

# TREATED WATER RECHARGE SITE EVALUATIONS



## Final Report COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING PROJECT Town of Chatham, Massachusetts



Prepared by:



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**June 2007**

**COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING PROJECT**  
**TREATED WATER RECHARGE SITE EVALUATIONS**  
**FINAL REPORT**

Prepared for  
Town of Chatham, Massachusetts

Prepared by  
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June 2007

Project No. 70098.52

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**TOWN OF CHATHAM  
COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING PROJECT  
TREATED WATER RECHARGE SITE EVALUATIONS**

**SECTION 1 – BACKGROUND INFORMATION**

The Town of Chatham (Town) is presently undertaking a Comprehensive Wastewater Management Planning (CWMP) Project (Project) to address wastewater treatment and recharge issues in various Wastewater Areas of Concern (AOCs). The Project has multiple phases including Needs Assessment, Alternatives Screening, and finally, the development of a Wastewater Facilities Plan and Environmental Impact Report. A component of the CWMP Project called for the identification of parcels of land, adjacent to or remote from the existing Chatham Waste Water Treatment Facility (WWTF) where treated water can be reclaimed by recharging it back to the groundwater system. Utilization of remote sites for the recharge of treated water was recommended because of the limited stipulated capacity of the existing rapid infiltration sand beds at the WWTF and the potential for expanding the existing collection system.

In the past, there was regulatory concern over treated water mounding and indirect affects of the adjacent unlined landfill. The concern centered on the potential for landfill contaminated groundwater flows to be drawn toward Indian Hill well due to treated water recharge mounding. As a result, the Town had agreed to limit the discharge rate at the existing WWTF sand beds as part of the Administrative Consent Order (ACO) issued by the Massachusetts Department of Environmental Protection (MADEP). The landfill has since been closed and capped and more detailed groundwater modeling was conducted by the USGS of potential mound impacts. A technical memorandum, issued on July 11, 2005, summarized this additional modeling which concluded that potential recharge at various sites (including the WWTF – Site 1 and Site 2) “do not result in the capture of any landfill plume by Indian Hill Well”.

As part of the Alternative Screening portion of the project, Stearns & Wheler, with the Town CWMP Technical Advisory Group (TAG) identified candidate locations for recharging treated water. Initially, fifteen (15) potential sites were identified based primarily on the availability of large parcels of vacant land. After the initial fifteen sites were screened, Stearns and Wheler met with Town personnel to discuss the viability of each of the sites. Based on this evaluation, sites were either rejected or selected for additional characterization. The sites considered and their statuses are presented in Table 1. Following this identification and screening process, six (6) sites were identified for subsurface investigations. Site investigations were conducted at the six sites identified below.

- Treatment Plant North (Site 1)
- Volunteer Park (Site 2)
- Chatham Airport (Site 4)
- Chatham High School (Site 7)
- Chatham Seaside Links Golf Course (Site 9)
- Hamden Place (Site 10)

These sites are illustrated on Figure 1.

## **SECTION 2 – FIELD INVESTIGATION TASKS AND RESULTS**

Stearns & Wheler and Town personnel inspected each site to confirm the viability of the site, determine the potential orientation, type (rapid infiltration beds or subsurface leaching), and location of recharge facilities, and determine the most appropriate locations for test pits and soil borings for the site characterization and subsurface investigation. Depending on parcel size and accessibility, each site was evaluated with one or two test pits with percolation tests, and one to three soil borings, completed as observation wells. Soil boring observations are summarized on Table 2. Test pit observations are summarized on Table 3.

Percolation tests were conducted at all test pits to obtain a generally qualitative assessment of the

soils capacity to allow water to infiltrate. Percolation rates were compared to standards in “Guidelines for the Design Construction, Operation, and Maintenance of Small Sewage Treatment Facilities with Land Disposal” (MADEP, 1988).

Hydraulic conductivity of the receiving aquifer was estimated through the completion of slug tests in the observation wells that were installed at the test sites. Slug tests entail removing a small volume (approximately 1 liter) of water from a well and recording the rate at which the water level in the well recovers. Because the volume of water is limited, slug tests are sensitive to interpretation and can yield unrepresentative results because they only test conditions in a very small volume of soil. Consequently, the results were variable across town, ranging from less than 1 foot/day to 380 feet/day. Slug test calculations are provided in the various appendices for each site. Based on the similarity of subsurface materials seen across town, it was concluded that assigning an average value across the sites, was more likely representative of general site conditions. A hydraulic conductivity of 150 feet per day was used for the mounding calculations based on input received from the United States Geologic Survey (USGS).

At each site, following the completion of field work, a preliminary mounding analysis was completed. Mounding analyses are performed to determine if there could be any adverse hydraulic impacts associated with the recharge, such as flooding the recharge system or flooding proximal structures including basements or septic systems. The mounding analysis evaluated the impact on the water table of recharging a given quantity of water to the subsurface. The mounding analysis was completed using each site’s depth to groundwater, the average permeability used by the USGS for their modeling efforts in the area, and loading rates based on the estimated capacity of the sites (a function of the recharge method, loading rate and the available area).

Recharge methods evaluated for the sites included rapid infiltration sand beds or subsurface leaching systems. The advantages of rapid infiltration sand beds is that they are the most efficient means of recharge and, therefore, require the least area; they are easily constructed and inexpensive to operated and maintain, needing only periodic mechanical raking. A disadvantage

is that depending on the size of the beds and the permeability of the underlying natural soils, treated water may pond in the beds. The rate of discharge into the beds is limited to minimize the chance of ponding. Based on the permeability of the underlying soils, MADEP currently allows a loading rate of up to 5 gallons per day per square foot of surface area of the bed; however, MADEP will consider higher loading rates after sufficient study. (It should be noted that subsequent to the performance of this evaluation in 2004, the Town has proceeded with the evaluation of higher loading rates at Site 1 and is currently in the process of additional groundwater modeling at Site 1 to address MADEP comments.)

Leaching systems are subsurface, similar to those associated with septic systems, except that they are recharging treated wastewater. The advantage of leaching systems is that they are below grade, allowing the overlying surface to have some beneficial use such as parking or playing fields. Leaching field disadvantages are that they have a lower loading rate than rapid infiltration open sand beds, resulting in the need for greater acreage; higher construction costs; higher treated water treatment requirements to minimize plugging; and complicated maintenance issues, system replacement usually being required.

At each site, a discharge capacity was calculated. In some instances more than one recharge scenario was developed. Depending on the site size, topography and land use, recharge designs of either sand beds, leaching systems or both were laid out for each site.

Mounding analyses were performed using the most likely or the most aggressive (highest loading rate) scenario at the sites where multiple loading scenarios had been proposed. In the following discussions of the sites, two (2) different land areas are identified: one is the total number of acres in the parcel or parcels that make up the site. The second, a smaller number, is the estimated area available for recharge facilities. This is a smaller area because portions of the parcels are set aside as a result of surface structures, land use, topography, and the need for berms or buffers around the recharge facilities.

## 2.1 TREATMENT PLANT NORTH (SITE 1)

1. Site Location. Treatment Plant North (Site 1) is located south of Middle Road and is adjacent to the north side of the existing treatment plant. The entire parcel is approximately 82 acres, of which approximately 10 acres would be considered for new treated water recharge facilities. The treatment plant lies in the southeast corner of the parcel while the evaluated location is on the north side of the parcel at the entry to an existing dirt access road. The location is approximately 900 feet from the treatment facility. This site is illustrated on Figure 2.
2. Deep Soil Boring. One soil boring and monitoring well installation was completed at this location (MW-1-1). The groundwater was encountered at a depth of 52.2'. The subsurface soil at this location was mostly coarse to medium sand. The observation well was installed to a depth of 66' and was screened in the bottom 10 feet. The boring log and well completion diagram are provided in Appendix A.
3. Test Pits. On May 17, 2003, two (2) test pits were excavated at the Treatment Plant North site. Both pits were excavated to a depth of 12 feet. The first test pit (TP-7) location is near the entrance to the access road off of Middle Road in the vicinity of the newly installed well. TP-7 possessed a top layer of sandy loam (2"-38"). Uniform, clean, coarse to medium sands were present in the remainder of TP-7. TP-8 was excavated in the sand pit near the Treatment Plant further up the access road. TP-8 possessed uniform, clean coarse to medium sand. Test pit logs are provided in Appendix A.
4. Percolation Tests. The percolation rate at TP-7 and TP-8 were both under 2 minutes per inch, indicating rapidly draining soil and preferable conditions for recharge facilities. Percolation Test records are provided in Appendix A.

5. Mounding Analysis. A mounding analysis was performed based on loading 1.1 mgd over an area of 800 by 500 feet. The loading rate is based on the use of rapid infiltration sand beds. The resulting mound was calculated to be just under 18 feet. Imposing an 18 foot mound on an initial water depth of 52 feet results in a calculated water depth of 34 feet. Therefore, the mounding is determined not to represent any adverse hydraulic impact.

Previous groundwater modeling evaluations by Metcalf & Eddy in 1993 through 1995 indicated that treated water recharged at the WWTF greater than 0.15 mgd could alter the groundwater flow path and possibly contribute flow to the Indian Hill Well. This flow direction question was not addressed with the recent mounding analysis and is expected to be addressed in the more comprehensive USGS groundwater modeling initiated in June 2004 in association with this site evaluation process. The mounding analysis results are presented in Appendix A.

## **2.2 VOLUNTEER PARK (SITE 2)**

1. Site Location. Volunteer Park (Site 2) is located off of Sam Ryder Road and is on Town owned parcels to the east of the treatment plant. The location evaluated on this site was just beyond the east end of the existing recreational fields. The site is approximately 4,400 feet from the treatment plant and is made up of multiple parcels totaling about 57 acres, of which approximately 13 acres would be considered for new treated water recharge facilities. This site is illustrated on Figure 3.
2. Deep Soil Boring. One soil boring and monitoring well installation was completed at this location (MW-2-1). Groundwater was encountered at a depth of 51.1'. A clay layer was present at 55'. The boring was terminated at a depth of 56 feet, within the clay layer. The soil above the clay layer at this location was mostly coarse sand with some samples yielding fine to medium sand. The observation well was installed to a depth of 56' with the bottom ten feet of the well being screened. The boring log and

well completion diagram are provided in Appendix B.

3. Test Pit Observations. On May 17, 2003, two (2) test pits were excavated at the Volunteer Park site. The two test pits were excavated to depths of 12 and 12.5 feet. The first test pit (TP-5) location is the northern part of the park. In the top layer (4"-40") of TP-5, sandy loam was observed. Uniform, clean, coarse to medium sands were present in the remainder of TP-5. TP-6 was excavated to the southeast of TP-5. From 0 to 4 feet a layer comprised of a mixture of sandy loam and coarse to medium sand was observed and in the remainder of the test pit, uniform, clean coarse to medium sand was observed. Test pit logs are provided in Appendix B.
4. Percolation Tests. The percolation rates at TP-5 and TP-6 were both under 2 minutes per inch, indicating rapidly draining soil and preferable conditions for recharge facilities. Percolation Test records are provided in Appendix B.
5. Mounding Analysis. A mounding analysis was performed based on loading 0.87 mgd over an area of 1,300 by 600 feet. The loading rate is based on the use of subsurface leaching beds. A subsurface system is recommended at this location so that use of park land is not restricted and to minimize any aesthetic impacts. The resulting mound was calculated to be just under 12 feet. Imposing a 12 foot mound on an initial water depth of 51 feet results in a calculated water depth of 39 feet. Therefore, the mounding is determined not to represent any adverse hydraulic impact. The mounding analysis results are presented in Appendix B.

### **2.3 CHATHAM AIRPORT (SITE 4)**

1. Site Location. Chatham Airport (Site 4) is located off of George Ryder Road across from the Town Annex. The site is approximately 97 acres and 8,000 feet from the treatment plant, of which approximately 13 acres would be considered for new treated water recharge facilities. There were three (3) locations evaluated on the Airport Site.

The first location was on the east side of the midpoint of the runway, at the fence line. The second location was at the north side of the parcel in a field where an existing communication shack was located. The third location was in the main tie-down area at the fence line. This site is illustrated in Figure 4.

