

North Brookfield Source Water Protection Plan



March 2006

Prepared by:



Prepared for:

Town of North Brookfield
Water Department

Horse/North Pond Reservoir

*The cover page for the **North Brookfield Source Water Protection Plan** is a picture taken by **Adam Hart-Davis** of the DHD Multimedia Gallery titled “Tap with Water Flowing”.*

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"There shall be no man or woman dare to wash any unclean linen, wash clothes,...nor rinse or make clean any kettle, pot, or pan or any suchlike vessel within twenty feet of the old well or new pump. Nor shall anyone aforesaid, within less than a quarter mile of the fort, dare to do the necessities of nature, since by these unmanly, slothful, and loathsome immodesties, the whole fort may be choked and poisoned."

--Governor Gage of Virginia, Proclamation for Jamestown, Va. (1610)

North Brookfield Source Water Protection Plan

Town of North Brookfield Water Department North Brookfield, MA

Adopted by the Source Water Protection Committee:



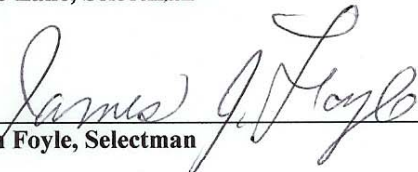
Stephen Jones, Superintendent

2/8/06
Date



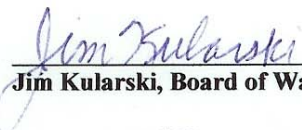
Bob Lane, Selectman

2/9/06
Date



Jim Foyle, Selectman

2/14/06
Date



Jim Kularski, Board of Water Commissioners

2/8/06
Date



Tim Nason, Board of Water Commissioners

2/8/06
Date

Review Annually and Update Every 3 Years

Date Reviewed	Reviewer	Changes or Comments

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Acknowledgements

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MassRWA wishes to thank all the individuals and organizations that contributed to this effort, including the system operator, Mr. Stephan Jones, who provided helpful information regarding the history and site characteristics of the Horse Pond Reservoir. Local officials and concerned citizens cheerfully attended monthly meetings to help formulate this plan and expertly presented their water protection goals and methods at the Source Water Protection Workshop in November (date yet to be determined) 2005.

The Source Water Assessment and Protection Report (SWAP) prepared by the Massachusetts Department of Environmental Protection (central division) provided an excellent resource for beginning this planning process. Another excellent and interesting resource contributing to this effort was the *Construction and First Annual Report of the Board of Water Commissioners of North Brookfield, Massachusetts of 1894*, a historical documentation of the construction of North Brookfield's water supply.

A number of water supply protection strategies were recommended during the SWPP process and the Source Water Protection Committee worked hard to create a viable Watershed Protection District By-law for North Brookfield's Town Warrant which will be voted on at the annual Town Meeting in May 2006.

Source Water Protection Plan Steering Committee

The Source Water Protection Plan Steering Committee provided background information about North Brookfield's water supply and its watershed, and assisted in the development of protection strategies. Members of the Advisory Committee include:

Stephen Jones, Superintendent - North Brookfield Water Department
Jim Kularski, Board of Water Commissioners
Tim Nason, Board of Water Commissioners
Jim Foyle, Select Board
Bob Lane, Select Board
John Krusell, Zoning Board

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Horse Pond, North Brookfield, MA.

Introduction

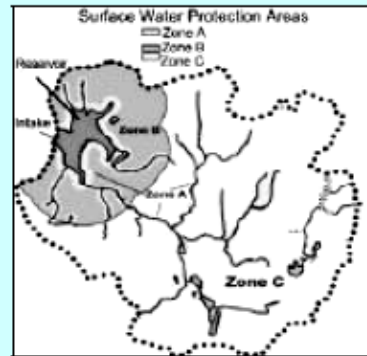
Source Water Protection Plan

A Source Water Protection Plan (SWPP) identifies water system vulnerabilities to contamination and describes techniques to manage potentially contaminating land uses. The North Brookfield Source Water Protection Plan has been developed by the North Brookfield Source Water Protection Steering Committee and MassRWA to aid in the protection of the public water system (PWS) for the Horse Pond Reservoir.

Public water suppliers around the state of Massachusetts and across the nation are increasingly finding that proactive planning and prevention are essential to both the long-term integrity of their water systems and limitation of their costs and liabilities. Despite our best efforts, accidental spills of hazardous chemicals are all too common and bacterial outbreaks still occur unexpectedly, sometimes with dangerous consequences. These types of events may result in costly treatment, remediation and/or litigation, and in worst-case scenario could permanently destroy a water source or injure/kill a water customer.

What is a Watershed?

A watershed is the land area that catches and drains rainwater down-slope into a river, lake or reservoir. As water travels down from the watershed area it may carry contaminants from the watershed to the drinking water supply source. For protection purposes, watersheds are divided into protection Zones A, B and C.



According to the National Center for Small Communities (2000), successful planning and prevention requires six basic steps:

1. Source protection area (SPA) delineation;
2. Identification of sources of contamination within Source Protection Area's;
3. Assessment of the risks to drinking water posed by contaminant sources;
4. Publication of the risk assessment results'
5. Implementation of measures to manage contaminant sources; and
6. Contingency planning for response to contamination incidents.

Source protection planning has numerous benefits including:

- Increasing consumer confidence that their drinking water source will continue to be protected and reliable;
- Reducing the likelihood that contamination incidents will occur with costly and/or potentially harmful results;
- Relationships with regulatory agencies, employees and the public are often enhanced through source protection
- Source Protection Plan's provide strong support to requests for financial assistance.

Source Water Assessment and Protection Reports

As a first step toward drinking water protection planning on a statewide basis, the Massachusetts Department of Environmental Protection (MA DEP) recently completed Source Water Assessment Program (SWAP) reports for most of Massachusetts Public Water Systems (PWSs).

The SWAP reports include descriptions of SPA delineation and land uses which may potentially contaminate water sources, as well as recommendations for managing those land



Doane Pond, North Brookfield, MA.

uses. Consequently, the reports provide water supplier with an important tool for initiating or improving source water protection in their area. (Please see Appendix A for a copy of the North Brookfield Water Department SWAP report.)

North Brookfield Water Department SWAP Report

The SWAP report for the North Brookfield Water Department determined that the overall ranking of source susceptibility for the Horse Pond Reservoir is “**High**” based land uses in the associated Source Protection Area (SPA). The Key issues identified by the SWAP report include:

1. Potential contamination from land uses in Zone A including:
 - Residential Land Uses
 - Septic Systems
 - Hazardous Materials Located in Zone A.
2. Aquatic Wildlife, especially beaver populations.
3. The need for a Water Supply Protection District and Source Protection By-laws to ensure the quality of North Brookfield’s public drinking water supply.

Specific protection strategies and recommendations by the SWAP report and the Source Water Protection Planning Committee will be addressed in detail throughout the North Brookfield Source Water Protection Plan.

Steve Jones, with the aid of Mass Rural Water, also addressed the following necessary additions and corrections to the SWAP Report for Horse Pond. A letter addressing the concerns presented in 3 and 4 was sent to the Central Regional Office of the MA DEP on November 16, 2004. All of the following additions and corrections have been included in North Brookfield’s Source Water Protection Plan.

1. North Brook, a major feeder stream to Horse Pond was not delineated on the original SWAP maps created by the Massachusetts DEP. Bruce Bouck, a DEP hydrologist came and delineated the Zone A of North Brook.
2. Section 1: Description of the Water System should read Horse Pond, also known North Pond.
3. There are errors in the SWAP Report completed by the MA DEP. In the section titled “Description of the Water System” the last paragraph (page 2) should read: “The water is pumped from Horse Pond to the treatment plant on Bell Hill where it is filtered. After filtering, the water is treated for corrosion control and disinfected using MIOX, a multi-oxidant. The treated water is then pumped to a 1,500,000 gallon storage tank before being gravity fed to the distribution system. For the current...”
4. Table 2: Land Use in the Watershed (page 5) is amended in the SWPP to accurately number the amount of residences with fuel oil storage to a total of 7 and septic systems to a total of 6.

See Resource Material at the back of this document for a full copy of the original 2002 SWAP Report.

Goals and Objectives of the North Brookfield SWPP Steering Committee

The North Brookfield SWPP Committee determined that the following goals and objectives were important to the success of the North Brookfield Source Water Protection Plan:

1. A plan for the implementation of a **Water Supply Protection District (WSPD) Bylaw** for the Horse Pond Reservoir and its watershed;
2. A Public Education and Outreach Program for residents and businesses residing within the Horse Pond Reservoir’s recharge area to inform them of the threats to quality drinking water;
3. A spill-pad requirement (BOH regulation) for any new development occurring within the WSPD;
4. Strategies for controlling high-risk land use and development within North Brookfield’s watershed that supplies its public drinking water;
5. Take advantage of the “Right of First Refusal” By-Law to ensure that sensitive land within the recharge area can be purchased by the Town.
6. Inform farmers about hazardous materials storage. Encourage to remove high risk materials.
7. Inform residents and farmers about the danger of abandoned wells to water supplies.
8. Encourage residents to report increased beaver activity in watershed.
9. Encourage residents to report suspicious behavior around Horse Pond.

Action Plan

ACTION	WHO	WHEN
1. Implement a Water Supply Protection (overlay) District (WSPD) to protect the Horse Pond Reservoir and its watershed from future contamination events.	North Brookfield Water Department (NBWD), Planning Board (PB), Board of Health (BOH), Conservation Commission (CC), Select Board (SB)	2006
2. Adopt “Right of first refusal” bylaws in order to purchase all the Zone A lands. Encourage Conservation Restrictions if this is not feasible.	NBWD, PB, Conservation Commission (CC)	2006-2007
3. Acquire available funds for land purchase and all other implementation strategies using the Ware Source Water Protection Plan as water resource management tool required by the Commonwealth Capital funding process.	NBWD, PB, SB	When available.
4. To the extent feasible, remove all non-water supply activities from the Zone A the Horse Pond Reservoir.	NBWD	2006
5. Conduct outreach to owners with septic systems in the Horse Pond WSPD.	NBWD, Board of Health (BOH)	2006
6. Strongly encourage septic system maintenance for all residential and business owners in the Horse Pond WSPD.	NBWD, Board of Health (BOH)	2006
7. A spill-pad requirement (BOH regulation) for any new development occurring within the WSPD.	NBWD, Board of Health (BOH)	2006
8. Inform residents and farmers about hazardous materials storage. Encourage to remove high risk materials.	NBWD	2006
9. Inform residents and farmers about the danger of abandoned wells to water supplies.	NBWD	2006
10. Encourage residents to report increased beaver activity in watershed.	NBWD	2006
11. Encourage residents to report suspicious behavior around Horse Pond.	NBWD	2006

Description of Water Supply

Table 1: North Brookfield Water Department Water Sources

Source Name	DEP Source ID#	Source Type	Source Susceptibility	Source Location
Horse (North) Pond	2212000-02S	Surface Water	High	Oakham Road

Source: Massachusetts DEP SWAP Report, July 26, 2002

History of North Brookfield's Water Supply

The history of the establishment North Brookfield's water supply is entertainingly and well documented in the report titled *Construction and First Annual Report of the Board of Water Commissioners of North Brookfield, Massachusetts, 1894*. An Act to supply the Town of North Brookfield with "pure water" was established on June 6, 1889 under Chapter 424 of the Acts of Massachusetts of that same year. The state legislature required that the residents of North Brookfield accept the act by a 2/3 vote within 3 years of its passing.

The main consumer of water in the community at that time was the A.H. Batchellor Company, a boot and shoe factory. Most wells and surface supplies located within the Town were susceptible to becoming dry or depleted during the dry summer and fall months. North Brookfield had suffered several water crises during this period threatening its manufacturing base and fire prevention capabilities.

On October 21, 1890 the Act to create a permanent water supply for the Town was approved by a vote of Town residents with 248 in favor and 78 opposed to the Act. After a careful study of several water sheds in the area by Charles A. Allen, a well-known and respected city engineer from Worcester, Horse Pond (also known locally as North Pond) and Doane Pond were chosen to supply the Town with potable water. A town meeting was called on March 30, 1892 to vote on "taking the water of Horse and Doane Ponds" to establish a public water supply and to also secure a financial loan of \$100,000 from the Commonwealth "at the very low rate of 3 ½ percent." The warrant passed with 241 voting yes and 114 voting no.

Work began on the reservoir about July 1, 1892. The Italian laborers hired to construct the reservoirs and waterworks were paid about \$1.25 per day.

Glossary Protection Zones

Zone A: is the most critical for protection efforts. It is the area 400 feet from the edge of the reservoir and 200 feet from the edge of the tributaries (rivers and/or streams) draining into it.

Zone B: is the area one-half mile from the edge of the reservoir but does not go beyond the outer edge of the watershed.

Zone C: is the remaining area in the watershed not designated as Zones A or B.

The attached map shows Zone A and your watershed boundary.

Despite the low wages of the laborers and due to unforeseen difficulties in engineering the reservoir, the construction of the waterworks was not completed in the estimated time allotment of six months and North Brookfield found itself needing to borrow more money to complete the project. Several town residents opposed borrowing any more money to complete the waterworks and a “protracted battle ensued” after it became apparent that taxes would need to be increased to meet the present debt. North Brookfield eventually secured another \$50,000 to complete the project and the Horse and Doane Pond Reservoir was fully completed in 1896.

In 1938, a severe hurricane swept through New England and caused the functioning sand filtration system constructed in Doane Pond to be washed away. The sand filtration system was not rebuilt and Doane Pond became a back-up supply water source for the Town. The Commonwealth of Massachusetts required all water systems to quantify the safe yield their water sources in nineteen eighties. Water withdrawal permits were then approved for all public sources. The Town of North Brookfield did not include Doane Pond in its permitting documents and consequently it is not considered a permitted source water for the community. Doane Pond is still hooked into the system and could be used if a state emergency is declared.

Watershed of Horse Pond

Horse Pond consists of a waterbody that is 63 acres in size. The Zone A of the reservoir and its feeder streams are 390 acres in size. The watershed including Zone A, B, and C extends into the community of New Braintree directly to the north of the Horse Pond Reservoir.

The Town of North Brookfield lies within the Chicopee River Basin Watershed. The undersurface composition is that of igneous crystalline and meta-sedimentary geology created in the Paleozoic and Precambrian eras. The watershed of the Chicopee River Basin is generally composed of glacial till or bedrock with sand and gravel lined streambeds.

Protection Zones

Zone A

The Zone A for a surface water supply is the most sensitive and critical land contributing to a reservoirs recharge. It is extremely important to protect the Zone A from potential sources of contamination. MA DEP regulations encourage the Town or Water District to own the Zone A outright, or in the case where this is not possible, to control or secure conservation restrictions on the Zone A property in order to reduce the likelihood of a major contamination event.



Steve Jones, North Brookfield Water Superintendent and Bruce Bouck, MA DEP, delineate Horse Ponds Zone A.

The 2002 SWAP Report map completed for the North Brookfield Water Department did not completely delineate the Zone A major feeder stream of North Brook. Bruce Bouck, a hydrologist with the MA DEP came to North Brookfield on August 11, 2005 and re-delineated the Zone A for Horse Pond to include North Brook, Hunter Swamp and Hunter Brook in the Zone A. (See **Map 1: Horse Pond Zone A Streams.**)

The streams that supply Horse Pond are North Brook, the East and West Branches of Stoddard Brook, Hunter Brook and Swamp, and a small unnamed streamlet just to the north of East Stoddard Brook.

There are several roads that cross Horse Pond's Zone A including Stoddard Road, Rufus Putnam Road, Barnes Road in North Brookfield and Moore Road in New Braintree. These roads are lightly use residential roads.

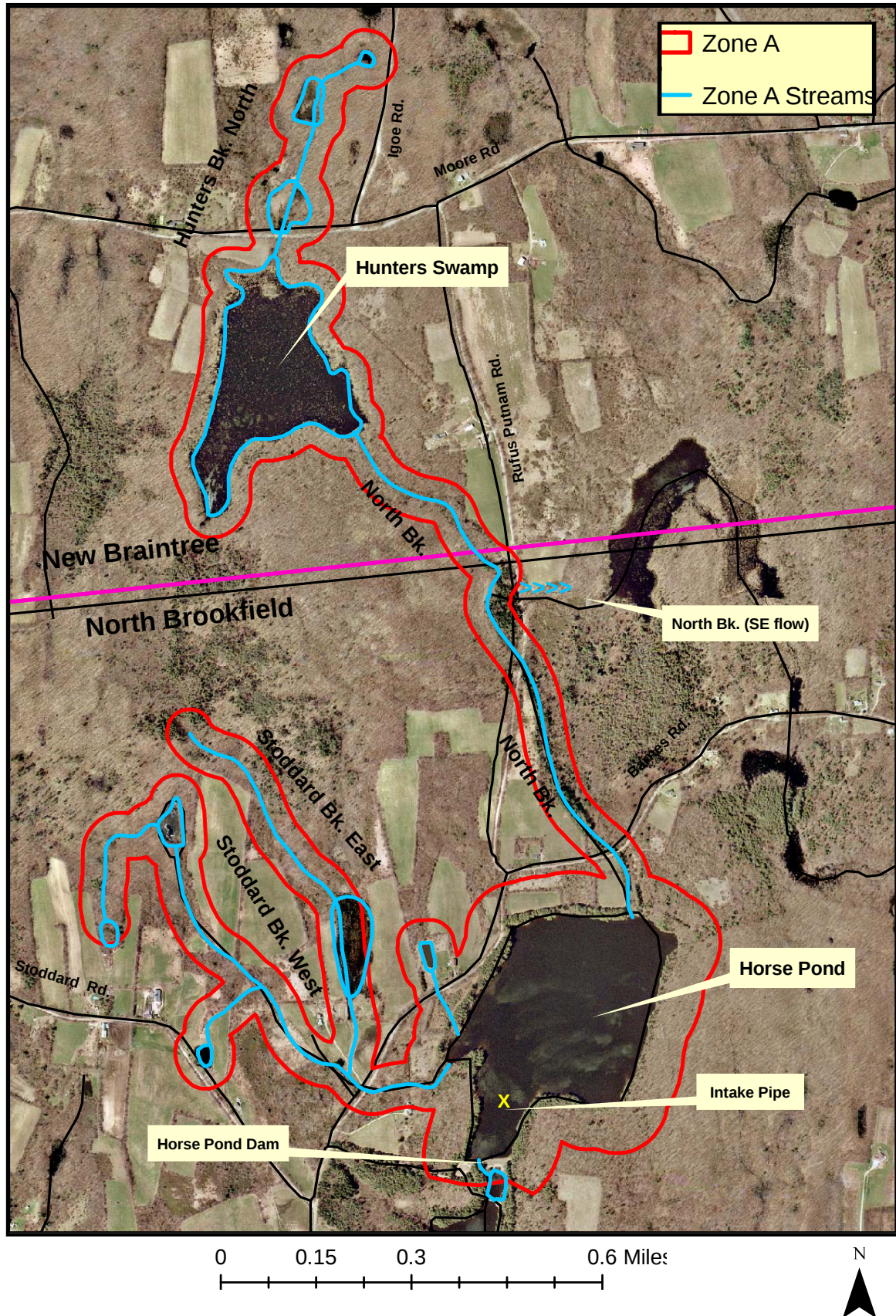


Hunter Swamp, New Braintree, MA. A major water source in the newly delineated Zone A for Horse Pond.

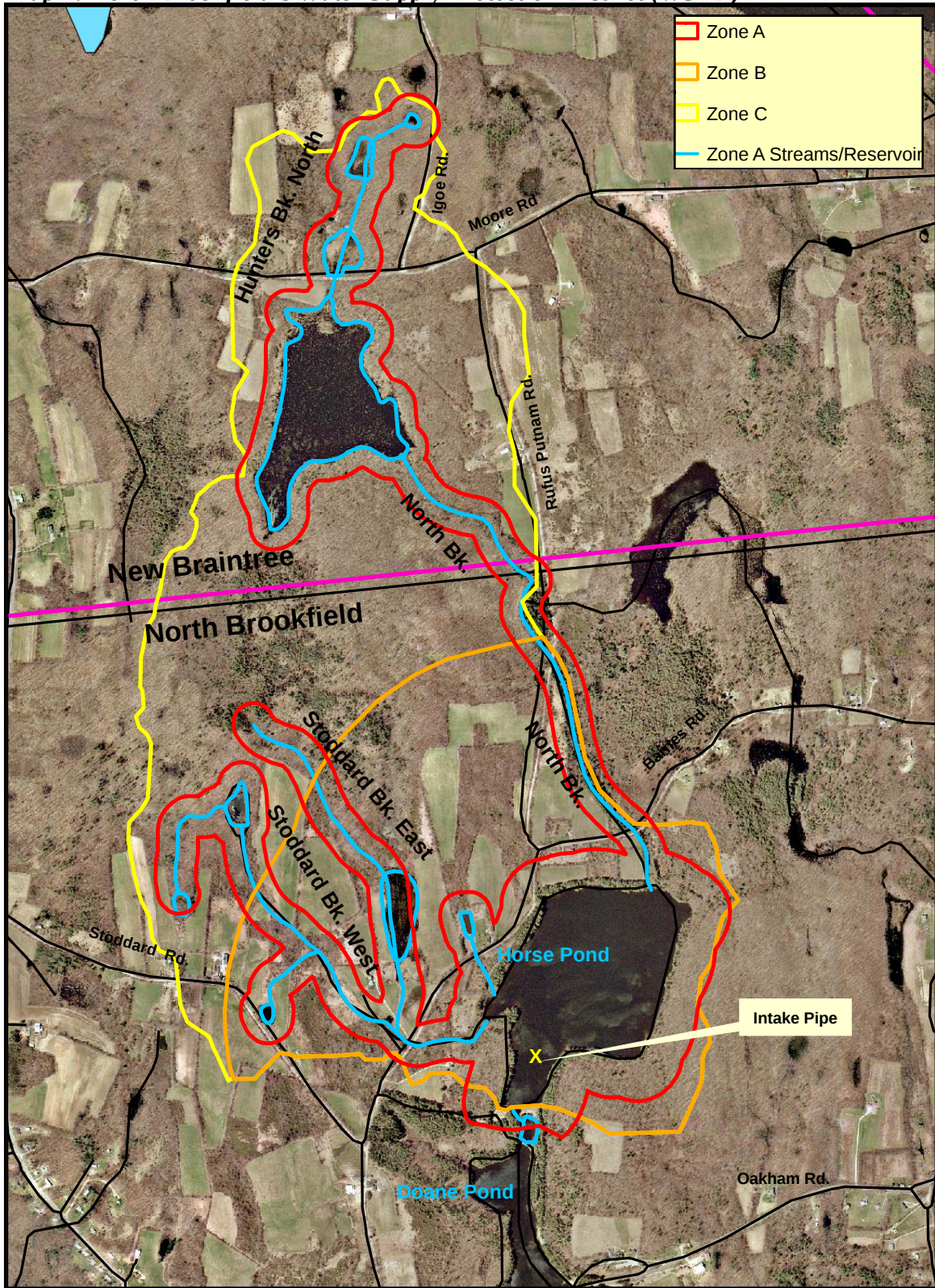
Water Supply Protection District

The Water Supply Protection District is the entire recharge area for the Horse Pond Reservoir. This includes the Zone A, B, and C of the watershed. **Map 2: North Brookfield's Water Supply Protection District (WSPD)** will be the official map to be included with the Water Supply Protection District Bylaw.

