WELLHEAD PROTECTION PLAN

Happy Hollow Wells #1 and #2
Baldwin Pond Wells #1, #2, and #3
Chamberlain Well #1
Campbell Well #1
Meadowview Well #1

PWS ID Number 3315000

Wayland, Massachusetts
June 2011

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&
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ACKNOWLEDGEMENTS

Funding for this project was provided through a United States congressional appropriation to the National Rural Water Association and the Mass Rural Water Association (MassRWA) and was administered in cooperation with the United States Environmental Protection Agency (EPA). The Wellhead Protection Committee (WPC) and Bruce Young met numerous times to formulate this plan and articulate its water protection goals and risk management strategies.

The WPC wishes to acknowledge the contribution of Catherine Sarafinas, Massachusetts Department of Environmental Protection (MassDEP), Drinking Water Program, who provided information and guidance throughout the planning process. The WPC also wishes to acknowledge the work of Douglas DeNatale, AECOM, whose Capture Zone reports, maps and analyses were frequently relied upon and referred to in this plan. MassRWA and the WPC also wish to thank Brendan Decker, GIS Coordinator, and the other town staff members, volunteers and residents who provided input and assistance in the development of this plan.

WELLHEAD PROTECTION COMMITTEE (WPC)

The Wayland Wellhead Protection Committee (WPC) was established by the Board of Water Commissioners on November 1, 2007, with the mission to develop, maintain, and oversee the Wellhead Protection Plan and ensure that every effort is made to carry out its details. In furtherance of its mission the WPC shall encourage community discussion through public outreach and education; develop strategies needed to protect Wayland's water supplies in accordance with the Massachusetts Department of Environmental Protection's Source Water Assessment and Protection (SWAP) report and other pertinent information; advise the Board of Water Commissioners (successor Department of Public Works as of July 1, 2009) and make recommendations regarding wellhead protection issues; and support ongoing source protection efforts (Appendix A).

The WPC has accomplished many tasks related to its mission since its inception in 2007 (Appendix B). The WPC is dedicated to working with the Department of Public Works (DPW), other town entities, and the public in a manner that is transparent and inclusive in order to protect Wayland's water supplies.

The members of the WPC include:
Sherre Greenbaum-Chairperson
Jennifer Riley-Vice Chairperson
Linda Segal-Secretary
Tom Sciacca-Treasurer
Kurt Tramposch-Member

Research and Writing of the Wellhead Protection Plan:
Bruce Young, EPA Source Water Protection Specialist
Mass Rural Water Association (MassRWA)

INTRODUCTION

The Town of Wayland, population 13,886, is part of the Concord River Basin in eastern Massachusetts in Middlesex County. Wayland, considered a semi-rural community, covers approximately fifteen square miles and is located about twenty miles west of Boston. The residents of Wayland historically have been dedicated to protecting Wayland's character, open space and natural resources through education, outreach, volunteer boards and committees, and the passage of protective bylaws.

Massachusetts regulates municipal water supply usage in the context of watersheds, since municipal boundaries are meaningless to water and all flows within a watershed are interrelated. Wayland is located almost entirely (and its wells are entirely) in the Sudbury River watershed, which is a part of the Concord River Basin. The Sudbury and Assabet Rivers rise and separate in Westborough, rejoin in Concord to form the Concord River, and empty into the Merrimack River below Billerica. Municipalities all along the Sudbury, Concord, and Assabet Rivers (often called the SuAsCo system) withdraw potable water and discharge wastewater to the watershed. Each municipality depends on those upstream to not draw more than their fair share and to not pollute the rivers with untreated wastewater. Billerica, which draws its drinking water directly from the Concord River, has as much right to adequate clean water as Westborough (Figure 1).

To ensure that all towns receive an equitable allotment of water and the rivers do not dry up, MassDEP regulates the quantity of water withdrawn from both surface and groundwater supplies under the Water Management Act (WMA) (M.G.L. c. 21G). The WMA consists of a few key components, including a registration program and a permit program. MassDEP's goal under the WMA is to limit residential water usage to 65 gallons per person per day (RGPCD). At this level of usage, MassDEP has determined that there should be enough water for all, including the fish and wildlife which depend on the rivers.

BACKGROUND

There are eight active Public Water Systems spread throughout Wayland; all eight systems develop their drinking water from groundwater.

Water taken from the ground that has not undergone adequate natural filtration by the soil is referred to as groundwater under the influence of surface water. This water has the potential to contain large diameter pathogens commonly found in surface waters. Groundwater under the influence of surface water is not currently an issue for the Wayland Water System.

A Public Water System, as defined by the EPA, is "a system for the provision to the public of piped water for human consumption if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least sixty days out of the year." The EPA has defined three types of Public Water Systems:

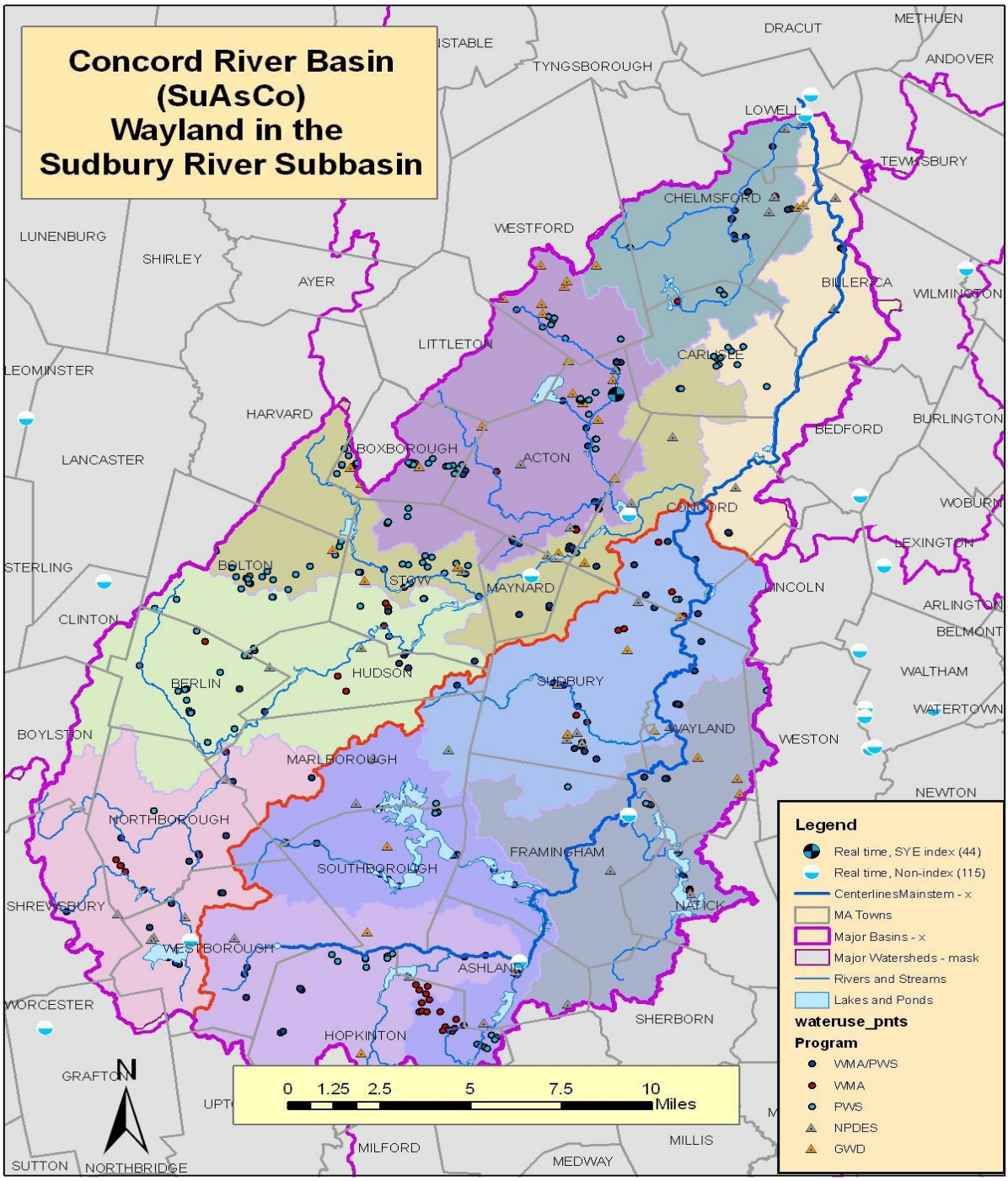
Concord River Basin
(SuAsCo)
Wayland in the
Sudbury River Subbasin
DRACUT
METHUEN
ANDOVER
TYNGSBOROUGH
LOWELL
TEWKSBURY
CHELMSFORD
WESTFORD
LUNENBURG
SHIRLEY
AYER
BILLERICA
WILMINGTON
LITTLETON
CARLISLE
LEOMINSTER
HARVARD
BURLINGTON
BEDFORD
LANCASTER
BOXBOROUGH
ACTON
CONCORD
WOBURN
LEXINGTON
STERLING
BOLTON
STOW
MAYNARD
LINCOLN
ARLINGTON
CLINTON
BELMONT
HUDSON
WALTHAM
BERLIN
SUDBURY
WATERTOWN
BOYLSTON
WAYLAND
WESTON
MARLBOROUGH
NEWTON
NORTHBOROUGH
FRAMINGHAM
SOUTHBOROUGH
SHREWSBURY
NATICK
WESTBOROUGH
ASHLAND
WORCESTER
SHERBORN
HOPKINTON
GRAFTON
MILFORD
MILLIS
MEDWAY
SUTTON
NORTHBRIDGE
N
0 1.25 2.5 5 7.5 10
Miles
Legend
Real time, SYE index (44)
Real time, Non-index (115)
CenterlinesMainstem - x
MA Towns
Major Basins - x
Major Watersheds - mask
Rivers and Streams
Lakes and Ponds
wateruse_pnts
Program
WMA/PWS
WMA
PWS
NPDES
GWD

Figure 1

- Community Water System (CWS): A Public Water System that supplies water to the same population year-round.
- Non-Transient Non-Community Water System (NTNC): A Public Water System that regularly supplies water to at least twenty-five of the same people at least six months per year, but not year-round. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.
- Transient Non-Community Water System (TNC): A Public Water System that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

All eight of the Public Water Systems in Wayland are classified as CWSs. Together these systems supply potable water to approximately 13,886 individuals through approximately 4,993 service connections. Of the eight wells, the water from three wells is treated at the Baldwin Pond Water Treatment Facility; the Meadowview Well is offline due to high concentrations of iron and manganese; and the other four groundwater wells pump directly to the water distribution system.

To help protect Public Water Systems, such as the eight wells in Wayland, the Federal Safe Drinking Water Act Amendments of 1996 (SDWA) require each state to implement a Source Water Assessment Program (SWAP). This state program emphasizes a comprehensive multi-barrier approach to source water protection. All six New England states began carrying out EPA-approved programs in 1990.

As part of the Massachusetts program, MassDEP has issued Source Water Assessment and Protection (SWAP) Reports for communities and water suppliers which identify certain land uses within water supply protection areas which may be potential sources of contamination. Source water assessments help characterize the susceptibility of public drinking water sources to contamination by summarizing information about the activities and land uses within recharge areas. On the local level, MassDEP recommends that a community develop a Wellhead Protection Plan (WPP) as a strategy to protect drinking water by managing the land areas that replenish the water supply. Although a WPP is not required by the state, local protection planning is an integral component of many programs within the Drinking Water Program.

Pursuant to the MassDEP Drinking Water Regulations (310 CMR 22.00), Wellhead Protection Areas are delineated into Zone I Wellhead Protection Areas (Zone I) and, either Zone II Wellhead Protection Areas (Zone II) or Interim Wellhead Protection Areas (IWPA). The initial buffer around a Public Water System is classified as the Zone I, which is defined as a fixed protective radius around a public water supply well or wellfield. The default Zone I radius is four hundred (400) feet for CWS wells, and is one hundred (100) feet for Non-Community Water System wells. Zone IIs are defined as "that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated (180 days of pumping at safe yield, with no recharge from precipitation)."

Zone II delineations require land use, topographic, hydrologic, hydrogeologic and stratographic analyses to be approved in Massachusetts. Wells that do not have approved

Zone II delineations are protected by IWPAs. IWPAs require a minimum buffer of 400 feet and extend to a maximum buffer of 2,640 feet; the buffer is directly proportional to the approved pumping rate of the well.

All eight of the Public Water Systems in Wayland have delineated Zone I wellhead protection areas of 400 feet and varying sized Zone II delineations. The MassDEP-approved Zone IIs, approximately 59% of all land in Wayland, comprise the town's Aquifer Protection District (APD) (Figure 2).

In 2008 the former Board of Water Commissioners upon the WPC's recommendation hired Earth Tech AECOM to further delineate Wayland's Wellhead Protection Areas at the five wellsites to include Capture Zones in a Phase I Report (Appendix C). The Wayland Capture Zones are defined as the aquifer volume through which groundwater flows that contribute water to the recovery of the well system during normal pumping conditions. Groundwater found in the Capture Zone will eventually be "captured" and pumped out of the ground at the well.

A Capture Zone includes the Zone I and is typically within the Zone II delineation area. Capture Zones comprise approximately 12% of all land in Wayland.

Due to a number of activities in the Capture Zone of the Happy Hollow Wells, which were determined to cumulatively threaten to degrade the quality of the water, additional studies were then recommended to define the Capture Zone of these wells with more precision and to evaluate potential sources of well contamination in detail. In 2009 and 2010, investigation by AECOM was undertaken which consisted of the installation of monitoring wells and well points, a seven-day pumping test conducted with the assistance of the DPW Water Division, an evaluation of hydrogeologic data, and approximating the Capture Zone under quasi-steady-state. The final Phase II Report was issued in July 2010 (Appendix D).

PURPOSE

Historically, Wayland enjoyed very high water quality, which over time came to be taken for granted. This has not been a cost-effective approach; in recent years, threats to water quality and supply have led to the need for expensive treatment measures. This is a clear case in which an ounce of prevention is worth a pound of cure.

Despite best efforts to protect the environment, accidental spills of hazardous chemicals and bacterial outbreaks can occur unexpectedly, sometimes with dangerous consequences. These types of events may result in costly treatment, remediation and/or litigation, and in worst-case scenarios, could permanently destroy a water source or seriously harm a water customer.

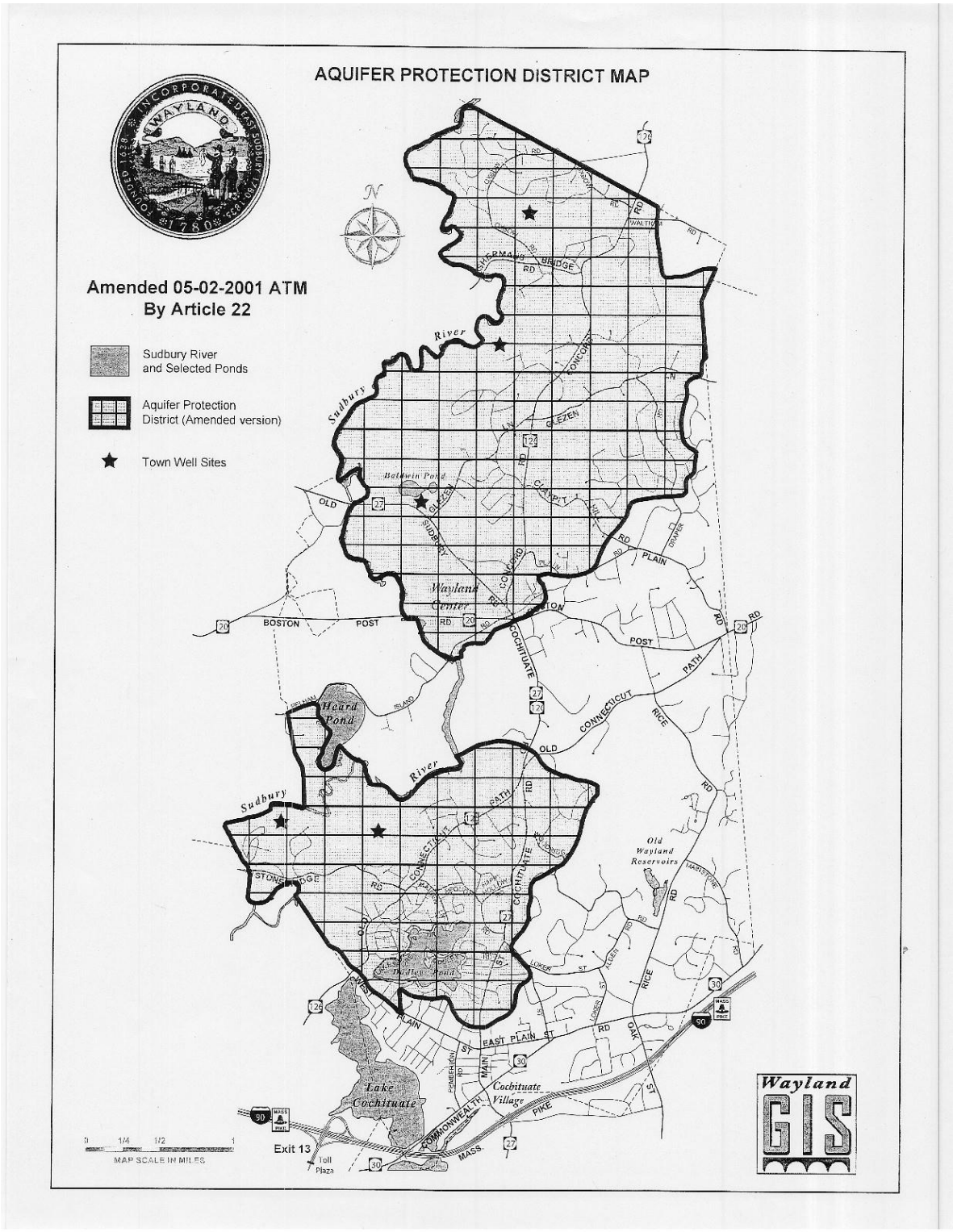
AQUIFER PROTECTION DISTRICT MAP
WAYLAND
INCORPORATED EAST SUDBURY 1638 FOUNDED 1780
Amended 05-02-2001 ATM
By Article 22
Sudbury River and Selected Ponds
Aquifer Protection District (Amended version)
Town Well Sites
Sudbury River
Heard Pond
Wayland Center
Baldwin Pond
Lake Cochituate
Cochituate Village
Old Wayland Reservoirs
Exit 13 Toll Plaza
MAP SCALE IN MILES
Wayland GIS

Figure 2

Public water suppliers around the Commonwealth 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 the limitation of their costs and liabilities.

Wellhead protection planning can provide numerous benefits including reducing the likelihood that contamination incidents will occur with costly and/or potentially harmful results; increasing consumer confidence; solidifying relationships among regulatory agencies, employees and the public; providing strong support to requests for financial assistance; and enhancing real estate values. Actions taken by water system managers, landowners, and the community eventually become the key to achieving comprehensive wellhead protection.

The purpose of the WPP is to identify potential sources of contamination within the Wellhead Protection Areas, including water system vulnerabilities not already identified in MassDEP's SWAP Report (2002) (Appendix E), and to provide specific management strategies in order to protect and maintain quality drinking water. It is a working document that is intended to be reviewed annually by the WPC and updated every three years to remain current, active, and viable. (See Implementation Chart.)

The Wayland WPP builds on the SWAP Report, MassDEP Water Withdrawal Permit (2003), Executive Office of Environmental Affairs (EOEA) and Water Resources Commission Water Conservation Standards (2006) (See Resources Section), MassDEP Public Water Supply Annual Statistical Reports (2004-2009), Annual Water Quality Reports (Consumer Confidence Reports) (1999-2010), WMA, MassDEP regulations, MassDEP directives and guidelines, Capture Zone Analyses Phase I and Phase II Reports (Appendices C and D), *The Groundwater Resources of Wayland, Massachusetts* by Richard Fortin (1981), and other land use reports, maps and information for Wayland. (See Resources Section.)

While focusing on protection of our drinking water, the strong connection between water usage levels and water quality must not be overlooked or underestimated.

Wells at Baldwin Pond have been in use since the late 1920's, but it is only in recent years that heavy use has drawn so much iron and manganese into the wells that an ultra filtration treatment plant needed to be built to filter out these contaminants (see page 42). Excessive pumping of groundwater over time can also increase the concentration of other naturally occurring compounds in the aquifers. This process may have contributed to the elevated sodium concentrations being detected in the Happy Hollow Wells (see page 24).

Water quality can be improved by conserving water, particularly water used for landscaping and irrigation. Lawn irrigation is by far the most important reason for the near doubling of Wayland's peak water use in the summer. Excessive lawn watering does not just waste water and contribute to potential contamination by naturally-occurring compounds, it also alters the grass plant ecosystem, requiring more fertilizer, herbicides, and pesticides. The water runoff from irrigation, which contains these and other contaminants, can then enter the water supply.

Because of Wayland's virtually complete reliance on individual septic systems, water conservation is also linked to prevention of well contamination by septage. Lower use of

water allows waste to spend more time in the septic tank and decompose more fully before being discharged to the ground through the leaching field. This becomes even more important where septic systems are substandard, failing or poorly maintained.

It should be noted that the recommendations regarding conservation education and outreach within this plan (see Management Strategies for each wellsite) are not presented as simply a good idea, but are necessary to maintain Wayland's right to withdraw water from the aquifer. As noted above, MassDEP authorizes the withdrawal of a volume of water under the WMA, which in Wayland's case is 1.77 million gallons per day (MGD). The WMA permit, which allows Wayland to continue to operate its wells, is scheduled for review and renewal in 2011. The town has been exceeding MassDEP's goal of 65 RGPCD for many years, but has been making progress toward reducing residential usage (Appendix F).

Water conservation is an essential component of a comprehensive effort to ensure that there will be sufficient water available now and in the future to meet the needs of humans as well as natural communities. By addressing the link between water conservation and water quality, the town can comply with the requirements of the WMA and the MassDEP Drinking Water Regulations (310 CMR 22.00) as well as protect the integrity of its water resources and decrease the costs of providing clean and safe drinking water.

The responsibility for ensuring a sustainable water future lies with the community as a whole; everyone has a role to play to make sure that all water (rainwater, stormwater, public water supply, etc.) is treated responsibly and planned for properly (Appendix G).

SOURCE WATER PROTECTION IN WAYLAND

In Wayland the residents live on top of their drinking water. The dedicated staffs of town departments, progressive members of town boards and committees, and involved residents have worked diligently over the years to protect the town's natural aquatic resources, the sole source of Wayland's drinking water.

Some of the existing source water and natural resource protection measures to ensure a sustainable future for the residents include:

- The private and public efforts to protect the meadows and marshes along the ten-mile stretch of the Sudbury River in Wayland. The Sudbury River was designated a Wild and Scenic River by the Federal Government in 1999 and is part of the Great Meadows National Wildlife Refuge (see Figure 8 on page 18).
- The relatively early (1961) adoption of the Conservation Commission (ConCom), which devotes much of its time to protecting the quality and quantity of surface and groundwater, preventing flooding and protecting wetland dependent wildlife and habitat through the Massachusetts Wetlands Protection Act and the Wayland Wetlands and Water Resources Protection Bylaw (Code of the Town of Wayland, Chapter 194). The ConCom today manages sixteen town-owned conservation areas totaling 739 acres and co-manages several other parcels with the Sudbury

Valley Trustees (SVT). About twenty percent of the town's area has been secured as protected open space through these efforts.

- The passage of the Stormwater and Land Disturbance Bylaw in 2008 to protect the quantity and quality of water recharge to the town's water supply aquifers, protect cold water fisheries, and to protect streams, rivers and private property from flood damage and changed flow patterns (Code of the Town of Wayland, Chapter 193).
- The passage of other zoning protections in the Code of the Town of Wayland including an Aquifer Protection District (Chapter 198, Article 16); Floodplain, Federal Flood Protection, and Watershed Protection Districts (Chapter 198, Article 17); Conservation Cluster Development District (Chapter 198, Article 18); lawn irrigation systems regulation (Chapter 191); and a declaration of a state of water supply conservation and restricted uses (Chapter 190).
- The adoption of an Emergency Response Plan (ERP) for our drinking water system in compliance with federal and state requirements.

Despite the above-mentioned source water protection accomplishments, it is noted that MassDEP notified the PWS in 2003 and advised the WPC in 2010 that the wellhead protection conditions of the Water Withdrawal Permit required the town to fully comply with the Drinking Water Regulations, which included amending its APD bylaw as well as adopting a non-zoning floor drain control. The requisite amendments to the APD bylaw were passed at town meetings in 2010 through warrant articles co-sponsored by the WPC. However, compliance with the floor drain control requirement of 310 CMR 22.21(2) has not been achieved. *For further discussion of this topic see page 44.*

TOWN OF WAYLAND WATER SYSTEM

The Town of Wayland water system utilizes eight groundwater supply sources (wells). The wells are classified by the state as being located in the Concord River Basin near the Sudbury River (see page 5) and include Happy Hollow Well**s** #1 and #2 (Figure 3); Baldwin Pond Well**s** #1, #2 and #3 (Figure 4); Chamberlain Well (Figure 5); Campbell Well (Figure 6); and Meadowview Well (Figure 3).

