10.18 through 10.23…

> (10) installation, repair, replacement, and maintenance of utility lines (gas, water, sewer, phone, electrical) for which all associated work is within ten feet from the edge of existing paved roads, and the repair and maintenance of overhead utility lines (phone, electrical) for which all associated work is within ten feet from the edge of existing unpaved roads,

provided, however, that unpaved utility access roads associated with exempt activities under 321 CMR 10.14(11) shall be addressed in and subject to the Division-approved operation and maintenance plan required thereunder;

Any changes to this portion of the proposed project or any additional work beyond that provided in the site plans may require a filing with the Division pursuant to the MESA and its implementing regulations.

If you have any questions about this letter, please contact Jesse Leddick, Endangered Species Review Biologist, at (508) 389-6386 or jesse.leddick@state.ma.us.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark White, Environmental Partners Group, Inc.

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

November 18, 2014

Maeve V. Bartlett, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Alex Strysky, EEA No. 15273
100 Cambridge St.
Boston, MA 02114

Project Name:	*Eastham Water System*
Project Description:	*Construction of Municipal Water System, Including Wells, Storage Tank and Distribution System*
Proponent:	*Town of Eastham*
Location:	*Eastham*
Document Reviewed:	*Environmental Notification Form*
EEA No.:	*15273*
NHESP No.:	*09-27553*

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the "Division") has reviewed the Environmental Notification Form (ENF) for the *Eastham Water System* and would like to offer the following comments regarding state-listed species and their habitats.

Portions of the project are located within *Priority Habitat* for state-listed rare species, as indicated in the MA Natural Heritage Atlas (13th Edition). Based on a review of the information that was submitted and the information that is contained in our database, the Division anticipates that portions of the proposed project will occur within the habitat of various state-listed invertebrate, vertebrate, and plant species. These species and their habitats are protected pursuant to the Massachusetts Endangered Species Act (MGL c.131A) and its implementing regulations (321 CMR 10.00) (MESA).

Portions of the project that will occur within the *Priority Habitat* for state-listed species, which are not otherwise exempt from MESA review pursuant to 321 CMR 10.14, require a direct filing with the Division for compliance with the MESA. The Proponent has submitted site plans and associated materials to the Division for review pursuant to the MESA, which is ongoing. The Division notes that the installation of utility systems within ten (10) feet of the edge of existing paved roads may be exempt from MESA review pursuant to 321 CMR 10.14, which states that "[t]he following Projects and Activities shall be exempt from the requirements of 321 CMR 10.18 through 10.23…"

> [10] installation, repair, replacement, and maintenance of utility lines (gas, water, sewer, phone, electrical) for which all associated work is within ten feet from the edge of existing paved roads, and the repair and maintenance of overhead utility lines (phone, electrical) for which all associated work is within ten feet from the edge of existing unpaved roads, provided, however,

that unpaved utility access roads associated with exempt activities under 321 CMR 10.14(11) shall be addressed in and subject to the Division-approved operation and maintenance plan required thereunder;

The complete list of MESA filing exemptions may be found on the Division's website. Based on a review of the information that was submitted, we anticipate that the majority of the proposed distribution system will qualify as exempt from MESA review pursuant to 321 CMR 10.14.

For non-exempt portions of the project, the Proponent has been involved in ongoing consultations with the Division to avoid and minimize impacts to state-listed species and their habitats. The Division's review is currently ongoing. At this time, the Division anticipates that the proposed Water Supply Well Fields at District G and Nauset Regional High School, as well as the Water Storage Tank at District G, may need to be conditioned in order to avoid a "take" of state-listed species. Conditions may include, but may not be limited to, implementation of a Division-approved turtle protection plan during construction.

The Division also anticipates that a small, non-exempt portion of the distribution system associated with the proposed Water Supply Well Fields and Storage Tank at District G, as currently designed, may necessitate surveys for state-listed plant species. Survey information would be used by the Division to determine if there will be a "take" of state-listed plants associated with the proposed project. If the project is determined to result in a "take," it may be possible to redesign the project to avoid a "take." If redesign is not possible, the Proponent should note that projects resulting in a "take" of state-listed species may only be permitted if they meet the performance standards for a Conservation and Management Permit (321 CMR 10.23). Although it is currently unclear whether the project will result in a "take," the Division anticipates being able to resolve any outstanding issues related to state-listed species during the MESA permitting process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed. We appreciate the opportunity to comment on this project, and look forward to working with the Proponent to address outstanding rare species concerns. If you have any questions or need additional information, please contact Jesse Leddick, Endangered Species Review Biologist, at jesse.leddick@state.ma.us or (508) 389-6386.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark White, Environmental Partners Group
Eastham Conservation Commission
Eastham Board of Selectmen
Eastham Planning Board

Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
tel: (508) 389-6360, fax: (508) 389-7891
www.nhesp.org

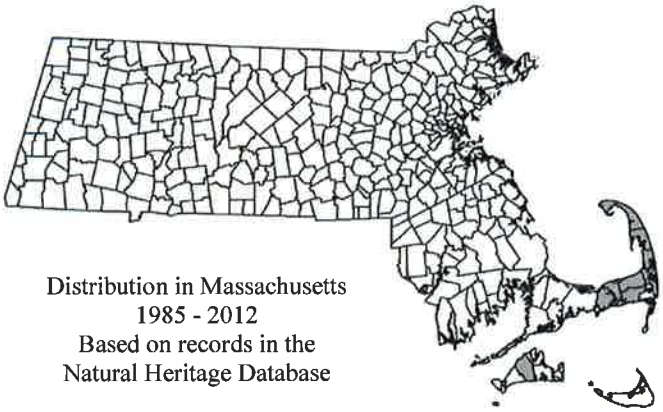
Commons's Panic-grass

Dichanthelium ovale (Ell.) Gould & Clark ssp. *pseudopubescens* (Nash) Freckmann and Lelong

State Status: Special Concern
Federal Status: None

Description: Commons's Panic-grass (*Dichanthelium ovale* ssp. *pseudopubescens*) is a short (15–60 cm; 6–24 in.), hairy perennial in the Grass family (Poaceae). It grows in small clumps and becomes more branched and bushy through the summer. Similar to other panic-grasses, Commons's Panic-grass has an open, branched cluster of small spikelets, and each spikelet contains a single floret (a small individual flower). In Commons's Panic-grass, the inflorescence is 3 to 10 cm tall. The lower stems and leaf sheaths (the lower part of the leaf surrounding the stem) of Commons's Panic-grass are hairy. The upper leaf blades are 2 to 6 mm wide and somewhat hairy on both the upper and lower surfaces.

Commons's Panic-grass growing with other sand plain vegetation on the coast of Massachusetts. Photo by Bruce Sorrie.



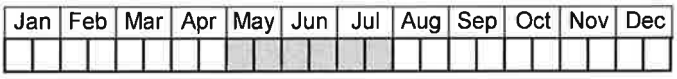
Distribution in Massachusetts
1985 - 2012
Based on records in the
Natural Heritage Database

Aids to Identification: To positively identify Commons's Panic-grass and other species of *Dichanthelium*, a technical manual must be used. Commons's Panic-grass is distinguished from other members of the genus in part by its distinct ligules of hairs that are 1 to 4 mm long extending from the top of the leaf sheath. Commons's Panic-grass is also characterized by its spikelets, which are 2.1 to 2.6 mm long. Hairs on the vegetative structures of Commons's Panic-grass do not have a small blister (pustule) at the base of each hair.

Similar Species: In Massachusetts, Commons's Panic-grass must be distinguished from *Dichanthelium ovale* ssp. *villosissimum*, which has pustulose-based hairs on the leaf sheaths and larger leaves that are 6 to 10 mm wide. Common's Panic-grass can be distinguished from other common *Dichanthelium* species by spikelet length. Both Round-fruited Panic-grass (*D. sphaerocarpon)* and Auburn Panic-grass (*D. acuminatum*) have smaller spikelets while Few-flowered Panic-grass (*D. oligosanthes*) has larger spikelets.

Please allow the Natural Heritage & Endangered Species Program to continue to conserve the biodiversity of Massachusetts with a contribution for 'endangered wildlife conservation' on your state income tax form as these donations comprise a significant portion of our operating budget.

Flowering in Massachusetts



Population Status in Massachusetts: Commons's Panic-grass is listed under the Massachusetts Endangered Species Act as Special Concern. All listed species are protected from killing, collecting, possessing, or sale, and from activities that would destroy habitat and thus directly or indirectly cause mortality or disrupt critical behaviors. Commons's Panic-grass is currently known from Barnstable and Dukes Counties, and was documented historically from Nantucket County.

Range: Commons's Panic-grass occurs on the coastal plain from Massachusetts to Florida and locally at inland locations from Pennsylvania to Illinois. It also occurs in Michigan, Minnesota, Ohio, and Wisconsin.

Habitat: Commons's Panic-grass is typically found in dry, sandy habitat on the coastal plain and in sand barrens. It can also be found in dry pine-oak woods in sites with moderate disturbance. Sandy areas along roadsides and power line cuts may provide ongoing disturbances needed to maintain habitat for Commons's Panic-grass. Plants found in association with Commons's Panic-grass include Auburn Panic-grass, Little Bluestem (*Schizachyrium scoparium*), and Pitch Pine (*Pinus rigida*).

Threats and Management Recommendations: Known habitat locations for Commons's Panic-grass should be protected from dramatic changes in light or moisture conditions. Moderate disturbance may be needed periodically to maintain sandy habitat and to prevent competition and succession. All active management of rare plant populations (including invasive species removal) is subject to review under the Massachusetts Endangered Species Act, and should be planned in close consultation with the Massachusetts Natural Heritage & Endangered Species Program.

References and Additional Information:

Gleason, H. A., and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada,* 2nd edition. The New York Botanical Garden, Bronx, NY.

Haines, A. 2011. *Flora Novae Angliae – a Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England.* New England Wildflower Society, Yale Univ. Press, New Haven, CT.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. *Sabatia campanulata.* NatureServe, Arlington, VA. http://www.natureserve.org/explorer.

Updated 2012
Map Updated 2012

Please allow the Natural Heritage & Endangered Species Program to continue to conserve the biodiversity of Massachusetts with a contribution for 'endangered wildlife conservation' on your state income tax form as these donations comprise a significant portion of our operating budget.

Environmental Partners
A partnership for engineering solutions.

September 30, 2014

MESA File Reviewer
Regulatory Review
Natural Heritage & Endangered Species Program
100 Hartwell Street, Suite 230
West Boylston, MA 01583

RE: Eastham, MA
Eastham Water Distribution System
MESA Project Review Checklist

Dear File Reviewer:

On behalf of the Town of Eastham, Environmental Partners Group has prepared this cover letter and attachments for a MESA Project Review of the proposed Eastham Water System project. This MESA submittal is being submitted in advance of environmental regulatory notifications being performed with the Massachusetts Executive Office of Environmental Affairs, Massachusetts Environmental Protection Act (MEPA) for an Expanded Environmental Notification Form and Environmental Impact Report, as well as for a Notice of Intent (MassDEP WPA Form 3 in accordance with the requirements of the Wetlands Protection Act.

The Town of Eastham, at their May 2014 Annual Town Meeting, voted to establish a municipal water system that will provide service to approximately one third of the Town's properties (2,021 parcels). The project consists of constructing two well fields, a water storage tank, and 45 miles of water mains. A plan showing this water system, as approved at the Town Meeting, is shown in Figure 1. Figure 1 also shows the location of NHESP Priority Habitats of Rare Species for the project area, as provided on Mass GIS mapping. A description of the various elements of the project is provided below.

Water Supply Well Fields at District G and Nauset Regional High School

The two water supply well fields to be constructed as part of this project, located at the so-called "District G" property owned by the Town (Figure 2) and at the Nauset Regional High School (NRHS) (Figure 3), have already successfully received New Source Approvals by DEP. As part of the New Source permitting that was performed, NHESP conducted a rare species review of these two well fields, as well as for a third well field ("District H") that will be constructed at a later date should the Town choose to authorize additional phases of this municipal water system. The NHESP review letter (File 09-27553) is attached for your convenience, and concluded that construction activities at these well field sites will not result in a prohibited take of state-listed rare species.

The well fields currently have existing 12-inch wells that were used for the prolonged aquifer performance tests associated with the DEP New Source approval process, and that will become the water supply wells serving the system. As part of the construction a small pump house (approximately 26' x 11') will be installed at each site to house telemetry and water conditioning equipment, together with a generator and propane tank for backup electrical and heating

purposes. Underground electrical utilities and water mains will be installed to the wells on existing access roads. Chain link fencing is to be placed around the wells and pump house for security purposes. Photographs showing existing conditions at District G and NRHS are attached (Photos #1 through #4).

Water Storage Tank at District G

The proposed storage tank is to be located at the southern area of the Town's District property. It will be located in a previously cleared area (see Photo #5), and is to be an elevated tank with a 750,000 gallon capacity. The overall area where the tank is to be located will be approximately 150' x 150' and includes underground water, drain and electrical utilities, a gravel driveway around the tank, and an 8-foot high security fence.

Distribution System

The distribution system consists of 45 miles of pipe with associated fire hydrants and valves that will serve 2,021 properties, representing approximately one-third of the community. Looped transmission mains are to be located throughout the Town to provide what is referred to as the "backbone" of the distribution system that, should the Town decide to do so in the future, serve a Town-wide water system. Water mains of 12-inch, 10-inch, and 6-inch diameter are to be installed, almost exclusively within existing roadway right-of-ways.

Calculation of Area of Disturbance

The area of disturbance was calculated on the basis of where construction activities at the two well fields, storage tank and water main piping will occur within the mapped Priority Habitat and outside existing paved areas. A large majority of the water main installations will take place within the limits of existing paved roadways (see Figure 1 and Photo #6) and therefore are exempt from review under CMR 321 CMR 10.14.(10). The overall project area is 31.8 acres in size, of which 3.5 acres will be disturbed

If you require additional information or have any questions, please contact me at (617) 657-0200.

Very truly yours,

ENVIRONMENTAL PARTNERS GROUP, INC.

Mark White
Project Manager

Attachments:
1. MESA Project Checklist
2. MESA Project Checklist and Supporting Figures
3. Division of Fisheries & Wildlife: MESA Review Letter (NHESP File No. 09-27553), January 2010
5. $300.00 Check – Review Fee

Cc: Sheila Vanderhoef, Eastham Town Administrator and Local Water Resources Management Official

MESA PROJECT REVIEW CHECKLIST

Massachusetts Endangered Species Act M.G.L. c. 131A and Regulations (321 CMR 10.00)

Massachusetts Division of Fisheries & Wildlife
Natural Heritage & Endangered Species Program

~~~~ CONTACT INFORMATION ~~~~

If you already completed your Notice of Intent- Form 3, you can send page 1 of the NOI in place of questions 1 through 4 in this section

1. **Project Location:**

Eastham, MA	Eastham	02642
Street Address/Location	City/Town	Zip Code
Map 6/Lot 140	Map 9/Lot 421; Map 5/Lot 005a; Map 5/Lot 28&29	
Assessors Map/Plat Number	Parcel /Lot Number	

2. **Applicant:**

Sheila	Vanderhoef	Town of Eastham
First Name	Last Name	Company
2500 State Highway		
Mailing Address		
Eastham	MA	02642
City/Town	State	Zip Code
508-240-5900x207		svanderhoef@eastham-ma.gov
Phone Number	Fax Number	Email address

3. **Property owner (if different from applicant):**

First Name	Last Name	Company
Mailing Address		
City/Town	State	Zip Code
Phone Number	Fax Number	Email address

4. **Representative (if any):**

Environmental Partners Group, Inc.		
Company		
Mark	White	
Contact Person First Name	Contact Person Last Name	
1900 Crown Colony Drive, Suite 402		
Mailing Address		
Quincy	MA	02169
City/Town	State	Zip Code
617-657-0200	617-657-0201	mnw@envpartners.com
Phone Number	Fax Number	Email address

~~~~ FILING FEES ~~~~

See Fee Schedule below

a. Total MESA Fee Paid $300.00 b. Acreage of Disturbance* 3.5 ac c. Total Site Acreage 31.8 ac

~~~~ REQUIRED SIGNATURES~~~~

I hereby certify under the penalties of perjury that the foregoing MESA filing and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

Signature of Property Owner/Record Owner of Property — Date

Mark M. White — Sept 30, 2014

Signature of Applicant (required, if different from Owner) — Date

Please send form, required information, and filing fee (payable to "Comm. of MA - NHESP") to:

Regulatory Review
Natural Heritage & Endangered Species Program
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife

Questions regarding this form should be directed according to the county that the property is located:

Berkshire, Essex, Franklin, Hampshire, Hampden, Middlesex & Worcester Counties call: 508-389-6361
Barnstable, Bristol, Dukes, Nantucket, Norfolk, Plymouth & Suffolk Counties call: 508-389-6364

PROJECT REVIEWS
321 CMR 10.18

Project Definition	Project Criteria	Fee	Response Time
Simple	Less than 5 acres of disturbance*	$ 300.00	60 days from determination of complete filing
Intermediate *(Moderate)*	5 to 20 acres of disturbance*	$ 1800.00	60 days from determination of complete filing
Complex	More than 20 acres of disturbance* or project requires wetlands variance	$ 4000.00	60 days from determination of complete filing
Linear	Projects greater than 1 mile in length.	$ 4000.00 per Priority Habitat intersected	60 days from determination of complete filing

* Disturbance means direct physical disturbance of the land surface or waterbody, soil and/or vegetation, if only a portion of the project site is located within Priority Habitat, indicate total area of disturbance for site as a whole.

~~~~ADDITIONAL INFORMATION ~~~~

1. Will this project require a filing with the Conservation Commission and/or DEP? ☐ No ☑ Yes
2. Will this project meet any threshold for a MA Environmental Policy Act (MEPA) filing (excluding rare species, 301 CMR 11.03 (2))? ☐ No ☑ Yes
3. Has this project previously been issued a NHESP Tracking Number (either by previous NOI Submittal or MESA Information Request Form)? ☐ No ☑ Yes

If Yes - Tracking No. 09-27553

~~~~PROJECT DESCRIPTION (attach separate sheet, as needed) ~~~~

Please note, certain projects or activities are exempt from review, see 321 CMR 10.14. The MESA does not allow project segmentation. Your filing must reflect all anticipated work associated with the proposed project (CMR 321 10.16).

Construction of a new water system in the Town of Eastham, MA. The work consists of two (2) well fields with pump house buildings, an elevated water storage tank, and 45 miles of water mains. Please refer to Figures 1, 2 and 3 for project locations.

~~~~INCLUDE THE FOLLOWING INFORMATION ~~~~

The NHESP will notify the applicant within 30 days if the materials submitted do not satisfy requirements for a filing and request submission of any missing materials (321 CMR 10.18(1)).

ALL Applicants must submit:

- ☑ USGS map (1:24,000 or 1:25,000) with property boundary clearly outlined
- ☑ Project plans for entire site (including wetland Resource Areas, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work)
- ☑ Assessor's map or right-of-way plan of site
- ☑ Project description
- ☑ Statement/proof that applicant is the Record Owner or that applicant is a person authorized in writing by the record owner to submit this filing
- ☑ Photographs representative of the site

Projects altering* 10 or more acres, must also submit:

- ☐ A vegetation cover type map of the site
- ☐ Project plans showing Priority Habitat boundaries

The NHESP may request additional information, such as, but not limited to, species and habitat surveys, wetland reports, soil map and reports, and stormwater management reports (321 CMR 10.16).

*Alteration: Any physical alteration of land, soils, drainage or destruction of plant life, see "Project or Activity" (321 CMR 10.02).

1. ***FIGURE 1 – WATER DISTRIBUTION SYSTEM AND NHESP PRIORITY HABITAT OF RARE SPECIES***
2. ***FIGURE 2 – DISTRICT G WELL AND TANK SITE***
3. ***FIGURE 3 – NRHS WELL SITE***
4. ***FIGURE 4 – WATER DISTRIBUTION SYSTEM WITH USGS QUAD BASEMAP 1:25,000***
5. ***TOWN ADMINISTRATOR WEB PAGE PRINTOUT (PROOF OF AUTHORIZED APPLICANT)***
6. ***PROJECT PHOTOGRAPHS***

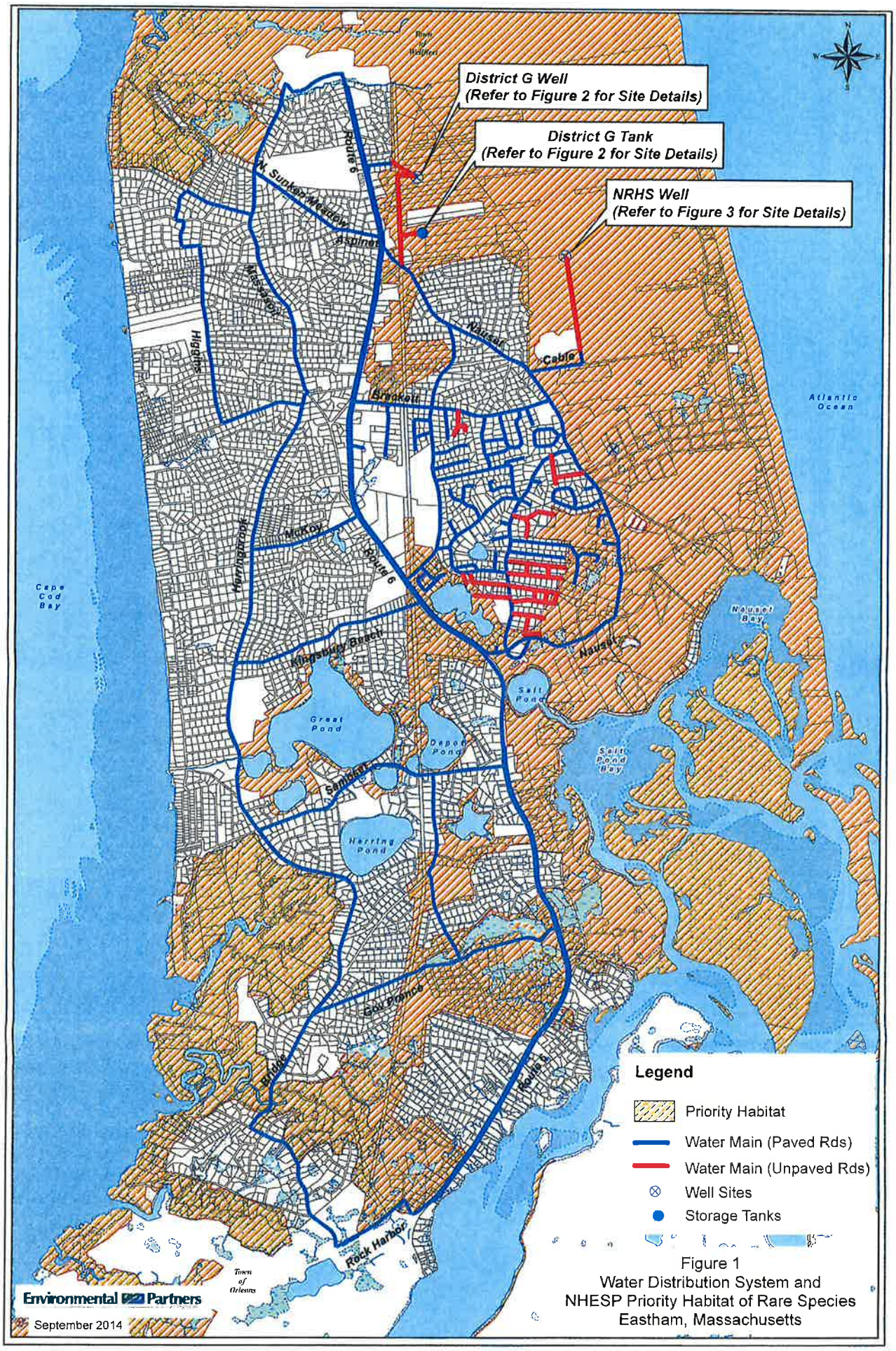


Figure 1
Water Distribution System and
NHESP Priority Habitat of Rare Species
Eastham, Massachusetts