Map 1: Horse Pond Zone A Streams



Map 2: North Brookfield's Water Supply Protection District (WSPD)



Distribution and Supply

The Town of North Brookfield obtains its water supply from Horse Pond, also known locally as North Pond. Horse Pond is a surface water supply located east of Rufus Putnam Road and north of Doane Pond.

The variable screen intake for the raw water was installed by Inner Space Dredging Services, Inc. and is adjustable to between 10 and 15 feet below the surface. According to a bathymetry map of the reservoir, the intake is positioned over a depth of 22 feet. At its deepest point, the reservoir is 25 feet deep. (See **Map 1: Horse Pond Zone A Streams** for the position of the intake valve.)

Water flows by gravity from Horse Pond to the Oakham Road Water Pump Station (constructed in 1896). Potassium permanganate and powdered carbon are added to at the pump station to correct taste and odor problems when needed. Taste and odor problems usually occur in the spring due to spring runoff. Chlorine, in the form of sodium hypochlorite, can also be added at the pump station in case of disinfection is needed.



The dam between Horse Pond and Doane Pond. The Reservoir's intake valve is located just in front of the old pumphouse.



Interior of the Oakham Road Pump Station.

The water is pumped from the pump station up to the Water Treatment Plant on Bell Hill Road through a 12" transmission main that was installed in 2000. There are no service lines tapped into this water main ensuring all homes and businesses receive filtered water. At the treatment plant, the water is pumped through two mixed media filters to remove the turbidity and color. The filters consist of layers of crushed anthracite, silica sand, and garnet sand. Each layer is made up of a smaller sized material ensuring a consistent 97% removal rate. Polyaluminum chloride (PACl) and a non-ionic coagulant are added to the water prior to the filters to change the consistency of the particles in the water so they can be removed by the filters. The water is then disinfected with MIOS, a multi-oxidant that consists mainly of chlorine.

The water from Horse Pond has a low alkalinity and a pH that ranges from 6.2 – 7.0. This combination makes the water very "soft" and corrosive. Sodium Hydroxide is added as the water is leaving the treatment plant to raise the pH up to 7.2 -7.8 to make it less corrosive. Zinc orthophosphate is added at the same time to coat the pipes so metals are not leached from pipes and solder.

The water is pumped from the clearwell in the treatment plant to the 1.5 million gallon water storage tank located next to the treatment plant of Bell Road. The water flows by gravity from the storage tank to all the services in the town. The water distribution system consists of approximately 28 miles of water mains ranging from one inch to sixteen inches in diameter.

The Town has 1.5 million gallon water storage tank located next to the filtration plant off of Bell Road. The water distribution system consists of approximately 28 miles of water mains ranging in diameter from two to twelve inches.

Water System Improvements/Upcoming Projects

During 2004 the North Brookfield Water Department completed their three year plan. The goal of this plan was to replace the water main on Madbrook Road. This water main contributed to 80% of the water main breaks that occurred in 2001, 63% of the breaks in 2002 and 50% of the breaks in 2004. The Water Department replaced over 3,000 feet of water main with new ductile iron pipes. Two hydrants were added and two replaced on Madbrook Road during the course of this project.

The Water Department has two major projects planned for 2005:

- **Reduce unaccounted for water.** More water leaves the storage tank than is registered by the meters installed in the rate payer's residences and businesses. The Water Department hired Water and Waste Pipe Testing, Inc. to conduct a Sonic Water Leak Detection Survey, the goal being to locate existing leaks in the distribution system and fix them. Eight leaks were found and they accounted for a loss of 69,120 gallons per day (25,228,800 gallons per year). All leaks were repaired and less water is being pumped which will account for lower costs for the water department.

- **Clean the clearwell and the storage tank.** The North Brookfield filtration plant has been on-line for five years as of July 5, 2005. American water Works Association standard call for the cleaning of all tanks and clearwells every five years. The Water Department hired Underwater Solutions to clean the clearwell and storage tank during the summer of 2005.

Capacity/Yield

The water in storage at the Bell Road filtration plant is approximately a three day supply under current delivery conditions of 420,000 gallons per day (gpd). North Brookfield's safe yield DEP permitted water use is presently 500,000 gpd.

Water Quality

State and National Water Quality Standards

Horse Pond Reservoir is classified as an Outstanding Resource Water under the Massachusetts Surface Water Quality Standards of 1995. According to 314 CMR 4.00: "Certain waters shall be designated for protection under this provision in 314 CMR 4.06(3) including Public Water Supplies (314 CMR 4.06(1)(d)1.). These waters constitute an outstanding resource as determined by their outstanding socioeconomic, recreational, ecological and/or aesthetic values. The quality of these waters shall be protected and maintained." (March 1, 1995).

The National Water Quality Standards database rates the Horse Pond's water quality as "good" and fully support *all* of their designated uses. Horse Pond's designated uses are secondary contact recreation (no swimming or direct contact) and aesthetic value. (http://www.epa.gov/waters/305b/assessing_quality.html)

See Table 2 for the North Brookfield Water Department's 2004 Consumer Confidence Report.

Beaver Control

Concerns about Water Quality

The presence of beavers or muskrats near public water supply sources may pose a threat to the protection of public health. Both animals have commonly been identified as carriers of *Giardia Lamblia* and *Cryptosporidium*--pathogens identified within the Surface Water Treatment Rule and Enhanced Surface Water Treatment Rule respectively as posing an unacceptable risk to drinking water. Amendments to the State's trapping laws charge DEP with determining when a threat to human health and safety exists as a result of the presence of beavers and muskrats in and around public water supply sources and pump stations. A DEP determination that a threat exists may be used by an applicant to petition the local Board of Health for an emergency permit to eliminate the threat.

Beavers are often associated with concerns about the quality of drinking water. Water exiting a beaver pond is high in organic chemicals and may be a cause for concern if beaver ponds are located near public water supplies.

Giardiasis, an intestinal ailment caused by a *Giardia* parasite, is referred to by some as “beaver fever” because beaver are known to carry the organism. Although beavers do carry the *Giardia* parasite, so do many other animals that are found around lakes and reservoirs. Despite this, beavers will continue to be the primary focus for concern because they spend so much time swimming in our drinking water.

The North Brookfield Water Department monitors for the evidence of beaver year round and takes appropriate measures to ensure that the animal does not impact the water supply. Residents within the Water Supply Protection District are encouraged to contact the Water Department if they notice heightened beaver activity in the area.

See the **Resource Materials** section for the MA DEP Procedures for Beaver Control.



Residents are encouraged to report any new beaver activity within the Water Supply Protection District.

Table 2: North Brookfield Water Department Drinking Water Quality Report 2004

This is a list of substances that were found in North Brookfield's drinking water. We are required to run tests for over 100 substances, most are not detected. If you have any questions on the tests please feel free to call our office.

Lead & Copper	Date	90th	Action	MCLG # of Sites	# of Sites	Violation
	Collected	percentile	Level		above Action Level	
Lead	12/31/030.009	.015	0	10	1	NO
Copper	12/31/030.2	1.3	1.3	10	0	NO

Source of Contamination: Corrosion of household plumbing systems

Infants and young children are typically more vulnerable to lead in drinking water than the general population. It is possible that lead levels at your home may be higher than at other homes in the community as a result of materials used in your home's plumbing. If you are concerned about elevated lead levels in your home's water, you may wish to have your water tested and flush your tap for 30 seconds to 2 minutes before using tap water. Additional information is available from the Safe Drinking Water Hotline at 800.426.4791.

Turbidity: Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of water quality

Turbidity	TT	Lowest Monthly %	Highest Detected	Violation	Source of Contaminant:
		of samples	Daily Value	(Y/N)	
Daily Compliance	.3	—	.15	N	
Soil run off					
Monthly Compliance	at least 95%	100%	—	N	

Microbiological Contaminants:

Substance	Monitoring	Number of	Highest Level	MCL	MCLG	Compliance
Status	Period	Samples	Detected			
Total Coliform Bacteria	Monthly—2003	5 per month	0	1 per mo.	0 per mo.	100%

There were no violations for the year 2003.

Radioactive Contaminants:

Regulated Contaminant	Dates Collected	Result (pC/L)	MCL (pC/L)	Violation (Y?N)	Source of Contamination
Gross Alpha Activity	05/13/03	0.2 (+/-1.2)	15	N	Erosion of natural deposits
Radium—226	05/13/03	0.4 (+/-0.3)	5	N	
Radium —228	05/13/03	0.6 (+/-0.6)	5	N	

Volatile Organic Compounds:

Compound	Dates Collected	Result	MCL ug/L	MCLG ug/L	Source of Contamination
Chloroform	08/08/03	49	Unregulated	Unregulated	Disinfection
Bromodichloromethane	08/08/03	5.6	Unregulated	Unregulated	By product
Haloacetic Acids	08/13/02	2.2	60	—	Byproduct of (HAA5), (ppb) drinking water disinfection
Total Trihalomethanes (ppb)	8/13/02	74	80	—	Byproduct of (TTHMs), drinking water chlorination

Inorganic Contaminants:

Contaminant	Dates Collected	Result or Range	Detected	Average	SMCL	ORSG	Possible Source
Flouride	06/16/03	0.17	—	0.10			Naturally Occurring

Unregulated Contaminants: Unregulated contaminants are those for which EPA has not established drinking water standards. The purpose of unregulated contaminant monitoring is to assist EPA in determining their occurrence in drinking water and whether future regulation is warranted. Of the 38 contaminants we tested for only sodium was detected.

Contaminant	Dates Collected	Result or Range	Detected	Average	SMCL	ORSG	Possible Source
Sodium (ppm)	9/11/01	12 mg/l	12mg/l	—	20		Naturally occurring and a by-product of treatment
Sulfate (ppm)	06/10/03	7.1	250	—			Naturally Occurring

Land Use

The land uses within the Zone A, B and C recharge areas (protection areas) for the Horse Pond Reservoir consist of forests, water bodies and wetland, open land, as well as a mix of low density residential and agricultural land uses.

A list of significant threats to all the Water Supply Protection Areas in the Town of North Brookfield can be found in Table 3. See the next section **Potential Sources of Contamination in Zones A, B, and C** for a detailed assessment of the threats to North Brookfield's water supplies. This section will also recommend various procedures to help prevent any future contamination of the Town's public water supplies.

Table 3: Land Uses in the Water Supply Protection Areas

Land Uses	Quantity	Threat*	Potential Contaminant Sources
Agriculture			
Farm	Few	H	Above ground diesel storage tank: Abandoned well: Improper handling of manure (microbial contaminants): Pesticides, petroleum products (handling, storage)
Crop Land	Few	H	Pesticides, petroleum products from farm equipment
Livestock Operations (Non-commercial)	Few	M	Improper handling of manure, pesticides, petroleum products
Residential			
Fuel Oil Storage (at residences)	7	M/H	Fuel oil: spills, leaks or improper handling
Septic Systems/Cesspools	6	M/H	Hazardous chemicals: microbial contaminants, and improper disposal
Lawn Care/Gardening/Hay	Numerous	M	Pesticides: over-application or improper storage and disposal
Miscellaneous			
Aquatic Wildlife	Occasional	M/H	Microbial contaminants
Transportation Corridors/Utility Right-of-way	Numerous	M/H	Accidental leaks or spills of petroleum products and other hazardous materials, over application or improper handling of salt and pesticides

Source: North Brookfield Water Department SWAP Report, DEP, July 26, 2002

***THREAT RANKING** - Where there are two rankings, the first is for surface water, the second for groundwater sources. The rankings (high, moderate or low) represent the relative threat of each land use compared to other PSCs. The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.

Protected Land

The Town of North Brookfield owns and controls all of the Horse Pond Reservoir and Doane Pond. It also controls the Oakham Pump Station and the Bell Hill Filtration Plant parcels.

There are three parcels under the Agricultural Preservation Restriction Program (APR) that abut the Horse Ponds Zone A. Please see Table 4: Protected Land in North Brookfield's WSPD. These parcels are considered to be Permanently Protected.

In addition, there are 4 parcels in New Braintree that are under the Chapter 61A program. These parcels are considered to be protected only until the owner decides to sell the parcels. Under Massachusetts State Law the Town has the "Right of First Refusal" to purchase the properties if they come up for sale. It is recommended that the North Brookfield Water Department contact the Town of New Braintree to discuss the importance of these parcels to the quality of Horse Pond Reservoirs water supply. (See Map 3: Protected Land)

Table 4: Protected Land in North Brookfield's WSPD

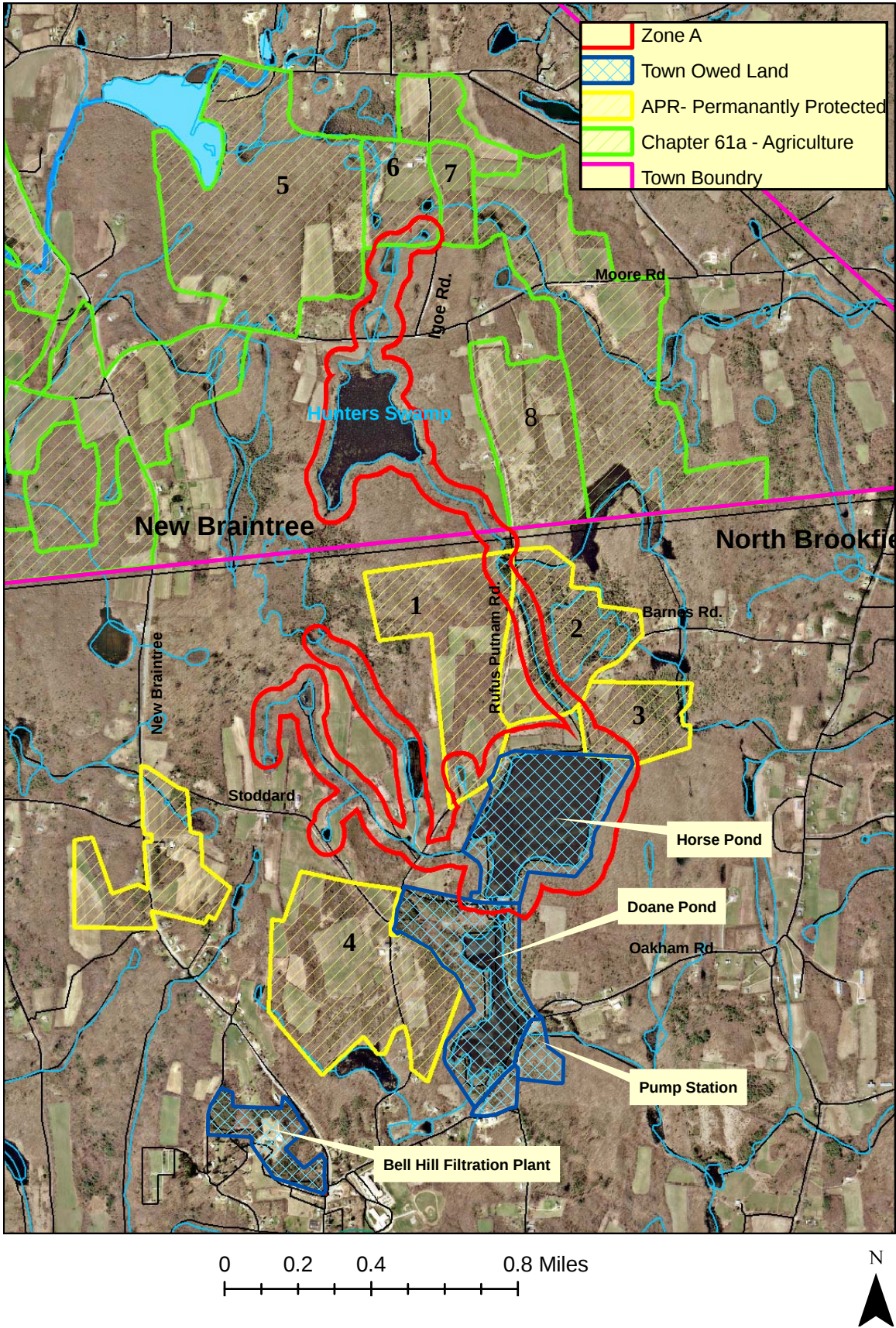
Parcel Owner	Program	Town	Acres	Location Number
Kalisa, Ann	APR	North Brookfield	106.12	1
John Mendala	APR	North Brookfield	64.8	2
John Mendala	APR	North Brookfield	41.25	3
Woodis	APR	North Brookfield	138.32	4
J&B Klem	Chapter 61A	New Braintree	184	5
J&B Klem	Chapter 61A	New Braintree	62	6
J&B Klem	Chapter 61A	New Braintree	15	7
GJ Morin	Chapter 61A	New Braintree	70	8

Priority Parcels

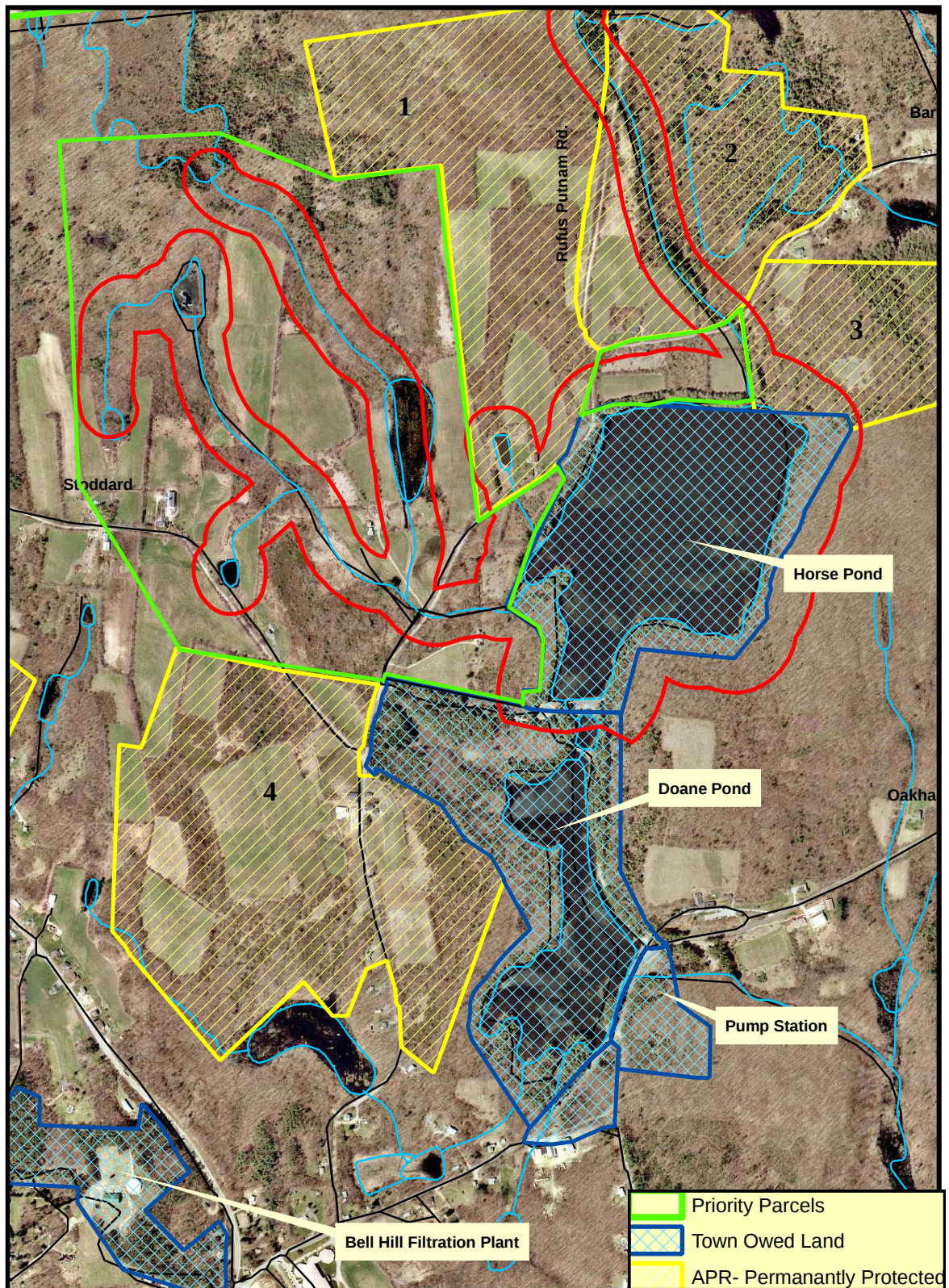
Priority parcels were discussed by the North Brookfield Source Water Protection Committee. These are parcels that are considered very important to the health and safety of the Horse Pond Reservoir. The first priority parcel for protection is the field belonging to the Mendala family just to the north of the reservoir. Though much of their land is in APR and permanently protected this field is considered to be especially important to the health of the reservoir. The field slopes downgradient to the northern shore of the reservoir and contains a potential abandoned well, several abandoned vehicles, and an active above ground fuel storage tank at the top of the slope. The Water Department will contact the owner of the parcel and encourage the owner to remove the potential sources of contamination. Also the owner will be encouraged to consider the Town as first buyer, if the land comes up for sale. Other options to protect the health of the reservoir are to put the property in a protection/conservation program.

Two other properties are considered important to the health and safety of the Horse Pond Reservoir. The Stomachas property and Long View Farm are also encouraged to put their properties in a conservation preservation program to help preserve the Horse Pond Reservoir. (See Map 4: Priority Parcels.)

Map 3: Protected Land



Map 4: Priority Parcels



Potential Sources of Contamination in the Water Supply Protection District

By their very nature, certain land uses are threatening to water supplies. There are some potential sources of contamination within the North Brookfield Water Department's Water Supply Protection District including:

1. **Potential contamination from land uses are:**
 - a. **Hazardous materials located near the Reservoir.**
 - b. **Residential/ Agricultural land uses**
 - c. **Septic systems**
2. **Aquatic Wildlife, especially beaver populations.**
3. **The need for a Water Supply Protection District and Source Protection By-laws to ensure the quality of North Brookfield's public drinking water supply.**

The following is a discussion of these potential sources of contamination and recommendations for their effective management. The primary recommendations were outlined by the DEP's 2002 SWAP Report for the North Brookfield Water Department. These recommendations are presented along with the protection strategies discussed by the North Brookfield Source Water Protection Committee.