2. Deep Soil Boring. Three (3) soil borings were completed at the Airport in each of the areas described above. Wells were completed in the first two borings. No well was installed at the northeast location because a clay layer was encountered at a depth of 40' before the water table was encountered. At this location (B-4-2) there was also a clay layer encountered from 23' to 25'. Based on observations in the other borings, the shallow clay layer was determined not to be continuous across the site.

In the well located midway along the east side of the runway (MW-4-1), groundwater was encountered at a depth of 43.5' and a clay layer at 50'. The soil above the clay layer at this location was mostly coarse to medium sand with an intermediate clay layer from 36' to 38'. Based on observations in the other borings, the shallow clay layer was determined not to be continuous across the site. An observation well was installed to a depth of 56' with the screen present in the bottom 10 feet of the boring.

In the boring located in the tie down area (MW-4-3), groundwater was encountered at 41.1'. The samples indicated medium to coarse sand at all depths down to a clay layer, which was encountered at 45'. A well was installed to a depth of 51'. Boring logs and well completion diagrams are provided in Appendix C.

3. Test Pit Observations. On May 17, 2003, two (2) test pits were excavated at the Airport Site. Both test pits were excavated to a depth of 12 feet. The first test pit (TP-9) location is on the northern part of the Airport near the communication shack. A top layer (0"-30") of sandy loam was present in the top of TP-9 and uniform, clean, coarse to medium sands were present in the remainder of TP-9. TP-10 was excavated near the back fence about mid-point along the runway. A top layer (0"-33") of sandy

loam was present at the top of TP-10 and uniform, clean, coarse to medium sands were present in the remainder of TP-10. Test pit logs are provided in Appendix C.

4. Percolation Tests. The percolation rates at TP-9 and TP-10 were both under 2 minutes per inch, indicating rapidly draining soil and preferable conditions for recharge facilities. Percolation Test records are provided in Appendix C.
  
5. Mounding Analysis. A mounding analysis was performed based on loading 1.15 mgd over an area of 1,800 by 600 feet. The loading rate is based on a combination of subsurface leaching systems plus the use of sand infiltration beds, depending on where on the airport property the discharge facilities are located. (the 1,800 by 600 foot area indicated above is a composite of the entire area that includes three smaller recharge areas and the land in between them). The resulting mound was calculated to be 25 feet. Imposing a 25 foot mound on an initial water depth of 41 feet results in a calculated water depth of 16 feet. Therefore, the mounding is determined not to represent any adverse hydraulic impact. The mounding analysis results are presented in Appendix C.

## **2.4 CHATHAM HIGH SCHOOL (SITE 7)**

1. Site Location. Chatham High School (Site 7) is located northwest of Chatham Center at the intersection of Crowell Road and Stepping Stone Road. The parcel is located approximately 5,100 feet north west of the rotary in the Town center and approximately 15,700 feet from the treatment plant. The entire High School site is approximately 33 acres, of which 5.5 acres would be considered for treated water recharge facilities. The site is generally comprised of the large athletic field on a terrace behind the school building. Two (2) locations within this site were evaluated. The first location was along the third base line of the upper baseball field and the second location was in the front and center portion of the athletic fields. This site is illustrated on Figure 5.

2. Deep Boring Observations. One soil boring and monitoring well installation was completed at each location on Site 7. In the well located near the front of the athletic field, (MW-7-1) groundwater was encountered at a depth of 44.5'. The soil at this location was mostly medium sand with some samples yielding fine to coarse sand. An observation well was installed to a depth of 56'. In the boring located on the third base line (MW-7-2), groundwater was encountered at 43.5'. The samples in this boring indicated medium to coarse sand at all depths. An observation well was installed to a depth of 60' with the well screen located in the bottom 10 feet of the well. Boring logs and well completion diagrams are provided in Appendix D.
  
3. Test Pit Observations. On May 17, 2003, two (2) test pits were excavated at the Chatham High School site. Both test pits were excavated to a depth of 12 feet. The first test pit (TP-1) location is near the third base of the upper baseball field in the vicinity of the newly installed observation well. A top layer (0''-9'') of fill was observed in TP-1, presumably emplaced when the field was created, and uniform, clean, fine to medium sands were present in the remainder of TP-1. TP-2 was excavated near the Tennis Courts. A top layer (0''-25'') of sandy loam was present in TP-2 and uniform, clean fine to medium sand in the remainder of the test pit. Test pit logs are provided in Appendix D.
  
4. Percolation Tests. The percolation rate at both TP-1 and TP-2 was under 2 minutes per inch, indicating rapidly draining soil and preferable conditions for recharge facilities. Percolation Test records are provided in Appendix D.
  
5. Mounding Analysis. A mounding analysis was performed based on loading 0.39 mgd over an area of 300 by 750 feet. The loading rate is based on the use of a subsurface leaching system, selected so that the use of the fields would not be reduced. The resulting mound was calculated to be 12 feet. Imposing a 12 foot mound on an initial water depth of 41 feet results in a calculated water depth of 29 feet. Given the

proximity of the slope immediately adjacent to the fields, and the calculated mound height, there is the potential for breakout of recharged wastewater along that slope. Additional observation wells should be installed to better define the site hydrogeology before this site is developed for recharge facilities. The mounding analysis results are presented in Appendix D.

## **2.5 CHATHAM SEASIDE LINKS GOLF COURSE (SITE 9)**

1. Site Location. Chatham Seaside Links Golf Course (Site 9) is located on Seaview Street, east of the rotary. The golf course is split by Seaview Street, with a northern and southern section. The property consists of one parcel owned by the Town, which is located approximately 19,300 feet from the treatment plant. The area of the entire Site 9 is approximately 22 acres, of which approximately 5 acres along the northern course would be considered for treated water recharge. Testing was limited to the northern section because of the irregular topography of the southern section. The test pit and well were completed on the access road behind the maintenance shed. This site is illustrated on Figure 6.
2. Deep Soil Boring. One soil boring and observation well installation was completed at this location (MW-9-1). Groundwater was encountered at a depth of 47.2'. The soil at this location was fine to medium sand with a thin silt layer at 5' below ground elevation. An observation well was installed to a depth of 60' and was screened in the bottom 10 feet. The boring log and well completion diagram are provided in Appendix E.
3. Test Pit Observations. On May 17, 2003, one test pit was excavated at the Chatham Sea Side Links Golf Course site. The test pit (TP-3) location is near the maintenance shed in the vicinity of the newly installed observation well. A top layer (0"-77") of silty loam was present in TP-3 and uniform, clean, medium to coarse sands were present in the remainder of the test pit. The test pit log is provided in Appendix E.

4. Percolation Tests. There was no percolation test completed at TP-3 due to the silt encountered at this site.
5. Mounding Analysis. A mounding analysis was performed based on loading 0.25 mgd over an area of 980 x 200 feet. The loading rate was based on the use of subsurface leaching facilities so that they could be constructed under the fairways, thus not impacting the use or aesthetics of the golf course. The resulting mound was calculated to be just over 4 feet. Imposing a 4 foot mound on an initial water depth of 47 feet results in a calculated water depth of 43 feet. Therefore, the mounding is determined not to represent any adverse hydraulic impact. The mounding analysis results are presented in Appendix E.

## **2.6 HAMDEN PLACE (SITE 10)**

1. Site Location. Hamden Place (Site 10) is located off of a private right of way that divides two (2) Town owned parcels. The site is off of Route 28 on the northern side of the Town and is approximately 16,800 feet from the treatment plant. The site occupies approximately 5 acres, of which 1.5 acres would be considered for treated water recharge facilities. This site is illustrated on Figure 7.
2. Deep Soil Bring. One soil boring and monitoring well installation was completed at this location (MW-10-1). Groundwater was encountered at a depth of 40.1'. The soil at this location was mostly coarse sand with some samples yielding gravel. An observation well was installed to a depth of 54' and was screened in the bottom 10 feet. The boring log and well completion diagram are provided in Appendix F.
3. Test Pit Observations. On May 17, 2003, two (2) test pits were excavated at the Hamden Place site. The test pit (TP-4R) location is approximately 300 feet from the entrance off of Route 28 on the left hand side in the vicinity of the newly installed

observation well. TP-4R possessed a top layer of fill (0"-26") and medium to coarse sands with slightly higher gravel content than other sites. The second test pit (TP-4W) was located in the woods, approximately 100 from the road. TP-4W did not show signs of fill as was seen in TP-4R; however the soils below the first 9-inches were medium to coarse sands with slightly higher gravel content than other sites. The test pit logs are provided in Appendix F.

4. Percolation Tests. The percolation rate at TP-4R and TP-4W was under 2 minutes per inch, indicating rapidly draining soil and preferable conditions for recharge facilities. Percolation test records are provided in Appendix F.
  
5. Mounding Analysis. A mounding analysis was performed based on loading 0.33 mgd over an area of 100 x 400 feet in subsurface leaching facilities. The resulting mound was calculated to be just under 8 feet. Initial depth to water was 40 feet. Imposing an 8 foot mound on an initial water depth of 40 feet results in a calculated water depth of 32 feet. Therefore, the mounding is determined not to represent any adverse hydraulic impact. The mounding analysis results are presented in Appendix F.

### **SECTION 3 – CONCLUSIONS**

Each evaluated site has the potential to serve as a treated water recharge site. This is a result of the presence of the similar medium to coarse grain sands seen at each site. At each site, similar loading rates were assigned, based on the comparable percolation rates observed. In accordance with MADEP guidance, which relates loading rate to percolation test infiltration rate, loading rates of 5 gpd/sq. ft. and 2.5 gpd/sq. ft. for sand beds or leaching fields respectively, were assigned to each site. The various sites do have limitations however, primarily a function of the available acreage.

A clay layer is known to exist across most of the Town. This clay layer was encountered in the Airport borings (45 to 50 feet) and in the Volunteer Park boring (55 feet). A clay layer

underlying the receiving aquifer, at a relatively shallow depth, can also limit the infiltration capacity of sites because of mounding. Greater mounding results when there is less aquifer thickness to disperse the water. Where the clay layer was not encountered, it was assigned a depth of 20 feet below the water table. Depth to clay at the Airport and Volunteer Park was assigned to be 8 feet and 5 feet below the water table, respectively. The available aquifer depth (the distance between the water table and the clay layer) has a significant affect on the mounding. However, using the recharge rates derived from the available infiltration area, mounding did not eliminate any site from further consideration. Mounding heights ranged from 4 feet at the golf course (low rate of recharge) to 25 feet at the Airport and 30 feet at Volunteer Park (shallow clay layer). However, even in the case of the Airport and Volunteer Park, groundwater levels are sufficiently deep enough that adverse impacts do not occur.

Groundwater modeling, initiated by USGS in June 2004, is expected to provide more accurate mounding interpretations and will also provide information on potential hydraulic impacts associated with proximal ponds. The USGS findings are discussed in greater detail as part of the Comprehensive Wastewater Management Planning Report as it pertains to the development of a recommended plan for the Town.

To conclude, each site has the potential to serve as a treated water recharge site. There are capacity limitations at each site, but all the sites can be considered to be available as a possible destination for either a portion of the flow from the existing treatment plant or the flow from a local, neighborhood satellite plant. Sites located within Zone II's of the Town's drinking water supply are considered less favorable because of the added restrictions of the MADEP "Interim Guidelines for Reclaimed Water Use", which imposes stricter permitting and treatment requirements. Table 4 provides a summary of each site, the treated water recharge technology used for modeling, capacity, and the capacity of sites in aggregate to address build-out treated water recharge needs.