The system that distributes water from these eight groundwater supply sources is comprised of approximately 101 miles of water main pipes with diameters ranging from four to sixteen inches. The water mains are constructed of various materials including unlined and cement lined cast iron, asbestos cement and ductile iron.

The distribution system includes 755 fire hydrants throughout the town as well as two water storage facilities and a booster pump station located on Reeves Hill. Water is pumped to the storage tanks from the individual wells. Water Storage Tank #1 is a 0.5 million gallon riveted steel reservoir with a diameter of 76.5 feet. This tank was constructed in 1927, and the interior was rehabilitated in 2004. Water Storage Tank #2 is a 2.0 million gallon precast concrete structure constructed in 1958 with a diameter of 150

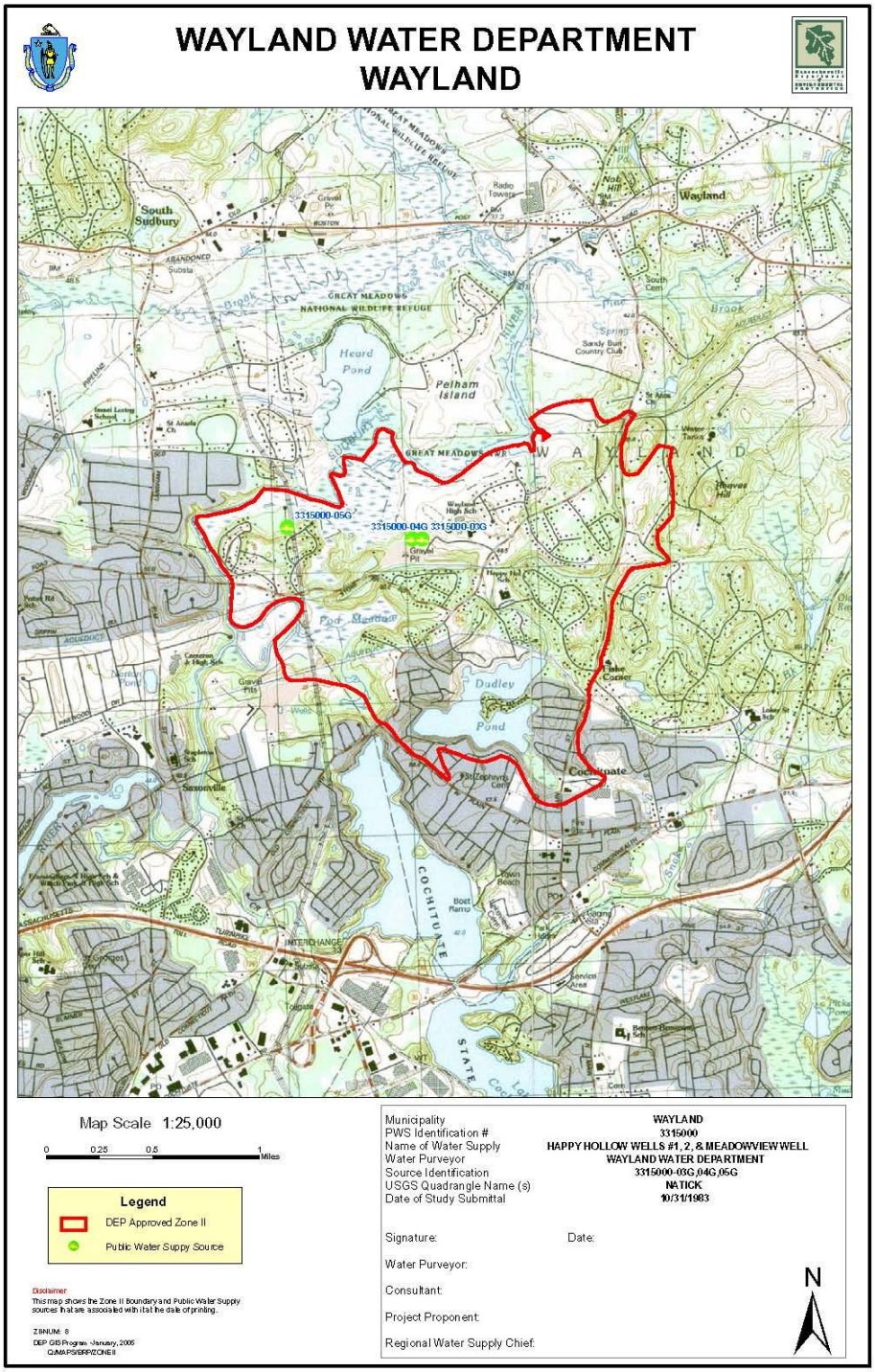
WAYLAND WATER DEPARTMENT
WAYLAND
South Sudbury
Wayland
GREAT MEADOWS NATIONAL WILDLIFE REFUGE
Heard Pond
Pelham Island
Sandy Dun Country Club
GREAT MEADOWS W.R.
W A Y L A N D
3315000-05G
3315000-04G
3315000-03G
Dudley Pond
Cochituate
Sassonville
COCHITUATE
INTERCHANGE
STATE
Map Scale 1:25,000
0 0.25 0.5 1 Miles
Legend
DEP Approved Zone II
Public Water Suppy Source
Disclaimer
This map shows the Zone II Boundary and Public Water Supply sources that are associated with it at the date of printing.
ZBNUM: 8
DEP GIS Program -January, 2005
G:\MAPS\ERP\ZONEII
Municipality WAYLAND
PWS Identification # 3315000
Name of Water Supply HAPPY HOLLOW WELLS #1, 2, & MEADOWVIEW WELL
Water Purveyor WAYLAND WATER DEPARTMENT
Source Identification 3315000-03G,04G,05G
USGS Quadrangle Name (s) NATICK
Date of Study Submittal 10/31/1983
Signature:
Date:
Water Purveyor:
Consultant:
Project Proponent:
Regional Water Supply Chief:
N

Figure 3

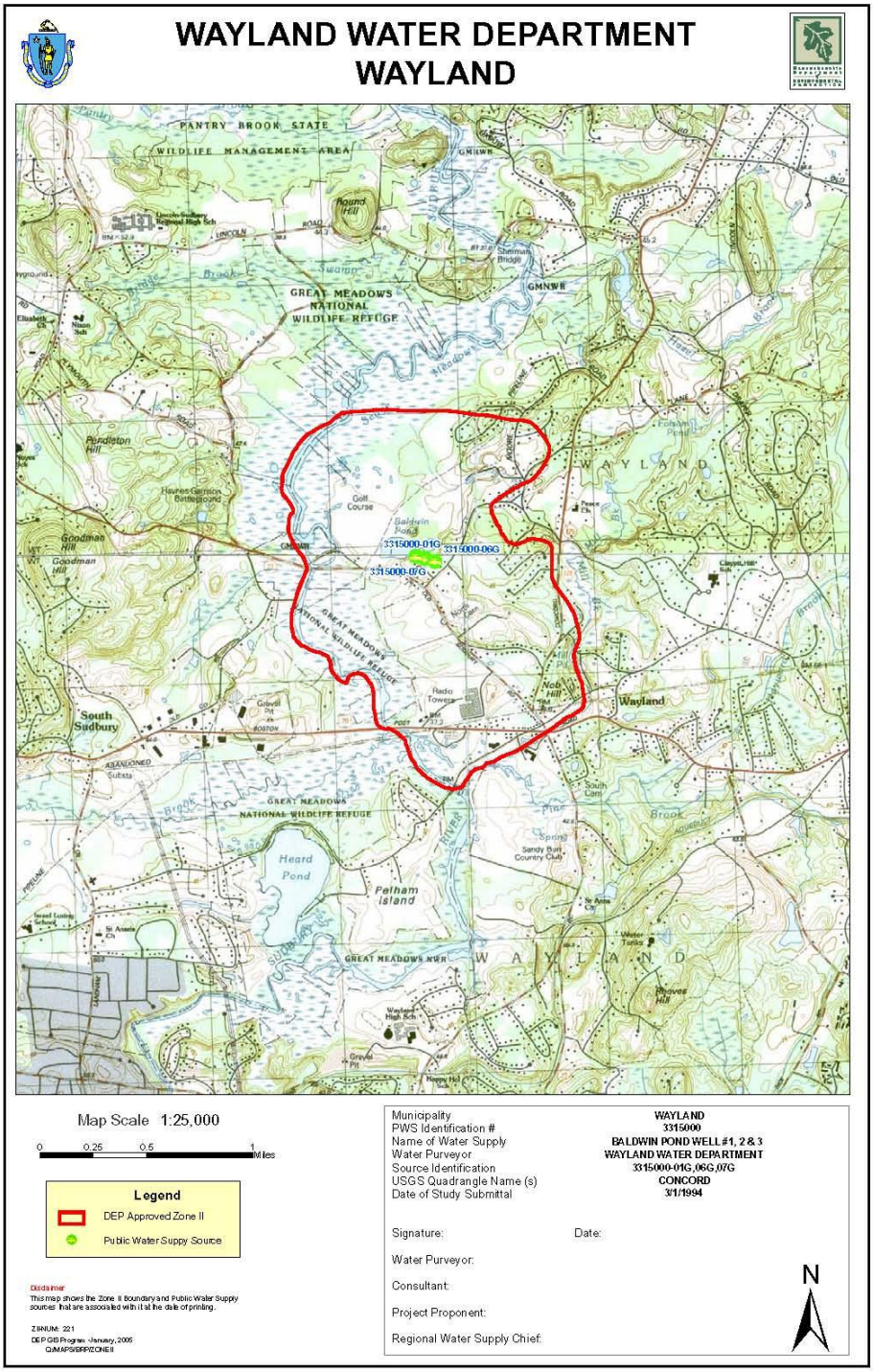
WAYLAND WATER DEPARTMENT
WAYLAND
PANTRY BROOK STATE
WILDLIFE MANAGEMENT AREA
GREAT MEADOWS
NATIONAL
WILDLIFE REFUGE
GMNWR
Round Hill
Pendleton Hill
Goodman Hill
Golf Course
Baldwin Pond
3315000-01G
3315000-06G
3315000-07G
Nob Hill
Wayland
South Sudbury
Heard Pond
Pelham Island
GREAT MEADOWS NWR
Map Scale 1:25,000
0 0.25 0.5 1 Miles
Legend
DEP Approved Zone II
Public Water Suppy Source
Disclaimer
This map shows the Zone II Boundary and Public Water Supply sources that are associated with it at the date of printing.
ZINUM: 221
DEP GIS Program - January, 2005
Q:\MAPS\ERP\ZONEII
Municipality WAYLAND
PWS Identification # 3315000
Name of Water Supply BALDWIN POND WELL #1, 2 & 3
Water Purveyor WAYLAND WATER DEPARTMENT
Source Identification 3315000-01G,06G,07G
USGS Quadrangle Name (s) CONCORD
Date of Study Submittal 3/1/1994
Signature: Date:
Water Purveyor:
Consultant:
Project Proponent:
Regional Water Supply Chief:
N

Figure 4

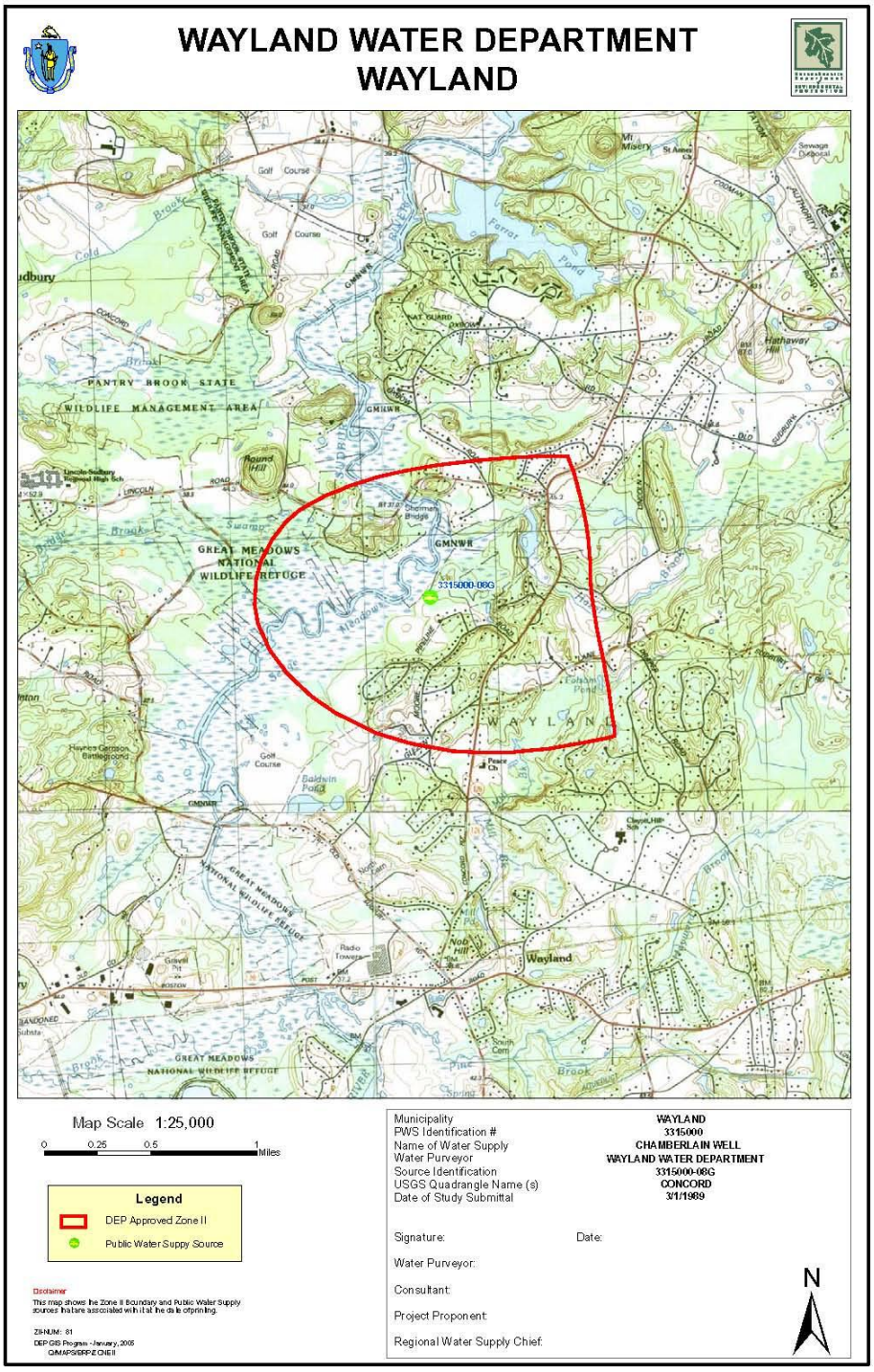
WAYLAND WATER DEPARTMENT
WAYLAND
PANTRY BROOK STATE
WILDLIFE MANAGEMENT AREA
GREAT MEADOWS
NATIONAL
WILDLIFE REFUGE
GMNWR
3315000-08G
WAYLAND
Wayland
Map Scale 1:25,000
0 0.25 0.5 1 Miles
Legend
DEP Approved Zone II
Public Water Suppy Source
Disclaimer
This map shows the Zone II boundary and Public Water Supply sources that are associated with it at the date of printing.
ZBNUM: 81
DEPGIS Program - January, 2005
Q:\MAPS\DRP\ZONEII
Municipality WAYLAND
PWS Identification # 3315000
Name of Water Supply CHAMBERLAIN WELL
Water Purveyor WAYLAND WATER DEPARTMENT
Source Identification 3315000-08G
USGS Quadrangle Name (s) CONCORD
Date of Study Submittal 3/1/1989
Signature: Date:
Water Purveyor:
Consultant:
Project Proponent:
Regional Water Supply Chief:
N

Figure 5

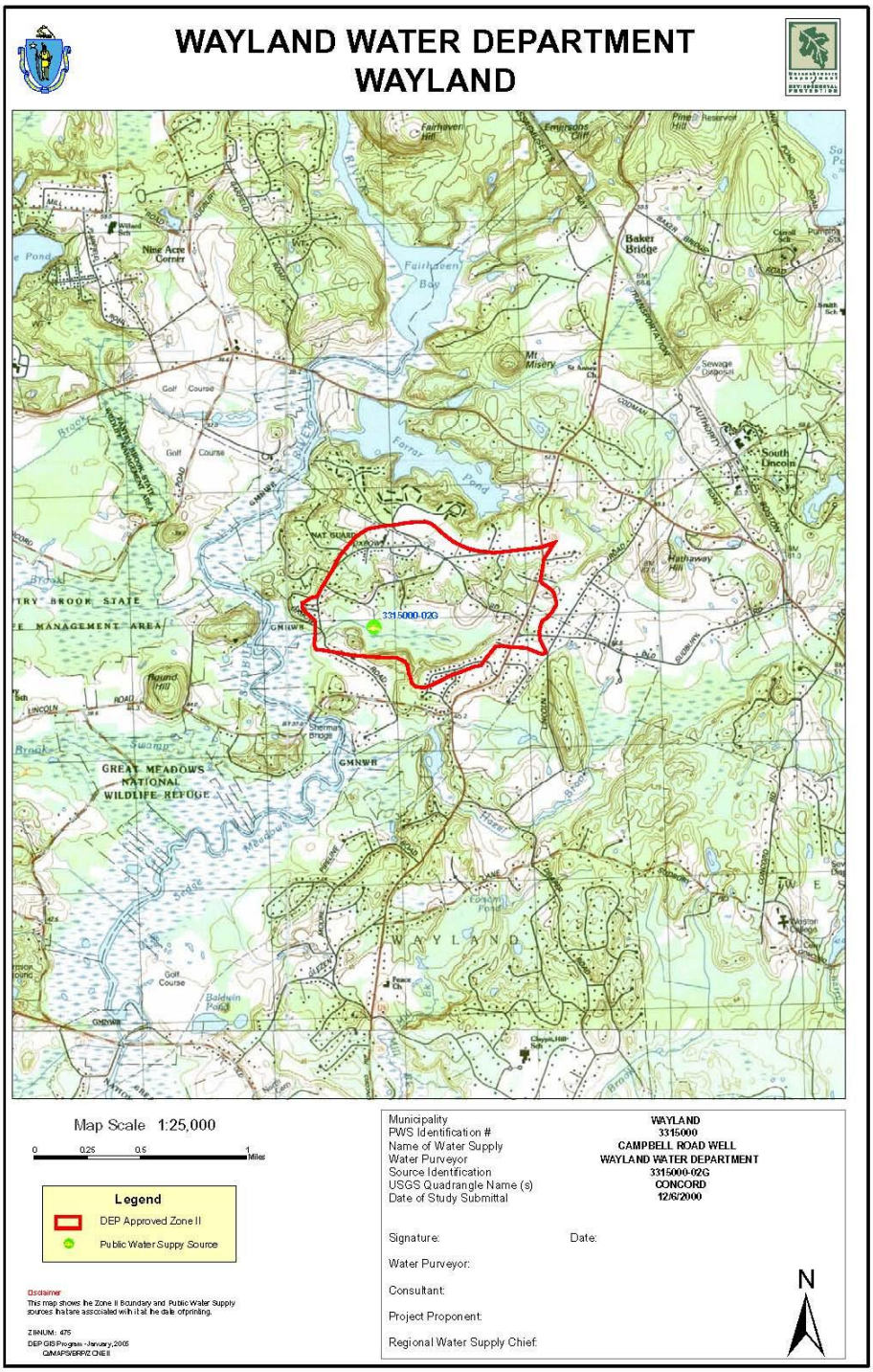
WAYLAND WATER DEPARTMENT
WAYLAND
Fairhaven Hill
Emersons Cliff
Pine Hill
Reservoir
Nine Acre Corner
Fairhaven Bay
Baker Bridge
Mt Misery
Golf Course
Sewage Disposal
Forror Pond
South Lincoln
Hathaway Hill
3315000-02G
GMNWR
Round Hill
Sherman Bridge
GREAT MEADOWS NATIONAL WILDLIFE REFUGE
WAYLAND
Baldwin Pond
Map Scale 1:25,000
0 0.25 0.5 1 Miles
Legend
DEP Approved Zone II
Public Water Suppy Source
Disclaimer
This map shows the Zone II Boundary and Public Water Supply sources that are associated with it at the date of printing.
ZIINUM: 475
DEP GIS Program - January, 2005
G:\MAPS\ERP\ZONEII
Municipality WAYLAND
PWS Identification # 3315000
Name of Water Supply CAMPBELL ROAD WELL
Water Purveyor WAYLAND WATER DEPARTMENT
Source Identification 3315000-02G
USGS Quadrangle Name (s) CONCORD
Date of Study Submittal 12/6/2000
Signature: Date:
Water Purveyor:
Consultant:
Project Proponent:
Regional Water Supply Chief:
N

Figure 6

feet (Figure 7). The overflow elevation of both tanks is 359 feet. MassDEP has approved the DPW Director's plan to demolish the smaller tank based on the town consultant's statement that the larger tank will be capable of maintaining both pressure and fire flows.

Figure 7

The water system has two emergency interconnections with the Town of Weston and one emergency interconnection with the Town of Lincoln.

According to the 2009 Annual Report for the Town of Wayland, the DPW Water Division, which is committed to providing water customers with high quality drinking water that meets or surpasses state and federal standards for water quality and safety, collected over 1,100 water samples, all of which complied with Federal and State Drinking Water Standards and the SDWA.

The town addressed water quality demands in 2009 by building a 1.5 million gallon per day (MGD) water treatment facility adjacent to Baldwin Pond to treat raw water from the three water supply wells situated onsite. The town's capital investment of approximately 11 million dollars in this facility helped to ensure that the town could remain self-sustaining rather than dependent upon the Massachusetts Water Resource Authority (MWRA) for its water supply. The treatment facility utilizes ozone oxidation and ultra filtration to remove iron and manganese from the blended raw water. Although other constituents are also removed through this process, the primary purpose of this plant is to optimize the removal of iron and manganese for essentially aesthetic considerations.

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

The water stored in the cracks and openings of subsurface rock or soil material is groundwater. Groundwater is one of the Earth's most critical natural resources. The term aquifer is used to describe an underground rock or soil formation that stores and transmits groundwater. Aquifers can occur at various depths and are essential to our water needs. Groundwater stored in aquifers can become contaminated by both liquids and solids flushed into wetlands, streams and rivers, or flushed downward through soils by rain and snowmelt.

Common sources of groundwater contamination are leaking underground storage tanks (USTs), household hazardous chemicals, stormwater runoff, deicing agents, leaking or

malfunctioning septic systems, leaking fuel tanks and/or spills from fluid transfers, and hazardous waste spills during transport or disposal.

Recent studies are generating a growing concern over pharmaceuticals and personal care products (PPCPs) entering water supplies. PPCPs include human and veterinary drugs (prescription and over-the-counter) and consumer products, such as cosmetics, fragrances, lotions, sunscreens, and house cleaning products. Over the past five years, the number of U.S. prescriptions increased 12 per cent to a record 3.7 billion, while nonprescription drug purchases held steady around 3.3 billion. Many of these drugs and personal care products do not biodegrade and may persist in the environment for years.

The EPA regulates Public Water Systems for contaminants including microbes, radionuclides, inorganic compounds, volatile organic compounds (VOCs), synthetic organic compounds (SOCs), disinfectants and disinfection byproducts. The sources of these drinking water contaminants range from human and animal fecal waste to industrial fertilizers to simple household cleaners. Small releases of these sources of contamination can appear to be insignificant and harmless, but cumulatively, over time, these sources pose a serious risk to the quality of our drinking water sources.

The MassDEP's SWAP Program identified the top five potential sources of contamination to public water sources in Massachusetts as: 1) residential lawn care/gardening; 2) residential septic systems and cesspools; 3) residential fuel oil storage; 4) stormwater discharge; and 5) state-regulated underground storage tanks (USTs).

This WPP utilizes information from the 2002 MassDEP SWAP Report and additional information gathered by the WPC during the wellhead protection planning process to identify potential sources of contamination located within the Zone I, Capture Zone and Zone II of Wayland's Public Water Sources. The plan provides strategies to reduce immediate threats as well as proactive strategies for future protection through education and outreach to ensure long-term source water sustainability.

Figure 8 photo by Judith Canty Graves

The historic Old Town Bridge on the Sudbury River in Wayland, site of the 2010 educational RiverFest Event sponsored by the WPC (Appendix B).

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

	Happy Hollow	Baldwin Pond	Chamberlain	Campbell	Meadowvie
Residential septic systems	x	x	x	x	x
Household hazardous waste	x	x	x	x	x
Residential activities	x	x	x	x	x
Residential USTs	x	x	x	x	x
Transformers	x	x	x	x	x
Stormwater basins	x	x	x	x	x
Transportation corridors	x	x	x		
Sand pit	x				
Artificial turf field	x				
WHS complex	x				
Town pool	x				
Commercial/industrial businesses		x			
Cemeteries		x			
Golf course		x			
Beavers		x		x	
Trail		x	x	x	
Agricultural uses		x	x	x	
Chemical deliveries			x		
Natural gas pipeline			x		

HAPPY HOLLOW WELLS #1 AND #2

CONTAMINATION RISK

The WPC considers the Happy Hollow Wells the highest potential contamination risk in Wayland. This is based on an apparent pattern of increasing sodium levels in the Happy Hollow Wells; a number of activities and other factors in the Happy Hollow Zone I and Capture Zone which cumulatively threaten to degrade the quality of the well water; geologic conditions described in the Phase I (Appendix C) and Phase II (Appendix D) Capture Zone Reports; and the EarthTech AECOM analyses.