Hazardous Materials Located near the Reservoir

There are hazardous materials located near North Brookfield's public water supply. These materials are considered to be Potential Sources of Contamination (PSOC's) for the water supply and are located at a residence directly to the north of Horse Pond. A survey of potential sources of contamination (PSOC) of the watershed found an above ground diesel storage tank and (what appears to be) an abandoned well directly across the road from the diesel storage tank. The tank does have fuel oil in it and the North Brookfield Water Department has contacted

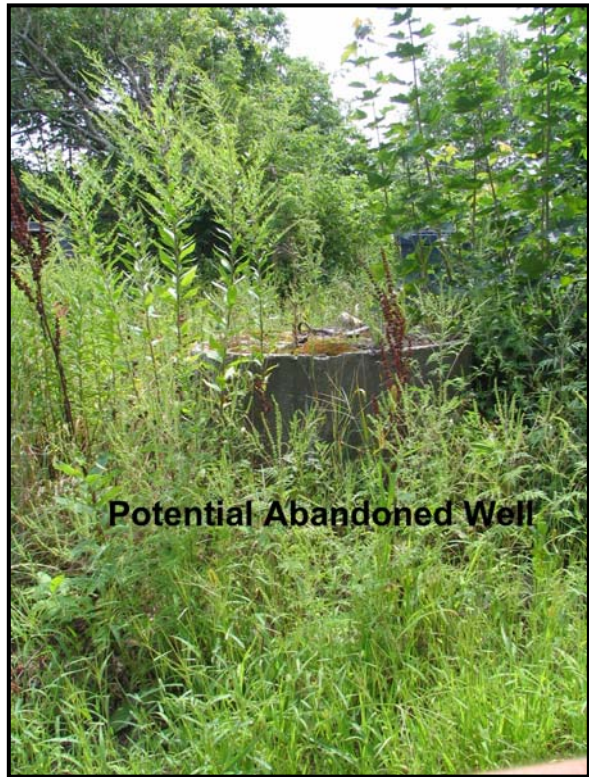


Above ground diesel fuel storage tank near Horse Pond. North Brookfield, MA.

the owner and requested that he remove the tank. The owner at the time refused, but has since passed away. The Water Department plans to contact the descendents or current parcel owner with a new request to remove or properly securing the fuel storage tank.

The combination of the above ground fuel storage tank and a potential abandoned well directly across the road from the tank poses a very serious threat to the public drinking water supply in North Brookfield. If the tank were to be damaged by winter plowing or simply fail due to a combination of age and the elements, the spilled fuel oil could potentially travel across the road to the abandoned well or follow the contour/slope of the land and enter Horse Pond directly to the south of the tank.

Abandoned wells are a serious threat to water supplies, as they are a direct conduit to ground water. It is highly recommended that the above ground diesel fuel tank be removed from the site and the potential abandoned well be capped according to MA DEP regulations.



Potential Abandoned Well near the Zone A of Horse Pond.

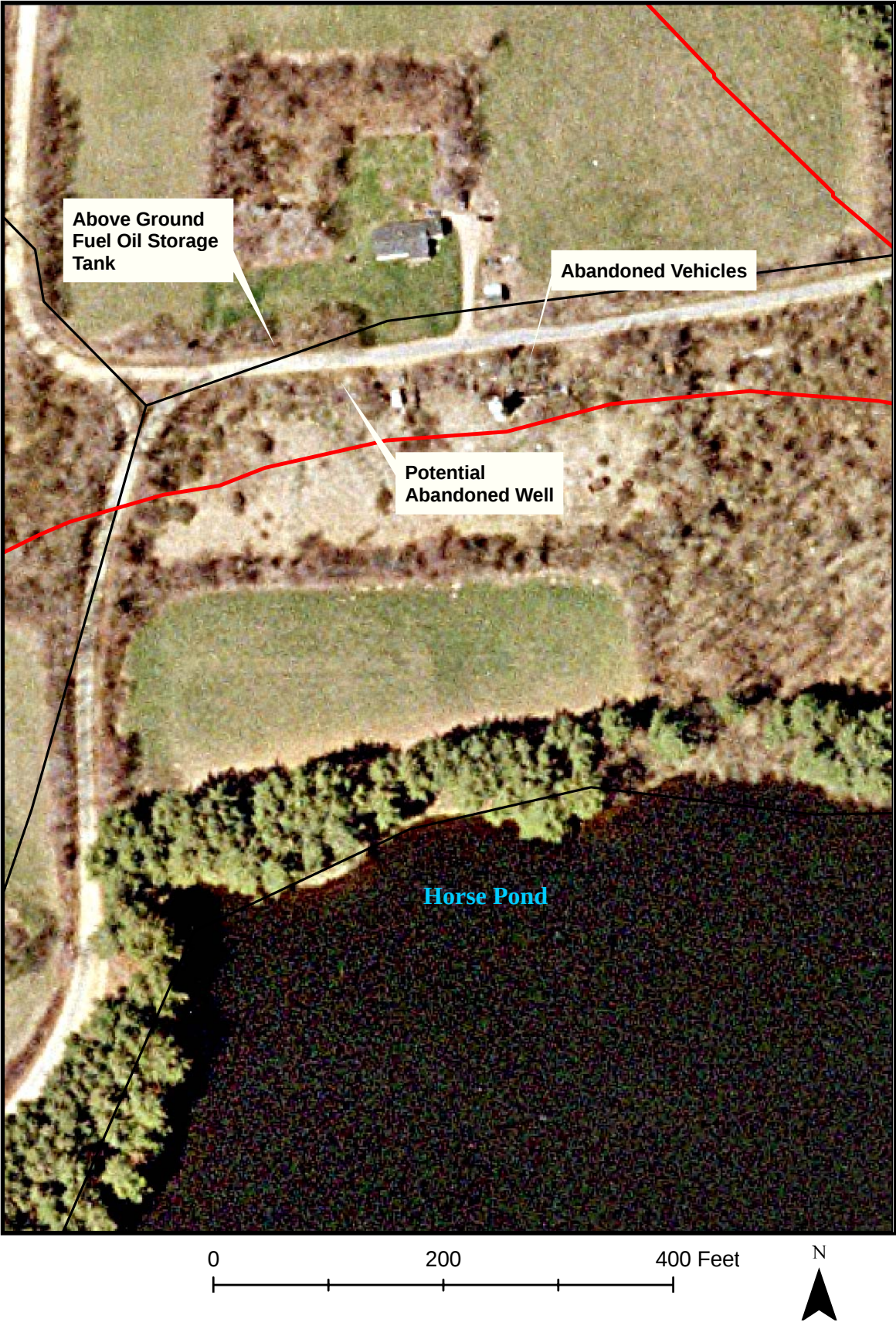


The field that runs down to Horse pond shoreline. The above ground storage tank and potential abandoned well are located at the top of the slope.

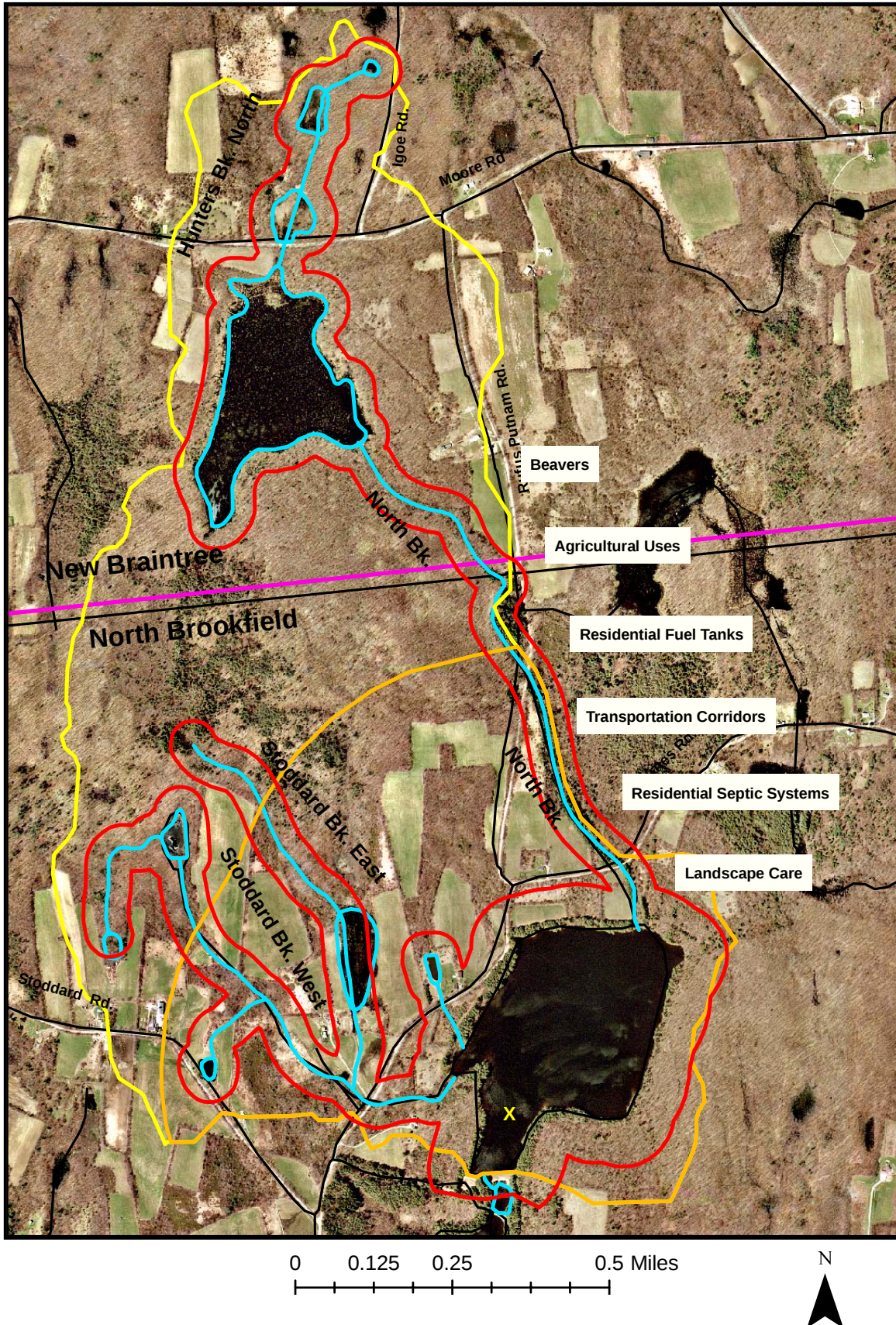
Recommendations:

- 1. Contact the owner of the parcel with the above ground storage tank and have it removed from the property. Remind owner that they are liable if the tank contaminates the public drinking water supply.**
- 2. Contact the owner of the parcel and survey if in fact there is an abandoned well. If so, determine if it has been capped properly. Cap according to MA DEP regulations if it has not been sealed.**
- 3. The Water Supply Protection District will specifically prohibit/regulate above ground fuel storage within the Water Supply Protection District (Zone A, B, and C).**
- 4. A survey of residents within the Water Supply Protection District is recommended to determine if there are any abandoned wells. All abandoned wells within the Water Supply Protection District (Zone A, B, and C) should be capped according to MA DEP regulations.**

Map 5: Hazardous Materials Located near Horse Pond Reservoir



Map 6: Other Potential Sources of Contamination in WSPD



Residential/ Agricultural Land Uses

Residential and agricultural land uses are known to pose threats to drinking water resources. Sources of residential/agricultural land use pollutants in North Brookfield's watershed for Horse Pond include household hazardous waste, septic systems, landscape care products, and home heating oil fuel storage.

Agriculture

Potential threats to the quality of water associated with agriculture include animal manure, pesticides, fertilizers, herbicides, and waste oil and fluids generated by farm equipment. Abandoned vehicles with hydraulic machinery, trucks, manure storage, fertilizer and pesticide application are potential contaminant threats to North Brookfield's drinking water supply.



Abandoned farm machinery and vehicles in the Water Supply Protection District of Horse Pond Reservoir.

The non-working farm to the North of Horse Pond has several abandoned vehicles on the property. It is recommended that the Town of North Brookfield enforce its abandoned vehicle bylaw within the Water Supply Protection District and require owners of unlicensed and unused vehicle to dispose of them properly.

This is imperative to ensuring that hazardous fluids such as oil, gas, and hydraulics are not leaching into the groundwater from abandoned machinery and vehicles.

It is also recommended to the extent possible, that all new permanent manure pits and new animal feed lots shall be designed to restrict infiltration, run-off or other movement of animal wastes or manure to the any aquifer or surface water. Although grazing cattle do not constitute a feed lot or manure pit, similar considerations should be given to the proximity of groundwater, surface water and the flow of runoff. In particular, private wells near large-scale farming activities may be especially vulnerable to contamination.

Encourage farmers and property managers to ensure that pesticides and fertilizers are being stored within a structure designed to prevent runoff. The USDA has various funding sources for government agencies, non-government organizations and agricultural facilities through programs such as those listed on the USDA web site:

<http://search.sc.egov.usda.gov/>.

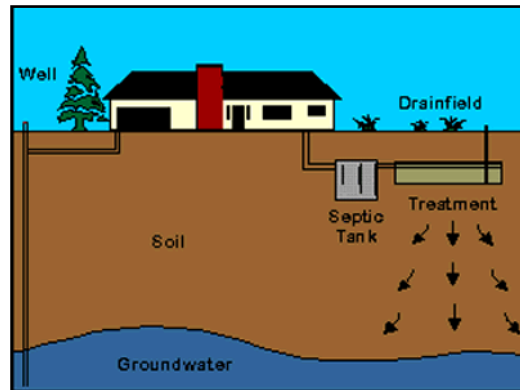
One program in particular, the Environmental Quality Incentives Program (EQIP) may be utilized in a variety of projects from DPW stormwater management to farm nutrient management designed to protect surface and groundwater. Review the fact sheet available online and call the local office of the NRCS for assistance:
<http://www.nrcs.usda.gov/programs/farmland/2002/pdf/EQIPFct.pdf>.

Recommendations:

- 1. Conduct outreach to area farmers to inform them of the relationship of their lands to the public and private drinking water supply and provide information about agricultural best management practices. Especially concentrating on manure, pesticide, herbicide, and fertilizer use and storage.**
- 2. Enforce the Town's abandoned vehicle by-law. Remove vehicles from property.**
- 3. Inform farmers about local waste oil and automotive fluid collection centers and services.**

Residential Septic Systems

The Town of North Brookfield's watershed has 7 residences with septic systems in the Horse Pond Water Supply Protection District. The Board of Health (BOH) records indicate that only one residence has pumped its septic system in the past few years. Though records of septic system maintenance are a recent requirement by many towns in the state of Massachusetts, it is important that the BOH and the Water Department conduct outreach to residential owners to remind them that the proper maintenance of their septic system is important to the health of the watershed and to prevent fecal coliform from entering the water supply.



Septic System Model

Commercial/Businesses Septic Systems

Commercial or business establishments that change in size or occupancy are a monitoring priority. Septic systems that are experiencing overuse on a regular basis are a concern. A regular monitoring program that tracks use and occupancy of commercial and business establishments is a recommended priority.

It is important to conduct septic system and stormwater management outreach towards businesses or commercial establishments nearest to the reservoir that provides North Brookfield's drinking water supply and that are within the Water Supply Protection District. Educational materials can help owners realize that the quality of groundwater drinking water supplies can be affected by the condition and capacity of a high use septic system.

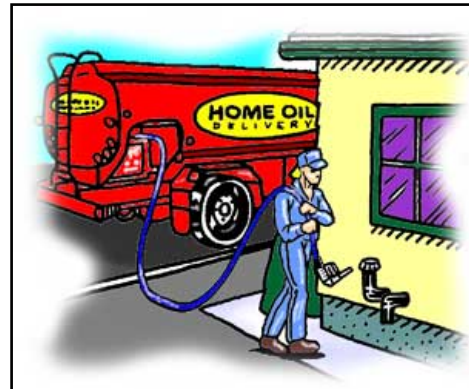
Recommendations:

- 1. Pass a Septic System Maintenance By-law to establish a mandatory septic system inspection and pumping program within sensitive recharge areas.**
- 2. Conduct educational outreach to parcel owners within the WSPD about the benefits of septic system maintenance.**
- 3. Monitor use and occupancy of businesses within the Water Supply Protection District's (WSPD) recharge area.**
- 4. Adopt regulations for the Water Supply Protection District that specifically prohibit septic system cleaners which contain toxic chemicals such as methylene chloride and 1-1-1 trichlorethane, and other hazardous wastes**

Residential Fuel Tanks

Many residents in North Brookfield use oil or gas to heat their homes. The tanks that hold household fuel in older homes may be old and subject to leakage. Fuel tanks should be inspected visually on an annual basis and properly seated on spill pads to prevent accidental spills or leaks from reaching groundwater through cracks or drains in the basement floor.

The North Brookfield Source Water Protection Committee will recommend that any new development in the Water Supply Protection District have spill pads installed under the fuel oil tanks. This will be achieved with a BOH regulation.

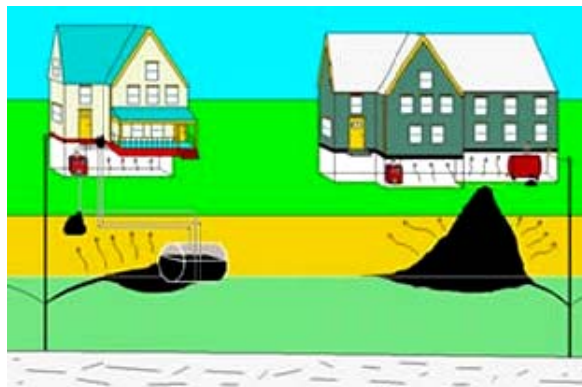


Inspect and maintain home fuel tanks.



Sample fuel oil tank spill pads (left).

A spreading plume of spilled fuel oil entering groundwater (right).

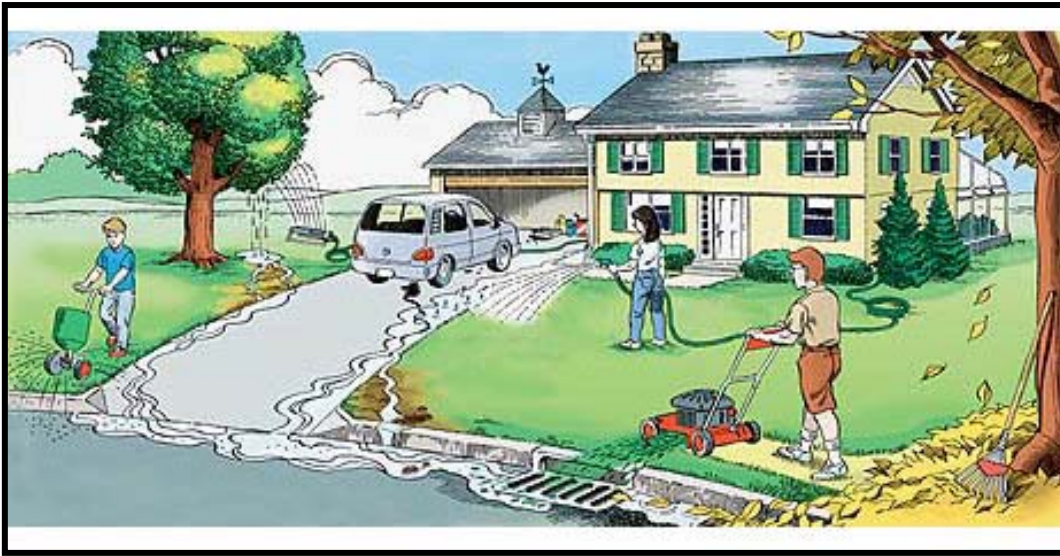


Recommendation:

- 1. Aging residential fuel tanks are a potential source of contamination near the Horse Pond Reservoir. An outreach program and survey aimed at residents within the WSPD recharge area are a priority to determine the age and leak potential of the tanks. Prevention of future oil spills is paramount. Encourage residents to install spill pads under their fuel oil tanks.**
- 2. Establish a BOH regulation that ensures that any new development within the WSPD will have a spill pad installed with the fuel oil tank.**

Landscape Care

Residential landscape care and maintenance typically involves the use of fertilizers, herbicides, and pesticides which pose a significant threat to drinking water and other water resources. Most of these products are highly soluble in water and are readily transported by stormwater to the nearest catchbasin, and ultimately to a wetland, pond, or stream. An outreach program to educate North Brookfield residents that fertilizers, pesticides, herbicides, lawn care chemicals or other similar materials shall be used with manufacture's label instructions and all other necessary precautions to minimize adverse impacts on surface and groundwater.



Everyday landscape practices can contaminate drinking water over time.

Recommendations:

- 1. Educate residents about appropriate landscape practices and products to prevent contamination of the aquifer.**
- 2. Work with local suppliers of landscape care products to ensure availability of organic fertilizers and pesticides, slow release nitrogen fertilizers, integrated pest management products, and other products appropriate for landscape care within a sensitive environmental area.**

Transportation Corridors

Roadways

There are a few residential roadways within the Water Supply Protection District recharge areas of Horse Pond. Catch basins transport stormwater from roadways and adjacent properties to the ground, streams, rivers or reservoir. As flowing stormwater travels, it picks up de-icing materials, petroleum chemicals and other debris on roads and contaminants from streets and lawns. Common potential contaminants in stormwater originate from automotive leaks, automobile maintenance and car washing, or accidental spills. Clandestine dumping is identified as a significant threat to the water supplies and roadways; remote roadways in particular, are frequent sites for illegal dumping of hazardous or other potentially harmful wastes.

Right-of-way maintenance can also be a source of contamination. Water suppliers should ensure that the utility managers are using accurate maps of source protection areas.

The following recommendations are important to address potential hazardous waste spills in transportation corridors such as roads. The recommendations also apply to railroad and power-line right-of-ways.

1. Be sure that Emergency Response (ER) teams for the highway, fire and police departments and the railway company are aware of the water supply protection areas. Provide them with an updated map, if necessary.
2. Work with the municipality or MA Highway to have catch basins inspected, maintained, and cleaned on a regular schedule. Regular street sweeping reduces the amount of potential contaminants in runoff.
3. Consider working with local watershed groups to institute a Storm Drain Stenciling Program, if there is not a local program. For more information on how to develop a storm drain stenciling program go to <http://www.earthwaterstencils.com>.
4. If storm drainage maps are available, review the maps with emergency response teams. If maps aren't yet available, work with town officials to investigate mapping options such as the upcoming NPDES Phase II Stormwater Rule requiring some communities to complete stormwater outfall mapping. For additional information, refer to the Stormwater Management Information at <http://www.state.ma.us/dep/brp/www/wwpubs.htm#storm>.
5. Review potential USDA funding for mitigation and prevention of runoff pollution through the Environmental Quality Incentives Program (EQIP). The USDA web site is www.ruraldev.usda.gov or call the local office in Hadley at 413-585-1000.
6. Review the fact sheet available on line and call the local office of the NRCS for assistance <http://www.nrcs.usda.gov/programs/farmbill/2002/pdf/EQIPFct.pdf>.
7. Visit DEP's Nonpoint Source Pollution web site for additional information and assistance at <http://www.state.ma.us/dep/brp/wm/nonpoint.htm>.

