Noncommunity Source Water Assessment Report

For

Byram Twp

Sussex, County

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HOW TO USE THIS SOURCE WATER ASSESSMENT REPORT

The following outlines the source water assessment report and directs you to general and/or noncommunity water system specific information.

Source Water Assessment Executive Summary
A summary of the Source Water Assessment Program and the susceptibility results statewide for noncommunity water systems. This summary also provides the susceptibility ratings for the noncommunity water systems' source(s) within the municipality.

The first three sections of the report contain general information; the last section is specific for the individual noncommunity water system(s) within the municipality.

Section I: Background Information on Drinking Water Systems page 1
General information on types of public drinking water systems (community and noncommunity) and sources of drinking water. The number of public water systems, wells, and surface water intakes in New Jersey is provided.

Section II: Source Water Assessment Program Overview page 7
An introduction to the Source Water Assessment Program and its goals.

Section III: Source Water Assessment Program Steps page 10
A description of the steps the Department of Environmental Protection (DEP) conducted to assess drinking water source(s) susceptibility to potential contamination. The contaminant categories of concern and the potential contaminant sources found to be significant in determining susceptibility (reffered to as explanatory variables) for the Source Water Assessment Program are included in this section. Table 5 provides the percentage of public noncommunity water system sources in New Jersey that rated high, medium, and low for each of the contaminant categories.

Section IV: Noncommunity Public Water System Individual Source Water Assessment Reports (arranged by PWID) page 25
The DEP developed a separate report for each noncommunity water system. This section of the report contains all of the noncommunity water system source water assessment reports that are within Byram Twp. The individual noncommunity source water assessment reports contain general information regarding the program (similar to the information in Section I through III), susceptibility ratings for the system's source(s), an inventory of the potential contaminant sources used to determine the sources' susceptibility, and a map illustrating the source water assessment areas. The map is municipality based; therefore the map is not specific to the system. If a noncommunity water system is interested in obtaining a map specific to its source water assessment area, contact the Bureau of Safe Drinking Water at 609-292-5550.

Appendix A contains additional specific information for the noncommunity water systems. Appendix A consists of tables and information relating to the susceptibility rating determination for the system's sources. These items include:

Contaminant Category Scoring System - Attachment 1
A series of tables illustrating how the rating score is determined for a source. This document is divided into surface water and ground water sections and provides a table(s) for each of the contaminant categories. Using these rating score tables and the Individual Explanatory Variable Inventory, the numerical susceptibility rating score can be determined. This rating score was then converted into a high, medium, or low susceptibility rating. (The susceptibility rating score conversions are also provided.)

Source Water Assessment Area Map - Attachment 2
A map illustrating the source water assessment areas for the Noncommunity water system's sources (wells and surface water intakes) within the municipality. If a noncommunity water system is interested in obtaining a map specific to its source water assessment area, it may contact the Bureau of Safe Drinking Water at 609-292-5550

Appendix B contains documents that further explain the procedures taken to determine susceptibility of public drinking water sources. These documents contain information addressing the three steps of a source water assessment: develop a source water assessment area, inventory the potential contaminant sources, and determine susceptibility to potential contaminant sources.

Appendix C contains materials to assist in understanding the source water assessment report and contact information for further questions.

SOURCE WATER ASSESSMENT

Executive Summary

As a requirement of the 1996 Amendments to the Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination.

Approximately 85 to 90 percent of New Jersey's population receive their drinking water from public water systems. These public water systems are highly regulated and perform routine monitoring for the presence of contaminants. In 2003, 606 public community water systems consisting of 2237 wells and 64 surface water sources served approximately 7.5 million New Jersey residents. In addition, the public was served by 3685 public noncommunity water systems through establishments such as: schools, hospitals, restaurants, office buildings, and rest stops that have their own drinking water source.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water sources' susceptibility.

- Identified the area that supplies water to a public drinking water system well or surface water intake (known as the source water assessment area). For ground water sources, this area is also known as the well head protection area.
- Inventoried the significant potential sources of contamination within the source water assessment area.
- Determined how susceptible each drinking water source is to contamination.

Susceptibility to the following categories of contamination was determined:

- Pathogens
- Nutrients (nitrates)
- Pesticides
- Volatile Organic Compounds (VOCs)
- Inorganics
- Radionuclides
- Radon
- Disinfection Byproduct Precursors (DBPs)

To determine susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

The first category consists of *sensitivity factors*, which includes items related to the construction of a well (such as whether the well is in a confined or unconfined aquifer) and naturally occurring factors (such as the geology of the unit in which a well is drawing water from or over which water flows to the surface water intake).

Significant Sensitivity Factors

- Confinement status: For ground water, the confinement status of the well was by far the most frequently occurring sensitivity factor in predicting susceptibility to contamination and in fact was a factor in all the models. Confined wells are protected from activities at the land surface by relatively thick, laterally extensive units of low permeability (clay layers) and are a sufficient distance from the outcrop area of the geologic unit so that the source water is less likely to be affected by contamination at the land surface. Confined wells were determined to be of low susceptibility to contamination occurring at the land surface. Some confined wells, however, are susceptible to contaminants of natural subsurface origin. In 2003, there were no confined noncommunity water system wells.
- Depth to the top of the open interval: For unconfined wells, depth to the top of the open interval of the well was the most common sensitivity factor to affect the potential for contamination of a well. Depth to top of open interval was found to be a factor in the following five models: pathogens, nutrients, pesticides, inorganics, and radon. The shorter the distance to the land surface, the more likely for the well to be affected by contamination originating at the surface from point sources and certain land uses.
- Percent soil organic matter: For surface water and ground water, percent soil organic matter was found to be a frequently occurring sensitivity factor. Percent soil organic matter was a factor in the VOC, inorganic, and disinfectant byproduct precursor models for both the surface water and ground water susceptibility models.

The second category of factors affecting a source's potential to become contaminated consists of *intensity of use factors*. This category addresses the susceptibility to contamination resulting from human activities at the land surface. Intensity of use factors include those coming from a specific point source, such as a landfill or leaking underground storage tank, and nonpoint sources of contamination grouped by land-use characteristics, such as agriculture or urban land use.

Significant Intensity of Use Factors

Nonpoint Sources

Overall, the results of the modeling performed by USGS show that of the nonpoint sources, factors related to urban land use and agricultural land use, were most often linked to susceptibility of drinking water sources to contamination.

- Surface water: factors related to urban land use from the 1995 coverage (including percentage of commercial/industrial land use, percentage of developed land, percentage of residential land) were important in predicting a source's susceptibility for four contaminant groups, specifically nutrients, pesticides, VOCs, and inorganics. Agricultural land use was found to be a significant factor in three of the surface water models - nutrients, pesticides, and inorganics.
- Ground water: factors related to urban land use from both 1970 and 1995 were important in predicting the susceptibility of source water for five of the models - nutrients, pesticides, VOCs, inorganics and radionuclides. Agricultural land use in 1970 and 1995 coverages

were factors in six of the ground water models: pathogens, nutrients, pesticides, radionuclides, radon, and inorganics.

Point Sources

- Surface water: factors related to New Jersey Pollutant Discharge Elimination System /Discharge to Surface Water (NJPDES/DSW) permits and sewage treatment plant density were found most often to be important factors, specifically for the nutrients, VOCs, and inorganics susceptibility models. NJPDES stormwater permitted locations, compost facilities, sites on DEP's Known Contaminated Site List (KCSL) and solid waste landfills were found to be factors in two of the models: VOCs and inorganics.
- Ground water: point sources were found to be significant only in the models for VOC, inorganics, and disinfection byproduct precursors. No point sources were found to be important in the models for pathogens, nutrients, pesticides, radionuclides, and radon.

The specific sensitivity and intensity of use factors for each drinking water source are provided in this Source Water Assessment Report in Tables 2, 3, and 4.

Using the susceptibility factors, the statistical models provided numerical ratings for each source of drinking water for each contaminant category, which were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating was given to drinking water sources where the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL. For the list of New Jersey primary and secondary drinking water standards, containing the MCLs, please refer to http://www.state.nj.us/dep/watersupply/standard.htm.

In some cases, insufficient data for particular supplies were available for all variables used in susceptibility models. In such cases, a default value for missing data was assumed. Use of default values could result in a different susceptibility rating than that which would result if the source-specific data were available.

Statewide Summary

Table E1 illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the contaminant categories. The table is separated by source type: ground water and surface water.

Table E1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent %)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	DBPs
Ground Water 3480 Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Intakes								
High	100[1]	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100[1]	100[1]	0

[1]All surface water intakes received high susceptibility ratings for pathogens and low susceptibility rating for radionuclides and radon

For the purpose of the source water assessments, the drinking water derived from all surface water intakes was assumed to be highly susceptible to contamination by pathogens. Therefore, all surface water intakes received a high rating for pathogens (100 percent). Surface water sources are subject to various sources of microbial contamination runoff containing fecal matter. Secondly, radionuclide and radon models for surface water were not developed. Radionuclides are primarily a concern of ground water, therefore, all surface water intakes received a low susceptibility rating for radionuclides and radon (0 percent).

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens). In fact, a high percentage of community water system surface water intakes were found to be highly susceptible to the same contaminant categories. Eighty-one percent of community water system surface water intakes were found to be highly susceptible to inorganics and 98% were found to be highly susceptible to disinfection byproduct precursors.

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%). When reviewing the results of the medium susceptibility ratings for noncommunity water system wells, the three contaminant categories

in which a high percentage of the wells rated medium are disinfection byproduct precursors (97%), radon (72%), pesticides and nutrients (both 66%).

Summary of Noncommunity Water Systems' Sources within Byram Twp

Byram Twp consists of 36 noncommunity water systems, consisting of 39 wells, and 0 surface water intake(s). **(The water system data used for the development of the original drinking water source inventory was compiled in the summer of 2003.)**

Table E2 provides a summary of the susceptibility ratings for the noncommunity water systems within Byram Twp. The first column provides the public water system's identification number (PWID) and the second column provides the name of the system and its source(s) (when available). The remaining columns provide the susceptibility ratings to each contaminant category for the source(s). A total of each of these ratings (overall susceptibility ratings) is provided at the bottom of the table.

Table E2: Summary of Susceptibility Ratings for Noncommunity Drinking Water Source(s) within Byram Twp

PWID	System Name / Source Name	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radionuclides			Radon			DBPs		
		H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
1904300	Byram Consolidated School	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904301	Frenches Grove Water Company	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0
1904302	Byram Township Intermediate School	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904304	Panther Lake Campground - Palidini	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0
1904305	Panther Lake Campground - Birch Park	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904306	Panther Lake Campground - Ash Park	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904307	Panther Lake Campground - Office	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1	0
1904309	Cartridge Actuated Devices	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0
1904311	Byram Township Municipal Building	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904312	Tony & Rosemary's Tavern	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904316	Byram Diner	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904318	Dunkin Donuts/Baskin Robbins	0	0	1	0	1	0	0	1	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904319	Cranbury Lake Volunteer Fire Company	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0

PWID	System Name / Source Name	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radionuclides			Radon			DBPs		
		H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
1904320	Wild West City	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0
1904321	Barones Restaurant	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904322	76ers Waterloo Inn	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0
1904323	Mountainside Restaurant	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0
1904324	Adam Todd Inn Restaurant	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904325	Porkey's-A Place for Ribs	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904335	Stafford Building	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0
1904340	Falconers Lackawanna Inn	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904342	Waterloo Village Foundation	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1	0
1904348	Lakeland Emergency Squad	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904350	Bagel & Bake	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904351	Mt Allamuchy Camp Wheeler	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0
1904352	Acorn Plaza Super X	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904353	Lynnes Nissan West Inc.	0	0	2	0	1	1	0	1	1	1	0	1	0	0	2	0	2	0	0	2	0	0	2	0
1904354	Byram Townsquare Center	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904355	Columbia Valley Campground Pool	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	1	0	0	0	1	0	0	1	0
1904356	Lake Lackawanna Golf Course	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0
1904357	Gordon Byram Association LLC	0	2	0	0	0	2	0	0	2	0	0	2	0	2	0	0	0	2	0	2	0	0	2	0

PWID	System Name / Source Name	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radionuclides			Radon			DBPs		
		H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
1904358	Columbia Valley Campground-Bambi	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	0
1904359	Frogmore Country Store	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
1904451	Waterloo Village Foundation	0	0	1	0	1	0	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1	0
1904452	Mt Allamuchy Camp Someers	0	1	1	0	0	2	0	0	2	0	0	2	0	0	2	0	1	1	0	2	0	0	2	0
1904454	Cranberry Market & Deli	0	1	0	0	0	1	0	0	1	0	0	1	0	1	0	0	1	0	0	1	0	0	1	0
Total for Byram Twp		0	5	34	0	12	27	0	12	27	8	0	31	0	11	28	5	25	9	0	39	0	0	39	0

If a drinking water source's susceptibility is high, it does not necessarily mean the drinking water is contaminated. The rating reflects the potential for contamination of source water, not the existence of contamination.

Under the State's Safe Drinking Water Regulations, all public noncommunity water systems must routinely monitor for contamination. If MCLs (drinking water standards) are exceeded, the noncommunity water system must immediately post a notice of failure in a place conspicuous to consumers until the system is compliant.

The Source Water Assessment Program was designed to encourage protection of drinking water sources by providing information to state and local regulatory agencies and the public to assist in watershed assessment and planning and to enhance the public's role as "water stewards." The results provide information to allow state and local agencies to determine if increased regulatory controls, including local land use ordinances, are warranted. In addition, the basic data gathered through the Source Water Assessment Program, including the locations of the public water system wells and surface water sources, will be available for DEP program use in efforts to improve environment regulatory actions, such as cleanup decisions in the hazardous and solid waste programs. For more information on DEP's Source Water Protection efforts please see the Statewide Summary Document available at www.state.nj/us/dep/swap.

For further information please refer to the detailed information in this Source Water Assessment Report or go to www.state.nj/us/dep/swap.

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SECTION I – BACKGROUND INFORMATION ON DRINKING WATER SYSTEMS

SECTION I – BACKGROUND INFORMATION ON DRINKING WATER SYSTEMS

This background information is provided to describe how public drinking water systems are regulated and the relationship of these water systems with the Source Water Assessment Program. The following section describes sources of drinking water (groundwater and surface water), types of drinking water systems according to the Department of Environmental Protection (DEP) and Environmental Protection Agency (EPA) definitions, and drinking water treatment.

Sources of Drinking Water

1. Ground Water
Ground water infiltrates the ground and is stored in aquifers, soil and rock below the surface. Aquifers typically consist of gravel, sandstone, sand, or fractured rock. An aquifer can be confined or unconfined. A confined aquifer is ground water bounded between impermeable layers, such as clay. An unconfined aquifer is not bounded by impermeable layers and is more directly linked to surface activities and resources.

Ground water is obtained from a spring or by pumping water from an aquifer through a well. A well is a hole or excavation that is drilled, bored, core driven, jetted, dug, driven or otherwise constructed for the purpose of removal of water from the subsurface for potable water supply. Public wells in New Jersey range from 15 to 1,984 feet deep (in 2002).

2. Surface Water
Surface water, is the water at or above the land's surface, which is neither ground water nor contained within the unsaturated zone, including, but not limited to, the ocean and its tributaries, all springs, streams, rivers, lakes, ponds, wetlands, and artificial waterbodies.

An important link exists between ground water and surface water. Surface water can infiltrate the ground and recharge aquifers. Conversely, ground water slowly moves to the surface and discharges into lakes, rivers, or streams and is known as baseflow. New Jersey's natural stream flow, especially during periods of low precipitation, is largely baseflow from ground water.

Figure 1 illustrates the water cycle, ground water and surface water, and potential sources of contamination to drinking water sources.

Figure 1: Hydrologic Cycle and Sources of Drinking Water

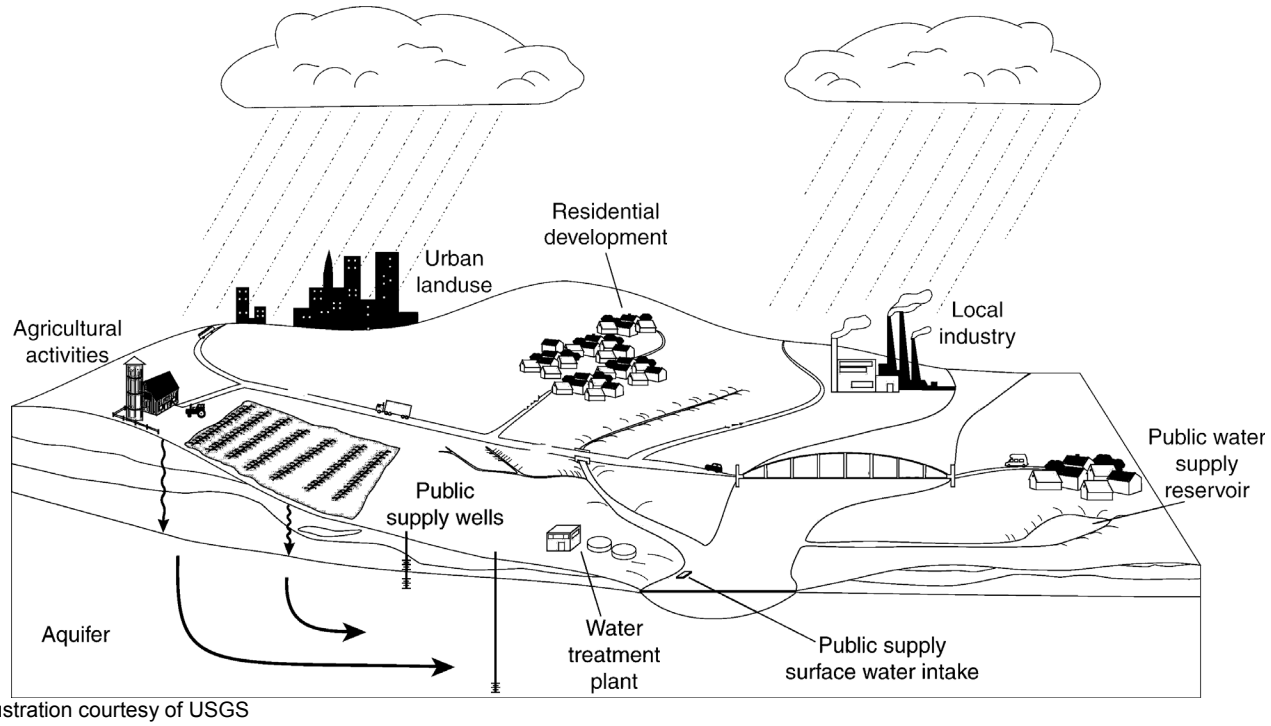


Illustration courtesy of USGS

Types of Public Water Systems

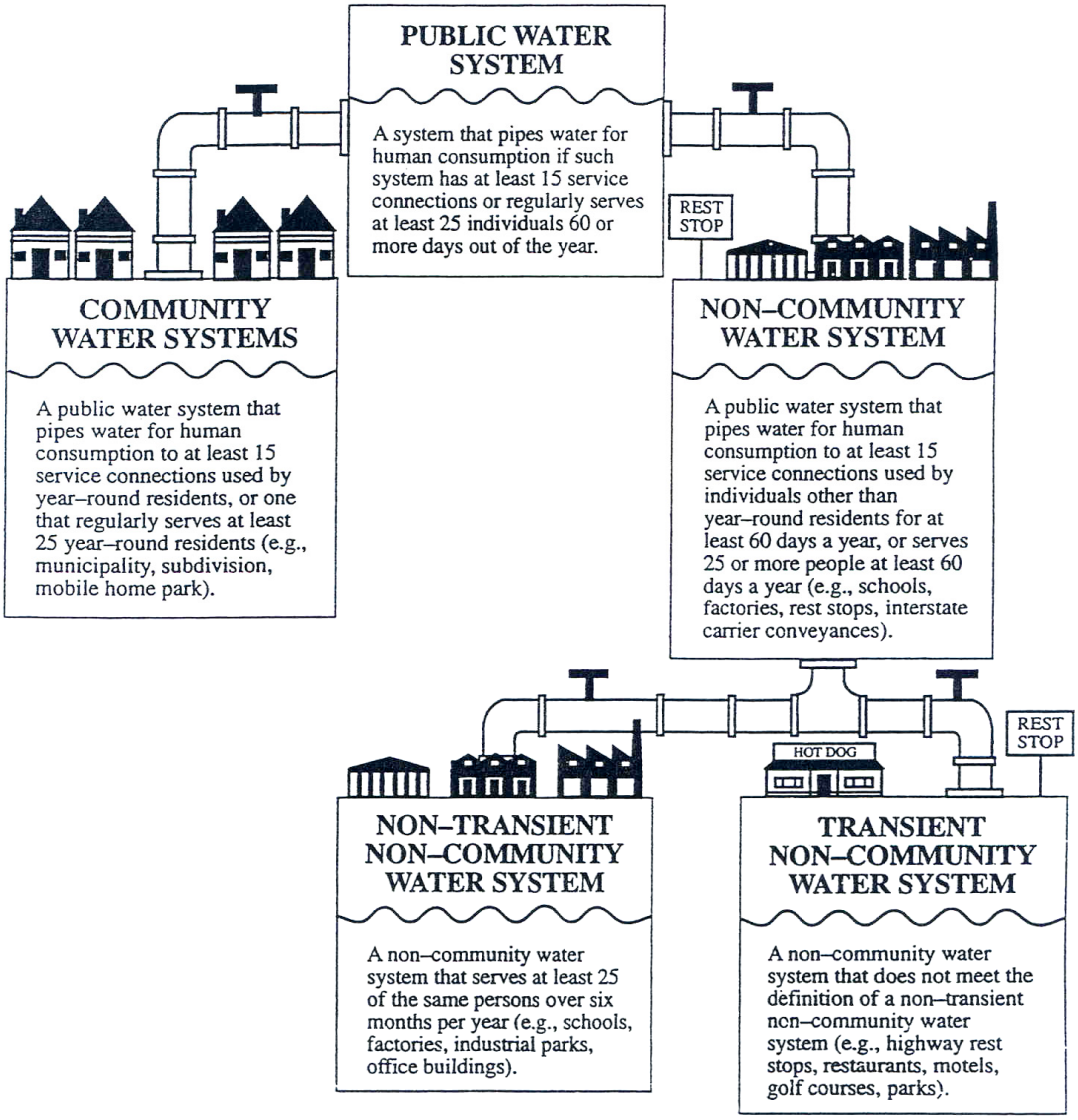
A public water system is defined as a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves at least 25 individuals. Ground water and/or surface water sources can be used for public water systems.

1. **Community Water System**: has at least 15 service connections used by year round residents, or regularly serves at least 25 year round residents. Examples of a community water system are mobile home communities, municipally owned water systems and privately owned water systems that have their own well(s) or surface water intake(s).

2. **Noncommunity Water System**: used by individuals other than year round residents for at least 60 days of the year. A noncommunity water system can be either transient or nontransient. A nontransient noncommunity water system serves at least 25 of the same persons over six months per year, such as schools, factories, and office buildings which have their own well(s) or surface water intake(s). Transient noncommunity water systems are systems that do not fall within the definition of a nontransient water system. Transient noncommunity water systems include rest stop areas, restaurants, and motels that have their own well(s).

A flow chart describing these definitions appears in Figure 2.

Figure 2: Types of Public Water Systems



From: Public Notification Handbook for Public Water Systems, USEPA Office of Water, USEPA Publication 570/9–89–002 September 1989

Approximately 85 to 90 percent of New Jersey's population is served by public water systems. Table 1 summarizes the number of public water systems, wells, and surface water sources in the State of New Jersey in 2003.

Table 1: Public Water Systems in New Jersey in 2003

Type of Public Water System	# of Public Water Systems*	# of Ground Water Sources	# of Surface Water Sources
Community	606	2237	64
Nontransient Noncommunity	876	1083	3
Transient Noncommunity	2654	2779	0
Total	4136	6099	67

* DEP, Bureau of Safe Drinking Water, NJ Public Water System Database.

The remaining New Jersey population is served by private wells (i.e. wells serving individual homes, small businesses, etc.) Private wells are not included in the SWAP. For more information on private wells please visit the Division of Water Supply web site at www.state.nj.us/dep/watersupply or refer to the EPA web site at www.epa.gov/safewater/pwells1.html.

Drinking Water Treatment

A public water system consists of interconnected pipes that lead from the source of drinking water to the consumer. Almost all community water system sources and some noncommunity water system sources are treated to remove microorganisms or dissolved chemicals or minerals. An entry point to the distribution system (EPTDS) is a location in the public water system where treated water from a treatment plant enters into the water distribution system. A public water system may contain one or more EPTDS. If the water is not treated, as some ground water systems are not, then the place where the untreated water source enters the network of pipes is the EPTDS.

Figure 3 illustrates general treatment schemes for both a surface water system and a ground water system. The means of acquiring water (well or surface water intake), the treatment process, and storage are shown. An individual water system may contain only part or even none (do not treat) of these pieces. Individual water treatment may vary according to source water quality.