The CWMP process has identified an estimated build-out maximum month wastewater flow of 3.1 mgd. Using the information summarized in Table 4 this could be accomplished in several

different ways. Because subsequent evaluations and a detailed layout has been prepared for Site 1, the capacity of that site, including the existing sand beds (that which would remain after WWTF expansion), would total 2.1 mgd. Therefore, the additional 1.0 mgd necessary, if no change in loading rates is allowed, could come from the following sites:

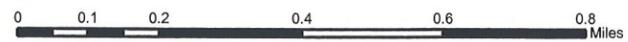
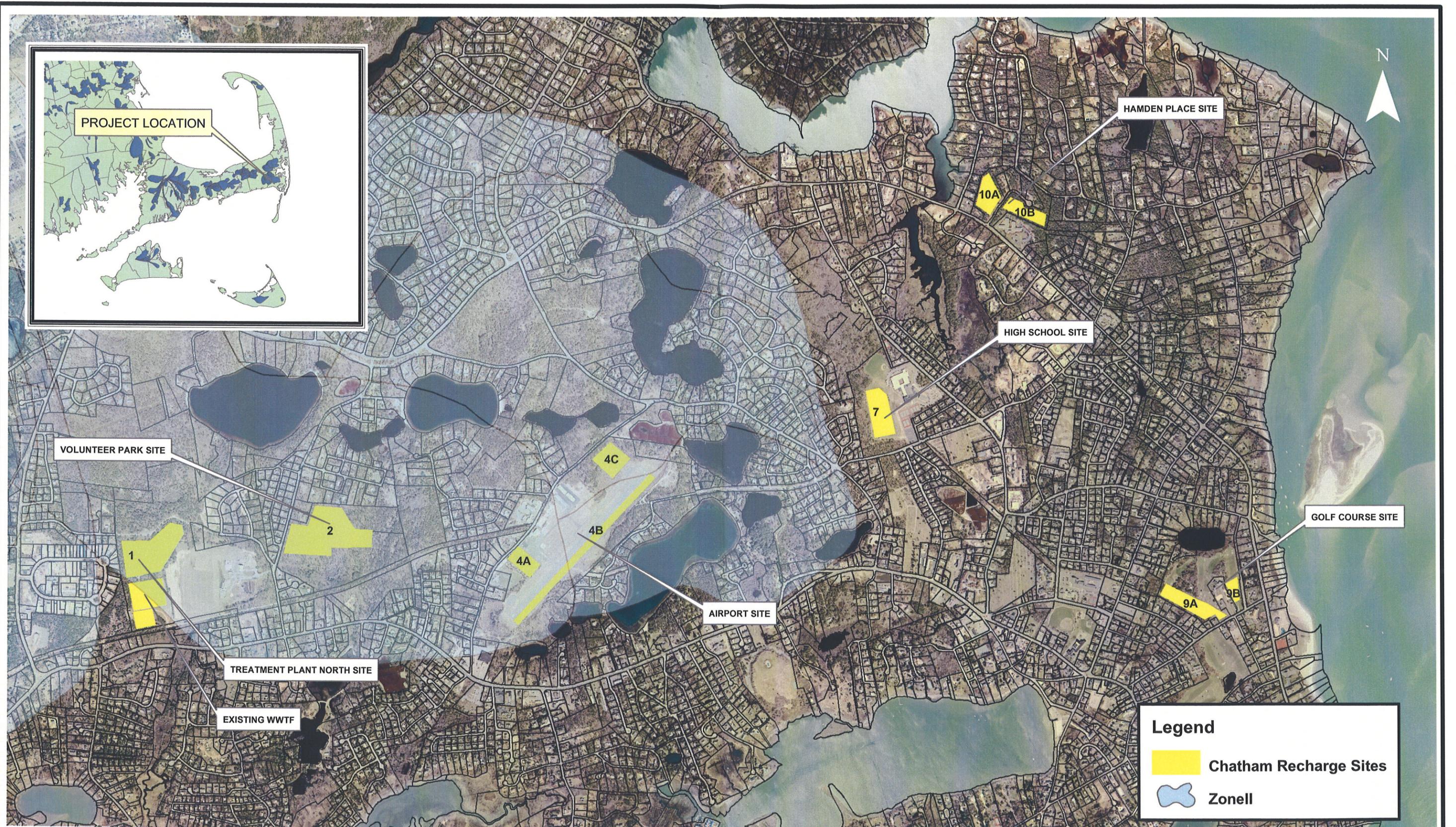
- Site 2 – Sand beds (Total 1.2 mgd)
- Site 2 – Leaching facilities plus 0.13 mgd from any other group of sites (Total 1.0 mgd)
- Site 4 – Option A (Sand beds and Leaching Trenches) (Total 1.15 mgd)
- Site 4 – Option B plus Site 7 – Leaching Trenches (upper fields) (Total 1.0 mgd)
- Or parts of Sites 4, 7, 9 and 10 all leaching trenches (approx. 0.25 mgd each) (Total 1.0 mgd)

#### **SECTION 4 – RECOMMENDATIONS**

The Town should incorporate these sites into alternative management plans for wastewater treatment and nitrogen mitigation as part of the CWMP Project. In addition, the Town should review the findings of this report with the MADEP to identify potential treated water recharge permit requirements for these sites and the possible need for hydraulic loading tests at these sites.

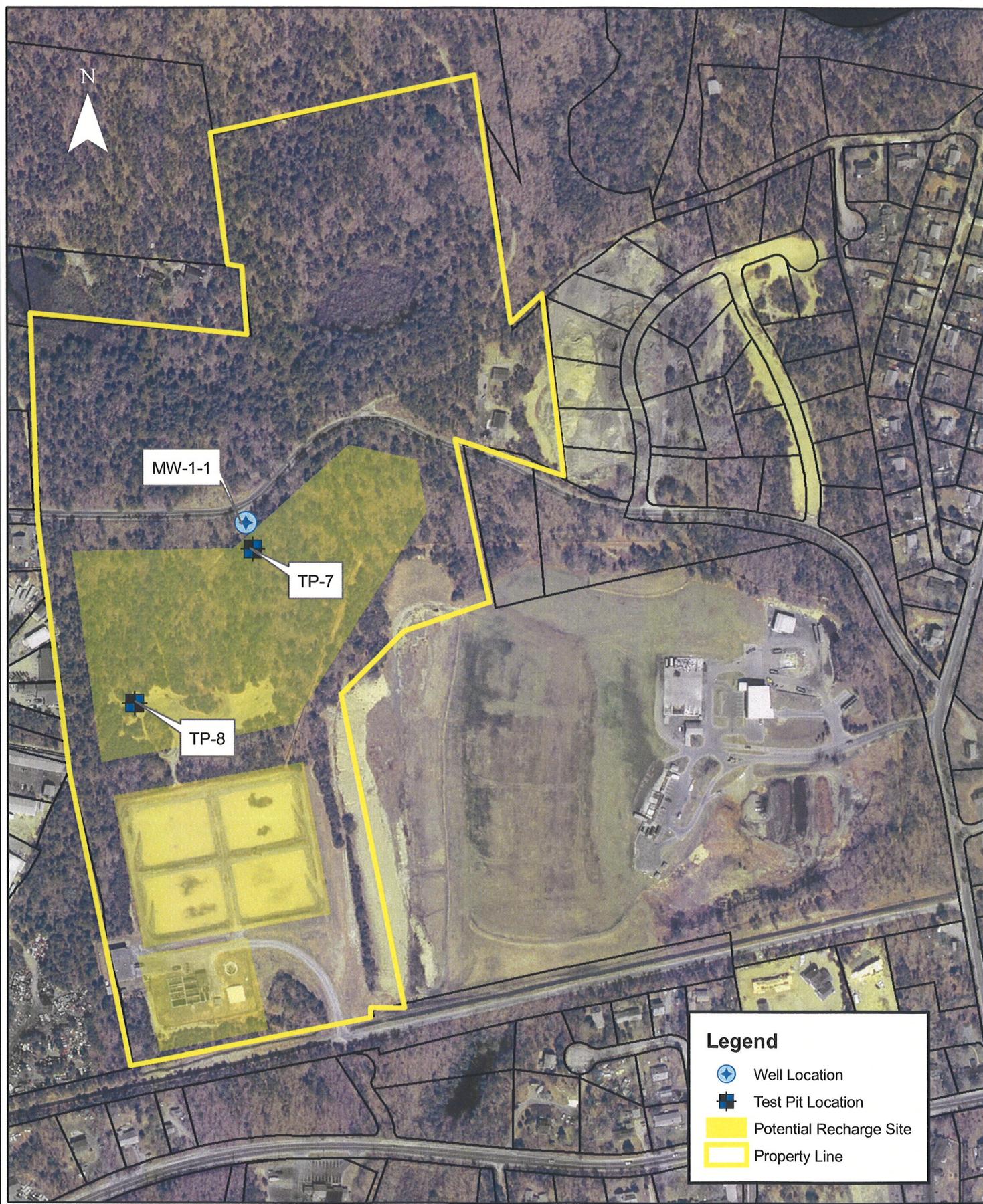
## Figures

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**TOWN OF CHATHAM, MASSACHUSETTS**  
**TREATED WATER RECHARGE SITES**  
**FIGURE 1 - LOCATION MAP**  
 DATE: JUNE 2007    PROJECT No. 70098

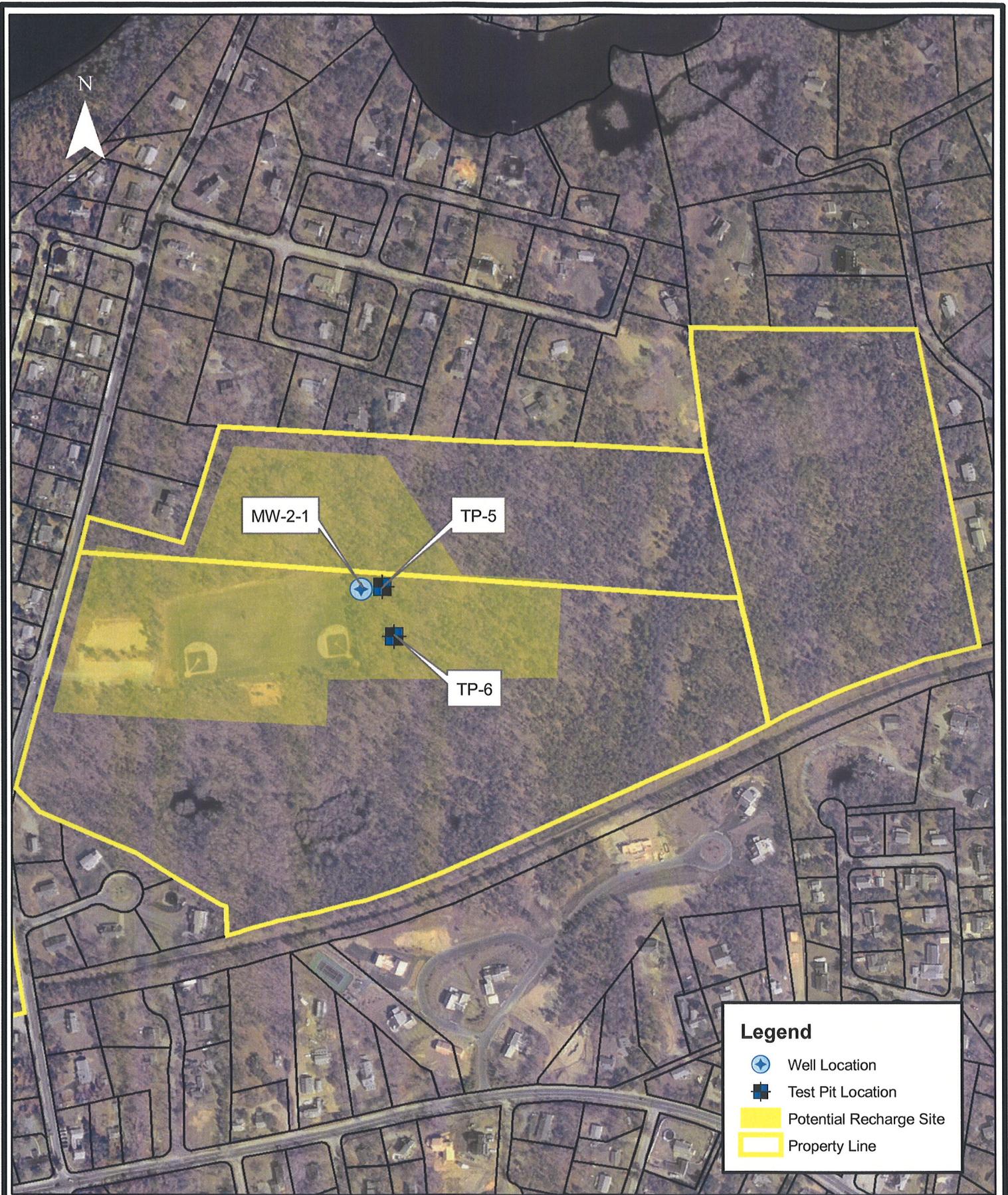


**Legend**

- Well Location
- Test Pit Location
- Potential Recharge Site
- Property Line

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Town of Chatham, Massachusetts  
 Treated Water Recharge Site Evaluations  
**FIGURE 2 - TREATMENT PLANT NORTH SITE**