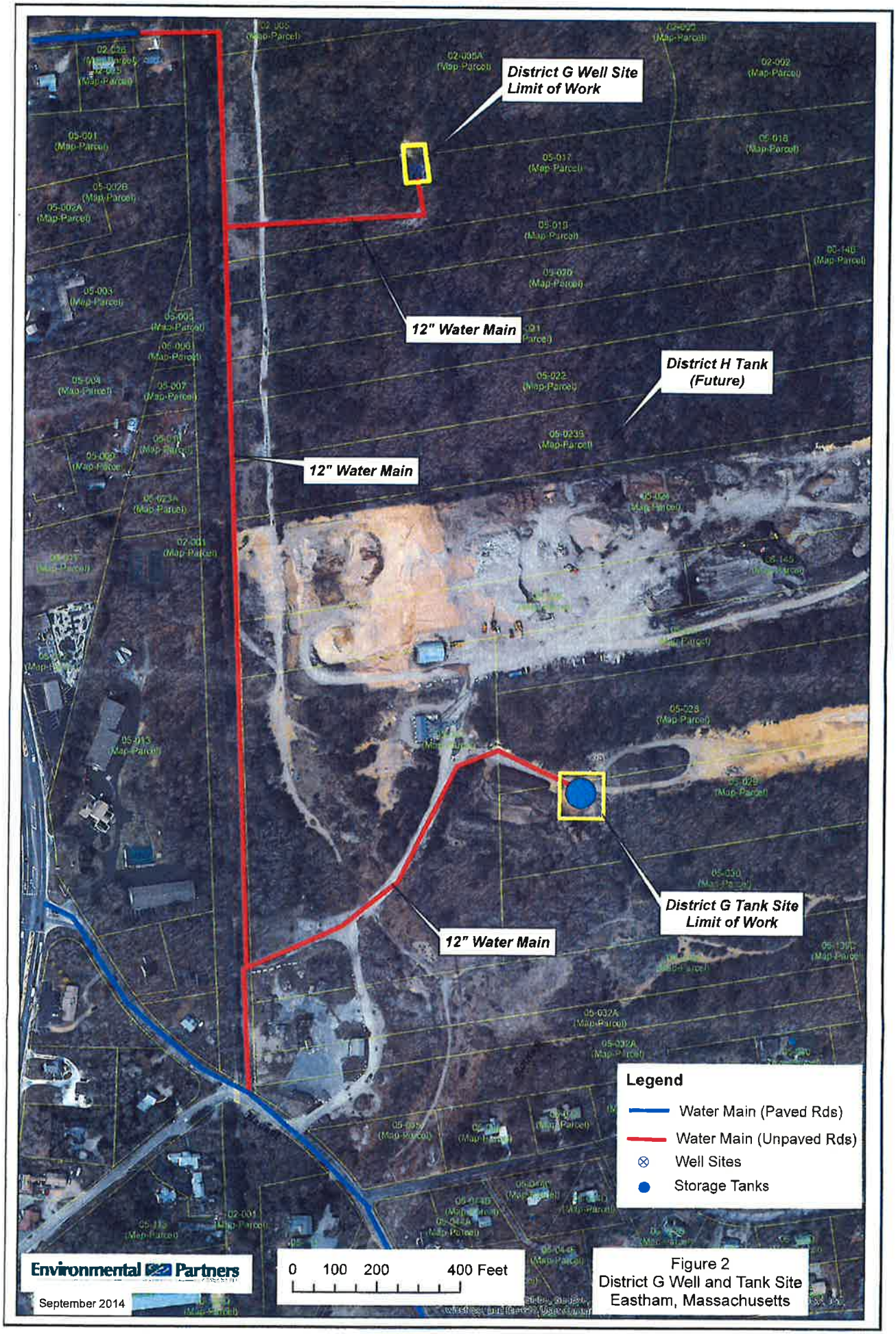


Figure 2
District G Well and Tank Site
Eastham, Massachusetts

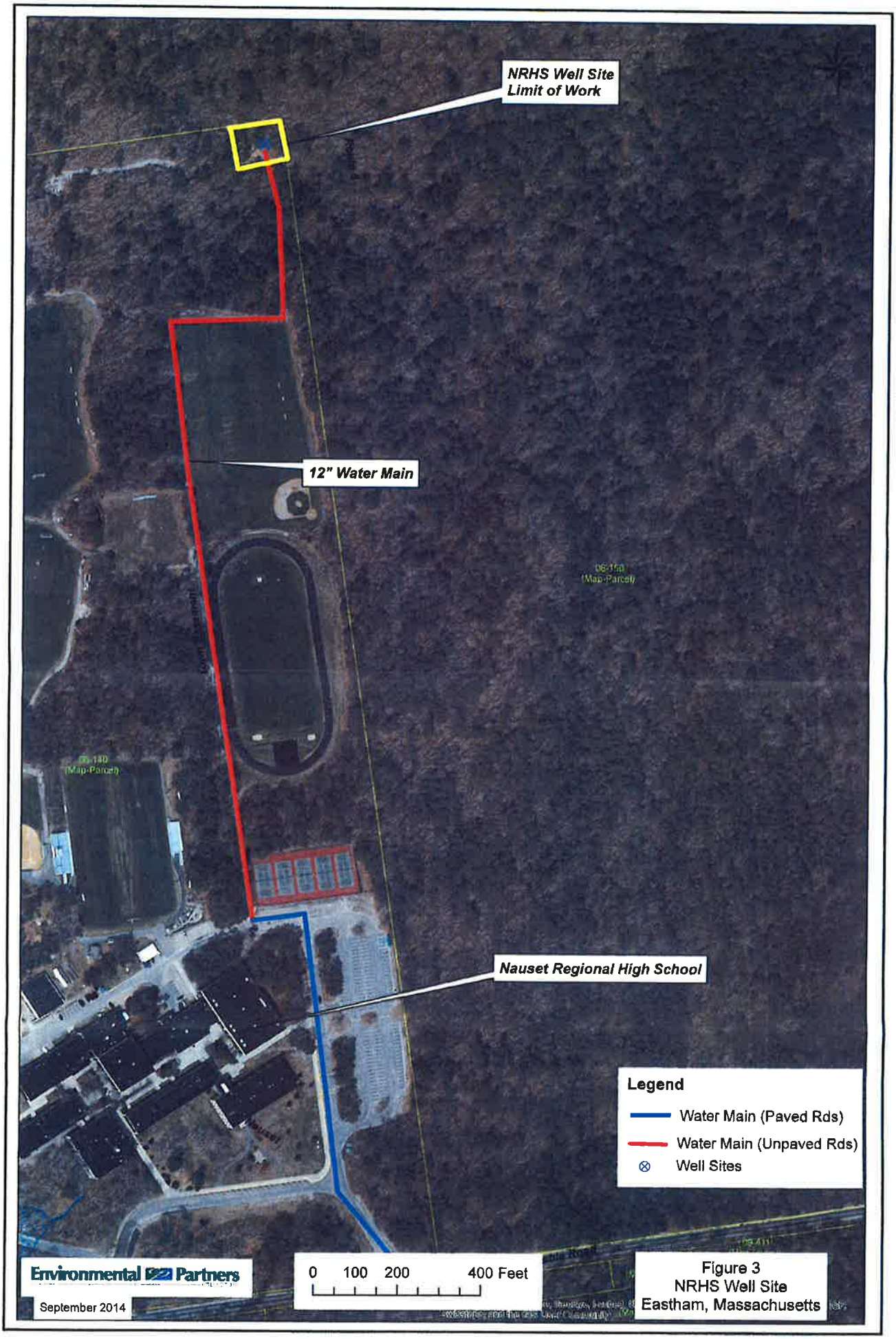


Figure 3
NRHS Well Site
Eastham, Massachusetts

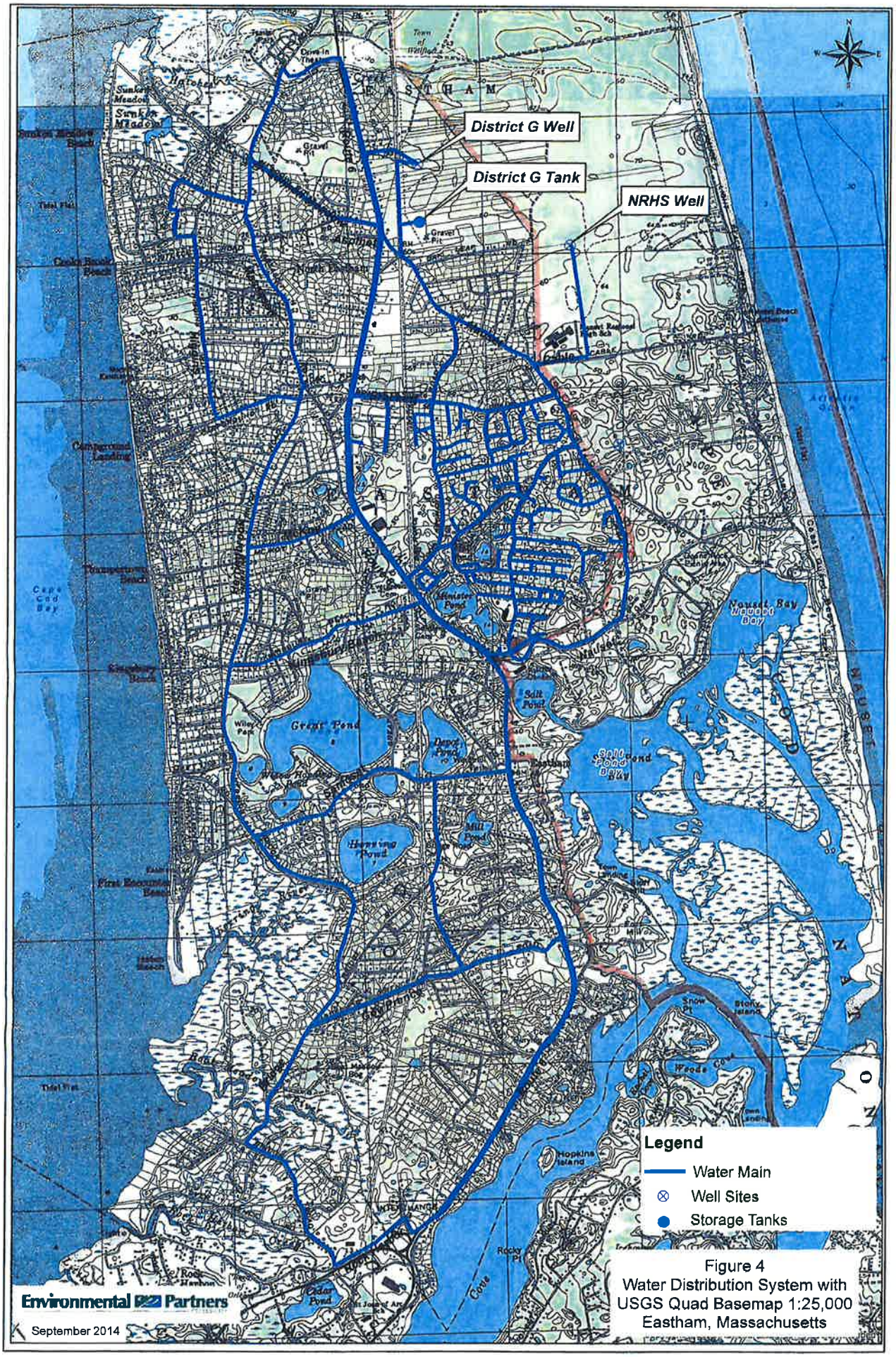


Figure 4
Water Distribution System with
USGS Quad Basemap 1:25,000
Eastham, Massachusetts

Photo #1: District G Well Site – Existing Access Road.

Photo #2: District G Well Site. New public water supply well will be located in the immediate vicinity of the existing test wells.

Photo #3: Nauset Regional High School Well Site – Access Road. Existing Nauset Regional High School well just visible at the end of the path in this photo.

Photo #4: Nauset Regional High School Well Site. Two test wells in center of photo. Existing High School well located just to the right of the photo. New public water supply well would be located in the immediate vicinity of the test wells.

Photo #5: District G StorageTank Site. The storage tank is to be located in the open, previously disturbed area shown.

Photo #6: Typical Eastham Paved Road. The majority of the water mains are to be placed within the paved areas of the roads.

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

January 05, 2010

Sheila Vanderhoef
Town of Eastham
2500 State Highway
Eastham MA 02642

RE:	Project Location:	Nauset Regional High School, "District H", and District "G" in Eastham
	Project Description:	Phase I - "Water Supply Source Development" including field studies and well construction/performance testing
	NHESP File No.:	**09-27553**

Dear Ms. Vanderhoef:

Thank you for submitting the MESA Project Review Checklist and other required materials to the Natural Heritage and Endangered Species Program (NHESP) of the MA Division of Fisheries & Wildlife for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

Based on a review of the information that was provided and the information that is currently contained in our database, the NHESP has determined that **Phase I**, as currently proposed, **will not result in a prohibited "take"** of state-listed rare species. **This project requires additional review for future phases.** This determination is a final decision of the Division of Fisheries & Wildlife pursuant to 321 CMR 10.18. Any changes to the proposed project or any additional work beyond that shown on the site plans may require an additional filing with the NHESP pursuant to the MESA. This project may be subject to further review if no physical work is commenced within three years from the date of issuance of this determination, or if there is a change to the project.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions regarding this letter please contact Amy Coman, Endangered Species Review Assistant, at (508) 389-6364.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: C. Carter Fahy, Environmental Partners Group, Inc

Town of Eastham, Massachusetts

On Our Site
- A History of Eastham
- Town Departments
- Boards & Commissions
- Town Calendars
- Emergency Services
- Assessment Data
- Tax Payment History
- Paying Your Taxes
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Limited Municipal Water System

Task 1 - Project Definition and Feasibility Study

August 2005

Town of Eastham

Environmental Partners GROUP
A partnership for engineering solutions.

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EXECUTIVE SUMMARY

The Town of Eastham (Town) contracted Environmental Partners Group (EPG) to provide engineering services related to development of a limited municipal water system near the Town's capped landfill. Historic and recent findings of an on-going groundwater monitoring program have shown elevated volatile organic compound (VOC) concentrations in areas South and East of the closed landfill. It is suspected that the landfill has affected drinking water supply wells on nearby private properties, thereby forcing the Town to provide bottled water or on-site water treatment to those home owners "reporting measurable concentrations of vinyl chloride-related impact" (Bennett and O'Reilly 2005 15). Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOC in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill.

The proposed limited municipal water supply area will be enclosed by Glacier Hills to the North, Old Orchard Road to the West, Nauset Road to the East, and Route 6 to the South. Based on an estimated 300 homes within the proposed service area and an average daily water demand of 200 gallons per connection, the estimated initial water requirement is 60,000 gallons per day (42 gallons per minute). The water supply area includes mainly single family homes, and therefore a peak day demand factor of two was utilized to develop an initial maximum day estimate of 120,000 gallons. Potential water supply sources were identified including existing and new groundwater withdrawal locations, and connection to the Town of Orleans water system was also given consideration. The possible water supply sources documented will be further researched and evaluated in EPG's next phase of work, *Task 2 – Water Supply Source Identification.*

Utilizing a 25% contingency for conceptual level water system planning, the proposed limited water supply system will be on the order of $4.8 million dollars including engineering, legal, and initial capital. Based on 300 existing homes within the limited municipal water supply system, the opinion of probable cost per homeowner equates to approximately $16,000. It is estimated that operation and maintenance costs for the proposed limited municipal water supply system would be on the order of approximately $150,000 to $200,000 per year. Based on 300 existing homes, the initial yearly cost per homeowner would equate to approximately $580. The "No Action" alternative in which the Town continues to provide one point of entry water treatment system at 325 Schoolhouse Road and bottled drinking water to seven other residents in the affected area in lieu of the proposed water system would cost approximately $150,000 per year. Depending on grant eligibility, the annual capital costs for the proposed limited municipal water system with operation and maintenance costs would range between $250,00 to $470,000.

1. INTRODUCTION/BACKGROUND

The Town of Eastham (Town) contracted Environmental Partners Group (EPG) to provide engineering services related to development of a limited municipal water system near the Town's capped landfill. The Town is a municipality located on Cape Cod, Massachusetts with a year-round population of approximately 5,646 and a land area of roughly 27 square miles. The Town is surrounded by the Atlantic Ocean and Cape Cod National Sea Shore to the East, Cape Cod Bay to the West, Town of Wellfleet to the North, and Town of Orleans to the South.

Historic and recent findings of an on-going groundwater monitoring program have shown elevated volatile organic compound (VOC) concentrations in areas South and East of the closed landfill. It is suspected that the landfill has affected drinking water supply wells on nearby private properties, thereby forcing the Town to provide bottled water or on-site water treatment to those home owners "reporting measurable concentrations of vinyl chloride-related impact" (Bennett and O'Reilly 2005 15). Well water of home owners within the estimated impact area was sampled in order to gauge the influence of the suspected landfill plume(s) on the local drinking water supply, as shown in *Appendix A – Water Quality Investigation Area Map* prepared by Bennett & O'Reilly, Inc.

Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOC in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill. An initial water supply feasibility report was completed by ATP Environmental circa 1996 to address Massachusetts Department of Environmental Protection (DEP) comments generated from the Eastham Landfill Comprehensive Site Assessment.

As part of EPG's scope of work, this report provides the Town with a feasibility study to evaluate the practicality of a limited water supply for the area of Eastham affected by elevated VOC groundwater concentrations. The assessment for the water supply system was made in terms of water needs, potential groundwater supply sources, opinion of probable program costs, funding alternatives, and review of regulatory and institutional issues. The product of this work task provides the Town with a conceptual plan to implement a limited water supply system in the area that appears to have been affected by the capped landfill. The demands and requirements of a possible future town-wide municipal water system were also considered during the preparation of this report and through the evaluation of the current proposed limited municipal water system. Once consensus has been reached on the conclusions and recommendations of this Task 1 report, EPG will continue work associated with developing a water supply system by identifying the most viable and cost effective potable water supply sources for the Town to pursue.

2. EVALUATION OF EXISITING CONDITIONS

2.1 Current Methods of Water Supply

With the exception of a small number of lots along the Town of Orleans and Eastham border, all home owners and businesses within the Town of Eastham currently utilize private groundwater wells for drinking water. The northern portions of the Town sit above the Nauset Lens aquifer, whereas southern Eastham rests above the Monomoy Lens. Both flow cells provide the Town with a potable freshwater source. The Town does not currently own or operate a municipal water system. The *Town of Eastham – Local Comprehensive Plan, Second Edition 2002* notes:

> Eastham's water delivery system consists entirely of private wells. Most of these are on-site domestic water supply wells drawing about 200 gallons per day (gpd). Some are Small Volume Wells, serving various businesses, condominiums, and office buildings for which the withdrawal volumes can be substantially larger. Currently, there are known to be 50 such wells of which seven (7) are non-transient/non-community public water supply systems, and 43 are transient/non-community public water supply systems. Only a few services near the Orleans town line are connected to the Orleans public water supply (30).

2.2 Landfill Contamination Threats

In 1997, the Town's sanitary landfill was capped and a groundwater monitoring program was instituted in accordance with regulatory requirements. Recently, elevated VOC concentrations in private groundwater drinking wells East and Southeast of the landfill have raised concerns with the possible contamination of drinking water wells by a landfill contamination plume. More specifically, it appears that "the presence of a low-level dissolved-phase chlorinated solvent plume which appears to have emanated from the Eastham Landfill prior to its capping in 1997" is affecting deep water wells (Bennett and O'Reilly 2005 15). Deep groundwater wells were installed for some properties around the landfill due to performance issues with shallow depth wells, such as fouling by iron bacteria. From recent private well sampling, "chlorinated solvents have been reported in isolated wells set below 150' bgs (-100' +/- NGVD)" (Bennett and O'Reilly 2005 4).

Drinking water quality has been affected for residents down gradient from the landfill, as shown in *Appendix A – Water Quality Investigation Area Map* prepared by Bennett & O'Reilly, Inc. To date, one point of entry water treatment system has been installed at 325 Schoolhouse Road and seven other residents in the area have been offered and/or provided bottled drinking water. From the current site investigation of the area down-gradient from the landfill, "based on the spacial occurrence of vinyl chloride and/or its parent contaminants…, the primary axis of the contaminant plume extends from the Eastham Landfill some 2,000' south-southeast to the area of the Residence at 325 Schoolhouse Road, while a secondary area of impact has been identified to the northwest of the subject Residence in a cross-gradient location" (Bennett and O'Reilly 2005 5).

Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOCs in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill. An initial limited water supply feasibility report was completed by ATP Environmental circa 1996 to address Massachusetts Department of Environmental Protection (DEP) comments generated from the Eastham Landfill Comprehensive Site Assessment. Additionally, the Bennett and O'Reilly *Immediate Response Action Status Report II – Tier Classification/Numerical Ranking February 14, 2005* states:

> Based on the technical feasibility and practicality of treatment as such low-level concentrations and depth within the aquifer, it appears that containment of chlorinated solvents through isolation is the most practical and cost effective remedial alternative at this time. Such isolation will likely come in the form of Board of Health and/or Zoning Regulations as previously discussed wherein they would be utilized as an interim measure until an alternate municipal water supply could be provided (15).

Based on this documentation between the Town and DEP, Eastham is considering construction of an alternate municipal water supply in the area East and South of the landfill to provide residents with safe, protected drinking water.

3. DEFINITION OF SERVICE AREA

As described in *Section 2.2 Landfill Contamination Threats*, a suspected contamination plume from the capped municipal landfill in the Town of Eastham has caused elevated VOC concentrations in nearby drinking water wells. The intent of the current project was to investigate a limited municipal water supply system to services areas South and East of the existing landfill to accommodate those properties affected by the suspected landfill plume. In the past, the Town has considered the possibility of a town-wide system to provide potable water to the residents and businesses of Eastham. The demands and requirements of a possible future town-wide municipal water system were considered during the preparation of this report and through the evaluation of the limited municipal water system as currently proposed by the Town.

3.1 Water Usage Estimates

Previous reports and studies completed for Eastham and lower Cape Cod have proposed a variety of water usage estimates. A summary of these estimates is provided in *Table 3.1 Water Usage Estimates*.