Recommendations:

1. **Regularly inspect the WSPD for illegal dumping and spills.**
2. **Continue working with local emergency response teams to ensure that any spills within the protection areas can be effectively contained.**
3. **Promote BMPs for stormwater management and pollution controls.**
4. **Partner with residents and local businesses in the WSPD area to ensure the proper storage, handling, and disposal of hazardous materials and to include the Water Department in their Emergency Response Plans.**

Protection and Management of the Wellhead Protection Area

Regulatory Strategies

Water Supply Protection District

North Brookfield is proposing to adopt a Water Supply Protection District (WSPD) Bylaw for the watershed that supplies Horse Pond with its water. A primary goal is to pass the Water Supply Protection District bylaw. Once the WSPD bylaw is in place North Brookfield's public drinking water supply will benefit from greater protection from contamination threats. See *Appendix A: Massachusetts Regulations for Surface Water Supply Protection*. The North Brookfield Water Supply Protection District will incorporate these documents in its WSPD bylaw.

Non-Regulatory Strategies

Septic System Inspection and Outreach Program

Improperly functioning or failing septic systems can contribute viruses, bacteria, nitrates, and chemical compounds to groundwater. Proper maintenance will prevent costly problems in the future and prevent contamination of nearby drinking water supplies as well as other water resources such as rivers, ponds, and wetlands.

Some communities have implemented Septic System Inspection and Outreach Programs through their Water Department or Board of Health to reduce the threat an improperly functioning septic system poses to groundwater. Such a program involves voluntary participation by the landowner. To encourage participation, it is important to establish at the outset that the goal of the program is not to penalize or fine property owners, but to work cooperatively to ensure the protection of our water supply.

Recommendations:

- 1. Enlist voluntary homeowner participation in septic system inspection program.**
- 2. Assist homeowners in getting financial assistance for failing septic systems.**
- 3. Conduct public education and outreach about septic system care and maintenance**

How to Establish a Septic System Inspection and Outreach Program:

1. Inspect Septic Systems Regularly

The Water Department, or Board of Health, generates a list of all properties and landowners within the WSPD that have septic systems. Landowners are contacted by mail or telephone to request their voluntary participation in a quarterly (or some other regular interval) inspection program. Upon the first inspection, the inspector meets with the property owner to map the location of the septic system for future inspections. A visual inspection for odor, seepage or lush green growth is performed. If any of the symptoms of an improperly functioning septic system are present, the inspector recommends that the homeowner consult a licensed wastewater disposal engineer for a more in depth evaluation of the problem.

Because the program is purely voluntary, some property owners may opt not to participate fearing financial repercussions. The town should contact local septic system pumping contractors to request that they notify the Board of Health if any of the above described symptoms are observed so that the town can get involved.

2. Town Assists in Procuring Financial Assistance for Homeowner Septic System Repair

The town provides assistance to property owners in contacting appropriate sources of financial assistance for septic system repair. The Commonwealth of Massachusetts has developed programs to assist homeowners with wastewater management problems.

The following financial assistance information was provided by the Department of Environmental Protection's Bureau of Resource Protection.

A. Massachusetts Housing Finance Agency (MHFA) Homeowner Septic Repair Program

Homeowners of low and moderate income are eligible. Approval is dependent on good credit and stable income. While income guidelines are geographically indexed, households of one or two with annual income of up to \$46,000 and households of three or more with annual income of up to \$57,000 generally are eligible. Homeowner Septic Repair Loans are available to eligible homeowners as low interest rates of 0%, 3%, and 5%, depending on income, for loans ranging in size from \$1,000 to a maximum of \$25,000.

More information about this financial assistance can be obtained from MFHA at One Beacon Street, Boston, MA 02108, (617) 854-1020.

B. Tax Credit

The Septic Tax Credit is a credit equal to 40% of the actual costs incurred in the repair or replacement of a failed septic system. The expenses are the lesser of the taxpayer's actual costs paid to repair or replace the system, or \$15,000. The maximum credit amount that can be claimed in any tax year is \$1,500. Any excess credit amount may be used in the five tax years following the year in which the credit was initially claimed. The total amount of credit that may be claimed by the owner for a residential property is \$6,000. Schedule SC (Septic Credit) Forms are available from the Department of Revenue. This information is based on 2001 Department of Revenue Septic Credit Program.

3. Conduct Public Education and Outreach

Some objectives of the outreach are to inform septic system owners of how a septic system works, how to care for it, what not to put in it, and the connection between septic systems and groundwater. If these objectives are achieved, the Town's drinking water supply is much less likely to be contaminated by wastewater.

Public education and outreach about septic systems should be conducted at regular intervals throughout the year. Once the list of all septic system owners within the North Brookfield Water Supply Protection District is generated, a mailing containing information about the Town's voluntary septic system program and an educational flier published by the National Small Flows Clearinghouse (NSFC) entitled *Groundwater Protection and Your Septic System* can be sent to homeowners.

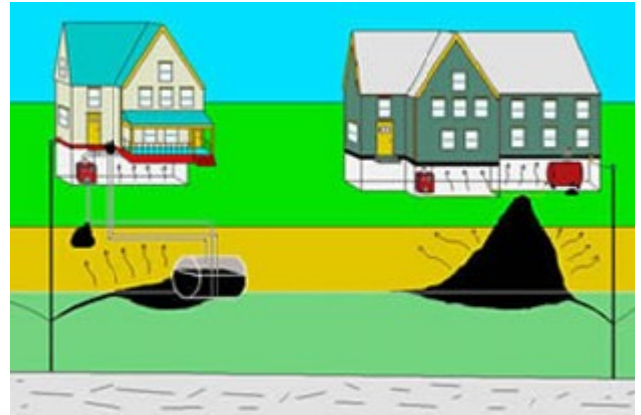
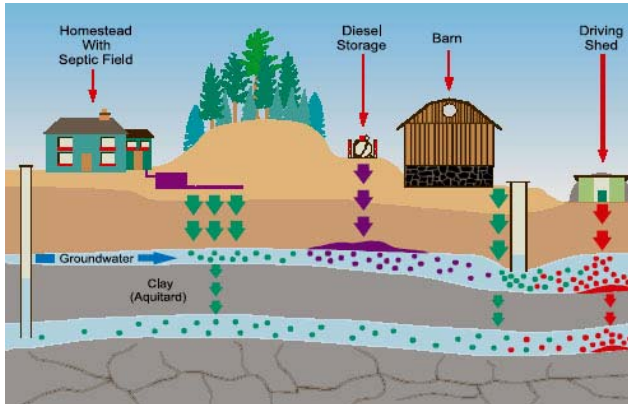
This information should also be made available at public buildings and storefronts around town. Periodically change the literature available in public locations and/or insert new fliers with the water bills. The NSFC also produces a video called *Your Septic System: A Reference Guide for Homeowners* that can be shown on local cable access television. The video can also be made available at the public library. Literature should also be provided to homeowners during inspections.

Table 5: Septic System Outreach Materials

Source	Materials
National Small Flows Clearinghouse West Virginia University P.O.Box 6064 Morgantown, WV 26506-6064 (800) 624-8301 (304) 293-4191 www.nsfc.wvu.edu	Groundwater Protection and Your Septic System Item #WWBRPE21 pamphlets The Care and Feeding of Your Septic System Item #WWBRPE18 pamphlets Your Septic System: A Reference Guide to Homeowners Pamphlet and Video

Hazardous Materials and Floor Drain Inspection Program

Some businesses and municipal operations that use hazardous materials, produce hazardous waste products, and/or store large quantities of hazardous materials. It is also very likely that many homeowners fall within one of these categories as well. Home heating oil is a classified hazardous waste. Floor drains can act as a direct conduit to the aquifer for hazardous waste that is improperly stored or disposed of. Abandoned wells, often left boarded over but not sealed, can also act as a conduit to the aquifer.



Common contamination sources of public and private water supplies.

Automotive Waste Oil

The proper disposal of automotive waste oil generated by homeowners and small businesses within the WSPD and for private wells is very important. Used motor oil should always be recycled - never thrown in the trash, dumped on the ground, or poured into the sewer or down the drain. Used oil contains heavy metals, which can contaminate water supplies and harm the environment. It doesn't take much to do a lot of damage. One gallon of used oil can pollute one million gallons of drinking water. One pint can produce an oil slick the size of a football field.



Under Massachusetts law, automotive stores must accept containers of used motor oil that they sell to individual customers if accompanied by a receipt. Sears Automotive, some Mobil and Exxon stations, and Valvoline Instant Oil Change will accept used oil without a receipt. The DEP Used Oil Hotline can provide the location of the nearest drop off location at (617) 556-1022 or visit the car oil recycling website at www.recycleoil.org

Recommendation:

1. Inform public about appropriate methods and locations for disposal of automotive waste oil with the use of a flier and displays around town.
2. Educate residents and business owners about potential contamination issues associated with floor drains.

Sample Homeowner Survey

As part of the Town of North Brookfield's ongoing efforts to protect our public and private water supply and ensure safe, clean drinking water for our community, we are conducting a survey about common structures that you may or may not have on your property. This information will help us better understand what direction our water supply protection and planning efforts should take. If you have questions please call the North Brookfield Water Department at **(508) 867-0207**. Please return in the enclosed self-addressed and stamped envelope by June 1, 2006.

1.) Do you use oil to heat your home? Yes _____ No _____

If you answered yes, please include the following information about your heating oil storage tank: age or date installed _____ size of tank _____

model or manufacturer _____ material made of _____

location _____

condition new _____ good _____ fair _____ poor _____

Would you be interested in financial assistance to replace or update your tank?

Yes _____ No _____

2.) Do you have any wells on your property that are no longer in use? Yes _____ No _____

Have they been sealed or capped? Yes _____ No _____

With what materials?

3.) Do you have floor drains in your basement, garage, barn, or other building on your property?

Yes _____ No _____

If yes, please explain the location, design of the drain, and to where the drain empties.

Once the survey is complete, the Town should have a better understanding of whether home heating oil storage, floor drains, and abandoned wells pose a tangible threat to any of North Brookfield's drinking water. Based on the results, the Town will seek an appropriate course of action to reduce or eliminate the threat to the drinking water. Possible actions include, capping abandoned wells, replacing deteriorating heating oil storage tanks, and sealing illegal floor drains.

Recommendations:

1. Survey landowners about home heating oil storage, abandoned wells, and residential floor drains.
2. Based on results of survey, contact landowners about removing threats to the aquifer.

Emergency Response/ Contingency Planning

Current Plans

The North Brookfield Water Department has an Emergency Spill Response Plan. The Emergency Response Plan, required by the MA DEP prepares the Town of North Brookfield for immediate action in the case of a hazardous spill that could potentially contaminate or harm the public drinking water supply. Immediate response and concerted efforts to contain the spill by the North Brookfield Water, Fire and Police Departments, and the Department of Environmental Protections Spill Response Team, is the objective of the Emergency Spill Response Plan.

Alternative Supply/ Contingency Planning Evaluation

In the event of a water supply emergency, alternative supplies need to be established in order to provide the community with adequate water. The alternative supply sources that were evaluated include emergency interconnections, bottled water and civil defense water provisions.

Potential emergencies include mechanical failure of the distribution system or contamination at the water supply source. The Town has 1.5 million gallon water storage tank, which in the case of an emergency could supply customers for approximately 3 days under current delivery conditions. In the event of an emergency the Water Department will use media contacts to notify the public that water conservation is a priority and notify the water users that the Water Restriction Bylaw is in full effect.

The North Brookfield Water Department has an agreement and interconnection with the Town of East Brookfield, a neighboring water system, to supply water in the case of an emergency. However, if the emergency were extended, additional measures would be required to meet system demands. These measures include either purchasing bottled water and distributing to consumers accordingly or contacting the civil defense for the utilization of water wagons. Poland Springs, a local water supplier will be contacted for additional resources if needed.

The Emergency Management Director, Stephan Jones, would also contact the Massachusetts Emergency Management Authority (MEMA) if necessary. MEMA can notify the National Guard or give names of other bulk water suppliers. The National Guard has potable water bladder units that could be transported to the site.

The North Brookfield Water Department could also petition the MA DEP for an Emergency Declaration allowing the use of Doane Pond as a water supply.

Drought and Emergency Procedures/Planning

The Town of North Brookfield has a Water Use Restrictions Bylaw in the case of severe drought.

Land Protection Strategies

Residential and commercial developments, with all of its associated land uses, are the biggest threats to a drinking water supply. Their contamination is slow and insidious, often overlooked until a crisis is thrust upon the community, usually requiring a lot of money that no one has to fix. Residents of North Brookfield value the areas of their town that are rural. Rural landscape provides many benefits including wildlife habitat, aquifer/surface water recharge, farmland, and aesthetic beauty. It is critically important that town officials discuss alternatives to development with landowners to preserve open space in North Brookfield.

CHAPTER 61 “Chapter Lands”

This is a tax relief program that is designed to give favorable treatment to land owners that are willing to manage their land for:

- Timber products: Chapter 61, lands taxed at only 5% of fair market value.
- Agriculture or Horticulture: Chapter 61A, for working or family farms. Tax rate determined by the Farmland Valuation Advisory Committee.
- Natural Resources and Recreation: Chapter 61B, lands taxed at 25% of fair market value.

There is a minimum acreage requirement for each program. Land must be registered each year at the Assessors office and you must agree to leave the land in the program for a certain number of years.

There are financial penalties for sudden withdrawal from the program, but no penalties for allowing this tax status to expire. Chapter lands are not permanently protected.

AGRICULTURAL PRESERVATION RESTRICTION (APR)

This is a state funded program used to protect the states prime and important agricultural lands.

It provides permanent protection to working farms and orchards. It is a voluntary program, but the application process is slow and requires a patient land owner. The state pays the difference between the fair market value and the agricultural value of the land. The landowner agrees to a permanent deed restriction that protects the land from uses that would have a negative impact on it's use for agricultural purposes.

LAND PRESERVATION AGREEMENT

Also known as a Conservation Easement (CE, CR)

Although a little complex, **this is a powerful tool for all land owners** who wish to permanently protect all or part of their property. The terms of the agreement are determined by the landowner.

- It is a voluntary agreement in which a landowner limits uses (e.g. development) while retaining private ownership.
- Landowners use land preservation agreements to protect a property's natural and scenic features.
- Significant federal income and estate tax benefits as well as local real estate tax benefits can result from granting a land preservation agreement.

- A qualified appraisal must be done on the land to determine the amount of the deduction and the value of the agreement.
- Land owners can sell or give away the property after the agreement has been placed on the land.
- All future owners are bound by the terms of the agreement.
- Every agreement is unique, tailored to a particular land owner's goals and land.
- Land preservation agreements can be donated or sold to a non-profit entity such as a local land trust, conservation commission, or a federally recognized charity under IRS Code Section 501(c)(3).
- The recipient who accepts the agreement is legally bound by to enforce the terms of the restriction in perpetuity. In order for the owner to qualify for a tax deduction, the agreement must be perpetual.
- The public does not automatically have access to property protected by a land preservation agreement.
- The agreement holder monitors the property, generally once a year, to assure that the terms are being upheld. Some agreement holders may request an endowment be made to ensure long-term monitoring and enforcement of the restriction.
- To accomplish the donation or sale of a land preservation agreement, the landowner needs to work closely with the organization or government entity that will hold the agreement. That may include:
 - Consulting with legal and tax counsel
 - Tour of the property to evaluate and discuss the easement
 - Approval from the holder's Board of Directors
 - Preparing baseline documentation of the property for monitoring purposes
 - Title search
 - Obtaining a mortgage subordination from the lender if there is an existing lien
 - Negotiating the agreement and drafting the document
 - Obtaining a qualified appraisal
 - Signing and recording the final restriction and legal documents

Community Preservation Act

Community Preservation Act (M.G.L. Ch. 44B) provides Massachusetts cities and towns with a mechanism to protect open space, preserve historic buildings and sites, and create affordable housing. Towns may establish by local referendum a property tax surcharge of up to 3% to help fund these activities. Funds raised locally through the Community Preservation Act (CPA) will be supplemented by state matching funds. At least 10% of CPA funds must be spent on each of the following three activities: open space protection, historic preservation and affordable housing. The remaining 70% may be used for any one or more of these three purposes in accordance with the community's priorities.

North Brookfield should consider adopting the CPA to provide a steady source of income for open space protection, historic preservation and affordable housing activities. There are two methods available to North Brookfield to adopt the CPA. First, Town Meeting can vote to place the question of adopting the CPA before the voters as a referendum. Second, if Town Meeting does not adopt the CPA language at least 90 days before a regular town election or 120 days before a state election, then a petition signed by 5% of the registered voters in North Brookfield can be filed to place the question on the ballot.

The CPA will be adopted if the referendum passes by a majority vote. If North Brookfield adopts the CPA, the Town may choose to exempt \$100,000 of value for each taxable parcel and/or the full value of residential property owned by low income persons or low and moderate income senior citizens. In addition, the CPA does not affect any other real estate tax exemptions or abatements authorized under M.G.L. Ch. 59 or any other state law.

Upon adoption of the CPA, a community must appoint a Community Preservation Committee consisting of between five and nine members, including one member from each of the following: Conservation Commission, Historic Commission, Planning Board, Board of Park Commissioners, and Housing Authority.

The Committee makes recommendations to Town Meeting for the use of money in the local Community Preservation Fund. In addition, communities may issue bonds in anticipation of Community Preservation Fund receipts. These funds may be used for:

- **Open Space:** Community Preservation funds may be used to purchase land, easements or restrictions to protect existing and future water supply areas, agricultural and forest land, coastal lands, frontage to inland water bodies, wildlife habitat, nature preserves, and scenic vistas. If the community is only spending 10% of its funds on open space, the open space cannot be purchased for recreational use.
- **Recreation:** Land can also be purchased for active and passive recreational uses including land for community gardens, trails, non-commercial youth and adult sports, and parks, playgrounds or athletic fields.
- **Historic Preservation:** Funds may be used to purchase, restore and rehabilitate historic structures and landscapes that have been determined by the local Historical Commission to be significant in the history, archeology, architecture or culture of a city or town, or that are listed or eligible for listing on the State Register of Historic Places.

- **Affordable Housing:** Funds may be used to create and preserve housing for low and moderate income individuals and families, including low and moderate income senior housing. The Act requires the Committee to recommend, wherever possible, the adaptive reuse of existing buildings or construction of new buildings on previously developed sites.

Recommendations:

- 1. Conduct outreach to landowners about options for protecting open space within the WSPD.**
- 2. Town may take proactive steps to acquire land through the adoption of the Community Preservation Act.**
- 3. Acquire available funds for land purchase through the Commonwealth Capital funding process.**

A. Outright Acquisition

Outright acquisition provides the highest amount of protection for a piece of property. In addition, the group that purchases the property is able to control how it is used or managed. However, outright acquisition is usually the most expensive technique, as well. Funding mechanisms for outright acquisition include:

1. Town funding from a one-time appropriation, an annual contribution to a land protection fund, or the Community Preservation Act (see below).
2. Grant funding: for example, the Town recently used the state's Self-Help program administered through the Division of Conservation Services to help purchase two open space parcels.
3. Private conservation organization such as the Trustees of Reservations, the Opacum Land Trust, or the Norcross Foundation.
4. Donations or "bargain sales" from landowners seeking to conserve their land or gain income tax benefits.

B. Restrictions and Easements

Restrictions and easements limit the future use of land by restricting or prohibiting development. However, the land continues to be owned and operated by a private owner. If the restriction on development is in perpetuity, this mechanism provides as much protection for land as outright acquisition. In addition, it can cost less than outright acquisition and offers more flexibility to meet the needs of the landowner. For example, a restriction could be negotiated that allows a landowner to continue to farm or log the land, live on the land, or even build another house on the property.

Funding can come from the same mechanisms as for outright acquisition. In addition, grant funding is available from various state programs including the Agricultural Preservation Restriction program, which purchases easements from farmers to restrict future development (see below).

C. Temporary Protections

The state's Chapter 61, 61A, and 61B programs offer tax incentives for landowners to keep their property in active forestry, agricultural, and recreation use, respectively. However, these programs offer no long-term protection for land. See Section 4.1.2 for additional discussion of these programs.

D. Other Tools

Other land conservation tools take advantage of the economics of land development to protect open space as part of new development projects (usually residential). As long as the open space is protected with a suitable conservation restriction, this form of open space protection is as good as outright acquisition. These tools include:

1. **Open Space Communities:** See Section 8.3.3 for recommendations on improving Monson's Open Space Communities Bylaw so that developers will be more inclined to use it.
2. **Other Zoning Tools:** Estate Lot provisions (Section 8.3.5), and a Density of Development Bylaw (Section 8.3.3) are other zoning policies to increase the amount of open space in new developments, even if the overall development density remains the same.
3. **Limited Development:** In a limited development project, a conservation group (usually a nonprofit but sometimes a government body) first purchases a piece of land they would like to conserve as open space. Then, a portion of the site that is least important for conservation purposes is carved off and sold as high-end real estate such as a "country estate." The proceeds from this sale, which can sometimes equal 50% of the purchase price or more, are used to repay money borrowed for the land purchase or used to fund future conservation efforts.

Table 6: Strategies for Protecting Open Space

	CHAPTER 61	CHAPTER 61A	CHAPTER 61B
<i>PURPOSE</i>	Tax incentive for long-term management of woodland for wood production.	Tax incentive for active agricultural or horticultural uses.	Tax incentive for land in natural, wild, open or landscaped use; or an approved recreational use.
<i>ELIGIBILITY</i>	Minimum of 10 contiguous acres. A continuous commitment to improving the 'quality and quantity' of timber crops on woodlands. Forest management plan approved by state forester.	Minimum of 5 acres "actively devoted" to agricultural and/or horticultural uses at least 2 years prior to classification. Minimum annual gross sales of \$500. Additional contiguous land may also qualify.	Minimum of 5 acres in open space or recreational uses.
<i>TAX ASSESSMENT</i>	Assessed at 5% fair market value, at commercial rate, plus 8% stumpage value of products harvested in prior year.	Assessed at agricultural/horticultural "use" value, at commercial rate. Values assigned by Board of Assessors and may change annually.	Assessed at maximum value of 25% fair market value, at commercial rate.
<i>HOW TO ENROLL</i>	Application package filed with State Forester by June 30. Approved application package submitted to Board of Assessors by August 31. Application good for 10 years.	Annual application filed with Board of Assessors by October 1.	
<i>ENROLLMENT PERIOD</i>	Enrolled until withdrawn from classification and withdrawal penalty paid. Forest management plan updated every 10 years.	Enrolled until sold for or converted to another use, and either conveyance tax or roll-back tax paid. Annual filing with Board of Assessors. Forest management plan updated every 10 years on acres classified as "productive woodlands".	Enrolled until sold for or converted to another use, and either conveyance tax or roll-back tax paid. Annual filing with Board of Assessors.
<i>WITHDRAWAL OR CHANGE OF USE PENALTY</i>	Penalty payment depends on number of years in the program, and is difference between taxes paid under Chapter 61 and what would have been paid if not classified, plus interest. Annual forest products tax credit may or may not be applied to withdrawal penalty,	Conveyance or roll-back tax imposed, but not both. Conveyance tax rate applied when land sold for a non-qualifying use, decreasing from 10% to 1% over first 10 years of ownership. Roll-back tax is difference between taxes paid under Chapter 61A and what would have been paid if not classified, with no interest. Roll-back tax imposed for 5 prior years.	Conveyance or roll-back tax imposed, but not both. Conveyance tax rate applied when land sold for a non-qualifying use, and is 10% for first five years of ownership and 5% for second 5 years. Roll-back tax is difference between taxes paid under Chapter 61B and what would have been paid if not classified, plus interest. Roll-back tax imposed for 10 prior years.
<i>TOWN'S RIGHT OF FIRST REFUSAL</i>	Town has first right of refusal when land sold or converted to residential, commercial, or industrial use. Option lasts for 120 days unless waived. Exception allowed for residential use by family member.		