**Legend**

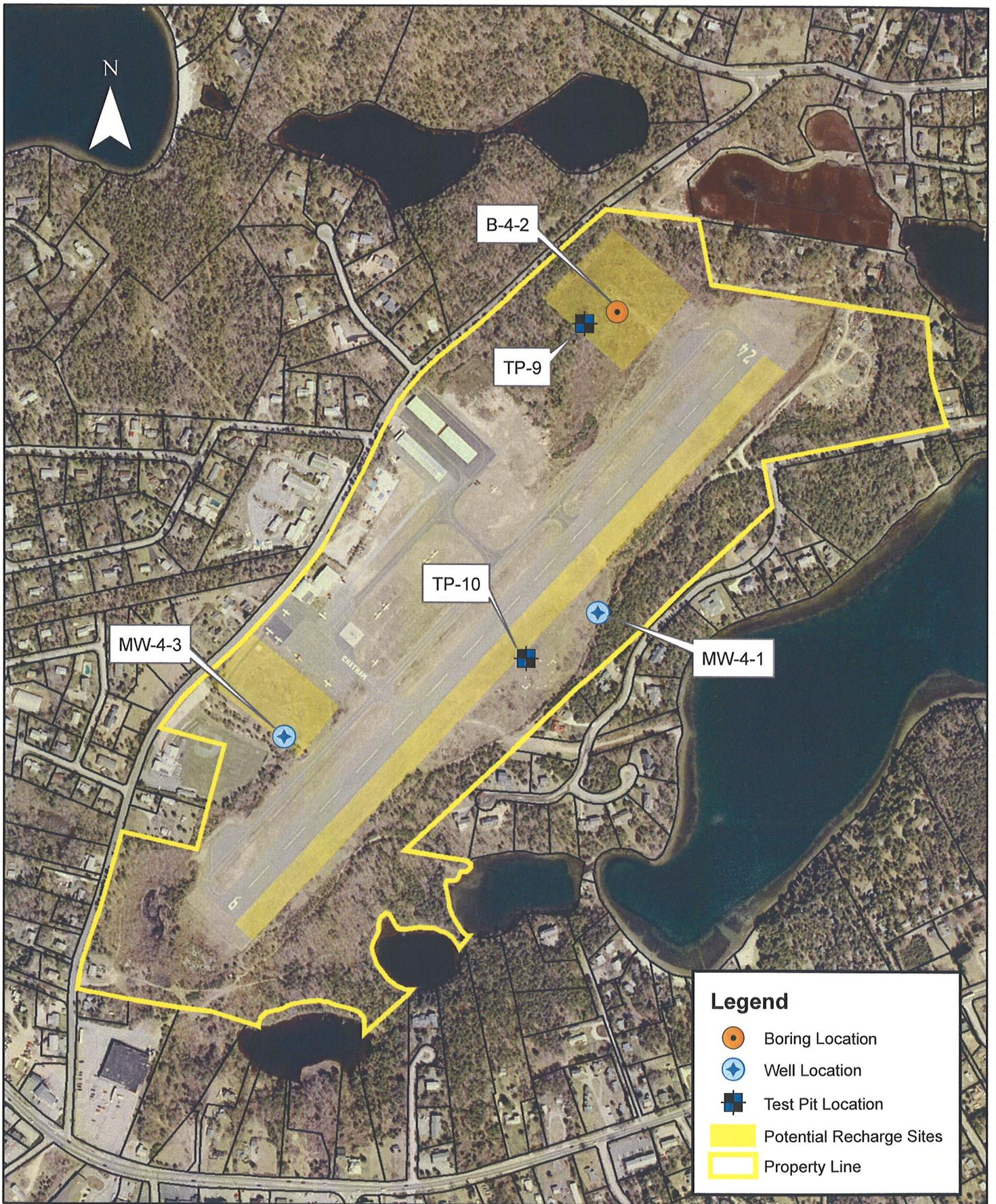
-  Well Location
-  Test Pit Location
-  Potential Recharge Site
-  Property Line



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 Treated Water Recharge Site Evaluations

**FIGURE 3 - VOLUNTEER PARK SITE**





**Legend**

-  Well Location
-  Test Pit Location
-  Potential Discharge Site
-  Property Line



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 Treated Water Recharge Site Evaluations  
**FIGURE 5 - HIGH SCHOOL SITE**

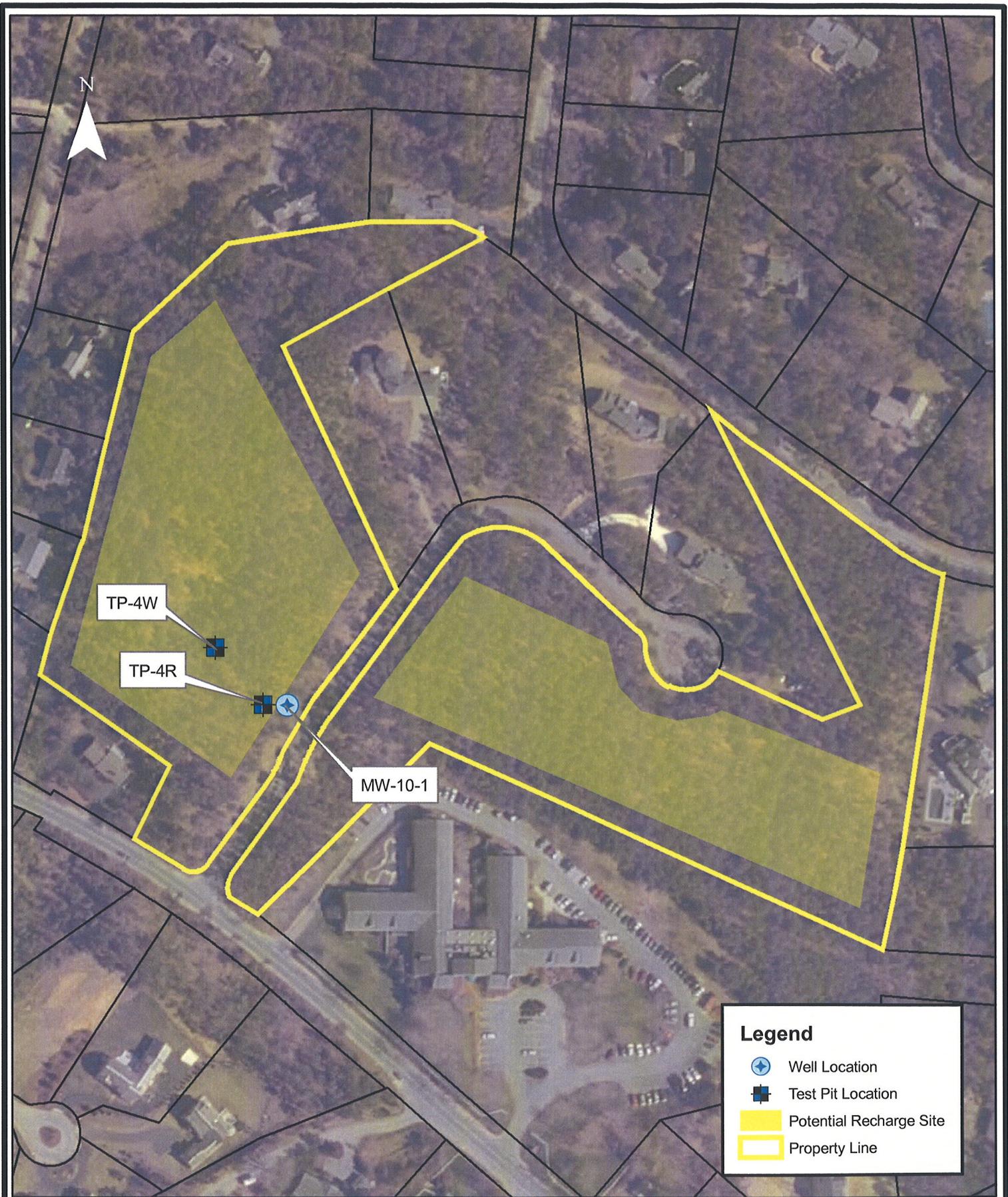


0 37.5 75 150 225 300 Feet


**Stearns & Wheeler, LLC**  
 Environmental Engineers and Scientists  
 HYANNIS, MASSACHUSETTS  
 phone: (508) 362-0500  
 web: www.stearnsandwheeler.com

Town of Chatham, Massachusetts  
 Treated Water Recharge Site Evaluations

**FIGURE 6 - GOLF COURSE SITE**



**Legend**

-  Well Location
-  Test Pit Location
-  Potential Recharge Site
-  Property Line

0 35 70 140 210 280 Feet

 **Stearns & Wheeler, LLC**  
 Environmental Engineers and Scientists  
 HYANNIS, MASSACHUSETTS  
 phone: (508) 362-6100  
 web: www.stearnsandwheeler.com

Job No.: 70098 Date: 6/07

Town of Chatham, Massachusetts  
 Treated Water Recharge Site Evaluations  
**FIGURE 7 - HAMDEN PLACE**

## **Tables**

---

**Table 1**

ORIGINAL SITE IDENTIFICATION  
TREATED WATER RECHARGE SITE EVALUATIONS  
Town of Chatham, MA

Site ID	Description	Map -Block - Lot	Approx. Land Area		Owner Type	Site Investigation
			Total (acres)	Potential Available (acres) <sup>(2)</sup>		
1	WPCF Site	6F T3	84.9	10.1	Town	Retained - combined as site 1, area north of existing plant but south of Middle road. Area north of Middle Raod rejected due to topography/low elevation
1A	North of Middle Road Sites <sup>(1)</sup>	4G 26 ND67	51.4	0.0	Town	
2	Volunteer Park <sup>(1)</sup>	6F 2	57.1	12.8	Town	Retained - Investigated
3	Town Landing at Forest Beach (MCI 1)	3A 4	9.0	0.0	Town	Rejected - proximity to sensitive estuaries
4	Chatham Municipal Airport	9F 2	96.7	13.0	Town	Retained - Investigated
5	Town of Chatham Triangle Site	8H 0 JP1	38.9	0.0	Conservation	Rejected - Potential Water Supply Site
6	RCA Site (MCI 2) <sup>(1)</sup>	10I 1A MCI3	172.8	0.0	Town	Rejected - limited area, rugged topography
7	Chatham High School	12H 11	33.1	5.5	Town	Retained - Investigated
7A	Crowell Road Conservation Foundation <sup>(1)</sup>	12H 6	24.4	0.0	Conservation	Rejected - low wet area, not Town owned
8	Chatham Main Street School (Elementary School)	14E 27	10.0	0.0	Town	Rejected - limited area
9	Town of Chatham Golf Course (Seaside Links) <sup>(1)</sup>	16E 6A S26	22.0	5.0	Town	Retained - Investigated
10	Hamden Place <sup>(1)</sup>	13J 2	5.4	1.5	Town	Retained - Investigated
11	Kendrick Road Site	14J 5A B2	2.4	0.0	Conservation	Rejected - not Town owned
12	Old Queen Ann Road Site	9H 0 B1	15.3	0.0	Conservation	Rejected - not Town owned
13	Plum Daffy Lane Site		3.9	0.0	Conservation	Rejected - not Town owned

Notes:

1) Multiple lots associated with these sites

2) Based on the most conservative land use estimate (will ultimately depend on technology and cost). Sites not considered under initial evaluation assigned value of zero.