It is noted that the Phase I study identified sandy and gravel soils and the lack of a significant overlying layer of fine-grained soils, so that the flow of groundwater is not restricted vertically by a "confining layer" of clay or fine-grained soil. Further analysis in Phase II concluded that the aquifer supplying the Happy Hollow Wells is geologically complex. It revealed a thick layer of clay immediately to the north of the wells which serves to channel groundwater flow from the east (the direction of the densely populated neighborhoods), and from the south (the direction of the sand or gravel pit) towards the wells. Since the issuance of the Phase II Report in July 2010, the protective vegetative layer covering the sand pit, which ordinarily serves to filter and biodegrade many contaminants**,** was essentially removed during excavation work in the Zone I (see Figures 11 and 12 on page 27).

SYSTEM DESCRIPTION

The Wayland High School complex is located adjacent to the Happy Hollow Wells #1 and #2 in the southwestern section of the distribution system off Old Connecticut Path (Route 126) (Figures 3 and 9). The two wells are approximately 200 feet apart and are connected to the distribution system through a 12-inch diameter water main.

Well #1 is a 24-inch by 48-inch gravel packed well that is approximately 42 feet deep. The well is equipped with a 40 horsepower constant feed vertical turbine pump that is capable of pumping up to 400 gallons per minute (GPM) or .58 million gallons per day (MGD). Well #1 was drilled in 1947.

Well #2 is a 24-inch by 48-inch gravel packed well that is approximately 47 feet deep. The well is equipped with a 75 horsepower vertical turbine pump that is capable of pumping up to 700 GPM or 1.0 MGD. Well #2 was drilled in 1953.

Due to the serious flooding onsite during spring 2010, plans to relocate the wells and wellhouse nearby to higher ground are underway.

Water from the Happy Hollow Wells is treated in a pre-cast concrete injection vault. The vault contains chemical injection ports capable of treating up to 900 GPM or 1.3 MGD. The water is treated with sodium hypochlorite (NaOCl) for disinfection, sodium fluoride (NaF) for tooth decay prevention and potassium hydroxide (KOH) for corrosion control.

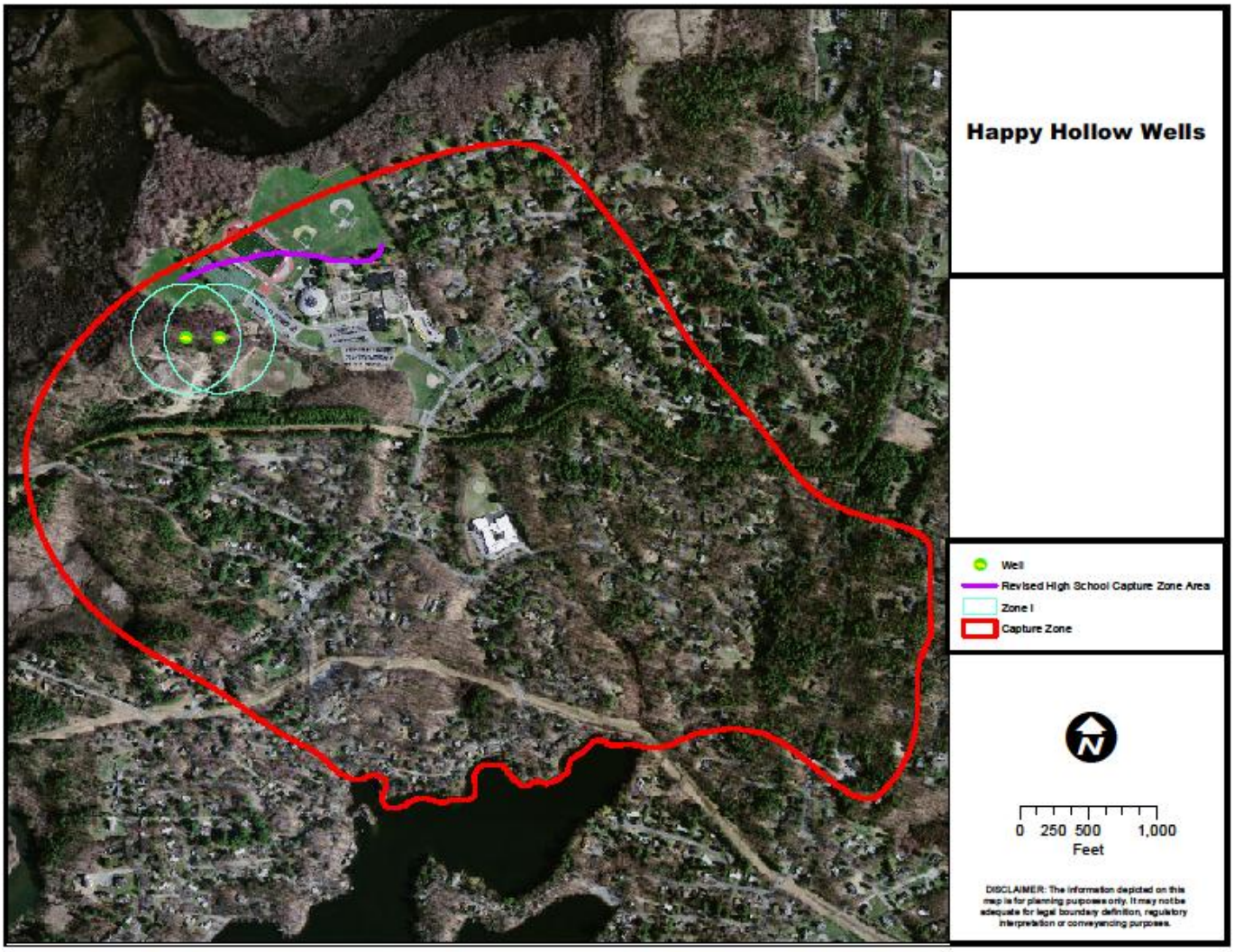
Happy Hollow Wells
Well
Revised High School Capture Zone Area
Zone I
Capture Zone
N
0 250 500 1,000
Feet
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.

Figure 9

Sodium testing shows that most of Wayland's wells contain very low levels of sodium, well below the MassDEP established guideline of 20 milligrams per liter (mg/l). A very important exception, however, are the Happy Hollow Wells. As far back as records have been discovered, sodium in these two wells, relative to other wells in Wayland, has been recorded at an elevated level. Furthermore, in the last ten years levels have increased substantially to more than twice the MassDEP established guideline (Appendix H).

Prior to the 1970's, the former Wayland Highway Department used the sand pit adjacent to the Happy Hollow Wells, located in the Zone I areas, as an operational staging area, which included salt storage. No measurements of sodium levels from this period have been reported, but an early 1980's study of Wayland's wells, *The Groundwater Resources of Wayland, Massachusetts* by Richard Fortin (see Resources section), notes that chloride levels (also linked to salt) had declined by more than a factor of three by 1980 as compared to their peak in 1971. Recently rising levels of sodium and chloride, therefore, most likely are not directly attributed to the historic misuse of the Zone 1 area for salt storage. In addition, in the 1970's, chloride levels in Happy Hollow Well #2 were higher than chloride levels in Happy Hollow Well #1, indicating a source to the south (the location of the sand pit) given the groundwater flow toward the river (west). In contrast, the recent sodium measurements consistently show higher levels in Happy Hollow Well #1, indicating a source to the east (in other words, impacting Happy Hollow Well #1 first) (Appendix H).

There appears to be a significant jump in the sodium level in 2003 to a new plateau of approximately 50 mg/l in Happy Hollow Well #1. The similar sodium level jump in Happy Hollow Well #2 is smaller and lags in time, but also jumps, to about 40 mg/l.

It should be noted that the 1994, 1998, and 2001 sodium readings were taken in late winter and early spring, when salt levels from nearby road salting should be highest. In contrast, most of the later readings were taken in warm weather months. It should also be noted that the multiple readings taken in 2009, from April through August, show little variation.

This pattern is consistent with a possible buildup of salt in the lower levels of the aquifer, with the higher density of salt water creating a halocline, with distinct layers of varying salinity. As salt has been used over the years for road deicing within the Capture Zone of the wells (see page 27), it may have been building up in the aquifer with the level of the halocline rising until it reached the level of the well points in the last decade.

This phenomenon can be further investigated by making use of the tri-level observation wells installed by IEP in the early 1980's. If salt concentrations are much higher at the lower levels of the aquifer it will confirm the mechanism. And, if confirmed, a major program to reduce salt usage within the Capture Zone of the wells will be warranted.

WELLHEAD PROTECTION AREAS

A Wellhead Protection Area or Source Protection Area is defined as the surface and subsurface area through which contaminants are likely to move toward and reach water supplies. The purpose of delineating a Wellhead Protection Area is to determine the recharge area that supplies water to a public water source. This recharge area for a groundwater source is defined by the nature of subsurface flow and that induced by pumping. Within a Wellhead Protection Area, land uses and/or naturally occurring materials may cause a Public Water System to be vulnerable to contamination. While naturally occurring contaminants can usually be controlled by treatment methods, potentially contaminating land uses can be addressed by management strategies outlined in a WPP.

The following are Wellhead or Source Protection Areas for the Happy Hollow Wells (Figure 10):

Happy Hollow Wells Zone I: The Zone I is a 400-foot radius around each well. This is the area where impacts are likely to be immediate and certain. The Zone I is the most critical area for protection.

According to the requirements of the MassDEP Drinking Water Regulations, "[a]ll suppliers of water shall acquire ownership or control of sufficient land around wells, infiltration galleries, springs and similar sources of ground water used as sources for drinking water to protect the water from contamination. This requirement shall generally be deemed to have been met if all land within Zone I is under the ownership or control of the supplier of water. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of the public water system or to other land uses which the public water system has demonstrated have no significant impact on water quality." (Appendix I).

A sand pit, part of the Wayland High School parking areas, trails, and sections of the soccer and lacrosse fields as well as the tennis courts are located in the Zone I.

Happy Hollow Wells Capture Zone: A Capture Zone analysis was used to determine the surface and subsurface area surrounding the Happy Hollow Wells where contaminants are reasonably likely to move toward and reach the well under actual pumping and recharge conditions. The Capture Zones for the Wayland Public Water Systems were delineated in October 2008 by Earth Tech AECOM largely using Wayland's pre-existing data including groundwater elevation contours, pumping test rates, aquifer transmissivity, and downgradient stagnation points (Appendix C).

The Capture Zone for the Happy Hollow Wells was definitively determined in 2010 based on the installation of monitoring wells and well points, a seven-day pumping test conducted with the assistance of the DPW Water Division, an evaluation of hydrogeologic data, and approximating the Capture Zone under quasi-steady-state

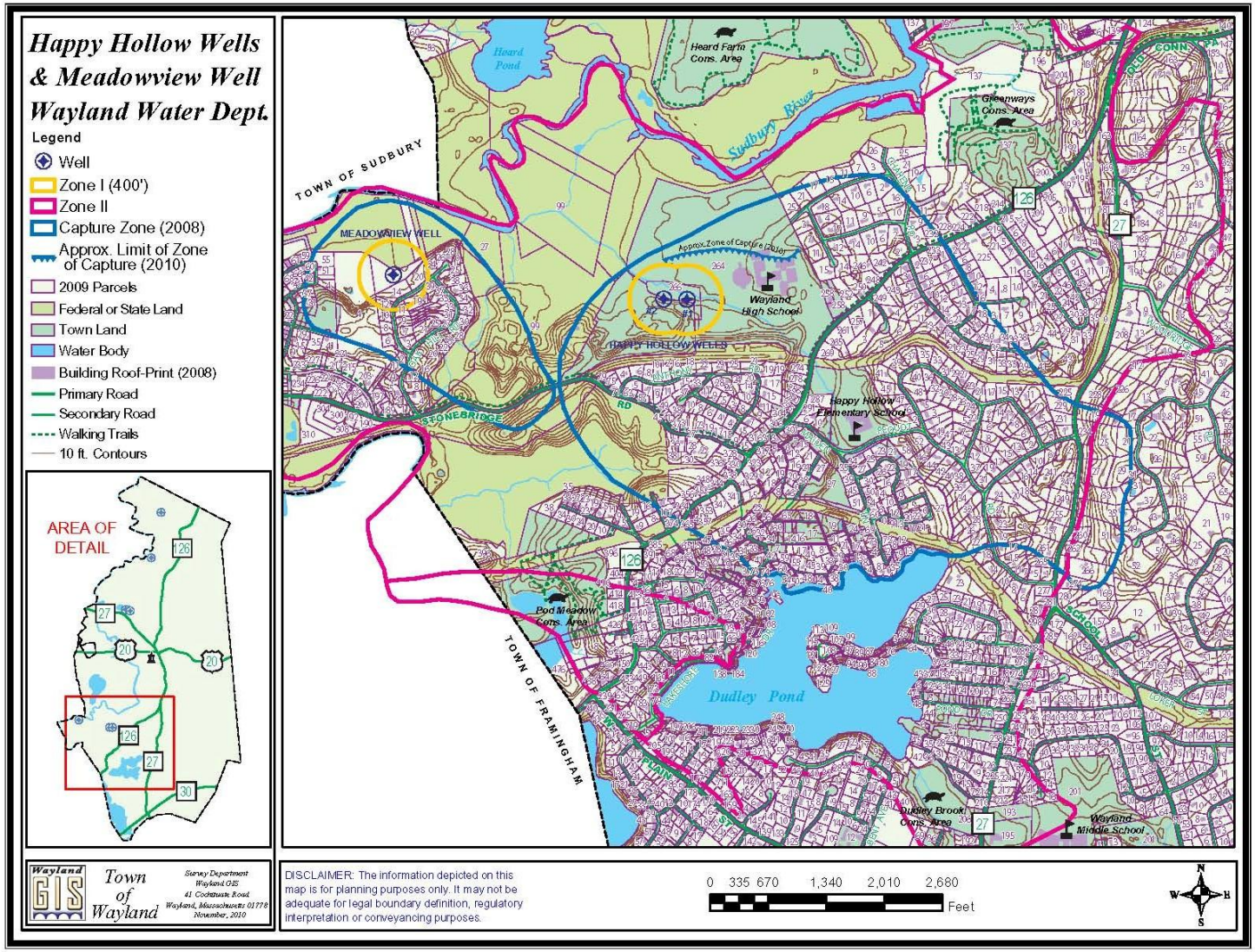
Happy Hollow Wells
& Meadowview Well
Wayland Water Dept.
Legend
Well
Zone I (400')
Zone II
Capture Zone (2008)
Approx. Limit of Zone of Capture (2010)
2009 Parcels
Federal or State Land
Town Land
Water Body
Building Roof-Print (2008)
Primary Road
Secondary Road
Walking Trails
10 ft. Contours
AREA OF DETAIL
TOWN OF SUDBURY
TOWN OF FRAMINGHAM
MEADOWVIEW WELL
HAPPY HOLLOW WELLS
Approx. Zone of Capture (2010)
Heard Pond
Heard Farm Cons. Area
Sudbury River
Greenways Cons. Area
Wayland High School
Happy Hollow Elementary School
Pod Meadow Cons. Area
Dudley Pond
Dudley Brook Cons. Area
Wayland Middle School
STONEBRIDGE RD
126
27
20
30
Wayland GIS
Town of Wayland
Survey Department
Wayland GIS
41 Cochituate Road
Wayland, Massachusetts 01778
November, 2010
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.
0 335 670 1,340 2,010 2,680
Feet
N
W
E
S

Figure 10

conditions (Appendix D). It comprises approximately 470 acres and includes most of the Wayland High School Campus, Town Pool, Happy Hollow School, residential areas, transportation corridors including a section of Old Connecticut Path (Route 126), and Dudley Brook (which drains into Dudley Pond).

Happy Hollow Wells Zone II: The Zone II includes the Zone I and Capture Zone and encompasses 1,515 acres in southwestern Wayland, and a small section of the Town of Framingham. It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. The Zone II is the area where impacts are possible from potential sources of contamination. The Zone II includes the Greenways Conservation Area, transportation corridors, and residential, educational, municipal and business uses.

When a water system is not a part of the municipality in which its Zone II is located, it is not always easy for the PWS to obtain local protection. For these water systems, MassDEP provides an alternative wellhead protection compliance standard under the Best Effort Requirement. To achieve compliance with the Best Effort Requirement, a PWS such as Wayland must demonstrate it has used its best efforts in encouraging the community to protect the Zone II with local controls that meet MassDEP Wellhead Protection Regulations (Appendix J).

In April 2010, upon the recommendation of the WPC, the DPW Water Division complied with the Best Effort Requirement by sending the requisite letter with attachments to the Town of Framingham and documentation thereof to MassDEP. To date Framingham has not responded to or acted upon the request.

The DPW will need to repeat this notification in the future if Framingham does not act to protect Wayland's water supplies. (See Action Plan.)

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Happy Hollow Wells PSOC #1-Transportation Corridors and Stormwater Basins
Transportation Corridors: Threats posed by roads and parking areas in the Capture Zone include leaks, spills and exposure of motor vehicle fluids, rubber particles, pavement sealers (sealcoaters), deicing products and numerous other hazardous materials. Some of the potential contaminants associated with these activities include sodium, chloride, heavy metals, Synthetic Organic Compounds (SOCs), and Volatile Organic Compounds (VOCs), which can make their way into the subsurface material and eventually into groundwater.

Impervious surfaces such as roadways, parking lots, sidewalks and rooftops block the absorption of water by the soil, thereby reducing groundwater recharge while increasing the surface water flow rate and amount of debris and pollutants in stormwater.

Rainwater or surface water runoff (stormwater) from roads and parking areas is traditionally piped offsite, often to the nearest stream or channel, which greatly increases the intensity of contaminant pollution in that area. Over time the system can become greatly impacted by these contaminants resulting in degraded drinking water and degraded wetland and aquatic systems.

A large amount of stormwater runoff from roads and parking areas around Wayland High School is directed to Dudley Brook, an intermittent stream, and wetlands located in the Capture Zone of the Happy Hollow Wells. Dudley Brook enters the Zone I and passes within approximately 100 feet of the wells.

In addition to rainwater, snow on impervious surfaces can become contaminated with road salt, sand, litter, and automotive pollutants. When large amounts of snow accumulate on streets, sidewalks and parking lots, snow may be moved to other sites for storage for public safety reasons. As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and, at certain levels, are toxic to aquatic life. Sand washed into waterbodies can create sand bars or fill in wetlands, ponds and streambeds, which impacts aquatic life, causes flooding, and ultimately reduces their effectiveness as natural water filters.

The largest transportation corridor potential threat is the runoff of deicing materials. In order to keep roads safe for winter travel, a large amount of de-icing materials is used on roads in Wayland and throughout roads in Massachusetts. Salt, or sodium chloride, is the most commonly used de-icing material. In general, the purpose of the application of road salt is to reduce adherence of snow to the pavement; keep the snow in a "mealy" condition and thereby permit nearly full removal by plowing; and prevent the formation of ice or snow ice (hard pack).

According to the National Research Council (NRC), road-salt use in the United States ranges from eight million to twelve million tons of sodium chloride per year. Massachusetts, New Hampshire, and New York report the highest annual road-salt loadings in the United States. Massachusetts reports the highest average of 19.94 tons/lane-mile/year. The Massachusetts Department of Transportation averages nearly 70 tons/lane-mile/year on state highways.

According to the EPA, high levels of sodium and chloride can create significant adverse health, environmental, and infrastructure problems. Road salt affects the taste and quality of water, destroys protective vegetation and soil buffers, and corrodes vehicles, bridges, and other infrastructure. Continued high levels of salt on the roads in Massachusetts could potentially jeopardize the health of residents who suffer from hypertension, heart disease or kidney disease. The MassDEP guideline of 20 mg/l of sodium in drinking water represents a level of sodium that physicians and sodium sensitive individuals should be aware of in cases where sodium exposures are being carefully controlled. (See Resources Section.)

Stormwater Basins: Stormwater basins and engineered controls are located in the Capture Zone of the Happy Hollow Wells.

Stormwater retention/detention basins and other engineered stormwater controls are typically designed to reduce peak flows, reduce pollution associated with runoff, facilitate groundwater recharge and improve groundwater quality. If maintained properly, stormwater controls typically function as designed. If not maintained, stormwater controls can fall into disrepair and become a hazard to the community's water supply. Improperly functioning stormwater controls can potentially concentrate pollutants into an area that may infiltrate into the groundwater or pass pollutants into nearby waterways.

Happy Hollow Wells PSOC #2-Zone I Sand Pit

The excavation of sand and gravel in the Zone I, adjacent to the Happy Hollow Wells, has resulted in a degraded land area that could negatively affect the quality of water in the Happy Hollow Wells.

Figure 11

Figure 12

Sand and gravel deposits are a legacy of the glaciers that melted away 10,000 years ago. These geological materials are a source of large quantities of high-quality ground water. Many of the highest-yielding wells in New England are constructed in sand and gravel aquifers.

According to the EPA, soil disturbance from sand and gravel excavation greatly increases the susceptibility to erosion and sedimentation. Furthermore, such excavation, by changing the shape of the land surface, can negatively affect groundwater supplies and, ultimately, the recharge of an aquifer. Such changes may increase or decrease rainwater recharge to groundwater which may affect the hydrology of the underlying sand and gravel aquifer. Other negative effects of sand and gravel excavation include the loss of the protection provided by soil and vegetation by removing the highly concentrated organic layer of soil found on the surface of sand deposit, which decreases the soil's ability to bind up substances and thus filter water as it passes through its pores.

In addition to potentially damaging changes in the land and the loss of a critical vegetation layer, the use of heavy excavation machinery and industrial equipment creates the opportunity for spills that could pollute groundwater in the disturbed area.

Happy Hollow Wells PSOC #3-Artificial Turf Field

An artificial turf sports field is built in the Capture Zone of the Happy Hollow Wells (Figure 13). The Capture Zone analysis determined that a portion of the field drains toward the Happy Hollow Wells (Appendix D).

A modern artificial field surface has polyethylene plastic blades that simulate grass and a several inch layer of infill that keeps the blades upright. The infill varies by manufacturer and, in Wayland, includes ground-up recycled rubber tires, or crumb rubber.

Figure 13

Synthetic turf fields have established and potential environmental risks. A 2010 study by the Connecticut Department of Environmental Protection demonstrated that the crumb rubber in artificial turf fields contains chemical carcinogens, neurotoxins, respiratory toxins, and skin and eye irritants. (See Resources Section.) Crumb rubber can migrate from a field (Figures 14 and 15) as well as degrade from weather and microbes, producing new chemicals. A 2007 California Office of Environmental Health Hazard Assessment (OEHHA) report summarized 46 studies that identified 49 chemicals released from tire crumbs - seven of which are carcinogenic. (See Resources Section.)

Figure 14

Figure 15

The results of other studies, including those submitted by Gale Associates, the town consultants for the 2007 ConCom hearings on the Wayland High School artificial turf field, indicate that these fields can leach heavy metals, including antimony, arsenic, chromium, copper, lead, nickel, thalium and zinc, into the groundwater through stormwater and irrigation runoff. Some of these contaminants are concentrated when new rubber is exposed to the elements, and others release more toxins through continued use over time. Additionally, the application of paints, paint removers, solvents, adhesives, brighteners, softeners, disinfectants and other potential contaminants are often used for field maintenance, repairs, disinfection, and cleaning.

More testing of the Wayland artificial turf field, particularly of the groundwater flowing between the field and the wells, is needed.

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Happy Hollow Wells PSOC #4-Residential Septic Systems, Household Hazardous Waste (HHW), and Residential Activities

Residential Septic Systems: There are approximately 460 residential septic systems in the Capture Zone of the Happy Hollow Wells.

According to the USGS, septic systems are the largest source by volume of waste discharged to the land. Furthermore, a nationwide survey by the EPA and Cornell University found that the most common water-quality problem in rural water supplies is bacterial contamination from septic-tank effluent. And, the contamination of drinking water by septic effluent may be one of the foremost water quality issues in the United States.

On-site septic treatment systems can stress the environment in a number of ways. They are often constructed in less than satisfactory soil conditions and are not always maintained properly. Improperly functioning or failing septic systems can contribute viruses, bacteria, nitrates, and chemical compounds to groundwater. Proper maintenance can 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.

According to the USGS, it is also estimated that from one-third to one-half of existing systems could be operating improperly because of poor location, design, construction or maintenance practices. Even when operating properly, systems can be spaced so densely that their discharge exceeds the capacity of the local soil to assimilate the pollutant loads.

Additionally, on-site septic systems are also unable to treat many modern day household cleaners and chemicals which, when flushed down the drain or toilet, often impair or kill the bacteria needed to make the system work. The end results are improper treatment of wastewater-if not outright failure of the system-and the contamination of adjacent wells with septic effluent containing bacteria and other pollutants. What happens to these contaminants in the ground is not well known. Some adhere to rock material while others travel with the water and end up in aquifers.