	CONSERVATION EASEMENT	AGRICULTURAL PRESERVATION RESTRICTION	ESTATE PLANNING
<i>PURPOSE</i>	To limit the use of land in order to protect specified conservation values including the natural, scenic, or open condition of the land.	To permanently protect farmland by paying landowners the difference between “fair market value” and the “agricultural value” of their land in exchange for a permanent deed restriction which precludes any use of the land that will have a negative impact on its agricultural viability.	To protect your land in a way that makes good financial sense for you and your family.
<i>ELIGIBILITY</i>	Conservation Restriction must demonstrate public benefit	Farm must be at least five acres in size; devoted to agriculture for the two immediately preceding tax years; at least \$500 gross sales per year; soil suitability for agriculture; degree of threat to the continuation of agriculture; potential economic viability of agriculture at that site; and, proximity to other APR lands.	Decisions to protect land require careful consideration of the special features of your property, your land conservation goals, your financial situation, and your family’s needs and wishes.
<i>TAX ASSESSMENT</i>	Tax assessment varies by town and by the type of restriction. Call the Town Assessor for details on tax abatement.	The land is eligible for farmland tax assessment under Chapter 61A, and under the APR program, it will continue to be eligible as long as it is “actively devoted” to agriculture. The landowner should apply to the local assessor each year prior to October 1 and the tax will be based on the current farm use. Dwellings and their lots and farm buildings will continue to be taxed as other real estate.	Federal estate taxes can be as high as 55% of a property’s fair market value. The following options provide tax relief: outright land donation, donation of undivided partial interests, donation of land by will, donation of remainder interest in land with reserved life estate, bargain sale of land to a land trust or conservation agency, lease, and mutual covenant. Conservation restrictions are also appropriate estate planning tools.
<i>HOW TO ENROLL</i>	Conservation restrictions must be submitted according to the written procedures of and approved by the Secretary of Environmental Affairs.	Once a completed application is received by the Dept. of Food and Agriculture, it is reviewed and a field inspection is completed within 1 to 2 months. Applications reviewed on a rolling basis. Priorities are established based upon above eligibility requirements. Timing of acquisition depends on availability of funds.	Because land conservation is a technical area of the law and because your decisions can have significant consequences, it is important to seek out advisors who are experienced in this field. Consult one of the listed resources below, a local land trust, tax accountant, or lawyer with appropriate experience.
<i>ENROLLMENT PERIOD</i>	Allowed for a period of years written into the restriction or in perpetuity. Less than perpetual restrictions will be approved only where demonstrated critical public interest exists.	In perpetuity	N/A

	CONSERVATION EASEMENT	AGRICULTURAL PRESERVATION RESTRICTION	ESTATE PLANNING
<i>WITHDRAWAL OR CHANGE OF USE PENALTY</i>	Withdrawal or change of use is very difficult. Conservation Restrictions should only be considered if they are to be in perpetuity or for a designated term written into the easement. There can be serious tax penalties for withdrawal from a conservation restriction.	Releasing an APR is very difficult and requires three steps: the Commissioner of the Dept. of Food and Agriculture must determine the land is no longer fit for agriculture, a 2/3 vote of the state legislature must approve the release (MGL Article 97), and landowner must reimburse the State for the value of the APR at today's value. A change in use other than stated in the APR also requires a 2/3 vote of the state legislature.	N/A
<i>TOWN'S RIGHT OF FIRST REFUSAL</i>	N/A	N/A	N/A
<i>FOR MORE INFORMATION</i>	MA Executive Office of Environmental Affairs Division of Conservation Services 617-626-1012	MA Dept. of Food and Agriculture 617-626-1700	Valley Land Fund 413-585-8513; Preserving Family Lands by Stephen J. Small available from Landowner Planning Center, PO Box 4508, Boston, MA 02101-4508

Public Education and Outreach

Public education and outreach are some of the most important actions a community can take to protect their water supply. Much of the information presented throughout this report is not simply known by all homeowners. This information needs to be passed on to the public so that they can engage in best management practices for protecting North Brookfield's public and private water supplies. The sources of potential contamination to North Brookfield's drinking water supplies, as well as public education and outreach recommendations, were presented at a Source Protection Workshop on November 2, 2005.

Mass Rural Water Association assisted the North Brookfield Water Department with educational outreach in the public schools. Together they visited grades 4 through 7 to and presented information on the Town's Public Water Supply. It is recommended that the Water Department visit the 4th grade each year to educate North Brookfield children on the importance of protection their water supply from potential contamination.

Table 8 lists some websites that contain further information about best management practices for homeowners.

Please also note the attached educational materials to use while conducting public education and outreach in the **Resources Materials** section of the North Brookfield Source Water Protection Plan.

Table 7: Internet Reference Sites for Educational Material

State of Massachusetts Community Recycling Information-Earth 911	http://massachusetts.earth911.org
Household Hazardous Waste Links Massachusetts	www.state.ma.us/dep/recycle/hazards/hhwhome.htm
EPA Recycling and Waste Homepage	http://www.epa.gov/epaoswer/osw/
Hazardous Waste Publications	http://www.epa.gov/epaoswer/non-hw/muncpl/hhwpubs.htm
Car Oil Recycling	www.recycleoil.org
Disposal and Management of Leftover Paint	http://www.paint.org/con_info/leftover.cfm
Non-Toxic Cleaning in the Home	http://www.ns-products.com/nontox.htm
Recycling Grass Clippings and Composting	http://www.mass.gov/dep/recycle/reduce/compos01.htm
Non-Point Source Information for Kids	http://www.epa.gov/owowwtr1/NPS/kids/whatwrng.htm

References

Construction and First Annual Report of the Board of Water Commissioners of North Brookfield, Massachusetts, 1894. Thank you to John Krusell, SWP Committee member, for lending his copy of the report to Mass Rural Water Association for review.

Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Drinking Water Program. 2002. *Source Water Assessment and Protection (SWAP) Report for North Brookfield Water Department*

Massachusetts Department of Environmental Protection, Drinking Water Program, Updated May 2000 *Developing a Local Surface Water Supply Protection Plan*

Massachusetts Geographic Information System. Assessed 2005-2006. Executive Office of Environmental Affairs, Commonwealth of Massachusetts.

Town of North Brookfield. *2004 Drinking Water Quality Report.* North Brookfield Water Department

Appendices

Appendix A: Massachusetts Regulations for Surface Water Supply Protection

310 CMR 22.20B: Surface Water Supply Protection

(1) To protect surface waters used as sources of drinking water supply from contamination, the requirements of 310 CMR 22.20B shall apply to Zones A, B, C of a surface water source, except at:

(a) Rivers and streams designated as Class B waters pursuant to 314 CMR 4.00 which are used as drinking water sources and are not impounded at some point by means of a dam or dike to create a reservoir at which the water supply intake is located;

(b) Emergency sources approved by the Department under the provisions of M.G.L. 21G.

(2) On and after January 1, 2001, a public water system shall prohibit the following new or expanded land uses within the Zone A of its surface water sources.

(a) All underground storage tanks,

(b) Above-ground storage of liquid hazardous material as defined in M.G.L. c.21E, or liquid propane or liquid petroleum products, except as follows:

1. The storage is incidental to:

a. normal household use, outdoor maintenance, or the heating of a structure;

b. use of emergency generators;

c. a response action conducted or performed in accordance with M.G.L. c.21E and 310 CMR 40.000 and which is exempt from a ground water discharge permit pursuant to 314 CMR 5.05(14); and

2. The storage is either in container(s) or above-ground tank(s) within a building, or outdoors in covered container(s) or above-ground tank(s) in an area that has a containment system designed and operated to hold either 10% of the total possible storage capacity of all containers, or 110% of the largest container's storage capacity, whichever is greater. However, these storage requirements do not apply to the replacement of existing tanks or systems for the keeping, dispensing or storing of gasoline provided the replacement is performed in accordance with applicable state and local requirements;

(c) Treatment or disposal works subject to 314 CMR 3.00 or 5.00, except the following:

1. The replacement or repair of an existing treatment or disposal works that will not result in a design capacity greater than the design capacity of the existing treatment or disposal works;

2. treatment or disposal works for sanitary sewage if necessary to treat existing sanitary sewage discharges in non-compliance with Title 5, 310 CMR 15.00, provided the facility owner demonstrates to the Department's satisfaction that there are no feasible siting locations outside of the Zone A. Any such facility shall be permitted in accordance with 314 CMR 5.00 and shall be required to disinfect the effluent. The Department may also require the facility to provide a higher level of treatment prior to discharge;

3. treatment works approved by the Department designed for the treatment of contaminated ground or surface waters and operated in compliance with 314 CMR 5.05(3) or 5.05 (13).

4. discharge by public water system of waters incidental to water treatment processes.

(3) All on-site subsurface sewage disposal systems, as defined in 310 CMR 15.000 (Title 5), within Zones A, B, and C, shall be in compliance with the requirements of 310 CMR 15.000.

(4) No stabling, hitching, standing, feeding or grazing of livestock or other domestic animals shall be located, constructed, or maintained within 100 feet of the bank of a surface water source or tributary thereto. Owners and operators of agricultural operations should consult the Massachusetts Department of Food and Agriculture's "On-Farm Strategies to Protect Water Quality - An Assessment & Planning Tool for Best Management Practices" (December 1996) for information about technical and financial assistance programs related to erosion and sediment control and nutrient, pest, pesticide, manure, waste, grazing, and irrigation management.

(5) No burial shall be made, except by permission in writing by the Board of Water Commissioners or like body having jurisdiction over such source of supply, in any cemetery or other place within 100 feet of the high water mark of a source of public water supply or tributary thereto. No lands not under the control of cemetery authorities and used for cemetery purposes, from which lands the natural drainage flows into said source of water supply or tributary thereto, shall be taken or used for cemetery purposes until a plan and sufficient description of the lands is presented to the Department and until such taking or use is expressly approved in writing by the Department.

(6) No person shall swim, wade or bathe in any public surface water source and no person shall, unless permitted by written permit by the Board of Water Commissioners or like body having jurisdiction over such source, fish in; enter or go in any boat, seaplane, or other vehicle ; enter upon the ice for any purpose, including the cutting or taking of ice; or cause or allow any animal to go into, or upon, any surface water source or tributary thereto.

(7) Enforcement. A public water system has the following enforcement responsibilities with respect to protection of the Zone A, B, and C of its surface water source(s)

(a) A public water system shall conduct regular and thorough inspections of Zones A, B, and C to determine and enforce compliance with 310 CMR 22.20B.

The public water system shall take prompt enforcement actions against persons violating 310 CMR 22.20B, and report all such enforcement actions to the Department in the system's Annual Statistical Report the results of the regular inspections made during the preceding calendar year. The report shall include the number and dates of the inspections, the number, nature and outcome of violations found, and enforced against by the public water system, and the general condition of the watershed at the time of the last inspection.

(b) The public water system shall document on a form provided by the Department and submitted to the Department in calendar year 2001, that the public water system has established a protocol that provides the system with an opportunity to review and comment on all proposed new or expanded land uses or activities within the watershed of its surface water source(s) to local boards, commissions and other authorities with primary responsibilities for approving such uses and activities.

(c) The Department may take enforcement actions against any public water system which fails to carry out its enforcement responsibilities under 310 CMR 22.20B, or may enforce directly against persons violating 310 CMR22.20B.

310 CMR 22.20C: Surface Water Supply Protection for New and Expanded Class A Surface Water Sources

(1) Source Approval.

(a) A public water system shall obtain prior written approval of the Department for:

1. the development of a new surface water source;
2. the physical expansion of an existing surface water source or the replacement or modification of an existing intake structure;
3. any increase in withdrawal from an existing surface water source in excess of the permitted threshold volume as defined in 310 CMR 36.00; or
4. placing an existing unapproved or inactive surface water on-line.

(b) Persons seeking Department approval for any of the activities described in 310 CMR 22.20C(1)(a) are required to follow the procedures set forth in the "Guidelines and Policies for Public Water System".

(c) In determining whether to grant such approval, the Department will apply the criteria set forth in 310 CMR 22.20C and the "Guidelines and Policies for Public Water Systems."

(d) The Department will not grant its approval pursuant to 310 CMR 22.20C(1), unless the public water system demonstrates to the Department's satisfaction that the system:

1. complies with the applicable "Guidelines and Policies for Public Water Systems",
2. meets all applicable water quality standards set forth in the Massachusetts Drinking Water Regulations, 310 CMR 22.00, and will meet the requirements of 310 CMR 22.20A,B, C;
3. has delineated and mapped Zones A, B and C of the proposed surface water source and provided a map depicting existing land uses existing within Zones A, B and C;
4. has developed a Surface Water Supply Protection Plan in accordance with the Department's "Guidelines and Policies for Public Water Systems" and "Developing a Local Surface Water Supply Protection Plan" (revised May 2000), which shall be updated by the public water system, with a copy submitted to the Department, every three years thereafter; and
5. has developed a reservoir and watershed public control plan, to specify allowable and non-allowable uses on existing public surface water sources and within adjacent public surface water supplier-owned lands at new and existing sources, and contains provisions for public education, inspection, and enforcement.
6. obtain a permit or permit amendment for any withdrawal, in accordance with the Water Management Act, M.G.L. c. 21G, and 310 CMR 36.00.

(e) Municipal Source.

1. No new municipal surface water source, or physical expansion of an existing surface water source shall be placed on line or allowed to expand, unless:

- a. in the case of a Zone A contained entirely within the municipality, the municipality has adopted and has in effect surface water protection zoning or nonzoning controls that prohibit siting within the Zone A of each source the land uses set forth in 310 CMR 22.20C(2) unless the land uses are designed in accordance with the performance standards specified in 310 CMR 22.20C(2); and
- b. in the case of a municipality or municipalities in which any part of the Zone A of a proposed or physically expanded municipal surface water source is located the municipality (or municipalities) has in effect zoning or nonzoning controls that prohibit siting within Zone A the land uses set forth in 310 CMR 22.20C(2) unless the land uses are designed in accordance with the performance standards established in 310 CMR 22.20C(2), or the municipal supplier of water demonstrates to the Department's satisfaction that it has used best efforts to have such zoning or nonzoning controls adopted and in effect; and
- c. the municipality has submitted to the Department a copy of the adopted zoning or nonzoning controls, if any, including any local legislation that provides a variance, waiver or exemption process related to surface water protection zoning and nonzoning controls applicable to the Zone A of the municipal source.

2. An owner or operator of a municipal surface water source that will increase its withdrawal of water by more than the threshold volume, as defined in 310 CMR 36.00, shall, within two years of the effective date of a Water Management Act permit or permit amendment that authorizes the increase:

- a. in the case of a Zone A contained entirely within the municipality, adopt and have in effect surface water protection zoning or nonzoning controls that prohibit siting within the Zone A of the source the land uses set forth in 310 CMR 22.20C(2), unless the land uses are designed in accordance with the performance standards specified in 310 CMR 22.20C(2); and
- b. in the case of a municipality or municipalities in which any part of the Zone A of the source is located, have zoning or nonzoning controls in effect that prohibit the siting within the Zone A of land uses set forth in 310 CMR 22.20C(2), unless the land uses are designed in accordance with the performance standards specified in 310 CMR 22.20C(2), or have demonstrated to the Department's satisfaction that the municipal water supplier has used its best efforts to have the municipality or municipalities where the Zone A is located adopt zoning or nonzoning controls; and

c. submit to the department a copy of the zoning or nonzoning controls in effect and any local legislation that provides a variance or exemption process related the surface water protection zoning and nonzoning controls.

(f) Non-Municipal Sources. No new surface water source, or existing surface water source physically expanding, or increasing its withdrawal by more than the threshold volume as defined by 310 CMR 36.00, that will be used in a non-municipal public water system owned or operated by a non-municipal public water supplier shall demonstrate to the Department's satisfaction that it has used its best efforts to have all municipalities in which Zones A, B and C of the surface water source are located establish zoning or nonzoning controls that prohibit siting within Zones A, B and C the land uses set forth in 310 CMR 22.20C(2), unless the land uses are designed in accordance with the performance standards specified therein.

(g) The proponent may meet the requirements set forth in 310 CMR 22.20C(1)(e) and 310 CMR 22.20C(1)(f) by demonstrating that the water supplier has acquired land for water supply purposes or the existing rights in perpetuity or for a specific period of years stated in the form of a restriction, easement, covenant or condition in a deed or other instrument, or other mechanism approved by the Department, prohibiting the siting within Zone A of the land uses set forth in 310 CMR 22.20C(2).

(h) Amendment or Repeal of Zoning/Nonzoning Controls: no public water system surface water source shall remain on-line more than 120 days following the amendment or repeal of surface water protection zoning or nonzoning controls protecting that surface water source, or the expiration of any rights stated in a deed or other instrument approved pursuant to 310 CMR 22.20C(1)(g), unless the Department finds in writing that the water supplier meets the requirements set forth in 310 CMR 22.20C(1)(e) or 310 CMR 22.20C(1)(f), whichever is applicable, or grants a variance in accordance with 310 CMR 22.20C(3).

(i) Water Supply Emergency. The Department may exempt a water supplier from any of the requirements set forth in 310 CMR 22.20C(1) while a declaration of a state of water supply emergency pursuant to M.G.L. Ch.21G is in effect. In the event that the Department declares a state of water supply emergency, the surface water source shall operate, for the duration of the state of water supply emergency, as directed by the Department.

(2) Restricted Activities Upon Surface Water Sources and Within Protection Zones. Required Surface Water Protection Controls Applicable to Zone A: Surface water protection zoning and nonzoning controls submitted to the Department in accordance with 310 CMR 22.20C(1), shall collectively prohibit the siting of the following new land uses within Zone A:

(a) land uses described in 310 CMR 22.20B(2); (as follows):

(2) On and after January 1, 2001, a public water system shall prohibit the following new or expanded land uses within the Zone A of its surface water sources.

- (a) All underground storage tanks,
- (b) Above-ground storage of liquid hazardous material as defined in M.G.L. c.21E, or liquid propane or liquid petroleum products, except as follows:

- 1. The storage is incidental to:
 - a. normal household use, outdoor maintenance, or the heating of a structure;
 - b. use of emergency generators;
 - c. a response action conducted or performed in accordance with M.G.L. c.21E and 310 CMR 40.000 and which is exempt from a ground water discharge permit pursuant to 314 CMR 5.05(14); and
- 2. The storage is either in container(s) or above-ground tank(s) within a building, or outdoors in covered container(s) or above-ground tank(s) in an area that has a containment system designed and operated to hold either 10% of the total possible storage capacity of all containers, or 110% of the largest container's storage capacity, whichever is greater. However, these storage requirements do not apply to the replacement of existing tanks or systems for the keeping, dispensing or storing of gasoline provided the replacement is performed in accordance with applicable state and local requirements;

- (c) Treatment or disposal works subject to 314 CMR 3.00 or 5.00, except the following:

- 1. the replacement or repair of an existing treatment or disposal works that will not result in a design capacity greater than the design capacity of the existing treatment or disposal works;
- 2. treatment or disposal works for sanitary sewage if necessary to treat existing sanitary sewage discharges in non-compliance with Title 5, 310 CMR 15.00, provided the facility owner demonstrates to the Department's satisfaction that there are no feasible siting locations outside of the Zone A. Any such facility shall be permitted in accordance with 314 CMR 5.00 and shall be required to disinfect the effluent. The Department may also require the facility to provide a higher level of treatment prior to discharge;
- 3. treatment works approved by the Department designed for the treatment of contaminated ground or surface waters and operated in compliance with 314 CMR 5.05(3) or 5.05 (13).
- 4. discharge by public water system of waters incidental to water treatment processes.

(3) All on-site subsurface sewage disposal systems, as defined in 310 CMR 15.000 (Title 5), within Zones A, B, and C, shall be in compliance with the requirements of 310 CMR 15.000.

(4) No stabling, hitching, standing, feeding or grazing of livestock or other domestic animals shall be located, constructed, or maintained within 100 feet of the bank of a surface water source or tributary thereto. Owners and operators of agricultural operations should consult the Massachusetts Department of Food and Agriculture's "On-Farm Strategies to Protect Water Quality - An Assessment & Planning Tool for Best Management Practices" (December 1996) for information about technical and financial assistance programs related to erosion and sediment control and nutrient, pest, pesticide, manure, waste, grazing, and irrigation management.

(5) No burial shall be made, except by permission in writing by the Board of Water Commissioners or like body having jurisdiction over such source of supply, in any cemetery or other place within 100 feet of the high water mark of a source of public water supply or tributary thereto. No lands not under the control of cemetery authorities and used for cemetery purposes, from which lands the natural drainage flows into said source of water supply or tributary thereto, shall be taken or used for cemetery purposes until a plan and sufficient description of the lands is presented to the Department and until such taking or use is expressly approved in writing by the Department.

(6) No person shall swim, wade or bathe in any public surface water source and no person shall, unless permitted by written permit by the Board of Water Commissioners or like body having jurisdiction over such source, fish in; enter or go in any boat, seaplane, or other vehicle; enter upon the ice for any purpose, including the cutting or taking of ice; or cause or allow any animal to go into, or upon, any surface water source or tributary thereto.

(7) Enforcement. A public water system has the following enforcement responsibilities with respect to protection of the Zone A, B, and C of its surface water source(s)

(a) A public water system shall conduct regular and thorough inspections of Zones A, B, and C to determine and enforce compliance with 310 CMR 22.20B. The public water system shall take prompt enforcement actions against persons violating 310 CMR 22.20B, and report all such enforcement actions to the Department in the system's Annual Statistical Report the results of the regular inspections made during the preceding calendar year. The report shall include the number and dates of the inspections, the number, nature and outcome of violations found, and enforced against by the public water system, and the general condition of the watershed at the time of the last inspection.

(b) the public water system shall document on a form provided by the Department and submitted to the Department in calendar year 2001, that the public water system has established a protocol that provides the system with an opportunity to review and comment on all proposed new or expanded land uses or activities within the watershed of its surface water source(s) to local boards, commissions and other authorities with primary responsibilities for approving such uses and activities.