Table 3.1
Water Usage Estimates

Report	Date	Average Day Usage	Max Day Usage
Report on Proposed Water System Eastham, MA by Whitman & Howard	1970	–	600 gpd/connection (150 gpd/person)
Water Resources of Outer Cape Cod by Lower Cape Water Management Task Force	1998	244 gpd/connection[1] 300 gpd/connection[2]	–
Town of Eastham – Local Comprehensive Plan	2002	200 gpd/domestic water supply well	–
Water System Master Plan Town of Wellfleet, MA by Environmental Partners Group	2003	155 gpd/connection	–
Massachusetts Department of Environmental Protection Guidelines	-	85 gpd/person	–

gpd – gallons per day
mgal – million gallons per day
1 – Cape Cod average use
2 – Projected usage for Wellfleet Center and the Rt. 6 corridor and landfill area in Eastham

To maintain consistency with the Town's existing Local Comprehensive Plan, an average day usage of 200 gallons per connection was utilized in calculating water demands for the proposed limited municipal water supply system.

3.2 Near-Term Service Area Demands

Studies completed by the Town and their consultant for the landfill monitoring, Bennett & O'Reilly, Inc., have identified the contamination plume in an elliptical shape bounded by Elda Lane to the North, the capped landfill to the West, Schoolhouse Road to the East, and Surrey Street to the South. As discussed with Town representatives in a Working Group Meeting July 11th, 2005, the proposed limited municipal water supply area will be enclosed by Glacier Hills to the North, Old Orchard Road to the West, Nauset Road to the East, and Route 6 to the South, as shown in *Appendix B – Proposed Limited Municipal Water Supply Service Area.* The proposed project area was larger than the elliptical shaped plume proposed by Bennet & O'Reilly to conservatively include all home owners that could be affected by the contaminated groundwater. Additionally, the proposed project area includes those private groundwater wells, approximately 30% of the homes sampled, where "trace levels of VOCs, primarily associated with BTEX and MtBE were detected" (Bennett and O'Reilly 2005 6).

Based on an estimated 300 homes within the proposed service area and an average daily water demand of 200 gallons per connection, the estimated initial water requirement is 60,000 gallons per day (42 gallons per minute). Full build-out of the proposed limited service area with an estimated 450 parcels would equate to a future water requirement of 90,000 gallons per day (63 gallons per minute). The water supply area includes mainly single family homes, and therefore a peak day demand factor of two was utilized to develop an initial maximum day estimate of 120,000 gallons. Fire flow requirements and any peak domestic demands would be satisfied by water storage facilities.

3.3 Potential Long-Term Demands

To estimate water demands for a municipal water supply system that serviced all areas of the Town, previous studies and reports were reviewed to gauge population projections, expected water requirements, and capital costs. After review of the Town's Local Comprehensive Plan, the year round 2000 population was estimated at 5,453 with a summer population of 27,500 (4). The Local Comprehensive Plan documents a 600,000 gallon per day water requirement at 100% build-out of 5,600 households (18). Applying a peak day demand factor of two, it is estimated that a Town wide water supply system should be capable of providing approximately 1.2 million gallons per day +/-.

4. INVESTIGATION OF POSSIBLE WATER SOURCES

The Town of Eastham has long considered the implementation of a town-wide municipal water system. During research conducted by the Town, consultants, and other agencies, many potential water sources have been suggested and evaluated as a permanent water source. Initially, these investigations centered around water yield with little to no consideration of environmental consequences. Efforts have been made by the Cape Cod Commission, U.S. Geological Survey, and others to identify and assess the potential impacts of groundwater withdrawal in terms of lowering the water table; influence on ponds, wetlands, and vernal pools; and salt water intrusion.

After review of existing Town documentation and reports and from discussions with Town representatives at Working Group Meetings, *Table 4.1 Water Supply Investigation Summary* provides a brief review of investigations into possible water sources for the Town of Eastham. Existing groundwater wells identified by the Town as a possible water supply source include the nursery school/day care center located on Nauset Road, the senior center located at 1405 Nauset Road, and the Nauset Regional High School located near the intersection of Nauset Road and Cable Road. Connecting to the Town of Orleans existing water system was also considered an option by the Town's Working Group. Table 4.1 below lists the well location; documented potential yield, if available; documented water quality, if available; source of information; and site identification. The general location of the identified wells are shown in *Appendix C – Possible Water Supply Well Locations*.

Table 4.1
Water Supply Investigation Summary

Site ID	Well Location	Potential Yield	Expected Water Quality	Report Name
Well-field Protection Zoning District "H"	Test Well No. 1 – East of Nauset Rd. & South of Cable Rd.	400 gpm	Good	Report on Proposed Water System Eastham, MA by Whitman & Howard
	Test Well No. 2 – West of Nauset Rd. & South of Bracket Rd.	500 gpm	Good	
	Test Well No. 3 – East of Nauset Rd. & South of Cable Rd.	300 gpm	Good	
	Test Well No. 4 – East of Nauset Rd. & South of Cable Rd.	700 gpm	Good	
	Northeast Eastham	0.65 mgd	Unknown	Water Resources of Outer Cape Cod by Lower Cape Water Management Task Force
	Marconi Beach (Wellfleet)	Unknown	Unknown	
Eastham Water Protection District "G"	Eastham Water Protection District (EWPD)	0.65 mgd	Unknown	
	Roach Property	0.22 mgd	Unknown	
	Little Creek (Nauset Road)	Unknown	Unknown	Water Resource Management Plan by Cape Cod National Seashore Massachusetts
	Eastham Elementary School	<70 gpm	Poor	–
	Nauset Regional High School	Unknown	Unknown	
	Eastham Senior Center	Unknown	Unknown	
	Nursery School/Day Care	<70 gpm	Unknown	
	Town of Orleans Water Supply System	Unknown	Good	

gpd – gallons per day
mgal – million gallons per day
Note that references to identical well locations/sites in multiple reports were only identified once.

The potential water supply sources listed in *Table 4.1 Water Supply Investigation Summary* will be further researched and evaluated in EPG's next phase of work, *Task 2 – Water Supply Source Identification*. The Task 2 study will provide the Town with recommended appropriate water supply sites for supplemental investigations leading to a DEP Site Examination and Pump Test.

5. PROJECT OPINION OF PROBABLE COSTS AND FUNDING

Using estimated water demands and the water supply service area developed in previous sections of this report, the following text provides an opinion of probable costs for a limited water supply system for the landfill area. General funding alternatives such as grants and low interest rate loans were also researched and described in the text below.

5.1 Near-Term Service Area

As described in *Section 3.2 Near-Term Service Area Demands*, the proposed limited municipal water supply area will be bounded by Glacier Hills to the North, Old Orchard Road to the West, Nauset Road to the East, and Route 6 to the South. The proposed service area is shown in *Appendix B – Proposed Limited Municipal Water Supply Service Area*. With an estimated water demand of 60,000 gallons per day, an opinion of probable cost for the proposed limited municipal water supply system was broken down into capital costs for well supply, distribution system, and storage. Additionally, water system operational costs were developed and is described in the text below.

5.1.1 Well Supply

As noted in *Section 4 – Investigation of Possible Water Sources*, a number of potential groundwater well sites have been identified as a potable water source for the proposed limited municipal water supply system. EPG's next phase of work to be completed in Task 2 will include further assessment of groundwater sources, including Zone I availability, Zone II issues, environmental considerations, and property ownership. For the purposes of estimating project costs, it was assumed that a groundwater well would be installed on Town owned property within the Cape Cod National Seashore Boundary, as identified in the Whitman and Howard, Inc. report completed in 1970. It was anticipated that the well supply would include a gravel packed well (10"x6") drilled to a depth of 150', a redundant well similar in construction to the main duty well, submersible centrifugal well pump, pump house, stand-by power, process instrumentation, and associated appurtenances. An opinion of probable costs for the well supply is detailed below.

Table 5.1
Well Supply Opinion of Probable Costs

Item Description	Unit	Quantity	Unit Price	Total
Gravel Packed Well	LF	300	$750	$225,000
Centrifugal Pump	LS	2	$25,000	$50,000
Pump House	SQ FT	400	$200	$80,000
Valves, Pipe, and Fittings	LS	1	$10,000	$10,000
Process Instrumentation	LS	1	$50,000	$50,000
Security Fencing	LF	200	$25	$5,000
Site Grading	LS	1	$15,000	$15,000
Access Road	SQ YD	300	$20	$6,000
Power	LS	1	$75,000	$75,000
Stand-by Power	LS	1	$50,000	$50,000
Electrical	LS	1	$84,900	$84,900
			Well Supply Total	**$650,900**

5.1.2 Distribution System

Based on the limited service area and water demand requirements, it is anticipated that the distribution system will consist primarily of 8" and 12" ductile iron pipe mains. Looping of the distribution system is recommended for fire flow protection and to minimize "stale" water conditions. Fire hydrants were assumed for every 300 feet of pipe length, and gate valve quantities were estimated at one valve per 500 feet of pipe length. Opinion of probable costs for the proposed limited distribution system, as shown in *Appendix B – Proposed Limited Municipal Water Supply Service Area*, were tabulated below.

Table 5.2
Distribution System Opinion of Probable Costs

Item Description	Unit	Quantity	Unit Price	Total
8" Ductile Iron Pipe	LF	14,600	$90	$1,314,000
12" Ductile Iron Pipe	LF	2,700	$135	$364,500
Fire Hydrants	EA	58	$2250	$116,000
Gate Valves	EA	35	$1000	$35,000
			Distribution System Total	**$1,829,500**

5.1.3 Water Storage

Water storage facilities are a typical means of providing peak day and fire flow capacity while equalizing demands on water source supply and potable water distribution. Usually storage is provided in an elevated structure such as a stand-pipe or elevated water tank. Preliminary sizing of a water storage tank for the proposed limited municipal water system was based on a fire flow requirement of 540,000 gallons (3,000 gallons per minute for 3 hours), per American Water Works Association guidance manuals.

Table 5.3
Water Storage Opinion of Probable Costs

Item Description	Unit	Quantity	Unit Price	Total
Steel Water Storage Tank	GAL	540,000	$1.25	$675,000
Security Fencing	LF	200	$25	$5,000
Site Grading	LS	1	$20,000	$20,000
			Water Storage Total	**$700,000**

5.1.4 Total Program Opinion of Probable Costs

Utilizing the developed opinion of probable costs for the anticipated well supply, distribution system, and water storage facilities, additional costs including engineering, legal, and contingencies were applied to develop a total program opinion of probable cost for the limited municipal water supply system. As shown in *Table 5.4 Total Program Opinion of Probable Costs*, with an appropriate 25% contingency for conceptual level water system planning, the proposed limited water supply system will be on the order of $4.8 million dollars including engineering, legal, and initial capital. Based on 300 existing homes within the limited municipal water supply system, the opinion of probable cost per homeowner equates to approximately $16,000+/-.

Table 5.4
Total Program Opinion of Probable Costs

Item Description	Total
Well Supply	$651,000
Distribution System	$1,830,000
Water Storage	$700,000
Engineering @ 20%	$636,000
Legal @ 1%	$32,000
Sub-Total	**$3,849,000**
Contingency @ 25%	$962,000
Total Program	**$4,811,000 +/-**

5.2 Operation and Maintenance Costs

The ability to supply and distribute a safe and reliable source of water for public consumption requires a full complement of qualified individuals to perform the administrative, management, operational, maintenance, and laboratory functions. Water system personnel must possess qualifications and skills to fulfill regulatory requirements, administrative functions, and ensure proper operating and maintenance procedures.

General administrative/managerial responsibilities for the water system to be provided by the Town would include:

- Assume the ultimate responsibility for the entire operation and maintenance of the water system.
- Be aware of all regulations and laws governing the operation of water supply, treatment, distribution, and storage facilities and oversee the completion of all operational duties so as to maintain regulatory compliance.
- Prepare daily, monthly, and annual reports for process control monitoring and compliance with regulations.
- Coordinate regular meter readings and submit bills to customers.
- Prepare budgets and reports that accurately reflect the system's fiscal and personnel needs for efficient operation and maintenance.

Operation and maintenance personnel include foreman, laborers, and treatment system operators. A summary of typical duties and responsibilities for operation and maintenance staff is listed below:

- Repair and maintain pumps, electric motors, pipes, process equipment, miscellaneous machinery, and distribution piping. Monitor, maintain and calibrate meters, gauges, analytical equipment, and other instrumentation and control equipment.
- Perform tasks required in the general upkeep of all water system facilities and grounds including cleaning, painting, snow removal, and landscaping.
- Maintain vehicles, machinery, hand tools, auxiliary equipment, and safety equipment in good working order.
- Operate water supply, treatment, and distribution system equipment including, emergency generators, well pumps, chemical feed systems, laboratory equipment, water meters, valves, hydrants, etc.
- Maintain distribution system by flushing and cleaning water lines to prevent the buildup of films, sediment, and debris.
- Respond to water system alarms and emergencies.

Based on similar potable water systems on the lower Cape, it is estimated that operation and maintenance costs for the proposed limited municipal water supply system would be on the order of approximately $150,000 to $200,000 per year. This would generally include administrative, operational, and maintenance expenses. Based on 300 existing homes, the initial yearly cost per homeowner would equate to $580 +/-. Assuming all 450 parcels were built out in the limited service area, the yearly cost per home would be on the order of $380 +/-. Literature indicates that "annual water bills on Cape Cod range from $150 to $248 with an average of $187 per connection", however due to the limited system and economies of scale the proposed per connection costs are appropriate for the anticipated water system (*Water Resources of Outer Cape Cod* by Lower Cape Water Management Task Force 21).

5.3 Funding Alternatives

"The capital expenses of adding a public water supply system are often subsidized by grants and low interest loans" (*Water Resources of Outer Cape Cod* by Lower Cape Water Management Task Force 19). A description of potential funding opportunities for the proposed limited water supply system is detailed below.

- The United States Department of Agriculture (USDA) Rural Development Utilities Program. The USDA (http://www.usda.gov/rus/) provides "loan and grant funds for water and wastewater projects serving the most financially needy communities" including rural areas of less than 10,000 people (*RUS Instruction 1780* 2). Loans and grants can be utilized "to construct, enlarge, extend, or otherwise improve rural water, sanitary sewage, solid waste disposal, and storm wastewater disposal facilities" (*RUS Instruction 1780* 6). Though there are specific limitations and requirements to the USDA Rural Development program, the Town of Eastham should purse possible grant eligibility with the USDA program for financing the proposed limited water supply system.

- Massachusetts Drinking Water State Revolving Fund Program (DWSRF). The Division of Municipal Services of DEP (www.mass.gov/dep/) and the Massachusetts Water Pollution Abatement Trust mutually oversee a financing program which includes low interest rate loans. "Financial assistance is available for the engineering, design, and construction of drinking water projects that protect public health and strengthen compliance with federal and state drinking water regulations" such as the proposed limited water supply system (MA *DEP Grant and Loans Program 2005* 10). Applicants for the low interest rate loans are ranked based on need, and projects assigned to the Intended Use Plan Project Listing (IUP) are "eligible to apply for financing in the current year" (MA *DEP Grant and Loans Program 2005* 11). It is anticipated that the Town of Eastham could secure a DWSRF low interest loan for the proposed limited municipal water supply project.

The Town has conducted preliminary discussions with Eastham's grant writer to explore grant and funding opportunities prior to detailed project work for the limited water supply system.

5.4 Financial Analysis

The following section details various financial scenarios to gauge fiscal liability for the proposed limited municipal water supply system. Opinion of probable costs developed in previous sections of this report were utilized in the financial analysis, specifically the total program opinion of probable cost of $4.8 million dollars. All amortized costs were based on a 20-year repayment period at a 2% interest rate. A "No Action" alternative was also presented in which the Town continues to provide one point of entry water treatment system at 325 Schoolhouse Road and bottled drinking water to seven other residents in the affected area in lieu of the proposed water system. The "No Action" alternative would include continued environmental monitoring and compliance with DEP mandates.

Table 5.5
Financial Analysis –Annualized Cost for Limited Municipal Water System

Item	Alternatives		
	No Action	75% Grants/ 25% Loans	100% Loans
Environmental Monitoring/Point of Entry System/ Bottled Water	$150,000[1]	–	–
Annualized Total Program Opinion of Probable Costs	–	$73,008	$292,056
Water System Operation and Maintenance Opinion of Probable Costs	–	$175,000	$175,000
Total Annual Opinion of Probable Cost (2005 Dollars)[2]	**$150,000**	**$248,008**	**$467,056**

1 – Information provided at Eastham Water Resources Advisory Committee Meeting July 12, 2005
2 – Annual cost per life of loan repayment period of 20 years

5.5 Long-Term Service Area

As documented in *Section 3.3 Potential Long-Term Demands*, the Local Comprehensive Plan documents a 600,000 gallon per day water requirement at 100% build-out of 5,600 households (18). Applying a peak day demand factor of two, it is estimated that a Town wide water supply system should be capable of providing approximately 1.2 million gallons per day +/-. At this stage of project planning, it is difficult to accurately quantify capital costs associated with a Town wide water system. However, the proposed conceptual limited water system in terms well supply, distribution, and water storage could be tied into a future Town wide water supply system. The *Report on Proposed Water System Eastham, MA* by Whitman & Howard circa 1970 estimated a cost of approximately $3.5 million dollars to construct and implement a water system for the Town of Eastham. The $3.5 million dollar cost was based on two gravel packed wells, approximately 25 miles of water main, and a 750,000 gallon elevated water storage tank. Utilizing the Engineering News Record Cost Index, the 1970 estimate in 2005 dollars would equate to approximately $18.8 million dollars. Utilizing an appropriate 25% contingency for conceptual level water system planning, the costs for a Town wide system would be on the order of $23.5 million dollars.

6. REGULATORY AND INSTITUTIONAL ISSUES

Prior to construction and implementation of the proposed limited municipal water supply system, the Town will have the responsibility to meet regulatory and institutional requirements related to the project. Regulatory issues include coordination and submission of project documentation with environmental protection organizations, whereas institutional issues would pertain to funding strategies and public support for a potable water system.

6.1 Regulatory Issues

In general a project of this scope and type could require regulatory coordination with the following,:

- Massachusetts DEP 310 CMR 22.00 Drinking Water Regulations
- Massachusetts DEP 310 CMR 36.00 Water Management Act Regulations
- Massachusetts Environmental Policy Act (MEPA) 301 CMR 11.00
- Massachusetts Endangered Species Act 321 CMR 10.00
- Massachusetts Wetland Protection Act 310 CMR 10.00 and 310 CMR 13.00
- Massachusetts Highway Department
- Army Corps of Engineers
- Eastham Conservation Commission
- Cape Cod Commission

Pursuit of a new groundwater well for the proposed limited water supply system would follow DEP's requirements for New Source Approval for groundwater sources less than 70 gallons per minute. The initial phase of work would include completing DEP application BRP WS 13 – Approval to Site a Source and Conduct Pumping Tests for Sources Under 70 Gallons Per Minute and required support information, including:

- Site map identifying existing public water supply wells, property boundaries, local zoning information, existing and potential future sources of contamination, and environmentally sensitive receptors
- Site exam
- Test well drilling for water quality sampling, estimate of well yield, and well log profile
- Test well prolonged pump test

Once the prolonged pump test was completed, the next phase of work would consist of completing DEP application BRP WS 15 – Approval Application to Construct a Source Less Than 70 Gallons per Minute. Supplemental information to BRP WS 15 required by DEP would include:

- Pump test report summarizing results, conclusions, and recommendations from the prolonged pump test
- Detailed engineering plans
- Plot plan showing necessary Zone 1 protective radius
- Construction opinion of probable costs

For scheduling purposes, it is estimated that testing, permitting, regulatory review, and design would take approximately 12 to 18 months.

6.2 Institutional Issues

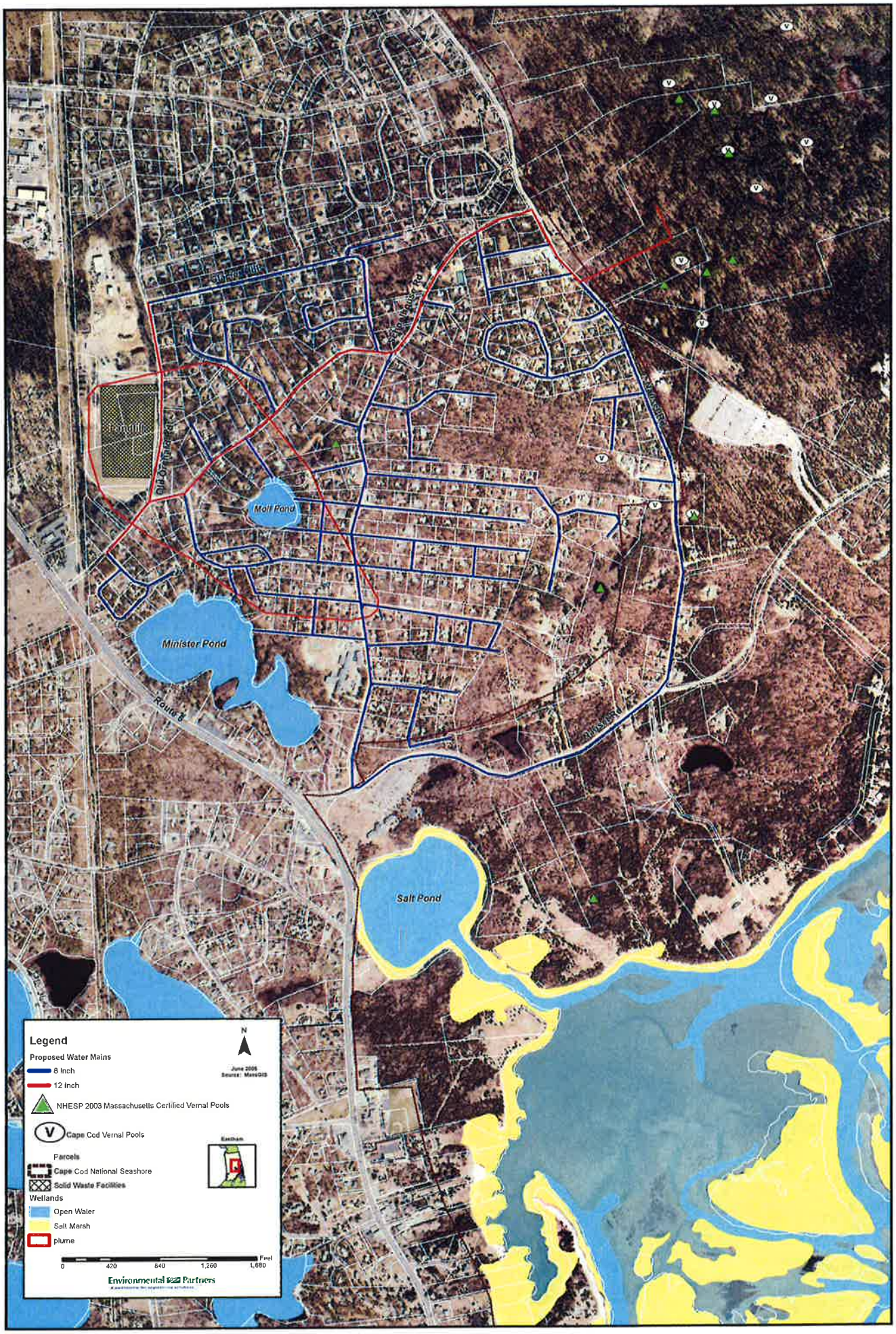
Institutional issues important to the proposed limited water supply to be resolved within the Town include which entity(ies) will bear the capital and operation and maintenance costs; what will the future scope and magnitude of environmental monitoring will be required by DEP; and will the residents of Eastham support a limited and/or Town-wide municipal water system. The key factors for the proposed limited municipal water supply system project to be successful include public support and project funding. Public support of the proposed water system through out-reach and educational programs will be essential. Through discussions with the Working Group, it appears that the Town will investigate possible grant and funding opportunities in advance of detailed project work to gauge potential cost burden. These institutional issues and others will need to be addressed to successfully implement a potable water system in the Town of Eastham.