Figure 3: Example of Drinking Water Treatment

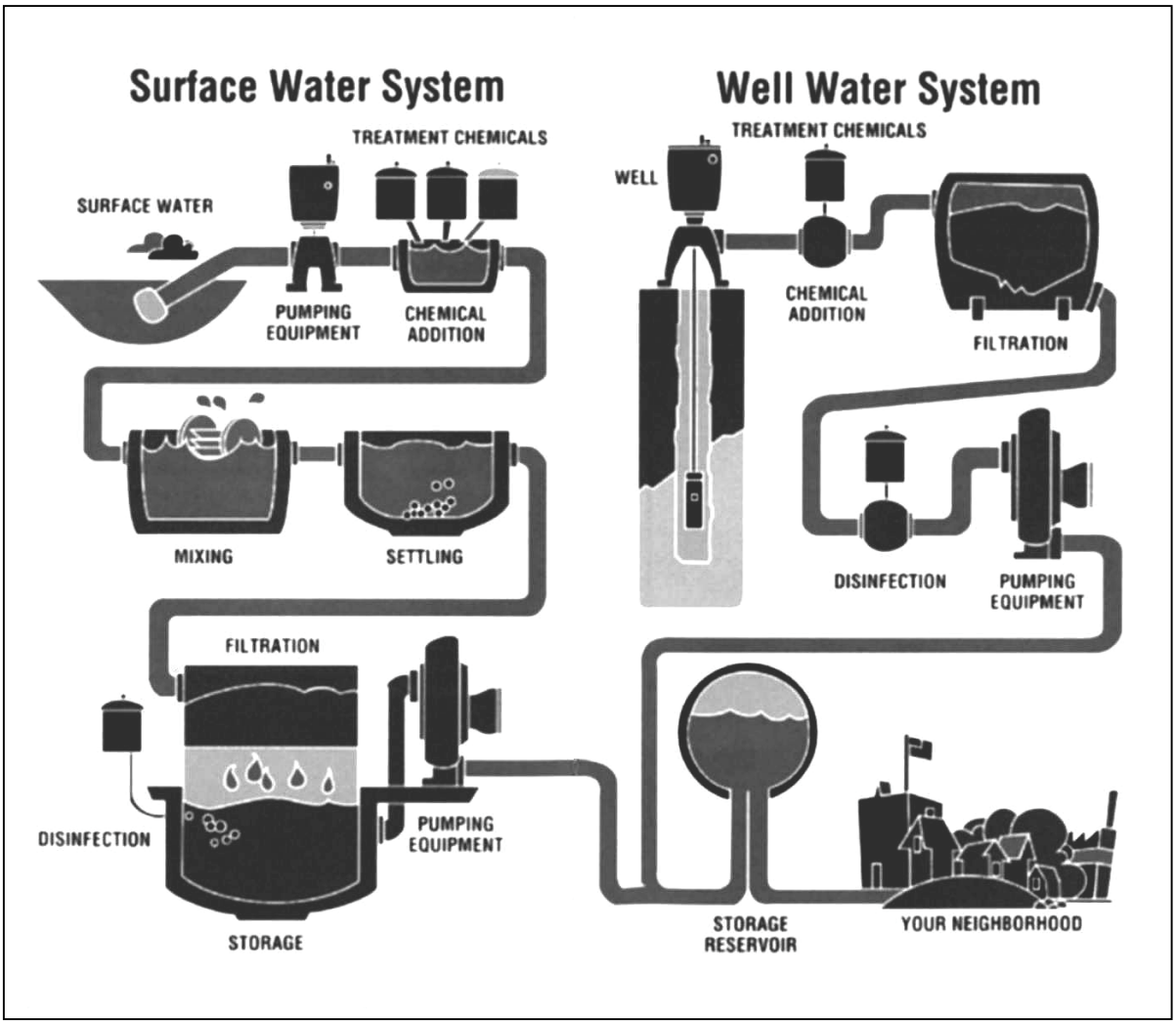


Illustration from “Safeguarding the Quality of Your Drinking Water”, prepared by the Public Information Committee of the New Jersey Section of the American Water Works Association.

SECTION II – SOURCE WATER ASSESSMENT PROGRAM OVERVIEW

SECTION II – SOURCE WATER ASSESSMENT PROGRAM OVERVIEW

Introduction

The 1996 Amendments to the Federal Safe Drinking Water Act place a strong emphasis on public awareness and the information provided to the public concerning the quality of drinking water. As part of the 1996 Amendments, all states were required to establish a Source Water Assessment Program (SWAP).

Through the SWAP, the DEP evaluated the susceptibility of public water systems to several categories of contamination. **If a system rates highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water.** The rating reflects the potential for contamination of source water, not the existence of contamination. Susceptibility to contamination is a function of several factors, including contaminant use near the water source and the characteristics of the water source.

New Jersey's SWAP Plan, which provides the framework for how DEP performed the assessments, can be found at www.state.nj.us/dep/watersupply/swap1.pdf.

The New Jersey SWAP incorporates four steps:

1. **Delineate the source water assessment area of each public drinking water source.**
2. **Inventory the potential contaminant sources within the source water assessment area.**
3. **Determine the water system's susceptibility to contaminants.**
4. **Incorporate public participation and education.**

Source Water Assessment Program Goals

The information obtained from the completed source water assessments may be used to achieve the goals listed below.

1. Protect sources of drinking water.

The source water assessments provide a susceptibility rating for each source of drinking water, which supplies information on how vulnerable the source is to contamination.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results can be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing the State's drinking water protection efforts. Based on the potential of a drinking water source to become contaminated, DEP can initiate a variety of activities to protect the drinking water source through existing DEP programs. For more information regarding DEP's Source Water Protection Strategy please refer to the Source Water Assessment Program Statewide Summary available on the Division of Water Supply's web site at http://www.state.nj.us/dep/watersupply//.

2. Public education of SWAP information.

DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP spoke to interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. Upon completion of the

source water assessments, DEP generated a source water assessment report and/or summary for each public water system to report the susceptibility ratings.

The goal of the public education efforts is to make the public more aware of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education requirement, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the EPA and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules can be customized based on the susceptibility of the sources of drinking water. The SWAP will provide better information for making these determinations.

Source Water Assessment Reports
DEP will issue the following reports to public water systems.

1. **Community Water System Source Water Assessment Report**: primarily intended for the public water system's reference and use, although the report is also available to the public. Individuals, environmental organizations, and municipalities interested in source water protection may also utilize the Community Water System Source Water Assessment Report for protection activities.

2. **Community Water System Source Water Assessment Summary**: a short (4-6 page) informative document created for distribution by the water system to the general public. In addition, DEP will post the summary document on the SWAP web site at http://www.state.nj.us/dep/swap/. The Community Water System Source Water Assessment Summary is a synopsis of the Source Water Assessment Report and provides the source susceptibility ratings for the community water system's sources.

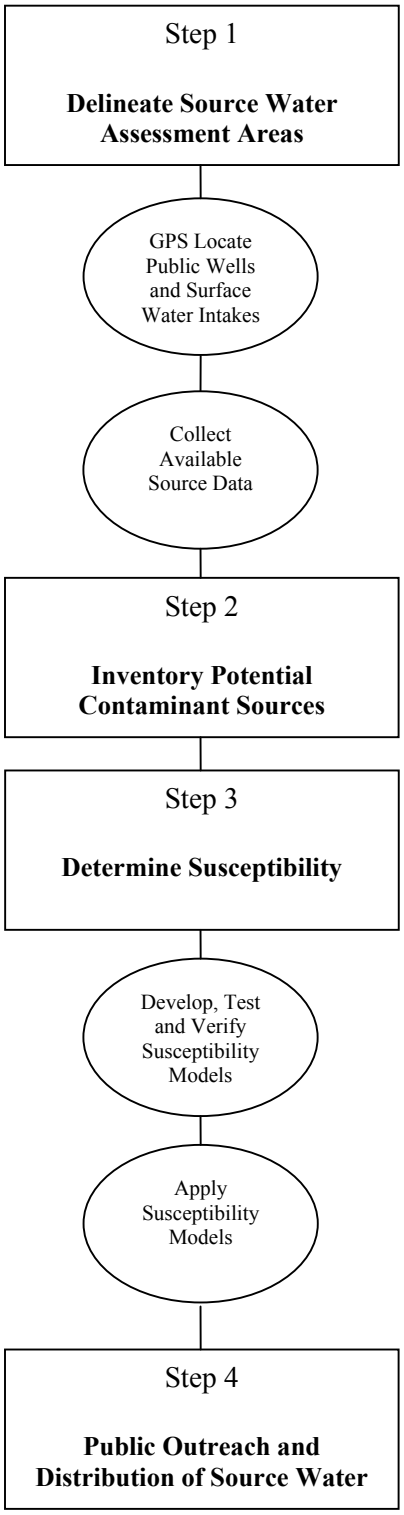
3. **Noncommunity Water System Source Water Assessment Report**: developed for the respective noncommunity water system. The report provides the susceptibility ratings of the system's sources. The general public may request the report from the noncommunity water system or the DEP. In addition, the DEP decided to develop a noncommunity water system report for each municipality. The report contains the noncommunity water system reports for the systems found in the same municipality. DEP hopes this report will assist local planning agencies and the public in source water protection efforts.

SECTION III – SOURCE WATER ASSESSMENT PROGRAM STEPS

SECTION III – SOURCE WATER ASSESSMENT PROGRAM STEPS

The SWAP consists of four fundamental steps that are illustrated in Figure 4.

Figure 4: Flowchart of Source Water Assessment Program Process



Step 1: Delineation

The first step of the SWAP process is to delineate the source water assessment area for each public water system well and surface water intake. For ground water sources, a source water assessment area in New Jersey is the area from which water is reasonably likely to flow to a well within a 12 year period. This area is also known as a wellhead protection area, or WHPA. For surface water sources, the source water assessment area is the area upstream of a surface water intake, including land that drains to the upstream areas.

Before the source water assessment area was delineated for a public well, attribute data was gathered. Since 1947, a property owner or well driller has been required to obtain a well permit from New Jersey's well permitting program to drill a well in New Jersey. After a licensed well driller drills the well, a well record must be submitted to the Division of Water Supply, DEP. The well record is an "as-built" description of the well construction, and usually contains important attribute data such as well depth, screened interval or length of open hole, and pumping rate/capacity. This information is needed to delineate the source water assessment area around the well. DEP used the well record to determine attribute data. In situations where DEP was unable to obtain attribute data, such as for a well drilled prior to 1947 or when a well record was not available, default values were generated using New Jersey Geological Survey's (NJGS) "Guidelines for Delineation of Well Head Protection Areas in New Jersey," Appendix B- Attachment 1. The guidance document is available on the internet at www.state.nj.us/dep/njgs/whpaguide.pdf, by contacting the DEP, New Jersey Geological Survey at (609) 292-1185, or from the DEP Maps and Publications Sales Office at (609) 777-1038.

For surface water intakes, source water assessment areas were developed based on the location of the intake and the entire drainage area upstream of the intake including headwaters and tributaries. These factors influence the shape and size of the delineations.

Next, the well or intake was located using Global Positioning System (GPS). All wells and intakes were GPS-located according to the "DEP GPS Data Collection Standards for GIS Data Development" available at www.state.nj.us/dep/gis/gpstrim.html. The DEP GPS-located the community water system wells and surface water intakes. The noncommunity water system wells were GPS-located by DEP, County Environmental Health Act (CEHA) Agencies, and the New Jersey Water Association.

After collecting the attribute data and GPS location, the source water assessment areas for wells and intakes were delineated. DEP performed the ground water source water assessment area delineations using the Combined Model/Calculated Fixed Radius Method for all public community water system wells and the Calculated Fixed Radius method for the noncommunity water system wells. For a detailed description of the delineation methods please refer to New Jersey's "Guidelines for Delineation of Well Head Protection Areas in New Jersey," Appendix B- Attachment 1.

For each ground water source, three tiers were calculated and labeled as Tier 1 (two year time of travel), Tier 2 (five year time of travel), and Tier 3 (12 year time of travel). Time of travel was established for determining the risk of contamination to a well. The two year time of travel was developed based on the potential for microbiological contamination. Studies show on average, bacteria can survive in ground water for approximately 170 days and

viruses can survive in ground water for approximately 270 days. The two year time of travel indicates the limits of concern for potential viable microbiological contamination of the water system through the source water.

The five year time of travel was established to address contamination from accidental discharges. This time of travel provides a reasonable amount of time to investigate, monitor, and/or remediate a spill within the source water assessment area. The third time of travel portion of the source water assessment area, 12 year, was designed in consideration of the known contaminant sources. Studies show that 10 to 15 years of time of travel generally covers the full length of a contaminant plume. The 12 year time of travel will permit enough time for responses to be made.

The DEP delineated the source water assessment areas for surface water intakes using the United States Geological Survey's (USGS) hydrologic unit code 14 (HUC14) as the base data-set for the delineations. Hydrologic unit codes identify drainage basins in a nested group from large to small. The larger the HUC number the smaller the drainage basin. For example a HUC4 will be made up of several smaller HUC8s, and the HUC8s will be made up of several smaller HUC14s. The source water assessment areas for the surface water intakes include the entire drainage area that flows past the intake, including headwaters and tributaries. For more information on the methodology used for surface water delineations, refer to Appendix B- Attachment 2, Surface Water Delineation Methodology.

The DEP has classified approximately 50 wells as "ground water under the direct influence of surface water" (GUDI). GUDI wells are classified according to site specific water quality measurements and provide additional treatment of the source water. For GUDI wells, the DEP performed a conjunctive delineation, an integrated delineation combining the ground water contribution and the surface water contribution to the well. The groundwater and surface water contribution were delineated using the same procedure described above, except the 2 year time of travel for the ground water delineation demarcated the downstream boundary.

A few GUDI wells do not have an obvious surface water body influencing the well. In these instances only the ground water delineated source water assessment area was available. Therefore, the 12 year time of travel boundary for the ground water delineation was used to define the surface water contribution area. An example of this scenario would be the Newton Water and Sewer Utility, Facility number 03, SFID number 010.

The ground water susceptibility models were applied to the GUDI wells ground water contribution area and the surface water susceptibility models were applied to the surface water contribution area. The final susceptibility rating for the GUDI well was determined by taking the higher susceptibility rating of the two (ground water and surface water). Using the pathogen contaminant category as an example, all surface water automatically received a high susceptibility rating for pathogens. Therefore, all GUDI wells received a high susceptibility rating for pathogens. Even if the GUDI well rated low to pathogens for the ground water contribution area, the high rating for the surface water contribution area was used as the final susceptibility rating (the highest rating of the two).

Step 2: Potential Contaminant Source Inventory

The second step of the SWAP is to identify the potential contaminant sources within the source water assessment area. These potential sources of contamination include point and nonpoint sources. Point source contaminants may be traced to a single source, such as known contaminated sites, industrial and commercial surface and ground water discharges, and sewage treatment discharges. Nonpoint source contaminants may not be traced to one single source because they come from several individual sources within a large area. Land use activities such as salting and runoff from roads and the application of pesticides and herbicides are examples of nonpoint sources. Nonpoint and point sources can have a significant impact on both surface water and ground water quality.

Potential contaminant source inventory information was primarily collected from existing DEP GIS databases. For nonpoint sources, digital GIS land use and land cover data for the years 1970, 1986, and 1995 were used. Several datasets of land coverage were used to account for the changes in land use over the years. The New Jersey Source Water Assessment Program Potential Contaminant Source Inventory (PCSI) Methodology, Appendix B-Attachment 3, describes how the potential contaminant source inventory was developed, the datasets used, the sites and activities included in the inventory, and the preliminary list of explanatory variables used in the susceptibility models.

For the purpose of the SWAP, the DEP, in conjunction with a Source Water Assessment Advisory Committee that met regularly during the development of the SWAP Plan, developed eight conceptual contaminant categories that represent microbiological and chemical contaminants of concern. These categories include pathogens, nutrients, volatile organic compounds, synthetic organic compounds, pesticides, inorganics, radionuclides and disinfection byproduct precursors. This list was further refined during the susceptibility model development process. Tables 2, 3, and 4 contain the final list of contaminant categories and explanatory variables. Each drinking water source was evaluated for susceptibility to each of the following contaminant categories.

Conceptual Contaminant Categories

Pathogens

Disease-causing organisms such as bacteria, protozoa, and viruses. Sources of pathogens include both point and nonpoint activities. An example of a point source of pathogens is a sewer system overflow. An example of a nonpoint source is runoff from areas where livestock are kept.

Nutrients

Common types of nutrients include nitrogen and phosphorous. Nutrients can harm environmental quality, human health, and the efficiency of the drinking water treatment plant by encouraging growth of photosynthetic microorganisms in surface water sources, which alter water characteristics (eutrophic conditions). Sources of nutrients are point and nonpoint sources. Effluents from a sewage treatment plant are a point source of nutrients. Nonpoint sources of nutrients include discharge from septic fields, areas where animal waste is stored, and runoff from agricultural and residential land where fertilizers were used.

Pesticides
Common sources of pesticides include land applications (nonpoint source) and manufacturing/distribution centers of pesticides (point source). Pesticides are manmade chemicals used to control bacteria, fungi, weeds, rodents, and insects. Examples include herbicides such as atrazine and insecticides such as chlordane.

Synthetic Organic Compounds (SOCs)
Sources of SOCs can be point and nonpoint. Common sources include chemical manufacturing plants, pharmaceutical plants, sewage treatment plants, and discharges from contaminated sites. Synthetic organic compounds are manmade.

Volatile Organic Compounds (VOCs)
Common types of VOCs include chemicals that are used as solvents, degreasers, and gasoline components. VOCs are manmade compounds and are the most common organic contaminants in ground water in New Jersey. Sources of VOCs can be point and nonpoint. Examples of VOCs are methyl tertiary butyl ether (MTBE), benzene and vinyl chloride.

Inorganics
Mineral-based compounds that are both naturally occurring and manmade. Sources of inorganics can be point and nonpoint; common sources include discharges from manufacturing plants, releases from contaminated sites, past land uses, and naturally occurring sources. Inorganics include arsenic, cadmium, copper, lead, mercury, and asbestos.

Radionuclides
Sources of radionuclides can be point and nonpoint; common sources include the decay of naturally occurring minerals, leaching of subsurface material (for example rocks and sedimentary materials) into ground water, and improper disposal of radioactive waste. Radionuclides are a category of contaminant that is both naturally occurring and manmade. Radionuclides are radioactive substances such as radium and radon.

Disinfection Byproduct (DBP) Precursors
Disinfection byproducts are formed when the disinfectants used to kill pathogens during treatment react with dissolved organic material present in the water. A common source of DBP precursors is naturally occurring organic material such as leaves in surface water. The amount of organic matter, the type of disinfectant, the concentration of disinfectant, time of contact, pH, and temperature all have an effect on the concentration of disinfection byproducts produced. Chlorine is the most common disinfectant used in New Jersey.

Step 3: Susceptibility Determination
The third step of the SWAP is to determine the public water system's susceptibility to contamination. Susceptibility is a function of source sensitivity (for example soil type and well construction characteristics) and the intensity of surrounding use factors (for example the density of contamination sites or the type of land use).

SUSCEPTIBILITY = Sensitivity + Intensity

DEP contracted with the USGS to develop susceptibility assessment models, with DEP guidance, to determine susceptibility ratings for public supply wells and surface water intakes

for the contaminant categories of concern described in Step 2. Some states have determined susceptibility using relatively simple approaches that account for factors such as distance to contaminant sources, but the more thorough modeling approach employed for New Jersey provides a more accurate estimate of susceptibility. The models were based on results from an extensive analysis of ground water and surface water quality data from the DEP-USGS statewide cooperative monitoring networks for a select set of sites in New Jersey. Please refer to the documentation Methods to Determine the Susceptibility of Source Water to Community and Noncommunity Water Supplies in New Jersey to Contamination, Appendix B- Attachment 4 for more information.

USGS developed susceptibility models for seven contaminant categories and radon for both ground water and surface water. DEP had originally intended to develop a susceptibility model for "synthetic organic compounds" (SOCs), but did not do so for two reasons. First, SOCs under the Federal and State Safe Drinking Water Acts consist primarily of pesticides and as part of SWAP, USGS developed a pesticide susceptibility model. Secondly, as USGS investigated whether it could construct a SOCs model, USGS and DEP jointly determined that there was insufficient SOC data that was neither pesticide nor volatile organic compound (VOC) related. (USGS also developed a separate VOC model.) However, it is DEP's experience that the presence of non-pesticide, non-volatile SOCs will typically co-occur with VOCs. Specifically, recent work by DEP and others at community water systems using ground water as a source and known to be contaminated by volatile organic contamination from hazardous waste sites determined that "tentatively identified compounds" (TICs) were present. In this study, although DEP and others were primarily looking for non-volatile organic compounds, TICs were found at some frequency at these sites. As part of the study, a "control" water system with no hazardous waste site nearby and with no volatile contamination was tested and contained no TICs. Qualitative evaluation of the data show systems with the higher levels of volatile organic chemicals and with more than one VOC present contained the highest number of TICs. For these reasons, DEP has determined the SOC rating for a water system would be the same as the public water system's VOC rating, and that a separate SOC susceptibility model was unnecessary.

Separate susceptibility models were developed for radon and other radionuclides for two reasons. First, radon, a gas, is chemically and physically different from other radionuclide constituents. Second, radon most often occurs in areas where other radionuclides are not present. The remedy for radon is different from the remedy for other radionuclides. DEP was concerned that if both radon and other radionuclides were combined, the susceptibility rating would not show the difference in susceptibility of water systems' sources to the different radionuclides.

For the purpose of the source water assessments, all surface water was assumed to be highly susceptible to pathogens, therefore a pathogen model was not developed for surface water. Surface water sources are subject to various sources of microbial contamination runoff containing fecal matter. All surface water intakes received a high rating for pathogens. Secondly, a radionuclide model was not developed for surface water. Radionuclides are primarily a concern of ground water, therefore, all surface water intakes received a low susceptibility rating for radionuclides.

The susceptibility models determined source water susceptibility based on the well or intake's location and explanatory variables. An explanatory variable is a variable that can be used to

predict the presence of a contaminant or the potential presence of a contaminant in ground water or surface water. Tables 2, 3, and 4 illustrate the final explanatory variables used in determining sensitivity and intensity ratings for surface water intakes, unconfined wells, and confined wells. These tables also contain the conceptual variables used in the susceptibility rating determinations. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

A list of all contaminant variables reviewed can be found in the documentation Methods to Determine the Susceptibility of Source Water to Community and Noncommunity Water Supplies in New Jersey to Contamination, Appendix B- Attachment 4. For further information, Appendix B- Attachment 5 and 6, Contaminant Group Reports, provide detailed descriptions of the models used for SWAP.

In addition to evaluating the contaminant variables separately, groupings of several point source variables together as a single explanatory variable were investigated to determine if a certain subset of point sources produced meaningful results. USGS determined that although several types of point sources are not statistically significant individually, grouping them as a unit could produce meaningful results. These combinations are known as "Point Source Groupings."

Point Source Grouping 1: consists of sites on the Known Contaminated Site List and on the Solid Waste Landfill Site list. In general, these point sources are existing contamination sources.

Point Source Grouping 2: consists of New Jersey Pollutant Discharge Elimination System for permitted discharges to surface water, New Jersey Pollutant Discharge Elimination System storm water discharges, and Compost Facilities. These point sources are potential surface water contamination problems.

Point Source Grouping 3: consists of New Jersey Pollutant Discharge Elimination System discharges for ground water (NJPDES/DGW), Solid Waste Resource Recovery Facilities (RRF), Solid Waste Transfer Facilities (SWTF), and Class B Recycling Facilities. These point sources are potential ground water contamination problems. The last three activities (RRF, SWTF, and Class B) are designed not to discharge contamination and degrade ground water. They do handle pollutants, and there is a potential to cause contamination. Thus, they are included in the inventory. Facilities that discharge via a NJPDES/DGW permit are given strict permit limits. The discharge standards are typically at or below the ground water quality standards. While these activities are grouped for modeling purposes, the RRF, SWTF, and Class B Recycling Facilities do not appreciably affect the model, based on analysis by USGS.

Point Source Grouping 4: consists of sites regulated by the DEP Discharge Prevention and Countermeasures Plan regulations and Discharge Cleanup and Removal Plan regulations. These facilities store, transfer, process, or use hazardous substances and must specify and submit information regarding prevention, containment and countermeasure plans and discharge cleanup and removal plans.

Point Source Grouping 5: consists of regulated Underground Storage Tanks (USTs). USTs were treated as a separate point source grouping due to the large number of USTs in New Jersey, relative to the number of other types of potential point sources. There are approximately 19,454 underground storage tank registrations in New Jersey, consisting of active and inactive tanks. USTs were treated separately so that the number of USTs would not obscure possible statistical relations between susceptibility and other potential contaminant sources.

Point Source Grouping 6: consists of the entire Potential Contaminant Source Inventory of point sources.

Several point source groupings were combined to determine whether or not these point source groupings had an effect on a source's susceptibility. If a point source grouping combination was found to be significant it was used as an explanatory variable in the susceptibility models. The explanatory variables can be found in Tables 2, 3, and 4 dependent on the type of drinking water source.

Table 2: Surface Water Explanatory Variables

Illustrates the explanatory variables USGS used in their SWAP surface water modeling.