According to the University of Maine Cooperative Extension, septic tanks should be cleaned out every three to five years, depending on the size of the tank and the amount

and quality of solids entering the tank. Furthermore, a visual inspection of the leach field should be completed annually. As a rule of thumb, the clean-out interval for a septic tank is determined on the basis of one hundred gallons of tank capacity per person per year. For example, a 1,000-gallon tank used by a family of two should be cleaned after five years [1,000 gal ÷ (100 gal per year x 2 people) = five years]. Checking sludge and scum build-up can be an unpleasant task. The best suggestion for determining a maintenance schedule is simply to have the tank pumped at regular intervals. The cleaning of a tank should be done by a commercial septic tank cleaning service.

HHW: HHW is a serious concern for the Happy Hollow Wells due to the number of residences in the Capture Zone.

Many hazardous chemicals, substances and products are used in and around the home every day. When discarded, these products are called household hazardous waste (HHW). HHWs are discarded materials and products that are ignitable, corrosive, reactive, toxic or otherwise listed as hazardous by the EPA. Products used and disposed of by a typical residence may contain more than one hundred hazardous substances. Such products include:

- Batteries
- Cleaners
- Cosmetics
- Fluorescent light bulbs
- Glues
- Heating oil
- Ink
- Pharmaceuticals
- Motor oil and automotive supplies
- Pavement sealers (sealcoaters)
- Paints, thinners, stains and varnishes
- Polishes
- Swimming pool chemicals
- Smoke detectors
- Thermometers
- Fuel

The EPA estimates the average American household generates 20 pounds of HHW each year. As much as 100 pounds of HHW can accumulate in the home and remain there until the resident moves or undertakes a thorough "spring cleaning."

Since the chemicals found in HHW can cause soil and groundwater contamination, generate hazardous emissions at landfills and disrupt water treatment plants, it is important to store and dispose of HHW properly.

Waste oil, which contains heavy metals and other contaminates, should always be recycled - never thrown in the trash, dumped on the ground, or poured into the sewer or down the drain. Furthermore, water used in washing cars, trucks, and other vehicles may also contain oil and a wide range of other contaminants including hydrocarbons, metals, detergents and road salt.

In 2008 Massachusetts passed Chapter 453, An Act Relative to Homeowner Heating Safety, to address homeowners' leaking fuel tanks and pipes that connect to a furnace. The Act requires homeowners with fuel supply or fuel return lines in direct contact with concrete, earth or other floor surfaces to complete an installation of either an oil safety valve (OSV) or an oil supply line with protective sleeve on systems that do not currently

have these devices. Regulatory changes made to the Board of Fire Prevention Regulations in 2010 conform to the Act. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities: Residential Activities are a serious concern for the Happy Hollow Wells due to the number of residences in the Capture Zone.

Homeowners often use fertilizers, herbicides and pesticides on their lawns and gardens during the growing season and sodium chloride on their sidewalks and driveways during the winter. These over the counter chemical additives get washed into storm drains or percolate into the groundwater with lawn irrigation water, rainwater or snowmelt. Multiply these small amounts of chemicals by thousands of households, and the effects on groundwater, waterbodies and aquatic life can be catastrophic.

In addition to lawn and landscape products, pet waste in residential yards can become a source of nutrients and pathogens (disease-causing organisms) that can degrade drinking water. Pet waste should be picked up daily and either buried, flushed or put in a sealed container in the trash.

The WPC aims to work with residents to reduce the cumulative effects of vehicle waste oil and washing water, deicing agents, lawn care products, cleaning and degreasing chemicals, and other harmful substances that pose a threat to groundwater in Wayland.

Happy Hollow Wells PSOC #5-Wayland High School Complex

Development of the new Wayland High School involves the construction of new impervious surfaces, grassed and landscaped areas, chemical storage areas, and waste management areas, as well as the demolition of the existing high school.

Impervious areas such as roads, sidewalks, parking lots and roofs increase the amount of water that will run off land during a rainstorm or as snow melts, which can lead to increased pollution. Heavy metals, nutrients, hydrocarbons, pathogens, and sediment that accumulate on impervious surfaces and are flushed away with stormwater runoff can contaminate groundwater. Numerous studies have examined the relationship between the amount of impervious surfaces in a watershed and the health of waterbodies in that watershed. Some studies find that the quality of streams, wetlands, and other waterbodies declines sharply when the impervious surfaces within the watershed exceeds just ten percent.

Furthermore, management of the stormwater from impervious surfaces, which has only been a subject of concern for the past ten to fifteen years, focuses on recharge and controlling volume and peak discharge rates of water from these surfaces. Optimally designed Best Management Practices (BMPs) are cost-effective and easy to implement, provide flood control, improve water quality and provide aesthetic benefits. However, compared to the conventional pipe-based stormwater facilities, BMPs are much more maintenance-intensive and their performance is dependent on the level of maintenance performed. Improper management of stormwater BMPs can become a major source of water pollution.

Landscaping, chemical storage, waste management and stormwater should be addressed in a comprehensive Operation and Maintenance (O & M) Plan for the new Wayland High School complex which is focused on reducing potential contamination to the adjacent Happy Hollow Wells.

Happy Hollow Wells PSOC #6-Underground Storage Tanks (USTs)

Until the mid-1980s, most USTs and associated piping were made of bare steel, which corrodes over time and leaks into the environment. Faulty installation or inadequate operating and maintenance procedures also can cause USTs to release their contents into the environment.

The greatest potential hazard from a leaking UST is the contamination of groundwater by petroleum products or other hazardous substances seeping into the soil. A leaking UST can present other risks including fire and explosion when explosive vapors seep into confined spaces and occupied dwellings.

The majority of USTs contain petroleum products (gasoline, diesel, heating oil, kerosene, jet fuel), but many other substances classified as hazardous by the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") are stored in USTs.

The federal UST Program was created in 1985 to protect human health and the environment by preventing contamination caused by releases from UST systems. Under the program systems found to be leaking or otherwise not functioning properly must be repaired or replaced by the tank owners and operators, and any resulting environmental damage assessed and cleaned up. However, tanks used for the storage of heating oil for consumptive use on the premises where stored were excluded from the federal regulations.

Through the state-regulated program, a major component of the Massachusetts groundwater resource protection effort, MassDEP implements the federal requirements addressing registration and inspection of regulated UST systems used to store petroleum products or other hazardous substances. A listing of USTs within Wayland water supply protection areas that meet state reporting requirements and report to the appropriate agencies was provided in the SWAP Report (Appendix E). State-wide data on tanks, piping, ownership and required inspections are also compiled by city or town and provided by MassDEP. (See Resources Section.)

There are some residential USTs in the Capture Zone and Zone II of the Happy Hollow Wells. Residential USTs, used solely for area heating and/or domestic hot water on the premises where stored, are not covered by the federal and state programs. The local fire department may provide recommendations and guidance regarding residential USTs to ensure the public safety. (See also Resources Section on Homeowner Heating Safety Information.)

Happy Hollow Wells PSOC #7-Town Pool and Residential Pools

There is a community pool in the Happy Hollow Wells Capture Zone and approximately 65 residential inground pools located within the Zone II.

Draining pool water to the street or backyard wetlands is a common practice which can prove harmful to the environment if the pool owner does not properly plan and prepare the water prior to draining. Pool water contains harmful additives and chemicals including chlorine which are considered to be HHW.

If the pool water is not properly treated to remove these contaminants prior to draining, they can cause damage to the health of our waterbodies. Additionally, when pool water is drained to the street, it can carry other pollutants such as oil, grease, sediment, bacteria and trash down the storm drain and into the nearest waterbody.

Chlorine levels must be lowered to less than one part per million prior to draining. This can be done naturally, by simply allowing the pool water to sit in the sun for a minimum of three days. Alternatively, dechlorination kits can be purchased at home supply stores at a very reasonable cost. These kits have the necessary tools a homeowner needs to reach the appropriate chlorine levels before draining a pool.

Pools in which algae is growing must not be drained in a Capture Zone Area. In these instances, algae must first be killed and removed. This is usually done by chlorinating the swimming pool until the algae is gone, then lowering chlorine to the allowable discharge level.

Happy Hollow Wells PSOC #8-Transformers

Ground level and pole mounted transformers can be found in the Zone I, Capture Zone and Zone II of the Happy Hollow Wells.

Transformers are essential for high voltage power transmission, which makes long distance transmission economically practical. Transformer oil or insulating oil is usually a highly-refined mineral oil dielectric fluid (MODEF) that is stable at high temperatures and has excellent electrical insulating properties. MODEF can be toxic to drinking water and may also contain polychlorinated biphenyls (PCBs).

PCBs are highly persistent, bioaccumulative and toxic chemicals, which were once commonly used as dielectric fluids in electrical equipment. A federal ban on the manufacturing of PCBs was passed in 1979. The Toxic Substances Control Act allows the continuing use of certain PCB bearing equipment, but the disposal of the oils from this equipment is strictly regulated.

When transformer manufacturers switched from PCB to non-PCB fluids, the new transformers were often filled using the same equipment that had been used for PCBs. The result was that some newer transformers were contaminated with various levels of PCBs.

Transformers in the Zone II of wells should be filled with an eco-friendly bio-based transformer oil in case of leaks or damage.

MANAGEMENT STRATEGIES FOR POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Strategies for Happy Hollow Wells PSOC #1-Transportation Corridors and Stormwater Basins

Transportation Corridors:

- Partner with the DPW to develop a plan to partially divert the drainage between Davelin Road and Rolling Lane down Charena Road. A possible plan would connect the Old Connecticut Path system to the 16-inch Charena Road drain pipe with a smaller pipe sufficient to carry "first flush" pollutants, salt, and spill contents, but which would fill in larger storms to prevent overloading of the Charena Road system. There it could connect to the Charena Farms drainage system which discharges to a small unnamed brook and from there to the river, away from the Happy Hollow Wells.
- Partner with the Fire Department to create a Capture Zone Road Map and Capture Zone Emergency Plan identifying stormwater basins to be carried on fire trucks in the event of a spill.
- Meet with local Emergency Response Team to discuss response to emergencies that may impact drinking water supplies.
- Partner with the DPW to create an Impervious Surface Monitoring Plan for the Capture Zone.
- Collaborate with the DPW to increase the amount of road sweepings in the Capture Zone to remove sediments, hydrocarbons and other potentially hazardous materials.
- Work with the DPW to create a formalized Road Deicing Policy to include the use of advanced technologies to reduce deicing applications in the Zone IIs throughout Wayland with particular focus on the Capture Zones.
- Partner with the DPW to create a Snow Storage Plan that limits use of the Zone II.

Stormwater Basins:

- Collaborate with ConCom and the DPW to identify all stormwater controls in the Capture Zone and to create a Stormwater Maintenance Plan for the Capture Zone integrated with the updated Phase II Stormwater Management Plan.
- Partner with the DPW to maintain basins by making sure the orifices are not blocked or clogged, repairing erosion, removing sediment, and managing the vegetation so that vegetation is kept to heights that allow for easy inspection for animal burrows, sinkholes, erosion, etc.
- Apply for Community Preservation Act (CPA) funding to purchase plaques for stormwater drains or to develop a storm drain stenciling program to inform residents and children that the drains lead to groundwater/drinking water sources.

Strategies for Happy Hollow Wells PSOC #2-Zone I Sand Pit

- Partner with the School Department to ensure all personnel onsite during construction and demolition are trained for an emergency spill and an emergency spill kit is located onsite at all times.
- Prohibit further operations unrelated to the supply of water in the Happy Hollow Zone I upon completion of the Wayland High School construction project to reduce the potential contamination threat to the public drinking water.
- Partner with the DPW upon completion of the Wayland High School construction project to create a sand pit closure plan and request that operation reports be available for current operations.
- Partner with the DPW upon completion of the Wayland High School construction project to seek funding to cover the exposed (excavated) area with topsoil and restore area with native vegetation and plantings.

Strategies for Happy Hollow Wells PSOC #3-Artificial Turf Field

- Initiate regular monitoring of drainage for potential contaminants from portion of existing field in the Capture Zone.
- Create a proactive plan to replace the crumb rubber infill and carpeted area with less toxic alternatives.
- Work with the DPW on a plan to identify and/or reduce all chemical applications (paint, paint removers, solvents, adhesives, brighteners, softeners, disinfectants and other potential contaminants) to the existing field, and ensure that the BOH, Athletic Director, Recreation Department and DPW coordinate in this effort.
- Work with the DPW to investigate construction of an underground intercept to divert drainage out of the Capture Zone.
- Collaborate with the DPW to create a long-term plan for the replacement of artificial turf field in the Capture Zone with a natural grass field.

Strategies for Happy Hollow Wells PSOC #4-Residential Septic Systems, Household Hazardous Waste (HHW), and Residential Activities

Residential Septic Systems:

- Partner with the BOH, Board of Assessors and GIS Coordinator to generate a list of all residents within the Zone II that have septic systems. Send educational information to all residents on the care and maintenance of individual septic systems and household hazardous waste disposal guidelines.
- After sending educational information to residents with septic systems located within the Zone II, partner with the BOH to follow up with a request for voluntary participation in an annual septic system inspection program that would include mapping the location of the systems for future inspections, and a visual inspection conducted by a qualified professional. Create a septic system database and, if necessary, recommend that residents consult with a registered sanitarian or
- licensed sanitary engineer for a more in depth evaluation of any problems identified during the inspection process.
- Partner with the BOH to follow up with residents in the Zone II and request their voluntary participation in a septic tank cleaning program. Coordinate with local septic tank cleaning services to create a neighborhood cleaning discount program.

- Partner with the BOH to promote the town's Community Septic Management Program which provides financial assistance to homeowners with failed septic systems as well as a state income tax credit. (See also Septic System Financial Assistance in Resources Section.)

HHW:

- Partner with the BOH to develop an educational program to reduce the use and runoff of household hazardous chemicals or to create a conversion program for eco-friendly products.
- Partner with the BOH on a voluntary program to provide incentives and to assist residents in sealing floor drains.
- Partner with the BOH on a program to educate residents on chemical storage practices and BMPs for draining swimming pools.
- Partner with the DPW to provide residents with information on the Transfer Station's programs to properly dispose of HHW as well as pharmaceuticals.
- Partner with the Police Department to collect medicines for proper disposal.
- Partner with the Fire Dept to educate residents in the Zone II on groundwater contamination risks from fuel oil spills and to meet the requirements of Chapter 453 of the Acts of 2008, An Act Relative to Homeowner Heating Safety. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities:

- Partner with the ConCom and the BOH to provide assistance with voluntary soil tests through the University of Massachusetts Extension Laboratory to help provide recommendations that lead to the wise and economical use of soils and soil amendments. (See Resources Section for information on University of Massachusetts Extension Soil Test Procedures.)
- Partner with the ConCom to provide residents with information on BMPs for the use of fertilizers, herbicides and pesticides on landscaped and grassed areas in the Capture Zone. (See Resources Section for Protecting Water Sources From Fertilizer Information.)
- Work with the DPW Water Division to develop a Drought Management Plan that follows American Water Works Association Drought Management Planning guidance. (See Resources Section on Water Conservation Standards.)
- Work with the DPW Water Division to implement a comprehensive Residential Water Conservation Program that seeks to reduce residential water use in accordance with the Water Conservation Standards. (See Resources Section on Water Conservation Standards.)
- Provide residents with information on alternatives to using sodium chloride on snow and ice in the Capture Zone.
- Partner with the ConCom to create an annual Organic Lawn and Garden Tour/Competition in Wayland.
- Continue with educational and outreach efforts, such as co-sponsorship of Demonstration Organic Lawn Project at Mellen Green.
- Partner with the School Department to evaluate and enhance existing source water protection and water conservation curricula.

Strategies for Happy Hollow Wells PSOC #5-Wayland High School Complex

- Partner with the DPW and School Department to create a comprehensive O & M plan for the school, fields and grounds including the use of cleaning chemicals, fertilizers and pesticides. Improve existing field sustainability through BMPs such as field rotation, seed variations, aeration, and irrigation.
- Partner with the School Department to ensure debris and hazardous substances such as asbestos and asphalt in existing building materials are not introduced to the Capture Zone during the demolition process and are completely removed from the site.
- Partner with the DPW to post additional Drinking Water Supply Area signage in the Zone I.

Figure 16

Strategies for Happy Hollow Wells PSOC #6-Underground Storage Tanks (USTs)

- Identify all residential USTs in the Zone II and in cooperation with the Fire Department provide tank owners with information on preventive measures to reduce the potential for releases, including measures owners can take to reduce the likelihood and minimize impact of spills during filling operations. (See Resources Section on Homeowner Heating Safety Information.)
- Provide information to residential UST owners on available financial assistance for removal of tanks. (See UST Financial Assistance in Resources Section.)

Strategies for Happy Hollow Wells PSOC #7-Town Pool and Residential Pools

- Partner with the Town Pool Manager to implement BMPs for neutralizing and draining pool water to avoid chemical contamination and green algae contamination.
- Partner with the Town Pool Manager to ensure:
    1. Chemical storage areas are secure against unauthorized entry.
    2. Chemicals are stored above impervious surfaces without floor drains.
    3. Chemical spill kits are located in the storage areas.
    4. Chemical containers are clearly and visibly labeled.
    5. Material Safety Data Sheets are available in the chemical storage area.
    6. Chemical storage areas are inspected weekly.

Strategies for Happy Hollow Wells PSOC #8-Transformers

- Contact NSTAR (utility company) to determine if any of the transformers in the Zone II contain PCBs, MODEF or other potential water source contaminants and, if necessary, collaborate with NSTAR to create a phase-out program.
- Partner with the DPW to utilize a global position system (GPS) to mark all transformers located within the Zone II and to create and disseminate transformer location maps to the DPW, Police Department and Fire Department.
- Partner with the DPW to create a Transformer Monitoring Program for potential leaks and management of trees, limbs and other hazards.

Happy Hollow Wells Action Plan	**WPC with**	**When**
1. Reduce pollutant and stormwater runoff to Capture Zone	DPW,ConCom,Fire,ERT	FY12, long-term
2. Close sand pit and restore area	DPW	FY13
3. Reduce most toxic aspects of artificial turf field	DPW, BOH, RecDept, AthDir	FY12, long-term
4. Replace artificial turf field with natural field	DPW	FY18
5. Reduce contamination from septic systems	BOH,Assessors,GIS	FY12, long-term
6. Create comprehensive O&M plan for new school complex	SchoolDept,DPW	FY13
7. Reduce potential of residential UST pollution	Fire	FY12, long-term
8. Reduce contamination from HHW & residential activities	BOH,ConCom,DPW, Police, Fire	FY12, long-term
9. Reduce potential of transformer accident/spill	Fire,Police	FY12, long-term
10. Comply with Best Effort Requirement	DPW	FY14

BALDWIN POND WELLS #1, #2, AND #3

CONTAMINATION RISK

The Baldwin Pond Wells are considered the second highest potential contamination risk in Wayland. This is due to a number of activities in the Baldwin Pond Wells Zone I and Capture Zone which cumulatively threaten to degrade the quality of the well water. There are also a relatively large number of residences in the Zone I and Capture Zone as well as geologic conditions including the sandy and gravel soils and the lack of significant overlying layers of fine-grained soils, so that the flow of groundwater is not restricted vertically by a "confining layer" of clay or fine-grained soil (Appendix C).

SYSTEM DESCRIPTION

The Baldwin Pond Wells are located in the northwestern section of the distribution system between Old Sudbury Road (Route 27) and Glezen Lane (Figure 17). The wells consist of three gravel-packed wells. Well #1 was originally an 18-inch diameter well approximately 48 feet deep drilled in 1962. A replacement 12-inch by 18-inch gravel packed well approximately 52 feet deep was installed in 2001. Well #2 was drilled in 1962 and is a 48-inch by 24-inch gravel packed well approximately 54 feet deep located just east of Well #1. Well #3 was drilled in 1953 and is located directly east of Well #2. Well #3 is a 24-inch diameter well approximately 53 feet in depth. The maximum rated capacity for the three wells combined is 1,575 GPM or 2.27 MGD.

The Baldwin Pond Water Treatment Facility uses a process called ultra filtration. Ultra filtration has several advantages over traditional water filtration including the removal of pathogens and turbidity in a single treatment step. Ultra filtration also provides an absolute barrier for bacteria, viruses, and parasites, and leaves no deactivated pathogens in the finished water.

The entire process involves a number of complex steps. First, raw water is pumped into the treatment plant from a combination of three ground water wells. The raw water from the three wells is dosed with ozone to oxidize the iron and manganese that is naturally present. Next, KOH is added to adjust the pH of the raw water and polyaluminum chloride is added to aide in flocculation of the iron and manganese particles. After the pH is adjusted and flocculants are added, the raw water enters an ozone contact tank for the oxidation and flocculation processes. After oxidation and flocculation occur, approximately 70 minutes after the water has left the wells, the water is pumped into one of two 500 micron pre-filters to remove any large particles. Once the pre-filter process is complete, the raw water enters the ultra filtration units. After ultra filtration, the water travels to a clear well where NaOCl is added for disinfection and NaF is added to prevent tooth decay.

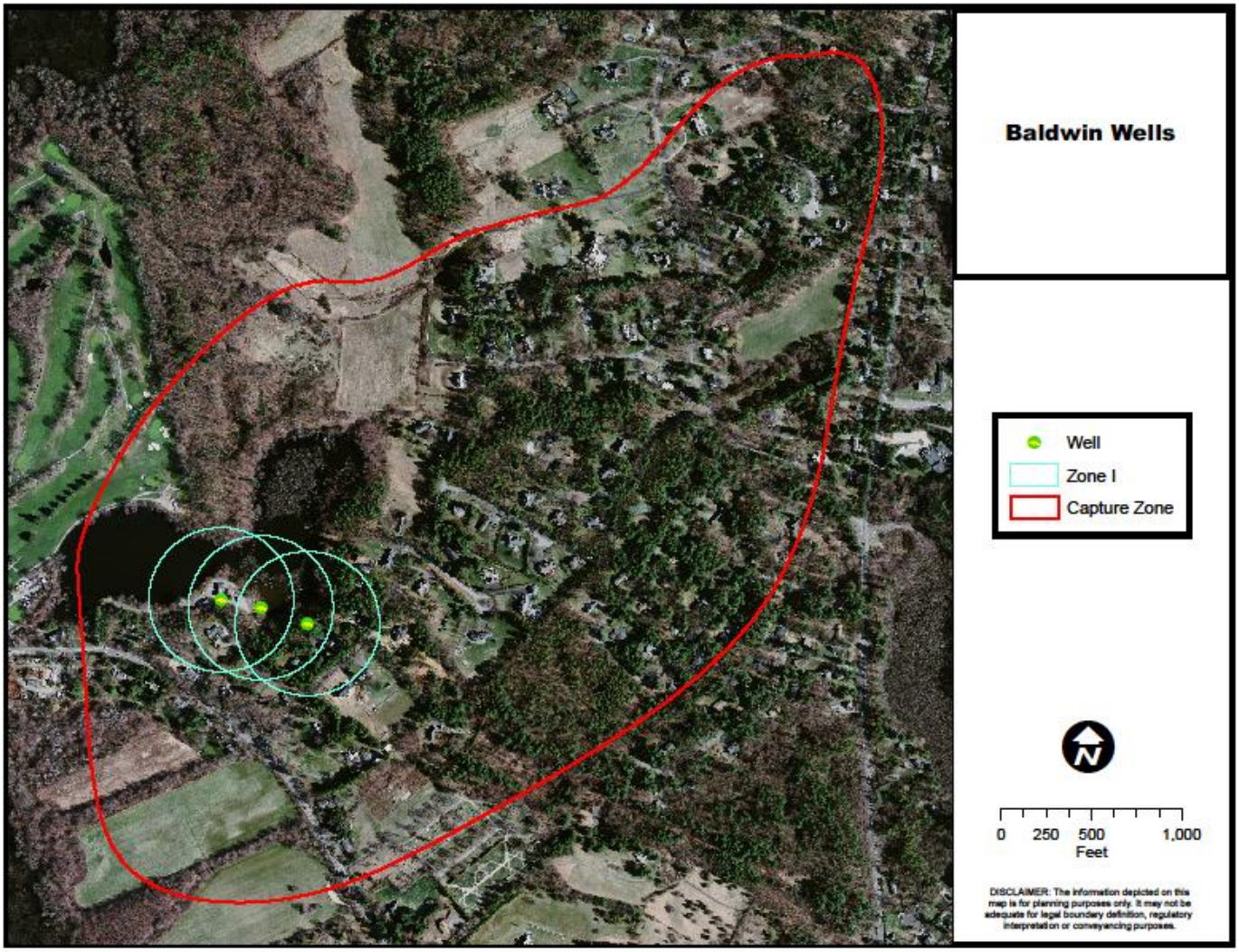
Baldwin Wells
Well
Zone I
Capture Zone
N
0 250 500 1,000
Feet
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.

Figure 17

WELLHEAD PROTECTION AREAS

A Wellhead Protection Area or Source Protection Area is defined on p. X. The following are Wellhead Protection Areas for the Baldwin Pond Wells (Figures 5 and 18):

Baldwin Pond Wells Zone I: The Zone I is a 400-foot radius around each well. This is the area where impacts are likely to be immediate and certain. The Zone I is the most critical area for protection.