**Table 2**

SOIL BORING SUMMARY  
TREATED WATER RECHARGE SITE EVALUATIONS  
Town of Chatham, MA

Location	Boring ID	Dates Installed	Boring Depth (ft)	Depth to Water (ft)	Screened Interval	Depth to Clay (ft)	General Soil Type	Well Depth	Well Type
Site 1 - Middle Road	MW-1-1	4/28/04-4/29/04	66	52.2	56-66	N/A	Coarse and Medium Sand	66	Stick-up
Site 2 - Volunteer Park	MW-2-1	4/29/04	56	51.1	46-56	55	Mostly Coarse Sand, some Medium and Fine Sand	56	Stick-up
Site 4 - Airport	MW-4-1	5/3/04	56	43.5	46-56	50	Coarse and Medium Sand	56	Stick-up
Site 4 - Airport	B-4-2	5/3/04-5/4/04				45	Medium and Coarse Sand, Fine Gravel	0	
Site 4 - Airport	MW-4-3	5/4/04	51	41.1	41-51	45	Coarse and Medium Sand	51	Stick-up
Site 7 - High School	MW-7-1	4/23/04	56	44.5	46-56	N/A	Mostly Coarse Sand, some Medium and Fine Sand	56	Flush
Site 7 - High School	MW-7-2	4/30/04	60	43.5	50-60	N/A	Coarse and Medium Sand	60	Flush
Site 9 - Golf Course	MW-9-1	4/26/04-4/27/04	60	47.2	50-60	N/A	Medium and Fine Sand	60	Flush
Site 10 - Hamden Place	MW-10-1	4/26/04	54	40.1	44-54	N/A	Coarse and Medium Sand, some Fine Gravel	54	Stick-up

Table 3

TEST PIT SUMMARY  
TREATED WATER RECHARGE SITE EVALUATIONS  
Town of Chatham, MA

Location	Test Pit ID	Barnstable County Soil Survey <sup>(1)</sup>		Surficial Geological Report <sup>(2)</sup>		On-Site Review					
		Map Unit	Soil Name	Map Unit	Glacial Deposit	Land Use	Surface Stones	Slope (%)	Vegetation	Parent Material	Percolation Rate (min/inch)
Site 1 - Middle Road	TP-7	CdC	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Vacant/Woods	None	1-3	Pine & Oak Woods	Outwash	<2
Site 1 - Near WPCF	TP-8	CdB	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Vacant/Sand pit	Few Cobbles	2-5	None (Sand Pit)	Outwash	<2
Site 2 - Volunteer Park (North)	TP-5	CdB	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Vacant/Woods	None	Flat	Pine & Oak Woods	Outwash	<2
Site 2 - Volunteer Park (South)	TP-6	CdD	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Vacant/Woods	None	2-5	Pine & Oak Woods	Outwash	<2
Site 4 - Airport (North)	TP-9	EaB	Eastchop loamy fine sand	Qhw	Harwich Outwash Plain Deposits	Field/Clearing	None	2-5	Grass, short brush	Outwash	<2
Site 4 - Airport (Windsock)	TP-10	Ud	Udipsammments, smoothed	Qhw	Harwich Outwash Plain Deposits	Field/Clearing	None	Flat	Grass, sparse short brush	Outwash	<2
Site 7 - High School (3rd Base)	TP-1	Ud	Udipsammments, smoothed	Qnd	Nantucket Sound Ice-Contact Deposits	Recreational Fields	None	0-8	Grass	Outwash	<2
Site 7 - High School (Tennis Courts)	TP-2	Ud	Udipsammments, smoothed	Qnd	Nantucket Sound Ice-Contact Deposits	Recreational Fields	None	3-8	Sparse grass	Outwash	<2
Site 9 - Golf Course	TP-3	CdB	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Golf Course/Woods	None	0-8	Pine & Oak Woods/grass	Outwash	N/A <sup>(3)</sup>
Site 10 - Hamden Place (Woods)	TP-4W	CdD	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Residential/Woods	None	3-8	Pine & Oak Woods	Outwash	<2
Site 10 - Hamden Place (Road)	TP-4R	CdD	Carver coarse sand	Qhw	Harwich Outwash Plain Deposits	Residential/Road Shoulder	None	3-8	Pine & Oak Woods/grass	Outwash	<2

- Notes:
1. Published 1993, Scale 1:25,000
  2. Published 1986, Scale 1:100,000
  3. Percolation Test not performed at Golf Course site due to depth of suitable materials

**Table 4**

ESTIMATED SITE CAPACITY SUMMARY  
TREATED WATER RECHARGE SITE EVALUATIONS  
Town of Chatham, MA

Site Number	Site Name	Option	Technology	Number of Infiltration Beds	Number of Leaching Fields	Estimated Available Area (Acres)	Loading Rate (gpd/sf)	Capacity (mgd)
1	WWTF	Existing	Sand Beds	4 (200'x150')			5.0	0.6
1	Middle Road	A	Sand Beds	10 (150'x150') <sup>(1)</sup>		10	5.0	1.13
1	Middle Road	B	Leaching Trenches		44 (100'x100')	10	2.5	0.69
2	Volunteer Park	A	Sand Beds (top)	6 (200'x200')		10	5.0	1.20
			Sand Beds (bottom)	6 (200'x150')		6.8	5.0	0.90
SUMMATION OF MULTIPLE RECHARGE AREAS								2.10
2	Volunteer Park	B	Leaching Trenches		56 (100'x100')	13	2.5	0.87
4	Airport	A	Sand Beds	4 (200'x200')		5.5	5.0	0.80
			Leaching Trenches		10 (70'x210')	5.2	2.5	0.23
			Leaching Trenches		8 (100'x100')	2.5	2.5	0.13
SUMMATION OF MULTIPLE RECHARGE AREAS								1.15
4	Airport	B	Leaching Trenches		22 (100'x100')	6.1	2.5	0.34
			Leaching Trenches		10 (70'x210')	5.2	2.5	0.23
			Leaching Trenches		8 (100'x100')	2.5	2.5	0.13
SUMMATION OF MULTIPLE RECHARGE AREAS								0.70
7	High School	A	Leaching Trenches (upper fields)		20 (100'x100')	5.5	2.5	0.31
			Leaching Trenches (lower fields)		5 (100'x100')	1.7	2.5	0.08
SUMMATION OF MULTIPLE RECHARGE AREAS								0.39
9	Golf Course	A	Leaching Trenches		16 (100'x100')	5.3	2.5	0.25
10	Hamden Place	A	Leaching Trenches		5 (100'x100')	1.5	2.5	0.08
10	Hamden Place	B	Leaching Trenches		16 (100'x100')	4.7	2.5	0.25
10	Hamden Place	C	Leaching Trenches		21 (100'x100')	6.8	2.5	0.33

## Notes:

1. Estimated area used as part of 2004 Draft Report, number of estimated bed area was increased during 2006 Preliminary Design (10 new beds, 1.8 mgd)

**Appendix A**

---

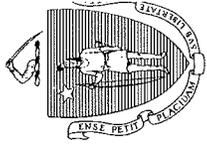
**Treatment Plant North (Site 1)**

Boring/Well ID: Treatment Plant N. MW-1-1

Project Name:	Chatham Treated Water Recharge
Job. No.:	70098.53.1000
Start Date & Time:	4/28/2004 1:00AM
Finish Date & Time:	4/29/2004 11:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	Tim Flores
S&W Inspector:	RHK
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	50s, Sunny

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	67.55
Measuring Point El:	69.90
GW Elevation:	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	Sample Description
						▼ Depth to = Ground Water	
0							
1							
2							
3							
4							
5	10,12	█	16				Light Brown, Orange COARSE to MEDIUM SAND, trace FINE GRAVEL
6	15,17	█					
7							
8							
9							
10	10,10,7,6	█	12				Light Brown, Orange COARSE SAND and FINE TO COARSE GRAVEL
11							1/2" Rocks
12							
13							
14							
15	7,8,10,8	█	16				Light Brown, Orange COARSE SAND and FINE GRAVEL
16							
17							
18							
19							
20	4,5,5,6	█	14				Orange, Light Brown COARSE SAND
21							
22							
23							
24							
25	6,9,9,11	█	14				Light Brown, Orange MEDIUM to COARSE SAND
26							
27							
28							
29							
30	10,17	█	18				Light Brown, Orange MEDIUM to FINE SAND
31	25,31	█					
32							
33							
34							
35	15,15	█	2				Light Brown MEDIUM to FINE SAND
36	21,22	█					
37							
38							
39							
40	8,18	█	20				Light Brown FINE to MEDIUM SAND
41	25,29	█					Some COARSE SAND
42							
43							
44							
45	15,25	█	18				Light Brown MEDIUM to FINE SAND
46	27,29	█					
47							
48							
49							
50	9,25	█	18				Light Brown MEDIUM to FINE SAND
51	36,41	█					
52				▼			
53							
54							
55	9,22	█	20				Light Brown COARSE to MEDIUM SAND
56	28,29	█					
57							
58							
59							
60	8,15	█	24				Light Brown FINE to MEDIUM SAND
61	N/A,N/A	█					
62							
63							
64							
65	11,23	█	24				Light Brown FINE to MEDIUM SAND
66	29, N/A	█					SILTY toward bottom



Commonwealth of Massachusetts  
City/Town of

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

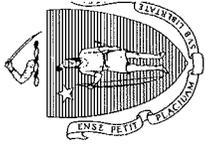
inches

elevation

Deep Observation Hole Number: Middle Road

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-2"	O <sub>e</sub>					Organic - Hemic					
2"-4"	A	10YR 4/3				Sandy Loam			Massive	Very Friable	
4"-38"	B <sub>w</sub>	7.5YR 5/8				Loamy Sand	10-20		Massive	Very Friable	
38"-144"	C	10YR 6/8				M-C Sand	10-20		Single Grain	Loose	Variegated

Additional Notes No weeping, standing water, or mottles observed.



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

elevation

inches

Deep Observation Hole Number: WPCF

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)		Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color		Percent	Gravel			
0"-144"	C	10YR 6/8			M-C Sand	10-20		Single Grain	Loose	Variegated

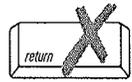
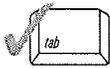
Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
 City/Town of  
**Percolation Test**  
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

**Important:**  
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



**A. Site Information**

Owner Name \_\_\_\_\_

Street Address or Lot # \_\_\_\_\_

City/Town \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contact Person (if different from Owner) \_\_\_\_\_ Telephone Number \_\_\_\_\_

**B. Test Results**

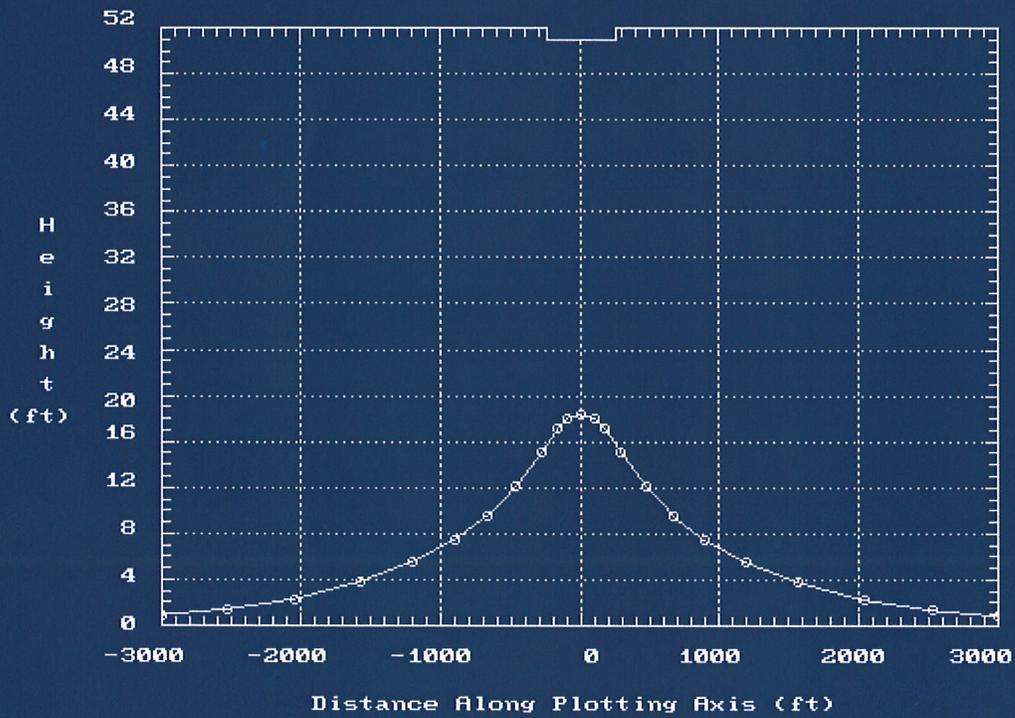
	5/17/04	14:42	5/17/04	15:13
	Date	Time	Date	Time
Observation Hole #	Middle Road		WPCF	
Depth of Perc	52" - 70"		49" - 67"	
Start Pre-Soak	14:42		15:13	
End Pre-Soak	14:46		15:17	
Time at 12"	NA		NA	
Time at 9"	NA		NA	
Time at 6"	NA		NA	
Time (9"-6")	NA		NA	
Rate (Min./Inch)	< 2 min./in.		< 2 min./in.	
	Test Passed: <input checked="" type="checkbox"/>		Test Passed: <input checked="" type="checkbox"/>	
	Test Failed: <input type="checkbox"/>		Test Failed: <input type="checkbox"/>	