7. CONCLUSIONS

This report provides the Town of Eastham with a feasibility study and conceptual plan for a limited water supply for the area of Eastham affected by elevated VOC groundwater concentrations. The assessment for the water supply system was made in terms of water needs, potential groundwater supply sources, opinion of probable program costs, funding alternatives, and review of regulatory and institutional issues. The following conclusions can be drawn from this Task 1 report:

- Drinking water quality has been affected for residents down gradient from the landfill. To date, one point of entry water treatment system has been installed and seven other residents in the area have been offered and/or provided bottled drinking water. From the current site investigation of the area down-gradient from the landfill completed by Bennet and O'Reilly, "based on the spacial occurrence of vinyl chloride and/or its parent contaminants..., the primary axis of the contaminant plume extends from the Eastham Landfill some 2,000' south-southeast to the area of the Residence at 325 Schoolhouse Road, while a secondary area of impact has been identified to the northwest of the subject Residence in a cross-gradient location" (Bennett and O'Reilly 2005 5).
- Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOC in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill.
- To maintain consistency with the Town's existing Local Comprehensive Plan, an average day usage of 200 gallons per connection was utilized in calculating water demands for the proposed limited municipal water supply system. Based on an estimated 300 homes within the proposed service area, the estimated initial water requirement is 60,000 gallons per day (42 gallons per minute). Full build-out of the proposed limited service area with an estimated 450 parcels would equate to a future water requirement of 90,000 gallons per day (63 gallons per minute). A peak day demand factor of two was utilized to develop an initial maximum day estimate of 120,000 gallons.
- Potential water supply sources were identified including existing and new groundwater withdrawal locations, and connection to the Town of Orleans water system was also given consideration. The possible water supply sources documented in Section 4 will be further researched and evaluated in EPG's next phase of work, *Task 2 – Water Supply Source Identification.*

- With a 25% contingency for conceptual level water system planning, the proposed limited water supply system will be on the order of $4.8 million dollars including engineering, legal, and initial capital. Based on 300 existing homes within the limited municipal water supply system, the opinion of probable cost per homeowner equates to approximately $16,000.
- It is estimated that operation and maintenance costs for the proposed limited municipal water supply system would be on the order of approximately $150,000 to $200,000 per year. This would generally include administrative, operational, and maintenance expenses. Based on 300 existing homes, the initial yearly cost per homeowner would equate to approximately $580.
- The "No Action" alternative in which the Town continues to provide one point of entry water treatment system at 325 Schoolhouse Road and bottled drinking water to seven other residents in the affected area in lieu of the proposed water system would cost approximately $150,000 per year. Depending on grant eligibility, the capital costs for the proposed limited municipal water system with operation and maintenance costs would range between $250,00 to $470,000 per year (assuming a 20 year loan @ 2%).
- The Town will have to satisfy regulatory and institutional issues before implementation of the proposed limited water supply system.


Landfill
Old Orchard Rd
Moll Pond
Minister Pond
Route 6
Salt Pond
Legend
Proposed Water Mains
8 Inch
12 Inch
NHESP 2003 Massachusetts Certified Vernal Pools
Cape Cod Vernal Pools
Parcels
Cape Cod National Seashore
Solid Waste Facilities
Wetlands
Open Water
Salt Marsh
plume
N
June 2005
Source: MassGIS
Eastham
Feet
0
420
840
1,260
1,680
Environmental Partners

WELLFLEET
Marconi Beach
Northeast Eastham
Roach Property
Nauset Regional High School
EWPD - Water Resources Protection Zoning District "G"
Eastham Senior Center
Well-field Protection Zoning District "H"
Nursery School/Day Care
Little Creek
Eastham Elementary School
EASTHAM
Campground Landing
Kingsbury Beach
First Encounter Beach
Great Pond
Depot Pond
Salt Pond
Salt Pond Bay
Herring Pond
Mill Pond
Minister Pond
Nauset Bay
NAUSET BEACH
ORLEANS
Legend
400' Radius
NHESP Certified Vernal Pools
Parcels
Potential Well Site
1 inch equals 2,500 feet
Environmental Partners
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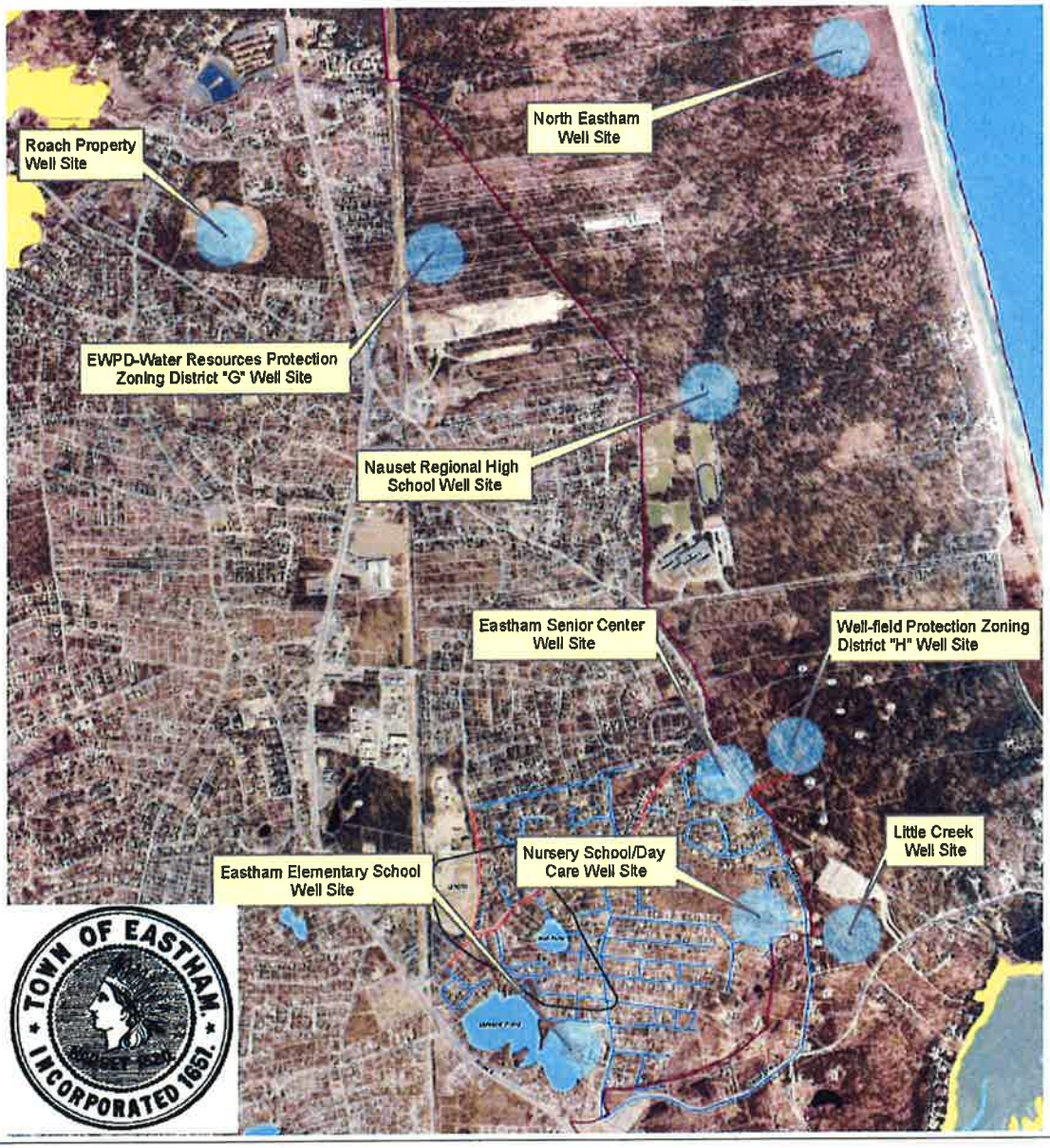
Limited Municipal Water System

Task 2 - Water Supply Source Identification

September 2005

Town of Eastham



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EXECUTIVE SUMMARY

The Town of Eastham (Town) contracted Environmental Partners Group (EPG) to provide engineering services related to development of a limited municipal water system near the Town's capped landfill. Historic and recent findings of an on-going groundwater monitoring program have shown elevated volatile organic compound (VOC) concentrations in areas South and East of the closed landfill. It is suspected that the landfill has affected drinking water supply wells on nearby private properties, thereby forcing the Town to provide bottled water or on-site water treatment to those affected home owners. Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOC in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill. The project basis and design criteria for the proposed limited municipal water system was developed in *Task 1 – Project Definition and Feasibility Study, Town of Eastham, August 2005* prepared by EPG.

The results of this evaluation and screening study of potential groundwater well sites identified Well-field Protection Zoning District "H" and Nauset Regional High School as highly favorable and most advantageous for a limited water supply source. Well-field Protection Zoning District "H" was given a highly favorable rating because the property is Town owned, and therefore requires no land taking or purchases, a 400 foot Zone I radius is available, the well-field is in close proximity to the proposed limited service area, and previous studies have demonstrated high potential water yield and good expected water quality. The Nauset Regional High School existing 4" well has an available 400 foot Zone I radius and the initial 48-hour pump test was conducted at the water system design requirement of 70 gallons per minute. Since the well and well site are not owned by Eastham, the Town would need to negotiate a water use agreement with the High School.

As a parallel approach in securing a water supply source for the proposed limited water system, the following is recommended as the next phase of work:

- The feasibility of connecting to the Nauset Regional High School as a permanent water supply source should be further evaluated. If a water use agreement between the Town and the High School can be reached, the Town should investigate permitting and pump test requirements with DEP for utilizing the existing well as a groundwater source.
- Pump tests should be conducted at Well-field Protection Zoning District "H" in order to gather critical field information necessary for permitting and designing a groundwater supply source. The Town should seek a meeting with the staff of the National Seashore to begin discussions on the proposed plan for water supply investigation, and to seek input from the Seashore on their needs and concerns.

1. INTRODUCTION/BACKGROUND

The Town of Eastham (Town) contracted Environmental Partners Group (EPG) to provide engineering services related to development of a limited municipal water system near the Town's capped landfill. Historic and recent findings of an on-going groundwater monitoring program have shown elevated volatile organic compound (VOC) concentrations in areas South and East of the closed landfill. It is suspected that the landfill has affected drinking water supply wells on nearby private properties, thereby forcing the Town to provide bottled water or on-site water treatment to those affected home owners. Given that the Town of Eastham does not have a municipal water system, and as a result of findings of VOC in drinking water wells around the landfill, the Town has proposed a limited municipal water system for the affected area adjacent to the landfill.

As part of EPG's scope of work, this report provides the Town with an evaluation and screening study of potential groundwater well sites for the proposed limited water system. The project basis and design criteria was developed in *Task 1 – Project Definition and Feasibility Study, Town of Eastham, August 2005* prepared by EPG. This report is an extension of Task 1, and will summarize the results of the site screening analysis and provide recommendations for moving forward with appropriate feasibility studies, field investigations, and pump tests.

2. REVIEW OF POSSIBLE WATER SOURCES

As documented in *Task 1 – Project Definition and Feasibility Study, Town of Eastham, August 2005* prepared by EPG, research conducted by the Town, consultants, and other agencies, have identified many potential water sources for the Town of Eastham. After review of existing Town documentation and reports and from discussions with Town representatives at Working Group Meetings, *Table 2.1 Water Supply Investigation Summary* provides a brief review of investigations into possible water sources for the Town's proposed limited water supply system. The table below notes the well identification, description of field location, potential yield of water, expected water quality, and source of information.

Table 2.1

Water Supply Investigation Summary

Site ID	Well Location	Potential Yield	Expected Water Quality	Report Name
Well-field Protection Zoning District "H"	Test Well No. 1 – East of Nauset Rd. & South of Cable Rd.	400 gpm	Good	Report on Proposed Water System Eastham, MA by Whitman & Howard
	Test Well No. 2 – West of Nauset Rd. & South of Bracket Rd.	500 gpm	Good	
	Test Well No. 3 – East of Nauset Rd. & South of Cable Rd.	300 gpm	Good	
	Test Well No. 4 – East of Nauset Rd. & South of Cable Rd.	700 gpm	Good	
	North Eastham	0.65 mgd	Unknown	Water Resources of Outer Cape Cod by Lower Cape Water Management Task Force
	Marconi Beach (Wellfleet)	Unknown	Unknown	
Eastham Water Protection District "G"	Eastham Water Protection District (EWPD)	0.65 mgd	Unknown	
	Roach Property	0.22 mgd	Unknown	
	Little Creek (Nauset Road)	Unknown	Unknown	Water Resource Management Plan by Cape Cod National Seashore Massachusetts
	Eastham Elementary School	<70 gpm	Poor	–
	Nauset Regional High School	<70 gpm	Good	
	Eastham Senior Center	<70 gpm	Unknown	
	Nursery School/Day Care	<70 gpm	Unknown	
	Town of Orleans Water Supply System	Unknown	Good	

gpd – gallons per day
mgal – million gallons per day
Note that references to identical well locations/sites in multiple reports were only identified once.

Well-field Protection Zoning District "H" and the Eastham Water Protection District (also referred to as Water Resources Protection Zoning District "G") are both town owned properties reserved as potential well sites for the Town of Eastham. District "H" is located within the Cape Cod National Seashore along Nauset Road and is approximately 120 acres in area. District "G" "lies in an area containing several town-owned "woodlot" parcels" in Northern Eastham just East of Route 6 (Local Comprehensive Plan 30). The *Town of Eastham – Local Comprehensive Plan, Second Edition 2002* notes:

> In 1997, Eastham acquired a 64-acre plot of land (known as the "Roach Property") as open space "for general municipal purposes, to be used for whatever the town deemed most suitable". A recent plan to develop this property for various public benefit applications envisions ca. one-third of it as a public water supply area, the Lower Cape Water Management Task Force identified this property as a potential secondary water supply area. Detailed evaluation of the site's suitability for this purpose remains to be done.

Four existing groundwater wells were identified as a possible water supply source for the proposed limited municipal water system, including the nursery school/day care center located on Nauset Road, the senior center located at 1405 Nauset Road, the Nauset Regional High School located near the intersection of Nauset Road and Cable Road, and the Eastham Elementary School at 200 Schoolhouse Road.

Little Creek, North Eastham, and Marconi Beach in Wellfleet were also identified as possible water supply sources for the Town's proposed limited water system. All three well sites are located within the Cape Cod National Seashore. Of the three properties, the Town of Eastham only owns property within the Little Creek area. The general location of the identified wells and their proximity to the limited service area are shown in *Appendix A – Possible Water Supply Well Locations*.

The Town of Orleans' existing water system has adequate capacity to supply potable water for Eastham's proposed limited water system. An approximate four mile water main along Route 6 would be required to connect the landfill area limited water system to the Town of Orleans. No formal discussion between the two Towns have been conducted during the preparation of this report.

3. SITE SCREENING CRITERIA

There are a number of important criteria to be evaluated in selecting sites for public groundwater supply wells. These criteria are listed below and were used in the identification of sites on which more detailed analyses will be conducted:

- Ability to meet DEP Zone I requirements
- Ownership
- Impacts on Environmental Receptors
- Potential Yield
- Water Quality
- Proximity to Service Area

Each of these factors is equivalent to an obstacle for development. The sites with the fewest obstacles will likely be the most advantageous.

Although each site needs to be considered on the basis of a comprehensive review of all evaluation criteria, some issues may be considered to be more critical than others. For example, the ability to meet Zone I requirements is paramount, since the Massachusetts Department of Environmental Protection (DEP) strictly adheres to the limitations placed on a source's yield as a function of available Zone I area. Similarly, ownership status of a site is important. If the Town does not own the land required for the proposed well site, the Town of Eastham would have to purchase the property which could be costly and time consuming. Another significant criterion is consideration of environmental receptors. Neither the DEP nor the National Park Service will allow sensitive environmental receptors to be compromised if other reasonable and alternative sites are viable. Any proposed groundwater well site within or adjacent to the Seashore boundary will be closely scrutinized.

3.1 Ability to Meet DEP Zone I Requirements

For any public water supply well, DEP regulations require ownership and control of land immediately around the well, referred to as the Zone I area. In order to protect the quality and integrity of the well, no development is allowed within Zone I, and only land uses pertaining to the production of water are permitted. The extent of land required for Zone I increases from a minimum of a 100-foot radius around the well, up to 400 feet, depending upon the amount of water to be withdrawn. For example, a 20,000 GPD well would require a Zone I radius of 300 feet, while a well with a capacity of 100,000 GPD or greater would require a Zone I radius of 400 feet.

From development of water usage rates for Task 1, based on an estimated 300 homes within the proposed service area, the estimated initial water requirement is 60,000 gallons per day (42 gallons per minute). Full build out of the proposed limited service area with an estimated 450 parcels would equate to a future water requirement of 90,000 gallons per day (63 gallons per minute). Based on water requirements, EPG would recommend that the Town install a groundwater well with a capacity of 100,000 gallons per day (less than 70 gallons per minute) for the proposed limited water supply system. A 400 foot Zone I radius would allow for withdrawal of 100,000 gallons per day, and therefore a 400 foot radius was used as the desired criteria for site screening purposes. A 400 foot radius is equivalent to a circular area of 11.5 acres.

3.2 Ownership

Municipal ownership was considered to be very important to satisfy the Zone I requirements, as well as to reduce costs, complexities and timeframes for development. To construct a well in property not owned by the Town, Eastham would need to acquire or purchase 11.5 acres comprising the desired Zone I area or abut the Cape Cod National Seashore directly. The most advantageous sites are those already owned by the Town thus avoiding the high cost of purchasing property. In view of the inherent preservation restrictions associated with the Cape Cod National Seashore, DEP will allow undeveloped Seashore property to be counted in the Zone I radius. Therefore, inside of the Cape Cod National Seashore boundary, the Town would be required to only own the well site with access out of the Seashore via Town land or some form of easement granted by the National Park Service.

3.3 Impacts on Environmental Receptors

Any new source of groundwater in Eastham will require a thorough environmental impact evaluation to satisfy DEP and the National Park Service that water withdrawal will not threaten natural resources such as wetlands, vernal pools, kettle ponds, and their associated fauna and flora. Some of the potential sites are located within the boundaries of the National Seashore or adjacent to it, and potential impacts to surface water bodies, associated wildlife, endangered species, and critical habitat areas will need to be identified. The ideal well site will have minimal impacts on such resources, and its location within or outside the Seashore boundaries will not be as important as the extent of impact on those resources.

3.4 Potential Yield

Hydrogeological conditions need to be favorable in order to consistently yield the desired quantity and quality of groundwater. The northern portions of the Town sit above the Nauset Lens aquifer, whereas southern Eastham rests above the Monomoy Lens. Both flow cells provide the Town with a potable freshwater source. Previous studies to estimate safe yields of potential well sites indicated that substantial yields were possible from a number of the sites evaluated herein. However, only site-specific soil conditions, pump test results, and impacts on natural resources will determine the actual volume that can be permitted for withdrawal from the aquifer. Limitations could be placed on withdrawal in order to minimize potentially detrimental impacts on environmental resources as discussed above.

3.5 Water Quality

It is preferable that the groundwater quality for any proposed well meets federal and state drinking water standards with minimum treatment. Elevated iron and manganese concentrations are always a concern on Cape Cod since they can impart color and taste to the water, and may require treatment. Also, a location remote from potential man-made contamination sources such as golf courses, dense development, and high-traffic areas is desirable in order to reduce the risk of accidental contamination from fuel spills or other sources. Proposed well sites near the landfill area will need to be rigorously evaluated in terms of potential leachate plume contamination. Groundwater modeling and analysis will likely be required for any well sites developed within close proximity of the identified leachate plume area, as shown in *Appendix A – Possible Water Supply Well Locations*.

3.6 Proximity to Service Area

Groundwater well location close to the service area is preferred to minimize the construction cost of transmission mains. Water age issues, such as stale water, from extended transmission lengths can lead to water quality complaints by customers.

4. SCREENING RESULTS

The sites screened in this study are shown below in *Table 4.1 Well Site Screening Matrix*. The results of the screening analysis for each site are summarized below and in Table 4.1. For each considered site, EPG in consultation with the Town's Working Group have assigned a relative ranking as highly favorable, less favorable, and unfavorable. The highest importance criteria during the evaluation process included Town ownership, ability to achieve a 400 foot Zone I area, potential yield, and distance to service area.

Note that the relative ranking system of the well sites is with respect to the proposed limited water supply service area. Sites that were deemed unfavorable for this study area could be considered favorable for other water supply service areas within Eastham.

Table 4.1

Well Site Screening Matrix

Table 4.1
Well Site Screening Matrix

Site ID		Ranking	Town Owned	400' Zone 1 Availability	Expected Water Quality	Potential Yield	CCNS	Distance to Service Area	Environmental Issues
Well-field Protection Zoning District "H"	Test Well No. 1 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	400 gpm	Inside	0 ft	Vernal Pools, Wetlands
	Test Well No. 3 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	300 gpm	Inside	0 ft	Vernal Pools, Wetlands
	Test Well No. 4 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	700 gpm	Inside	0 ft	Vernal Pools, Wetlands
North Eastham		Unfavorable		Yes	Unknown	450 gpm	Inside	18,650 ft	Unknown
Marconi Beach (Wellfleet)		Unfavorable		Yes	Unknown	Unknown	Inside	18,450 ft	Wetlands
Eastham Water Protection District (EWPD)		Less Favorable	X	Yes	Unknown	450 gpm	Outside	12,365 ft	Wetlands
Roach Property		Unfavorable	X	Yes	Unknown	150 gpm	Outside	11,582 ft	Wetlands
Little Creek (Nauset Road)		Unfavorable		Yes	Unknown	Unknown	Inside	0 ft	Vernal Pools, Wetlands
Eastham Elementary School		Unfavorable	X	No	Poor	20 gpm	Outside	0 ft	Minister Pond, Wetlands
Nauset Regional High School		Highly Favorable		Yes	Good	<70 gpm	Inside	7,582 ft	Wetlands, Vernal Pools
Eastham Senior Center		Unfavorable	X	No	Unknown	<70 gpm	Outside	0 ft	Vernal Pools, Wetlands
Nursery School/Day Care		Unfavorable	X	No	Unknown	<70 gpm	Outside	0 ft	Vernal Pools, Wetlands
Town of Orleans Water Supply System		Unfavorable	-	-	Good	-	-	20,000+ ft	-

4.1 Well-field Protection Zoning District "H"

The Town of Eastham and their consultant, Whitman & Howard, Inc., completed a well testing program and preliminary Town wide water supply study circa 1970 as documented in *Report on Proposed Water System, Eastham, Massachusetts, February 6, 1970*. As part of the groundwater investigation, four tests wells 40 to 50 foot in depth were drilled in an area generally around the Nauset and Cable Road area. The Whitman & Howard study reported "testing for a water supply indicated that all four locations tested were good" and the expected yield ranged from 300 to 700 gallons per minute.