According to the requirements of the MassDEP Drinking Water Regulations, "[a]ll suppliers of water shall acquire ownership or control of sufficient land around wells, infiltration galleries, springs and similar sources of ground water used as sources for drinking water to protect the water from contamination. This requirement shall generally be deemed to have been met if all land within Zone I is under the ownership or control of the supplier of water. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of the public water system or to other land uses which the public water system has demonstrated have no significant impact on water quality." (Appendix I)

The Baldwin Pond Wells Zone I consists of the 12.9 acre Baldwin Pond Water Treatment Plant site, conservation land, a public trail, a section of Glezen Lane and sections of 11 residential properties.

Baldwin Pond Wells Capture Zone: A Capture Zone analysis was used to determine the surface and subsurface area surrounding the Baldwin Wells where contaminants are reasonably likely to move toward and reach the well under actual pumping and recharge conditions. The Capture Zones for the Wayland Public Water Systems were delineated in October 2008 by Earth Tech AECOM largely using Wayland's pre-existing data including: groundwater elevation contours, pumping test rates, aquifer transmissivity and downgradient stagnation points (Appendix C).

The Capture Zone for the Baldwin Pond Wells is 294.4 acres and includes residential sections of Old Sudbury Road (Route 27), Glezen Lane, Rose Hill Lane, Barley Lane, Saddle Lane, Orchard Lane, Pheasant Run, Ellen Mary Lane, Training Field Road, and Moore Road. The Capture Zone also includes the northeast section of the Wayland Country Club Golf Course, Baldwin Pond, agricultural land, portions of Cow Common and Sedge Meadows Conservation Areas, and an undeveloped portion of the Old North Cemetery.

B**aldwin Pond Wells Zone II**: The Zone II includes the Zone I and Capture Zone and encompasses 1,134 acres in the mid-western section of Wayland and a small section of the Town of Sudbury. It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. The Zone II is the area where impacts are possible from potential sources of contamination. The Zone II includes transportation corridors and residential, commercial and municipal uses. The Beit Olam Cemetery, a developed section of the Old North

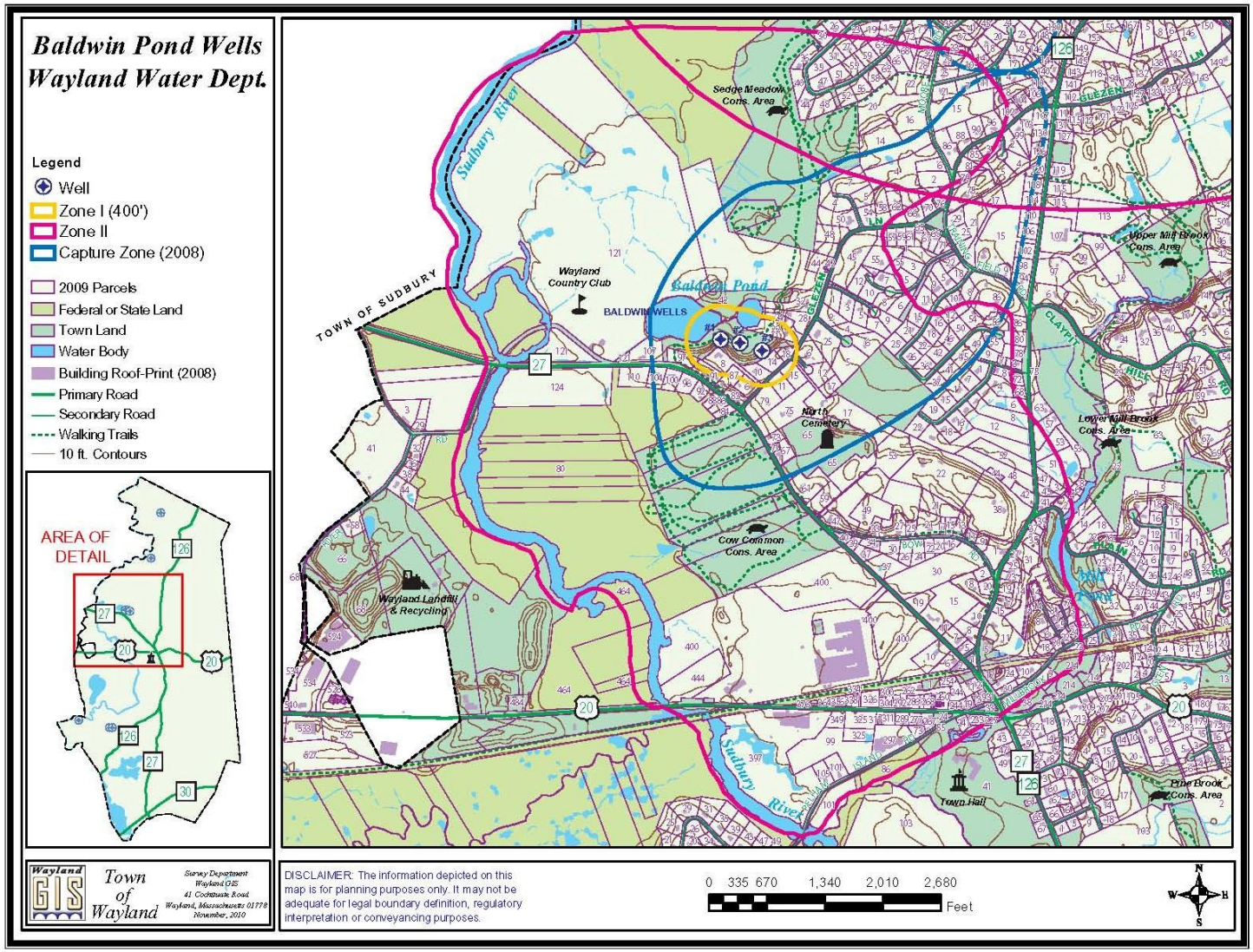
Baldwin Pond Wells
Wayland Water Dept.
Legend
Well
Zone I (400')
Zone II
Capture Zone (2008)
2009 Parcels
Federal or State Land
Town Land
Water Body
Building Roof-Print (2008)
Primary Road
Secondary Road
Walking Trails
10 ft. Contours
AREA OF DETAIL
Sudbury River
Sedge Meadow Cons. Area
Wayland Country Club
Baldwin Pond
BALDWIN WELLS
TOWN OF SUDBURY
Upper Mill Brook Cons. Area
North Cemetery
Lower Mill Brook Cons. Area
Cow Common Cons. Area
Wayland Landfill & Recycling
Town Hall
Pine Brook Cons. Area
Town of Wayland
Survey Department
Wayland GIS
41 Cochituate Road
Wayland, Massachusetts 01778
November, 2010
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.
0 335 670 1,340 2,010 2,680
Feet
N
W
E
S

Figure 18

Cemetery and the Wayland Country Club Golf Course are in the Zone II.

The Zone II of the Baldwin Pond Wells is also the location of two hazardous waste cleanups: the former Watertown Dairy and the former Raytheon facility on Route 20. The remediation of the Watertown Dairy was completed in 1990. The waste disposal site in the southwest portion of the property is also in the Capture Zone of the wells (Appendix K). The remediation at Raytheon is ongoing (Appendix L). In order for the town to continue monitoring for future changes in low-level VOCs in the Zone II, Raytheon installed five sentinel wells on Cow Common Conservation Area, to the northwest between the site and the Baldwin Pond Wells, pursuant to a 2009 agreement with the ConCom. Beginning in 2012, the DPW Water Division will have sole responsibility for the monitoring and testing of the sentinel wells (Appendix M).

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Baldwin Pond Wells PSOC #1-Residential Septic Systems

There are 7 residential septic systems located in the Baldwin Pond Wells Zone I. There are approximately 115 residential septic systems located in the Baldwin Pond Wells Capture Zone.
For full discussion of this topic see page 29.

Baldwin Pond Wells PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW: HHW is a serious concern for the Baldwin Pond Wells due to the number and location of residences in the Zone I and Capture Zone.
For full discussion of this topic see page 30.

There are approximately 21 residential inground pools located within the Zone II.
For full discussion of this topic see page 33.

Residential Activities: Residential activities are a serious concern for the Baldwin Pond Wells due to the number and location of residences in the Zone I and Capture Zone.
For full discussion of this topic see page 31.

Baldwin PSOC #3-Transportation Corridors and Stormwater Basins

Transportation Corridors: There are over 1.25 acres of paved area at the Baldwin Pond Water Treatment Facility; a main throughway, Old Sudbury Road (Route 27); and a connector road, Glezen Lane (west), located in the Capture Zone of the Baldwin Pond Wells.
For full discussion of this topic see page 25.

Stormwater Basins: Stormwater basins and engineered controls are located in the Capture Zone of the Baldwin Pond Wells.
For full discussion of this topic see page 26.

Baldwin Pond Wells PSOC #4-Commercial/Industrial Businesses

Businesses and professional offices are located throughout Wayland, but the heaviest concentration of commercial use is along Routes 20 and 27 in the Zone II of the Baldwin Pond Wells (Figure 19).

Business owners understand that a clean, safe water supply is critical to the future sustainability and growth of local businesses. However, commercial, industrial and retail businesses and professional offices can discharge high volumes of wastewater, hazardous waste and pollutants to local groundwater sources. Additionally, businesses and offices often have large impervious parking areas, landscaping and stormwater infrastructure that can include fertilization, pesticide application, sweeping, deicing and other maintenance activities. Businesses may also use or store varying amounts of chemical compounds, cleaning solutions, pesticides, fertilizers, deicing materials and other hazardous materials for their daily operations. The cumulative effects of wastewater production, maintenance activities, and potential hazardous material spills can seriously degrade the quality of drinking water in Wayland.

The SWAP Report lists numerous contaminants and/or activities related to commercial and industrial facilities in the Zone II of the Baldwin Pond Wells (Appendix E). Since the issuance of this report by MassDEP in 2002, there have been changes in the land use in this business corridor.

Industrial floor drain discharges to the ground are suspected sources of contamination of several public drinking water supplies in Massachusetts. There are many cases where floor drain discharges have caused soil and/or groundwater contamination. The most common types of unauthorized systems are floor drains and/or slop sinks that lead to dry wells, septic systems, or subsurface leaching pits. Discharges from floor drains occur more frequently at smaller facilities like dry cleaners, auto repair, body shops, and machine shops.

As previously mentioned (see page 12), MassDEP advised the WPC in 2010 that the wellhead protection conditions of the Water Withdrawal Permit require the town to adopt a non-zoning floor drain control in order to comply with 310 CMR 22.21(2) of the Drinking Water Regulations. The WPC has discussed the adoption of floor drain control regulations such as the MassDEP model regulations with the Health Director and the BOH. Since the BOH did not act on adopting its own regulations, the WPC also discussed with the DPW the alternative of submitting a non-zoning warrant article at town meeting. To date compliance with the requisite floor drain controls has not been achieved. (See Management Strategies and Action Plan.)

Baldwin Pond Wells PSOC #5-Cemeteries

Cemeteries cover approximately 3.15 acres of the Baldwin Pond Wells Capture Zone.

In 1998, the World Health Organization (WHO) Nancy Project Office conducted a short review of the current state of knowledge regarding the presence, or absence, of soil and groundwater contamination from cemeteries. The study showed that, at that time, there was little published information on whether cemeteries should be regarded as potential sources of pollutants.

Town of Wayland Zoning: Light Manufacturing Districts A&B; Limited Commercial District

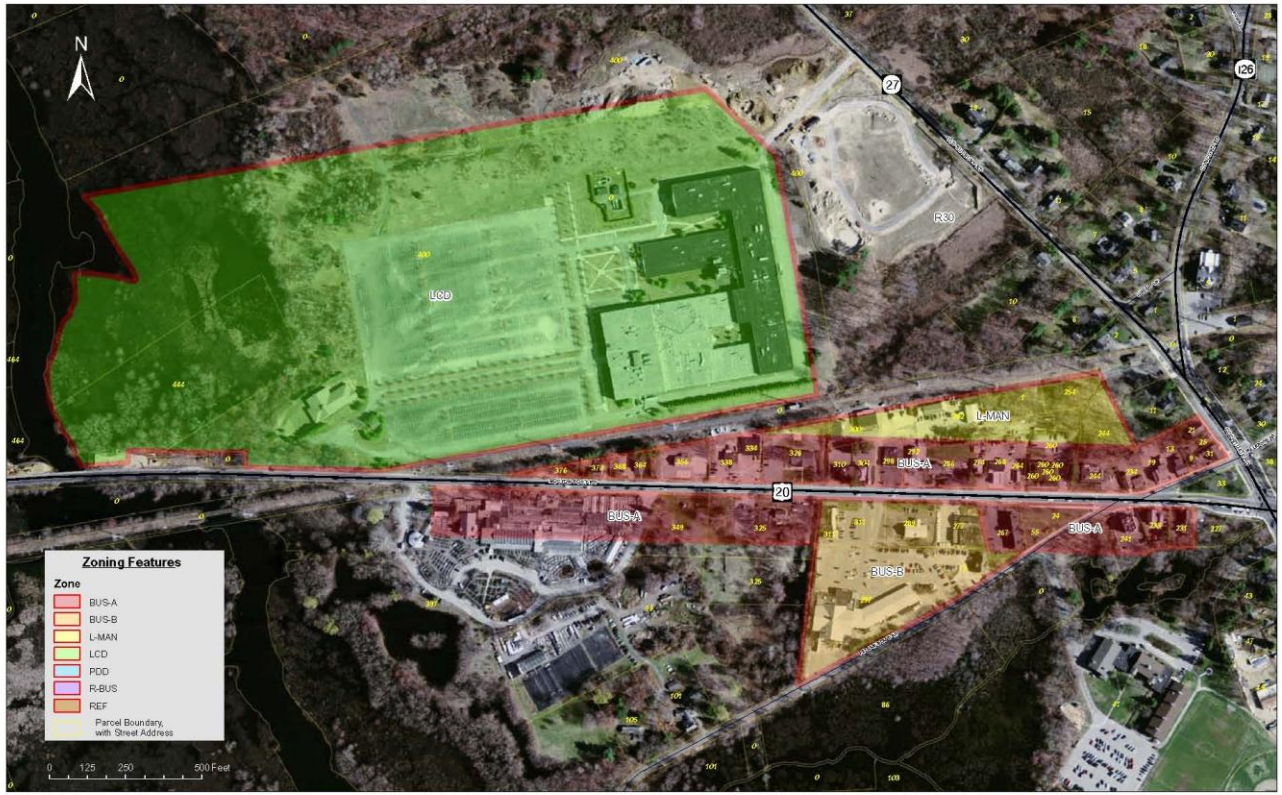

Figure 19

The study concluded that there is a seepage of decay products into percolating water. This seepage contains bacteria, viruses and organic and inorganic chemical decomposition products including heavy metals. If the cemetery is located in a porous soil type, such as sand or gravel, movement of seepage can be rapid and mix easily with the groundwater beneath the site. This could conceivably be a cause of local epidemics from waterborne diseases where the groundwater is used as a water source. Typical microorganisms known to be responsible for waterborne diseases and present in seepage include micrococcaceae, streptococci, bacillus and entrobacteria. (See Resources Section.)

Since the WHO study was released in 1998, there have been numerous additional studies linking the burial of corpses in cemeteries and their subsequent degradation to groundwater pollution. Potential cemetery groundwater contaminants not only stem from natural decay, but from additives introduced during the burial ceremonies and normal maintenance including embalming fluid, plastics, glues, toxic materials and wood preservatives used in the construction of coffins, concrete and polymers mixed with concrete, and landscaping chemicals.

Baldwin Pond Wells PSOC #6-Golf Course

Golf courses are a unique form of land use in that they produce relatively little runoff but possibly a great deal of groundwater pollution. The unusually high rates of fertilizers and pesticides applied to tees and greens make golf courses a prime potential source of contamination. The Wayland Country Club Golf Course is located in the Zone II of the Baldwin Pond Wells.

Baldwin Pond Wells PSOC #7-Agricultural Uses on Conservation Land

Land is leased on the Cow Common and Sedge Meadow Conservation Areas through the ConCom for agriculture.

Potential threats to the quality of water associated with agricultural uses include the application of manure, herbicides, pesticides, fertilizers and other soil amendments as well as potential spills of waste oil and other fluids by farm equipment.

Agricultural water pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into the groundwater. The effects of agricultural pollutants on specific waters vary and may not always be fully assessed. However, we know that these pollutants can have harmful effects on drinking water supplies, recreation, fisheries, and wildlife.

According to the EPA, the most prevalent problem is high levels of nitrate from application of manure and fertilizer. Ammonium, a major component of fertilizer and manure, is very soluble in water, and increased concentrations of nitrate that result from nitrification of ammonium are commonly present in both ground water and surface water associated with agricultural lands. Nitrate is a colorless, odorless and tasteless compound that has been associated with methemoglobinemia, a condition found in infants under six months that can result in brain damage and death.

Applications of herbicides and pesticides to cropland can result in significant additions of contaminants to water resources. Some herbicides and pesticides may be broken down quickly or are only slightly soluble in water and may attach to soil particles instead of remaining in solution; these compounds are less likely to cause contamination of ground water. Others, however, are persistent and water soluble and can be found in potentially dangerous concentrations in both groundwater and surface water.

Baldwin Pond Wells PSOC #8-Beavers

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. Also, the presence of beavers near public water supply sources may pose a threat to the protection of public health because the animals have commonly been identified as carriers of *Giardia Lamblia* and *Cryptosporidium*, pathogens that pose an unacceptable risk to drinking water.

An amendment to the state's trapping laws charge the MassDEP with determining when a threat to human health and safety exists as a result of the presence of beavers in and around public water supply sources and pump stations. A MassDEP determination that a threat exists may be used by an applicant to petition the local BOH for an emergency permit to eliminate the threat.

Beavers have been removed from Baldwin Pond. Baldwin Pond should be carefully monitored to ensure that the CWS does not become contaminated from beaver activity.

Baldwin Pond Wells PSOC #9-Public Trail

A trail runs through the Zone I of the Baldwin Pond Wells near the treatment facility. The Zone I is the most critical area for protection, where impacts are likely to be immediate and certain.

Baldwin Pond Wells PSOC #10-USTs

There are some residential USTs in the Capture Zone and Zone II of the Baldwin Pond Wells.
For full discussion of this topic see page 32.

Baldwin Pond Wells PSOC #11-Transformers

Ground level and pole mounted transformers can be found in the Capture Zone and Zone II of the Baldwin Pond Wells.
For full discussion of this topic see page 33.

MANAGEMENT STRATEGIES FOR POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Strategies for Baldwin Pond Wells PSOC #1-Residential Septic Systems

- Partner with the BOH, Board of Assessors and GIS Coordinator to generate a list of all residents within the Zone I, Capture Zone and Zone II that have septic systems. Send educational information to all residents on the care and maintenance of individual septic systems.

- After sending educational information to residents with septic systems, partner with the BOH to follow up with a request for voluntary participation in a septic system inspection program that would include mapping the location of the systems for future inspections, and a visual inspection conducted by a qualified professional. Create a septic system database and, if necessary, recommend that residents consult with a registered sanitarian or licensed sanitary engineer for a more in-depth evaluation of any problems identified during the inspection process. Focus on the Zone I and Capture Zone but include all willing residents within the Zone II.
- Partner with the BOH to follow up with residents and request voluntary participation in a septic tank cleaning program. Coordinate with local septic tank cleaning services to create a neighborhood cleaning discount program.
- Partner with the BOH to promote the town's Community Septic Management Program which provides financial assistance to homeowners with failed septic systems as well as a state income tax credit. (See also Septic System Financial Assistance in Resources Section.)

Strategies for Baldwin Pond Wells PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW:

- Partner with the BOH to develop an educational program to reduce the use of and runoff of household hazardous chemicals or to create a conversion program for eco-friendly products.
- Partner with the BOH on a voluntary program to provide incentives and to assist residents in sealing floor drains.
- Partner with the BOH on a program to educate residents on chemical storage practices and BMPs for draining swimming pools.
- Partner with the DPW to provide residents with information on the Transfer Station's programs to properly dispose of HHW and pharmaceuticals.
- Partner with the Police Department to collect medicines for proper disposal.
- Partner with the Fire Department to educate residents on groundwater contamination risks from fuel oil spills and to meet the requirements of Chapter 453 of the Acts of 2008, An Act Relative to Homeowner Heating Safety. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities:

- Partner with the ConCom to provide residents with information on BMPs for the use of fertilizers, herbicides and pesticides on landscaped and grassed areas in the Capture Zone. (See Resources Section for Protecting Water Sources From Fertilizer Information.)
- Partner with the ConCom and the BOH to provide assistance with voluntary soil tests through the University of Massachusetts Extension Laboratory to help provide recommendations that lead to the wise and economical use of soils and soil amendments. (See Resources Section for information on University of Massachusetts Extension Soil Test Procedures.)

- Work with the DPW Water Division to develop a Drought Management Plan that follows American Water Works Association Drought Management Planning guidance. (See Resources Section for Water Conservation Standards.)
- Work with the DPW Water Division to implement a comprehensive Residential Water Conservation Program that seeks to reduce residential water use in accordance with the Water Conservation Standards. (See Resources Section for Water Conservation Standards.)
- Partner with the ConCom to create an annual Organic Lawn and Garden Tour/Competition in Wayland.
- Continue with educational and outreach efforts, such as co-sponsorship of Demonstration Organic Lawn Project at Mellen Green (Figure 20).
- Provide residents with information on alternatives to using sodium chloride on snow and ice in the Zone I and Capture Zone.
- Partner with the School Department to evaluate and enhance existing source water protection and water conservation curricula.

Figure 20

Strategies for Baldwin Pond Wells PSOC #3-Transportation Corridors and Stormwater Basins

Transportation Corridors:

- Partner with the DPW to create an Impervious Surface Monitoring Plan for the Capture Zone.
- Collaborate with the DPW to increase the amount of road sweepings in the Capture Zone to remove sediments, hydrocarbons and other potentially hazardous materials.
- Work with the DPW to create a formalized Road Deicing Policy to include the use of advanced technologies to reduce deicing applications in the Zone IIs throughout Wayland with particular focus on the Capture Zones.
- Partner with the DPW to create a Snow Storage Plan that limits use of the Zone II.
- Partner with the Fire Department to create a Capture Zone Road Map and Capture Zone Emergency Plan identifying stormwater basins to be carried on fire trucks in the event of a spill.
- Meet with local Emergency Response Team to discuss response to emergencies that may impact drinking water supplies.

Stormwater Basins:

- Collaborate with ConCom and the DPW to identify all stormwater controls in the Capture Zone and to create a Stormwater Maintenance Plan for the Capture Zone integrated with the updated Phase II Stormwater Management Plan.
- Partner with the DPW to maintain basins by making sure the orifices are not blocked or clogged, repairing erosion, removing sediment, and managing the vegetation so that vegetation is kept to heights that allow for easy inspection for animal burrows, sinkholes, erosion, etc.
- Apply for CPA funding to purchase plaques for stormwater drains or to develop a storm drain stenciling program to inform residents and children that the drains lead to groundwater/drinking water sources.

Strategies for Baldwin Pond Wells PSOC #4-Commercial/Industrial Businesses

- Continue to work with the BOH to adopt floor drain control regulations or, in the alternative, with the DPW to submit a non-zoning floor drain control bylaw for town meeting. (See Action Plan.)
- Work with businesses to develop spill prevention and response plans that include:
    1. Description of business activities, with a site map showing where hazardous materials are stored
    2. A list of spill control equipment on the site
    3. An emergency response procedure, including whom to call in an emergency
    4. Training and awareness for employees on a regular basis
- Work with businesses to keep all hazardous materials in secondary containment.
- Work with businesses to reduce the amount of hazardous materials used and stored onsite.
- Work with MassDEP to update the SWAP Report to reflect changes in the land use in the Zone II.
- Partner with the DPW Water Division to monitor and test the sentinel wells in the Zone II on Cow Common Conservation Area for future changes in low-level VOCs (Appendices N and O).

Strategies for Baldwin Pond Wells PSOC #5-Cemeteries

- Partner with the cemetery management staff to create an option for "green" burials.
- Work with the DPW to limit expansion of the Old North Cemetery into the Capture Zone.

Strategies for Baldwin Pond Wells PSOC #6-Golf Course

- Encourage the Wayland Country Club Golf Course grounds manager to pursue an organic and non-chemical grounds management program in order to eliminate toxic pesticides and fertilizers. Although Integrated Pest Management (IPM) is an ecologically-based approach designed to lessen impact on the environment, it does not provide adequate protection for the water supply.
- Partner with the Wayland Country Club management team to implement BMPs for water use including irrigation leak detection and system layout, metering,

system maintenance, soil testing, nutrient management planning, and creating riparian zones for water quality protection.
- Partner with Wayland Country Club management team to control goose populations in the Zone II.
- Partner with the Wayland Country Club management team on environmental stewardship and transitioning to a designated "green" golf course.

Strategies for Baldwin Pond Wells PSOC #7-Agricultural Uses on Conservation Land

- Partner with the ConCom to make policies and farm agreements to reduce or eliminate the use of fertilizers and pesticides on the agricultural land located on the Cow Common and Sedge Meadow Conservation Areas within the Capture Zone and Zone II.