Constituent/Variable	Pathogens [1]	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides [1]	Radon [1]	DBPs - conceptual [2]
Sensitivity								
% Soil Clay			X					
% Soil Organic Matter				X [2]	X [2]			X [2]
PH of water-quality sample					X			
Physiographic Province					X [2]			
Water Region					X			
Intensity								
% Agricultural Land Use, 1995		X						
% Commercial/Industrial Land Use, 1995					X [2]			
% Developed Land, 1995					X [2]			
% Residential Land Use, 1995			X					
% Urban Land Use, 1995		X		X	X			
Distance to Agricultural Land, 1995			X		X [2]			
Distance to Wetlands, 1995								X [2]
Density of NJPDES SW/Storm, Compost Facilities (Point Source Grouping 2)					X			
Density of KCSL, SWL, NJPDES SW/Storm, Compost Facilities (Point Source Groupings 1,2)				X				
Density of KCSL, SWL, NJPDES GW, SWRRF, SWTF200011, Class B Recycling, DPCC, UST (Point Source Groupings 1, 3, 4, 5)					X			
Sewage Treatment Plant Density		X						
Total Pesticide Application			X					

[1] For the purpose of developing susceptibility models, a pathogen model was not developed because all surface water sources are considered highly susceptible to pathogens; a radionuclide model was not developed because radionuclides are not a concern in surface water.

[2] This conceptual variable shows a graphical relation to water-quality, improves the model, and is supported by scientific investigations.

Table 3: Ground Water Unconfined Explanatory Variables

Illustrates the explanatory variables USGS used in their SWAP ground water unconfined modeling.

Constituent/Variable	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	DBPs
Sensitivity								
% Soil Clay					X[4]		X[2]	
% Soil Organic Matter				X	X[2]			X[1]
Conceptual - GWUDI	X[3]							
Depth to Top of Open Interval	X	X[2]	X[2]		X[4]		X	
Depth of Well						X[2]		
Dissolved Oxygen of water-quality sample					X			
Length of Open Interval		X[2]	X[2]					
NJGS Hydrologic Unit (Aquifer)								X[1]
pH of water-quality sample					X	X		
Physiographic Province					X[4]	X	X	
Soil Available Water Capacity	X[1]							
Soil Hydraulic Conductivity					X	X[2]		
Intensity								
% Agricultural Land Use, 1970						X		
% Agricultural Land Use, 1986		X	X					
% Agricultural Land Use, 1995							X	
% Barren Land Use, 1995					X			
% Commercial/Industrial Land Use, 1995				X				
% Urban Land Use, 1970					X			
% Urban Land Use, 1995		X	X[2]					
Area of Urban Land Use, 1995 (square miles)				X				
% Urban Land Use, Tier 1, 1995						X		
% Developed Land, Tier 1, 1995						X		
% Impervious Surface, 1995				X				
Distance to Agricultural Land, 1995	X		X		X	X[1]		
Distance to Golf Course			X[2]					
Distance to DOT Roads					X			
Distance to Sewage Treatment Plant					X			
Distance to Wetlands, 1995							X[2]	
Square Miles of Wetlands, 1995								X[2]
Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC (Point Source Groupings 2, 3, 4)								X

Table 3 continued

Constituent/Variable	**Pathogens**	**Nutrients**	**Pesticides - conceptual[3]**	**SOCs[1]**	**VOCs**	**Inorganics**	**Radionuclides**	**Radon**	**DBPs**
Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facility, SWRRF, SWTF200011, Class B Recycling, DPCC, UST (Point Source Groupings 1, 2, 3, 4, 5)						X			
Density of SWL, UST, KCSL (Point Source Groupings 1, 5)					X				
Population Density						X			
Population Density, Tier 1						X			
Septic Tank Density	X[1]								
Septic Tank Density in Piedmont							X		
Sewage Treatment Plant Density						X			
Conceptual - Presence of Streams, Tier 1	X[3]								
Length of Railroads						X			

[1] This conceptual variable shows a graphical relation, improves the model, and is supported by scientific investigations.
[2] This conceptual variable shows a graphical relation to water quality and improves the model.
[3] Statistical tests could not be used because the variable was unavailable for the data set used to develop the model.
[4] This factor is a conceptual variable and an explanatory variable for the contaminant category. As a result of the contaminant category consisting of several inorganics (arsenic, barium, beryllium, fluoride, lead, and mercury), the factor is used as a conceptual and statistically significant variable. Percent soil clay is a conceptual variable (X^2) for lead and mercury, but a statistically significant explanatory variable for beryllium. For depth to top of open interval, the factor is conceptual (X^2) for fluoride and lead, and a statistically significant explanatory variable for beryllium. Thirdly, physiographic province is a conceptual variable (X^3) for mercury and a statistically significant explanatory variable for the arsenic, barium, beryllium, and fluoride models.

Table 4: Ground Water Confined Explanatory Variables

Illustrates the explanatory variables USGS used in their SWAP ground water modeling.

Constituent/Variable	**Pathogens**	**Nutrients**	**Pesticides**	**VOCs**	**Inorganics**	**Radionuclides**	**Radon**	**DBPs**
Sensitivity								
% Soil Organic Matter								
NJGS Hydrologic Unit (Aquifer)								X
Geologic Unit					X	X	X	
pH of water-quality sample								X
Intensity [1]								

[1] Confined wells are not susceptible to intensity variables.

Susceptibility is the measurement of potential for a public water system to become contaminated. The susceptibility models developed by the USGS were applied to all noncommunity water system sources and resulted in a high, medium, or low susceptibility rating for each source of water.

If a drinking water source's susceptibility is high, it does not mean the water is contaminated. High susceptibility is a vulnerability rating, not a factor determining whether or not the water is or is not safe to drink. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels. The water utility may be contacted for additional water quality information.

DEP calculated the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the contaminant categories. Table 5 summarizes the susceptibility rating information.

Table 5: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent %)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	DBPs
Ground Water[1]								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water[2]								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

[1] Noncommunity water systems wells in New Jersey in 2003 = 3480
[2] Noncommunity water system surface water sources in New Jersey in 2003 = 3

USGS developed a rating scoring system for each susceptibility model. When each model was applied to a well or intake, a rating score was generated. This score was then converted into a susceptibility rating of high, medium, or low. For further information on the susceptibility rating score scheme please refer to Appendix A- Attachment 2. The Safe Drinking Water Maximum Contaminant Levels (MCLs) were used to guide the division between the three susceptibility ratings. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant. A medium susceptibility rating was assigned where the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high susceptibility rating was assigned where the potential contaminant level was equal to or greater than 50 percent of the MCL. For the list of New Jersey primary and secondary drinking water standards, containing the MCLs, please refer to http://www.state.nj.us/dep/watersupply/standard.htm.

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens). In fact, a high percentage of community water system surface water intakes were found to be highly susceptible to the same contaminant categories. Eighty-one percent of community water system surface water intakes were found to be highly

susceptible to inorganics and 98% were found to be highly susceptible to disinfection byproduct precursors.

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%). When reviewing the results of the medium susceptibility ratings for noncommunity water system wells, the three contaminant categories in which a high percentage of the wells rated medium are disinfection byproduct precursors (97%), radon (72%), pesticides and nutrients (both 66%).

Step 4: Public Participation and Outreach

The fourth step, public participation and outreach, is an essential component of the SWAP. The 1996 Amendments to the Federal Safe Drinking Water Act place a strong emphasis on public participation. To ensure the source water assessments are used for source water protection efforts, the public was involved from the beginning of the program.

The DEP used a variety of techniques to include the public in the program.

1. **Created a Source Water Assessment Advisory Committee to provide input on the draft and final SWAP Plan**. The Source Water Assessment Advisory Committee continued to meet with the DEP regularly to discuss the status of the assessments and provide suggestions during the development of the program. In addition, the Source Water Assessment Advisory Committee provided advice concerning the source water assessment summaries and reports.

2. **Developed a SWAP newsletter, the "New Jersey Source Water Assessment News."** Issues of the "New Jersey Source Water Assessment News" may be found at www.state.nj.us/dep/swap. The newsletter was sent to committee members, public water systems, county health agencies, environmental organizations, municipalities, drinking water laboratories, and other interested parties. The New Jersey Source Water Assessment News informed readers of the status of the SWAP, contact information, source water protection issues, and other related topics.

3. **Published SWAP articles in several organizations' newsletters.** For example, articles were published in the New Jersey Section of American Water Works Association newsletter "Pipeline" and the DEP Division of Watershed Management newsletter "Focus."

4. **Provided speakers for numerous SWAP presentations throughout the State.** The presentations were regularly presented to water purveyors at New Jersey Water Association training courses and other interested organizations such as the watershed management area committees.

The DEP will continue its public outreach following the release of the source water assessments. Public outreach activities will include training sessions for water purveyors, published SWAP articles, and correspondence with interested parties such as purveyors, municipalities, planning boards, and environmental commissions.

SECTION IV - NONCOMMUNITY PUBLIC WATER SYSTEM INDIVIDUAL SOURCE WATER ASSESSMENT REPORTS (ARRANGED BY PWID)

Byram Consolidated School

1904300

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

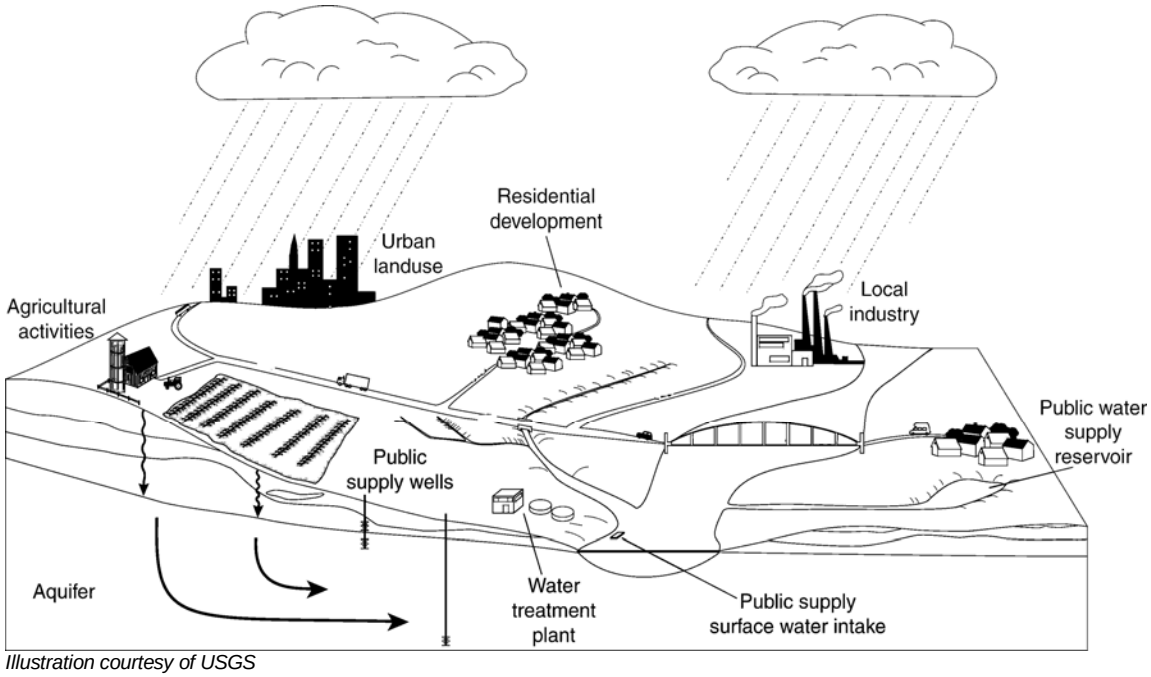


Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Byram Consolidated School

Byram Consolidated School (PWID 1904300) at 55 Lackawanna Drive, Stanhope, NJ, is a public noncommunity water system that serves approximately 418 people (in 2003). Byram Consolidated School consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Byram Consolidated School's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well 1	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 1 **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.15	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	160.79
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	43.41
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	43.41
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	17.48	% Impervious Surface, 1995	9.6
		% Commercial/Industrial Land Use, 1995	3.89
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	33
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	33
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	406.86
% Soil Clay	6.27	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	33.2	% Urban Land Use, 1970	30.2
Conceptual % Soil Organic Matter	17.48	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	45.55
		Length of railroads	0
		Population Density	475.83
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	78.82
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	78.9
Conceptual Soil Hydraulic Conductivity	33.2	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.27	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	216.77
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	17.48	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.02
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Frenches Grove Water Company

1904301

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

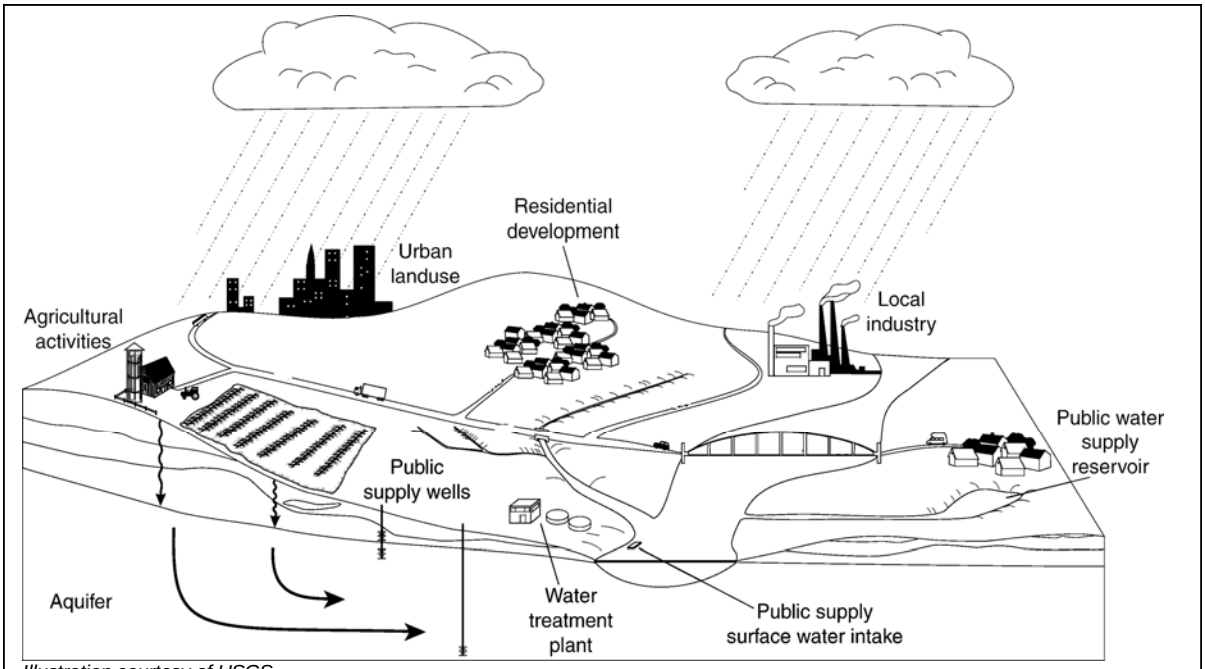


Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Frenches Grove Water Company

Frenches Grove Water Company (PWID 1904301) at Po Box 474, Byram Twp, NJ, is a public noncommunity water system that serves approximately 225 people (in 2003). Frenches Grove Water Company consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Frenches Grove Water Company's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**L**	**M**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.03	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	89.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.35
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.35
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.13	% Impervious Surface, 1995	24.5
		% Commercial/Industrial Land Use, 1995	11.59
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	162.91
% Soil Clay	4.21	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	12.34	% Urban Land Use, 1970	44.94
Conceptual % Soil Organic Matter	0.13	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	206.05
		Length of railroads	958.68
		Population Density	162.99
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	74.5
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	74.5
Conceptual Soil Hydraulic Conductivity	12.34	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.21	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.13	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Byram Township Intermediate School

1904302

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

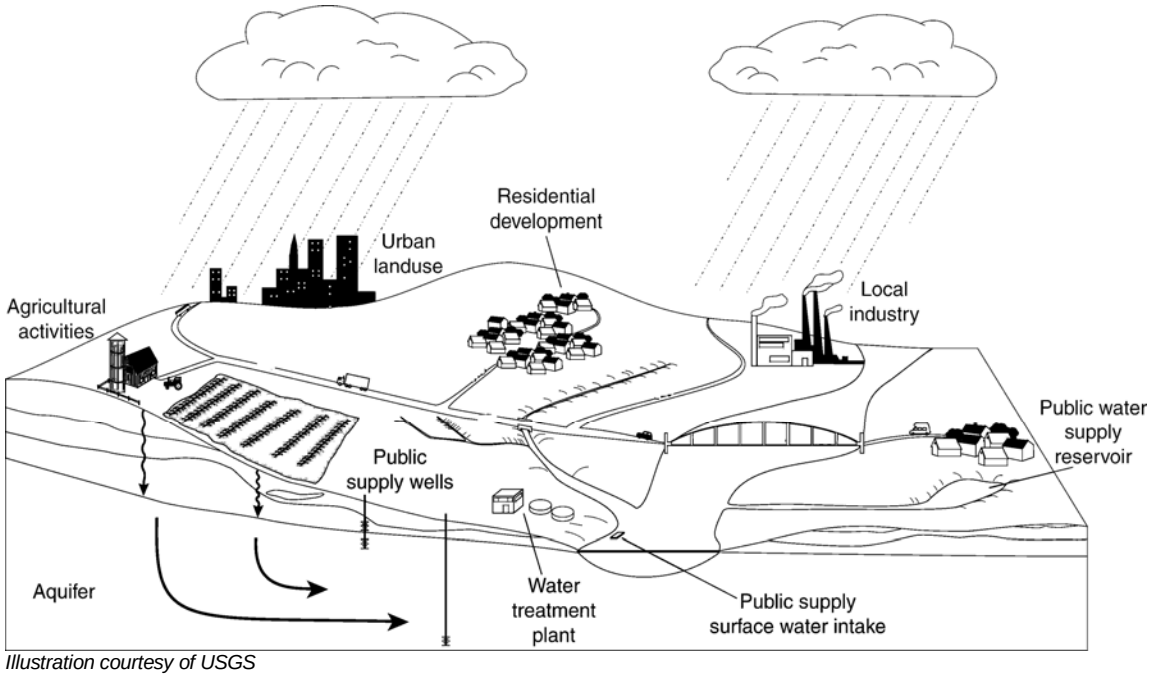


Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Byram Township Intermediate School

Byram Township Intermediate School (PWID 1904302) at 12 Mansfield Drive, Stanhope, NJ, is a public noncommunity water system that serves approximately 820 people (in 2003). Byram Township Intermediate School consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Byram Township Intermediate School's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well 1	**L**	**L**	**L**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 1 **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.09	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	296.81
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	33.27
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	33.27
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	1.24	% Impervious Surface, 1995	12.9
		% Commercial/Industrial Land Use, 1995	16.08
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	28.4
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	28.4
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	430	Population Density, Tier 1	863.25
% Soil Clay	8.21	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	52.47	% Urban Land Use, 1970	65.33
Conceptual % Soil Organic Matter	1.24	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	106.55
		Length of railroads	0
		Population Density	863.25
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	42.1
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	430	% Developed Land, Tier 1, 1995	42.1
Conceptual Soil Hydraulic Conductivity	52.47	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	8.21	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	39.4
Depth to Top of Open Interval	430		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	1.24	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.03
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Panther Lake Campground - Palidini

1904304

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

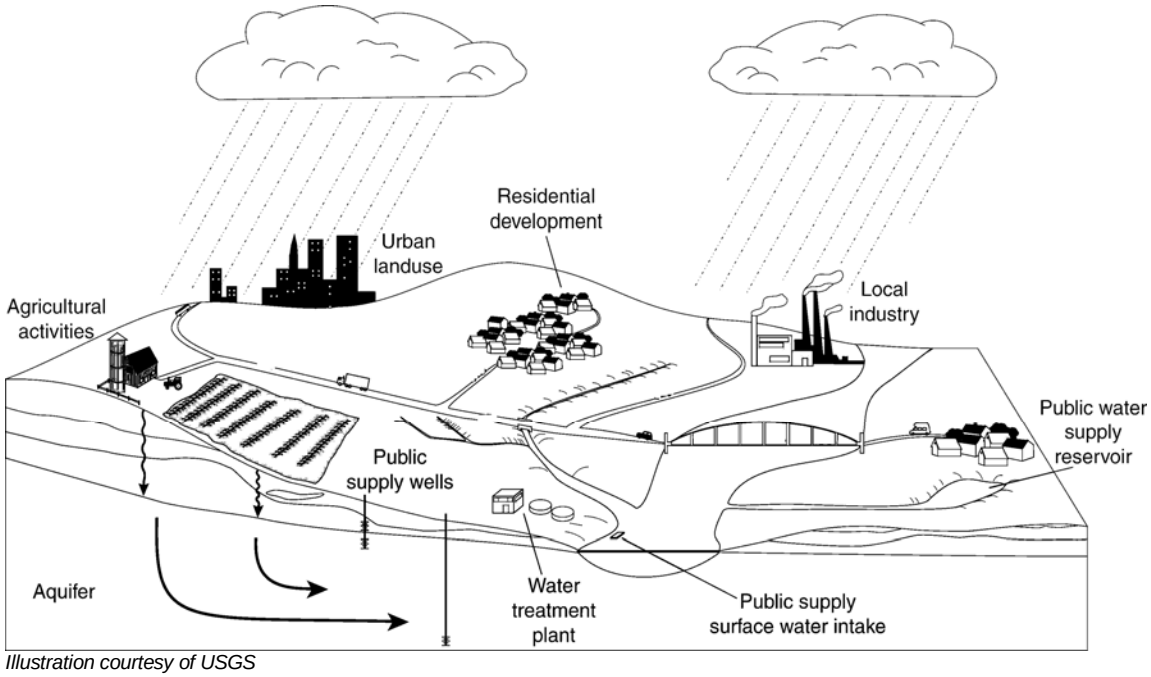


Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Panther Lake Campground - Palidini

Panther Lake Campground - Palidini (PWID 1904304) at 6 Panther Lake Road, Andover, NJ, is a public noncommunity water system that serves approximately 300 people (in 2003). Panther Lake Campground - Palidini consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Panther Lake Campground - Palidini's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Palidini House Well	**L**	**M**	**M**	**L**	**M**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Palidini House Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.05	Distance to Agricultural Land Use, 1995	652.42
Depth to Top of Open Interval		Conceptual Septic Tank Density	350.92
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	54.2
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0.3
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	54.2
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0.3
		Distance to Agricultural Land Use, 1995	652.42
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.39	% Impervious Surface, 1995	9.7
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	652.42
Depth to Top of Open Interval	250	Population Density, Tier 1	1058.02
% Soil Clay	4.98	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	53.56	% Urban Land Use, 1970	45.8
Conceptual % Soil Organic Matter	0.39	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	20.68
		Length of railroads	50.86
		Population Density	1050.84
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	59.2
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	652.42
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	59.2
Conceptual Soil Hydraulic Conductivity	53.56	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.98	% Agricultural Land Use, 1995	0.3
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.39	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Panther Lake Campground - Birch Park

1904305

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

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Where does drinking water come from?