Three of the original four test wells are now within the Cape Cod National Seashore boundary, however the Town owns approximately 120 acres of Seashore land around the Nauset and Cable Road area for groundwater well development. The *Town of Eastham – Local Comprehensive Plan, Second Edition 2002* notes:

> District H lies in ca. 120 acres of town-owned land, which was tested in 1970 as a possible municipal well-field site with a potential yield of 1 million gpd. Located within the National Seashore, District H is currently relatively unthreatened by other land uses. District H also contains a large number of vernal pools that are otherwise uncommon in the Town, ecologically significant, and protected by state and federal law (31-32).

As documented in the Local Comprehensive Plan, utilizing District "H" as a groundwater supply area would require assessment and consideration of sensitive environmental receptors such as vernal pools and wetlands. Initial groundwater modeling, and in-field monitoring of environmental receptors during a pump test would likely be required by the Cape Cod National Seashore and regulatory agencies.

A supply well drilled within District "H" would meet DEP's 400 foot Zone I radius requirements between Town and Cape Cod National Seashore available property. District "H" is adjacent to the limited water supply area, and therefore transmission costs will be minimized. A well developed within this area would require coordination between the Town and the Seashore for site access to the water supply well and pump station. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Highly Favorable**
Positive Factors:	Town owned, 400 foot Zone I radius available, previous studies indicate good water quality and high potential yield, and close proximity to service area
Issues of Concern:	Site access and environmental issues

4.2 North Eastham

The North Eastham well site is located in an undisturbed area of the Cape Cod National Seashore near the Eastham/Wellfleet town border. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*. The well site would meet the requirements of a 400 foot Zone I radius, however the property is not Town owned and would be a major obstacle for development as a groundwater supply. Distance to the proposed limited service area is also a limiting factor for the North Eastham area. The study completed by the Lower Cape Water Management Task Force does identify the North Eastham site as one that would "cause the least impact to surface waters" (28).

Ranking:	**Unfavorable**
Positive Factors:	Zone I radius available
Issues of Concern:	Property not Town owned, site access, and distance to service area

4.3 Marconi Beach (Wellfleet)

Similar to North Eastham, the Marconi Beach well site in Wellfleet is located in an undisturbed area of the Cape Cod National Seashore. Limited information is available for the Marconi Beach site as the Town of Wellfleet has generally investigated water supply sources in the Chequesset Lens. The study completed by the Lower Cape Water Management Task Force does identify the Marconi Beach site as one that would "cause the least impact to surface waters" (28). The well site would meet the requirements of a 400 foot Zone I radius, however the property is not Town owned. Transmission main distance to the proposed limited service area is also a limiting factor for the Marconi Beach site as a suitable water supply area. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Unfavorable**
Positive Factors:	Zone I radius available
Issues of Concern:	Property not Town owned, distance to service area, and limited background data

4.4 Eastham Water Protection District (EWPD)

In addition to District "H", the Town of Eastham has reserved the Eastham Water Protection District (EWPD), also known as the Water Resources Protection Zoning District "G", as a site for potential development of a municipal water supply (Local Comprehensive Plan 30). "District G lies in an area containing several town-owned "woodlot" parcels, and is relatively unthreatened by other land uses" (Local Comprehensive Plan 30). From Working Group discussions, residential supply wells South of EWPD, Oak Leaf Road area, have been identified with contamination by TCE (trichloroethylene). The potential well field's close proximity to the gravel pit to the South and Route 6 to the West were a consideration in the screening evaluation.

The EWPD site is owned by the Town of Eastham, and District "G" would meet DEP's 400 foot Zone I radius requirements. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*. The Lower Cape Management Task Force lists the potential yield of EWPD at 450 gallons per minute (31). A transmission main from EWPD to the proposed limited water supply service area would likely be installed along Route 6 and Nauset Road.

Ranking:	**Less Favorable**
Positive Factors:	Town owned, 400 foot Zone I radius available, and high potential yield
Issues of Concern:	Water quality and distance to service area

4.5 Roach Property

The *Town of Eastham – Local Comprehensive Plan, Second Edition 2002* notes:

> In 1997, Eastham acquired a 64-acre plot of land (known as the "Roach Property") as open space "for general municipal purposes, to be used for whatever the town deemed most suitable". A recent plan to develop this property for various public benefit applications envisions ca. one-third of it as a public water supply area, the Lower Cape Water Management Task Force identified this property as a potential secondary water supply area. Detailed evaluation of the site's suitability for this purpose remains to be done.

From Town Working Group discussions, a portion of the Roach site has been developed under the Massachusetts State statue Chapter 40B which provides zoning for affordable housing. Based on the estimated Chapter 40B area, the Roach Property appears to meet DEP's 400 foot Zone I radius requirements.

Groundwater modeling by the United States Geological Survey (USGS) has concluded that pumping of the Roach Property at 380 gallons per minute would affect streamflow at Hatch's Creek located North of the proposed well site. Development of the Roach site for a limited municipal water supply of less than 70 gallons per minute would require further groundwater modeling to assess the potential affects on Hatch's Creek. A transmission main from the Roach Property to the proposed limited water supply service area would likely be installed along Route 6 and Nauset Road. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Unfavorable**
Positive Factors:	Town owned and 400 foot Zone I radius available
Issues of Concern:	Distance to service area and environmental issues

4.6 Little Creek (Nauset Road)

The proposed Little Creek well site is within the Cape Cod National Seashore boundary just South of Doane Rock, East of Nauset Road. Though the Town owns property in the Little Creek area, the well site shown in *Appendix B – Well Location Figures* is owned by the Seashore. The Town owns a small lot along Doane Road, however the property is surrounded by development and would not meet DEP's Zone I requirements. No development is allowed within Zone I, and only land uses pertaining to the production of water are permitted.

Though space is limited, the Little Creek site could meet the requirements of a 400 foot Zone I radius. However, the property is not Town owned and would be a major obstacle for development as a groundwater supply. The proposed well site is adjacent to the proposed limited water system, and transmission main costs would be minimal. Environmental issues would include vernal pools and wetlands.

Ranking:	**Unfavorable**
Positive Factors:	Zone I radius available and adjacent to service area
Issues of Concern:	Property not Town owned and environmental issues

4.7 Eastham Elementary School

The Eastham Elementary School, located at 200 Schoolhouse Road, utilizes an existing groundwater well for potable water. Though the Town does own an majority of the area around the well, it does not appear that a full 400 foot Zone I radius is available. The Zone I radius is limited by surrounding residential properties and Minister Pond, and the groundwater well is currently rated for 20 gallons per minute based on a Zone I radius of 225 feet. In addition to not meeting water demand capacity requirements for the proposed limited water supply system, the water quality is considered poor due to iron fouling bacteria typically found in shallow depth wells for this area of Eastham. Environmental issues related to this well site include draw-down of Minister Pond, and potential impacts to vegetation and wildlife. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Unfavorable**
Positive Factors:	Town owned and adjacent to service area
Issues of Concern:	400 foot Zone 1 radius not available, water quality, potential yield, and environmental issues

4.8 Nauset Regional High School

The Nauset Regional High School, located on Cable Road, utilizes an existing 4" groundwater well for potable water. The existing gravel pack well has a total depth of 87 feet with 15 foot of #20 slot stainless steel screen set between 72 to 87 feet below grade. The well was originally permitted with a Zone I radius of 400 feet and an average day daily withdrawal of 35.7 gallons per minute. In February 2000, DEP completed a Source Water Assessment Program (SWAP) calculation sheet back-calculating the Zone 1 radius as 357 feet based on a pumping rate of 51,408 gallons per day (35.7 gallons per minute). In review of existing DEP documentation and with consideration to the well site, it appears that the original Zone I radius of 400 feet is still available. Additionally, the original 48-hour pump test was conducted with a sustained pumping rate of 70 gallons per minute. From available data, it appears that the existing Nauset Regional High School groundwater well could be a viable supply source for the proposed limited water system.

Since the well and well site are not owned by Eastham, the Town would need to negotiate a water use agreement with the High School. Based on the location of the existing well, the proposed service area would likely be feed by a water main approximately 1.5 miles +/- in length. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Highly Favorable**
Positive Factors:	Existing production well and 400 foot Zone I radius available
Issues of Concern:	Coordination with Nauset Regional High School and distance to service area

4.9 Eastham Senior Center

The Eastham Senior Center, located at 1405 Nauset Road, utilizes an existing groundwater well for potable water. The Town owns three lots around the well, however a full 400 foot Zone I radius is not available. The Zone I radius is limited by surrounding residential properties, and the groundwater well is likely rated for much less than 70 gallons per minute. In addition to not meeting water demand capacity requirements for the proposed limited water supply system, the water quality is questionable due to iron fouling bacteria typically found in shallow depth wells for this area of Eastham. Environmental issues for the Eastham Senior Center site include wetlands and possible vernal pools. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Unfavorable**
Positive Factors:	Town owned and adjacent to service area
Issues of Concern:	400 foot Zone 1 radius not available, water quality, and potential yield

4.10 Nursery School/Day Care

The Nursery School/Day Care, located along Nauset Road, utilizes an existing groundwater well for potable water. Though the Town does own an majority of the area around the well, it does not appear that a full 400 foot Zone I radius is available. The Zone I radius is limited by surrounding residential properties, and the groundwater well is likely rated for less than 70 gallons per minute. In addition to not meeting water demand capacity requirements for the proposed limited water supply system, the water quality is questionable due to iron fouling bacteria typically found in shallow depth wells for this area of Eastham. An identified Cape Cod vernal pool is within close proximity of the existing well, and therefore would further limit the capacity of the well. A larger scale drawing of the proposed well site is shown in *Appendix B – Well Location Figures*.

Ranking:	**Unfavorable**
Positive Factors:	Town owned and adjacent to service area
Issues of Concern:	400 foot Zone 1 radius not available, water quality, potential yield, and environmental issues

4.11 Town of Orleans Water Supply System

The Town of Orleans provides potable water to approximately 4,800 accounts which is equivalent to almost 95% of the Town. The Town of Orleans draws water from the Monomoy Lens aquifer through seven groundwater wells. The water distribution system includes approximately 103 miles of water mains and two standpipes each with a capacity of 3.1 and 1.9 million gallons, respectively. The Town of Orleans water system does have excess safe yield capacity to provide potable water to Eastham's proposed limited water supply service area. The three major issues with connecting to the Town of Orleans include: political issues and water agreements between the two Towns, environmental issues related to interbasin transfer of water, and construction costs related to installation of an approximate 4 mile transmission main along Route 6 to service the landfill area water system. From discussions with the Working Group, at this time the Town of Eastham would prefer to develop its own water supply source for the proposed limited supply service area to eliminate dependence on the Town of Orleans for water.

Ranking:	**Unfavorable**
Positive Factors:	Existing water system and maintenance and operation by others
Issues of Concern:	Political issues, water rates and agreements, dependence on the Town of Orleans, interbasin transfer of water, and distance to service area

5. CONCLUSIONS

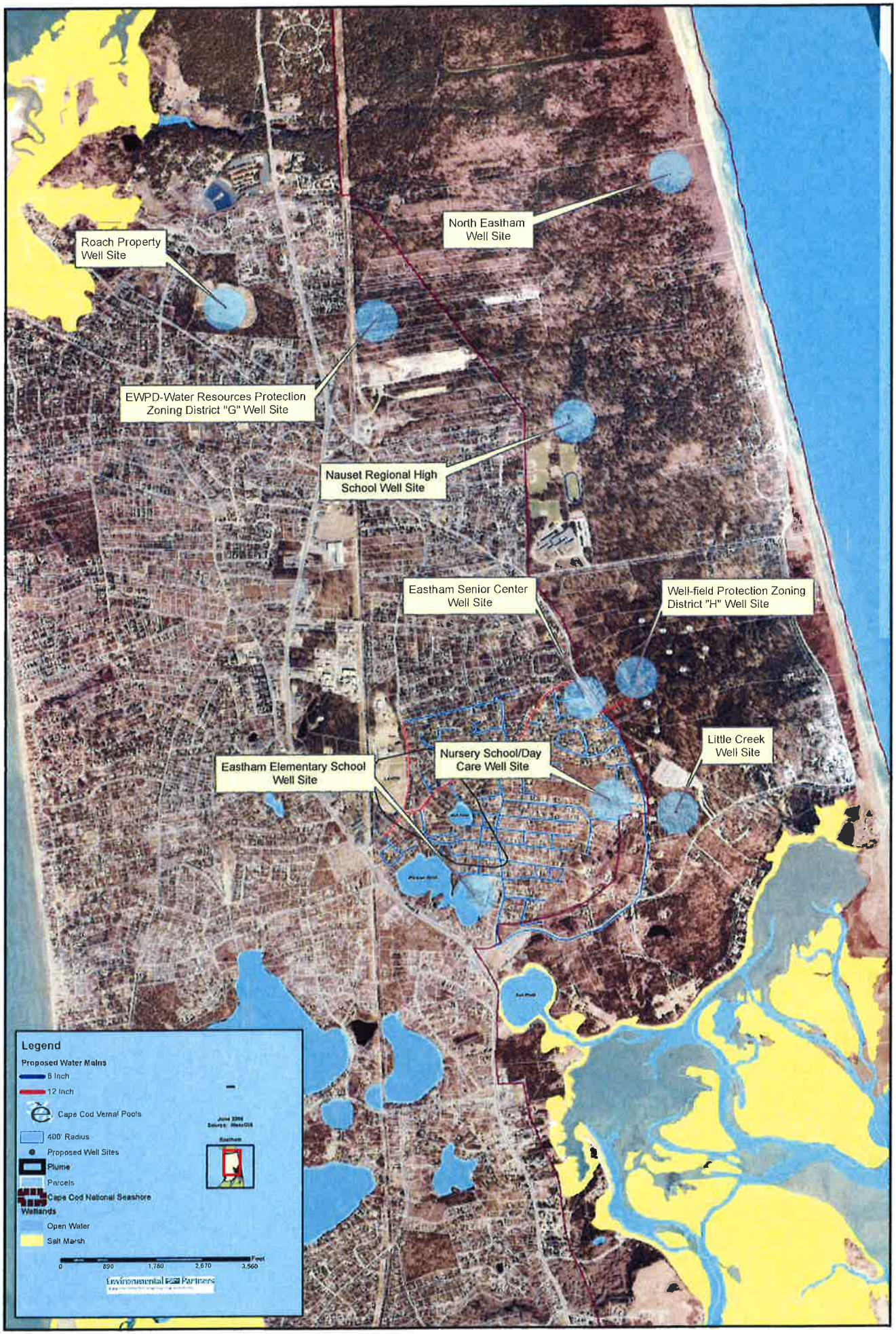
This report provides the Town of Eastham with an evaluation and screening study of potential groundwater well sites for the proposed limited water system in the landfill area. With consideration to the project basis and design criteria developed in *Task 1 – Project Definition and Feasibility Study, Town of Eastham, August 2005* prepared by EPG, and from evaluation of the identified possible water supply sources, the following conclusions can be drawn from this Task 2 report:

- Of the eleven potential water supply sites screened under this evaluation, the highly favorable and most advantageous sites for a water supply source for the proposed limited water system include:
    - Well-field Protection Zoning District "H"
    - Nauset Regional High School
- Well-field Protection Zoning District "H" was given a highly favorable rating because the property is Town owned, and therefore requires no land taking or purchases, a 400 foot Zone I radius is available, the well-field is in close proximity to the proposed limited service area, and previous studies have demonstrated high potential water yield and good expected water quality. Based on initial hydrogeological investigations in the District "H" area, this potential well site could possibly provide the Town with a larger supply source for a Town-wide water supply system.
- The Nauset Regional High School existing groundwater well was identified as a highly favorable water supply source. The existing 4" well has an available 400 foot Zone I radius and the initial 48-hour pump test was conducted at the water system design requirement of 70 gallons per minute. Since the well and well site are not owned by Eastham, the Town would need to negotiate a water use agreement with the High School. Capital cost savings realized from utilizing the existing well will be off-set by construction of a 1.5 mile +/- water supply main to feed the proposed service area.
- The Town has reserved the Eastham Water Protection District (EWPD), also known as the Water Resources Protection Zoning District "G", as a site for potential development of a municipal water supply. The potential well site is Town owned and a 400 foot Zone I radius is available. However, because of the distance to the proposed service area and identified water quality issues South of the well site, EWPD was rated as less favorable.

- Little Creek, North Eastham, and Marconi Beach in Wellfleet were identified as unfavorable water supply sources. The properties are not Town owned, and therefore would be a major obstacle for development as a groundwater supply.
- The Town of Eastham owns a 64-acre plot of land known as the Roach Property, and has reserved a third of the property for potential development of a municipal water supply. The Roach Property was ranked as unfavorable because of the distance to the proposed service area and environmental issues related to Hatch's Creek.
- The Eastham Elementary School, Eastham Senior Center, and Nursery School/Day Care were identified as unfavorable water supply sources. A 400 foot Zone I radius is not available at these potential well sites, and therefore a groundwater well in these locations could not meet the 70 gallons per minute water capacity design criteria.
- The Town of Orleans water system does have excess safe yield capacity to provide potable water to Eastham's proposed limited water supply service area. The three major issues with connecting to the Town of Orleans include: political issues and water agreements between the two Towns, environmental issues related to interbasin transfer of water, and construction costs related to installation of a transmission main along Route 6 to service the landfill area water system. From discussions with the Working Group, at this time the Town of Eastham would prefer to develop its own water supply source for the proposed limited supply service area to eliminate dependence on the Town of Orleans for water, and therefore this option was ranked unfavorable.
- Environmental Partners Group recommends the following as a parallel approach in securing a water supply source for the proposed limited water system:
    - The feasibility of connecting to the Nauset Regional High School as a permanent water supply source should be further evaluated. The Town should meet with High School administrators to discuss the integration of the existing groundwater well into a water supply source for the Town's proposed limited water system. If a water use agreement between the Town and the High School can be reached, the Town should investigate permitting and pump test requirements with DEP for utilizing the existing well as a groundwater source.

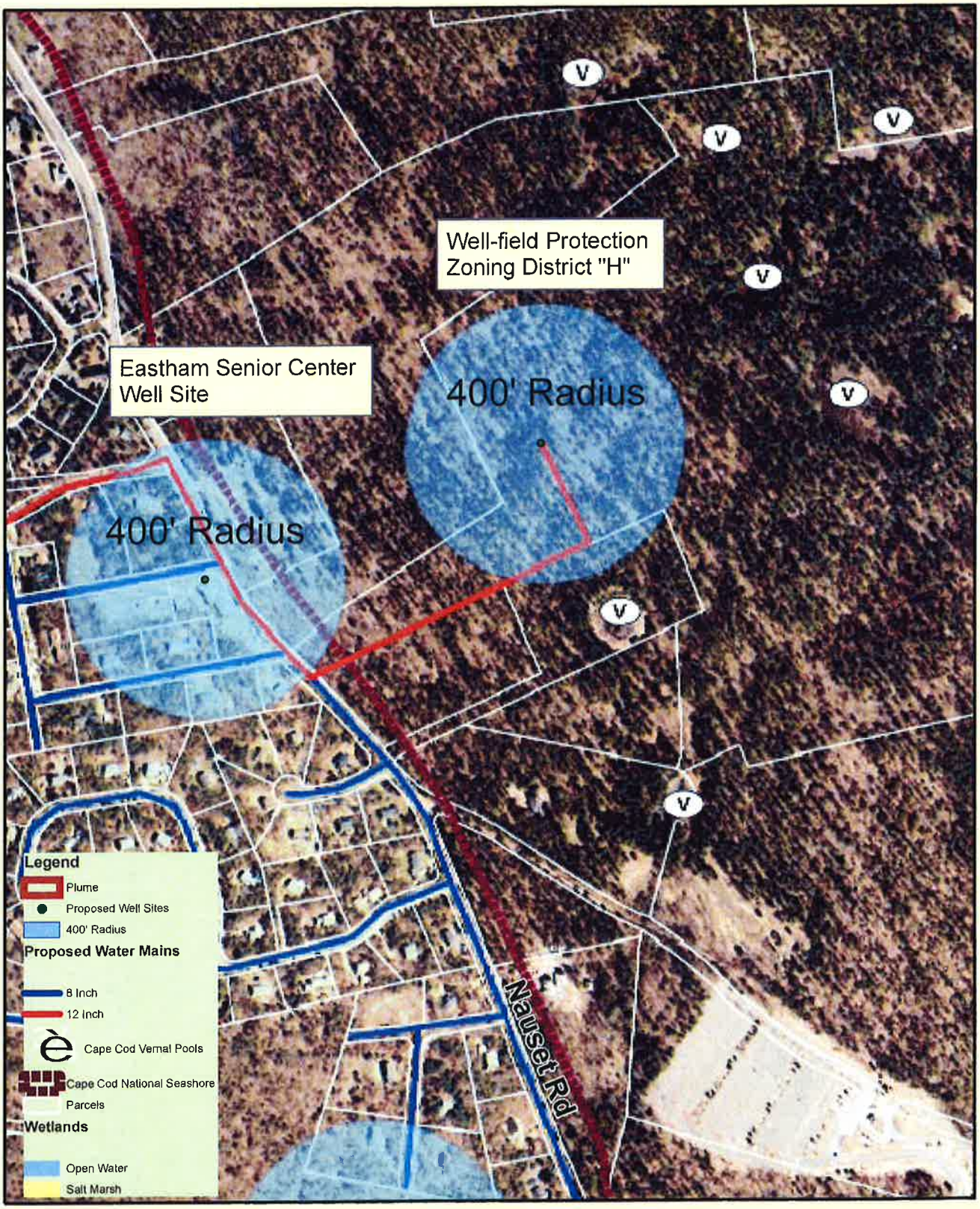
- Pump tests should be conducted at Well-field Protection Zoning District "H" in order to gather critical field information necessary for permitting and designing a groundwater supply source. The Town should seek a meeting with the staff of the National Seashore to begin discussions on the Town's programmatic plans for water supply investigation, and to seek input from the Seashore on their needs and concerns.