Strategies for Baldwin Pond Wells PSOC #8-Beavers

- Partner with the DPW Water Division to create a beaver monitoring system and a plan to take appropriate measures should the animal begin to impact the water supply. (See Resources Section for Standard Operating Procedures for Determining a Threat to Public Water Supplies Related to the Presence of Beaver and Muskrat.)

Strategies for Baldwin Pond Wells PSOC #9-Public Trail

- Partner with the ConCom to determine the nature of the trail and delineate an alternate area for walking outside the restricted Zone I of the wells.
- Prohibit dog walking within the restricted Zone I of the wells.
- Partner with the DPW Water Division to post additional Drinking Water Supply Area signage in the Zone I.

Strategies for Baldwin Pond Wells PSOC #10-USTs

- Identify all residential USTs in the Zone II and in cooperation with the Fire Department provide tank owners with information on preventive measures to reduce the potential for releases, including measures owners can take to reduce the likelihood and minimize impact of spills during filling operations. (See Resources Section on Homeowner Heating Safety Information.)
- Provide information to residential UST owners on available financial assistance for removal of tanks. (See UST Financial Assistance in Resources Section.)

Strategies for Baldwin Pond Wells PSOC #11-Transformers

- Contact NSTAR (utility company) to determine if any of the transformers in the Zone II contain PCBs, MODEF or other potential water source contaminants and, if necessary, collaborate with NSTAR to create a phase-out program.
- Partner with the DPW to utilize a global position system (GPS) to mark all transformers located within the Zone II and to create and disseminate transformer location maps to the DPW, Police Department and Fire Department.
- Partner with the DPW to create a Transformer Monitoring Program for potential leaks and management of trees, limbs and other hazards.

Baldwin Pond Wells Action Plan	**WPC with**	**When**
1. Reduce contamination from septic systems	BOH,Assessors,GIS	FY12, long-term
2. Reduce contamination from HHW & residential activities	BOH,ConCom,DPW, Police, Fire	FY12, long-term
3. Reduce pollutant and stormwater runoff to Capture Zone	DPW,ConCom,Fire,ERT	FY12, long-term
4.a Adopt floor drain control regulations or	BOH	By Dec 15, 2011
4.b. Submit non-zoning floor drain control bylaw for town meeting	DPW	By Jan 15, 2012
5. Reduce potential contamination from cemeteries	DPW	FY12
6. Reduce potential pollution from golf course	property owner	FY12, long-term
7. Reduce potential contamination from agricultural uses	DPW,ConCom	FY12, long-term
8. Reduce potential pollution from beaver activities	DPW	FY12, long-term
9. Reduce potential pollution from trail	DPW,ConCom	FY12
10. Reduce potential of residential UST pollution	Fire	FY12, long-term
11. Reduce potential of transformer accident/spill	Fire/Police	FY12, long-term
12. Monitor sentinel wells on Cow Common	DPW	FY13, long-term

CHAMBERLAIN WELL

CONTAMINATION RISK

After the Happy Hollow Wells and the Baldwin Pond Wells, the Chamberlain Well is considered the third highest potential contamination risk in Wayland. The well is located on permanently protected conservation land, and the geologic and pumping test records show that the well is partially confined by a few layers of clay at the site. There is, however, a lack of confining clay layers surrounding the well (within the Capture Zone) (Appendix C), and there are also residential areas and transportation corridors located within the Capture Zone which cumulatively threaten to degrade the quality of the well water.

SYSTEM DESCRIPTION

The Chamberlain Well is located in the northwestern section of the distribution system off Moore Road (Figures 5, 21 and 22). The well is connected to the distribution system through a 12-inch diameter water main that connects to an 8-inch main on Moore Road. The well is a 24- inch by 48-inch gravel packed well approximately 63.5 feet deep. The well is equipped with a 75 horsepower constant speed vertical pump.

Water from the Chamberlain Well is disinfected with a liquid solution of NaOCl, via a solenoid-actuated diaphragm pump. The day tank volume of NaOCl is 55-gallons and bulk storage is in 55-gallon drums or 5-gallon carboys. Powder or granule type NaF (added for tooth decay prevention) is stored in 50-lb. bags and is added to a 50-gallon saturator tank also via a solenoid-actuated diaphragm pump. For pH adjustment, a liquid solution of KOH, stored in two 700-gallon tanks and delivered through a 50-gallon day tank, is added by a positive displacement diaphragm pump. The Chamberlain Well treatment system is capable of treating up to 575 GPM or 0.83 MGD, the maximum daily rate of withdrawal allowed under the 2003 WMA permit.

Figure 21

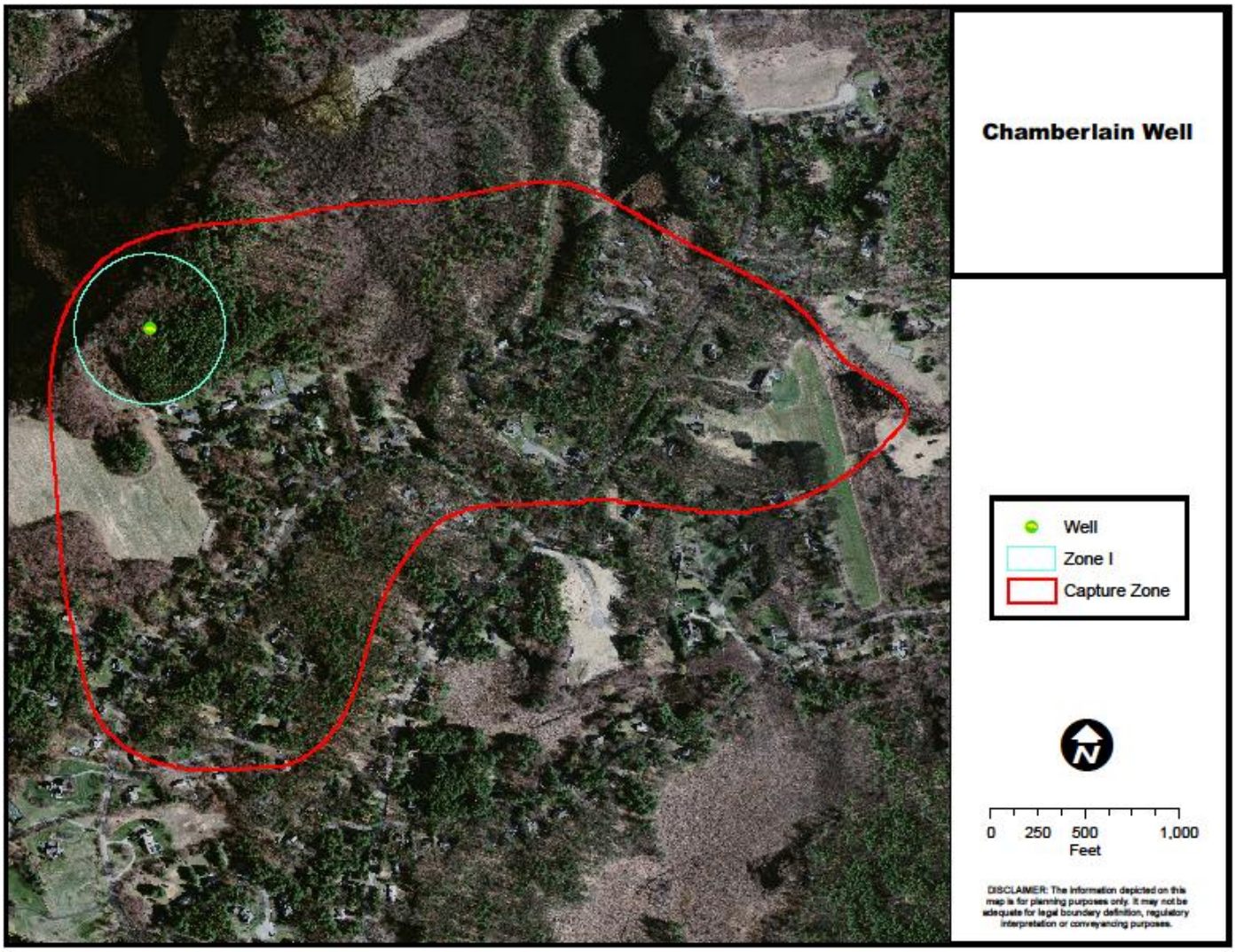
Chamberlain Well
Well
Zone I
Capture Zone
N
0
250
500
1,000
Feet
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.

Figure 22

WELLHEAD PROTECTION AREAS

A Wellhead Protection Area or Source Protection Area is defined on p. X. The following are Wellhead Protection Areas for the Chamberlain Well (Figure 23):

Chamberlain Well Zone 1: The Zone I is a 400-foot radius around each well. This is the area where impacts are likely to be immediate and certain. The Zone I is the most critical area for protection.

According to the requirements of the MassDEP Drinking Water Regulations, "[a]ll suppliers of water shall acquire ownership or control of sufficient land around wells, infiltration galleries, springs and similar sources of ground water used as sources for drinking water to protect the water from contamination. This requirement shall generally be deemed to have been met if all land within Zone I is under the ownership or control of the supplier of water. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of the public water system or to other land uses which the public water system has demonstrated have no significant impact on water quality." (Appendix I).

The Chamberlain Well Zone I includes a section of the Sedge Meadow Conservation Area, a permanently protected conservation land owned by the Town of Wayland, and a section of the Great Meadows National Wildlife Refuge, a permanently protected refuge along the Sudbury River.

Chamberlain Well Capture Zone: A Capture Zone analysis was used to determine the surface and subsurface area surrounding the Chamberlain Well where contaminants are reasonably likely to move toward and reach the well under actual pumping and recharge conditions. The Capture Zones for the Town of Wayland Public Water Systems were delineated in October 2008 by Earth Tech AECOM largely using Wayland's pre-existing data including groundwater elevation contours, pumping test rates, aquifer transmissivity and downgradient stagnation points (Appendix C).

The Chamberlain Well Capture Zone is 192 acres and includes the Zone I, a section of an agricultural field (located within the Sedge Meadow Conservation Area and managed by the ConCom), and residential areas to the south and east of the well located off of Spruce Tree Lane, Wayside Road, Loblolly Lane, Sweet Grass Lane, Lewis Path, Hickory Hill Road and Acorn Lane as well as sections of Concord Road (Route 126), Moore Road and Sedgemeadow Road.

Chamberlain Well Zone II: The Zone II includes the Zone I and Capture Zone and encompasses 1196.5 acres in total. The Zone II covers a large section of northwestern Wayland and a small section of the Town of Sudbury. It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. The Zone II is the area where impacts are

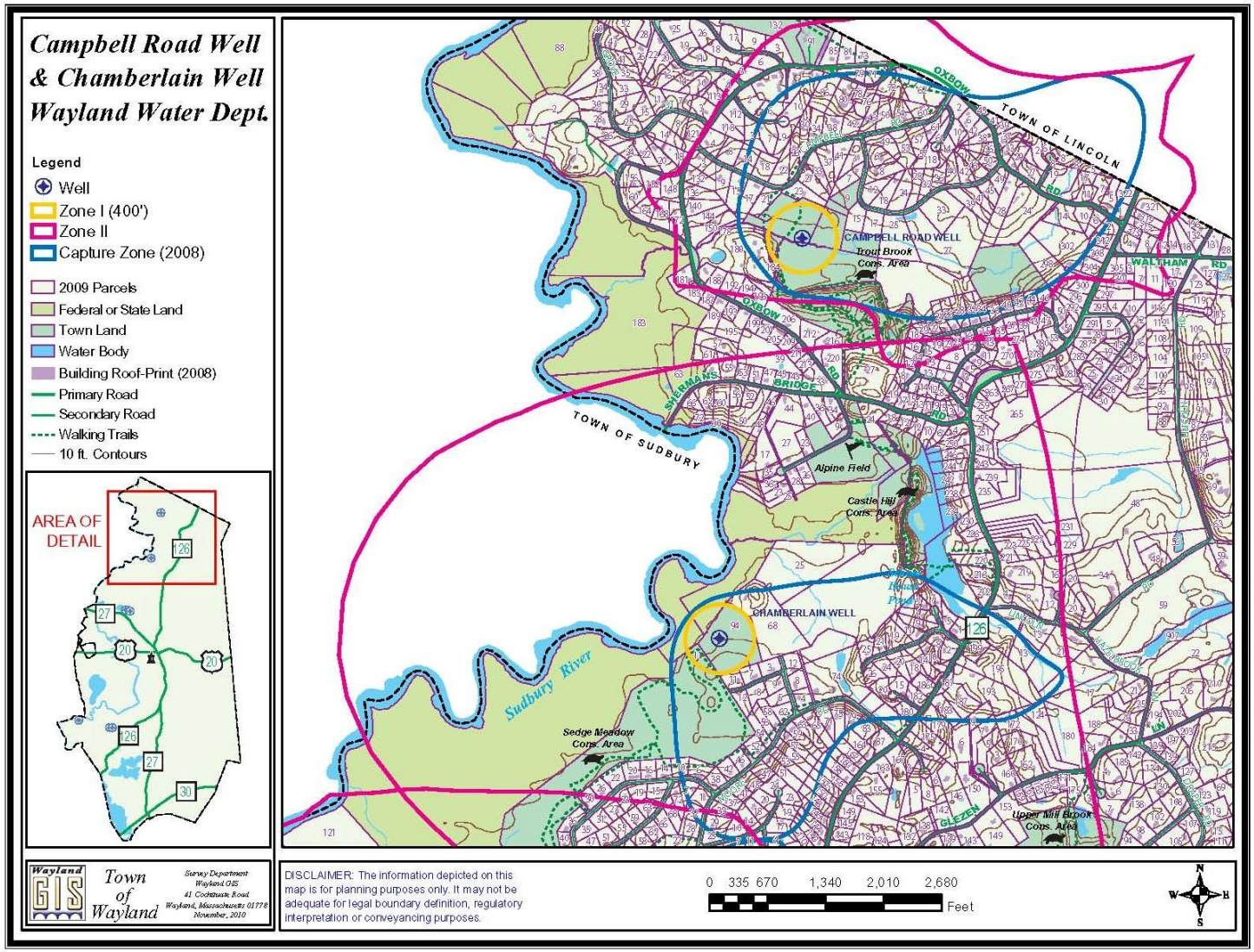
Campbell Road Well
& Chamberlain Well
Wayland Water Dept.
Legend
Well
Zone I (400')
Zone II
Capture Zone (2008)
2009 Parcels
Federal or State Land
Town Land
Water Body
Building Roof-Print (2008)
Primary Road
Secondary Road
Walking Trails
10 ft. Contours
AREA OF DETAIL
CAMPBELL ROAD WELL
Trout Brook Cons. Area
CHAMBERLAIN WELL
Sedge Meadow Cons. Area
Alpine Field
Castle Hill Cons. Area
Upper Mill Brook Cons. Area
Sudbury River
TOWN OF LINCOLN
TOWN OF SUDBURY
OXBOW
WALTHAM RD
SHERMANS BRIDGE RD
GLEZEN LN
Wayland GIS
Town of Wayland
Survey Department
Wayland GIS
41 Cochituate Road
Wayland, Massachusetts 01778
November, 2010
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.
0 335 670 1,340 2,010 2,680
Feet
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Figure 23

possible from potential sources of contamination. The Zone II includes transportation corridors; conservation and recreation areas; and residential areas in the towns of Wayland and Sudbury.

A portion of the former Watertown Dairy is located in the Zone II of the Chamberlain Well. As previously noted, this was the site of a hazardous waste cleanup completed in 1990 (Appendix K).

When a water system is not a part of the municipality in which its Zone II is located, it is not always easy for the PWS to obtain local protection. For these water systems, MassDEP provides an alternative wellhead protection compliance standard under the Best Effort Requirement. To achieve compliance with the Best Effort Requirement, a PWS such as Wayland must demonstrate it has used its best efforts in encouraging the community to protect the Zone II with local controls that meet MassDEP Wellhead Protection Regulations (Appendix J).

In April 2010, upon the recommendation of the WPC, the DPW Water Division complied with the Best Effort Requirement by sending the requisite letter with attachments to the Town of Sudbury and documentation thereof to MassDEP. To date Sudbury has not responded to or acted upon the request.

The DPW will need to repeat this notification in the future if Sudbury does not act to protect Wayland's water supplies. (See Action Plan.)

CHAMBERLAIN WELL POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Chamberlain Well PSOC #1-Residential Septic Systems

There are approximately 80 residential septic systems in the Capture Zone of the Chamberlain Well.
For full discussion of this topic see page 29.

Chamberlain Well PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW: HHW is a serious concern for the Chamberlain Well due to the residential areas located within the Capture Zone.
For full discussion of this topic see page 30.

There are approximately 20 residential inground pools located within the Zone II.
For full discussion of this topic see page 33.

Residential Activities: Residential Activities are a serious concern for the Chamberlain Well due to the residential areas located within the Capture Zone.
For full discussion of this topic see page 31.

Chamberlain Well PSOC #3-Chemical Deliveries to the Chamberlain Well Pump House

Water treatment chemicals are delivered to the Chamberlain Well Pump House an average of 3-4 times per year. These chemicals include NaOCl for disinfection, NaF for tooth decay prevention and KOH for pH adjustment. The dirt access road that runs along the agricultural field in the Sedge Meadow Conservation Area is narrow, steep at one point, and requires a tight ninety degree turn prior to gaining access to the delivery pad at the pump house. Furthermore, the pump house is downgradient from the access gate off of Moore Road and the slope can become slippery in winter conditions. The delivery area is pervious and does not contain a chemical spill containment berm. A chemical delivery spill and the use of de-icing agents in this area could be detrimental to the drinking water source. A spill kit is on-site at all times.

Chamberlain Well PSOC #4-Transportation Corridors and Stormwater Basins

Transportation corridors: A main throughway, Concord Road (Route 126), is located in the Capture Zone of the Chamberlain Well.
For full discussion of this topic see page 25.

Stormwater Basins: Stormwater basins and engineered controls are located in the Capture Zone of the Chamberlain Well.
For full discussion of this topic see page 26.

Chamberlain Well PSOC #5- Trail on Conservation Land

The Sedge Meadow Conservation Area consists of 93 acres of land owned by the Town of Wayland and the SVT. The area consists of active and fallow farm fields, wetlands and woodland areas. The Pod Meadow section of the conservation area offers roughly 1.5 miles of trails with several loop options. If leashed or under strict voice control, dogs are allowed in the conservation area. The main trail may pass through the Zone I and Capture Zone as it heads around the farm fields, around the meadows and through the wooded area.

Figure 24

Dog walking on conservation land is a concern in the Chamberlain Well Zone I and Capture Zone. According to the Massachusetts Department of Conservation and Recreation, pet waste can have many adverse effects on the environment, as it is full of

harmful bacteria and excess nutrients. Dogs and other domestic animals commune with humans and can transmit disease-causing bacteria and viruses that can contaminate water sources, including roundworm, giardia, campylobacter, leptospira, tapeworm, cryptosporidium, E. coli and fecal coliform. Furthermore, pet waste, like agricultural fertilizers, can also contain large percentages of ammonium.

Chamberlain Well PSOC #6- Agricultural Uses on Conservation Land
Land is leased through the ConCom for agriculture.
For full discussion of this topic see page 46.

Chamberlain Well PSOC #7-Natural Gas Pipeline
A natural gas pipeline is located in the Capture Zone of the Chamberlain Well.

Figure 25

Pipeline operators will regularly conduct aerial and ground inspections to check right-of-way conditions, test for leaks, install and maintain pipeline markers and to clear brush that restricts access to the right-of-way or visibility during inspections. Rights-of-way are kept clear of trees, brush and other obstructions so the pipeline operator can safely operate, inspect, maintain and repair its pipelines. Rights-of-way are often cleared using defoliating chemical spray herbicides and other harmful chemicals that can leach into groundwater.

Chamberlain Well PSOC #8- USTs
There are some residential USTs in the Zone II of the Chamberlain Well.
For full discussion of this topic see page 32.

Chamberlain Well PSOC #9-Transformers
Ground level and pole mounted transformers can be found in the Capture Zone and Zone II of the Chamberlain Well.
For full discussion of this topic see page 33.

MANAGEMENT STRATEGIES FOR POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Strategies for Chamberlain Well PSOC #1-Residential Septic Systems

- Partner with the BOH, Board of Assessors and GIS Coordinator to generate a list of all residents within the Zone II that have septic systems. Send educational information to all residents on the care and maintenance of individual septic systems and household hazardous waste disposal guidelines.
- After sending educational information to residents with septic systems located within the Zone II, partner with the BOH to follow up with a request for voluntary participation in an annual septic system inspection program that would include mapping the location of the systems for future inspections, and a visual inspection conducted by a qualified professional. Create a septic system database and, if necessary, recommend that residents consult with a registered sanitarian or licensed sanitary engineer for a more in depth evaluation of any problems identified during the inspection process.
- Partner with the BOH to follow up with residents in the Zone II and request their voluntary participation in a septic tank cleaning program. Coordinate with local septic tank cleaning services to create a neighborhood cleaning discount program.
- Partner with the BOH to promote the town's Community Septic Management Program which provides financial assistance to homeowners with failed septic systems as well as a state income tax credit. (See also Septic System Financial Assistance in Resources Section.)

Strategies for Chamberlain Well PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW:

- Partner with the BOH to develop an educational program to reduce the use of and runoff of household hazardous chemicals or to create a conversion program for eco-friendly products.
- Partner with the BOH on a voluntary program to provide incentives and to assist residents in sealing floor drains.
- Partner with the BOH on a program to educate residents on chemical storage practices and BMPs for draining swimming pools.
- Partner with the DPW to provide residents with information on the Transfer Station's programs to properly dispose HHW and pharmaceuticals.
- Partner with the Police Department to collect pharmaceuticals for proper disposal.
- Partner with the Fire Department to educate residents in the Zone II on groundwater contamination risks from fuel oil spills and to meet the requirements of Chapter 453 of the Acts of 2008, An Act Relative to Homeowner Heating Safety. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities:

- Partner with the ConCom to provide residents with information on BMPs for the use of fertilizers, herbicides and pesticides on landscaped and grassed areas in the Capture Zone. (See Resources Section for Protecting Water Sources From Fertilizer Information.)

- Partner with the ConCom and the BOH to provide assistance with voluntary soil tests through the University of Massachusetts Extension Laboratory to help provide recommendations that lead to the wise and economical use of soils and soil amendments. (See Resources Section for information on University of Massachusetts Extension Soil Test Procedures.)
- Work with the DPW Water Division to develop a Drought Management Plan that follows American Water Works Association Drought Management Planning guidance. (See Resources Section for Water Conservation Standards.)
- Work with the DPW Water Division to implement a comprehensive Residential Water Conservation Program that seeks to reduce residential water use in accordance with the Water Conservation Standards. (See Resources Section for Water Conservation Standards.)
- Partner with the ConCom to create an annual Organic Lawn and Garden Tour/Competition in Wayland.
- Continue with educational and outreach efforts, such as co-sponsorship of Demonstration Organic Lawn Project at Mellen Green.
- Provide residents with information on alternatives to using sodium chloride on snow and ice in the Capture Zone.
- Partner with the School Department to evaluate and enhance existing source water protection and water conservation curricula.

Strategies for Chamberlain Well PSOC #3-Chemical Deliveries to Chamberlain Well Pump House

- Partner with the DPW Water Division to improve the chemical delivery road for safer deliveries.
- Partner with the DPW Water Division to design/build an impervious chemical delivery pad at the pump house with a bermed containment area.
- Partner with the DPW Water Division to ensure that DPW staff are trained in the use of the on-site emergency spill kit.
- Meet with local Emergency Response Team to discuss response to emergencies that may impact drinking water supplies.

Strategies for Chamberlain Well PSOC #4-Transportation Corridors and Stormwater Basins

Transportation Corridors:

- Partner with the DPW to create an Impervious Surface Monitoring Plan for the Capture Zone.
- Collaborate with the DPW to increase the amount of road sweepings in the Capture Zone to remove sediments, hydrocarbons and other potentially hazardous materials.
- Work with the DPW to create a formalized Road Deicing Policy to include the use of advanced technologies to reduce deicing applications in the Zone IIs throughout Wayland with particular focus on the Capture Zones.
- Partner with the DPW to create a Snow Storage Plan that limits use of the Zone II.

- Partner with the Fire Department to create a Capture Zone Road Map and Capture Zone Emergency Plan identifying stormwater basins to be carried on fire trucks in the event of a spill.

Stormwater Basins:

- Collaborate with ConCom and the DPW to identify all stormwater controls in the Capture Zone and to create a Stormwater Maintenance Plan for the Capture Zone integrated with the updated Phase II Stormwater Management Plan.
- Partner with the DPW to maintain basins by making sure the orifices are not blocked or clogged, repairing erosion, removing sediment, and managing the vegetation so that vegetation is kept to heights that allow for easy inspection for animal burrows, sinkholes, erosion, etc.
- Apply for CPA funding to purchase plaques for stormwater drains or to develop a storm drain stenciling program to inform residents and children that the drains lead to groundwater/drinking water sources.

Strategies for Chamberlain Well PSOC #5-Trail on Conservation Land

- Partner with the ConCom to determine the nature and location of the trail in the Sedge Meadow Conservation Area and delineate an area for walking outside the restricted Zone I of the wells.
- Partner with the ConCom to prohibit dog walking within the restricted Zone I of the wells.