Samuel Philos Jensen  
 Test Performed By: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Comments:  
 Poured 24 gallons, couldn't maintain 9"

PREDICTED GROUNDWATER MOUNDING  
Treatment Plant 20



**Appendix B**

---

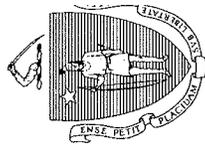
**Volunteer Park (Site 2)**

Boring/Well ID: Volunteer Park MW-2-1

Project Name:	Chatham Treated Water Recharge
Job. No.:	70098.53.1000
Start Date & Time:	4/29/2004 1:00AM
Finish Date & Time:	4/29/2004 11:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	Tim Flores
S&W Inspector:	RHK
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	50s, Sunny

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	68.84
Measuring Point El:	71.69
GW Elevation:	

Depth (ft)	Blow Counts (every 6')	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:
						▼ Depth to Ground Water =
0						Sample Description
1						
2						
3						
4						
5	20,29	█	16			
6	35,32	█				
7						
8						
9						
10	14,18	█	20			
11	17,18	█				
12						
13						
14						
15	6,12	█	14			
16	10,12	█				
17						
18						
19						
20	10,16	█	16			
21	14,13	█				
22						
23						
24						
25	10,12	█	14			
26	17,15	█				
27						
28						
29						
30	7,12	█	18			
31	15,14	█				
32						
33						
34						
35	20,14	█	20			
36	11,13	█				
37						
38						
39						
40	10,17	█	20			
41	26,25	█				
42						
43						
44						
45	42,39	█	20	▼		
46	40,58	█				
47						
48						
49						
50	15,28	█	14			
51	34,N/A	█				
52						
53						
54						
55	8,10	█	24			
56	13,17	█				



Commonwealth of Massachusetts  
City/Town of

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

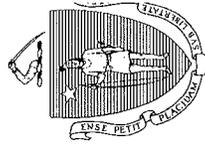
elevation

inches

Deep Observation Hole Number: Volunteer Park South

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-2"	O <sub>e</sub>					Organic - Hemic					
2"-8"	A	10YR 4/3				Loamy Sand			Massive	Very Friable	
8"-14"	E	10YR 7/2				M-C Sand	5-10		Single Grain	Loose	
14"-48"	B <sub>w</sub>	7.5YR 5/8				Sandy Loam	5-10		Massive	Very Friable	
48"-150"	C	2.5YR 7/6				M-C Sand	10-20		Single Grain	Loose	Variegated

Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
City/Town of

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

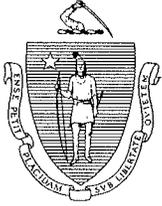
elevation

inches

Deep Observation Hole Number: Volunteer Park North

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)		Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color		Percent	Gravel			
0"-4"	O <sub>e</sub>				Organic - Hemic					
4"-10"	A	10YR 4/3			Sandy Loam			Massive	Very Friable	
10"-40"	B <sub>w</sub>	7.5YR 5/8			Sandy Loam		5-10	Massive	Very Friable	
40"-144"	C	10YR 6/8			M-C Sand		10-20	Single Grain	Loose	Variegated

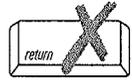
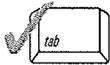
Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
 City/Town of  
**Percolation Test**  
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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**A. Site Information**

Owner Name \_\_\_\_\_

Street Address or Lot # \_\_\_\_\_

City/Town \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contact Person (if different from Owner) \_\_\_\_\_ Telephone Number \_\_\_\_\_

**B. Test Results**

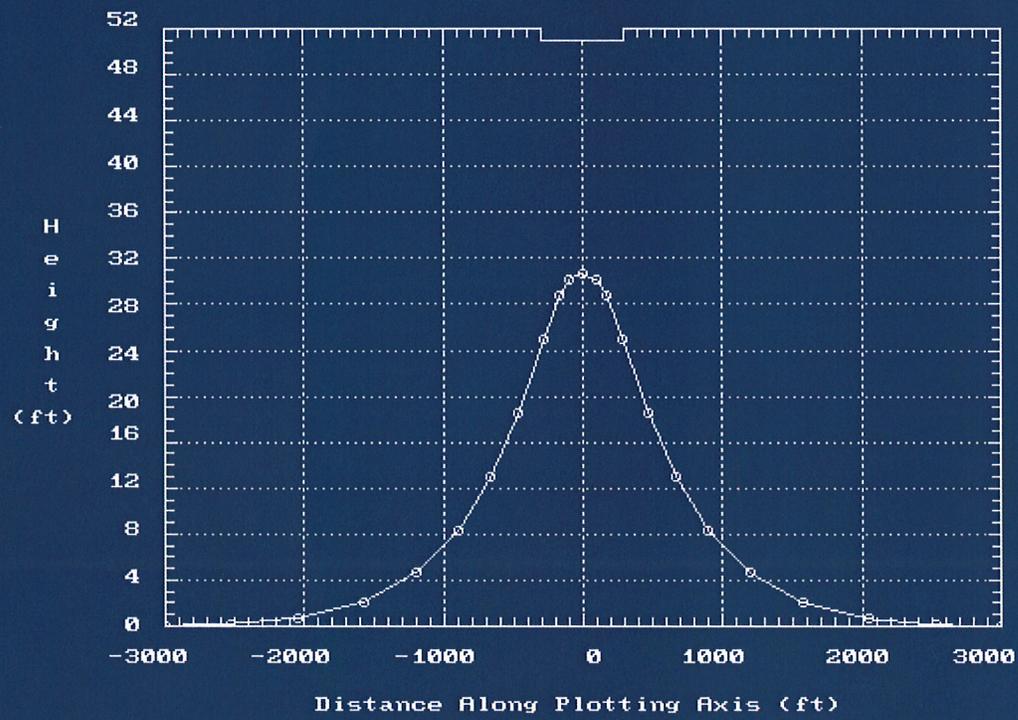
	5/17/04 Date	13:22 Time	5/17/04 Date	13:56 Time
Observation Hole #	Volunteer Park - North		Volunteer Park - South	
Depth of Perc	52" - 70"		56" - 74"	
Start Pre-Soak	13:22		13:56	
End Pre-Soak	13:26		13:59	
Time at 12"	NA		NA	
Time at 9"	NA		NA	
Time at 6"	NA		NA	
Time (9"-6")	NA		NA	
Rate (Min./Inch)	< 2 min./in.		< 2 min./in.	
	Test Passed:	<input checked="" type="checkbox"/>	Test Passed:	<input checked="" type="checkbox"/>
	Test Failed:	<input type="checkbox"/>	Test Failed:	<input type="checkbox"/>

Samuel Philos Jensen  
 Test Performed By: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Comments:  
 Poured 24 gallons, couldn't maintain 9"

PREDICTED GROUNDWATER MOUNDING  
Volunteer 5



**Appendix C**

---

**Chatham Airport (Site 4)**

Boring/Well ID: Airport (Back Fence) MW-4-1

Project Name:	Chatham Treated Water Recharge
Job. No.	70098.53.1000
Start Date & Time:	5/3/2004 8:00AM
Finish Date & Time:	5/3/2004 1:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	George Guinto
S&W Inspector:	DZ
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	60, Rainy

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	62.53
Measuring Point El:	65.60
GW Elevaton:	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	Sample Description
						▼ Depth to Ground Water =	
0							
1							
2							
3							
4							
5	8,12	█	12				Light Brown COARSE SAND, FINE GRAVEL, Some 1" Rocks, Some White Stone
6	17,20						
7							
8							
9							
10	7,10	█	16				Light Brown, Orange COARSE SAND FINE to COARSE GRAVEL
11	10,12						
12							
13							
14							
15	5,10	█	14				Light Brown, some Dark Brown MEDIUM to COARSE SAND
16	11,10						
17							
18							
19							
20	6,10	█	18				Light Brown, trace Orange MEDIUM to COARSE SAND trace FINE GRAVEL
21	13,15						
22							
23							
24							
25	6,9	█	20				Light Brown COARSE to MEDIUM to FINE SAND
26	12,14						
27							
28							
29							
30	6,9	█	20				Light Brown COARSE to MEDIUM SAND
31	17,16						
32							
33							
34							
35	3,4	█	24				6" Light Brown COARSE SAND
36	9,6						17" Light Brown SILT to CLAY (Wet)
37							1" Gray CLAY
38							
39							
40	7,11	█	14				4" Dark Brown MEDIUM to COARSE SAND, 10" Light Brown MEDIUM to FINE SAND (Dry)
41	14,14						
42							
43				▼			
44							
45	7,9	█	20				12" Light Brown MEDIUM to COARSE SAND, 8" Brown SILT to CLAY
46	10,12						
47							
48							
49							
50	5,7	█	24				Gray CLAY
51	9,10						
52							
53							
54							
55							

Boring/Well ID: Airport (Northeast) B-4-2

Project Name:	Chatham Treated Water Recharge
Job. No.	70098.53.1000
Start Date & Time:	5/3/2004 2:00PM
Finish Date & Time:	5/4/2004 10:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	George Guinto
S&W Inspector:	DZ
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	60, Rainy

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	63.20
Measuring Point El:	
GW Elevation:	

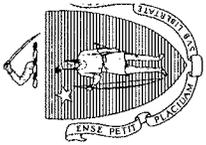
Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key: ▼ Depth to Ground Water
0						<b>Sample Description</b>
1						
2						
3						
4						
5	7,10	█	14			
6	14,21	█				
7						
8						
9						
10	7,11	█	14			
11	12,12	█				
12						
13						
14						
15	5,10	█	14			
16	12,12	█				
17						
18						
19						
20	10,14	█	18			
21	18,14	█				
22						
23						
24						
25	13,17	█	18			
26	18,15	█				
27						
28						
29						
30	13,22	█	16			
31	27,32	█				
32						
33						
34						
35	11,13	█	20			
36	19,25	█				
37						
38						
39						
40	8,13	█	16			
41	12,12	█				
42						
43						
44						
45	5,15	█	24			
46	18,21	█				
47						
48						
49						
50	5,9	█	24			
51	11,17	█				

Boring/Well ID: Airport (Tie down Area) MW-4-3

Project Name:	Chatham Treated Water Recharge
Job. No.	70098.53.1000
Start Date & Time:	5/4/2004 10:00AM
Finish Date & Time:	5/4/2004 2:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	George Guinto
S&W Inspector:	DZ
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	50s, Sunny

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	55.28
Measuring Point El:	57.90
GW Elevation:	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	Sample Description
						▼ Depth to Ground Water =	
0							
1							
2							
3							
4							
5	4,6	█	12				Light Brown, Orange MEDIUM to COARSE SAND, some FINE GRAVEL
6	8,8	█					
7							
8							
9							
10	3,3	█	18				Light Brown, Orange COARSE SAND, FINE to COARSE GRAVEL
11	4,4	█					
12							
13							
14							
15	4,5	█	18				Light Brown, some Orange, COARSE SAND to FINE GRAVEL
16	6,7	█					
17							
18							
19							
20	3,5	█	20				Light Brown, Orange COARSE to MEDIUM SAND, some FINE GRAVEL
21	6,8	█					
22							
23							
24							
25	3,5	█	18				Light Brown, Orange COARSE to MEDIUM SAND, some FINE GRAVEL
26	7,8	█					
27							
28							
29							
30	5,8	█	20				Light Brown, Orange FINE to MEDIUM SAND, some COARSE SAND
31	17,21	█					
32							
33							
34							
35	5,6	█	20				Light Brown MEDIUM SAND Some FINE SAND and SILT
36	8,12	█					
37							
38							
39							
40	7,12	█	18				Top 6" Light Brown FINE SAND
41	12,14	█		▼			Middle 4" Light Brown COARSE SAND to FINE GRAVEL
42							Bottom 8" Light Brown MEDIUM to COARSE SAND
43							Top 10" Light Brown COARSE SAND
44							Bottom 14" Brown SILT to CLAY
45	6,9	█	24				
46	10,13	█					
47							
48							
49							
50	5,11	█	24				Top 10" Light Brown COARSE SAND
51	14,N/A	█					Bottom 14" Brown SILT to CLAY



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

inches

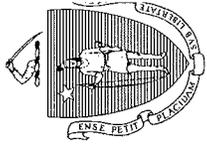
elevation

Deep Observation Hole Number: Airport, Windsock

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-2"	A	7.5Y 4/4				Sandy Loam					
2"-33"	B <sub>w</sub>	7.5Y 5/8				Sandy Loam	10-20		Massive	Very Friable	
33"-144"	C	10YR 6/6				M-C Sand	15-25		Single Grain	Loose	Variegated

Additional Notes: No weeping, standing water, or mottles observed.