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Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

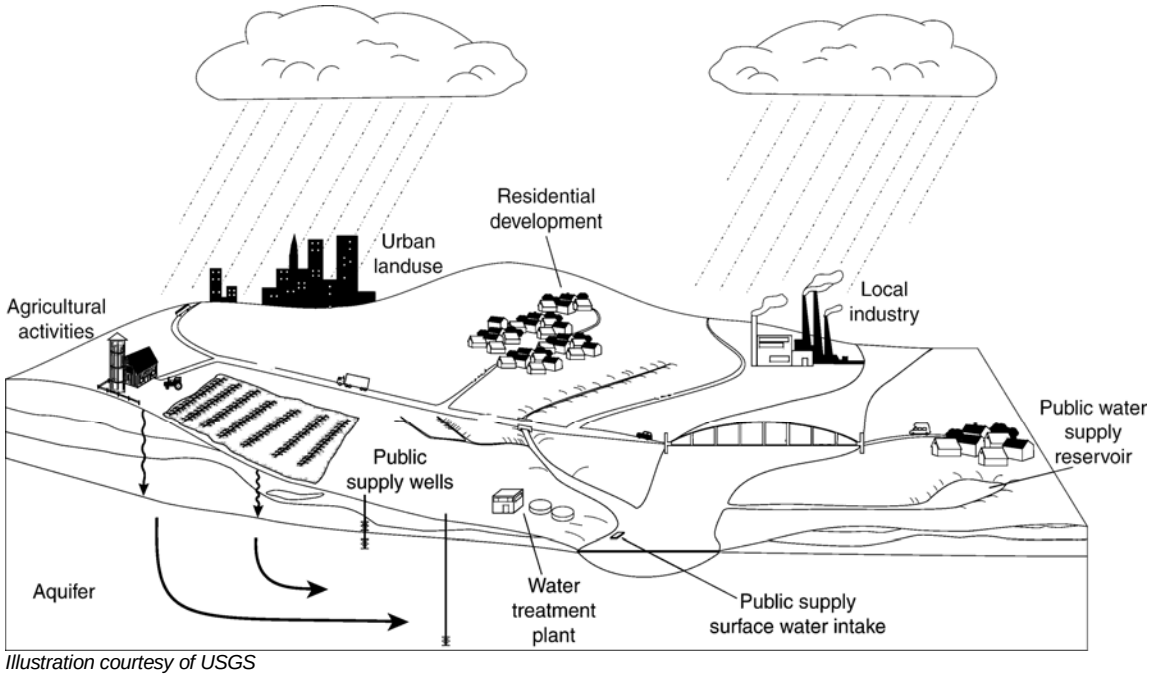

Illustration courtesy of USGS

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- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Panther Lake Campground - Birch Park

Panther Lake Campground - Birch Park (PWID 1904305) at 6 Panther Lake Road, Byram, NJ, is a public noncommunity water system that serves approximately 200 people (in 2003). Panther Lake Campground - Birch Park consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Panther Lake Campground - Birch Park's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Birch Park Well	**L**	**M**	**M**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Birch Park Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	353.02
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	65.23
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	65.23
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.9	% Impervious Surface, 1995	9.7
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.04
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	1058.02
% Soil Clay	5.29	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	59.65	% Urban Land Use, 1970	33.2
Conceptual % Soil Organic Matter	0.9	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	273.28
		Length of railroads	0
		Population Density	1058.02
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	92.9
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	92.9
Conceptual Soil Hydraulic Conductivity	59.65	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	5.29	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.9	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Panther Lake Campground - Ash Park

1904306

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

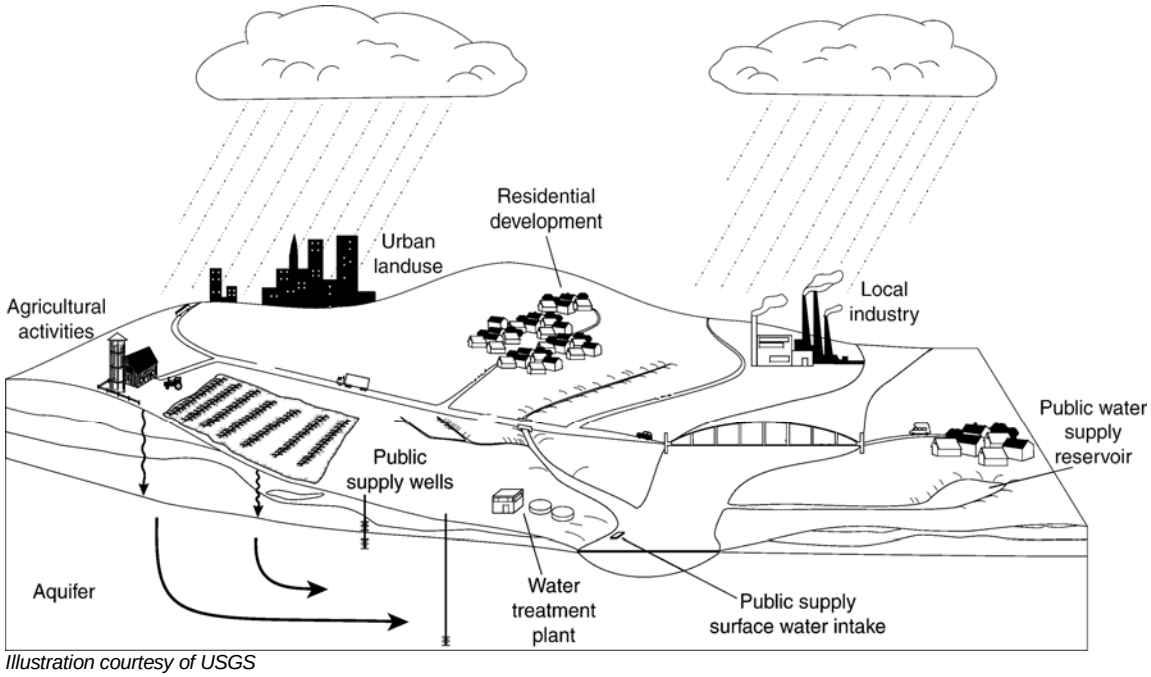

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Panther Lake Campground - Ash Park

Panther Lake Campground - Ash Park (PWID 1904306) at 6 Panther Lake Road, Byram, NJ, is a public noncommunity water system that serves approximately 400 people (in 2003). Panther Lake Campground - Ash Park consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Panther Lake Campground - Ash Park's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Ash Park Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Ash Park Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	353.02
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	44.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	44.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	1.4	% Impervious Surface, 1995	4.7
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	1058.02
% Soil Clay	6.54	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	32.91	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	1.4	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	512.95
		Length of railroads	0
		Population Density	1058.02
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	61.4
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	61.4
Conceptual Soil Hydraulic Conductivity	32.91	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.54	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	193.25
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	1.4	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Panther Lake Campground - Office

1904307

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

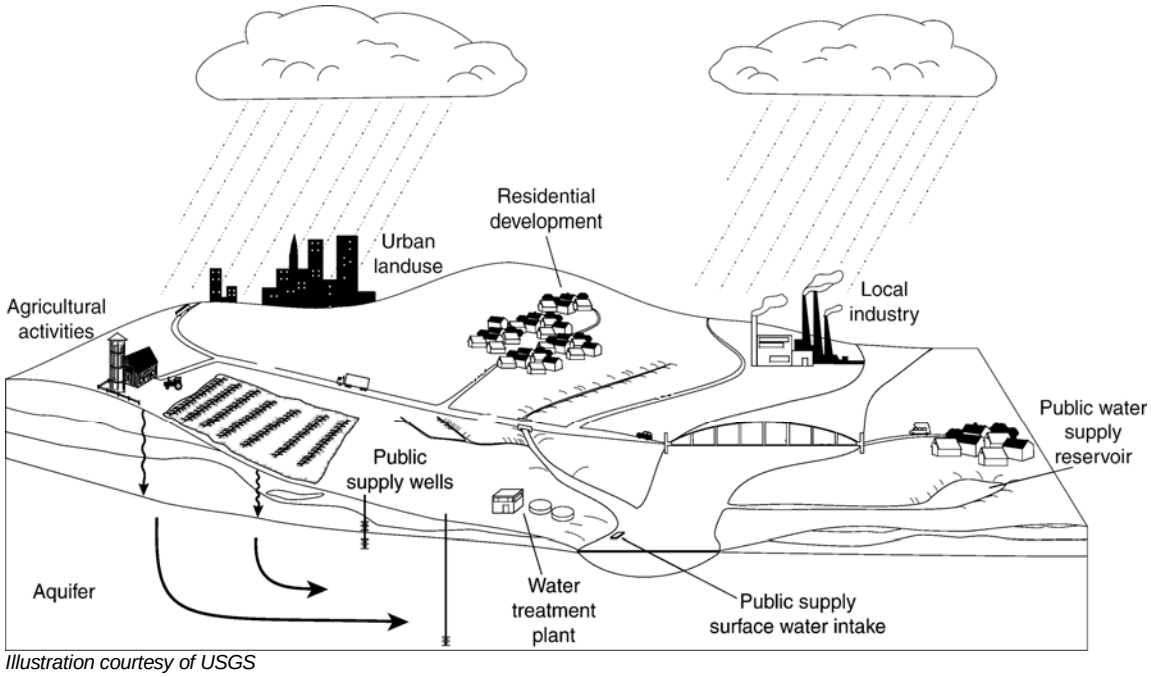

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

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Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Panther Lake Campground - Office

Panther Lake Campground - Office (PWID 1904307) at 6 Panther Lake Road, Andover, NJ, is a public noncommunity water system that serves approximately 100 people (in 2003). Panther Lake Campground - Office consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Panther Lake Campground - Office's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Orchard Park Well	**L**	**M**	**M**	**L**	**M**	**H**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Orchard Park Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	0
Depth to Top of Open Interval		Conceptual Septic Tank Density	254.49
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.9
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	20.86
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.9
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	20.86
		Distance to Agricultural Land Use, 1995	0
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.26	% Impervious Surface, 1995	4.9
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	0
Depth to Top of Open Interval	250	Population Density, Tier 1	898.68
% Soil Clay	4.65	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	68.95	% Urban Land Use, 1970	38.3
Conceptual % Soil Organic Matter	0.26	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	167.1
		Length of railroads	1373.42
		Population Density	723.26
Radionuclides Explanatory Variables – Source Rating = H			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	48.7
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	0
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	99.7
Conceptual Soil Hydraulic Conductivity	68.95	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.65	% Agricultural Land Use, 1995	20.34
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	634.56
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.26	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Cartridge Actuated Devices

1904309

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

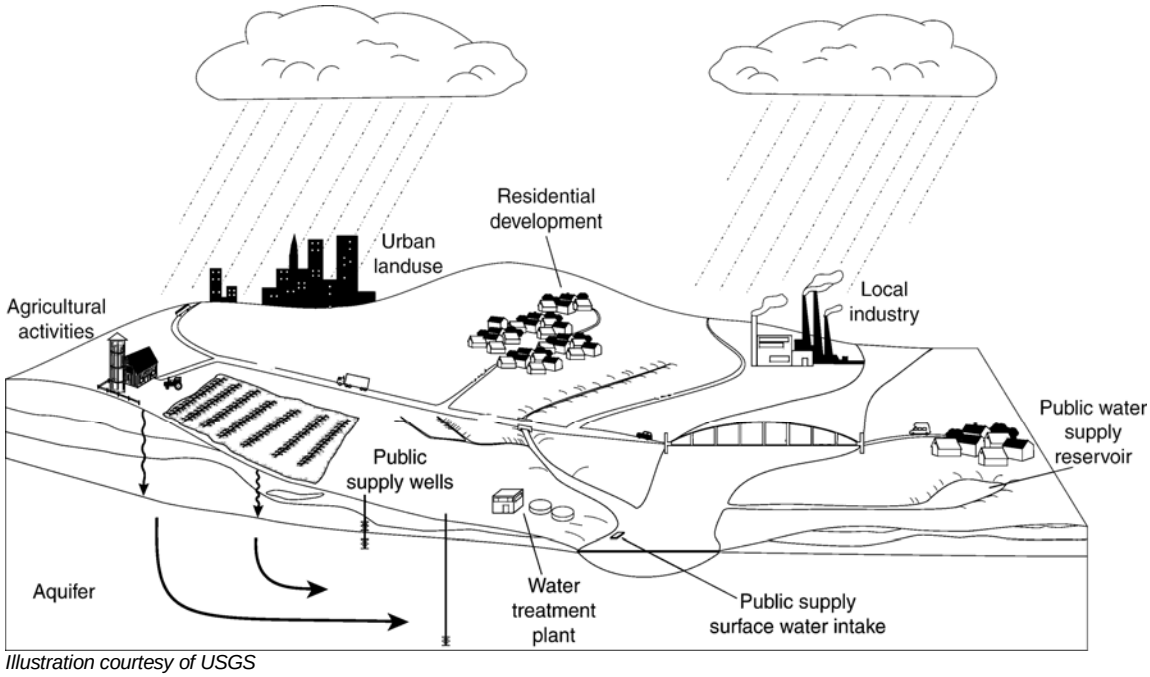

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Cartridge Actuated Devices

Cartridge Actuated Devices (PWID 1904309) at 40 Old Indian Springs Rd, Andover, NJ, is a public noncommunity water system that serves approximately 35 people (in 2003). Cartridge Actuated Devices consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Cartridge Actuated Devices's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**M**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.04	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	80.55
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	14.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	14.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.22	% Impervious Surface, 1995	2.9
		% Commercial/Industrial Land Use, 1995	14.6
		Sq. Mi. of Urban Land Use, 1995	0.01
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	247.34
% Soil Clay	4.75	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	6.92	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.22	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	298.97
		Length of railroads	0
		Population Density	247.34
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	47.5
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	47.5
Conceptual Soil Hydraulic Conductivity	6.92	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.75	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.22	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Byram Township Municipal Building

1904311

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

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Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

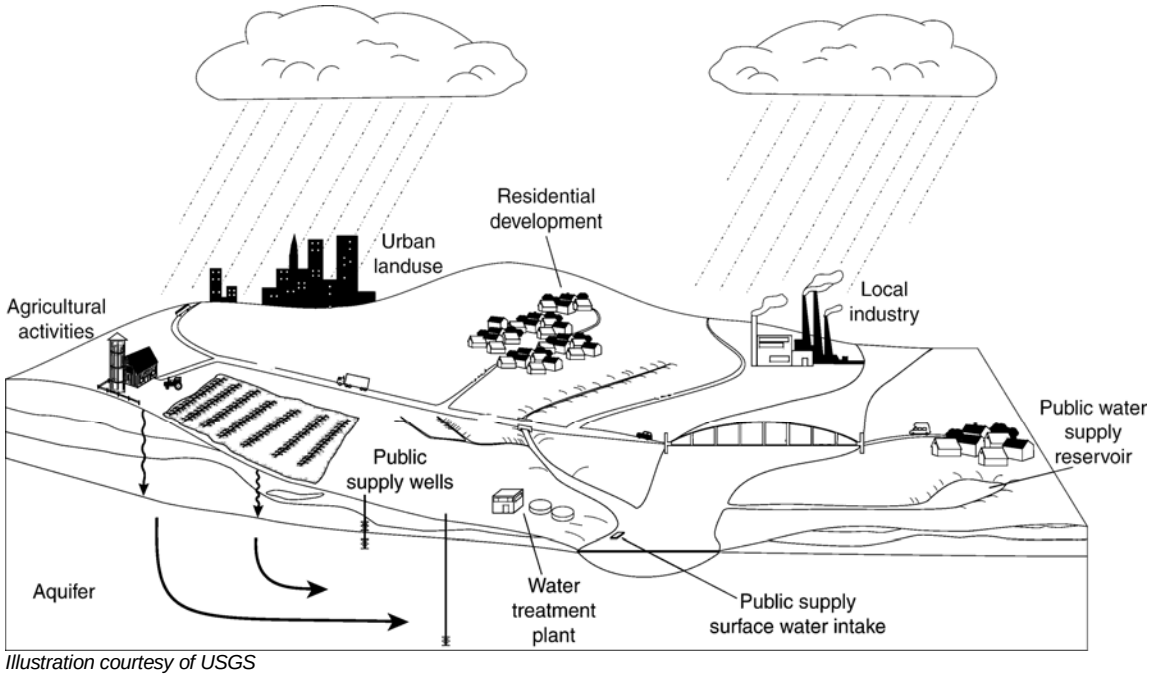

Illustration courtesy of USGS

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What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Byram Township Municipal Building

Byram Township Municipal Building (PWID 1904311) at 10 Mansfield Drive, Stanhope, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Byram Township Municipal Building consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Byram Township Municipal Building's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well 1	**L**	**L**	**L**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 1 **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.08	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	296.81
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	40.06
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	40.06
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.78	% Impervious Surface, 1995	16.1
		% Commercial/Industrial Land Use, 1995	28.87
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	49.6
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	49.6
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	300	Population Density, Tier 1	863.25
% Soil Clay	9.43	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	45.51	% Urban Land Use, 1970	9.41
Conceptual % Soil Organic Matter	0.78	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	42.74
		Length of railroads	0
		Population Density	863.25
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	76.1
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	300	% Developed Land, Tier 1, 1995	76.1
Conceptual Soil Hydraulic Conductivity	45.51	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	9.43	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	193.52
Depth to Top of Open Interval	300		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.78	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Tony & Rosemary's Tavern

1904312

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

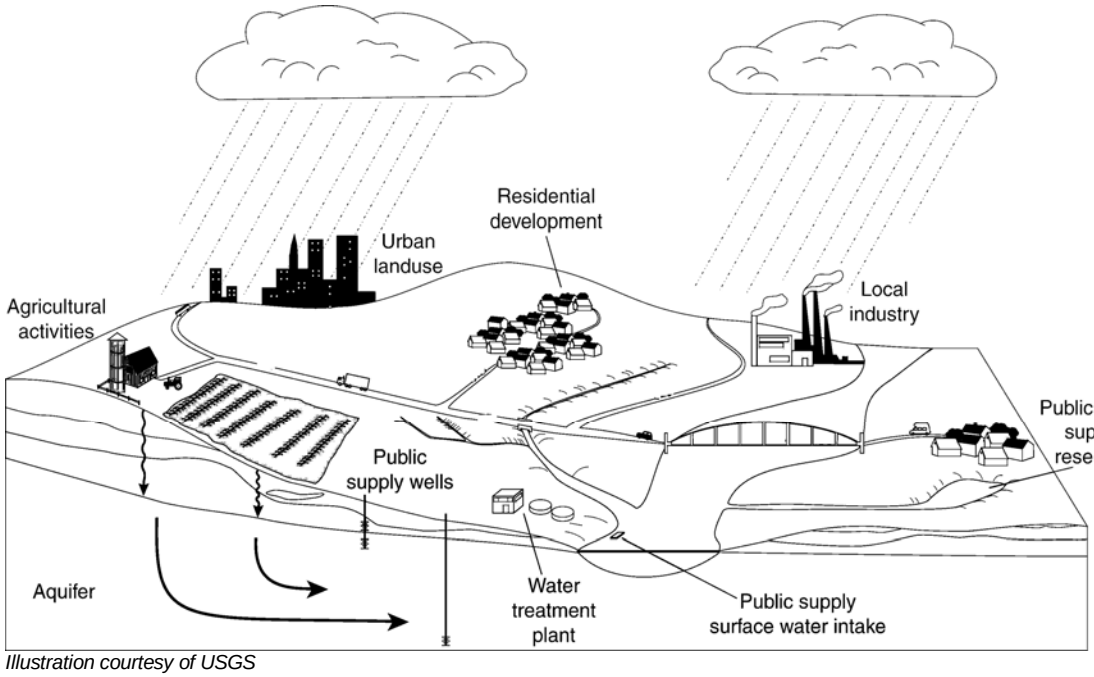

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Tony & Rosemary's Tavern

Tony & Rosemary's Tavern (PWID 1904312) at 11 Route 206 South, Stanhope, NJ, is a public noncommunity water system that serves approximately 30 people (in 2003). Tony & Rosemary's Tavern consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Tony & Rosemary's Tavern's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	249.37
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	76.8
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	76.8
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.81	% Impervious Surface, 1995	36.2
		% Commercial/Industrial Land Use, 1995	38.3
		Sq. Mi. of Urban Land Use, 1995	0.05
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	866.46
% Soil Clay	7.08	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	14.81	% Urban Land Use, 1970	100
Conceptual % Soil Organic Matter	0.81	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	116.56
		Length of railroads	0
		Population Density	974.49
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	87.2
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	87.2
Conceptual Soil Hydraulic Conductivity	14.81	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.08	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	324.33
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.81	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Byram Diner

1904316

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

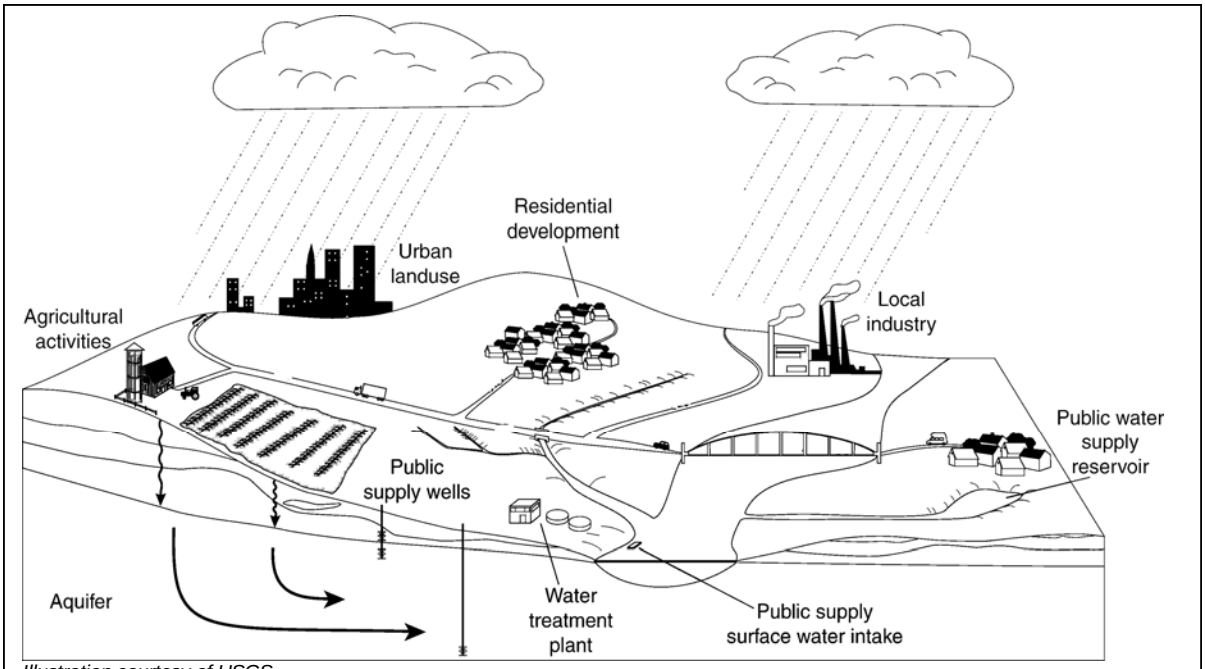

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Byram Diner

Byram Diner (PWID 1904316) at 26 Route 206, Stanhope, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Byram Diner consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Byram Diner's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	285.34
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	88.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	88.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.42	% Impervious Surface, 1995	44.1
		% Commercial/Industrial Land Use, 1995	53.7
		Sq. Mi. of Urban Land Use, 1995	0.05
		Density of SWL, USTs, and KCSL	16.5
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	16.5
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	865.14
% Soil Clay	7.12	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	36.14	% Urban Land Use, 1970	83.9
Conceptual % Soil Organic Matter	0.42	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	49.2
		Length of railroads	0
		Population Density	865.29
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	100
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	100
Conceptual Soil Hydraulic Conductivity	36.14	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.12	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	653.63
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.42	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Dunkin Donuts/Baskin Robbins

1904318

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

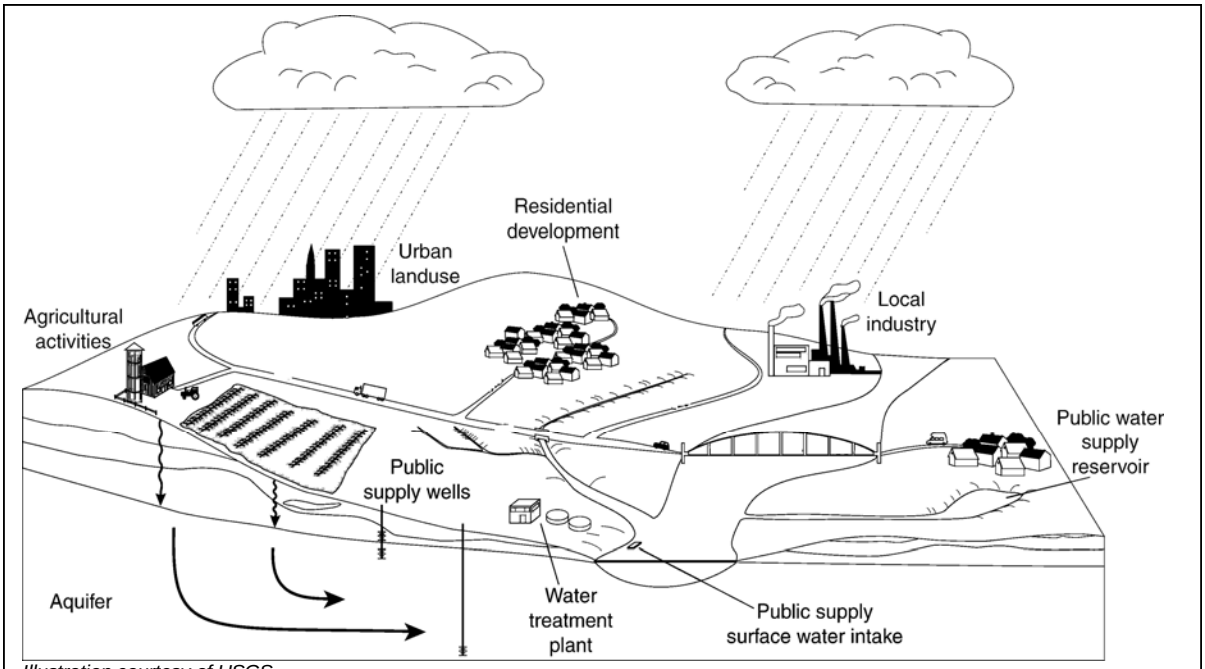

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

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Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Dunkin Donuts/Baskin Robbins

Dunkin Donuts/Baskin Robbins (PWID 1904318) at 25 Rt 206, Byram Twp, NJ, is a public noncommunity water system that serves approximately 900 people (in 2003). Dunkin Donuts/Baskin Robbins consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Dunkin Donuts/Baskin Robbins's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	282.52
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	93.31
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	93.31
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.47	% Impervious Surface, 1995	47.6
		% Commercial/Industrial Land Use, 1995	56.24
		Sq. Mi. of Urban Land Use, 1995	0.06
		Density of SWL, USTs, and KCSL	16.5
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	16.5
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	866.36
% Soil Clay	6.32	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	37.13	% Urban Land Use, 1970	91
Conceptual % Soil Organic Matter	0.47	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	84.29
		Length of railroads	0
		Population Density	865.81
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	100
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	100.1
Conceptual Soil Hydraulic Conductivity	37.13	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.32	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.47	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Cranbury Lake Volunteer Fire Company