Appendix A –
Possible Water Supply Well Locations


Roach Property Well Site
North Eastham Well Site
EWPD-Water Resources Protection Zoning District "G" Well Site
Nauset Regional High School Well Site
Eastham Senior Center Well Site
Well-field Protection Zoning District "H" Well Site
Little Creek Well Site
Nursery School/Day Care Well Site
Eastham Elementary School Well Site
Legend
Proposed Water Mains
8 Inch
12 Inch
Cape Cod Vernal Pools
400' Radius
Proposed Well Sites
Plume
Parcels
Cape Cod National Seashore
Wetlands
Open Water
Salt Marsh
0
890
1,780
2,670
3,560
Feet

Appendix B –
Well Location Figures

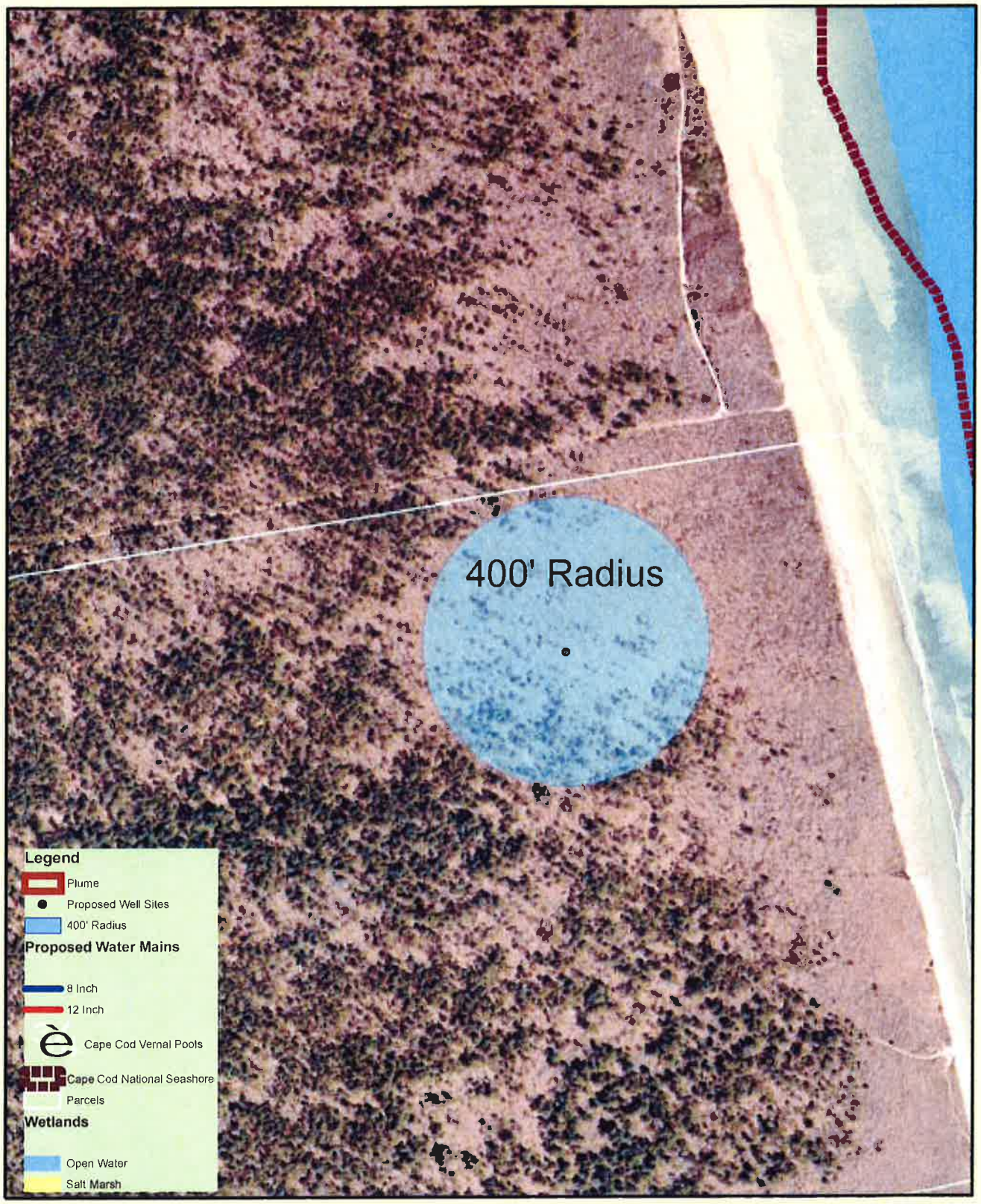
Site ID		Ranking	Town Owned	400' Zone I Availability	Expected Water Quality	Potential Yield	CCNS	Distance to Service Area	Environmental Issues
Well-field Protection Zoning District "H"	Test Well No. 1 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	400 gpm	Inside	0 ft	Vernal Pools, Wetlands
	Test Well No. 3 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	300 gpm	Inside	0 ft	Vernal Pools, Wetlands
	Test Well No. 4 – East of Nauset Rd. & South of Cable Rd.	Highly Favorable	X	Yes	Good	700 gpm	Inside	0 ft	Vernal Pools, Wetlands
North Eastham		Unfavorable		Yes	Unknown	450 gpm	Inside	18,650 ft	Unknown
Marconi Beach (Wellfleet)		Unfavorable		Yes	Unknown	Unknown	Inside	18,450 ft	Wetlands
Eastham Water Protection District (EWPD)		Less Favorable	X	Yes	Unknown	450 gpm	Outside	12,365 ft	Wetlands
Roach Property		Unfavorable	X	Yes	Unknown	150 gpm	Outside	11,582 ft	Wetlands
Little Creek (Nauset Road)		Unfavorable		Yes	Unknown	Unknown	Inside	0 ft	Vernal Pools, Wetlands
Eastham Elementary School		Unfavorable	X	No	Poor	20 gpm	Outside	0 ft	Minister Pond, Wetlands
Nauset Regional High School		Highly Favorable		Yes	Good	<70 gpm	Inside	7,582 ft	Wetlands, Vernal Pools
Eastham Senior Center		Unfavorable	X	No	Unknown	<70 gpm	Outside	0 ft	Vernal Pools, Wetlands
Nursery School/Day Care		Unfavorable	X	No	Unknown	<70 gpm	Outside	0 ft	Vernal Pools, Wetlands
Town of Orleans Water Supply System		Unfavorable	-	-	Good	-	-	20,000+ ft	-



Eastham Senior Center & Well-field Protection Zoning District "H" Well Sites

0 75 150 300 450 Feet

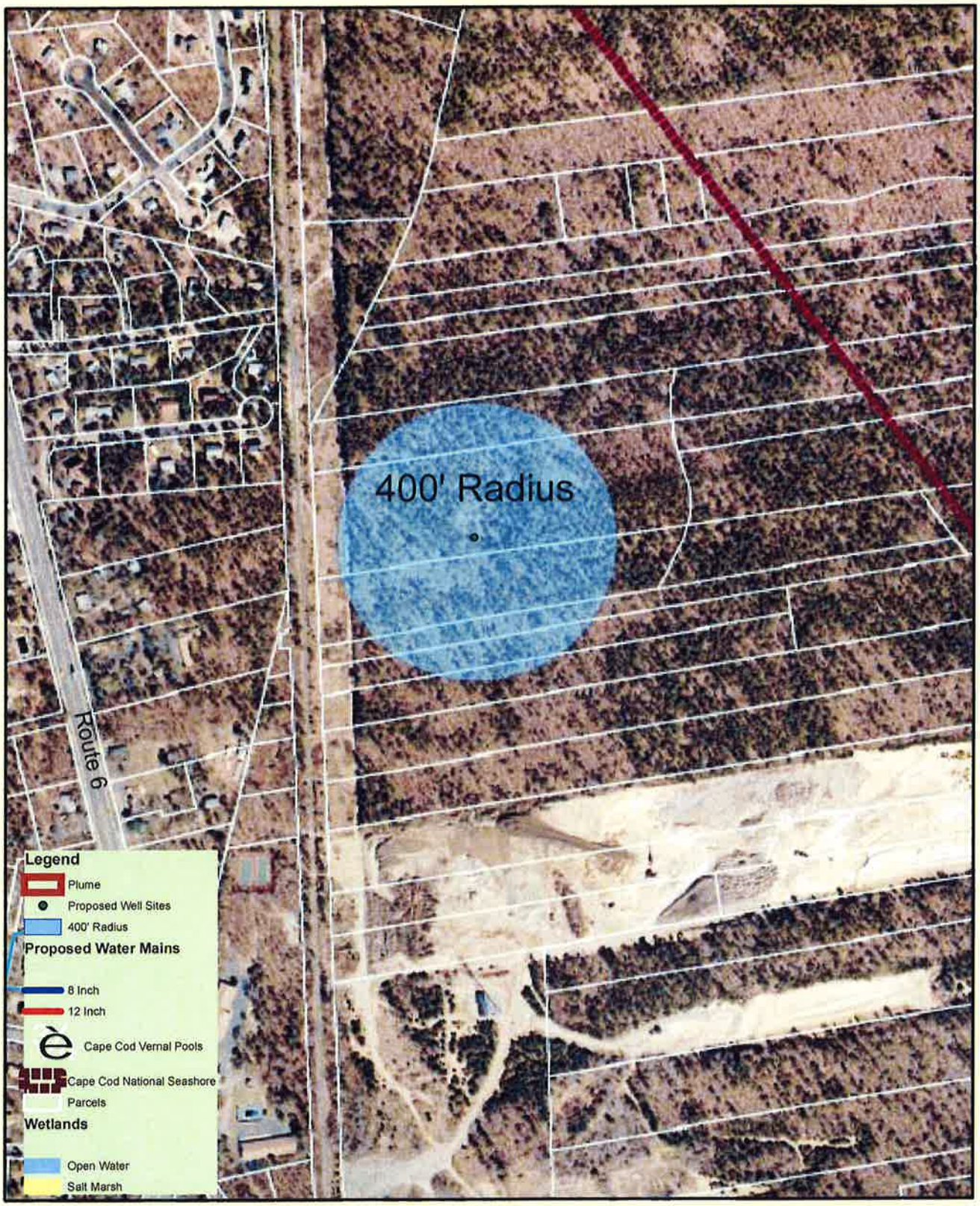
Environmental Partners



North Eastham Well Site

0 75 150 300 450 Feet

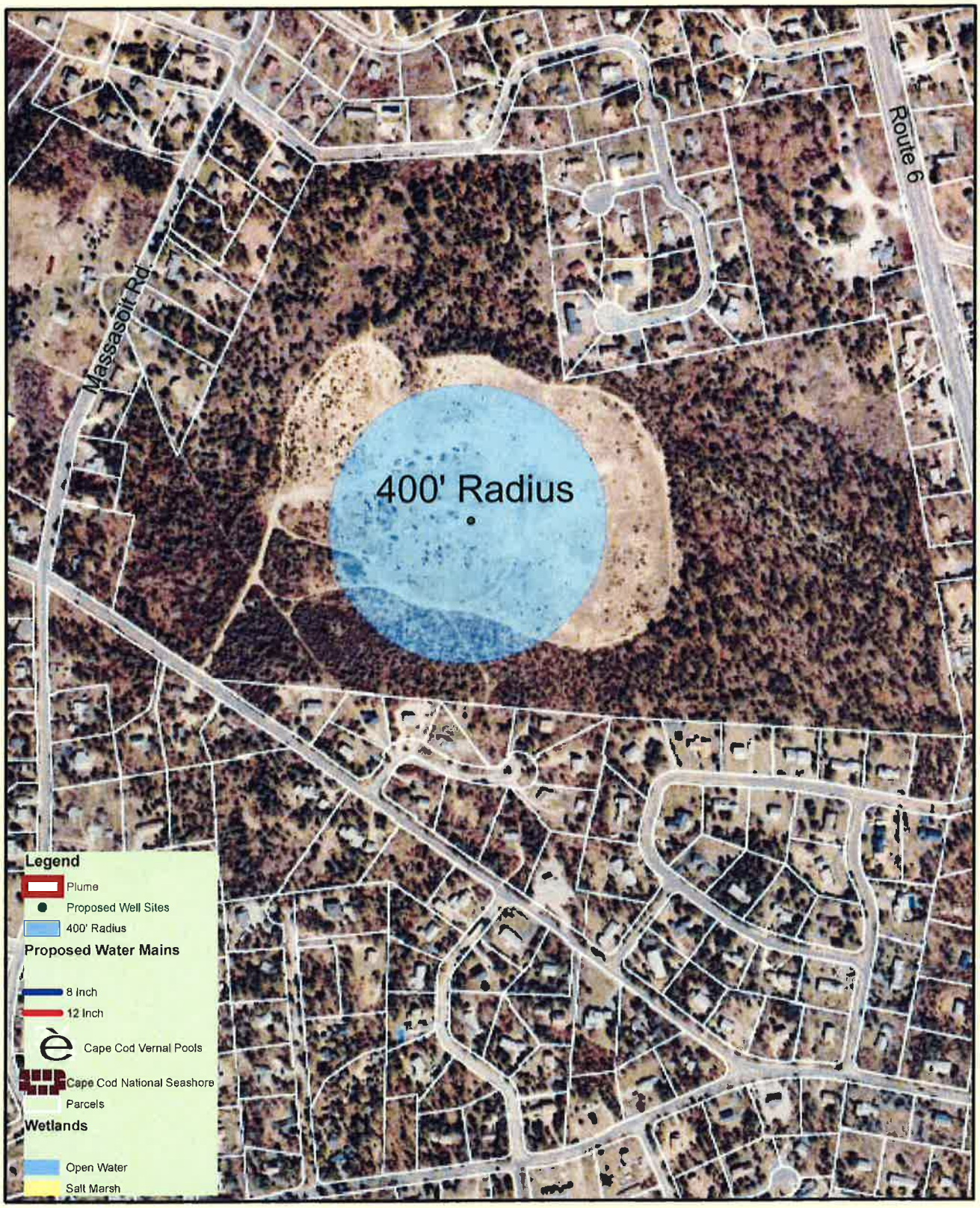
Environmental Partners



EWPD- Water Resources Protection Zoning District "G" Well Site

0 75 150 300 450 Feet

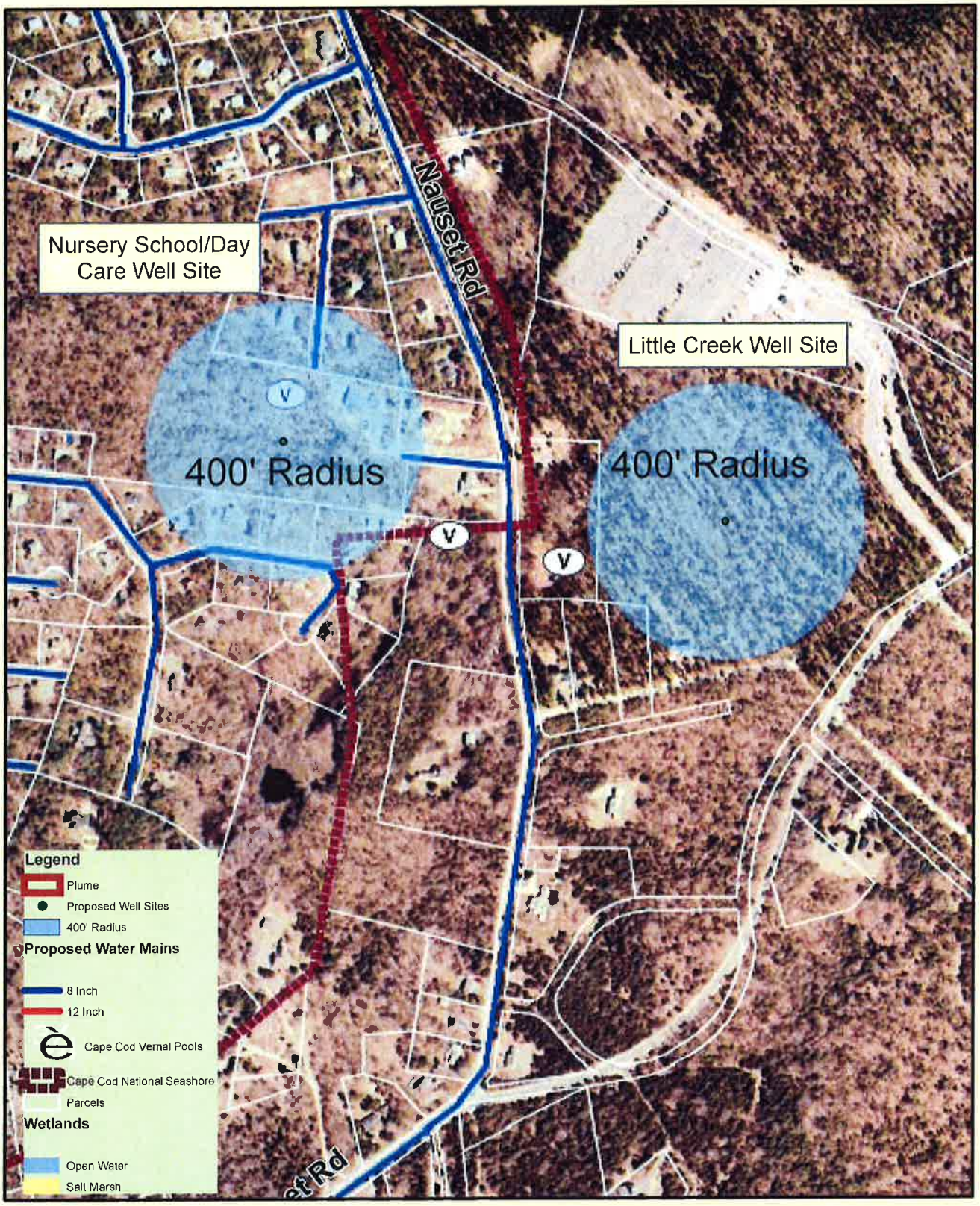
Environmental Partners



Roach Property
Well Site

0 75 150 300 450
Feet

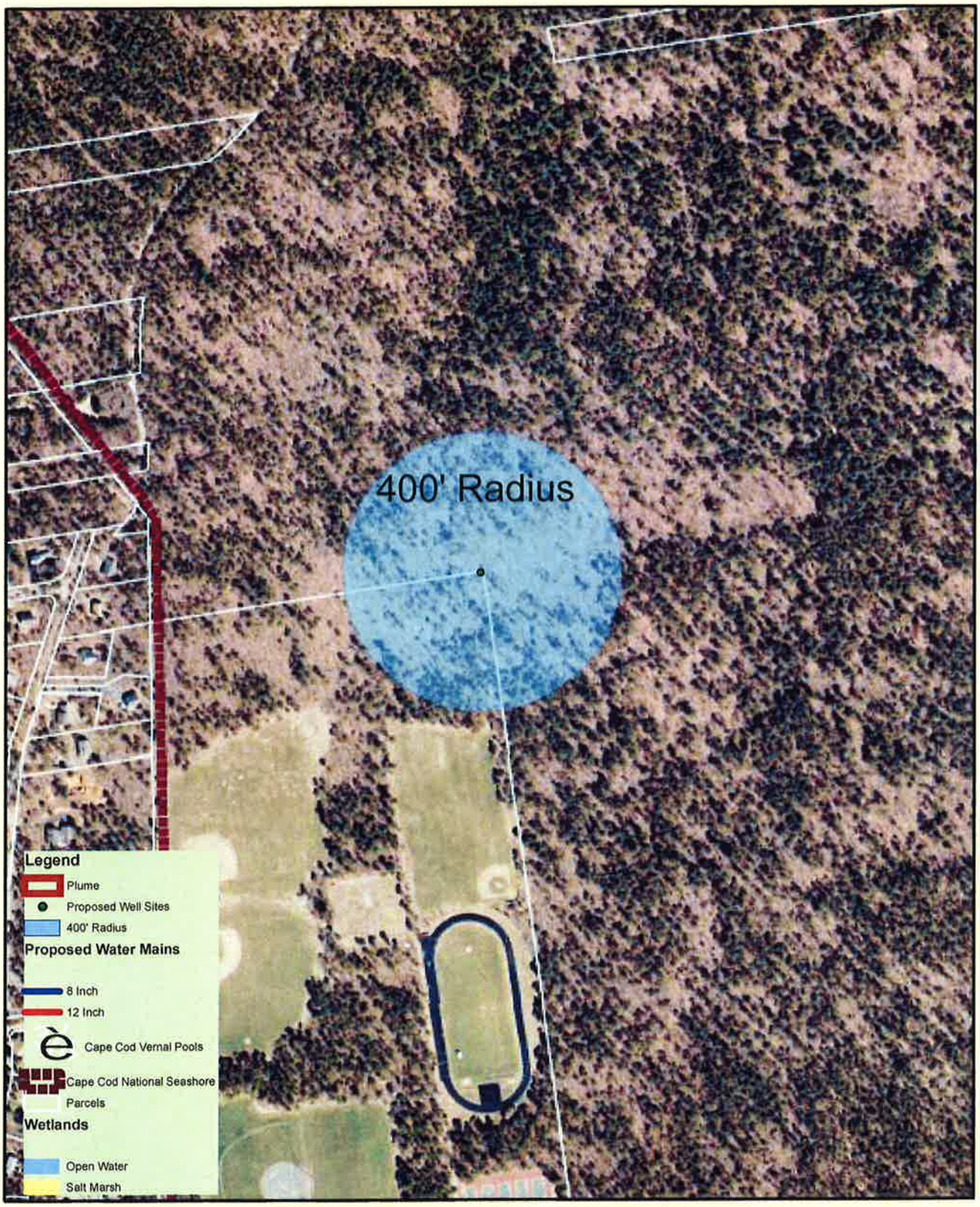
Environmental Partners



Nursery School/Day Care & Little Creek Well Sites

0 75 150 300 450 Feet

Environmental Partners



Nauset Regional High School Well Site

0 75 150 300 450 Feet

Environmental Partners

Appendix C – References

Summer, 2003

Inner Cape Cod Bay
Area of Critical Environmental Concern (ACEC)

Designation Date:	October 11, 1985
Total approximate acreage:	2,600 acres
Watershed/subwatershed:	Cape Cod/Namskaket Creek
Municipalities (% of ACEC):	Brewster (15%), Eastham (56%), Orleans (29%)

What makes this area so special?

Designation Overview

The Inner Cape Cod Bay ACEC was nominated by the Conservation Commissions, Boards of Selectmen, and Planning Boards from the Towns of Brewster, Eastham, and Orleans and was designated as an ACEC in 1985 because of the area's extraordinary natural resources. The boundary for this ACEC generally follows the 10-foot contour line on the landward side, and the mean low water on the seaward side, and extends from First Encounter Beach south to include Namskaket Creek. Included within the ACEC boundary are hundreds of acres of saltmarsh, highly productive shellfish beds, undisturbed wildlife habitat, barrier beaches, salt ponds, and tidal rivers and creeks. These areas provide flood control, storm damage prevention, improved water quality, and recreation opportunities to surrounding communities.

Wildlife Habitats

The diverse and relatively unaltered habitats of this ACEC provide feeding, spawning, and nursery grounds for numerous shellfish, finfish, amphibians, reptiles, birds, and mammals. In 2002, the state's Natural Heritage and Endangered Species Program (NHESP) identified approximately 2,340 acres or 90% of the ACEC as core habitat through their BioMap project, which highlights areas in Massachusetts with high biodiversity and most in need of protection. That same year the NHESP listed four species that were either Endangered (E), Threatened (T), or of Special Concern (SC) including: salt reed grass (SC - plant), the oysterleaf (E - plant), the seabeach dock (T - plant), and the diamondback terrapin (T - reptile). In 2001, the NHESP located three potential vernal pools in the ACEC. In addition, the Herring River in Eastham and Rock Harbor Creek in Orleans are migratory fish runs for alewives and blue-black herring that travel to spawn in Cape Cod Bay. Habitat for oysters, quahogs, and razor, soft shell, and surf clams can be found within the ACEC boundary according to draft maps made in 2003 by the Division of Marine Fisheries and based on historical information and interviews with local shellfish officers.

Land Use

The estuaries and surrounding salt marsh predominate most of the area in this ACEC. Most land falls within the 100-year floodplain, which minimizes development within the ACEC boundary. However, much of the land immediately adjacent to the boundary has been converted to residential development. The majority of the 350 acres of protected open space within the boundary, including portions of Namskaket Marsh, First Encounter Beach, Nickerson State Park, and land owned by the Orleans Conservation Trust, is owned by either the municipalities, non-profit organizations, or the state.

Economic Benefits

The economies of the three towns are tied to this area since local fishing and tourism industries depend on the natural resources in this ACEC. In 2002, eight acres of aquaculture lease sites used by 12 license holders were located in tidal areas. The economy is also supported by many public recreation areas throughout the ACEC. Herring Pond offers swimming, boating, trout fishing, and other recreational opportunities while First Encounter Beach and Hatch Beach offer public access to the ocean. Residents and tourists are drawn to the pristine beaches and waters for multiple recreation opportunities as well as scenic views of Cape Cod Bay.