Strategies for Chamberlain Well PSOC #6-Agricultural Uses on Conservation Land

- Partner with the ConCom to make policies and farm agreements to reduce or eliminate the use of fertilizers and pesticides on the agricultural land located in the Sedge Meadow Conservation Area within the Capture Zone and Zone II.

Strategies for Chamberlain Well PSOC #7-Natural Gas Pipeline

- Partner with the DPW Water Division to communicate with the pipeline company to inform them of the location of the Capture Zone and request a meeting to discuss reducing any toxic chemical sprays in the area.

Strategies for Chamberlain Well PSOC #8-USTs

- Identify all residential USTs in the Zone II and in cooperation with the Fire Department provide tank owners with information on preventive measures to reduce the potential for releases, including measures owners can take to reduce the likelihood and minimize impact of spills during filling operations. (See Resources Section on Homeowner Heating Safety Information.)
- Provide information to residential UST owners on available financial assistance for removal of tanks. (See UST Financial Assistance in Resources Section.)

Strategies for Chamberlain Well PSOC #9-Transformers

- Contact NSTAR (utility company) to determine if any of the transformers in the Zone II contain PCBs, MODEF or other potential water source contaminants and, if necessary, collaborate with NSTAR to create a phase-out program.

- Partner with the DPW to utilize a global position system (GPS) to mark all transformers located within the Zone II and to create and disseminate transformer location maps to the DPW, Police Department and Fire Department.
- Partner with the DPW to create a Transformer Monitoring Program for potential leaks and management of trees, limbs and other hazards.

Chamberlain Well Action Plan	**WPC with**	**When**
1. Reduce contamination from septic systems	BOH,Assessors,GIS	FY12, long-term
2. Reduce contamination from HHW and residential activities	BOH,ConCom,DPW, Police, Fire	FY12, long-term
3. Reduce possibility of chemical delivery spill	DPW, ERT	FY13
3. Reduce pollutant and stormwater runoff to Capture Zone	DPW,ConCom,Fire	FY12, long-term
5. Reduce potential contamination from trail & agriculture on conservation land	ConCom	FY12, long-term
6. Reduce potential contamination from natural gas pipeline	DPW	FY12
7. Reduce potential of residential UST pollution	Fire	FY12, long-term
8. Reduce potential of transformer accident/spill	Fire/Police	FY12, long-term
9. Comply with Best Effort Requirement	DPW	FY14

CAMPBELL WELL

CONTAMINATION RISK

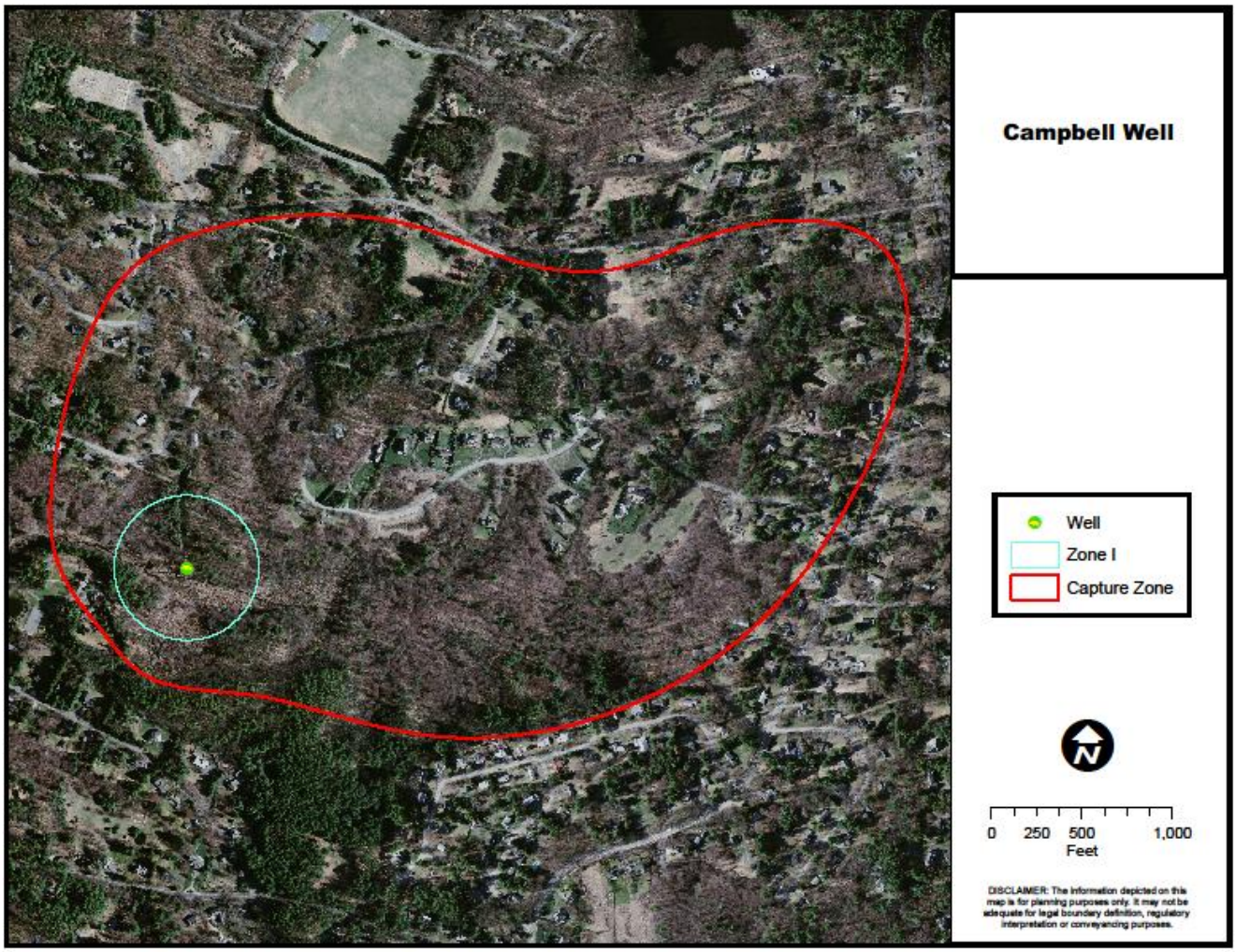
The Campbell Well is considered to be at a lower risk of potential contamination than the Happy Hollow, Baldwin Pond and Chamberlain wells because it exists under a confining layer of fine sand and clay approximately 50 feet thick (Appendix C), and it is located in a less densely populated area.

SYSTEM DESCRIPTION

The Campbell Well, which was drilled in 1968, is located in the northwestern section of the distribution system off Campbell Road (Figures 6, 26 and 27). The well is connected to the distribution system through a 12-inch diameter water main that connects to a 12-inch main on Campbell Road. The well is a 24-inch by 48-inch gravel packed well approximately 57 feet deep. The well is equipped with a 60 horsepower vertical turbine pump. It has a maximum rated capacity of 450 GM or 0.65 MGD.

Water from the Campbell Well is disinfected with a liquid solution of NaOCl, added via a solenoid-actuated diaphragm pump. The day tank volume of NaOCl is 35-gallons and bulk storage is in 55-gallon drums or 5-gallon carboys. Powder or granule type NaF (added for tooth decay prevention) is stored in 50-lb. bags, added to a 50-gallon saturator tank and also delivered through a solenoid-actuated diaphragm pump. For pH adjustment, a liquid solution of KOH is stored in a 1,200-gallon tank and delivered through a 50-gallon day tank via a positive displacement diaphragm pump. The Campbell Well treatment system is capable of treating up to 450 GPM or 0.65 MGD.

Figure 26


Campbell Well
Well
Zone I
Capture Zone
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DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.

Figure 27

WELLHEAD PROTECTION AREAS

A Wellhead Protection Area or Source Protection Area is defined on p. X. The following are Wellhead Protection Areas for the Campbell Well (Figure 28):

Campbell Well Zone 1: The Zone I is a 400-foot radius around each well. This is the area where impacts are likely to be immediate and certain. The Zone I is the most critical area for protection.

According to the requirements of the MassDEP Drinking Water Regulations, "[a]ll suppliers of water shall acquire ownership or control of sufficient land around wells, infiltration galleries, springs and similar sources of ground water used as sources for drinking water to protect the water from contamination. This requirement shall generally be deemed to have been met if all land within Zone I is under the ownership or control of the supplier of water. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of the public water system or to other land uses which the public water system has demonstrated have no significant impact on water quality." (Appendix I).

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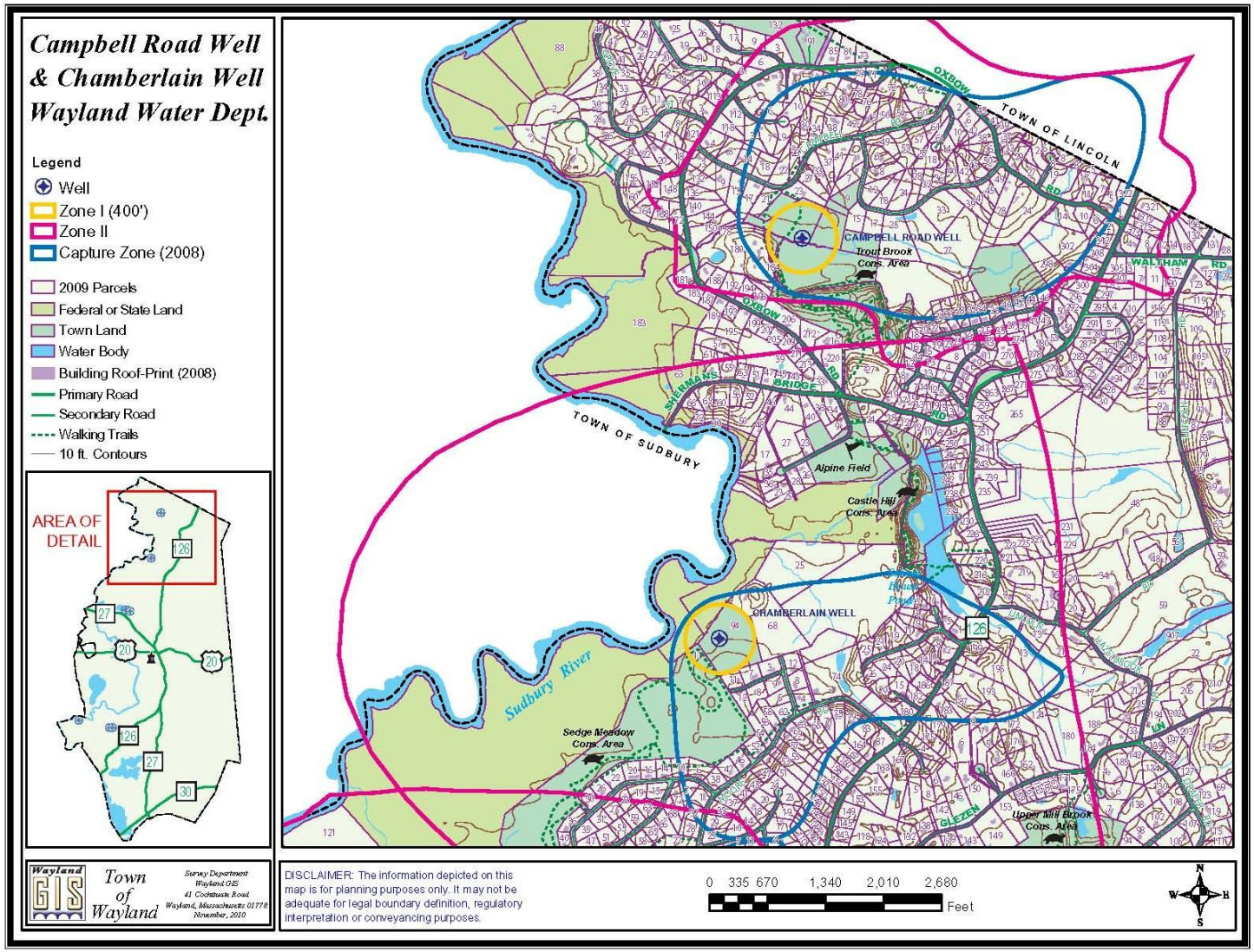
The Campbell Well Zone I is located entirely within the Trout Brook Conservation Area on permanently protected conservation land owned by the Town of Wayland.

Campbell Well Capture Zone: A Capture Zone analysis was used to determine the surface and subsurface area surrounding the Campbell Well where contaminants are reasonably likely to move toward and reach the well under actual pumping and recharge conditions. The Capture Zones for the Wayland Public Water Systems were delineated in October 2008 by Earth Tech AECOM largely using Wayland's pre-existing data including groundwater elevation contours, pumping test rates, aquifer transmissivity and downgradient stagnation points (Appendix C). The Campbell Well Capture Zone is 249.6 acres and includes the Zone I, agricultural fields, and residential areas located off of Campbell Road, York Road, Oxbow Road, Pine Ridge, and residential sections in the Town of Lincoln.

Campbell Well Zone II: The Zone II includes the Zone I and Capture Zone and encompasses 389.6 acres in total. The Zone II covers a large section of northern Wayland and a small section of the Town of Lincoln. It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. The Zone II is the area where impacts are possible from potential sources of contamination. The Zone II includes transportation corridors as well as residential areas in the towns of Wayland and Lincoln.

When a public water system is not a part of the municipality in which its Zone II is located, it is not always easy for the PWS to obtain local protection. For these water systems, MassDEP provides an alternative wellhead protection compliance standard under the Best Effort Requirement. To achieve compliance with the Best Effort Requirement, a PWS such as Wayland must demonstrate it has used its best efforts in


Campbell Road Well
& Chamberlain Well
Wayland Water Dept.
Legend
Well
Zone I (400')
Zone II
Capture Zone (2008)
2009 Parcels
Federal or State Land
Town Land
Water Body
Building Roof-Print (2008)
Primary Road
Secondary Road
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10 ft. Contours
AREA OF DETAIL
CAMPBELL ROAD WELL
Trout Brook Cons. Area
CHAMBERLAIN WELL
Sudbury River
Sedge Meadow Cons. Area
Alpine Field
Castle Hill Cons. Area
Upper Mill Brook Cons. Area
TOWN OF LINCOLN
TOWN OF SUDBURY
OXBOW
WALTHAM RD
SHERMANS BRIDGE RD
GLEZEN LN
Wayland GIS
Town of Wayland
Survey Department
Wayland GIS
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Wayland, Massachusetts 01778
November, 2010
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.
0 335 670 1,340 2,010 2,680
Feet
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Figure 28

encouraging the community to protect the Zone II with local controls that meet MassDEP Wellhead Protection Regulations (Appendix J).

In April 2010, upon the recommendation of the WPC, the DPW Water Division complied with the Best Effort Requirement by sending the requisite letter with attachments to the Town of Lincoln and documentation thereof to MassDEP. To date Lincoln has not acted upon the request.

The DPW will need to repeat this notification in the future if Lincoln does not act to protect Wayland's water supplies. (See Action Plan.)

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Campbell Well PSOC #1-Residential Septic Systems

There are approximately 95 residential septic systems in the Capture Zone of the Campbell Well in Wayland (and some residential septic systems in the Capture Zone in Lincoln).
For full discussion of this topic see page 29.

Campbell Well PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW:
For full discussion of this topic see page 30.

There are approximately 16 residential inground pools located within the Zone II.
For full discussion of this topic see page 33.

Residential Activities:
For full discussion of this topic see page 31.

Campbell Well PSOC #3-Agricultural Uses

For full discussion of this topic see page 46.

Campbell Well PSOC #4-Trail on Conservation Land

The Trout Brook Conservation Area consists of land owned by the Town of Wayland and the SVT. The area has numerous trails and access points as wells as streams, wetlands and upland wooded areas (Figure 29). If leashed or under strict voice control, dogs are allowed in the conservation area. One trail and a man-made bridge may pass through the Zone I of the Campbell Well.

The main concern for the use of the Trout Brook Conservation Area is potential contamination from pet waste.
For full discussion of this topic see page 58.

Figure 29

Campbell Well PSOC #5-Stormwater Basins
Stormwater basins and engineered controls are located in the Capture Zone of the Campbell Well.

Stormwater retention/detention basins and other engineered stormwater controls are typically designed to reduce peak flows, reduce pollution associated with runoff, facilitate groundwater recharge and improve groundwater quality. If maintained properly, stormwater controls typically function as designed. If not maintained, stormwater controls can fall into disrepair and become a hazard to the community's water supply.

Improperly functioning stormwater controls can potentially concentrate pollutants into an area that may infiltrate into the groundwater or pass pollutants into nearby waterways. Repairing erosion early can save significant costs, both in the erosion and the resulting sedimentation that can end up needing to be removed from the stormwater basin.

Campbell Well PSOC #6-Beavers
Campbell Well should be carefully monitored to ensure that the CWS does not become contaminated from beaver activity since beavers have been removed from the area.
For full discussion of this topic see page 47.

Campbell Well PSOC #7-USTs
There are some residential USTs in the Capture Zone and Zone II of the Campbell Well.
For full discussion of this topic see page 32.

Campbell Well PSOC #8-Transformers
Ground level and pole mounted transformers can be found in the Capture Zone and Zone II of the Campbell Well.
For full discussion of this topic see page 33.

MANAGEMENT STRATEGIES FOR POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Strategies for Campbell Well PSOC #1-Residential Septic Systems

- Partner with the BOH, Board of Assessors and GIS Coordinator (as well as the Town of Lincoln) to generate a list of all residents within the Capture Zone and Zone II that have septic systems. Send educational information to all residents on the care and maintenance of individual septic systems.
- After sending educational information to residents with septic systems located within the Zone II, partner with the BOH to follow up with a request for voluntary participation in an annual septic system inspection program that would include mapping the location of the systems for future inspections, and a visual inspection conducted by a qualified professional. Create a septic system database and, if necessary, recommend that residents consult with a registered sanitarian or licensed sanitary engineer for a more in depth evaluation of any problems identified during the inspection process.
- Partner with the BOH to follow up with residents in the Zone II and request their voluntary participation in a septic tank cleaning program. Coordinate with local septic tank cleaning services to create a neighborhood cleaning discount program.
- Partner with the BOH to promote the town's Community Septic Management Program which provides financial assistance to homeowners with failed septic systems as well as a state income tax credit. (See also Septic System Financial Assistance in Resources Section.)

Strategies for Campbell Well PSOC #2-HHW and Residential Activities

HHW:

- Partner with the BOH to develop an educational program to reduce the use of and runoff of household hazardous chemicals or to create a conversion program for eco-friendly products.
- Partner with the BOH on a voluntary program to provide incentives and to assist residents in sealing floor drains.
- Partner with the BOH on a program to educate residents on chemical storage practices and BMPs for draining swimming pools.
- Partner with the DPW to provide residents with information on the Transfer Station's programs to properly dispose of HHW and pharmaceuticals.
- Partner with the Police Department to collect medicines for proper disposal.
- Partner with the Fire Department to educate residents on groundwater contamination risks from fuel oil spills and to meet the requirements of Chapter 453 of the Acts of 2008, An Act Relative to Homeowner Heating Safety. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities:

- Partner with the ConCom to provide residents with information on BMPs for the use of fertilizers, herbicides and pesticides on landscaped and grassed areas in the Capture Zone. (See Resources Section for Protecting Water Sources From Fertilizer Information.)

- Partner with the ConCom and the BOH to provide assistance with voluntary soil tests through the University of Massachusetts Extension Laboratory to help provide recommendations that lead to the wise and economical use of soils and soil amendments. See Resources Section for information on University of Massachusetts Extension Soil Test Procedures.)
- Work with the DPW Water Division to develop a Drought Management Plan that follows American Water Works Association Drought Management Planning guidance. (See Resources Section for Water Conservation Standards.)
- Work with the DPW Water Division to implement a comprehensive Residential Water Conservation Program that seeks to reduce residential water use in accordance with the Water Conservation Standards. (See Resources Section for Water Conservation Standards.)
- Partner with the ConCom to create an annual Organic Lawn and Garden Tour/Competition in Wayland.
- Continue with educational and outreach efforts, such as co-sponsorship of Demonstration Organic Lawn Project at Mellen Green.
- Provide residents with information on alternatives to using sodium chloride on snow and ice in the Capture Zone.
- Partner with the School Department to evaluate and enhance existing source water protection and water conservation curricula.

Strategies for Campbell Well PSOC #3-Agricultural Uses

- Partner with local farmers, horse and livestock owners, greenhouse owners, etc. to reduce or eliminate the use of fertilizers and pesticides on the agricultural land located within the Capture Zone and Zone II.

Strategies for Campbell Well PSOC #4-Trail on Conservation Land

- Partner with the ConCom to prohibit dog walking in the Trout Brook Conservation Area within the restricted Zone I of the wells.
- Partner with the DPW Water Division to fence in the pump house and chemical feed/storage areas.

Strategies for Campbell Well PSOC #5-Stormwater Basins

- Collaborate with ConCom and the DPW to identify all stormwater controls in the Capture Zone and to create a Stormwater Maintenance Plan for the Capture Zone integrated with the updated Phase II Stormwater Management Plan.
- Partner with the DPW and the homeowners association of the Residences at 89 Oxbow Condominiums to maintain basins by making sure the orifices are not blocked or clogged, repairing erosion, removing sediment, and managing the vegetation so that vegetation is kept to heights that allow for easy inspection for animal burrows, sinkholes, erosion, etc.
- Apply for CPA funding to purchase plaques for stormwater drains or to develop a storm drain stenciling program to inform residents and children that the drains lead to groundwater/drinking water sources.

Strategies for Campbell Well PSOC #6-Beavers

- Partner with the DPW Water Division to create a beaver monitoring system and a plan to take appropriate measures should the animal begin to impact the water supply. (See Resources Section for Standard Operating Procedures for Determining a Threat to Public Water Supplies Related to the Presence of Beaver and Muskrat.)

Strategies for Campbell Well PSOC #7-USTs

- Identify all residential USTs in the Zone II and in co-operation with the Fire Department provide tank owners with information on preventive measures to reduce the potential for releases, including measures owners can take to reduce the likelihood and minimize impact of spills during filling operations. (See Resources Section on Homeowner Heating Safety Information.)
- Provide information to residential UST owners on available financial assistance for removal of tanks. (See UST Financial Assistance in Resources Section.)

Strategies for Campbell Well PSOC #8-Transformers

- Contact NSTAR (utility company) to determine if any of the transformers in the Zone II contain PCBs, MODEF or other potential water source contaminants and, if necessary, collaborate with NSTAR to create a phase-out program.
- Partner with the DPW to utilize a global position system (GPS) to mark all transformers located within the Zone II and to create and disseminate transformer location maps to the DPW, Police Department and Fire Department.
- Partner with the DPW to create a Transformer Monitoring Program for potential leaks and management of trees, limbs and other hazards.

Campbell Well Action Plan	WPC with	When
1. Reduce contamination from septic systems	BOH,Assessors,GIS,(Lincoln)	FY12, long-term
2. Reduce contamination from HHW and residential activities	BOH,ConCom,DPW, Police,Fire	FY12, long-term
3. Reduce potential pollution from agricultural uses	property owners	FY12, long-term
4. Reduce potential pollution from use of conservation land	ConCom/DPW	FY12, long-term
5. Reduce contamination from stormwater basins	DPW,ConCom	FY12, long-term
6. Reduce potential pollution from beaver activities	DPW	FY12, long-term
7. Reduce potential of residential UST pollution	Fire	FY12, long-term
8. Reduce potential of transformer accident/spill	Fire/Police	FY12, long-term
9. Comply with Best Effort Requirement	DPW	FY14

MEADOWVIEW WELL

CONTAMINATION RISK

The Meadowview Well is offline due to high levels of manganese and, although important, is the lowest priority site for wellhead protection planning. It is categorized as an active well and can be used in an emergency (Figure 30).

SYSTEM DESCRIPTION

The Meadowview Well, which was drilled in 1972, is located in the southwestern section of the distribution system off Meadowview Road (Figures 3 and 31). The well is connected to the distribution system through an 8-inch diameter water main that connects to an 8-inch main on Meadowview Road. The well is a 24-inch by 48-inch gravel packed well approximately 62 feet deep. It is equipped with a 50 horsepower single speed submersible turbine pump. The well's maximum rated capacity is 280 GPM or 0.4 MGD.

Water from the Meadowview Well is disinfected with a liquid solution of NaOCl via a solenoid-actuated diaphragm pump. The day tank volume of NaOCl is 35-gallons and bulk storage is in 55-gallon drums or 5-gallon carboys. Powder or granule type NaF (added for tooth decay prevention) is stored in 50-lb. bags, added to a 50-gallon saturator tank and also delivered through a solenoid-actuated diaphragm pump. For pH adjustment, a liquid solution of KOH is stored in a 1,700-gallon tank and delivered through a 50-gallon day tank via a positive displacement diaphragm pump. The Meadowview Well treatment system is capable of treating up to 375 GPM or 0.54 MGD.