1904319

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

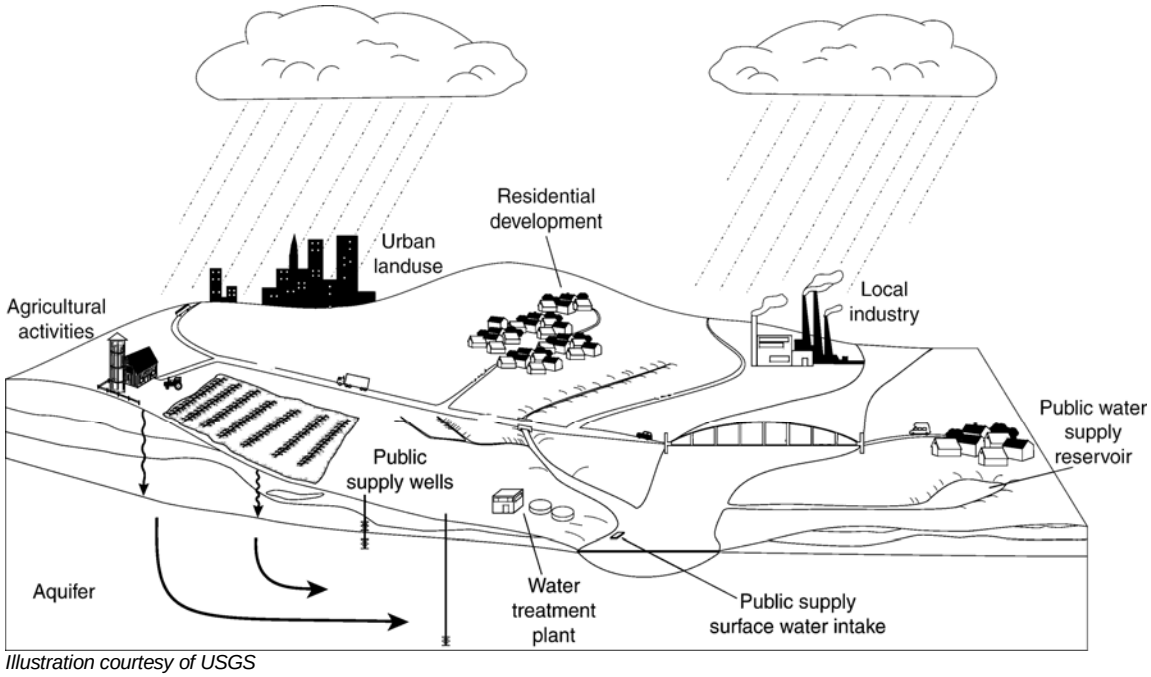

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Cranbury Lake Volunteer Fire Company

Cranbury Lake Volunteer Fire Company (PWID 1904319) at Route 206 South, Andover, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Cranbury Lake Volunteer Fire Company consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Cranbury Lake Volunteer Fire Company's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.14	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	190.08
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	46.39
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	46.39
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	11.67	% Impervious Surface, 1995	18
		% Commercial/Industrial Land Use, 1995	10.72
		Sq. Mi. of Urban Land Use, 1995	0.06
		Density of SWL, USTs, and KCSL	24.8
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	24.8
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	697.69
% Soil Clay	7	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	45.34	% Urban Land Use, 1970	35.9
Conceptual % Soil Organic Matter	11.67	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	85.66
		Length of railroads	1009.7
		Population Density	598.21
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	81.1
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	81.1
Conceptual Soil Hydraulic Conductivity	45.34	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	358.52
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	11.67	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.04
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Wild West City

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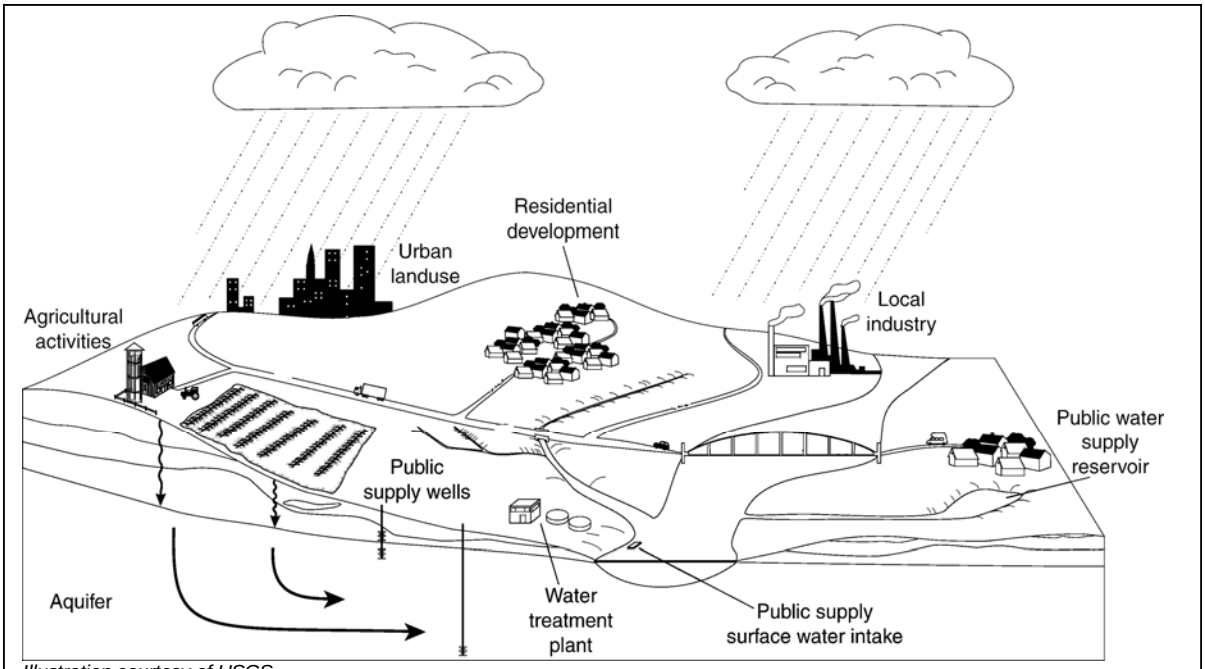

Illustration courtesy of USGS

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- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Wild West City

Wild West City (PWID 1904320) at 50 Lackawanna Dr, Byram Twp, NJ, is a public noncommunity water system that serves approximately 500 people (in 2003). Wild West City consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

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Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Wild West City's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

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This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	296.81
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	37.8
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	37.8
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.41	% Impervious Surface, 1995	4.1
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	863.25
% Soil Clay	7.79	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	12.16	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.41	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	154.98
		Length of railroads	0
		Population Density	863.25
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	38.7
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	38.7
Conceptual Soil Hydraulic Conductivity	12.16	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.79	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	653.71
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.41	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Barones Restaurant

1904321

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

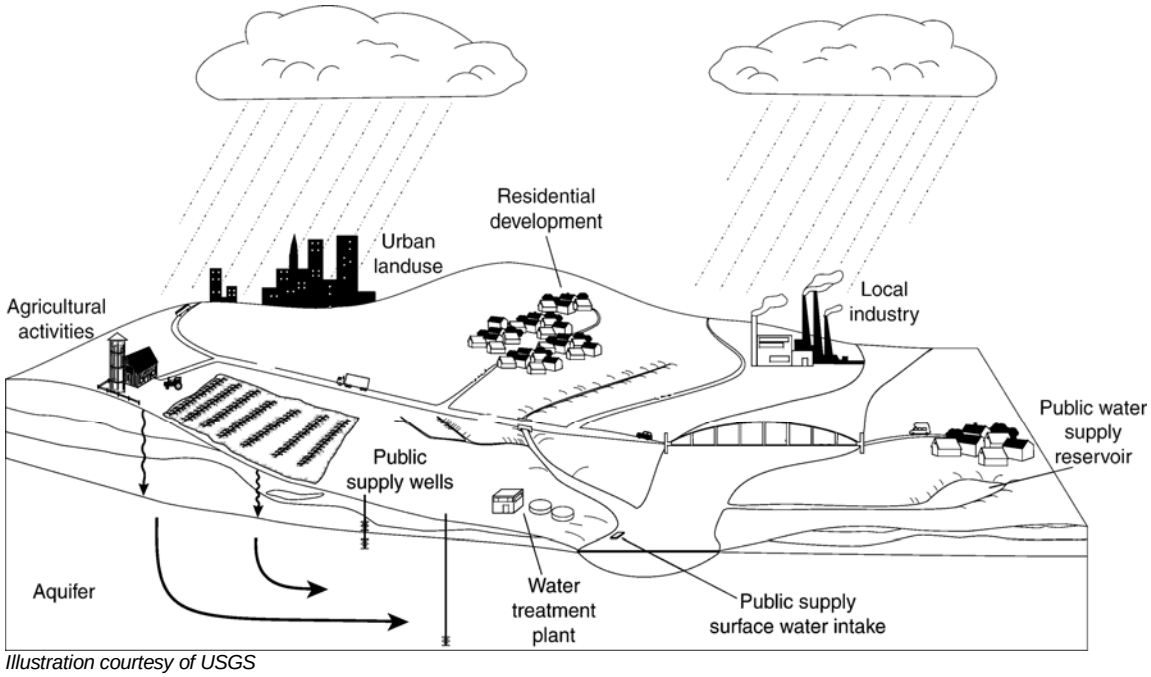

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Barones Restaurant

Barones Restaurant (PWID 1904321) at 77 Route 206, Stanhope, NJ, is a public noncommunity water system that serves approximately 75 people (in 2003). Barones Restaurant consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Barones Restaurant's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.08	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	266.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	46.09
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	46.09
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.45	% Impervious Surface, 1995	26.3
		% Commercial/Industrial Land Use, 1995	45.99
		Sq. Mi. of Urban Land Use, 1995	0.01
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	400	Population Density, Tier 1	867.65
% Soil Clay	6.75	% Barren Land Use, 1995	1.9
Soil Hydraulic Conductivity	44.11	% Urban Land Use, 1970	1.7
Conceptual % Soil Organic Matter	0.45	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	132.28
		Length of railroads	0
		Population Density	836.57
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	90
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	400	% Developed Land, Tier 1, 1995	90
Conceptual Soil Hydraulic Conductivity	44.11	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.75	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	208.75
Depth to Top of Open Interval	400		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.45	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

76ers Waterloo Inn

1904322

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

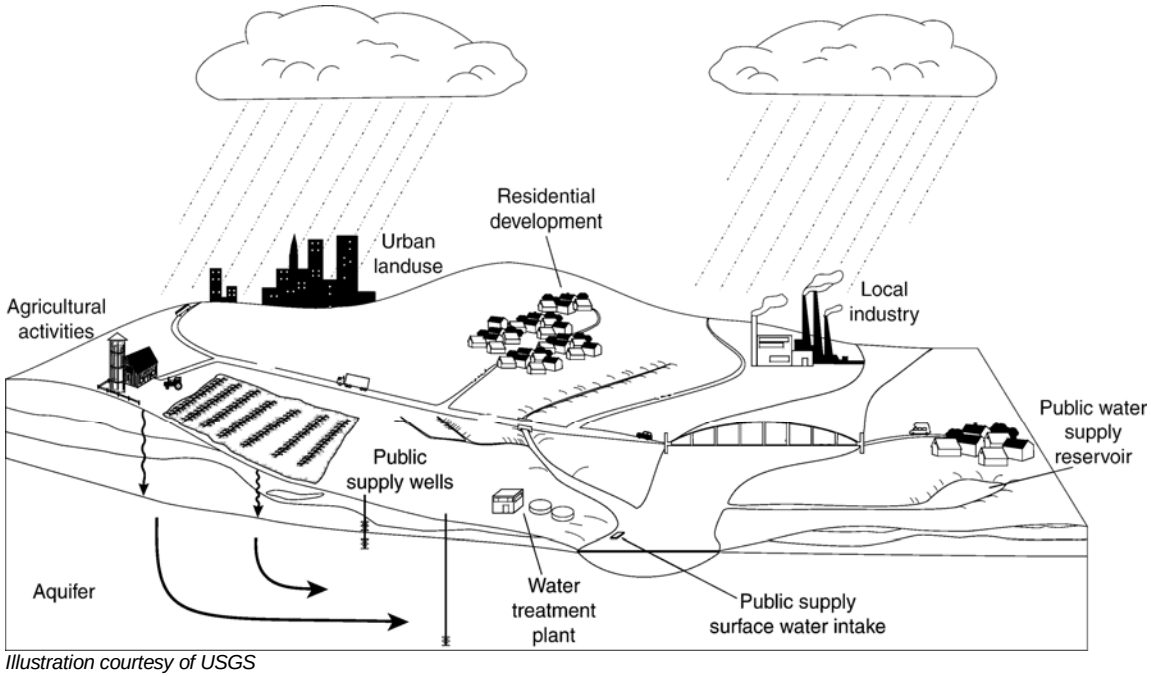

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for 76ers Waterloo Inn

76ers Waterloo Inn (PWID 1904322) at 109 Route 206 (south), Stanhope, NJ, is a public noncommunity water system that serves approximately 100 people (in 2003). 76ers Waterloo Inn consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for 76ers Waterloo Inn's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	207.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	15.88
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	15.88
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.22	% Impervious Surface, 1995	6.1
		% Commercial/Industrial Land Use, 1995	15.88
		Sq. Mi. of Urban Land Use, 1995	0
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	825.46
% Soil Clay	5.35	% Barren Land Use, 1995	8.29
Soil Hydraulic Conductivity	8.62	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.22	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	62.2
		Length of railroads	0
		Population Density	658.61
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	38.9
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	38.9
Conceptual Soil Hydraulic Conductivity	8.62	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	5.35	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	188.3
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.22	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Mountainside Restaurant

1904323

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

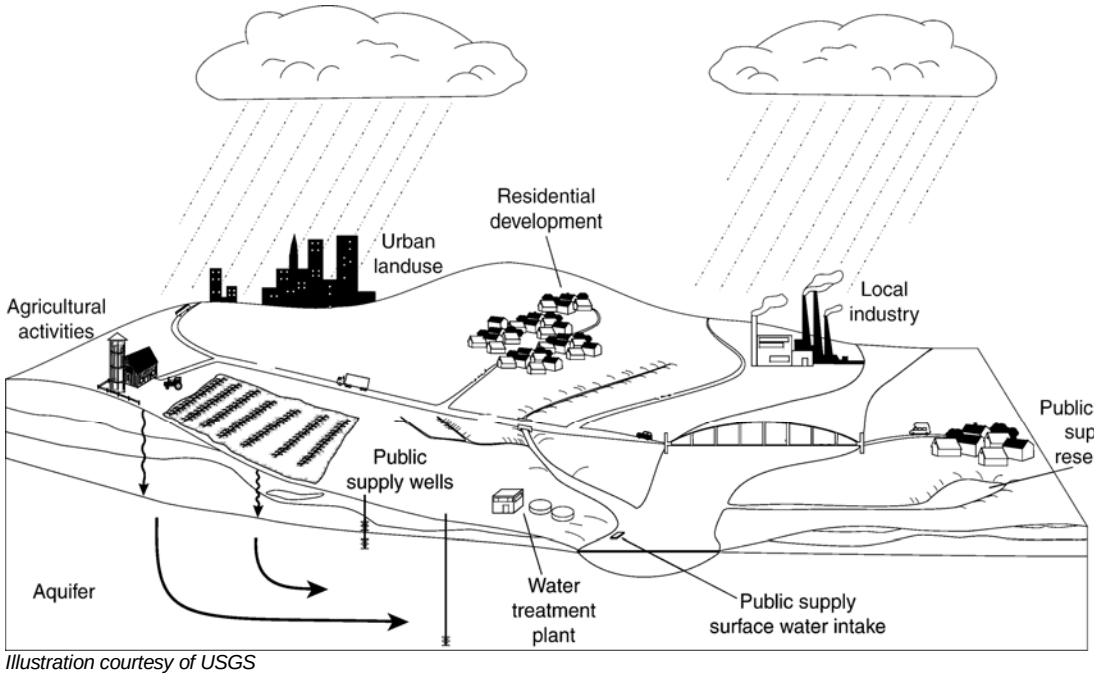

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Mountainside Restaurant

Mountainside Restaurant (PWID 1904323) at 198 Route 206, Andover, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Mountainside Restaurant consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Mountainside Restaurant's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.13	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	170.24
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	5.71
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	5.71
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	13.13	% Impervious Surface, 1995	2.7
		% Commercial/Industrial Land Use, 1995	2.6
		Sq. Mi. of Urban Land Use, 1995	0
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	548.82
% Soil Clay	5.65	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	36.77	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	13.13	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	63.2
		Length of railroads	0
		Population Density	537.66
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	15.88
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	15.9
Conceptual Soil Hydraulic Conductivity	36.77	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	5.65	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	112.85
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	13.13	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.01
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Adam Todd Inn Restaurant

1904324

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

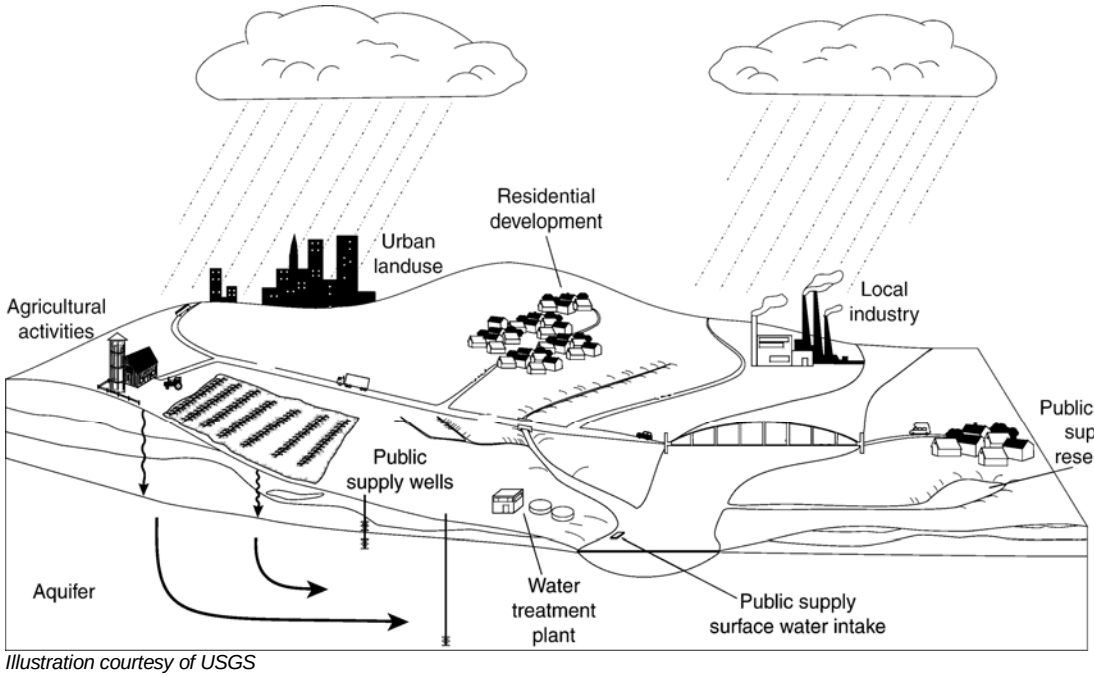

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Adam Todd Inn Restaurant

Adam Todd Inn Restaurant (PWID 1904324) at 263 Rte 206, Andover, NJ, is a public noncommunity water system that serves approximately 75 people (in 2003). Adam Todd Inn Restaurant consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Adam Todd Inn Restaurant's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	91.56
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	43.39
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	43.39
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.39	% Impervious Surface, 1995	30.4
		% Commercial/Industrial Land Use, 1995	27.96
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	181.14
% Soil Clay	6.04	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	43.52	% Urban Land Use, 1970	45.75
Conceptual % Soil Organic Matter	0.39	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	60.42
		Length of railroads	1449.59
		Population Density	214.69
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	71.9
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	71.9
Conceptual Soil Hydraulic Conductivity	43.52	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.04	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	141.4
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.39	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.01
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Porkey's-A Place for Ribs

1904325

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

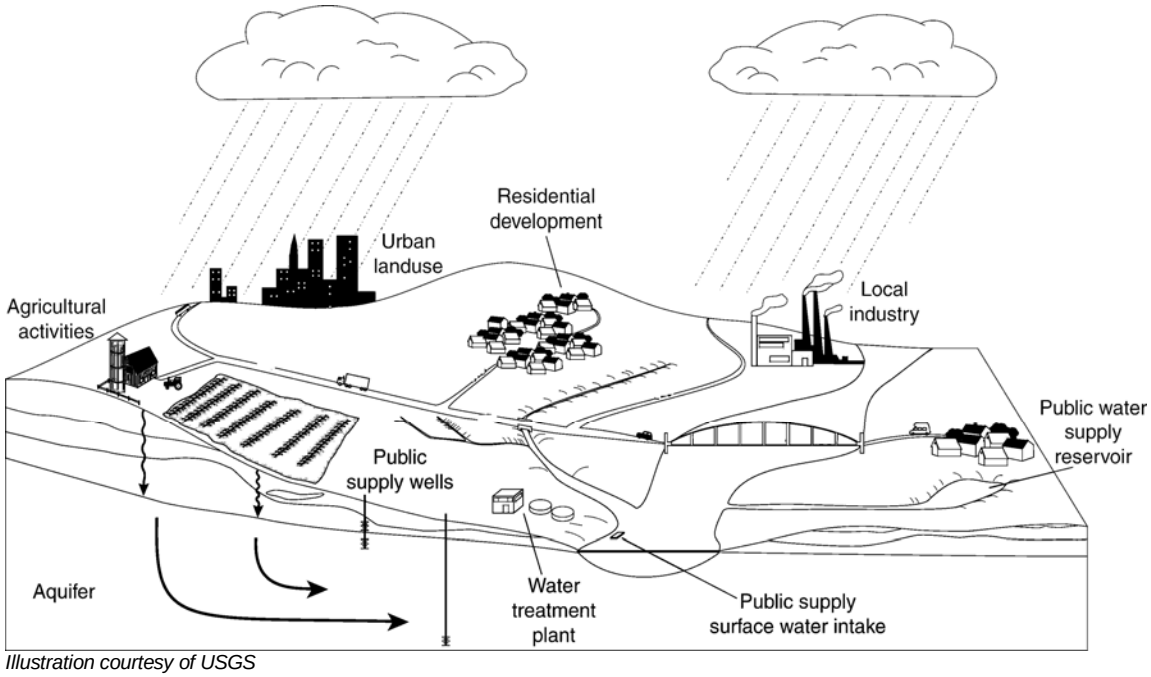

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

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Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Porkey's-A Place for Ribs

Porkey's-A Place for Ribs (PWID 1904325) at 239 Rt 206, Andover, NJ, is a public noncommunity water system that serves approximately 60 people (in 2003). Porkey's-A Place for Ribs consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Porkey's-A Place for Ribs's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.11	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	182.39
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	55.14
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	55.14
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	5.64	% Impervious Surface, 1995	23.3
		% Commercial/Industrial Land Use, 1995	17.38
		Sq. Mi. of Urban Land Use, 1995	0.04
		Density of SWL, USTs, and KCSL	26.3
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	26.3
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	398	Population Density, Tier 1	720.56
% Soil Clay	7.57	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	46.02	% Urban Land Use, 1970	35.26
Conceptual % Soil Organic Matter	5.64	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	70.87
		Length of railroads	883.06
		Population Density	566.48
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	86.7
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	398	% Developed Land, Tier 1, 1995	86.7
Conceptual Soil Hydraulic Conductivity	46.02	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.57	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	217.25
Depth to Top of Open Interval	398		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	5.64	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.02
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Stafford Building

1904335

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
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- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