Archaeology

The interrelated system of estuaries and surrounding wetlands of the Inner Cape Cod Bay ACEC contain between 13 to 15 archaeological sites. Of these, two sites are of particular note: the Chase Farm, located along the margins of the Herring River, was continuously occupied on a seasonal basis for thousands of years beginning as early as 9,000 - 8,000 years ago, and another site which dates back 450 - 400 years is located somewhere near the mouth of the Herring River and Cape Cod Bay in the vicinity of First Encounter Beach.

What are some stewardship activities?

One goal of the ACEC program is to promote stewardship of this area's resources through the participation, cooperation, and expertise of many interest groups. The Towns of Orleans, Eastham, and the UMass School of Marine Science and Technology have been partnering through the state's *Estuaries Project - Southeastern Massachusetts Embayment Restoration.* Water quality samples are being taken in Rock Harbor, Namskaket Creek, and Boat Meadow Creek. The towns hope this information can lead to long-term strategies for wastewater and stormwater remediation. The United States Geological Survey has also been involved for the past 15 years in leading water quality studies on Namskaket Creek to determine how a contaminant plume travels from the Brewster, Orleans, and Eastham tri-town wastewater treatment facility. The USGS has put monitoring wells near the treatment facility and along the creek to sample water quality. Ultimately, the results show how the wastewater plume and nitrogen transport affects the aquifer, marsh, and creek ecosystems.

In 1999, the Massachusetts Office of Coastal Zone Management (CZM) began a wetland study in the ACEC at the junction of the Boat Meadow Creek and the Cape Cod Rail Trail. This study took a detailed inventory of animal and plant life to see how the creek's natural tidal flow was affected by a small culvert restricting the channel beneath the rail line. Results indicated a decrease in tidal exchange, upstream flooding, and lower diversity and abundance of native wildlife upstream of the tidal restriction. In 2002, a wetland restoration project was undertaken through a partnership of state and local agencies. CZM worked with DCR through the Cape Cod Rail Trail and the Wetlands Restoration Program to complete this culvert replacement project and will continue to monitor this site for long-term restoration progress.

By becoming active stewards, community members can help monitor the condition, target problems, and find ways to improve and protect the natural resources in their ACEC. If you have any questions or ideas for stewardship in the Inner Cape Cod Bay ACEC, please contact the Massachusetts Office of Coastal Zone Management's ACEC Stewardship Coordinator, Katie Lund, at (508) 289-2889 or the Department of Conservation and Recreation's ACEC Coastal Coordinator, Liz Sorenson, at (617) 626-1394.

Local ACEC Stewards

Towns of Brewster, Eastham, and Orleans
Brewster Conservation Trust

Brewster Pond Stewards
Orleans Conservation Trust
Orleans Water Quality Taskforce
Nickerson State Park

What coastal resources are included (partially or entirely) in the ACEC?

Harbors, Sounds, Bays: Cape Cod Bay (*Brewster, Eastham, Orleans*)

Rivers: Boat Meadow (*Eastham*); Herring (*Eastham*)

Lakes, Ponds: Cedar Pond (*Orleans*); Herring Pond (*Eastham*)

Brooks, Creeks: Little Namskaket Creek (*Orleans*); Namskaket Creek (*Brewster, Orleans*); Rock Harbor Creek (*Eastham, Orleans*)

Great Ponds (ponds > 10 acres): Cedar Pond (*Orleans*); Herring Pond (*Eastham*)

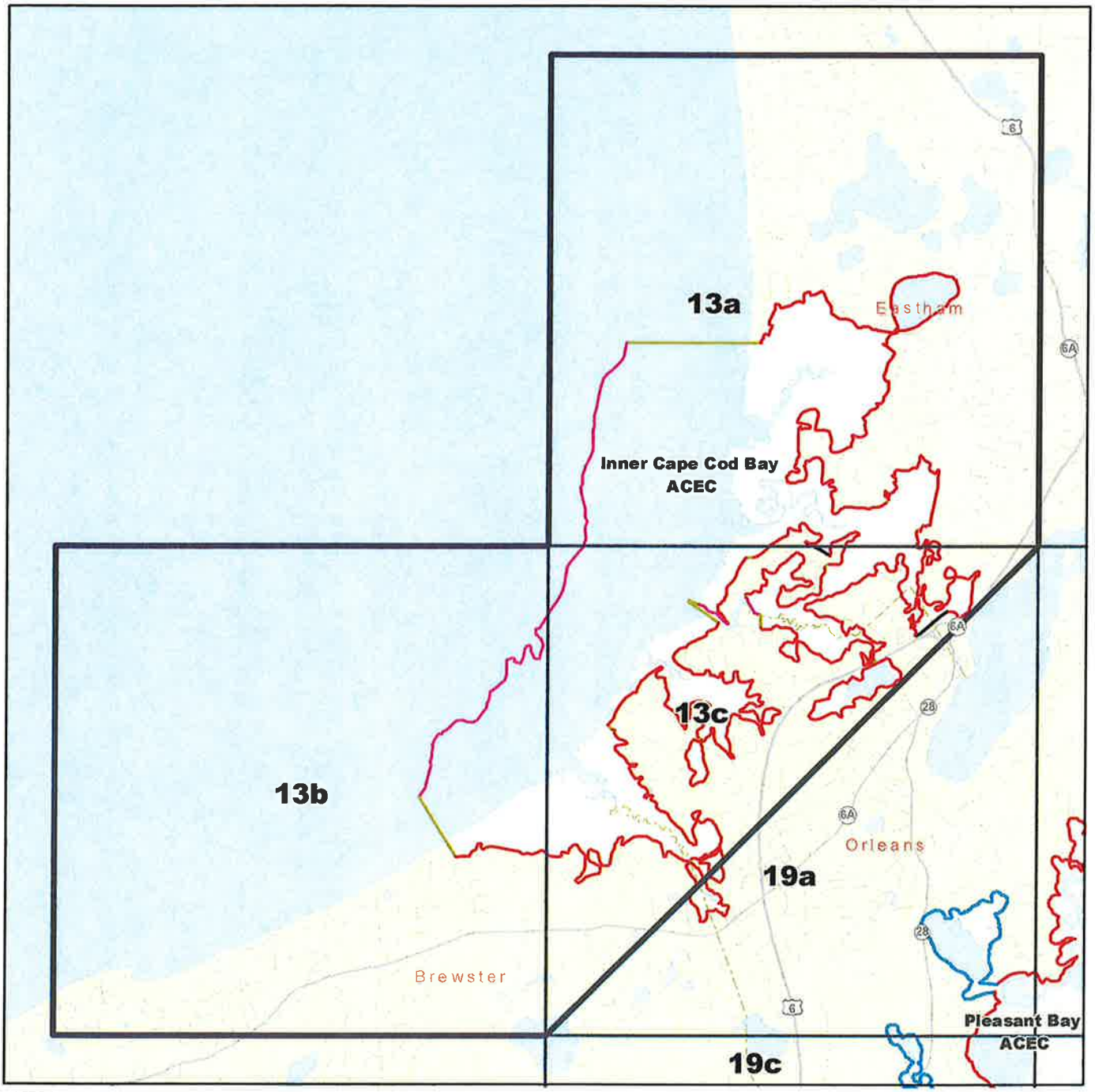
Outstanding Resource Waters (ORWs): All waters including rivers, ponds, and creeks except for Cape Cod Bay. *(ORWs are waters, such as public water supplies and vernal pools that are protected by the most stringent standards because they constitute an outstanding resource as determined by their socio-economic, recreational, ecological, and/or aesthetic values).*

Barrier Beaches (Massachusetts Barrier Beach Inventory, CZM, 1982): beach south of Namskaket Creek *(Brewster)*; First Encounter Beach/Hatch Beach (Eh-2), beach south of Herring River (Eh-3), beach south of Boat Meadow River (Eh-4), beach north of Rock Harbor (Eh-5) *(Eastham)*; beach between Rock Harbor and Little Namskaket Creek, Skaket Beach (Ol-2), beach north of Namskaket Creek (Ol-3), beach south of Namskaket Creek (Ol-4, connected to Bt-1) *(Orleans)*

NATURAL RESOURCE ACREAGE ESTIMATES

Note: acreages are estimated using Massachusetts Geographic Information System data (2001).

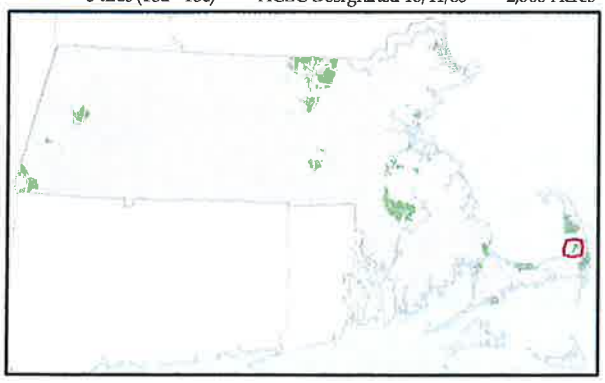
HABITAT TYPE	ACREAGE in ACEC	% of ACEC	LAND USE	ACREAGE in ACEC	% of ACEC
barrier beach	95	4	recreation	25	9
eelgrass	95	4	Agriculture	--	--
salt marsh	840	32	Residential	105	4
tidal flat	1,095	42	Commercial	--	--
freshwater wetland	130	5	Industrial	5	<1
cranberry bog	5	<1	OPEN SPACE		
forest	205	8	*Federal*	--	--
open water	1,450	56	*State*	40	2
100 yr floodplain	1,245	48	*Municipal*	250	10
			private/nonprofit	320	13
			chapter 61	--	--
			protected	350	13



ACEC #

13 Inner Cape Cod Bay ACEC - Index Map

3 tiles (13a - 13c) ACEC Designated 10/11/85 2,600 Acres



Massachusetts Department of Conservation and Recreation

Areas of Critical Environmental Concern (ACEC) Program

This index map shows the locations of the map tiles that are available as individual sections of 1:24,000 USGS maps. The map number is the ACEC number plus a sequential letter, e.g. "21a". Some smaller ACECs may have only one tile. Determine which tiles you want to view, note their map tile numbers, and open them individually from the ACEC website.

For more information:

www.mass.gov/dcr/stewardship/acec

Town Boundary
ACEC Map Tiles
ACECs

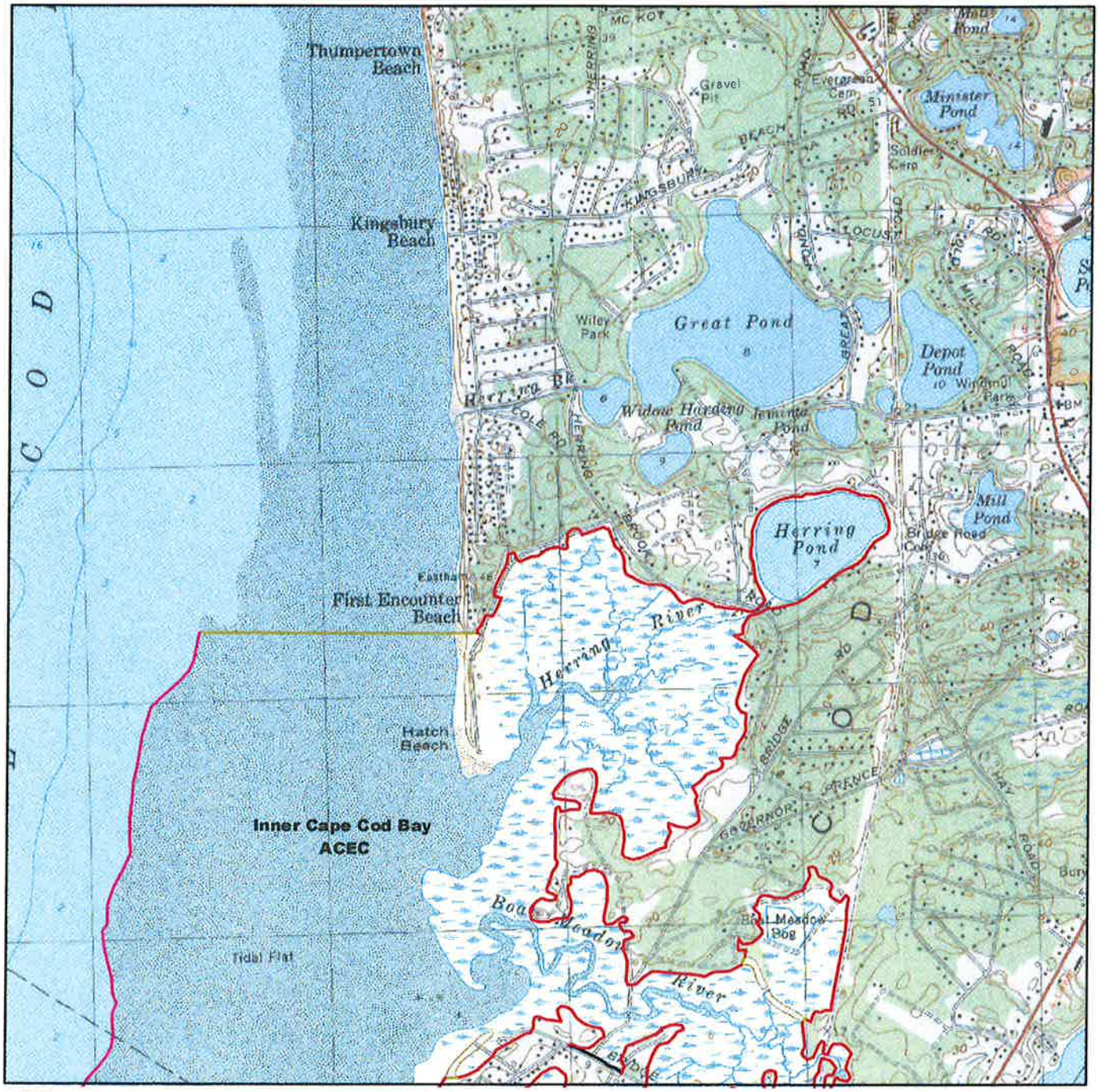
ACEC Boundaries by Type

- Road/Rail based
- River based
- Wetland based
- Floodplain based
- Tide based
- Contour based
- Political boundary
- Property line based
- Other
- Digital update required

dcr
Massachusetts

1 inch equals 0.8 miles

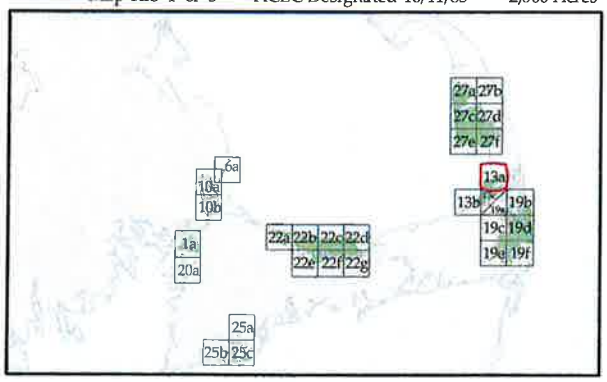
N



Map # **13a**

Inner Cape Cod Bay ACEC

Map Tile 1 of 3 ACEC Designated 10/11/85 2,600 Acres



Massachusetts Department of Conservation and Recreation

Areas of Critical Environmental Concern (ACEC) Program

This map is intended to be used with the written boundary description contained in the ACEC designation document. The mapped boundary is not to be used by itself for definitive ACEC boundary delineation or regulatory interpretation. For review of site-specific projects within the ACEC boundary, determinations may need to be made in the field or in consultation with ACEC Program Staff.

For more information:

www.mass.gov/dcr/stewardship/acec

ACEC Boundaries by Type

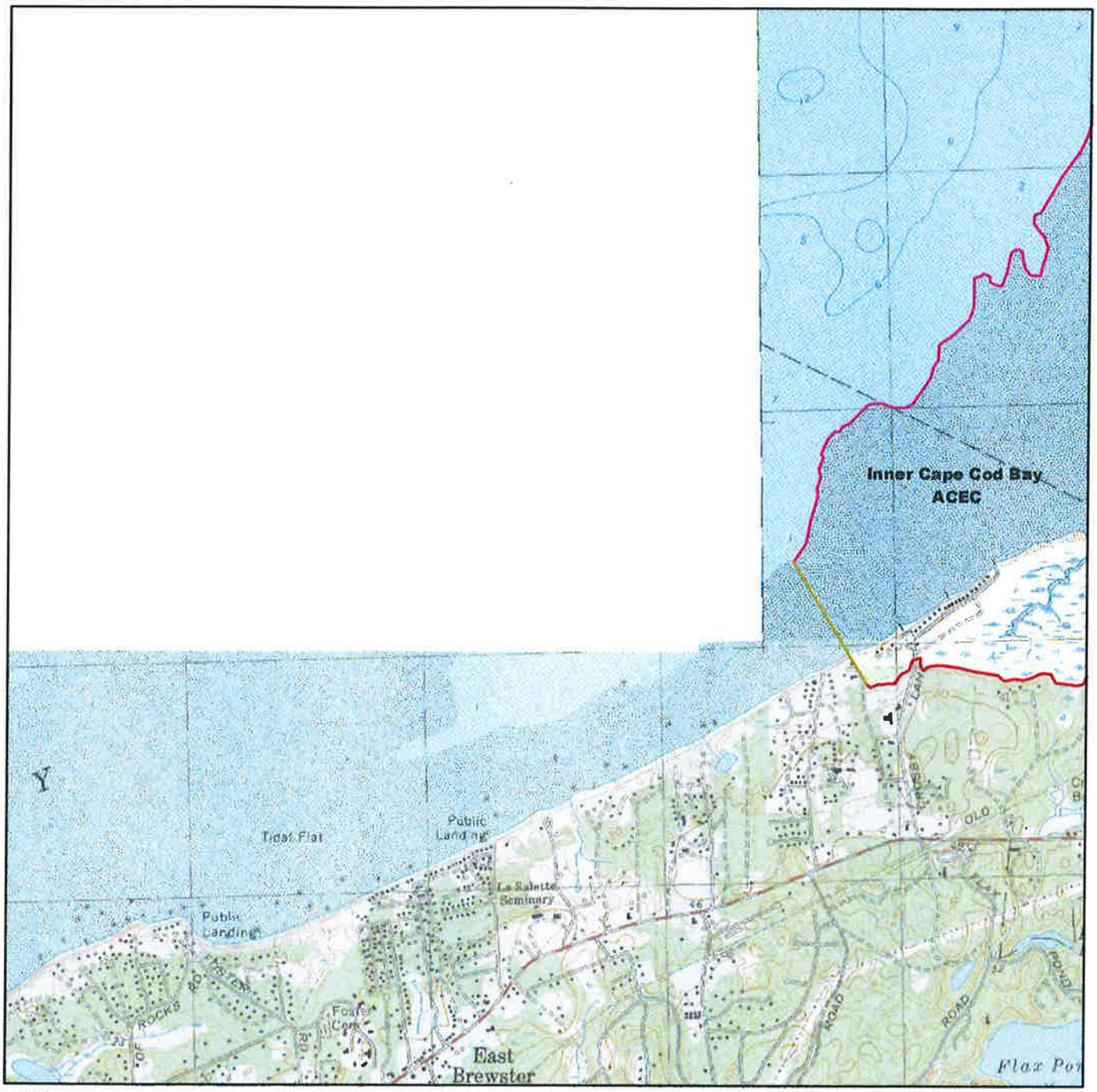
- Road/Rail based
- River based
- Wetland based
- Floodplain based
- Tide based
- Contour based
- Political boundary
- Property line based
- Other
- Digital update required

Areas not within an ACEC are shaded with a gray mask.

dcr Massachusetts

0.25 miles

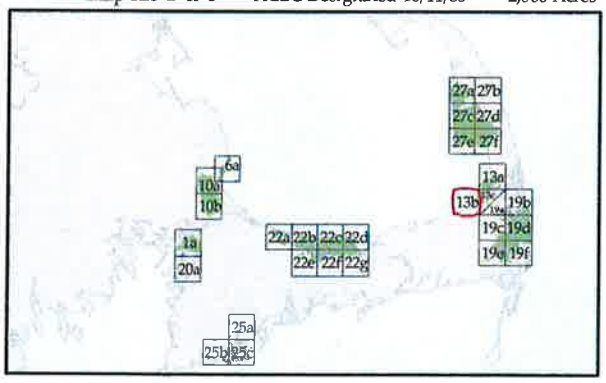
N



Map #

13b Inner Cape Cod Bay ACEC

Map Tile 2 of 3 ACEC Designated 10/11/85 2,600 Acres



Massachusetts Department of Conservation and Recreation

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dcr Massachusetts

0.25 miles

N

Map # 13c

Inner Cape Cod Bay ACEC

Map Tile 3 of 3 ACEC Designated 10/11/85 2,600 Acres

Massachusetts Department of Conservation and Recreation

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dcr Massachusetts

0.25 miles

N

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

October 14, 2014

Sheila Vanderhoef
Town Administration
Town of Eastham
2500 State Highway
Eastham, MA 02642

RE: Eastham Water System, Eastham, MA. MHC # RC.48184.

Dear Ms. Vanderhoef :

Staff of the Massachusetts Historical Commission (MHC) have reviewed the Project Notification Form (PNF) submitted by Environmental Partners Group, Inc., received October 1, 2014, for the project referenced above. The proposed project consists of the construction of water wells and associated infrastructure, including an elevated water storage tank and the installation of water distribution system within multiple roads in Eastham.

The PNF indicates that the project also requires review through the Massachusetts Environmental Policy Act (MEPA). Under MHC's state regulations, a Section 106 review automatically substitutes for a state-level MHC review (see 950 CMR 71.04(2)). This provision acts as an important streamlining process to enable federally-funded projects to proceed in a prompt manner, without any duplicative historic preservation reviews as it goes to MEPA for MEPA review or to state agencies for applicable state agency permits. A copy of the Environmental Notification Form (ENF) should be submitted to the MHC when it is filed with the MEPA office.

The MHC has previously reviewed portions of the project in consultation with the US Department of Agriculture Rural Development in 2010, including proposed wellfields at the Nauset Regional High School and at locations within Districts G adjacent to currently proposed locations for this project. The PNF indicates that wells, water lines and associate infrastructure are proposed primarily within existing paved roads. Other project impact areas are proposed within unpaved roads that may have minimal previous ground disturbance and be archaeologically sensitive. Review of the Inventory of Historic and Archaeological Assets of the Commonwealth indicates that multiple ancient Native American archaeological sites are recorded in Eastham in proximity to the current road network. This archaeological sensitivity is primarily due to environmental setting, with level, sandy, well-drained soils in proximity to the fresh and saltwater wetlands and water resources of the Outer Cape, favorable for ancient and historic period Native American land use and occupation. The general east Eastham area around Salt Pond Bay was a center of historic Native American occupation and settlement.

Buried archaeological resources associated with ancient and historic period occupation of Eastham, including unmarked human burials, may be expected within archaeologically sensitive, intact portions of project impact areas, especially project impact areas in proximity to significant historic burial grounds, including the Cove Burying Ground (MHC # EAS.800), and the Bridge Road Cemetery (EAS.803), listed in the State and National Registers of Historic Places. The National Register nomination forms for these burial grounds indicate that cemetery boundaries have changed over time, and unmarked human burials may be present outside the currently marked cemetery boundaries, within and adjacent to the current road right-of-ways at these locations.