6" thick layer (average) of sandy loam (10YR 5/3) at 48" in south wall of pit.



Commonwealth of Massachusetts  
City/Town of

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

elevation

inches

Deep Observation Hole Number: Airport, North

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)		Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color		Percent	Gravel			
0"-4"	A	7.5Y 4/4			Sandy Loam			Massive	Very Friable	
4"-30"	B <sub>w</sub>	7.5Y 5/8			Sandy Loam	5-10		Massive	Very Friable	
30"-144"	C	10YR 7/6			M-C Sand	10-20		Single Grain	Loose	Variegated

Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
 City/Town of  
**Percolation Test**  
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

**Important:**

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



**A. Site Information**

Owner Name \_\_\_\_\_

Street Address or Lot # \_\_\_\_\_

City/Town \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contact Person (if different from Owner) \_\_\_\_\_ Telephone Number \_\_\_\_\_

**B. Test Results**

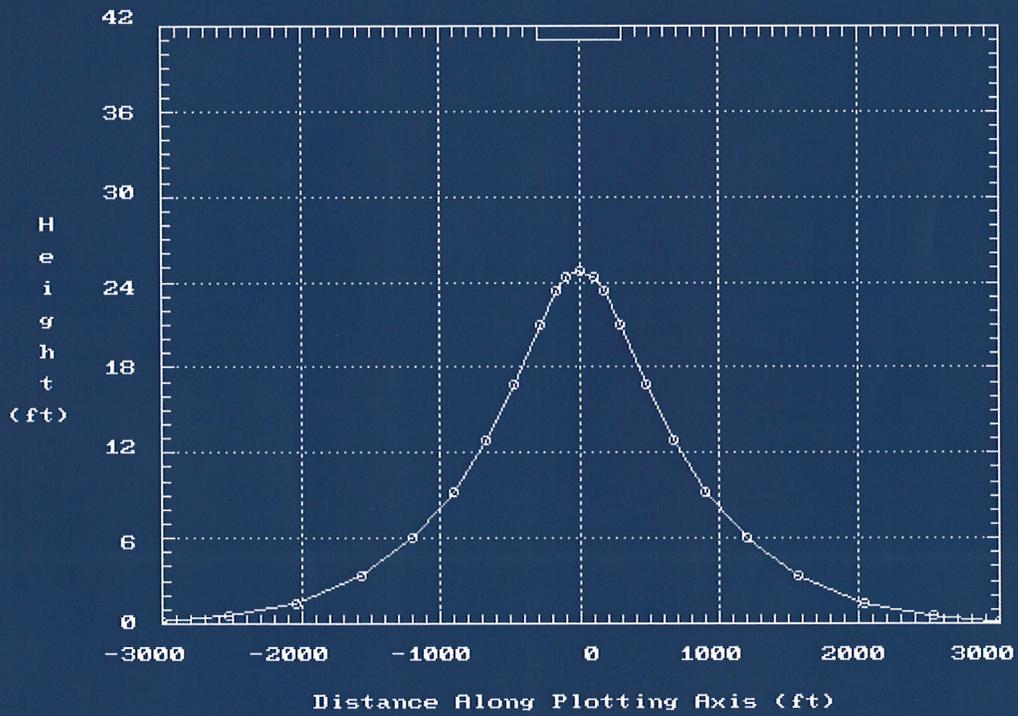
	5/17/04 Date	8:05 AM Time	5/17/04 Date	8:39 AM Time
Observation Hole #	Airport - North		Airport - Windsock	
Depth of Perc	64" - 82"		54" - 72"	
Start Pre-Soak	8:05		8:39	
End Pre-Soak	8:09		8:44	
Time at 12"	NA		NA	
Time at 9"	NA		NA	
Time at 6"	NA		NA	
Time (9"-6")	NA		NA	
Rate (Min./Inch)	< 2 min./in.		< 2 min./in.	
	Test Passed:	<input checked="" type="checkbox"/>	Test Passed:	<input checked="" type="checkbox"/>
	Test Failed:	<input type="checkbox"/>	Test Failed:	<input type="checkbox"/>

Samuel Philos Jensen  
 Test Performed By: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Comments:  
 Poured 24 gallons, could not maintain 9"

PREDICTED GROUNDWATER MOUNDING  
Airport 8



Duration:  
180 days

---

**Appendix D**  
**Chatham High School (Site 7)**

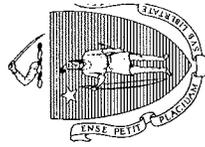
**Boring/Well ID:** High School (Front of field) MW-7-1

<b>Project Name:</b>	Chatham Treated Water Recharge
<b>Job. No.</b>	70098.53.1000
<b>Start Date &amp; Time:</b>	4/23/2004 8:00AM
<b>Finish Date &amp; Time:</b>	4/23/2004 3:00PM
<b>Drilling Co.:</b>	Soil Exploration Corp
<b>Driller:</b>	Tim Flores
<b>S&amp;W Inspector:</b>	RHK
<b>Rig Type:</b>	Truck
<b>Drilling Method:</b>	Auger w/SS samples
<b>Weather:</b>	50s, Cloudy

Groundwater Observations	
<b>Time:</b>	
<b>Casing Depth:</b>	
<b>Boring Depth:</b>	
<b>Depth to Water:</b>	
<b>Below Surface:</b>	
<b>Below Meas. Point:</b>	
<b>Surface Elevation:</b>	67.31
<b>Measuring Point El:</b>	67.33
<b>GW Elevation:</b>	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	
						▼ Depth to Ground Water	
0							
1							
2							
3							
4							
5	5,6,7,6	█	20		Light Brown, FINE to MEDIUM SAND		
6							
7							
8							
9							
10	2,3,4,4	█	20		Light Brown, MEDIUM SAND		
11							
12							
13							
14							
15	3,4,4,5	█	15		Light Brown, Orange COARSE SAND		
16							
17							
18							
19							
20	3,3,4,4	█	20		Light Brown COARSE SAND		
21							
22							
23							
24							
25	6,8,8,12	█	18		Mostly Light Brown FINE SAND		
26					Middle 6" of sample, SILT		
27					Orange Specks throughout sample		
28							
29							
30	10,13	█	20		Light Brown, FINE SAND		
31	17,17	█					
32							
33							
34							
35	10,13	█	20		Light Brown FINE to MEDIUM SAND		
36	16,16	█					
37							
38							
39							
40	8,11	█	22		Light Brown to Orange		
41	15,15	█			FINE to MEDIUM SAND		
42							
43							
44							
45	5,9	█	24	▼	Light Brown MEDIUM SAND, Water		
46	10,12	█					
47							
48							
49							
50	9,13	█	30		Light Brown MEDIUM SAND		
51	26,28	█					
52							
53							
54							
55	7,11,39	█	30	Only 3 Blow Counts-- Hung up	Light Brown MEDIUM SAND		
56							





Commonwealth of Massachusetts  
City/Town of

**Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal**

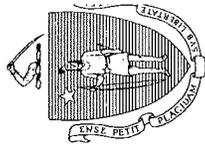
inches

elevation

Deep Observation Hole Number: High School, Third Base

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-9"	Fill										
9"-39"	C1	2.5Y 7/4				Medium Sand	1-5		Single Grain	Loose	
39"-53"	C2	2.5Y 6/2				Fine Sand	1-5		Massive	Friable	Pockets of fine loamy sand
53"-119"	C3	2.5Y 7/4				M-C Sand	5-10		Single Grain	Loose	
119"-144"	C4	2.5Y 6/2				Fine Sand	1-5		Massive	Friable	

Additional Notes No weeping, standing water, or mottles observed.



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

inches

elevation

Deep Observation Hole Number: High School, Tennis Courts

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-25"	B <sub>w</sub>	10YR 6/8				Sandy Loam	5-10		Massive	Very Friable	
25"-51"	C1	10YR 6/6				Medium Sand	5-10		Single Grain	Loose	Variegated
51"-144"	C2	10YR 6/6				F-M-C Sand	5-10		Single Grain	Loose	Variegated

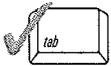
Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
 City/Town of  
**Percolation Test**  
 Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

**Important:**  
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



**A. Site Information**

Owner Name \_\_\_\_\_

Street Address or Lot # \_\_\_\_\_

City/Town \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contact Person (if different from Owner) \_\_\_\_\_ Telephone Number \_\_\_\_\_

**B. Test Results**

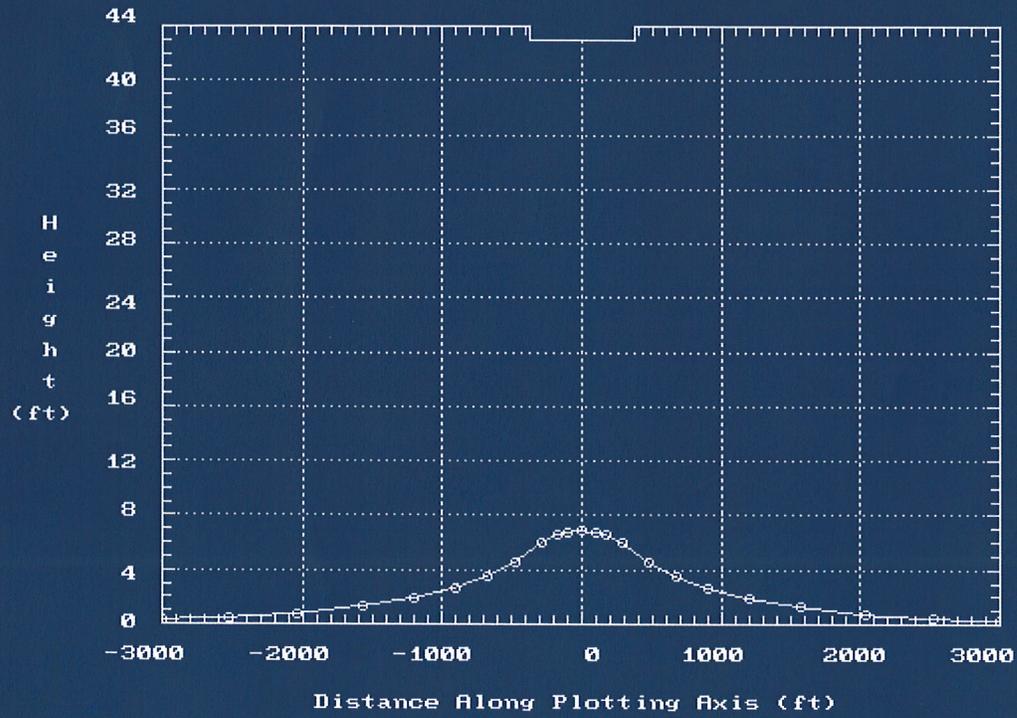
	<u>5/17/04</u> Date	<u>9:38</u> Time	<u>5/17/07</u> Date	<u>10:14</u> Time
Observation Hole #	<u>High School - 3<sup>rd</sup> Base</u>		<u>High School - Tennis Courts</u>	
Depth of Perc	<u>64" - 82"</u>		<u>55" - 73"</u>	
Start Pre-Soak	<u>9:38</u>		<u>10:14</u>	
End Pre-Soak	<u>9:42</u>		<u>10:18</u>	
Time at 12"	<u>NA</u>		<u>NA</u>	
Time at 9"	<u>NA</u>		<u>NA</u>	
Time at 6"	<u>NA</u>		<u>NA</u>	
Time (9"-6")	<u>NA</u>		<u>NA</u>	
Rate (Min./Inch)	<u>&lt; 2 min./in.</u>		<u>&lt; 2 min./in.</u>	
	Test Passed:	<input checked="" type="checkbox"/>	Test Passed:	<input checked="" type="checkbox"/>
	Test Failed:	<input type="checkbox"/>	Test Failed:	<input type="checkbox"/>