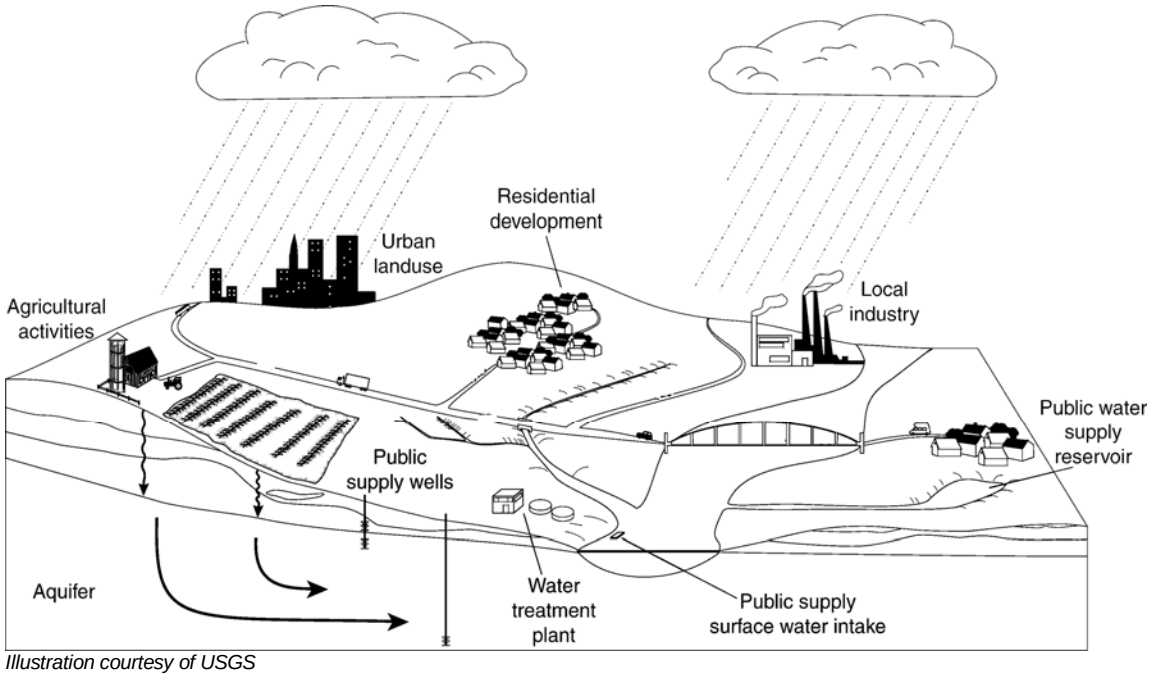

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Stafford Building

Stafford Building (PWID 1904335) at 276 Route 206 North, Andover, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Stafford Building consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Stafford Building's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**M**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.04	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	159
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	34.63
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	34.63
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.2	% Impervious Surface, 1995	22.1
		% Commercial/Industrial Land Use, 1995	21.52
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	458.2
% Soil Clay	4.45	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	28.75	% Urban Land Use, 1970	15.78
Conceptual % Soil Organic Matter	0.2	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	32.21
		Length of railroads	1467.39
		Population Density	421.57
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	35.6
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	35.6
Conceptual Soil Hydraulic Conductivity	28.75	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.45	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	544.68
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.2	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Falconers Lackawanna Inn

1904340

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

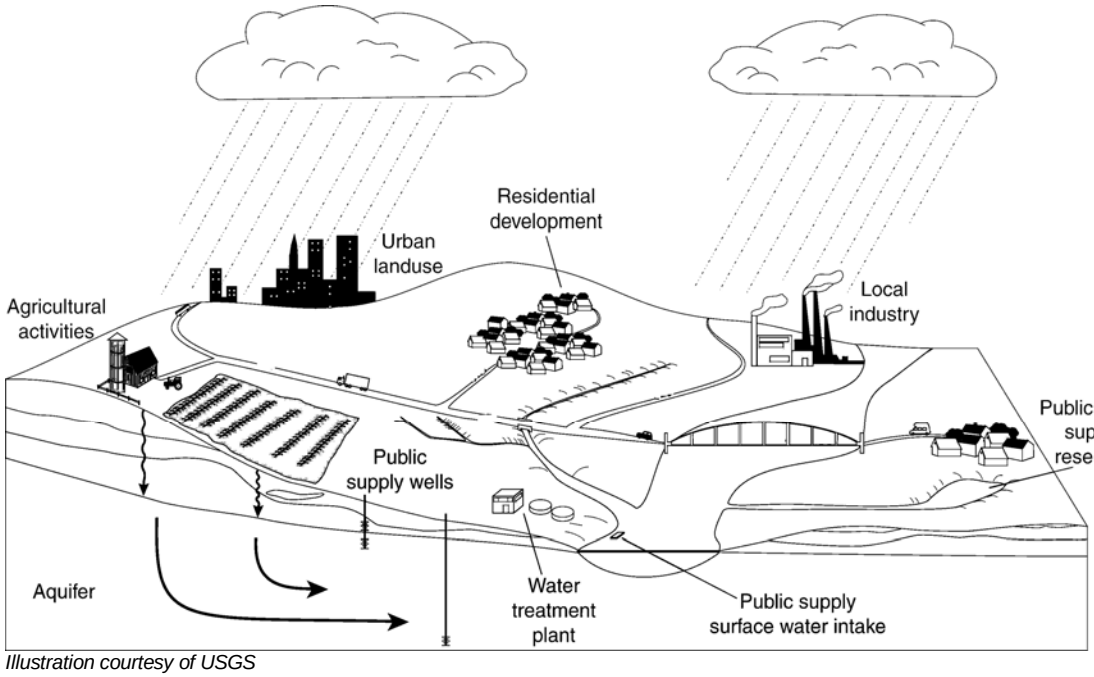

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Falconers Lackawanna Inn

Falconers Lackawanna Inn (PWID 1904340) at 172 Lackawanna Drive, Stanhope, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Falconers Lackawanna Inn consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Falconers Lackawanna Inn's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.02	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	197.54
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	31.4
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	31.4
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.14	% Impervious Surface, 1995	8.8
		% Commercial/Industrial Land Use, 1995	3.2
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	511.58
% Soil Clay	5.62	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	12.91	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.14	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	11.98
		Length of railroads	0
		Population Density	580.55
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	63.74
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	63.8
Conceptual Soil Hydraulic Conductivity	12.91	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	5.62	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.14	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Waterloo Village Foundation

1904342

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

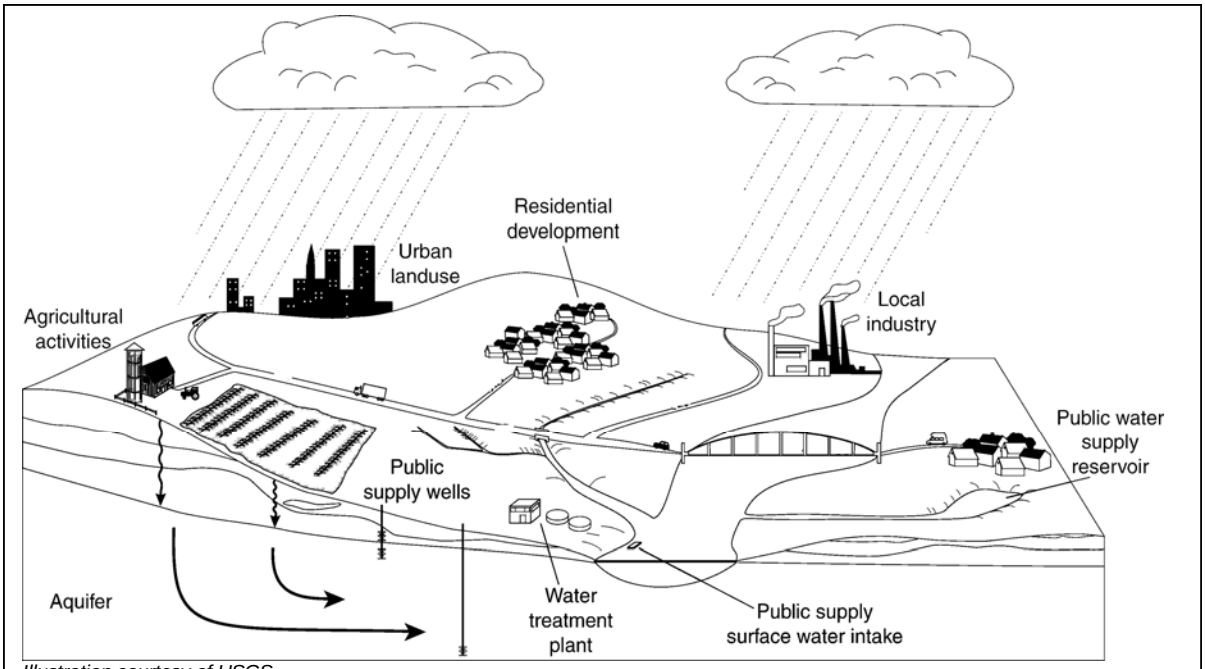

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Waterloo Village Foundation

Waterloo Village Foundation (PWID 1904342) at 525 Waterloo Village Road, Stanhope, NJ, is a public noncommunity water system that serves approximately 500 people (in 2003). Waterloo Village Foundation consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Waterloo Village Foundation's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well 1	**L**	**M**	**M**	**L**	**M**	**H**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 1 **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.05	Distance to Agricultural Land Use, 1995	262.56
Depth to Top of Open Interval		Conceptual Septic Tank Density	89.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	53.29
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	5.12
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	53.29
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	5.12
		Distance to Agricultural Land Use, 1995	262.56
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.24	% Impervious Surface, 1995	9.8
		% Commercial/Industrial Land Use, 1995	26.65
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	262.56
Depth to Top of Open Interval	110	Population Density, Tier 1	162.91
% Soil Clay	3.76	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	84.5	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.24	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	249.06
		Length of railroads	0
		Population Density	162.91
Radionuclides Explanatory Variables – Source Rating = H			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	51.25
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	262.56
Conceptual Depth of Well	110	% Developed Land, Tier 1, 1995	51.5
Conceptual Soil Hydraulic Conductivity	84.5	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	3.76	% Agricultural Land Use, 1995	4.39
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	298.33
Depth to Top of Open Interval	110		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.24	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Lakeland Emergency Squad

1904348

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

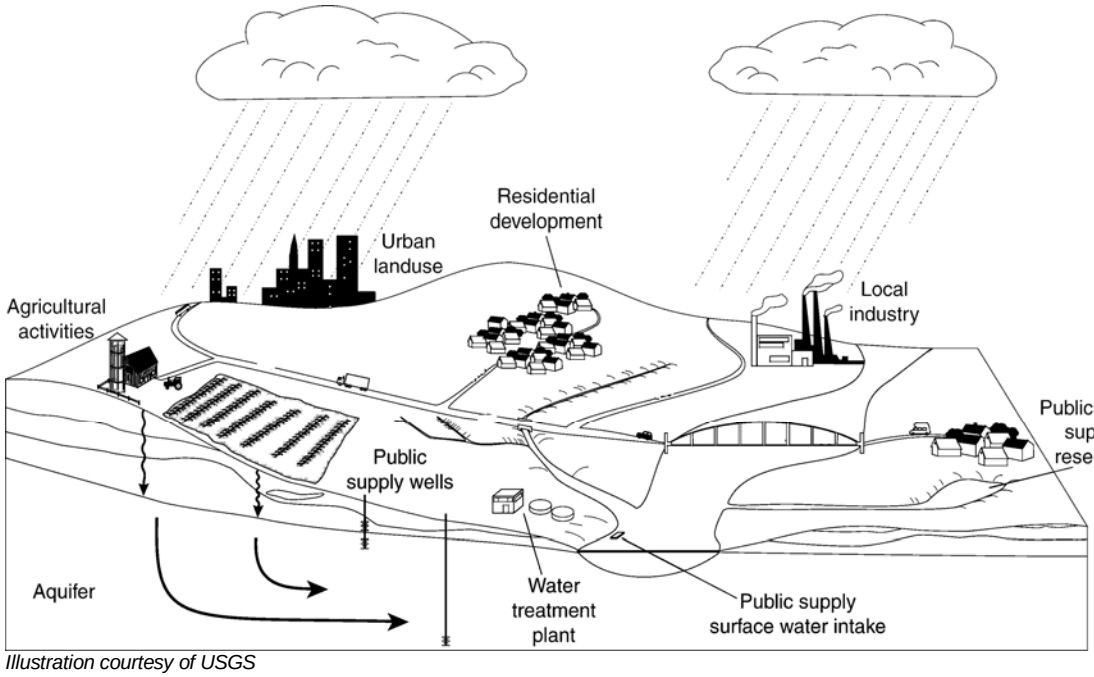

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

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Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Lakeland Emergency Squad

Lakeland Emergency Squad (PWID 1904348) at 221 Route 206, Andover, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Lakeland Emergency Squad consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Lakeland Emergency Squad's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.12	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	201.76
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	52.35
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	52.35
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	9.37	% Impervious Surface, 1995	20.9
		% Commercial/Industrial Land Use, 1995	13.29
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	175	Population Density, Tier 1	741.72
% Soil Clay	7.47	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	33.7	% Urban Land Use, 1970	28.6
Conceptual % Soil Organic Matter	9.37	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	58.17
		Length of railroads	0
		Population Density	639.6
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	72.6
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	175	% Developed Land, Tier 1, 1995	72.6
Conceptual Soil Hydraulic Conductivity	33.7	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.47	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	377.27
Depth to Top of Open Interval	175		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	9.37	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Bagel & Bake

1904350

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

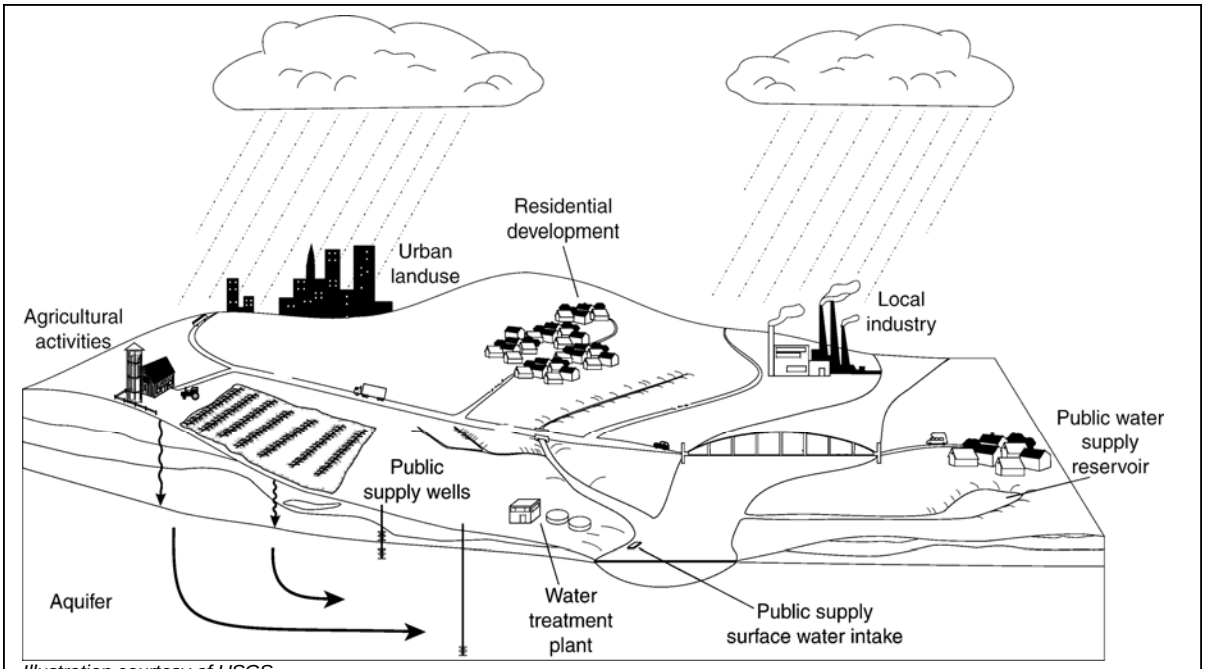

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Bagel & Bake

Bagel & Bake (PWID 1904350) at 13 Route 206, Stanhope, NJ, is a public noncommunity water system that serves approximately 300 people (in 2003). Bagel & Bake consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Bagel & Bake's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	263.74
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	82.68
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	82.68
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.71	% Impervious Surface, 1995	39.9
		% Commercial/Industrial Land Use, 1995	42.34
		Sq. Mi. of Urban Land Use, 1995	0.06
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	175	Population Density, Tier 1	865.81
% Soil Clay	7.01	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	19.41	% Urban Land Use, 1970	100
Conceptual % Soil Organic Matter	0.71	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	45.14
		Length of railroads	0
		Population Density	930.64
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	97.3
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	175	% Developed Land, Tier 1, 1995	97.4
Conceptual Soil Hydraulic Conductivity	19.41	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.01	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	512.4
Depth to Top of Open Interval	175		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.71	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

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Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

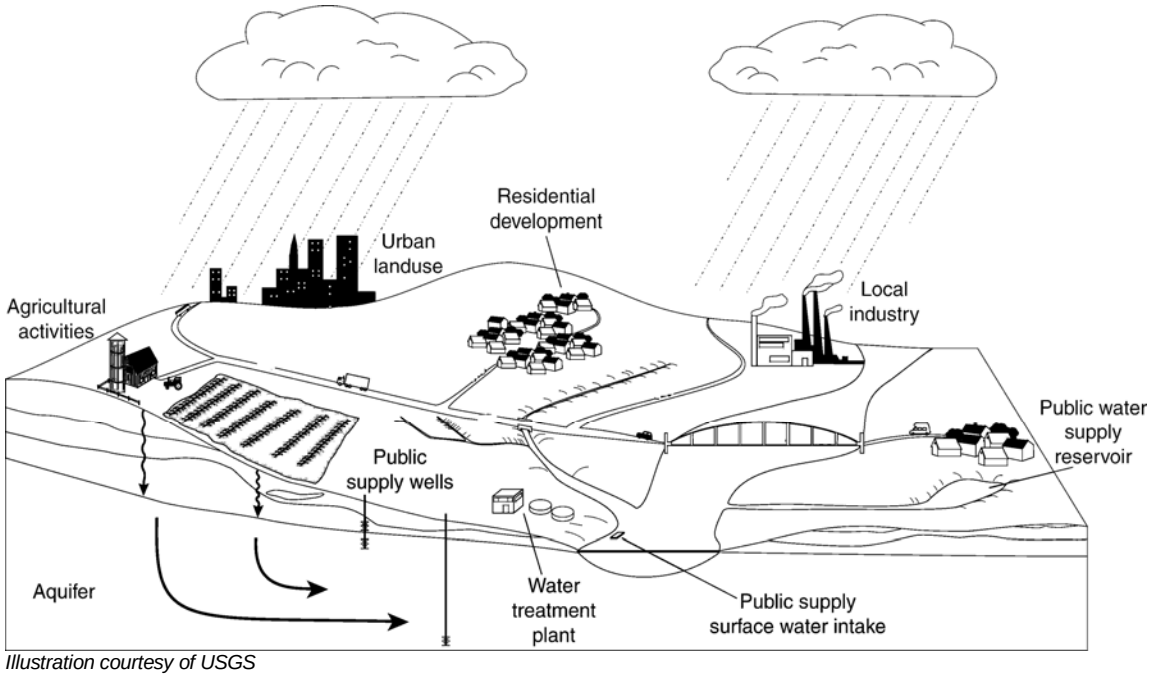

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Mt Allamuchy Camp Wheeler

Mt Allamuchy Camp Wheeler (PWID 1904351) at 750 Waterloo Road, Stanhope, NJ, is a public noncommunity water system that serves approximately 37 people (in 2003). Mt Allamuchy Camp Wheeler consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Mt Allamuchy Camp Wheeler's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Pool Well	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Pool Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	89.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	0
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	0
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	1.88	% Impervious Surface, 1995	0
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	162.91
% Soil Clay	7.67	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	18.48	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	1.88	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	
		Length of railroads	0
		Population Density	162.91
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	0
Conceptual Soil Hydraulic Conductivity	18.48	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.67	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	453.06
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	1.88	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Acorn Plaza Super X

1904352

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

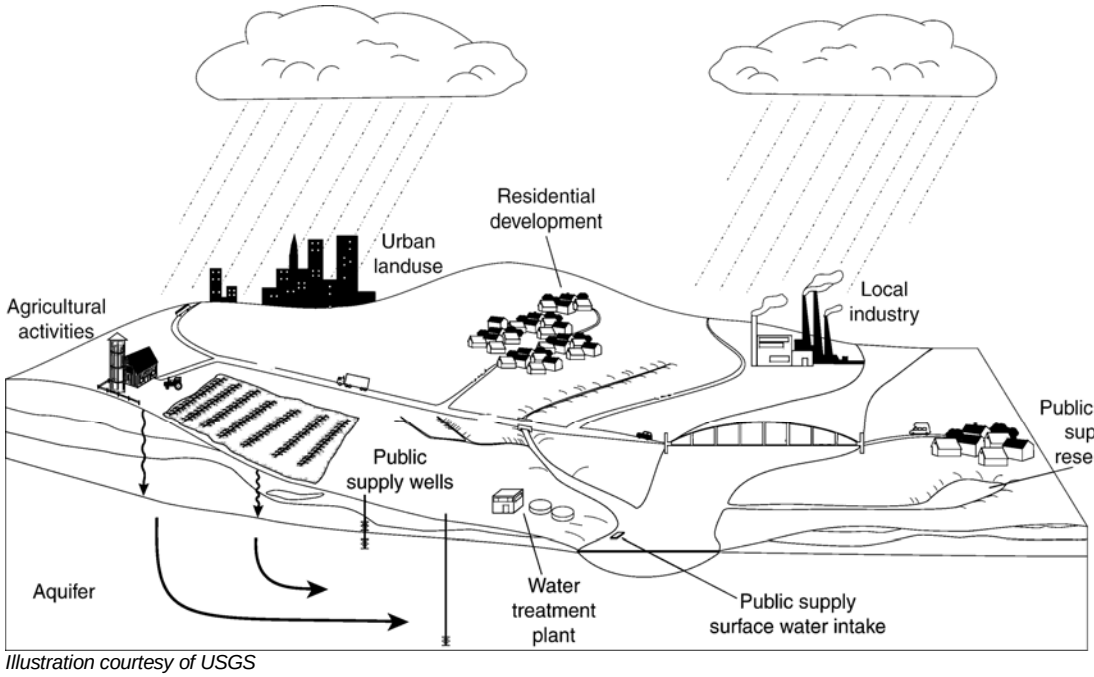

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Acorn Plaza Super X

Acorn Plaza Super X (PWID 1904352) at Rt. 206 North, Acorn Street, Stanhope, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Acorn Plaza Super X consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Acorn Plaza Super X's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	175.78
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.6
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.32	% Impervious Surface, 1995	25.2
		% Commercial/Industrial Land Use, 1995	29.8
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	500	Population Density, Tier 1	1189.33
% Soil Clay	6.19	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	9.76	% Urban Land Use, 1970	94.2
Conceptual % Soil Organic Matter	0.32	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	7.27
		Length of railroads	0
		Population Density	1244.55
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	71.73
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	500	% Developed Land, Tier 1, 1995	71.8
Conceptual Soil Hydraulic Conductivity	9.76	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.19	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	97.91
Depth to Top of Open Interval	500		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.32	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Lynnes Nissan West Inc.

1904353

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
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- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

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DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

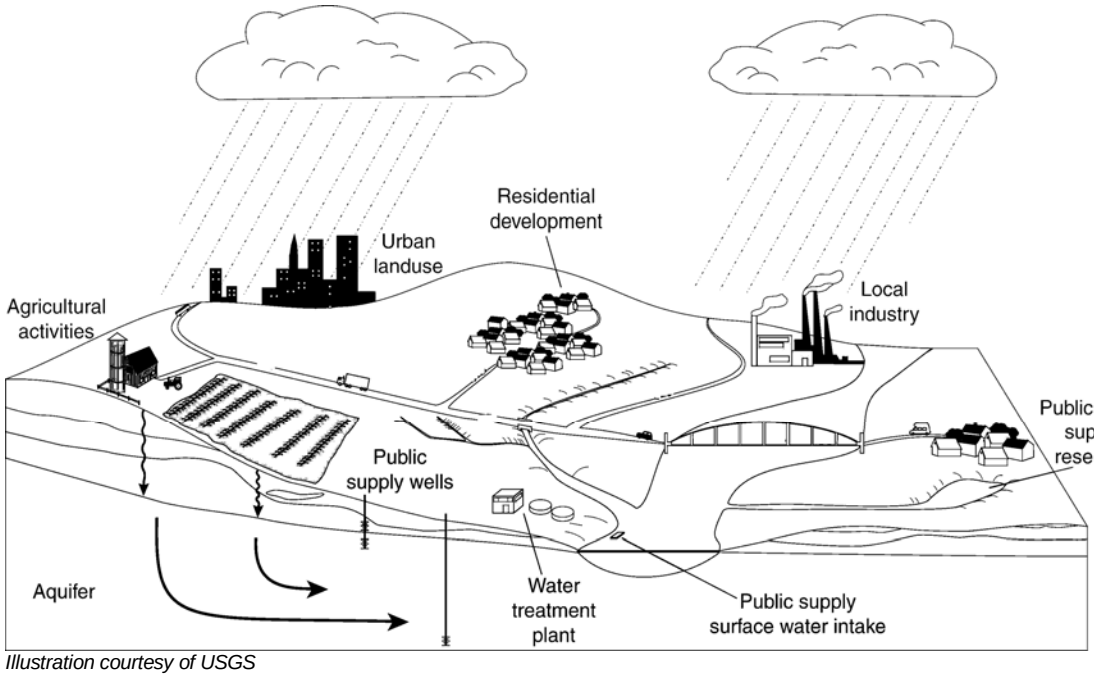

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

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- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Lynnes Nissan West Inc.