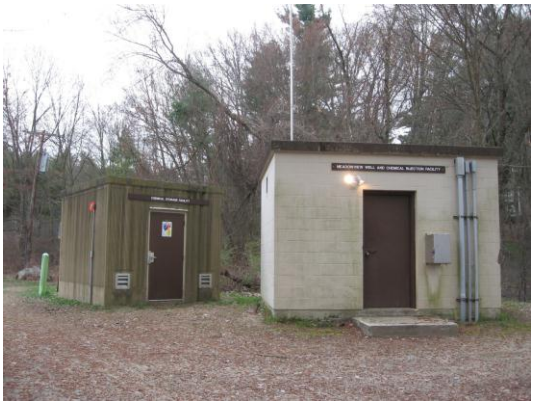

Figure 30

WELLHEAD PROTECTION AREAS

A Wellhead Protection Area or Source Protection Area is defined on p. X. The following are Wellhead Protection Areas for the Meadowview Well (Figure 32):

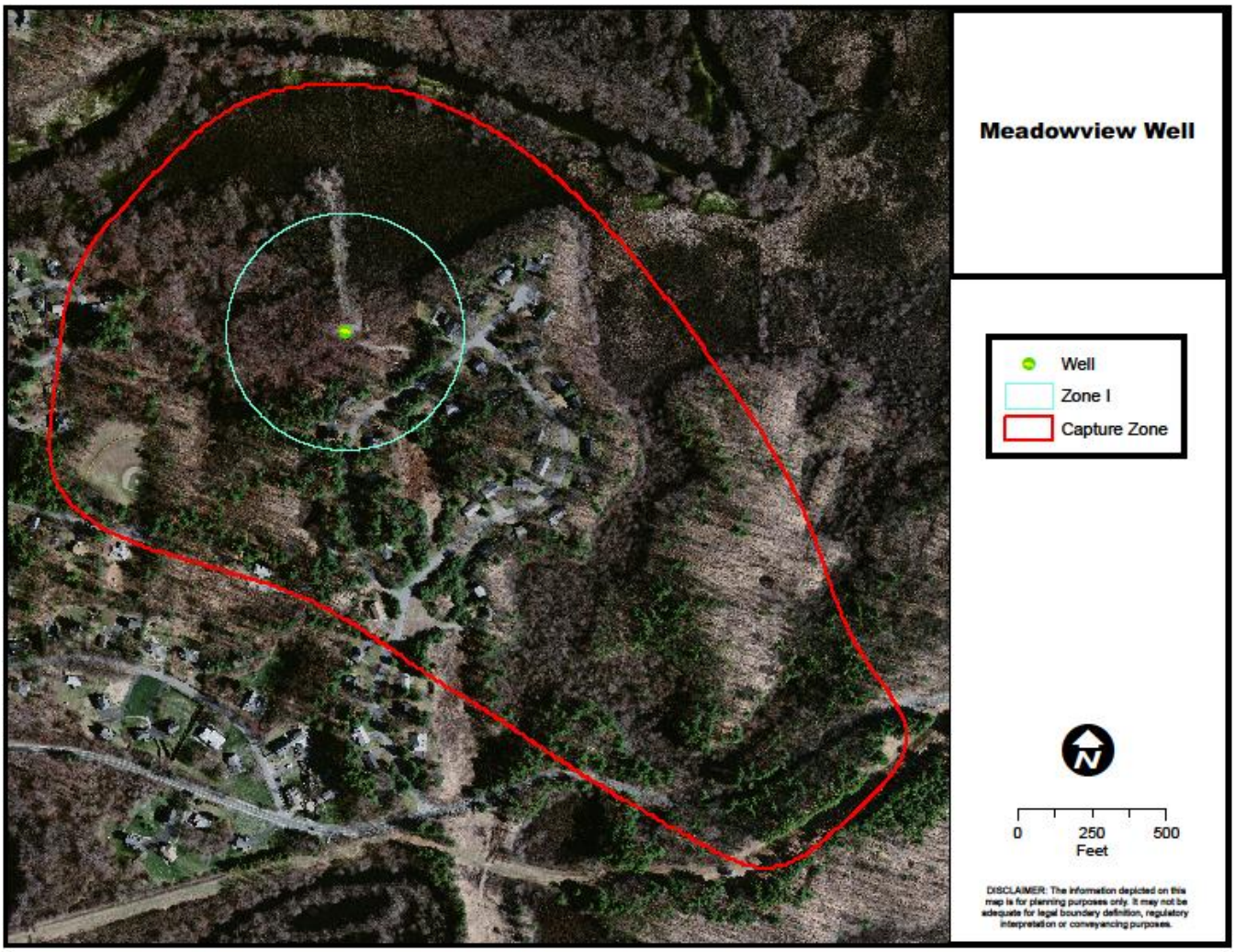
Meadowview Well
Well
Zone I
Capture Zone
N
0
250
500
Feet
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.

Figure 31

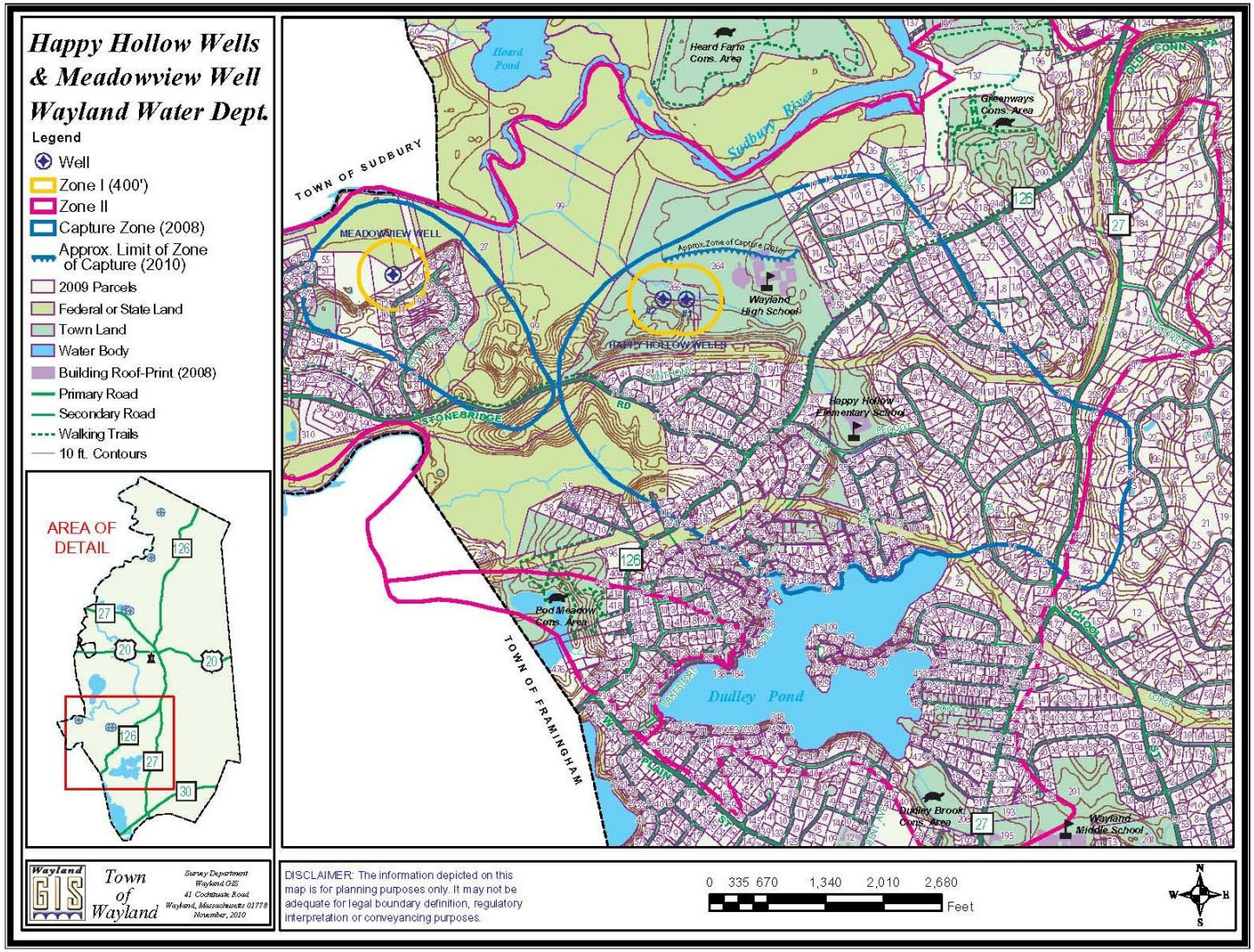
Happy Hollow Wells
& Meadowview Well
Wayland Water Dept.
Legend
Well
Zone I (400')
Zone II
Capture Zone (2008)
Approx. Limit of Zone of Capture (2010)
2009 Parcels
Federal or State Land
Town Land
Water Body
Building Roof-Print (2008)
Primary Road
Secondary Road
Walking Trails
10 ft. Contours
AREA OF DETAIL
TOWN OF SUDBURY
TOWN OF FRAMINGHAM
MEADOWVIEW WELL
HAPPY HOLLOW WELLS
Heard Pond
Heard Farm Cons. Area
Sudbury River
Greenways Cons. Area
Wayland High School
Happy Hollow Elementary School
Pod Meadow Cons. Area
Dudley Pond
Dudley Brook Cons. Area
Wayland Middle School
STONEBRIDGE RD
Approx. Zone of Capture (2010)
Wayland GIS
Town of Wayland
Survey Department
Wayland GIS
41 Cochituate Road
Wayland, Massachusetts 01778
November, 2010
DISCLAIMER: The information depicted on this map is for planning purposes only. It may not be adequate for legal boundary definition, regulatory interpretation or conveyancing purposes.
0 335 670 1,340 2,010 2,680
Feet
N
W
E
S

Figure 32

Meadowview Well Zone 1: The Zone I is a 400-foot radius around the well. This is the area where impacts are likely to be immediate and certain. The Zone I is the most critical area for protection.

According to the requirements of the MassDEP Drinking Water Regulations, "[a]ll suppliers of water shall acquire ownership or control of sufficient land around wells, infiltration galleries, springs and similar sources of ground water used as sources for drinking water to protect the water from contamination. This requirement shall generally be deemed to have been met if all land within Zone I is under the ownership or control of the supplier of water. Current and future land uses within the Zone I shall be limited to those land uses directly related to the provision of the public water system or to other land uses which the public water system has demonstrated have no significant impact on water quality." (Appendix I).

Most of the Meadowview Well Zone I is located in the Great Meadows National Wildlife Refuge, a permanently protected refuge along the Sudbury River. The remainder of the Zone I includes sections of two privately owned parcels.

Meadowview Well Capture Zone: A Capture Zone analysis was used to determine the surface and subsurface area surrounding the Meadowview Well where contaminants are reasonably likely to move toward and reach the well under actual pumping and recharge conditions. The Capture Zones for the Town of Wayland Public Water Systems were delineated in October 2008 by Earth Tech AECOM largely using Wayland's pre-existing data including groundwater elevation contours, pumping test rates, aquifer transmissivity, and downgradient stagnation points (Appendix C).

The Meadowview Well Capture Zone is 96 acres and includes the Zone I, sections of the Great Meadows National Wildlife Refuge and residential areas located off of Meadowview Road. The Wayland Rod & Gun Club is also located in the Capture Zone, but upon investigation does not appear to pose any discernible threat to groundwater.

Meadowview Well Zone II: The Zone II includes the Zone I and Capture Zone and encompasses 1,514.7 acres in total. The Zone II covers a large section of southwestern Wayland, and a small section of the Town of Framingham. It is bounded by the groundwater divides that result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. The Zone II is the area where impacts are possible from potential sources of contamination. The Zone II includes transportation corridors as well as residential areas in Wayland.

When a water system is not a part of the municipality in which its Zone II is located, it is not always easy for the PWS to obtain local protection. For these water systems, MassDEP provides an alternative wellhead protection compliance standard under the Best Effort Requirement. To achieve compliance with the Best Effort Requirement, a PWS such as Wayland must demonstrate it has used its best efforts in encouraging the community to protect the Zone II with local controls that meet MassDEP Wellhead Protection Regulations (Appendix J).

In April 2010, upon the recommendation of the WPC, the DPW Water Division complied with the Best Effort Requirement by sending the requisite letter with attachments to the Town of Framingham and documentation thereof to MassDEP. To date Framingham has not responded to or acted upon the request.

The DPW will need to repeat this notification in the future if Framingham does not act to protect Wayland's water supplies. (See Action Plan.)

In the event construction begins at the Danforth Farm housing project at the former New England Sand and Gravel site near the boundary of Wayland at Old Connecticut and River Paths in Framingham, it is noted that monies were earmarked in the January 2005 $1.45 million litigation settlement agreement (to be paid by the developer) to fund hiring a Wayland Licensed Site Professional (LSP) and for the construction of a groundwater monitoring well on the Wayland side of the Sudbury River to protect the Meadowview well field. Of particular concern is a plume of VOCs from a 1986 release of hazardous materials by the US military, which has been the subject of a groundwater cleanup under Mass DEP Public Involvement Plan (PIP) regulations. The goal is to prevent threats to Wayland's Zone II from project construction including impacts from decades of sand and gravel mining operations, possible dumping activities, as well as chemicals migrating slowly towards the river (Appendix N).

It is also noted that the potential reapplication by the Town of Framingham to reactivate the Birch Road Wells on the Wayland border may be of interest to the DPW Water Division since the water supply of the town could be affected thereby.

POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Meadowview Well PSOC #1-Residential Septic Systems

There are 5 residential septic systems located in the Meadowview Well Zone I. There are approximately 40 residential septic systems located in the Meadowview Well Capture Zone.
For full discussion of this topic see page 29.

Meadowview Well PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW:
For full discussion of this topic see page 30.

There are approximately 6 residential inground pools located within the Zone II.
For full discussion of this topic see page 33.

Residential Activities:
For full discussion of this topic see page 31.

Meadowview Well PSOC #3-USTs

There are some residential USTs in the Zone II of the Meadowview Well.
For full discussion of this topic see page 32.

Meadowview Well PSOC #4-Stormwater Basins:
Stormwater basins and engineered controls are located in the Capture Zone of the Meadowview Well.
For full discussion of this topic see page 69.

Meadowview Well PSOC #5-Transformers
Ground level and pole mounted transformers can be found in the Capture Zone and Zone II of the Meadowview Well.
For full discussion of this topic see page 33.

MANAGEMENT STRATEGIES FOR POTENTIAL SOURCES OF CONTAMINATION (PSOCs)

Strategies for Meadowview Well PSOC #1-Residential Septic Systems

- Partner with the BOH, Board of Assessors and GIS Coordinator to generate a list of all residents within the Zone II that have septic systems. Send educational information to all residents on the care and maintenance of individual septic systems and household hazardous waste disposal guidelines.
- After sending educational information to residents with septic systems located within the Zone II, partner with the BOH to follow up with a request for voluntary participation in an annual septic system inspection program that would include mapping the location of the systems for future inspections, and a visual inspection conducted by a qualified professional. Create a septic system database and, if necessary, recommend that residents consult with a registered sanitarian or licensed sanitary engineer for a more in depth evaluation of any problems identified during the inspection process.
- Partner with the BOH to follow up with residents in the Zone II and request their voluntary participation in a septic tank cleaning program. Coordinate with local septic tank cleaning services to create a neighborhood cleaning discount program.
- Partner with the BOH to promote the town's Community Septic Management Program which provides financial assistance to homeowners with failed septic systems as well as a state income tax credit. (See also Septic System Financial Assistance in Resources Section.)

Strategies for Meadowview Well PSOC #2-Household Hazardous Waste (HHW) and Residential Activities

HHW:

- Partner with the BOH to develop an educational program to reduce the use of and runoff of household hazardous chemicals or to create a conversion program for eco-friendly products.
- Partner with the BOH on a voluntary program to provide incentives and to assist residents in sealing floor drains.
- Partner with the BOH on a program to educate residents on chemical storage practices and BMPs for draining swimming pools.

- Partner with the DPW to provide residents with information on the Transfer Station's programs to properly dispose of HHW and pharmaceuticals.
- Partner with the Police Department to collect medicines for proper disposal.
- Partner with the Fire Department to educate residents in the Zone II on groundwater contamination risks from fuel oil spills and to meet the requirements of Chapter 453 of the Acts of 2008, An Act Relative to Homeowner Heating Safety. (See Resources Section on Homeowner Heating Safety Information.)

Residential Activities:

- Partner with the ConCom and the BOH to provide assistance with voluntary soil tests through the University of Massachusetts Extension Laboratory to help provide recommendations that lead to the wise and economical use of soils and soil amendments. (See Resources Section for University of Massachusetts Extension Soil Test Procedures.)
- Partner with the ConCom to provide residents with information on BMPs for the use of fertilizers, herbicides and pesticides on landscaped and grassed areas in the Capture Zone. (See Resources Section for Protecting Water Sources From Fertilizer Information.)
- Work with the DPW Water Division to develop a Drought Management Plan that follows American Water Works Association Drought Management Planning guidance. (See Resources Section on Water Conservation Standards.)
- Work with the DPW Water Division to implement a comprehensive Residential Water Conservation Program that seeks to reduce residential water use in accordance with the Water Conservation Standards. (See Resources Section on Water Conservation Standards.)
- Provide residents with information on alternatives to using sodium chloride on snow and ice in the Capture Zone.
- Partner with the ConCom to create an annual Organic Lawn and Garden Tour/Competition in Wayland.
- Continue with educational and outreach efforts, such as co-sponsorship of Demonstration Organic Lawn Project at Mellen Green.
- Partner with the School Department to evaluate and enhance existing source water protection and water conservation curricula.

Strategies for Meadowview Well PSOC #3-Stormwater Basins:

- Collaborate with ConCom and the DPW to identify all stormwater controls in the Capture Zone and to create a Stormwater Maintenance Plan for the Capture Zone integrated with the updated Phase II Stormwater Management Plan.
- Partner with the DPW to maintain basins by making sure the orifices are not blocked or clogged, repairing erosion, removing sediment, and managing the vegetation so that vegetation is kept to heights that allow for easy inspection for animal burrows, sinkholes, erosion, etc.
- Apply for CPA funding to purchase plaques for stormwater drains or to develop a storm drain stenciling program to inform residents and children that the drains lead to groundwater/drinking water sources.

Strategies for Meadowview Well PSOC #4-USTs

- Identify all residential USTs in the Zone II and in co-operation with the Fire Department provide tank owners with information on preventive measures to reduce the potential for releases, including measures owners can take to reduce the likelihood and minimize impact of spills during filling operations. (See Resources Section on Homeowner Heating Safety Information.)
- Provide information to residential UST owners on available financial assistance for removal of tanks. (See UST Financial Assistance in Resources Section.)

Strategies for Meadowview Well PSOC #5-Transformers

- Contact NSTAR (utility company) to determine if any of the transformers in the Zone II contain PCBs, MODEF or other potential water source contaminants and, if necessary, collaborate with NSTAR to create a phase-out program.
- Partner with the DPW to utilize a global position system (GPS) to mark all transformers located within the Zone II and to create and disseminate transformer location maps to the DPW, Police Department and Fire Department.
- Partner with the DPW to create a Transformer Monitoring Program for potential leaks and management of trees, limbs and other hazards.

Meadowview Well Action Plan	**WPC with**	**When**
1. Reduce contamination from septic systems	BOH,Assessors,GIS	FY12, long-term
2. Reduce contamination from HHW and residential activities	BOH,ConCom,DPW, Police,Fire	FY12, long-term
3. Reduce contamination from stormwater basins	DPW,ConCom	FY12, long-term
4. Reduce potential of residential UST pollution	Fire	FY12, long-term
5. Reduce potential of transformer accident/spill	Fire/Police	FY12, long-term
6. Comply with Best Effort Requirement	DPW	FY14
7. Monitor Danforth Farm housing project	DPW	long-term
8. Monitor Birch Road Wells reactivation	DPW	long-term

IMPLEMENTATION CHART

Review Annually and Update Every 3 Years

Date Reviewed	Review Board	Changes or Comments

FIGURES

GLOSSARY OF ABBREVIATIONS

AST	aboveground storage tank
APD	Aquifer Protection District
BMP	Best Management Practices
BOH	Board of Health
BOPW	Board of Public Works
CVOC	Chlorinated Volatile Organic Compound
CWS	Community Water System
ConCom	Conservation Commission
DPW	Department of Public Works
DDT	dichlorodiphenyltrichloroethane
ERP	Emergency Response Plan
ERT	Emergency Response Team
EPA	Environmental Protection Agency
GPD	gallons per day
GPM	gallons per minute
GIS	geographic information system
GPS	global position system
HHW	household hazardous waste
IPM	Integrated Pest Management
IWPA	Interim Wellhead Protection Area
LSP	Licensed Site Professional
MCP	Massachusetts Contingency Plan
MassDEP	Massachusetts Department of Environmental Protection
MassRWA	Massachusetts Rural Water Association
MtBE	methyl tertiary butyl ether
mg/l	milligrams per liter
MGD	million gallons per day
MGY	million gallons per year
MODEF	mineral oil dielectric fluid
NTNC	Non-Transient Non-Community Water System
OEHHA	Office of Environmental Health Hazard Assessment
O & M	Operation and Maintenance
PPCP	pharmaceuticals and personal care products
PCB	polychlorinated biphenyls
PAH	polycyclic aromatic hydrocarbons
PAH	polycyclic aromatic hydrocarbons
KOH	potassium hydroxide
PSOC	Potential Sources of Contamination
PIP	Public Involvement Plan
PWS	public water supplier

RGPCD	Residential Gallons per Capita Day
SDWA	Safe Drinking Water Act Amendments of 1996
SWAP	Source Water Assessment and Protection
SWAP	Source Water Assessment Program
NaF	sodium fluoride
NaOCl	sodium hypochlorite
SVT	Sudbury Valley Trustees
SOC	synthetic organic compounds
TNC	Transient Non-Community Water System
UST	underground storage tank
USGS	United States Geological Survey
VOC	volatile organic compounds
WMA	Water Management Act
WPC	Wellhead Protection Committee
WPP	Wellhead Protection Plan

APPENDICES

Appendix A - WPC Mission Statement
Appendix B - WPC Accomplishments
Appendix C - Earth Tech Phase I Report
Appendix D - AECOM Phase II Report
Appendix E - MassDEP SWAP Report (2002)
Appendix F - Gallons/day Consumption Chart Since 2004
Appendix G - Master Plan Advisory Committee Water Goals
Appendix H - Happy Hollow Wells Sodium Concentrations Chart
Appendix I - MassDEP Drinking Water Regulations Zone I -excerpt
Appendix J - MassDEP Best Effort Requirement Zone II
Appendix K- Watertown Dairy Hazmat Summary
Appendix L- Raytheon Hazmat Summary
Appendix M - Raytheon Sentinel Wells Map
Appendix N - Danforth Farm Summary

RESOURCES (listed alphabetically)

California OEHHA, "Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products" (2007): http://www.calrecycle.ca.gov/publications/Tires/62206013.pdf

Capital Efficiency Plan, Tata & Howard, April 2009 – located in DPW/Water Division Office

Connecticut DEP, "Artificial Turf Study, Leachate and Stormwater Characteristics" (2010): http://www.ct.gov/dep/lib/dep/artificialturf/dep_artificial_turf_report.pdf

Danforth litigation settlement documents and three-page January 19, 2005 press release – Located in Wayland Selectmen's Office

EOEA & Water Resources Commission Water Conservation Standards (2006): http://www.mass.gov/Eoeea/docs/eea/wrc/water_conservation_standards.pdf

Fortin, Richard. *The Groundwater Resources of Wayland, Massachusetts* (1981) - located in Wayland Town Surveyor's office

Goldberg-Zoino & Associates, "Hydrogeologic Study, Wayland Aquifer," Newton, MA. (1982)

IEP Diagnostic Feasibility Study of Dudley Pond (1983): http://www.facebook.com/note.php?note_id=107768942592099

MassDEP Beavers: http://www.mass.gov/dep/water/beaverws.pdf

MassDEP Beavers: August & October 2001, order for permanent chlorination of town wells – located in DPW/Water Division Office

MassDEP Drinking water regulations: http://www.mass.gov/dep/water/laws/regulati.htm

MassDEP Fertilizer information: http://www.mass.gov/dep/water/resources/lawn.htm

MassDEP Homeowner Heating Safety information: http://www.mass.gov/dep/public/press/1210spil.htm

MassDEP Model Floor Drain Health Regulation: http://www.srpedd.org/by-laws/Floor%20Drain%20Regulation.pdf

MassDEP Septic System Financial Assistance: http://www.mass.gov/dep/water/finance.htm

MassDEP Sodium guidelines: http://www.mass.gov/dep/water/laws/policies.htm

MassDEP SWAP Report (2002): http://www.mass.gov/dep/water/drinking/3315000.pdf

MassDEP UST data: http://db.state.ma.us/dep/ust/ustQueryPage.asp

MassDEP UST Financial Assistance: http://www.mass.gov/dep/cleanup/helpforh.htm

MassDEP Water Tank Removal Approval, April 21, 2011 – located in DPW/Water Division Office

Raytheon extranet link: www.ermne.com (username=raytheon, password=wayland)

TURI – Toxics Use Reduction Institute, UMass Lowell: http://www.turi.org/community

UMass Soil Test Procedures: http://www.umass.edu/soiltest/

Wayland Wellhead Protection Committee website: http://www.wayland.ma.us/Pages/WaylandMA_BComm/WellheadProtection/index

World Health Organization study regarding cemeteries (1998) http://whqlibdoc.who.int/euro/1998-99/eur_icp_ehna_01_04_01(a).pdf