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

The MHC requires additional information to ascertain the extent of previous disturbance within the project impact area to offer further technical assistance in archaeology and historic preservation, including recommendations for archaeological survey. As project planning proceeds, please submit additional information, including the results of geotechnical survey, soil borings, information on existing utilities, and scaled existing and proposed conditions project plans for the project to the MHC, to assist in further consultation to avoid, minimize or mitigate adverse effects to significant historic and archaeological resources.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and M.G.L Chapter 9, Sections 26-27C (950 CMR 71). If you have any immediate questions or require additional information please contact Jonathan K. Patton, Archaeologist/Preservation Planner, at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: John F. Knight, Eastham Water Commission Chairman
Neil Andres, Superintendant, Eastham Department of Public Works
Marty Mickle, Assistant Superintendant, Eastham DPW
John Felix, DEP-BRP
Bettina Washington, Wampanoag Tribe of Gay Head (Aquinnah)
Ramona Peters, Mashpee Wampanoag Tribe
Steve Chrabascz, USDA Rural Development
George E. Price, Jr. Superintendant, Cape Cod National Seashore, Attn: Bill Burke
DEP-SERO, Div. Water Pollution Control
Eastham Historical Commission
Mark N. White, Environmental Partners Group, Inc.

Mashpee Wampanoag Tribe
Tribal Historic Preservation Office

RECEIVED
OCT 29 2014
BY:

Project Notification Request

October 24, 2014

Sheila Vanderhoef
Town Administration
Town of Eastham
2500 State Highway
Eastham, MA 02642

RE: Town of Eastham's –Eastham Water System Project

Dear Sheila Vanderhoef,

The Mashpee Wampanoag Tribe's Historic Preservation Office has been made aware that the town of Eastham's intended Eastham Water System project is being reviewed by MHC as a section 106 undertaking under MEPA. Therefore our inclusion in protection of cultural resources through "meaningful consultations" is prudent. These Consultations are to address interest and concerns through mitigation of "Adverse effects" with regard to your Section 106 "Undertakings".

To facilitate our consultation we'll need a packet containing construction documents showing areas of potential effect and previous ground disturbance so that we may do a thorough review. Following a review we will send a response letter addressing our concerns and suggestions.

In the case that you will be doing any archaeological assessments with in the project areas, we insist on being included prior to Archaeological sensitivity assessments. Our primary concerns at this time are focused on the protocol procedures which include proper notification early enough in the process to allow the THPO's involvement throughout the planning stages as a consultant and interested party.

The Mashpee Wampanoag Tribe's historic preservation department is dedicated to protecting Native American burials and remains first and foremost. We regard this area as highly sensitive due to known Native American habitation which numbered in the thousands pre-contact. We require monitoring of all ground disturbances as they relate to archaeological sensitivity assessments, surveys, reconnaissance and recoveries whether terrestrial or marine.

483 Great Neck Rd. South, Mashpee, MA 02649 | 508.477.0208*101 | Rpeters@mwtribe.com

In closing, we appreciate the outsanding respose to the recent accidental disturbance of a Wampanoag burial. Please feel free to contact me with any questions or concerns that you may have regarding this project.

In Thanksgiving, Ramona Peters

Mashpee Wampanoag THPO

Cc: Brona Simon, Commonwealth of Massachusetts, SHPO
Jim Peters, Commission on Indian Affairs

483 Great Neck Rd. South, Mashpee, MA 02649 | 508.477.0208*101 | Rpeters@mwtribe.com

Environmental Partners
A partnership for engineering solutions.

September 30, 2014

State Historic Preservation Officer
Massachusetts Historical Commission
The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, MA 02125

RE: Eastham, MA
Eastham Water Distribution System
MHC Project Notification Form

To the State Historic Preservation Officer:

On behalf of the Town of Eastham, Environmental Partners Group, Inc. (EPG) has prepared this cover letter and attachments for the proposed Eastham Water System MHC Project Notification Form (PNF). This form is being submitted in advance of environmental regulatory notifications being performed under the Massachusetts Executive Office of Environmental Affairs, Massachusetts Environmental Protection Act (MEPA) Unit through an Expanded Environmental Notification Form. A list of applicable permits and funding sources that have been or are anticipated to be requested by the Town is provided on the table accompanying this PNF.

The Town of Eastham, at their May 2014 Annual Town Meeting, voted to establish a municipal water system that will provide service to approximately one third of the Town's properties (2,021 parcels). The project consists of constructing two well fields, a water storage tank, and 45 miles of water mains. A plan showing this water system, as approved at the Town Meeting, is shown on Figure 1. A description of the various elements of the project is provided below.

Water Supply Well Fields at District G and Nauset Regional High School

The two water supply well fields to be constructed as part of this project, located at the so-called "District G" property owned by the Town (Figure 2) and at the Nauset Regional High School (NRHS) (Figure 3), have already successfully received New Source Approvals by DEP. The well fields currently has existing 12-inch wells that were used for prolonged aquifer performance tests associated with the DEP New Source approval process, and that will become the water supply wells serving the system. As part of the construction a small pump house (approximately 26' x 11') will be installed at each site to house telemetry and water conditioning equipment, together with a generator and propane tank for backup electrical and heating purposes. Underground electrical utilities and water mains will be installed to the wells on existing access roads. Chain link fencing is to be placed around the wells and pump house for security purposes. Photographs showing existing conditions at District G and NRHS are attached (Photos #1 through #4).

Water Storage Tank at District G

The proposed storage tank is to be located at the southern area of the Town's District property. It will be located in a previously cleared area (see Photo #5), and is to be an elevated tank with a 750,000 gallon capacity. The overall area where the tank is to be located will be approximately

Hyannis:
396 North Street, Hyannis, MA 02601
TL 508.568.5103 • FX 508.568.5125

Headquarters:
1900 Crown Colony Drive, Suite 402, Quincy, MA 02169
TL 617.657.0200 • FX 617.657.0201

Woburn:
18 Commerce Way, Suite 2000, Woburn, MA 01801
TL 781.281.2542 • FX 781.281.2543

www.envpartners.com

150' x 150' and includes underground water, drain and electrical utilities, a gravel driveway around the tank, and an 8-foot high security fence.

Distribution System

The distribution system consists of 45 miles of pipe with associated fire hydrants and valves that will serve 2,021 properties, representing approximately one-third of the community. Looped transmission mains are to be located throughout the Town to provide what is referred to as the "backbone" of the distribution system that, should the Town decide to do so in the future, serve a Town-wide water system. Water mains of 12-inch, 10-inch, and 6-inch diameter are to be installed, almost exclusively within existing roadway right-of-ways.

This municipal water system for Eastham is scheduled for construction beginning in spring 2015, continuing through 2017. The welllfield and storage tank construction is to occur during 2015 such that the Town can start providing water service to some of the properties in early 2016.

We appreciate your review of this PNF. If you should have any questions or require additional information, please do not hesitate to contact me at (617) 657-0251. I can also be reached via e-mail at mnw@envpartners.com.

Very Truly Yours,

ENVIRONMENTAL PARTNERS GROUP, INC.

Mark N. White

Mark White
Project Manager

Attachments:
1. MHC Project Notification Form (PNF)
2. PNF Supporting Documentation

Cc: Sheila Vanderhoef, Eastham Town Administrator and Local Water Resources Management Official
John F. Knight, Eastham Water Commissioners Chairman

APPENDIX A

MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

PROJECT NOTIFICATION FORM

Project Name: Eastham Water System

Location / Address: Town of Eastham, MA

City / Town: Eastham

Project Proponent

Name: Sheila Vanderhoef, Eastham Town Administrator

Address: 2500 State Highway

City/Town/Zip/Telephone: Eastham, MA 02642

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

Agency Name	Type of License or funding (specify)
Refer to the Attached Permitting and Funding List	

Project Description (narrative):

Construction of a new water system in Eastham, MA. The work consists of the construction of a new municipal water system for the Town of Eastham, including one(1) water storage tanks, two (2) water supplies and approximately 45 miles of water main. Refer to Figure 1 for project locations.

Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.

No

Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.

No

Does the project include new construction? If so, describe (attach plans and elevations if necessary).

The project includes construction of the Eastham Water System, as discussed in the cover letter accompanying this PNF.

APPENDIX A (continued)

To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.

No

What is the total acreage of the project area?

Woodland	0.3	acres	Productive Resources:		
Wetland	0.1	acres	Agriculture		acres
Floodplain	0.1	acres	Forestry		acres
Open space	2	acres	Mining/Extraction		acres
Developed	29.3	acres	Total Project Acreage	31.8	acres

What is the acreage of the proposed new construction? 31.8 acres

What is the present land use of the project area?

Primarily paved roadways. Well sites are to be constructed on Town owned property where existing water supply well casings are located. The District G Storage Tank is to be located on a Town owned property currently used as a storage and leaf composting site by the Eastham Department of Public Works.

Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.

USGS Quadrangle Maps attached.

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: Mark N. White Date: Sept 30, 2014

Name: Mark N. White - Environmental Partners Group, Inc.

Address: 1900 Crown Colony Drive, Suite 402

City/Town/Zip: Quincy, MA 02169

Telephone: 617-657-0200

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

Guidance for Completing MHC's ***Project Notification Form*** *(950 CMR 71.00, Appendix A)*

❖ Please make sure you **type or print legibly** the Project Notification Form (PNF) and fill out **all** sections of the form.

❖ Please submit a PNF for **each** project separately. This will facilitate MHC's review of multiple project submissions.

❖Please include the street and number in the address line of the project area. Please be sure to specify the town name.

❖ Please make sure you fill out *both* the **project address section** and the **project contact** section. Please note that these two addresses may be the same in some cases. It is important for MHC to have a contact person in order to facilitate review, should questions arise.

❖ The funding, licensing, and permitting section **must be completed** in order for MHC to review the PNF. Be sure to list *all* funding, licensing and permitting involved with the entire project; this includes **federally** funded, licensed, and permitted projects, as well as **state** funded, licensed, and permitted projects. Some examples of common funding, licensing, and permitting agencies and funding sources are: **Army Corps of Engineers; Federal Communications Commission; Community Development Block Grants; School Building Assistance from the Massachusetts Department of Education; Department of Housing and Community Development; Department of Environmental Protection (permits such as sewer connection, wetlands, or Chapter 91 permits); Massachusetts Highway Department (curb cut permits), etc. There are many others.**

❖ Please be sure to **describe** the proposed project in **detail.** Attach additional pages if necessary. If dates of construction on buildings or dates of alterations to a site are known, please be sure to include this information in your project description.

❖ Please include photographs of the proposed project site. If the project involves demolition or rehabilitation of a building(s), be sure to include photos of major elevations of the building(s). Please also be sure to label photographs. Attach the most current project plans and elevations if available.

❖ **Please be sure to include a photocopy of the pertinent section of the U.S.G.S. map with your submission.** The MHC cannot review a PNF without a U.S.G.S. section map. You can purchase U.S.G.S. maps at local camping, hiking, and sporting goods stores, or download U.S.G.S. maps from the World Wide Web at www.topozone.com; or make a photocopy of U.S.G.S. maps at libraries.

❖ Do not use other maps instead of the U.S.G.S. map. However, additional maps such as plot plans or assessors' maps may be included **in addition** to the U.S.G.S. section map.

❖ **Boundaries of the project area** should be specific. Do not circle a large plot of land on the U.S.G.S. map and indicate that the project falls within the circle.

This guidance document is offered to assist in compliance with M.G.L. Chapter 9, Section 26-27c, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71.00)

1. ***FEDERAL AND STATE PERMITTING AND FUNDING LIST***
2. ***FIGURE 1 – EASTHAM WATER DISTRIBUTION SYSTEM***
3. ***FIGURE 2 – DISTRICT G WELL AND TANK SITES***
4. ***FIGURE 3 – NRHS WELL SITE***
5. ***FIGURE 4 – WATER DISTRIBUTION SYSTEM WITH USGS QUAD BASE MAP 1:25,000***
6. ***PROJECT PHOTOGRAPHS***

Permitting Requirements

Description	Permit
MEPA Certification	Expanded ENF and EIR
DEP Water Withdrawal Permit	BRP WM 03
DEP Permit to Construct a Water Supply Source of 70 gpm or Greater	BRP WS 20
DEP Distribution Modifications for Public Water Systems That Serves More Than 3,300 People	BRP WS 32
DEP Wetlands Protection Act – Notice of Intent	WPA Form 3
FAA – Notice of Proposed Construction	FAA Form 7460-1
Massachusetts Department of Transportation	State Highway Access Permit

Funding Sources

Description	Type
Massachusetts Drinking Water State Revolving Fund (Requested, not yet Awarded)	Loan
USDA - Rural Development Program (to be Requested)	Grant/Loan

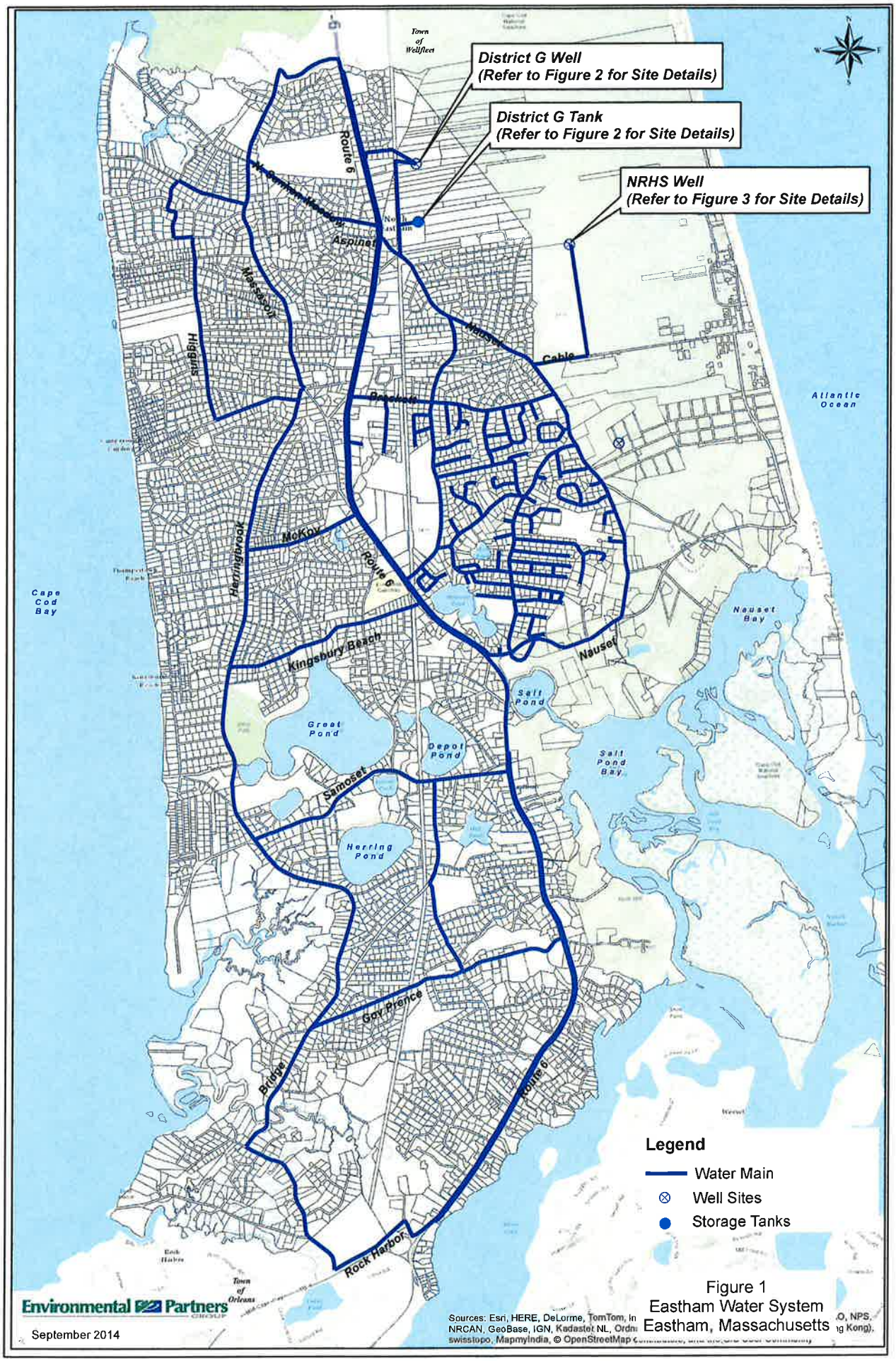

Figure 1
Eastham Water System
Eastham, Massachusetts

Figure 2
District G Well and Tank Site
Eastham, Massachusetts

Figure 3
NRHS Well Site
Eastham, Massachusetts

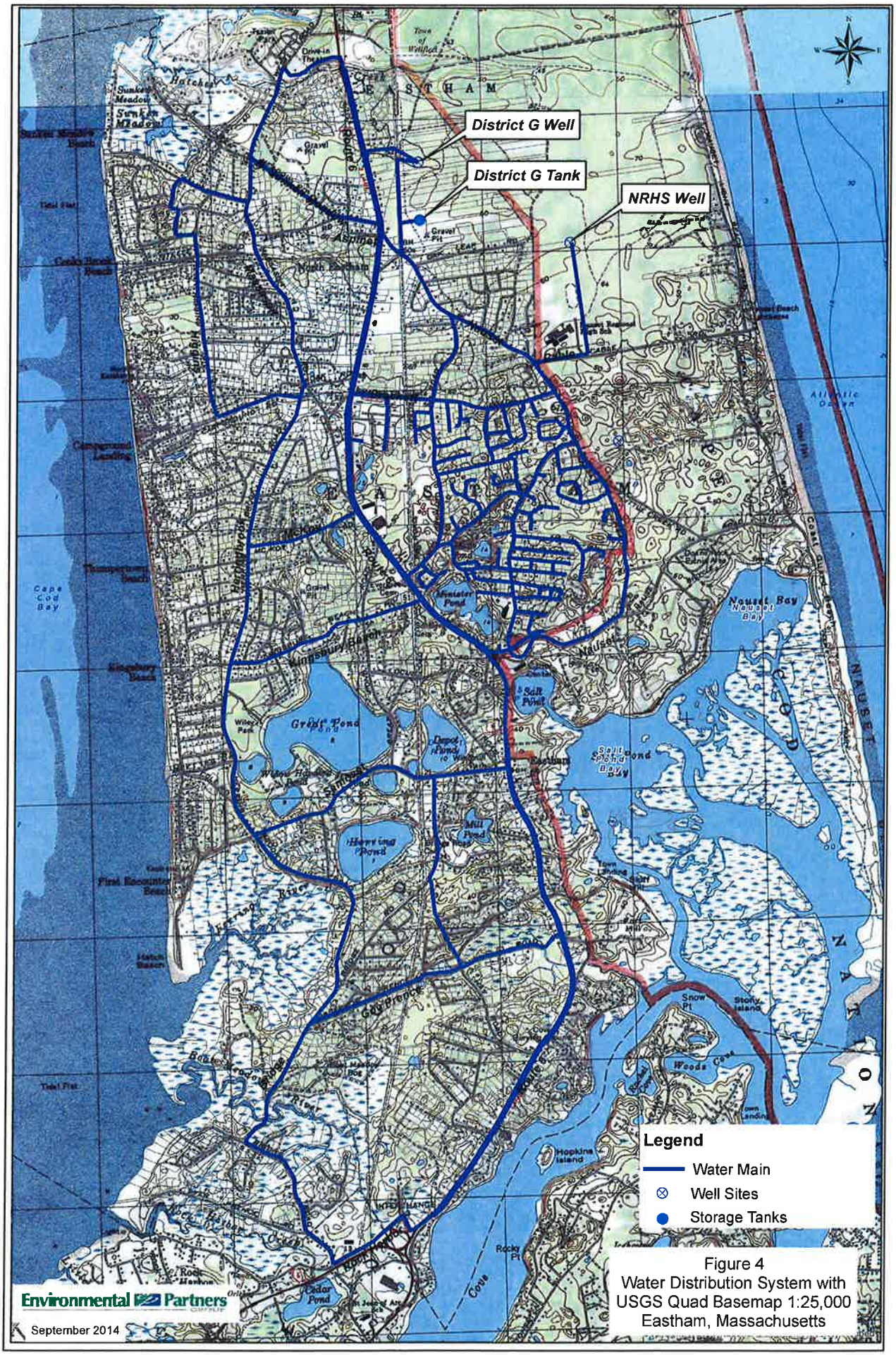

Figure 4
Water Distribution System with
USGS Quad Basemap 1:25,000
Eastham, Massachusetts

Photo #1: District G Well Site – Existing Access Road.

Photo #2: District G Well Site. New public water supply well will be located in the immediate vicinity of the existing test wells.

Photo #3: Nauset Regional High School Well Site – Access Road. Existing Nauset Regional High School well just visible at the end of the path in this photo.

Photo #4: Nauset Regional High School Well Site. Two test wells in center of photo. Existing High School well located just to the right of the photo. New public water supply well would be located in the immediate vicinity of the test wells.

Photo #5: District G Storage Tank Site. The storage tank is to be located in the open, previously disturbed area shown.

Photo #6: Typical Eastham Paved Road. The majority of the water mains are to be placed within the paved areas of the roads.

APPENDIX L

List of Agencies and Persons Receiving Copies of the Eastham Water System MEPA Expanded ENF

Two copies:

Secretary Richard K. Sullivan, Jr.
Executive Office of Energy and Environmental Affairs
Attn. MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

One copy:

Department of Environmental Protection
Boston Office
One Winter Street
Boston, MA 02108

Department of Environmental Protection - Southeast Regional Office
Attn: MEPA Coordinator
20 Riverside Drive
Lakeville, MA 02347

Massachusetts Department of Transportation
Public/Private Development Unit
10 Park Plaza
Boston, MA 01240

Massachusetts Department of Transportation
District #5
Attn: MEPA Coordinator
Box 111
1000 County Street
Taunton, MA 02780

Massachusetts Historical Commission
The MA Archives Building
220 Morrissey Boulevard
Boston, MA 02126

Cape Cod Commission
3225 Main Street
Barnstable, MA 02630

Sheila Vanderhoef, Town Administrator
Town of Eastham
2500 State Highway
Eastham, MA 02642

Board of Selectmen
Town of Eastham
2500 State Highway
Eastham, MA 02642

Planning Board
Town of Eastham
2500 State Highway
Eastham, MA 02642

Conservation Commission
Town of Eastham
2500 State Highway
Eastham, MA 02642

Board of Health
Town of Eastham
2500 State Highway
Eastham, MA 02642

Division of Marie Fisheries (South Shore)
Attn: Environmental Reviewer
1213 Purchase Street – 3rd Floor
New Bedford, MA 02740-6694

Natural Heritage and Endangered Species Program
Commonwealth of Massachusetts
Route 135
Westborough, MA 01581

DCR
Attn: MEPA Coordinator
251 Causeway Street, Suite 600
Boston, MA 02114

Division of Energy Resources
Attn: MEPA Coordinator
100 Cambridge Street, 10th Floor
Boston, MA 02114

Environmental Partners GROUP

A partnership for engineering solutions

www.envpartners.com