(c) The Department may take enforcement actions against any public water system which fails to carry out its enforcement responsibilities under 310 CMR 22.20B, or may enforce directly against persons violating 310 CMR22.20B.

(8) No person shall apply herbicides to any surface water body including but not limited to any reservoir and their tributaries, which serve as a source of public water supply without a permit issued by the Department pursuant to M.G.L. c. 111, § 5E. This requirement does not apply to the application of algaecides containing copper by the public water system. However, the public water system shall notify the Department in writing prior to the application of such algaecides. (End of 310 CMR 22.20B(2))

(b) facilities that, through their acts or processes, generate, treat, store or dispose of hazardous waste that are subject to M.G.L. c. 21C and 310 CMR 30.000, except for the following:

1. very small quantity generators, as defined by 310 CMR 30.000;
2. treatment works approved by the Department designed in accordance with 314 CMR 5.00 for the treatment of contaminated ground or surface waters;

(c) sand and gravel excavation operations;

(d) uncovered or uncontained storage of fertilizers;

(e) uncovered or uncontained storage of road or parking lot de-icing and sanding materials;

(f) storage or disposal of snow or ice, removed from highways and streets outside the Zone A, that contains deicing chemicals;

(g) uncovered or uncontained storage of manure;

(h) junk and salvage operations;

(i) motor vehicle repair operations;

(j) cemeteries (human and animal) and mausoleums;

(k) solid waste combustion facilities or handling facilities as defined at 310 CMR 16.00;

(l) land uses that result in the rendering impervious of more than 15%, or more than 20% with artificial recharge, or 2500 square feet of any lot, whichever is greater; and

(m) commercial outdoor washing of vehicles, commercial car washes.

(3) Department Variances.

(a) The Department may grant a variance from the requirements of 310 CMR 22.20C(1)(f) to a proponent that, despite its best efforts, is unable to adopt one or more of the requirements set forth in 310 CMR 22.20C(2) if the Department finds that strict compliance with such requirements would result in an undue hardship and would not serve to further the intent of 310 CMR 22.20A, B and C.

(b) The Department will consider the following factors in making the finding necessary to grant a variance pursuant to 310 CMR 22.20C(3):

1. the reasonableness of available alternatives to the proposed surface water source;
2. the overall effectiveness of existing land use controls and other measures on the protection of the proposed surface water source and any other water sources used by the supplier of water;
3. the nature and extent of the risk of contamination to the proposed surface water source that would result from the granting of the variance; and
4. whether the variance is necessary to accommodate an overriding community, regional, state, or national public interest.
5. These factors need not be weighed equally, nor must all of these factors be present for the Department to grant a variance. The presence of any single factor may be sufficient for the granting of a variance.

(c) A variance granted pursuant to 310 CMR 22.20C(3) shall be conditioned on such monitoring, public education or other requirements as the Department may prescribe.

(d) Requests for variances shall be made in writing and clearly state the provision or requirement from which the variance is sought and the reasons and facts that support the granting of a variance, and shall include an evaluation of the reasonableness of alternatives to the proposed surface water source.

(e) Within 14 days of filing a request for variance under 310 CMR 22.20C(3)(a), the proponent filing the request shall notify persons served by the supplier of water by direct mail and by publication on not less than three consecutive days in a newspaper of general circulation in the service area of the supplier of water. The notice shall include:

1. the provision or requirement from which the variance is being sought;
2. the identity of the proponent of the surface water source;
3. the identity of the person requesting the variance, the address where a copy of the request for variance will be available for public inspection, and the times it will be available; and

4. a statement that the Department will receive written comments concerning the request from the public for a 30 day period commencing on the last date of newspaper publication.
- (f) Each proponent submitting a request for variance shall submit to the Department a copy of the public notice required by 310 CMR 22.20C(3)(e) and affidavits attesting to the fact that the notices have been given. The Department will receive written comments concerning the request from the public for a 30- day period commencing on the last date of newspaper publication.
- (g) Within 30 days of the close of the comment period, each proponent requesting a variance under 310 CMR 22.20C(3)(a) shall respond in writing to all reasonable public comments received by the Department.
- (h) The Department may schedule a public hearing on any request for variance submitted in accordance with 310 CMR 22.20C(3) if it determines on the basis of the public comments received that such a hearing is in the public interest. In the event that the Department schedules a hearing, the proponent filing the request shall notify persons served by the supplier of water of the hearing by publication on not less than three consecutive days in a newspaper of general circulation in the service area of the supplier of water. In addition, the proponent filing the request shall notify each person who submitted written comment concerning the request to the Department by direct mail. The proponent filing the request shall submit to the Department a copy of the public notices required by 310 CMR 22.20C(3)(h), and an affidavit attesting to the fact that the notices have been given, prior to the hearing. Proponents filing a request for a variance under 310 CMR 22.20C(3) shall pay in full the cost of any hearing scheduled.
- (i) Within 30 days of the grant of a variance under 310 CMR 22.20C(3), any proponent who receives a variance shall notify persons served by the supplier of water of the granting of the variance, including any conditions imposed by the Department, by direct mail and by publication on not less than three consecutive days in a newspaper of general circulation in the service area of the supplier of water. The proponent who receives the variance shall submit to the Department a copy of the public notices and an affidavit attesting to the fact that the notices have been given upon completion of the public notification.

Resource Materials



Massachusetts Department of Environmental Protection
Source Water Assessment and Protection (SWAP) Report
for
North Brookfield Water Department (Draft)

What is SWAP?

The Source Water Assessment and Protection (SWAP) program, established under the federal Safe Drinking Water Act, requires every state to:

- inventory land uses within the recharge areas of all public water supply sources;
- assess the susceptibility of drinking water sources to contamination from these land uses; and
- publicize the results to provide support for improved protection.

Susceptibility and Water Quality

Susceptibility is a measure of a water supply's potential to become contaminated due to land uses and activities within its recharge area.

A source's susceptibility to contamination does *not* imply poor water quality.

Water suppliers protect drinking water by monitoring for more than 100 chemicals, disinfecting, filtering, or treating water supplies, and using source protection measures to ensure that safe water is delivered to the tap.

Actual water quality is best reflected by the results of regular water tests. To learn more about your water quality, refer to your water supplier's annual Consumer Confidence Reports.

Table 1: Public Water System Information

PWS Name	North Brookfield Water Department
PWS Address	75 Oakham Road
City/Town	North Brookfield, Massachusetts
PWS ID Number	2212000
Local Contact	Stephen Jones, Water Superintendent
Phone Number	(508) 867-0207

Introduction

We are all concerned about the quality of the water we drink. Drinking water may be threatened by many potential contaminant sources, including storm runoff, road salting, and improper disposal of hazardous materials. Citizens and local officials can work together to better protect these drinking water sources.

Purpose of this report:

This report is a planning tool to support local and state efforts to improve water supply protection. By identifying land uses within water supply protection areas that may be potential sources of contamination, the assessment helps focus protection efforts on appropriate Best Management Practices (BMPs) and drinking water source protection measures.

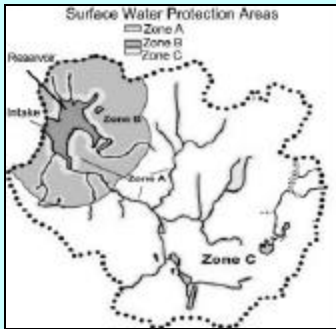
Refer to Table 3 for Recommendations to address potential sources of contamination. Department of Environmental Protection (DEP) staff are available to provide information about funding and other resources that may be available to your community.

This report includes the following sections:

1. Description of the Water System
2. Land Uses within Protection Areas
3. Source Water Protection
4. Appendices

What is a Watershed?

A watershed is the land area that catches and drains rainwater down-slope into a river, lake or reservoir. As water travels down from the watershed area it may carry contaminants from the watershed to the drinking water supply source. For protection purposes, watersheds are divided into protection Zones A, B and C.



Glossary Protection Zones

Zone A: is the most critical for protection efforts. It is the area 400 feet from the edge of the reservoir and 200 feet from the edge of the tributaries (rivers and/or streams) draining into it.

Zone B: is the area one-half mile from the edge of the reservoir but does not go beyond the outer edge of the watershed.

Zone C: is the remaining area in the watershed not designated as Zones A or B.

The attached map shows Zone A and your watershed boundary.

Section 1: Description of the Water System

Source Name	Source ID	Susceptibility
Horse Pond	2212000-02S	High

The North Brookfield Water Department obtains its water supply from North Pond, a surface water supply located east of Rufus Putnam Road and north of Doane Pond. Water flows by gravity from North Pond to the pumping station located of Oakham Road.

The northern portion of the reservoir extends into the Town of New Braintree.

The water is chlorinated and then pumped into the distribution system. Overflow from the distribution is pumped into a 3,200,000 gallon storage reservoir located at Bell Hill. Water from the storage reservoir is again chlorinated before entering the distribution system. As part of the Surface Water Treatment Rule (SWTR) requirement, North Brookfield filters the water. For current information on monitoring results and treatment, please contact the Public Water System contact person listed above in Table 1 for a copy of the most recent Consumer Confidence Report. Drinking water monitoring reporting data are also available on the web at <http://www.epa.gov/safewater/ccr1.html>.

Section 2: Land Uses in the Protection Areas

The protection area for North Brookfield is a mixture of residential, protected open space and forest land uses (refer to attached map for details). Land uses and activities that are potential sources of contamination are listed in Table 2.

Key Land Uses and Protection Issues include:

1. Zone A Land Uses
2. Residential land uses
3. Aquatic Wildlife
4. Protection Planning

The overall ranking of susceptibility to contamination for the system is high, based on the presence of at least one high threat land use within the water supply protection areas, as seen in Table 2.

1. Zone A Land Uses - The Zone A is the land area within 400 feet of a reservoir and 200 feet of its tributaries. The land uses and activities within the Zone As include: residences with on-site septic systems, aboveground storage tanks, roads, illegal recreational activities, and wild life. Public water systems are responsible for enforcing the prohibition of certain new or expanded land uses within the Zone A, as detailed in 310 CMR 22.20(b).

Zone A Recommendations:

- ✓ Continue to actively monitor new or expanded land uses within the Zone A according to your watershed protocol submitted to DEP.
- ✓ Control aquatic wildlife within the Zone A.
- ✓ Work with local emergency response teams to practice containment of spills within the Zone A.
- ✓ Continue to conduct regular inspections of the Zone A for illegal dumping and spills.

2. Residential Land Uses – Approximately four residences are located in the watershed. None of the homes have public sewers, and so all use septic systems. If managed improperly, activities associated with residential areas can contribute to drinking water contamination. Common potential sources of contamination include:

- **Septic Systems** – Improper disposal of household hazardous chemicals to septic systems is a potential source of contamination. If septic systems fail or are not properly maintained they can be a potential source of microbial contamination.
- **Household Hazardous Materials** - Hazardous materials may include automotive wastes, paints, solvents, pesticides, fertilizers, and other substances. Improper use, storage, and disposal of chemical products used in homes are potential sources of contamination.
- **Heating Oil Storage** - If managed improperly, Underground and Aboveground Storage Tanks (USTs and ASTs) can be potential sources of contamination due to leaks or spills of the fuel oil they store.

Residential Land Use Recommendations:

- ✓ Educate residents on best management practices (BMPs) for protecting water supplies. Distribute the fact sheet “Residents Protect Drinking Water” available in Appendix A and on www.mass.gov/dep/brp/dws/protect.htm, which provides BMPs for common residential issues.
- ✓ Work with planners to control new residential developments in the water supply protection areas.
- ✓ Promote BMPs for stormwater management and pollution controls.

3. Aquatic Wildlife—Birds, particularly gulls, are attracted to large open bodies of water. Birds may increase coliform levels through the release of fecal matter into the water and may carry other bacteria and viruses. Beaver and muskrat may introduce the pathogens *Giardia* and *Cryptosporidium* into water through fecal matter. Because of their constant contact with the water, these aquatic mammals represent a potential threat to drinking water reservoirs. Appendix A contains a DEP fact sheet titled *What You Need To Know About Microbial Contamination*.

Aquatic Wildlife Recommendations:

- ✓ Monitor wildlife populations in and around the reservoir.
- ✓ Where necessary, discourage and control aquatic wildlife. See <http://mass.gov/dep/brp/dws/protect.htm> for guidance and permits.

4. Protection Planning – Protection planning protects drinking water by managing the land area that supplies water to a reservoir. Currently, the Town does not have water supply protection controls that meet DEP’s Surface Water Protection regulations 310 CMR 22.20 (b) and (c). A Surface Water Supply Protection Plan coordinates community efforts, identifies protection strategies, establishes a timeframe for implementation, and provides a forum for

Benefits of Source Protection

Source Protection helps protect public health and is also good for fiscal fitness:

- Protects drinking water quality at the source
- Reduces monitoring costs through the DEP Waiver Program
- Treatment can be reduced or avoided entirely, saving treatment costs
- Prevents costly contamination clean-up
- Preventing contamination saves costs on water purchases, and expensive new source development

Contact your regional DEP office for more information on Source Protection and the Waiver Program.

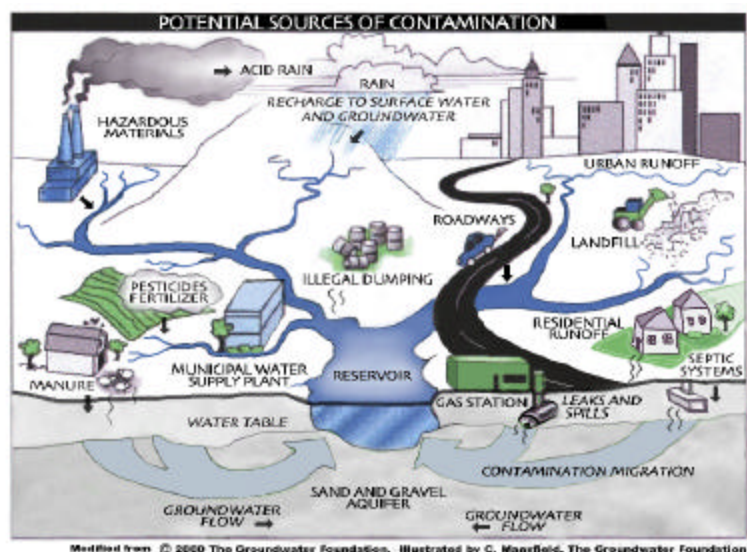


Figure 1: Sample watershed with examples of potential sources of contamination

public participation. There are resources available to help communities develop a plan for protecting drinking water supply reservoirs.

Protection Planning Recommendations:

- ✓ Develop a Surface Water Supply Protection Plan. Establish a protection team, and refer them to <http://mass.gov/dep/brp/dws/protect.htm> for a copy of DEP's guidance, "Developing a Surface Water Supply Protection Plan".
- ✓ If there are no local controls or they do not meet the current regulations, adopt controls that meet 310 CMR 22.20 (b) and (c). For more information on DEP land use controls see <http://mass.gov/dep/brp/dws/protect.htm>.
- ✓ Work with town boards to review and provide recommendations on proposed development within your water supply protection areas. To obtain information on build-out analyses for the town, see the Executive Office of Environmental Affairs' community preservation web site, <http://commpres.env.state.ma.us/>.

Identifying potential sources of contamination is an important initial step in protecting your drinking water sources. Further local investigation will provide more in-depth information and may identify new land uses and activities that are potential sources of contamination. Once potential sources of contamination are identified, specific recommendations like those below should be used to better protect your water supply.

Section 3: Source Water Protection Conclusions and Recommendations

Current Land Uses and Source Protection:

As with many water supply protection areas, the system watersheds contain potential sources of contamination. However, source protection measures reduce the risk of actual contamination, as illustrated in Figure 2.

The water supplier is commended for promoting source protection through the following:

- Requesting in writing that local and regional boards and commissions place the Water Department on the list of whom to notify when new or expanding projects are proposed within their watershed.
- Active interest in increasing the area protected by the water system.
- Taking an active role in promoting source protection measures in the Water Supply Protection Areas.

(Continued on page 6)

For More Information

Contact Josephine Yemoh-Ndi in DEP's Worcester Office at (508) 849-4030 for more information and assistance on improving current protection measures.

Copies of this report have been provided to the public water supplier and town boards.

What are "BMPs?"

Best Management Practices (BMPs) are measures that are used to protect and improve surface water and groundwater quality. BMPs can be structural, such as oil & grease trap catch basins, nonstructural, such as hazardous waste collection days or managerial, such as employee training on proper disposal procedures.

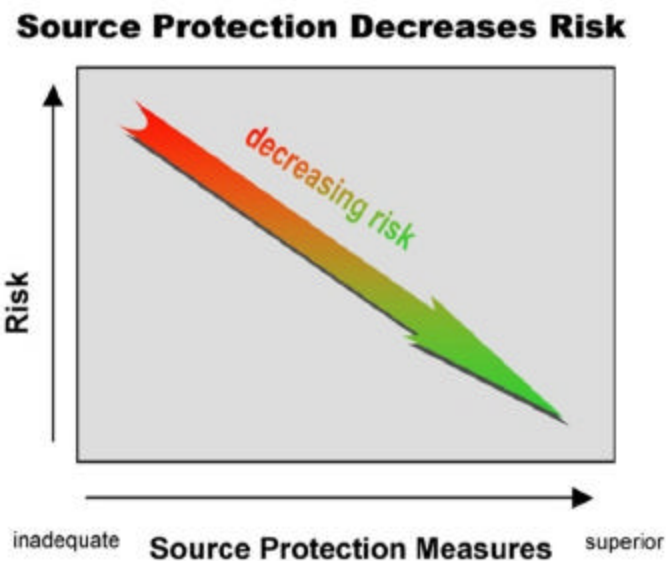


Figure 2: Risk of contamination decreases as source protection increases. This is true for public water systems of any susceptibility ranking, whether High, Moderate, or Low.

Potential Source of Contamination vs. Actual Contamination

The activities listed in Table 2 are those that typically use, produce, or store contaminants of concern, which, if managed improperly, are potential sources of contamination (PSC).

It is important to understand that a release may never occur from the potential source of contamination provided facilities are using best management practices (BMPs). If BMPs are in place, the actual risk may be lower than the threat ranking identified in Table 2. Many potential sources of contamination are regulated at the federal, state and/or local levels, to further reduce the risk.

Table 2: Land Use in the Watershed

Activities	Quantity	Threat*	Potential Source of Contamination
Residential			
Fuel Oil Storage (at residences)	4	M	Fuel oil: spills, leaks, or improper handling
Septic Systems / Cesspools	4	M	Hazardous chemicals: microbial contaminants, and improper disposal
Miscellaneous			
Aquatic Wildlife	Few	H	Microbial contaminants
Notes: - When specific potential contaminants are not known, typical potential contaminants or activities for that type of land use are listed. Facilities within the watershed may not contain all of these potential contaminant sources, may contain other potential contaminant sources, or may use Best Management Practices to prevent contaminants from reaching drinking water supplies. - For more information on regulated facilities, refer to Appendix B: Regulated Facilities within the Water Supply Protection Area information about these potential sources of contamination. - For information about Oil or Hazardous Materials Sites in your protection areas, refer to Appendix C: Tier Classified Oil and/or Hazardous Material Sites. * THREAT RANKING - The rankings (high, moderate or low) represent the relative threat of each land use compared to other PSCs. The ranking of a particular PSC is based on a number of factors, including: the type and quantity of chemicals typically used or generated by the PSC; the characteristics of the contaminants (such as toxicity, environmental fate and transport); and the behavior and mobility of the pollutants in soils and groundwater.			

(Continued from page 4)

Source Protection Recommendations:

To better protect the sources for the future:

- ✓ Inspect the Zone A regularly, and when feasible, remove any non-water supply activities.
- ✓ Educate residents on ways they can help you to protect drinking water sources.
- ✓ Work with emergency response teams to ensure that they are aware of the stormwater drainage in your watershed and to cooperate on responding to spills or accidents.
- ✓ Develop and implement a Surface Water Supply Protection Plan.

Conclusions:

These recommendations are only part of your ongoing local drinking water source protection. Additional source protection recommendations are listed in Table 3, the Key Issues above and Appendix A.

DEP staff, informational documents, and resources are available to help you build on this SWAP report as you continue to improve drinking water protection in your community. The Department's Source Protection Grant Program provides funds to assist public water suppliers in addressing water supply source protection through local projects. Protection recommendations discussed in this document may be eligible for funding under the Grant Program. Please note: each spring DEP posts a new Request for Response (RFR) for the grant program.

Other grants and loans are available through the Drinking Water State Revolving Loan Fund, the Clean Water State Revolving Fund, and other sources. For more information on grants and loans, visit the Bureau of Resource Protection's Municipal Services web site at: <http://mass.gov/dep/brp/mf/mfpubs.htm>.

The assessment and protection recommendations in this SWAP report are provided as a tool to encourage community discussion, support ongoing source

Top 5 Reasons to Develop a Local Surface Water Protection Plan

- ➊ Reduces Risk to Human Health
- ➋ Cost Effective! Reduces or Eliminates Costs Associated With:
 - ♦ Increased monitoring and treatment
 - ♦ Water supply clean up and remediation
 - ♦ Replacing a water supply
 - ♦ Purchasing water
- ➌ Supports municipal bylaws, making them less likely to be challenged
- ➍ Ensures clean drinking water supplies for future generations
- ➎ Enhances real estate values – clean drinking water is a local amenity. A community known for its great drinking water in a place people want to live and businesses want to locate.

Additional Documents:

To help with source protection efforts, more information is available by request or online at www.state.ma.us/dep/brp/dws including:

1. Water Supply Protection Guidance Materials such as model regulations, Best Management Practice information, and general water supply protection information.
2. MA DEP SWAP Strategy
3. Land Use Pollution Potential Matrix
4. Draft Land/Associated Contaminants Matrix

protection efforts, and help set local drinking water protection priorities. Citizens and community officials should use this SWAP report to spur discussion of local drinking water protection measures. The water supplier should supplement this SWAP report with local information on potential sources of contamination and land uses. Local information should be maintained and updated periodically to reflect land use changes in the watershed. Use this information to set priorities, target inspections, focus education efforts, and to develop a long-term drinking water source protection plan.

Section 4: Appendices

- A. Protection Recommendations
- B. Additional Documents on Source Protection

Table 3: Current Protection and Recommendations

Protection Measures	Status	Recommendations
Zone A		
Is the Zone A posted with “Public Drinking Water Supply” Signs?	YES	Additional economical signs are available from the Northeast Rural Water Association (802) 660-4988.
Is the Zone A regularly inspected?	YES	Continue daily inspections of drinking water protection areas.
Municipal Controls (Zoning Bylaws, Health Regulations, and General Bylaws)		
Does the municipality have Surface Water Protection Controls that meet 310 CMR 22.20C?	NO	Refer to www.state.ma.us/dep/brp/dws/ for model bylaws, health regulations, and current regulations.
Do neighboring communities protect the water supply protection areas extending into their communities?	NO	Work with neighboring municipalities to include the watershed in their protection controls.
Planning		
Does the PWS have a local surface water supply protection plan?	NO	Develop a surface water supply protection plan. Follow “Developing a Local Surface Water Supply Protection Plan” available at: www.state.ma.us/dep/brp/dws/ .
Does the PWS have a formal “Emergency Response Plan” to deal with spills or other emergencies?	YES	Augment plan by developing a joint emergency response plan with fire department, Board of Health, DPW, and local and state emergency officials. Coordinate emergency response drills with local teams.
Does the municipality have a watershed protection committee?	NO	Establish committee; include representatives from citizens’ groups, neighboring communities, and the business community.
Does the Board of Health conduct inspections of commercial and industrial activities?	YES	For more guidance see “Hazardous Materials Management: A Community’s Guide” at www.state.ma.us/dep/brp/dws/files/hazmat.doc
Does the PWS provide watershed protection education?	NO	Aim additional efforts at commercial, industrial and municipal uses within the watershed.