Samuel Philos Jensen  
 Test Performed By:

Witnessed By: \_\_\_\_\_

Comments:  
Poured 24 gallons, couldn't maintain 9"

PREDICTED GROUNDWATER MOUNDING  
High School 20



**Appendix E**

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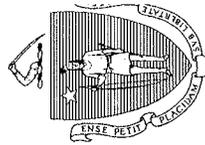
**Chatham Seaside Links Golf Course (Site 9)**

<b>Boring/Well ID:</b>	Golf Course MW-9-1
------------------------	--------------------

<b>Project Name:</b>	Chatham Treated Water Recharge
<b>Job. No.</b>	70098.53.1000
<b>Start Date &amp; Time:</b>	4/27/2004 9:00AM
<b>Finish Date &amp; Time:</b>	4/28/2004 11:00PM
<b>Drilling Co.:</b>	Soil Exploration Corp
<b>Driller:</b>	Tim Flores
<b>S&amp;W Inspector:</b>	RHK
<b>Rig Type:</b>	Truck
<b>Drilling Method:</b>	Auger w/SS samples
<b>Weather:</b>	50s, Cloudy

Groundwater Observations	
<b>Time:</b>	
<b>Casing Depth:</b>	
<b>Boring Depth:</b>	
<b>Depth to Water:</b>	
<b>Below Surface:</b>	
<b>Below Meas. Point:</b>	
<b>Surface Elevation:</b>	53.82
<b>Measuring Point El:</b>	53.86
<b>GW Elevation:</b>	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	Sample Description
						▼ Depth to = Ground Water	
0							
1							
2							
3							
4							
5	10,13	█	20				Top 12" Brown SILT
6	16,15	█					8" MEDIUM SAND
7							
8							
9							
10	5,7,12,9	█	18				Light Brown COARSE SAND
11							
12							
13							
14							
15	8,8,10,8	█	18				Light Brown MEDIUM to COARSE SAND
16							
17							
18							
19							
20	7,9,9,10	█	15				Light Brown to Orange MEDIUM SAND
21							
22							
23							
24							
25	16,16	█	20				Light Brown, Orange, Gray
26	21,23	█					FINE to MEDIUM SAND
27							
28							
29							
30	17,20	█	4				Light Brown MEDIUM SAND
31	15,21	█					
32							
33							
34							
35	10,12	█	20				Light Brown, Orange FINE SAND
36	15,23	█					
37							
38							
39							
40	5,8	█	15				Light Brown MEDIUM SAND
41	15,20	█					
42							
43							
44							
45	11,18	█	18				Light Brown, Orange FINE SAND
46	20,23	█					Some MEDIUM SAND
47				▼			
48							
49							
50	6,9	█	18				Light Brown, some Orange
51	10,12	█					FINE SAND, some SILT
52							
53							
54							
55	6,12	█	24				Light Brown, some Orange
56	20,32	█					FINE SAND, some SILT
57							
58							
59							
60	13,15	█	15				Light Brown, some Orange
61	17,25	█					FINE SAND, some SILT



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

elevation

inches

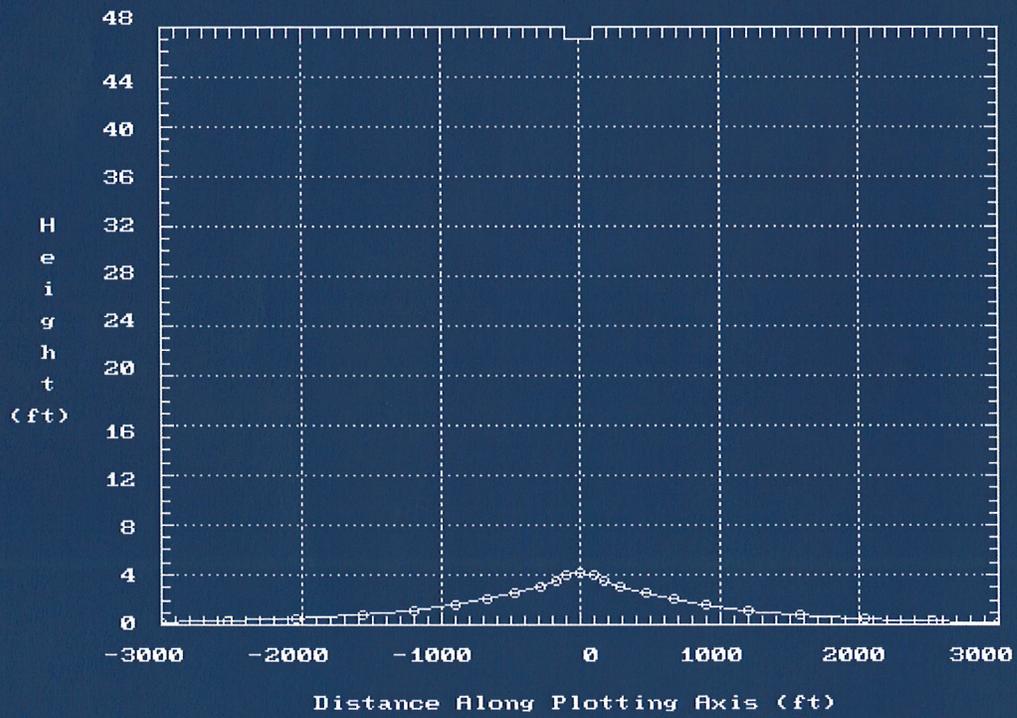
Deep Observation Hole Number: Golf Course

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-6"	A	10YR 4/2				Sandy Loam					
6"-20"	B	10YR 5/8	6"	7.5YR6/8 2.5Y7/2	10	Silt Loam	1-5		Massive	Firm	
20"-77"	C1	10YR 5/6				Silt Loam	1-5		Massive	Firm	
77"-144"	C2	10YR 6/6				M-C Sand	10-20		Single Grain	Loose	Variegated

Additional Notes Apparent perched ground water above the C1 horizon.

Did not perform a percolation test at this site due to depth of suitable material.

PREDICTED GROUNDWATER MOUNDING  
Golf Course 20



Duration:  
180 days

**Appendix F**

---

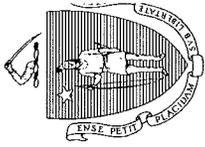
**Hamden Place (Site 10)**

Boring/Well ID: Hamden Place MW-10-1

Project Name:	Chatham Treated Water Recharge
Job. No.	70098.53.1000
Start Date & Time:	4/26/2004 8:00AM
Finish Date & Time:	4/26/2004 2:00PM
Drilling Co.:	Soil Exploration Corp
Driller:	Tim Flores
S&W Inspector:	RHK
Rig Type:	Truck
Drilling Method:	Auger w/SS samples
Weather:	50s, Cloudy

Groundwater Observations	
Time:	
Casing Depth:	
Boring Depth:	
Depth to Water:	
Below Surface:	
Below Meas. Point:	
Surface Elevation:	44.10
Measuring Point El:	46.43
GW Elevation:	

Depth (ft)	Blow Counts (every 6")	Sample Log	Recovery (in)	Other Notes	Lithology	Other Notes Key:	Sample Description
						▼ Depth to Ground Water =	
0							
1							
2							
3							
4							
5	5,4,4,9	█	15				Light Brown, MEDIUM SAND
6							
7							
8							
9							
10	11,13	█	20				Light Brown MEDIUM SAND
11	16,23	█					Some COARSE SAND
12							
13							
14							
15	16,16	█	18				Light Brown, MEDIUM SAND
16	19,27	█					Some COARSE SAND, GRAVEL
17							(1/4" to 1/2" Rocks in Sample)
18							
19							
20	6,12	█	20				Light Brown, some Orange
21	20,20	█					COARSE SAND with FINE to COARSE
22							GRAVEL
23							
24							
25	9,11	█	18				Light Brown to Orange
26	12,15	█					MEDIUM SAND
27							
28							
29							
30	17,18	█					Light Brown, COARSE SAND to
31	19,21	█					FINE GRAVEL
32							
33							
34							
35	16,22	█	20				Light Brown, MEDIUM to COARSE
36	24,29	█					SAND, FINE GRAVEL
37							
38							
39							
40	11,14	█		▼			Light Brown, COARSE SAND
41	17,20	█					
42							
43							
44							
45	7,13	█	10				Light Brown, FINE to COARSE GRAVEL
46	40, NO	█					
47							
48							
49							
50	14,19	█	10				Light Brown, FINE GRAVEL
51	41, NO	█					COARSE SAND
52							
53							
54							
55	65, NO	█	24"				Light Brown, FINE GRAVEL
56	NO, NO	█					COARSE SAND



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

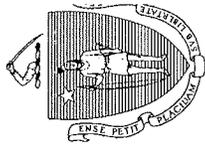
inches

elevation

Deep Observation Hole Number: Hamden Place, Woods

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-2"	O <sub>e</sub>					Organic - Hemic					
2"-9"	A	10YR 4/2				Loamy Sand			Massive	Very Friable	
9"-16"	E	10YR 7/2				M-C Sand	5-10		Single Grain	Loose	
16"-38"	B <sub>w</sub>	7.5YR 5/8				Loamy Sand	5-10		Massive	Very Friable	
38"-144"	C	7.5YR 5/6				M-C Sand	5-10		Single Grain	Loose	Variegated

Additional Notes No weeping, standing water, or mottles observed.



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

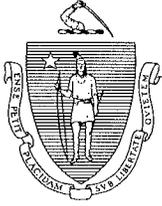
inches

elevation

Deep Observation Hole Number: Hamden Place, Road

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0"-26"	Fill										
26"-32"	E	10YR 7/2				M-C Sand	5-10		Single Grain	Loose	
32"-54"	B <sub>w</sub>	7.5YR 5/8				Sandy Loam	10-20		Massive	Very Friable	
54"-144"	C	7.5YR 5/6				M-C Sand	10-20		Single Grain	Loose	Variegated

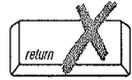
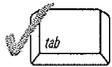
Additional Notes No weeping, standing water, or mottles observed.



Commonwealth of Massachusetts  
 City/Town of  
**Percolation Test**  
**Form 12**

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

**Important:**  
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



**A. Site Information**

Owner Name \_\_\_\_\_

Street Address or Lot # \_\_\_\_\_

City/Town \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

Contact Person (if different from Owner) \_\_\_\_\_ Telephone Number \_\_\_\_\_

**B. Test Results**

	5/17/04 Date	11:02 Time	5/17/04 Date	11:24 Time
Observation Hole #	Hamden Place - Woods		Hamden Place - Road	
Depth of Perc	52" - 70"		60" - 78"	
Start Pre-Soak	11:02		11:24	
End Pre-Soak	11:05		11:28	
Time at 12"	NA		NA	
Time at 9"	NA		NA	
Time at 6"	NA		NA	
Time (9"-6")	NA		NA	
Rate (Min./Inch)	< 2 min./in.		< 2 min./in.	
	Test Passed:	<input checked="" type="checkbox"/>	Test Passed:	<input checked="" type="checkbox"/>
	Test Failed:	<input type="checkbox"/>	Test Failed:	<input type="checkbox"/>

Samuel Philos Jensen  
 Test Performed By: \_\_\_\_\_

Witnessed By: \_\_\_\_\_

Comments:  
 Poured 24 gallons, couldn't maintain 9"

PREDICTED GROUNDWATER MOUNDING  
Hamden Place 20