Lynnes Nissan West Inc. (PWID 1904353) at 59 Rte 206, Stanhope, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Lynnes Nissan West Inc. consists of 2 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Lynnes Nissan West Inc.'s Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**H**	**L**	**M**	**M**	**M**
Well	**L**	**M**	**M**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.08	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	282.28
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.05
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	50.05
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.58	% Impervious Surface, 1995	24.7
		% Commercial/Industrial Land Use, 1995	39.94
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	21.8
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	21.8
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	330	Population Density, Tier 1	866.51
% Soil Clay	9.29	% Barren Land Use, 1995	7.11
Soil Hydraulic Conductivity	22.14	% Urban Land Use, 1970	27.9
Conceptual % Soil Organic Matter	0.58	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	64.72
		Length of railroads	0
		Population Density	865.84
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	91.3
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	330	% Developed Land, Tier 1, 1995	91.3
Conceptual Soil Hydraulic Conductivity	22.14	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	9.29	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	440.85
Depth to Top of Open Interval	330		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.58	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	267.73
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	83.18
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	83.18
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.76	% Impervious Surface, 1995	41
		% Commercial/Industrial Land Use, 1995	44.24
		Sq. Mi. of Urban Land Use, 1995	0.05
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	865.86
% Soil Clay	7.13	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	18.98	% Urban Land Use, 1970	100
Conceptual % Soil Organic Matter	0.76	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	48.04
		Length of railroads	0
		Population Density	917.3
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	99
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	99
Conceptual Soil Hydraulic Conductivity	18.98	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.13	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	508.54
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.76	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Byram Townsquare Center

1904354

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

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The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

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What factors may affect the quality of your drinking water source?

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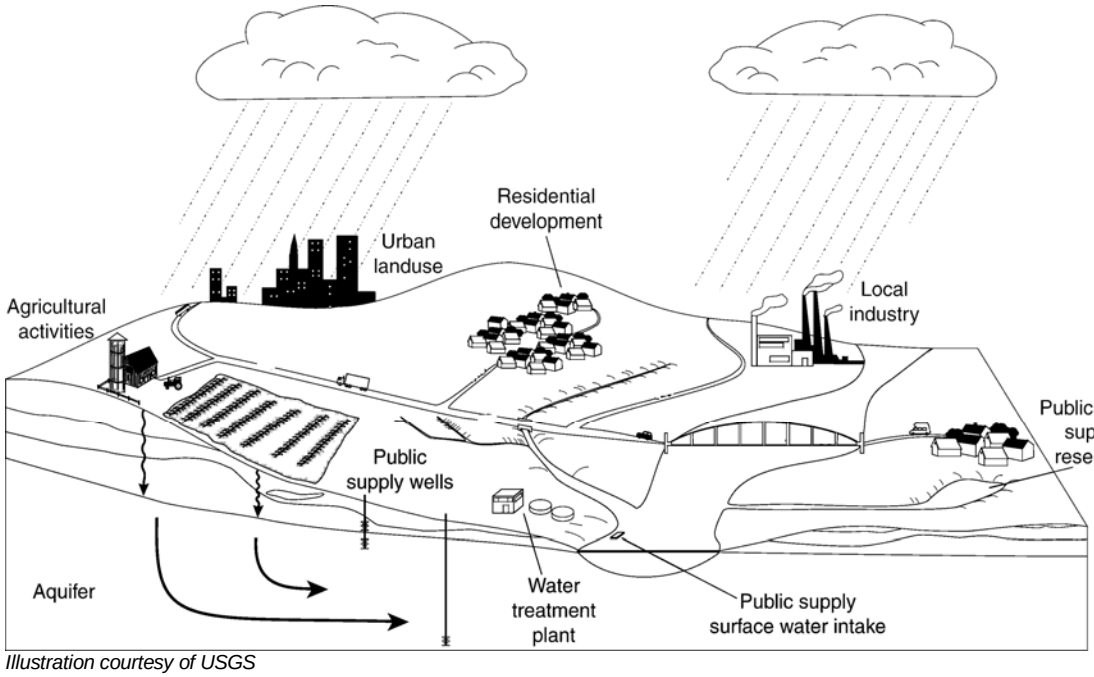

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

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- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Byram Townsquare Center

Byram Townsquare Center (PWID 1904354) at 12 Rte 206, Stanhope, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Byram Townsquare Center consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

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	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
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Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Byram Townsquare Center's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	215.93
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	68.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	68.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.59	% Impervious Surface, 1995	31.4
		% Commercial/Industrial Land Use, 1995	31.3
		Sq. Mi. of Urban Land Use, 1995	0.07
		Density of SWL, USTs, and KCSL	9.9
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	9.9
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	150	Population Density, Tier 1	888.63
% Soil Clay	6.5	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	15.52	% Urban Land Use, 1970	97.7
Conceptual % Soil Organic Matter	0.59	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	116.04
		Length of railroads	0
		Population Density	1098.16
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	85.3
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	150	% Developed Land, Tier 1, 1995	85.3
Conceptual Soil Hydraulic Conductivity	15.52	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.5	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	356.25
Depth to Top of Open Interval	150		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.59	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Columbia Valley Campground Pool

1904355

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

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DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

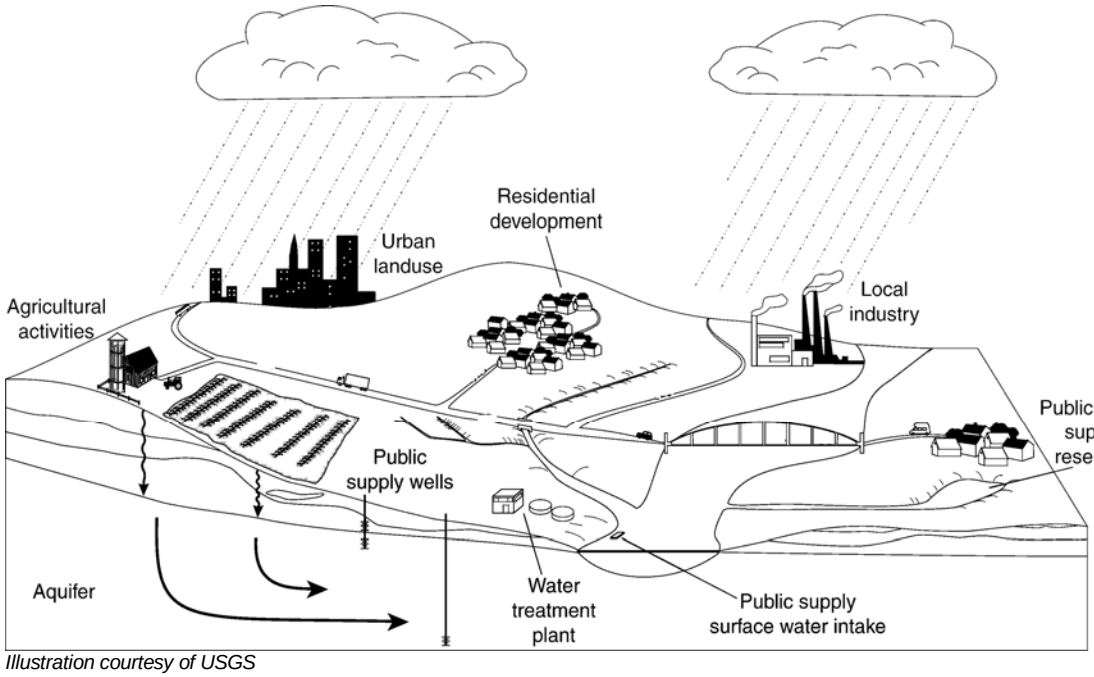

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Columbia Valley Campground Pool

Columbia Valley Campground Pool (PWID 1904355) at 289 Lackawanna Dr, Andover, NJ, is a public noncommunity water system that serves approximately 180 people (in 2003). Columbia Valley Campground Pool consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Columbia Valley Campground Pool's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**L**	**L**	**L**	**M**	**H**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

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This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

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For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.08	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	45.3
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	54.95
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	54.95
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.28	% Impervious Surface, 1995	8.3
		% Commercial/Industrial Land Use, 1995	4.6
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	150	Population Density, Tier 1	102.82
% Soil Clay	4.23	% Barren Land Use, 1995	7.99
Soil Hydraulic Conductivity	47.36	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.28	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	231.45
		Length of railroads	0
		Population Density	115.88
Radionuclides Explanatory Variables – Source Rating = H			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	93.4
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	150	% Developed Land, Tier 1, 1995	93.4
Conceptual Soil Hydraulic Conductivity	47.36	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.23	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	345.47
Depth to Top of Open Interval	150		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.28	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.01
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Lake Lackawanna Golf Course

1904356

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

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The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

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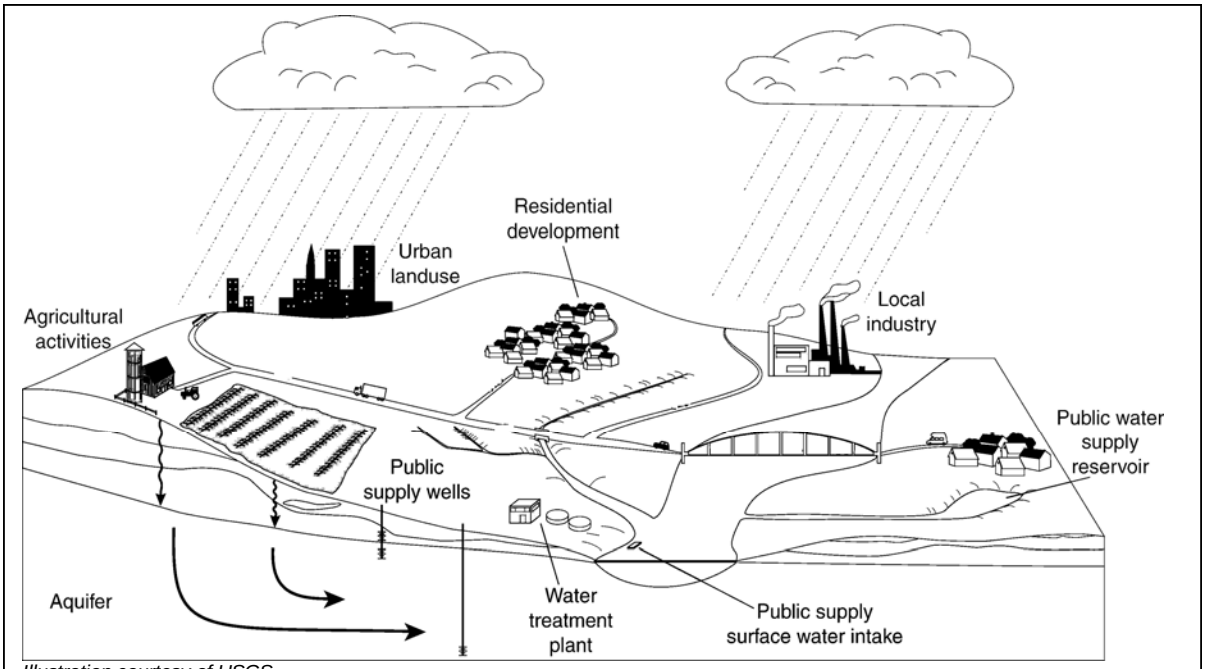

Illustration courtesy of USGS

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While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Lake Lackawanna Golf Course

Lake Lackawanna Golf Course (PWID 1904356) at 14 Reis Ave, Stanhope, NJ, is a public noncommunity water system that serves approximately 180 people (in 2003). Lake Lackawanna Golf Course consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Lake Lackawanna Golf Course's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	296.81
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	137.98
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.33	% Impervious Surface, 1995	5.5
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	863.25
% Soil Clay	6.11	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	48	% Urban Land Use, 1970	45.3
Conceptual % Soil Organic Matter	0.33	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	185.15
		Length of railroads	0
		Population Density	863.25
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	51.2
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	51.2
Conceptual Soil Hydraulic Conductivity	48	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	6.11	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	63.7
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.33	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Gordon Byram Association LLC

1904357

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

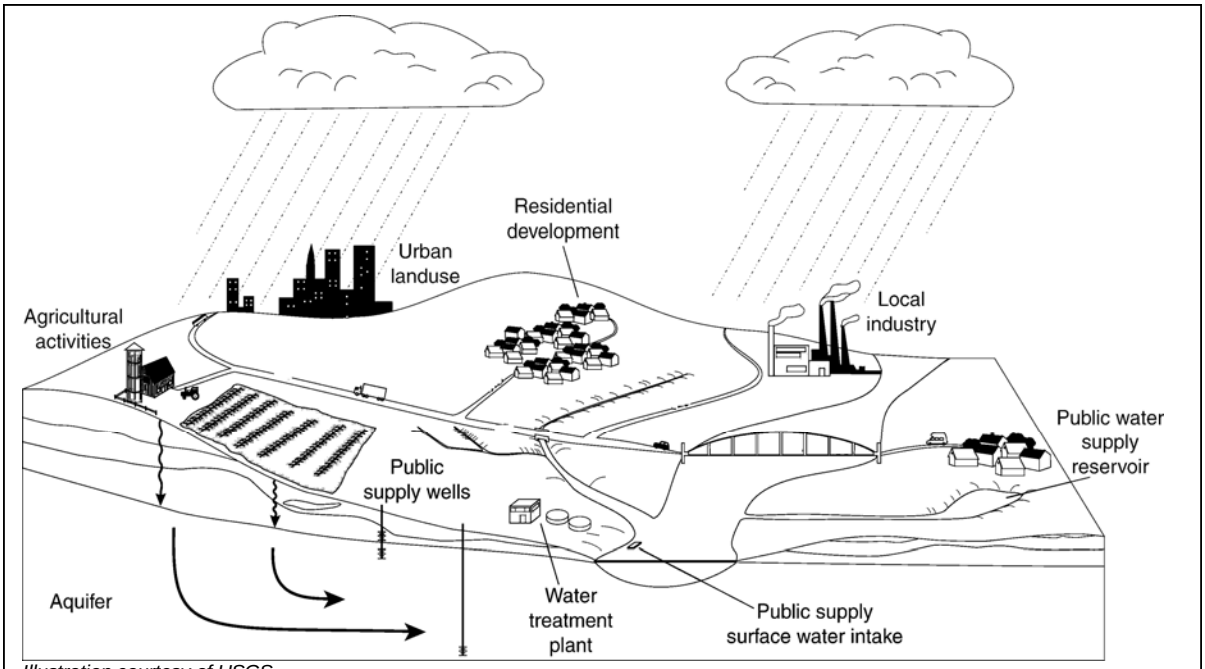

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Gordon Byram Association LLC

Gordon Byram Association LLC (PWID 1904357) at 90 Rt. 206, Linden, NJ, is a public noncommunity water system that serves approximately 100 people (in 2003). Gordon Byram Association LLC consists of 2 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Gordon Byram Association LLC's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
old well	**M**	**L**	**L**	**L**	**M**	**L**	**M**	**M**
new well	**M**	**L**	**L**	**L**	**M**	**L**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: old well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = M			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	121.5
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	991.67
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	8.57
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	8.57
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.99	% Impervious Surface, 1995	4.4
		% Commercial/Industrial Land Use, 1995	7.18
		Sq. Mi. of Urban Land Use, 1995	0.01
		Density of SWL, USTs, and KCSL	13.2
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	13.2
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	500	Population Density, Tier 1	247.34
% Soil Clay	7.98	% Barren Land Use, 1995	40.48
Soil Hydraulic Conductivity	12.63	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.99	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	167.11
		Length of railroads	0
		Population Density	376.69
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	500	% Developed Land, Tier 1, 1995	0
Conceptual Soil Hydraulic Conductivity	12.63	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.98	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	734.86
Depth to Top of Open Interval	500		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.99	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: new well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = M			
Conceptual-Soil Available Water Capacity	0.06	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	117.74
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	1076.71
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	7.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	7.7
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	1.45	% Impervious Surface, 1995	3.9
		% Commercial/Industrial Land Use, 1995	6.5
		Sq. Mi. of Urban Land Use, 1995	0.01
		Density of SWL, USTs, and KCSL	12.7
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	12.7
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	500	Population Density, Tier 1	247.34
% Soil Clay	7.75	% Barren Land Use, 1995	39.1
Soil Hydraulic Conductivity	12.95	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	1.45	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	103.52
		Length of railroads	0
		Population Density	364.28
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	500	% Developed Land, Tier 1, 1995	0
Conceptual Soil Hydraulic Conductivity	12.95	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	7.75	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	796.12
Depth to Top of Open Interval	500		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	1.45	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Columbia Valley Campground-Bambi

1904358

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

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- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

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- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

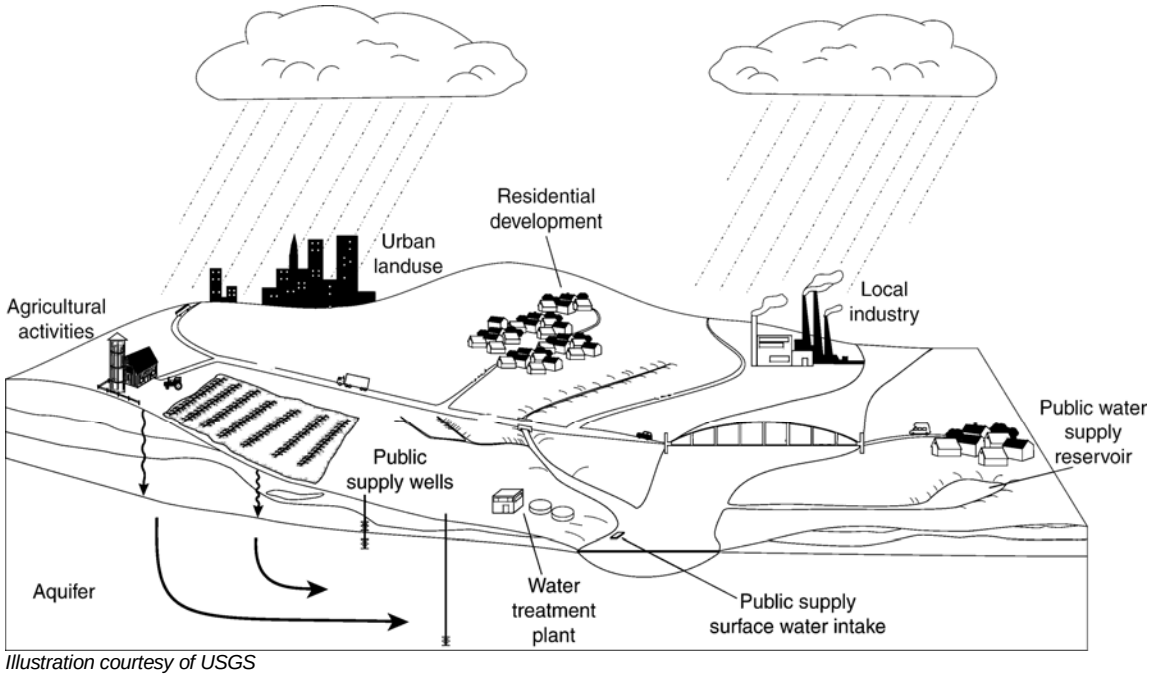

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Columbia Valley Campground-Bambi

Columbia Valley Campground-Bambi (PWID 1904358) at 289 Lackawanna Dr, Byram, NJ, is a public noncommunity water system that serves approximately 100 people (in 2003). Columbia Valley Campground-Bambi consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Columbia Valley Campground-Bambi's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
	M	**M**	**M**	**L**	**L**	**H**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Status: P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = M			
Conceptual-Soil Available Water Capacity	0.08	Distance to Agricultural Land Use, 1995	458.9
Depth to Top of Open Interval		Conceptual Septic Tank Density	67.06
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	580.1
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	45.25
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	5.11
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	45.25
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	5.11
		Distance to Agricultural Land Use, 1995	458.9
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.15	% Impervious Surface, 1995	5.4
		% Commercial/Industrial Land Use, 1995	4.5
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	458.9
Depth to Top of Open Interval	250	Population Density, Tier 1	125.74
% Soil Clay	4.36	% Barren Land Use, 1995	0.7
Soil Hydraulic Conductivity	33.8	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.15	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	
		Length of railroads	0
		Population Density	130.72
Radionuclides Explanatory Variables – Source Rating = H			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	60.2
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	458.9
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	60.2
Conceptual Soil Hydraulic Conductivity	33.8	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	4.36	% Agricultural Land Use, 1995	5.11
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	454.3
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.15	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.01
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Frogmore Country Store

1904359

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

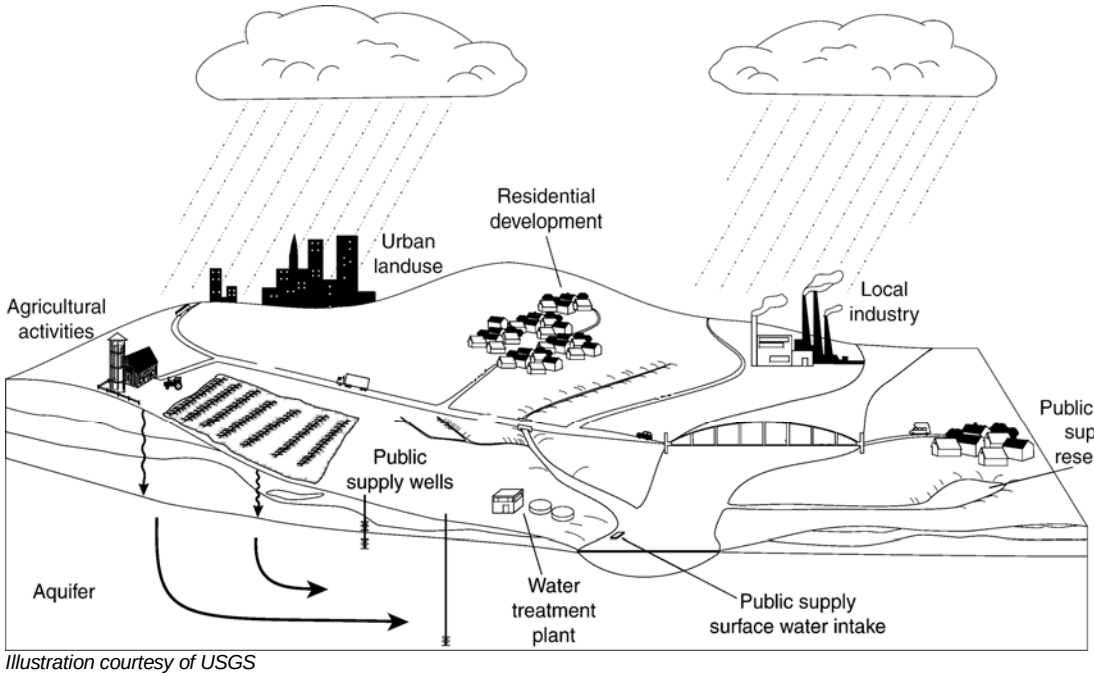

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Frogmore Country Store

Frogmore Country Store (PWID 1904359) at 238 US 206, Andover, NJ, is a public noncommunity water system that serves approximately 30 people (in 2003). Frogmore Country Store consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Frogmore Country Store's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
	L	**L**	**L**	**H**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Status: P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.09	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	184.85
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	81.9
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	81.9
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = H			
% Soil Organic Matter	0.76	% Impervious Surface, 1995	39.1
		% Commercial/Industrial Land Use, 1995	39.9
		Sq. Mi. of Urban Land Use, 1995	0.02
		Density of SWL, USTs, and KCSL	82.8
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	82.8
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	500	Population Density, Tier 1	630.07
% Soil Clay	8.95	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	40.44	% Urban Land Use, 1970	40.1
Conceptual % Soil Organic Matter	0.76	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	39
		Length of railroads	0
		Population Density	584.3
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	100
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	500	% Developed Land, Tier 1, 1995	100.1
Conceptual Soil Hydraulic Conductivity	40.44	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	8.95	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	252.29
Depth to Top of Open Interval	500		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.76	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Waterloo Village Foundation