Conventional Septic Systems

A septic system consists of a **septic tank**, a **distribution system** and a **drainfield**, all connected by pipes. The typical septic tank is a large buried rectangular concrete container.

Your septic system treats your household wastewater by temporarily holding it in the **septic tank** where heavy solids settle to the bottom and bacterial action partially decomposes them. Most of the lighter solids rise to the top and form a scum layer. The solids stored in the tank need to be removed by a professional septic tank pumper every three to five years.

The wastewater leaving the septic tank is a liquid called **effluent**. It has been partially treated but still contains disease-causing bacteria and other pollutants.

The effluent flows into the **distribution system**, which separates the effluent flow evenly into a network of **drainfield trenches**.

The drainfield is a network of perforated

pipes laid in gravel-filled trenches, or beds in the soil. Drainage holes at the bottom of each pipe allow the effluent to drain into the gravel trenches for temporary storage.

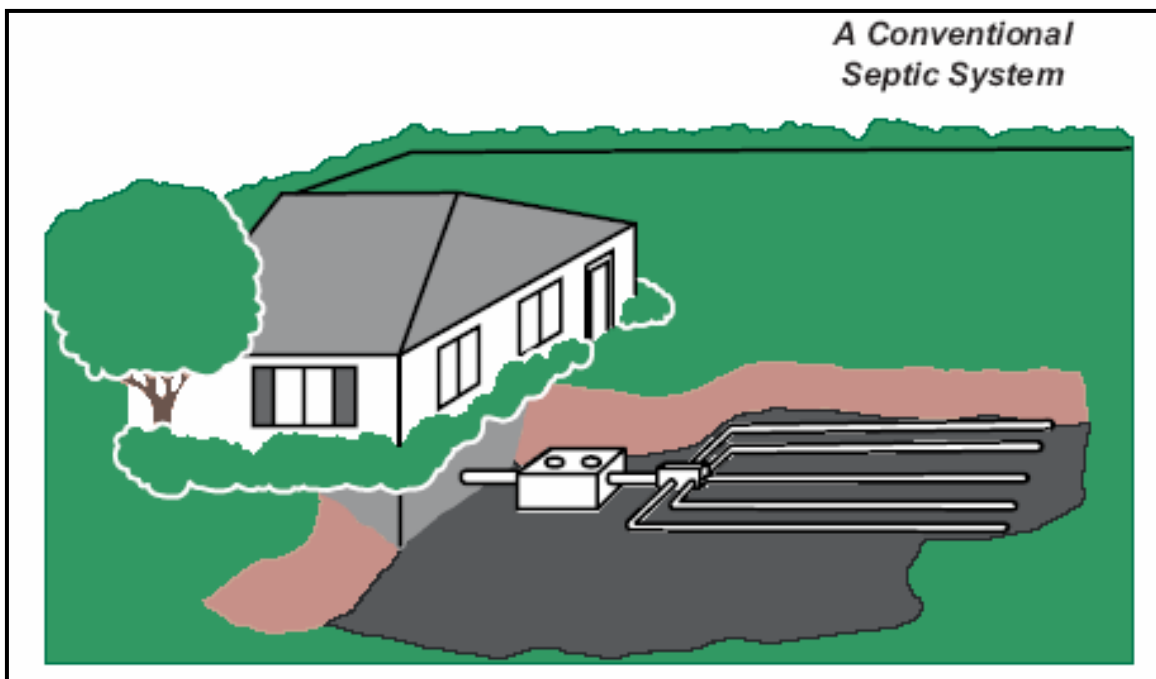
The effluent then slowly seeps into the soil where it is further treated and purified. Chemical and biological processes treat the effluent before it reaches groundwater. A properly functioning septic system does not pollute the **groundwater**.

Caring for Your Septic System

The accumulated solids in the bottom of the septic tank should be pumped out every three to five years to prolong the life of your system.

Neglect or abuse of your septic system can cause system failure. Failing systems can:

- reduce the value of your property,
- be very expensive to repair,
- cause a serious health threat to your family and neighbors,
- degrade the environment, especially groundwater, lakes and streams.



Septic Tank Additives

Many products on the market, such as solvents, yeast, bacteria, and enzymes claim to improve septic tank performance, or reduce the need for routine pumping. Do not use an additive unless it is specifically approved by the health department.

Some can cause solids to carry over to the drainfield, which results in early soil clogging and the need for a new drainfield.

Products containing organic solvents contribute to groundwater pollution.

System Failure

Warning signs of a failing system:

- surfacing sewage, or lush vegetation in the drainfield area,
- sewage back-ups in the house,
- slow draining toilets or drains,
- sewage odors.

If you notice any of these signs or if you suspect your septic tank system may be having problems - contact your local Board of Health

System Management

1. Keep accurate records.

Know where your septic tank system is and keep a diagram of its location. Records of its size and location may be available at Board of Health office.

Keep records of maintenance on the system. These records will be helpful if problems occur, and will be valuable to the next owner of your home.

2. Inspect your system once every three years.

Have the level of solids and scum in your septic tank checked to assure that the layer of solids and scum are not within the early warning levels.

The tank also should be checked to see if the baffles or tees are in good condition.

Periodically inspect the drainfield and downslope areas for odors, wet spots, or surfacing sewage.

3. Practice water conservation. The more waste water you produce, the more the soil must treat and dispose. By reducing your use, you can extend the life of the drainfield, decrease the possibility of system failure, and avoid costly repairs.

To reduce your water use:

- Use water-saving devices in faucets, showerheads and toilets.
- Repair dripping faucets and leaking toilets.
- Take shorter showers or baths with a partially-filled tub.
- Wash only full loads of dishes and laundry.

4. Pump out your septic tank every three to five years or as needed by a licensed septic contractor.

Don't wait until you have a problem. Routine pumping can prevent failures, such as clogging of the drainfield and sewage back-up into the home. Using a garbage disposal is not recommended because it will increase the amount of solids entering the septic tank and require more frequent pumping.

5. Never flush harmful materials into your septic tank.

Grease, cooking fats, newspaper, paper towels, rags, coffee grounds, sanitary napkins, disposable diapers, plastics and cigarettes cannot easily decompose in the tank.

6. Never flush harmful chemicals into your septic tank.

Chemicals such as gasoline, oil, paint, paint thinner, pesticides, antifreeze, etc. are harmful to the system's proper operation and can kill the beneficial bacteria that treat your wastewater.

7. Divert all runoff away from your system.

Water from surfaces such as roofs, driveways, or patios should be diverted away from the septic tank and drainfield area. Soil over your system should be slightly mounded to help surface water runoff.

8. Protect your system from damage.

Keep traffic such as vehicles, heavy equipment, or livestock off your drainfield or replacement area.

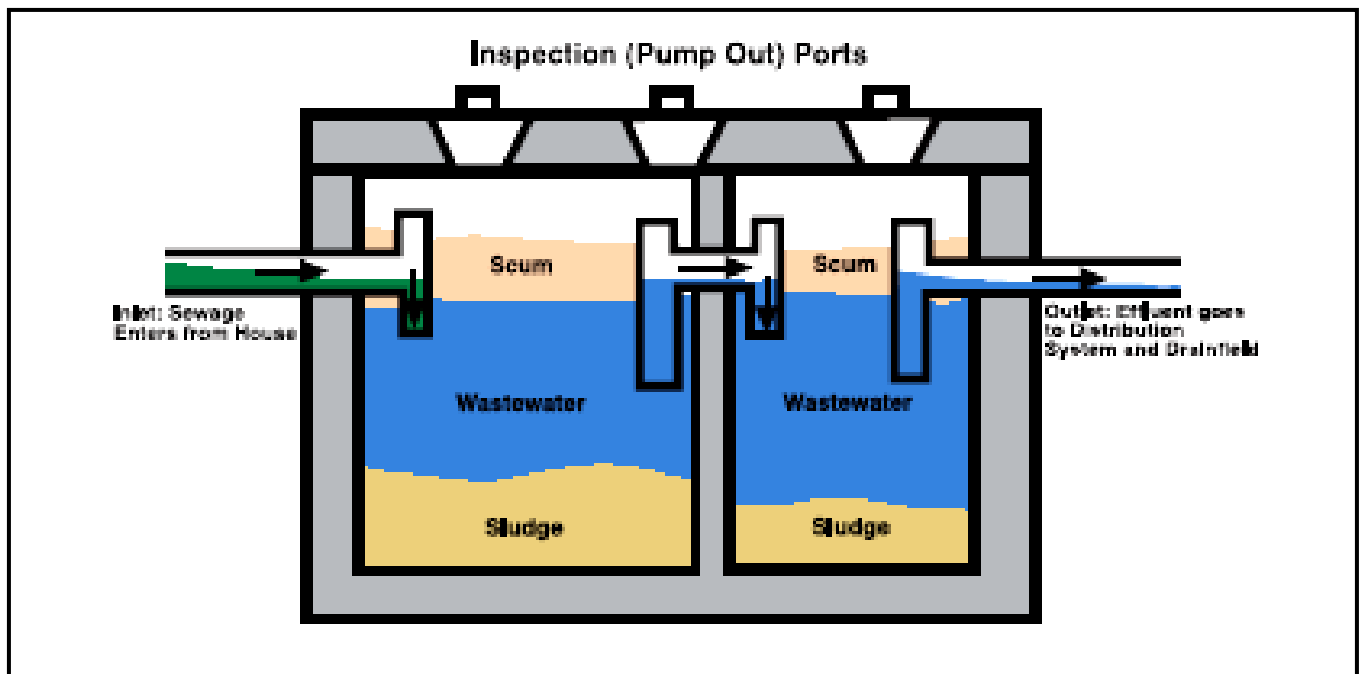
The pressure can compact the soil or damage pipes. Consult the health department before you construct a building, plant a garden, or install a pool or underground sprinkler system.

9. Landscape your system properly.

Grass is the best cover for your system. Do not place impermeable materials over your

drainfield or replacement area. Materials, such as concrete or plastic, reduce evaporation and the supply of oxygen to the soil for proper treatment. Roots from nearby trees or shrubs may clog and damage your drain lines.

10. Obtain the required health department permit before making system repairs. Use professional licensed septic contractors when needed. Many problems can be corrected with a minimum amount of cost and effort if done properly.



Homeowner Septic System Checklist

Septic System Description

Contact your local authority if you don't have this information.

Date system installed _____

Installer

Phone _____

Tank size _____ **gallons**

Capacity_____ **bedrooms**

Type ☐ conventional

☐ alternative (type) _____

**For more information about
septic systems, contact:**

Clean Water
starts at
Home

U.S. Environmental Protection Agency

www.epa.gov/owm/onsite/

Things to keep in mind:

- ✓ **Inspect your system (every 1 to 3 years) and pump your tank (as necessary, generally every 3 to 5 years).**
 - ✓ **Use water efficiently.**
 - ✓ **Don't dispose of household hazardous wastes in sinks and toilets.**
 - ✓ **Plant only grass over and near your septic system. Roots from nearby trees or shrubs might clog and damage the drainfield.**
 - ✓ **Don't drive or park vehicles on any part of your septic system. Doing so can compact the soil in your drainfield or damage the pipes, tank, or other septic system components.**
- 
- A graphic in the bottom right corner features the text "Not in My Septic System" in a green, stylized font. Below it is a clipboard with a silver clip. On the clipboard, a green "X" is next to the word "Cloggers" in a bold, italicized font. Below "Cloggers", the words "diapers, cat litter" and "filters" are listed in a smaller font, with "filters" on a new line.



Not in My Septic System!

X Cloggers
diapers, cat litter
filters

diapers, cat litter, cigarette
filters, coffee grounds,
grease, feminine hygiene
products, etc.

X Killers

household chemicals,
gasoline, oil, pesticides,
antifreeze, paint, etc.

Septic System Maintenance Record

[illegible]

Place on electrical box (fuse box) or other convenient location.



Massachusetts
Department
of
ENVIRONMENTAL
PROTECTION

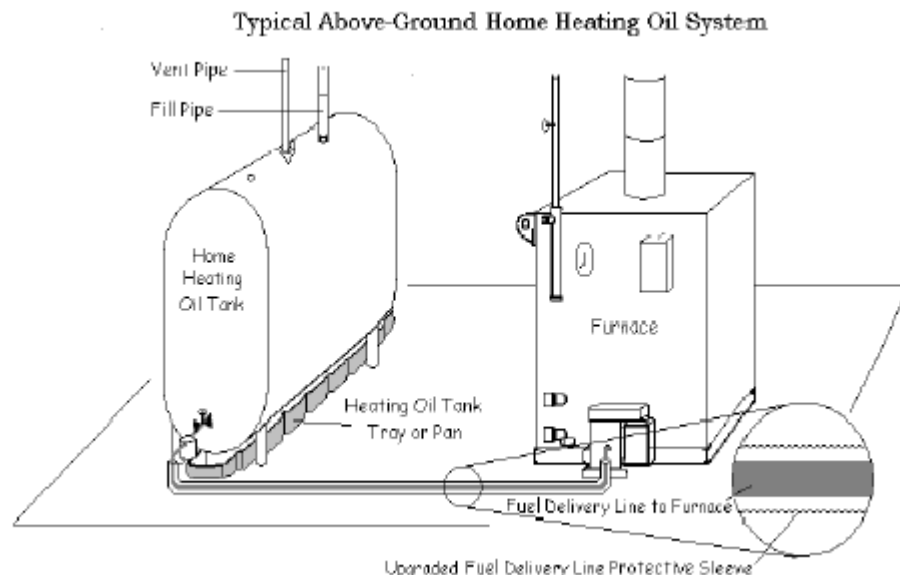
fact sheet

Tips For Maintaining Your Home Heating System: Prevent Heating Oil Leaks and Spills

Cleaning up oil leaks from home heating systems can be very expensive. The average cost can range between \$20,000 and \$50,000, with some cleanups costing significantly more. Here are some ways to save money, help prevent leaks and spills, and protect the environment.

For all heating oil systems:

- Annually:
 - Inspect for leaks. Look at the tank, fuel delivery line, valves, piping, and fittings.
 - Have your oil company:
 - Clean the furnace and repair or replace damaged parts. A well-maintained furnace means lower fuel bills and cleaner emissions.
 - Install an oil **safety valve** or replace the fuel delivery line with one encased in a **protective sleeve**. These are inexpensive upgrades. Contact the fire department to determine if a permit is required for this work.
 - Each fall, inspect the vent pipe to ensure that it is free of obstructions and that an audible signal (whistle) is on the vent. Oil company personnel listen for the whistle to help avoid overfills, a common source of spills.
- At least every 10 years, have the oil tank cleaned out. Over time, water (from condensation) and sludge can cause corrosion resulting in leaks.
- When appropriate:
 - Remove abandoned fill and vent pipes immediately.
 - Clearly mark the location of the tank's fill pipe.
 - Consider upgrading to a modern, fuel-efficient furnace.



Massachusetts Department of
Environmental Protection
One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Mitt Romney, Governor
Kerry Healey, Lt. Governor

Executive Office of
Environmental Affairs
Ellen Roy Herzfelder, Secretary

Department of
Environmental Protection
Robert W. Gollidge, Jr.,
Commissioner

Produced by the
Bureau of Waste Site Cleanup,
1/02/rev. 5/04.
Printed on recycled paper

This information is available in
alternate format by calling our ADA
Coordinator at
(617) 292-5565.



- Determine if the underground storage tank is made of steel (common) or fiberglass (rare). Most steel underground storage tanks will last approximately 10 to 20 years. If the tank is older than that or the age is unknown, replace it with an above-ground storage tank. Locate your new tank under a shelter, or inside a basement or garage, to prevent rust, corrosion, or damage.

For outdoor above-ground tanks:

- Ask your oil company to inspect the stability of the above-ground tank. A full 275-gallon tank weighs more than 2,000 pounds! They have metal legs and should sit on a concrete pad. If the legs become loose or the pad cracks, the tank can fall over and rupture.
- Replace an outdoor above-ground storage tank that has been uncovered for 10 years or longer. These tanks rust from the inside out, so cleaning or painting the outside does not usually prolong their life.
- Protect the tank from the weather, such as falling snow and ice, and prevent ruptures by tree limbs.

For indoor above-ground tanks:

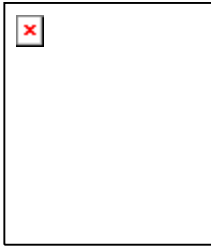
- Inspect indoor above-ground storage tanks for signs of pitting and corrosion, particularly at the bottom of the tank. Tanks primarily rust from the inside out, so if signs of aging are present, replace the tank. Indoor tanks do not last more than about 30 years, and often their lifespan is much shorter.
- Consider placing a plastic heating oil tray or pan under the tank. This makes it easier to keep the tank area clean and help identify and contain small leaks.

If your oil company offers to perform a "tightness test," ask if this could cause a problem. Generally, these tests should NOT be performed on older residential heating oil systems. Because of the pressure used during a tightness test, older equipment can fail, causing a leak or spill. If you have a tank, fuel delivery line, valves, piping, and fittings on which it is inadvisable to perform a tightness test because of age or condition, then it is probably better to replace the equipment that is causing the concern.

Visit our web site: <http://www.mass.gov/dep/bwsc/facts.htm> to review related documents, including "Heating Oil Delivery Lines" (<http://www.mass.gov/dep/bwsc/files/deline.pdf>).

If you suspect an oil leak or spill, **immediately** contact your oil company and fire department for assistance. Leaks or spills of 10 gallons or more must be reported to DEP within 2 hours. To report a leak or spill, call DEP (within 2 hours) and the fire department.

DEP's 24-hour statewide emergency response number is 888-304-1133.



COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

MARGARET PAUL CELLUCCI
Governor

JANE SWIFT
Lieutenant Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

**Determining a Threat To Public Water Supplies Related to Presence of Beaver and Muskrat
Standard Operating Procedure (SOP)
Drinking Water Program**

Applies to Public Water Suppliers (PWSs) with beaver or muskrat populations endangering public water supply sources or pump stations:

Rationale: The presence of beavers or muskrats near public water supply sources may pose a threat to the protection of public health. Both animals have commonly been identified as carriers of *Giardia Lamblia* and *Cryptosporidium*--pathogens identified within the Surface Water Treatment Rule and Enhanced Surface Water Treatment Rule respectively as posing an unacceptable risk to drinking water. Amendments to the State's trapping laws charge DEP with determining when a threat to human health and safety exists as a result of the presence of beavers and muskrats in and around public water supply sources and pump stations. A DEP determination that a threat exists may be used by an applicant to petition the local Board of Health for an emergency permit to eliminate the threat.

Applications

Applications to DEP requesting that a determination as to the existence of a threat to human health and safety resulting from beavers and muskrats in and around public water supply sources and pump stations must include the following information:

1. A scaled site map showing the location of all affected areas where determinations are requested in relation to all potentially impacted public water supply sources or pump stations. All public water supply sources and pump stations must be labeled on the site plan.
2. A narrative which:
 - a. Details the reason for the determination request;
 - b. Identifies the duration of the problem;
 - c. Identifies control mechanisms already used;
 - d. Identifies changes in water levels or flowpath. This information will be specific to problems related to flooding; and
 - e. Includes available evidence of interaction between groundwater sources and surface waters.
3. A description of the proposed method for eliminating the threat which:

This information is available in alternate format by calling our ADA Coordinator at (617) 574-6872.

DEP on the World Wide Web: <http://www.state.ma.us/dep>

 Printed on Recycled Paper

- a. Specifies the type of trap, if any, that will be used;
- b. Specifies if dams will be breached; and
- c. Specifies if the use of non-lethal management or water-flow devices is proposed.

Review and Determination

DEP may determine that a threat to human health and safety exists if beavers or muskrats or dams or active lodges are observed:

- Within a pathogen control zone previously sanctioned by the Massachusetts Division of Fisheries and Wildlife.
- Within a terminal reservoir or in a tributary within 400 feet of a terminal reservoir.
- Within 400 feet of a public water supply well or wellfield.
- Within 200 feet of a public water supply pump station.
- In a tributary, beyond 400 feet of a terminal reservoir, if the applicant can demonstrate that degradation in water quality is occurring. Parameters used to demonstrate a degradation in water quality shall include:
 - Fecal coliform
 - Total coliform
 - Turbidity
 - Total Organic Carbon
 - *Giardia*
 - *Cryptosporidium*

Actions

Following the submittal of a complete application, the DEP will conduct a site visit to determine if a threat exists to a water supply. The DEP/Wetlands Program, local Board of Health, and local conservation commission will be invited to any field visit for a determination. After the field visit, DEP will send the applicant a determination letter with a copy to the local Board of Health, Massachusetts Division of Fisheries and Wildlife, and Massachusetts Department of Public Health. DEP will try to issue its determination within 5 business days from receipt of a complete application. If that determination identifies that a threat exists, the applicant may petition the local Board of Health for an emergency permit to abate the threat. The determination from DEP will require that the applicant notify DEP within a specified time period as to the actions completed and whether the threat was successfully eliminated. Proposals for the removal or breaching of dams, or other actions which will lower water levels must receive the approval of the local conservation commission within the City/Town that the proposed action will take place.

The emergency permit for trapping is for ten days during which trapping can be carried out and dams may be removed as allowed. There is authority by Fisheries and Wildlife for their Director to permit an extension for an additional 30 days.

Student Name: _____

Household Member Name: _____

Personal Water Use Chart

{ ----- To be filled in by student ----- }

Activity	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total Number of Times	Estimated Amount of Water Used (gallons)	Total Weekly Water Use (gallons)
Washing face or hands									1	
Taking a shower (standard shower head)									50	
Taking a shower (low flow shower head)									25	
Taking a bath									40	
Brushing teeth (water running)									2	
Brushing teeth (water turned off)									0.25	
Flushing the toilet (standard flow toilet)									5	
Flushing the toilet (low flow toilet)									1.5	
Shaving									2	
Getting a drink									0.25	
Cooking a meal									3	
Washing dishes by hand									10	
Running a dishwasher									15	
Doing a load of laundry									30	
Watering lawn									300	
Washing car									50	
Total Weekly Water Use by Household Member (gallons)										

The Water Cycle at Work

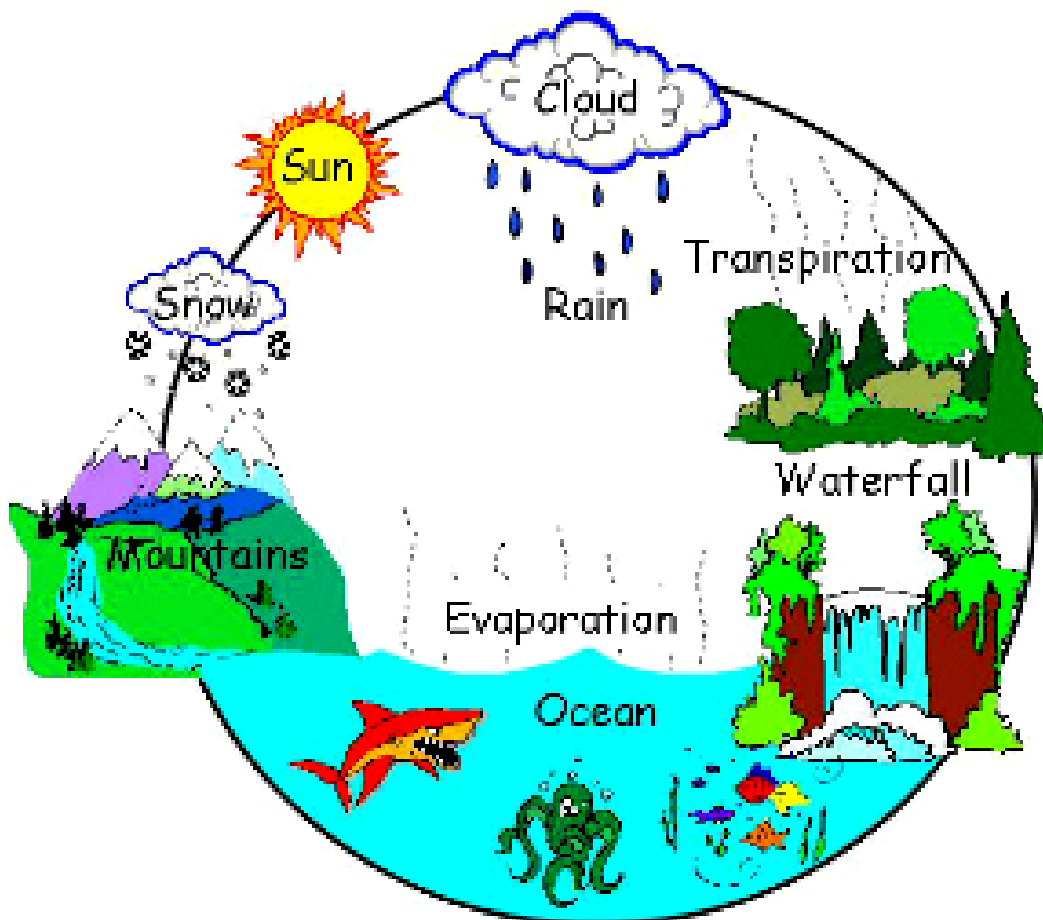
Water never stops moving.

Snow and rain fall to the earth from clouds.
The rain and melted snow
run downhill into rivers and lakes,
sometimes crashing over waterfalls.

Eventually, the water flows into the ocean.

During evaporation,
the water turns from liquid into gas,
and moves from oceans and lakes
into the atmosphere
where it forms clouds.

Then the cycle begins all over again.





How Much Water Do You Use?

DID YOU KNOW... that we all use water everyday in a variety of activities? Some activities use a little water, and some a lot. For example, every time you brush your teeth you use an average of 4 gallons of water... and watering your lawn for an hour can take up to 300 gallons!

(How much water is in a gallon...? Do you know those big plastic milk jugs? Those are a gallon. Imagine using 4 of those to brush your teeth with! Imagine pouring 300 of those on your yard!)

Here's how much water it takes to do some common everyday activities:

- Flushing the toilet = 5 gallons per flush
- Brushing your teeth = 4 gallons each time
- Taking a bath = 36 gallons each time
- Running the dishwasher = 15 gallons each time
- Washing your hands & face = 4 gallons each time
- Taking a shower = 25 gallons each time
- Washing a load of laundry = 45 gallons each time

Watering your lawn = 300 gallons each time

Blue Thumb Word Search

New Vocabulary Words:

water sources- bodies of water such as lakes, rivers, reservoirs, and underground aquifers from which we draw water for drinking.

aquifers- An underground, water-bearing layer of earth, porous rock, sand, or gravel, through which water can seep or be held in natural storage. Aquifers generally hold sufficient water to be used as a water supply.

treatment- a series of chemical and physical processes to remove dissolved and suspended solids from raw water to produce safe water to drink.

contaminate- to make unsafe for drinking.

pesticide- a chemical used to kill pests.

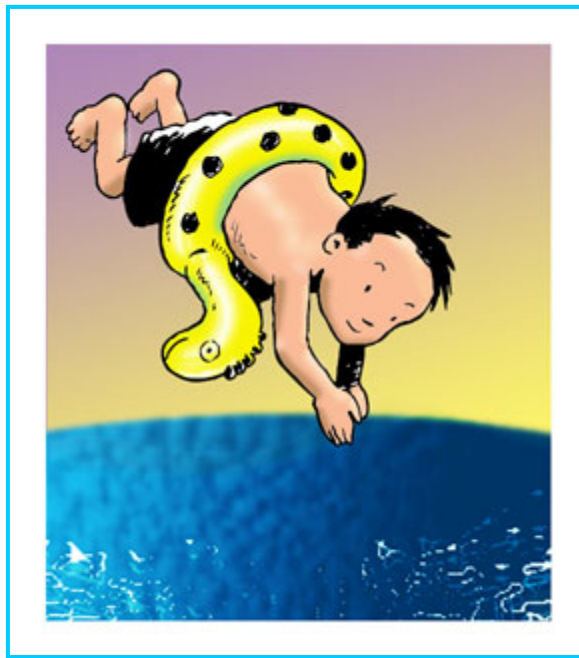
hazardous- dangerous or harmful

Most people in North America get their water from a **public water utility**. Public utilities are companies or government agencies that supply needs such as electricity, gas, or water to the public. Water utilities get their water from rivers, lakes, reservoirs, or underground aquifers. Often, the water must be treated to make it safe to drink.

We reuse the same water over and over and it can become polluted by people and industry. Even deep underground aquifers can be polluted from the surface. For example, many household items, such as car wax, spot remover, or floor polish, should not be poured down the drain or thrown out in the trash. Even lawn chemicals and other garden toxins used outdoors can contaminate water sources by running off the land into storm drains. And water can end up in lakes and rivers.

Let's take care of our water resources. Use your "Blue Thumb" to conserve water, protect it, and get involved.





Can You Find These Words?

(circle each one)

nature
 recycle
 treatment
 drink
 pesticide
 leaks
 toxic
 oil
 tap
 fertilizer
 batteries
 pollute
 paint
 contaminate
 protect
 gasoline
 hazardous
 wells
 water sources
 safe
 clean

W	E	L	L	S	D	M	P	Q	S	V	F
L	A	B	O	T	P	O	L	L	U	T	E
H	Z	T	R	E	A	T	M	E	N	T	R
C	P	A	E	R	I	C	B	C	U	E	T
O	Y	P	C	R	F	E	N	L	K	D	I
N	A	H	Y	J	S	T	M	E	H	I	L
T	E	A	C	P	Z	O	C	A	L	C	I
A	F	Z	L	K	T	R	U	N	T	I	Z
M	A	A	E	D	O	P	E	R	B	T	E
I	S	R	I	X	X	N	W	G	C	S	R
N	M	D	P	A	I	N	T	S	L	E	V
A	B	O	I	L	C	F	S	M	O	P	S
T	F	U	O	D	R	I	N	K	T	E	S
E	D	S	L	M	O	H	J	L	A	M	R
P	A	T	B	A	T	T	E	R	I	E	S
G	K	U	E	F	N	A	T	U	R	E	L

United States
Environmental Protection Office of Water EPA 810-F-95-001
Agency 4601 April 1995

WATER TRIVIA FACTS

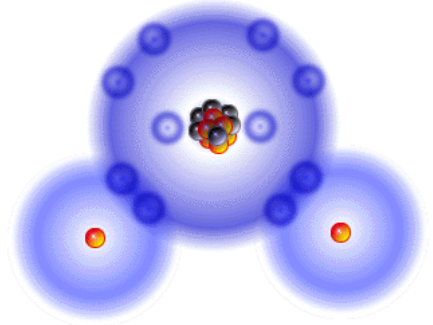
What is the most common substance found on earth?

Water - It is composed of two elements, Hydrogen and Oxygen.

2 Hydrogen + 1 Oxygen =

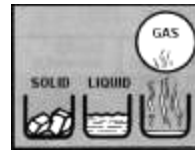


Water Molecule



Water is the only substance found on earth naturally in the three forms.

True (solid, liquid, and gas)



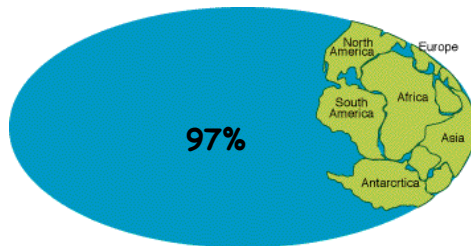
How much of the earth's surface is water?

80%



Of all the earth's water, how much is ocean or seas?

Nearly 97% of the world's water is salty or otherwise undrinkable.



www.mos.org/oceans/planet/

How much of the world's water is frozen and therefore unusable?

Another 2% is locked in ice caps and glaciers.



How much of the earth's water is suitable for drinking water?

Only 1% for all of humanity's needs — all its agricultural, residential, manufacturing, community, and personal needs.



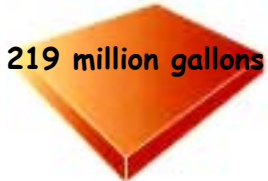
How much does one gallon of water weigh?

8.34 pounds



How many gallons of water would it take to cover one square mile with one foot of water?

219 million gallons



How much water is in one cubic foot?

7.48 gallons



How many gallons of water do you get per acre, when it rains one inch?



27,000 gallons per acre

At what temperature does water freeze?

32 degrees F, 0 degrees C



Water expands by 9% when it freezes. Frozen water (ice) is lighter than water, which is why ice floats in water.



At what temperature does water vaporize?

212 degree F, 100 degrees C

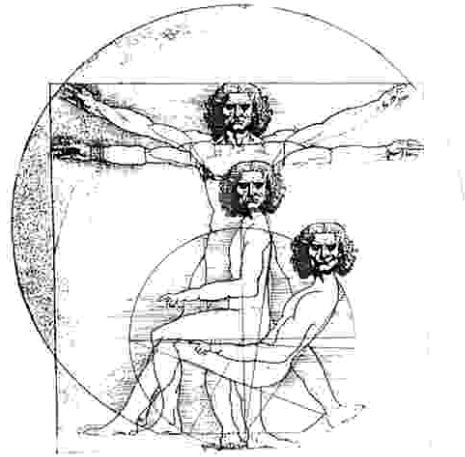


How much of the human body is water? **66%**

Water also regulates the temperature of the human body, carries nutrients and oxygen to cells, cushions joints, protects organs and tissues, and removes wastes.



75% of the human brain is water.



How long can a person live without food?

More than a month



How long can a person live without water?

Approximately one week, depending upon conditions.



How much water must a person consume per day to maintain health?



2.5 quarts from all sources (*i.e.*, water, food)



Does water regulate the earth's temperature?



Yes

Water regulates the Earth's temperature (it is a natural insulator).

How much water does a birch tree give off per day in evaporation?



70 gallons

75% of a living tree is water.

How much water does an acre of corn give off per day in evaporation? **4,000 gallons**



How much water does the average residence use during a year?

107,000 gallons

How much water does an individual use daily?



50 gallons

How much water is used to flush a toilet?

2-7 gallons



How much water is used in the average five-minute shower?



25-50 gallons

How much water is used to brush your teeth?

2 gallons



How much water is used on the average for an automatic dishwasher?

9-12 gallons



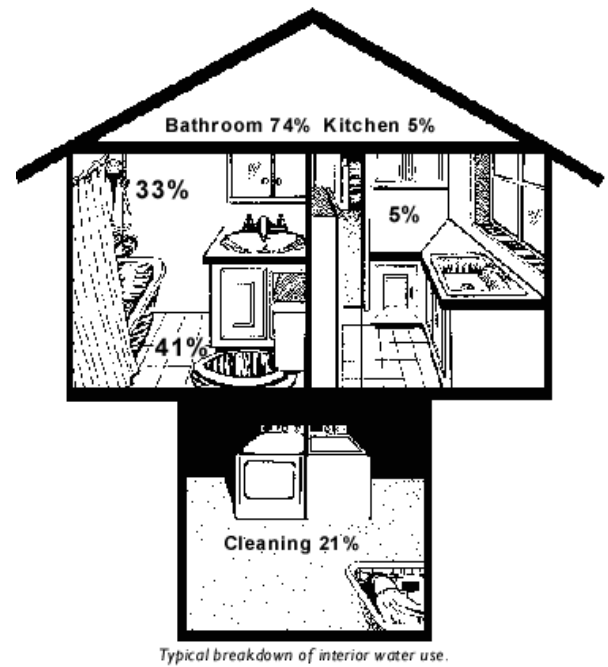
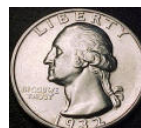
On the average, how much water is used to hand wash dishes?

20 gallons



What does a person pay for water on a daily basis?

National average is 25 cents



Typical breakdown of interior water use.

Is it possible for me to drink water that was part of the dinosaur era?



There is the same amount of water on Earth as there was when the Earth was formed. The water from your faucet could contain molecules that dinosaurs drank.

How much water does it take to process a quarter pound of hamburger?



Approximately one gallon.

How much water does it take to make four new tires?

2,072 gallons



What is the total amount of water used to manufacture a new car, including new tires?

39,090 gallons per car



How much water does it take to process one can of fruit or vegetables?

9.3 gallons



How much water does it take to make one board foot of lumber?

5.4 gallons



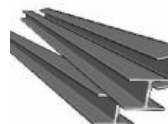
How much water does it take to refine one barrel of crude oil?

1,851 gallons



How much does it take to produce one ton of steel?

62,600 gallons



How much water does it take to process one ton of cane sugar to make processed sugar?

28,100 gallons



How many households use private wells for their water supply?

17,000,000 households



How many community public water systems are there in the United States?

56,000



What were the first water pipes made from in the US?



Fire charred bored logs

How many miles of pipeline and aqueducts are in the US and Canada?

**Approximately one million miles,
or enough to circle the earth 40 times**



How much water do these utilities process daily?



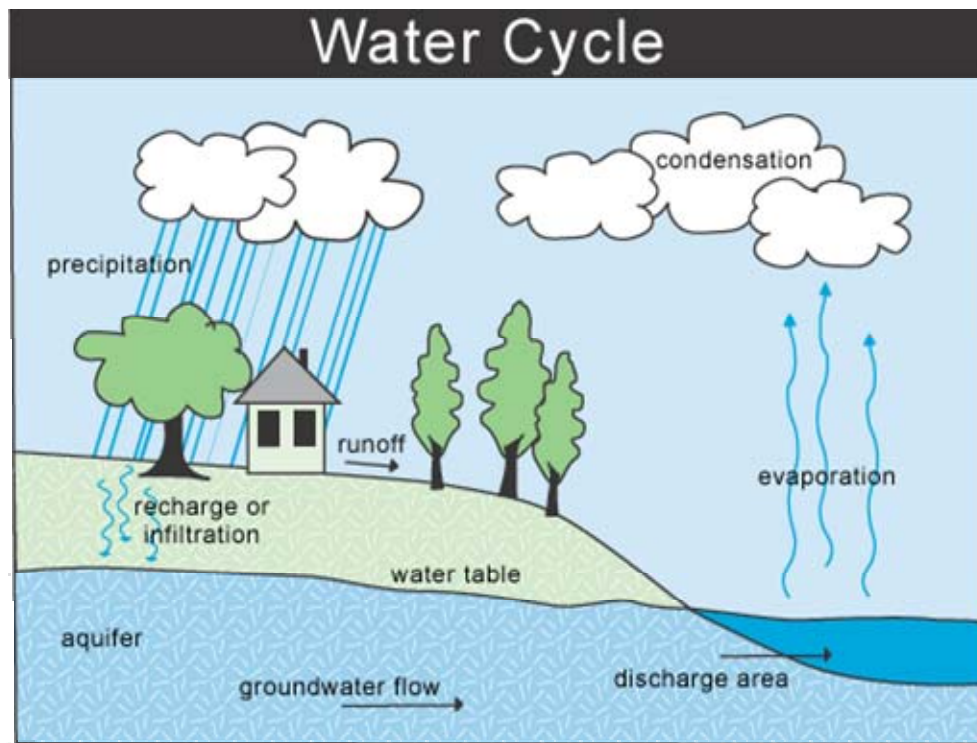
34 billion gallons

Water is part of a deeply interconnected system. What we pour on the ground ends up in our water, and what we spew into the sky ends up in our water.

If all community water systems had to be replaced, what would it cost?

In excess of \$175 billion





1. The process when water becomes a gas in the atmosphere is called _____.
2. The movement of water underground is called _____.
3. _____ is water that falls from clouds as rain or snow.
4. Water on the earth's surface which moves into a stream or lake without absorbing into the soil is called _____.
5. Groundwater is contained in layers of rock or sediment that is called a (an) _____.
6. _____ is the downward movement of water through the spaces of rock or soil; when surface water becomes groundwater.
7. The process when gas condenses to form clouds is called _____.
8. The top of the saturated zone is known as the _____.
9. The _____ is the area where groundwater enters a lake or stream.

(Answers on last page of handout.)

ANSWER KEY FOR WATER CYCLE FILL-IN

1. evaporation
2. groundwater flow
3. precipitation
4. runoff
5. aquifer
6. recharge or infiltration
7. condensation
8. water table
9. discharge area

testing might be warranted if your water has elevated nitrite/nitrate concentrations or significant amounts of pesticide have been applied near the well. These less-routine tests may not be performed at all state certified laboratories.

When To Test

DEP recommends that prospective homebuyers test the water in a home with a private well before purchase. Water quality in wells is generally stable, and if a change is going to occur, it occurs slowly. Thus the interval between water quality tests, once you've purchased the home, can generally be in terms of years (see chart) if a well is properly constructed and located in a safe area.

However, the following conditions would prompt more frequent testing:

- Heavily developed areas with land uses that handle hazardous chemicals.
- Recent well construction activities or repairs. DEP recommends taking a bacterial test after any well repair or pump or plumbing modification, but only after disinfection and substantial flushing of the water system.
- Contaminant concentrations above state or federal standards found in earlier testing.
- Noticeable variations in quality like a water quality change after a heavy rain, extended drought, or an unexplained change in a previously trouble-free well (i.e. funny taste, cloudy appearance, etc.).

When taking any sample, DEP recommends that it be taken after a heavy rainstorm. These events tend to highlight conditions of improper well construction or poor soil filtration.

What the Tests Tell You

Results will reveal the level at which any of the tested substances were found in your water sample. The mere presence of these contaminants in well water does not necessarily imply that there is a problem. However, when levels exceed state or federal health standards, you should take steps to correct the situation. Several methods are available from commercial contractors to treat contaminated water.

For More Information

As private wells in Massachusetts are regulated at the local level, you should first contact your local Board of Health for your town's private well testing requirements. For more information about private wells including additional water quality testing recommendations, you should refer to the *DEP Private Well Guidelines*, which are available on the Drinking Water Program's Publication web page. Other information such as the listing of state certified laboratories can also be accessed through the web page.

For additional assistance contact the DEP Drinking Water Program at:

**Massachusetts Department of
Environmental Protection Drinking Water Program**
1 Winter Street, 6th Floor
Boston, MA 02108
phone: 617-292-5770

www.mass.gov/dep

Protect Your Family

Test Your Well's Water Quality Today



A Guide to Water Quality Testing for Private Wells



Private Wells

If you have a private well, then water quality testing should be important to you and your family.

Some contaminants in drinking water have been linked to cancer and toxicity, posing a risk to human health. Many contaminants often have no taste, odor, or color. Their presence can only be determined by laboratory testing.

While there is no state requirement to have your well water tested (although there may be from your mortgage lender or local Board of Health), the Massachusetts Department of Environmental Protection (DEP) recommends that all homeowners with private wells do so, and use a state certified laboratory.

Contamination of Wells

Well water originates as rain and snow that then filters into the ground. As it soaks through the soil, the water can dissolve materials that are present on or in the ground, becoming contaminated.

Some contaminants are naturally occurring from features found in the rocks and soils of Massachusetts. These include substances like bacteria, radon, arsenic, uranium, and other minerals.

Other contaminants find their way onto the land from human activities. On a large scale, industrial/commercial activities, improper waste disposal, road salting, and fuel spills can introduce hazardous substances to the ground. However, even typical residential activities, such as the application of fertilizers and pesticides, fueling of lawn equipment, and disposal of household chemicals can contaminate

the ground when done improperly. Even an on-site residential septic system can pose a threat to your well. That is why taking measures to protect your well from contamination is so important.

Recommended Tests

The following tests provide only the most basic indicators of a well's water quality. These tests identify some of the common natural and man-made contaminants found in our state's well water. However, you should also consider nearby land uses to decide whether additional tests are appropriate for your well. *It is not necessary to do all of the tests at one time.*

💧 Standard Analysis

This basic analysis covers the most common contaminants. Some of these contaminants pose health-related concerns, while others only affect aesthetics (taste and odor).

💧 Radon

Radon can be a well water problem in Massachusetts, especially in bedrock wells. Presently, there are no federal or state standards for radon in drinking water, only suggested action levels. [Note: If Radon levels are elevated in your well water, you should also consider checking your indoor radon levels.]

💧 Gross Alpha Screen

Radioactive minerals, such as radium and uranium, may be dissolved in well water. A Gross Alpha Screen is a simple test to judge whether further testing for specific radioactive minerals such as radium or uranium might be needed.

Contaminants & Testing Frequency

Standard Analysis

Arsenic
Chloride
Copper
Fluoride
Hardness
Iron
Lead
Manganese
pH
Sodium

Testing Frequency

Monitor initially for all contaminants, and then at a minimum of once every ten years (except for bacteria and nitrate/nitrite which should be sampled yearly), or as otherwise required by the local Board of Health.

Coliform Bacteria
Nitrate/Nitrite
Radon
Gross Alpha Screen
(bedrock wells only)
VOCs

💧 Volatile Organic Compounds (VOCs)

The most common VOCs come from gasoline compounds (such as MtBE and benzene) and industrial solvents (such as TCE). MtBE can be found in well water even in remote areas.

💧 Additional Tests

Circumstances relative to your well may require additional testing not described here. For instance, DEP does not recommend frequent testing for things like pesticides, herbicides, or synthetic organic compounds, mainly because of the high cost. However, such (cont. over)