1904451

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

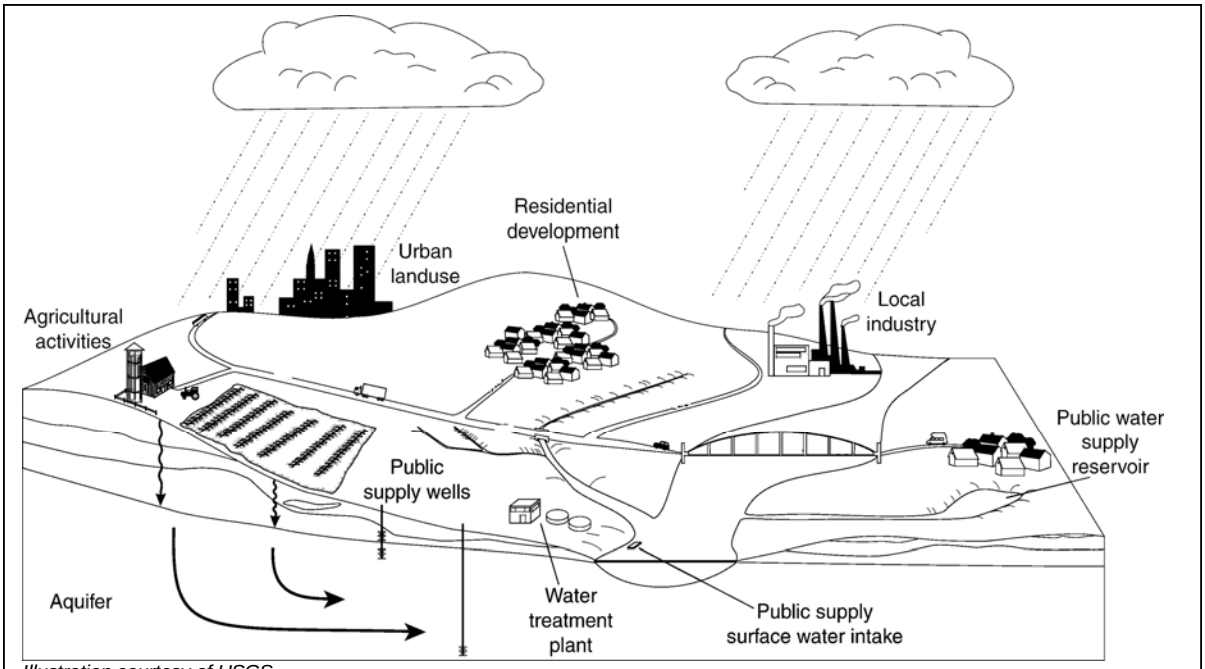

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Waterloo Village Foundation

Waterloo Village Foundation (PWID 1904451) at 525 Waterloo Road, Stanhope, NJ, is a public noncommunity water system that serves approximately 25 people (in 2003). Waterloo Village Foundation consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Waterloo Village Foundation's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**L**	**M**	**M**	**L**	**M**	**H**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.04	Distance to Agricultural Land Use, 1995	482.63
Depth to Top of Open Interval		Conceptual Septic Tank Density	85.91
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.95
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	3.72
Pesticides Explanatory Variables – Source Rating = M			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	51.95
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	3.72
		Distance to Agricultural Land Use, 1995	482.63
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.2	% Impervious Surface, 1995	9.8
		% Commercial/Industrial Land Use, 1995	25.17
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	482.63
Depth to Top of Open Interval	110	Population Density, Tier 1	162.91
% Soil Clay	3.91	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	76.11	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.2	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	296.55
		Length of railroads	0
		Population Density	166.67
Radionuclides Explanatory Variables – Source Rating = H			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	82.32
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	482.63
Conceptual Depth of Well	110	% Developed Land, Tier 1, 1995	82.4
Conceptual Soil Hydraulic Conductivity	76.11	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	3.91	% Agricultural Land Use, 1995	3.2
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	497.13
Depth to Top of Open Interval	110		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.2	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Mt Allamuchy Camp Someers

1904452

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

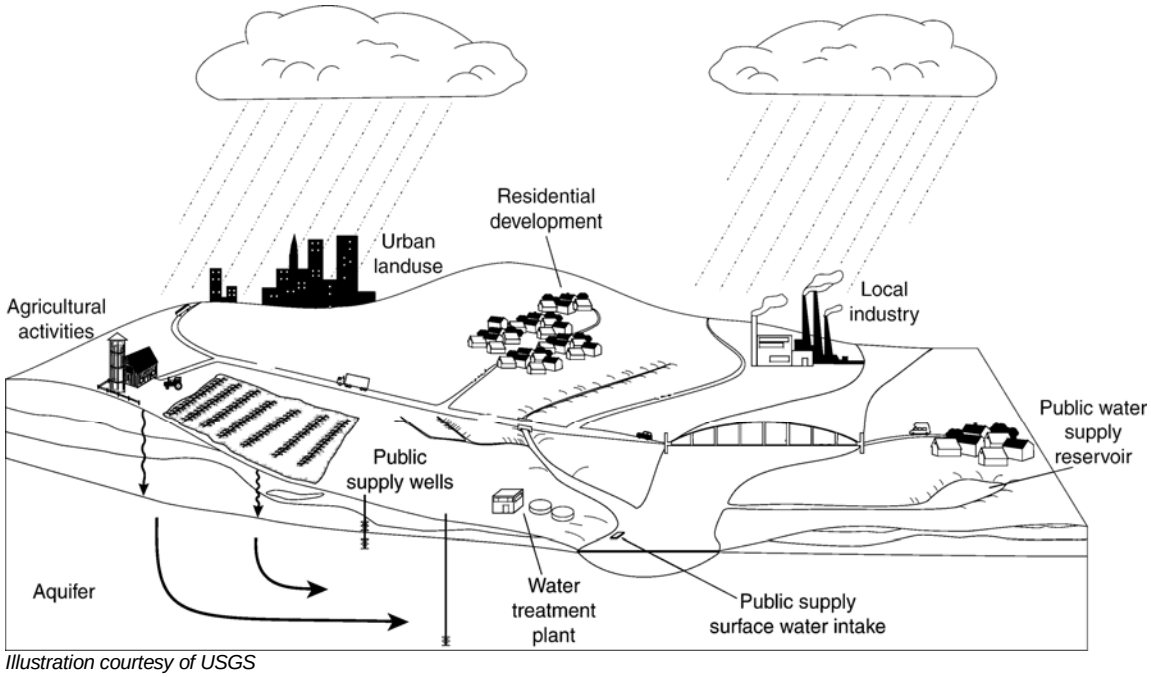

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

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What can you and others do to help?

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Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Mt Allamuchy Camp Someers

Mt Allamuchy Camp Someers (PWID 1904452) at 750 Waterloo Road, Stanhope, NJ, is a public noncommunity water system that serves approximately 50 people (in 2003). Mt Allamuchy Camp Someers consists of 2 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Mt Allamuchy Camp Someers's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well 1 ?	**M**	**L**	**L**	**L**	**L**	**L**	**M**	**M**
Well 2 ?	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 1 ? **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = M			
Conceptual-Soil Available Water Capacity	0.07	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	67.78
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	805.05
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	8.09
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	8.09
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	1.33	% Impervious Surface, 1995	3.8
		% Commercial/Industrial Land Use, 1995	3.5
		Sq. Mi. of Urban Land Use, 1995	0.03
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	250	Population Density, Tier 1	156.07
% Soil Clay	9.39	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	10.74	% Urban Land Use, 1970	20.18
Conceptual % Soil Organic Matter	1.33	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	1281.7
		Length of railroads	0
		Population Density	127.56
Radionuclides Explanatory Variables – Source Rating = L			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	5.8
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	250	% Developed Land, Tier 1, 1995	5.8
Conceptual Soil Hydraulic Conductivity	10.74	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	9.39	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	507.51
Depth to Top of Open Interval	250		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	1.33	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.02
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well 2 ? **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = L			
Conceptual-Soil Available Water Capacity	0.05	Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval		Conceptual Septic Tank Density	89.61
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	0
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	30.07
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	30.07
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	0
		Distance to Agricultural Land Use, 1995	
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.68	% Impervious Surface, 1995	4
		% Commercial/Industrial Land Use, 1995	0
		Sq. Mi. of Urban Land Use, 1995	0.01
		Density of SWL, USTs, and KCSL	0
Inorganics Explanatory Variables – Source Rating = L			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	0
pH of water-quality sample		Distance to Agricultural Land Use, 1995	
Depth to Top of Open Interval	347	Population Density, Tier 1	162.91
% Soil Clay	8.69	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	10.21	% Urban Land Use, 1970	0
Conceptual % Soil Organic Matter	0.68	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	
		Length of railroads	0
		Population Density	162.91
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	53.7
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	
Conceptual Depth of Well	347	% Developed Land, Tier 1, 1995	53.7
Conceptual Soil Hydraulic Conductivity	10.21	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	8.69	% Agricultural Land Use, 1995	0
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	379.47
Depth to Top of Open Interval	347		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.68	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			

Cranberry Market & Deli

1904454

Source Water Assessment Report

A State Assessment of Your Drinking Water Source's Vulnerability

As a requirement of the 1996 Amendments to the Federal Safe Drinking Water Act, New Jersey Department of Environmental Protection (DEP) performed a source water assessment of each source of public drinking water and determined each source's susceptibility to contamination. Susceptibility is a measure of the potential exposure of a drinking water source to contamination; actual (if any) contamination is not measured.

DEP, in conjunction with the United States Geological Survey (USGS), performed the following steps to determine the drinking water source's susceptibility.

- Identifying the area (known as the source water assessment area) that supplies water to your public drinking water system;
- Inventorying any significant potential sources of contamination in the area; and
- Analyzing how susceptible the drinking water source is to the potential sources of contamination.

DEP evaluated the susceptibility of all public water system sources to eight categories of contaminants.

- **Pathogens:** Disease-causing organisms such as bacteria and viruses. Common sources are animal and human fecal wastes.
- **Nutrients:** Compounds, minerals and elements that aid growth, that are both naturally occurring and man-made. Examples include nitrogen and phosphorus.
- **Volatile Organic Compounds:** Man-made chemicals used as solvents, degreasers, and gasoline components. Examples include benzene, methyl tertiary butyl ether (MTBE), and vinyl chloride.
- **Pesticides**: Man-made chemicals used to control pests, weeds and fungus. Common sources include land application and manufacturing centers of pesticides. Examples include herbicides such as atrazine, and insecticides such as chlordane.
- **Inorganics:** Mineral-based compounds that are both naturally occurring and man-made. Examples include arsenic, asbestos, copper, lead, and nitrate.
- **Radionuclides:** Radioactive substances that are both naturally occurring and man-made. Examples include radium and uranium.
- **Radon:** Colorless, odorless, cancer-causing gas that occurs naturally in the environment. For more information go to http://www.nj.gov/dep/rpp/radon/index.htm or call (800) 648-0394.
- **Disinfection Byproduct Precursors**: A common source is naturally occurring organic matter in surface water. Disinfection byproducts are formed when the disinfectants (usually chlorine) used to kill pathogens react with dissolved organic material (for example leaves) present in surface water.

To determine a source's susceptibility to these contaminants, the USGS, with DEP assistance, developed statistical models based on extensive analysis of existing well sample data and surface water intake data. The statistical models determined the relationship between environmental factors and the probability for contamination to occur. These models identified factors, such as land use or geology, found to be significantly "linked" to a public water system source's potential to become contaminated by one or more categories of contaminants. DEP and USGS looked at factors that might affect the quality of drinking water sources and separated them into two categories.

- How “sensitive” the water supply is to contamination. For example, a shallow well or surface water source, like a reservoir, would be more exposed to contamination from the surface or above ground than a confined well.
- How frequently a contaminant is used or exists near the source. This is known as “intensity of use.” For example, the number and/or types of activities (such as industry or agriculture) surrounding the source.

The specific sensitivity and intensity of use factors and their values within each source water assessment area for your source(s) are provided on page 7 of this report.

Using the susceptibility factors, the statistical models provided a numerical score for each source of drinking water for each contaminant category. These were then converted into high (H), medium (M), or low (L) susceptibility ratings.

The Safe Drinking Water Standards or Maximum Contaminant Levels (MCLs) were used to define the three susceptibility ratings (H, M, and L). These standards are developed based health effects, analytical and treatment factors on either acute or long-term impacts related to drinking water exposure. A low susceptibility rating means a potential contaminant level was predicted to be less than 10 percent of the MCL for that contaminant category. A medium rating means the potential contaminant level was predicted to be equal to or greater than 10 percent and less than 50 percent of the MCL. A high rating was assigned to those sources that were predicted to have potential contaminant levels equal to or greater than 50 percent of the MCL. Sources with high susceptibility ratings are still likely to have contaminant concentrations below the MCL.

The susceptibility ratings of your sources to each of the contaminant categories are provided on page 6 of this report.

Source Water Assessment Program Goals

The information obtained from the source water assessments may be used to achieve the following goals:

1. Protect sources of drinking water.

Source water protection focuses on preserving and protecting the public drinking water source. The source water assessment results may be used by DEP, purveyors, and local planning officials to lay the groundwork for advancing drinking water protection efforts. State and local agencies, as well as the regulated community, have made significant strides to protect the quality of our water resources. Major water quality improvements have been made as a result of water quality and drinking water standards and programs (both regulatory and nonregulatory) designed to ensure standards are met. Waste management and clean up programs have had success in controlling releases and ensuring actions are taken to achieve standards if releases occur. Recent measures to control non-point sources have expanded the DEP’s water quality protection programs by recognizing the link between land use change and water resource impacts. The Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets drinking water standards. In addition to these programs, major initiatives such as the Highlands Water Protection and Planning Act, Surface Water Quality Standards and Category One Designation, and Stormwater Management Rules have recently been accomplished. Despite this success, the DEP recognizes the ongoing importance of using new information such as that from the source water assessments to evaluate the need for additional protection measures of drinking water sources. The DEP is currently reviewing the source water assessments to identify any necessary additional source water protection measures.

2. Public education of SWAP information.
DEP incorporated public education throughout the development and implementation of the Source Water Assessment Program. During the source water assessment process, DEP met with interested parties, beginning with the development of the SWAP Plan, published articles, wrote two newsletters, and developed a SWAP web site. The SWAP web site contains information on the program, technical resources, frequently asked questions, source water assessment results, and links to additional sites of interest. Upon completion of the source water assessments, DEP generated a source water assessment report for each public water system to report the susceptibility ratings of public drinking water sources to potential contamination.

The goal of the public education efforts is to raise public awareness of the source of their drinking water and the potential contaminants that could impair the water's quality. To continue fulfilling the education goal, DEP will conduct training sessions following the release of the Source Water Assessment Reports.

3. Establish a customized monitoring schedule for each public water system.
The source water assessments will assist DEP in improving current monitoring requirements for individual public water systems. Currently, the Environmental Protection Agency (EPA) and the DEP have mandatory monitoring schedules that depend on a variety of factors that can include the source of the water (ground water or surface water) and the surrounding land use. These schedules may be customized based on the susceptibility of the sources of drinking water.

Where does drinking water come from?

There are two basic sources of drinking water: ground water and surface water.

Ground water is water found beneath the Earth's surface. Ground water comes from rain and snow seeping into rock and soil. Ground water is stored in underground areas called aquifers. Aquifers supply wells and springs. Wells in New Jersey range from about 15 feet to 2,000 feet deep.

Surface water is the water naturally open to the atmosphere, such as rivers, lakes, streams and reservoirs. Precipitation that does not infiltrate the ground or evaporate into the sky runs off into surface water bodies.

Ground water can seep into a stream, river or other surface water body, recharging surface water bodies. Likewise, under some circumstances, surface water can seep into an adjacent aquifer.

A water system obtains its water from 1) wells drilled into the ground that pump out ground water; 2) devices called surface water intakes placed on a river, stream, or reservoir; or 3) both.

What factors may affect the quality of your drinking water source?

A variety of conditions and activities may affect the quality of drinking water source. These include geology (rock and soil types); depth of a well or location of a surface water intake; how the land surrounding the source is used (for industry, agriculture or development); the use of pesticides and fertilizers; and the presence of contaminated sites, leaking underground storage tanks, and landfills. Please refer to pages 6 and 7 of this report for specific potential contaminant source information.

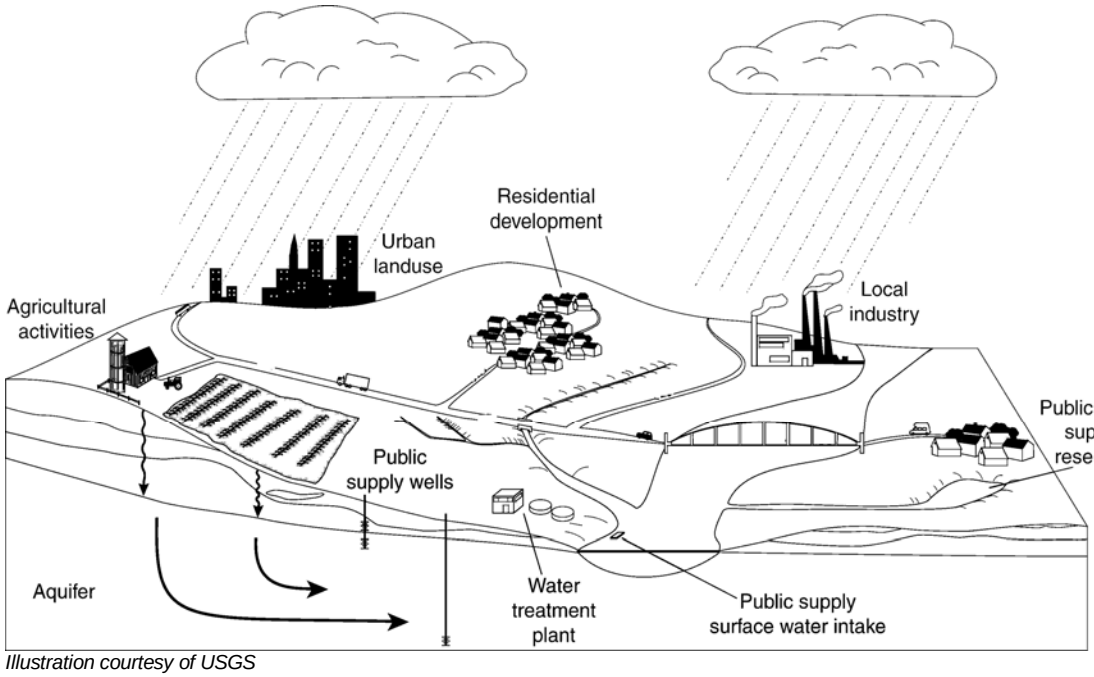

Illustration courtesy of USGS

What steps are being taken now to ensure my drinking water quality?

The DEP has numerous programs in place to maintain and protect the quality of our State's water resources. For example, the Safe Drinking Water Program is designed to ensure that water delivered for human consumption meets DEP's stringent health-based drinking water standards. Additionally, DEP has permitting, waste management, and clean up programs in place to avoid and control potential contamination. Key DEP drinking water protection initiatives will be phased-in over time in source water assessment areas to advance existing program protections.

What can you and others do to help?

While government at the state and local levels can do their part, there are actions you and your neighbors can take now to help protect our precious and shared natural resource.

Here's just a few ways you and others can help ensure clean and plentiful water for New Jersey – now and in the future. Join us today for a clean water future.

- Dispose of waste properly. Some materials such as motor oil, paint, flea collars, and household cleaners have the potential to contaminate source water. Contact your local Department of Public Works for proper household hazardous waste disposal.
- Limit your use of fertilizer, pesticides, and herbicides.

Here are some actions that municipal and county officials/local and county planners can take and you can help encourage and support.

- Manage and work with owners of existing potential contaminant sources to minimize potential contamination.
- Establish regulations prohibiting or restricting certain activities or land uses within the source water assessment area. Take appropriate enforcement action when necessary.
- Update municipal master plans to ensure greater protection.
- Purchase lands or create conservation easements within the source water assessment area.

Specific Source Water Assessment Information for Cranberry Market & Deli

Cranberry Market & Deli (PWID 1904454) at 274 US 206, Andover, NJ, is a public noncommunity water system that serves approximately 150 people (in 2003). Cranberry Market & Deli consists of 1 active well(s) and 0 surface water intake(s).

Susceptibility Ratings

Table 1 below illustrates the percentage of noncommunity water system sources in New Jersey that rated high, medium, and low for each of the eight contaminant categories. This table is separated by source type: ground water and surface water. Table 2 illustrates the susceptibility ratings for **each source in your system** to each of the contaminant categories.

For the purpose of the Source Water Assessment Program, radionuclides were considered more of a ground water concern than a surface water issue. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating. DEP considered all surface water highly susceptible to pathogens; therefore all intakes received a high rating for the pathogen category.

Table 1: Summary of Statewide Susceptibility Ratings for Noncommunity Water System Sources (Percent)

	Pathogens	Nutrients	Pesticides	VOCs	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
Ground Water 3480 Total Wells								
High	2	0	0	32	19	69	17	3
Medium	18	66	66	0	42	28	72	97
Low	80	34	34	68	39	3	11	0
Surface Water 3 Total Intakes								
High	100	33	0	0	100	0	0	100
Medium	0	67	67	33	0	0	0	0
Low	0	0	33	67	0	100	100	0

Statewide, 85 percent of the noncommunity water system sources (ground water and surface water) rated high for at least one of the contaminant categories.

For surface water, the three contaminant categories in which all of the noncommunity water system surface water intakes (three total) received a high susceptibility rating were inorganics, disinfection byproduct precursors, and pathogens (all assumed to be highly susceptible to pathogens).

For ground water, the three contaminant categories in which the highest percentage of sources received a high susceptibility rating are radionuclides (69%), volatile organic compounds (32%), and inorganics (19%).

Table 2: Susceptibility Ratings for Cranberry Market & Deli's Sources

Sources	Pathogens	Nutrients	Pesticides	Volatile Organic Compounds	Inorganics	Radionuclides	Radon	Disinfection Byproduct Precursors
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
Well	**M**	**L**	**L**	**L**	**M**	**M**	**M**	**M**

If a system is rated highly susceptible for a contaminant category, it does not mean a customer is or will be consuming contaminated drinking water. The rating reflects the potential for contamination of source water, not the existence of contamination. Public water systems are required to monitor for regulated contaminants and to install treatment if any contaminants are detected at frequencies and concentrations above allowable levels.

Which Sensitivity and Intensity Factors Determine a Source's Susceptibility?

The susceptibility models determined source water susceptibility is based on the well or intake's location and sensitivity and intensity factors (also known as explanatory variables). An explanatory variable can be used to predict the presence of or the potential presence of a contaminant in ground water or surface water.

Some explanatory variables are considered conceptual. A conceptual variable is one that has been shown in a previous scientific investigation to be related to, or is expected to have an effect on, the concentrations of a constituent. Conceptual variables that did not produce significant univariate statistical relations may however, produce a significant relation when used with other variables in multivariate statistical tests.

The following page contains an Individual Explanatory Variable Inventory, which provides the values of each explanatory variable within your source water assessment area. **This is not the entire potential contaminant source inventory for this system's source(s)**.

If the variable value is shown as zero, then attributes or land activities are not present in the source water assessment area. If a value is not shown, this represents either unavailable data, or in the case of "Distance to" variables land activities of that type are not present in the source water assessment area.

This information, used in conjunction with USGS's susceptibility rating scheme, calculates the susceptibility rating for each source to each contaminant category. If you are interested in USGS's rating schemes please refer to the "Contaminant Category Scoring System for Noncommunity Water Systems Appendix A – Attachment 2" available in the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County or on the Source Water Assessment Program website at http://www.state.nj.us/dep/swap/.

Following the Individual Explanatory Variable Inventory for your system is a source water assessment map illustrating the source water assessment areas for systems with in Byram Twp.

For more information please refer to the Noncommunity Source Water Assessment Report for Byram Twp, Sussex County, available on the Source Water Assessment Program website. You may also contact the Bureau of Safe Drinking Water at 609-292-5550.

Individual Explanatory Variable Groundwater Susceptibility Models			
Source: Well **Status:** P **Source Type:** G			
Sensitivity Variable Inventory		**Intensity Variable Inventory**	
Pathogens Explanatory Variables - Source Rating = M			
Conceptual-Soil Available Water Capacity	0.05	Distance to Agricultural Land Use, 1995	1506
Depth to Top of Open Interval		Conceptual Septic Tank Density	148.33
Conceptual - GWUDI		Conceptual – Presence of Streams, Tier 1	1224.32
Nutrients Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	32.2
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	2.12
Pesticides Explanatory Variables – Source Rating = L			
Conceptual – Depth to Top of Open Interval		% Urban Land Use, 1995	32.2
Conceptual – Length of Open Interval		% Agricultural Land Use, 1986	2.12
		Distance to Agricultural Land Use, 1995	1506
		Conceptual – Distance to golf course	
VOCs Explanatory Variables – Source Rating = L			
% Soil Organic Matter	0.39	% Impervious Surface, 1995	11.5
		% Commercial/Industrial Land Use, 1995	5.32
		Sq. Mi. of Urban Land Use, 1995	0.18
		Density of SWL, USTs, and KCSL	5.3
Inorganics Explanatory Variables – Source Rating = M			
Dissolved Oxygen of water-quality sample		Density of KCSL, SWL, NJPDES GW/SW/Storm, Compost Facilities, SWRRF, SWTF200011, Class B Recycling, DPCC, UST	5.3
pH of water-quality sample		Distance to Agricultural Land Use, 1995	1506
Depth to Top of Open Interval	172	Population Density, Tier 1	370.5
% Soil Clay	5.63	% Barren Land Use, 1995	0
Soil Hydraulic Conductivity	24.53	% Urban Land Use, 1970	24.1
Conceptual % Soil Organic Matter	0.39	Distance to STP	
Physiographic Province	NEW ENGLAND	STP Density	0
		Distance to DOT roads	65.09
		Length of railroads	4530.66
		Population Density	401.09
Radionuclides Explanatory Variables – Source Rating = M			
pH of water-quality sample		% Urban Land Use, Tier 1, 1995	39.7
Physiographic Province	NEW ENGLAND	Conceptual Distance to Agricultural Land Use, 1995	1506
Conceptual Depth of Well	172	% Developed Land, Tier 1, 1995	39.7
Conceptual Soil Hydraulic Conductivity	24.53	% Agricultural Land Use, 1970	0
Radon Explanatory Variables – Source Rating = M			
Conceptual % Soil Clay	5.63	% Agricultural Land Use, 1995	2.01
Physiographic Province	NEW ENGLAND	Conceptual Distance to Wetlands Land Use, 1995	340.61
Depth to Top of Open Interval	172		
DBPs Explanatory Variables – Source Rating = M			
Conceptual – % Soil Organic Matter	0.39	Conceptual – Sq. Mi. of Wetlands Land Use, 1995	0.06
Conceptual NJGS Hydrologic Unit (aquifer)		Number of NJPDES SW/GW/Storm, Compost, SWWRF, SWTF200011, Class B Recycling, and DPCC	0
pH of water-quality sample			