SOURCE WATER PROTECTION PLAN

High Bridge Department of Public Works

Hunterdon County, New Jersey

Community Water System

PWSID# 1014001

November 2014

Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever does.

-Margaret Mead

NJ WATER ASSOCIATION

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OVERVIEW

The 1986 Federal Safe Drinking Water Act Amendments (section 1428, P.L. 93-523, 42 USC 300 et. Seq.) directed all states to develop a Well Head Protection Program (WHPP) for both public community (PWS) and public non-community (NCWS) water-supply wells. The U.S. Environmental Protection Agency (USEPA) approved New Jersey's WHPP Plan in December 1991. The goal of the Plan was to prevent contamination of ground-water resources, which provided drinking water to roughly forty-two percent of New Jersey's population. The delineation of Well Head Protection Areas is one component of the WHPP. The Well Head Protection Area (WHPA) is the area from which a well draws its water within a specified time frame. In New Jersey, source-water areas for all public supply wells were established by use of WHPA delineation methods.

Once delineated, these areas become a priority for efforts to prevent and clean up ground water contamination. Other components of the WHPP Plan include pollution-source inventories, development and implementation of best management practices to protect ground water, land-use planning, and education to promote public awareness of each person's role in protecting our ground-water resources.

The Safe Drinking Water Act Amendments of 1996 (P.L. 104-182) established the need for state Source Water Assessment Programs. The Source Water Assessment Program requires complete assessments for all Public Water Systems (PWS's), utilizing ground and/or surface water, which include source water protection area delineations, inventories of certain contamination sources, and determinations of susceptibility that provide for "**the protection and benefit of public water systems.**" A Source Water Assessment provides not only an understanding of current conditions, but also serves as a predictive tool for source water management and protection.

The Source Water Protection Program is a voluntary effort encouraged by the USEPA and USDA Farm Service Agency (FSA). Its purpose is to utilize the information provided by the mandatory Source Water Assessment Program in order to allow participation of rural and small communities to protect their drinking water sources. Once potential contaminant sources are identified, the communities can then implement measures to safeguard against future contamination. The Source Water Protection Plan will outline the implementation measures that each involved entity could perform. The Plan will also outline a contingency plan in order to assure adequate drinking water is available to the communities in case of a contamination event or a disruption of their normal water supply. The most basic contingency plan consists of a phone list of everyone to call in case of an emergency. This list is often the community's emergency response team and the local emergency management team.

Public supply wells draw water from underground water sources known as aquifers. Aquifers are geologic units that are porous and permeable enough to allow water to flow through them in quantities sufficient to supply wells. The water contained in these aquifers is called ground water. Ground water moves from points of high pressure (often high elevation) to points of lower pressure such as streams or pumping wells. The longer a well pumps, the greater the distance from which ground water will flow through the aquifer to the pumping well. For example, pumping a typical community supply well in New Jersey's coastal plain for two years will draw ground water within about 1,000 feet of the well. However, if the well continues to pump for twelve years, ground water

will be drawn in from about a mile up gradient of the well. The time it takes a given particle of ground water to flow to a pumping well is known as time of travel (TOT). The TOT is directly related to the distance the water has to travel to arrive at the well once it starts pumping. However, for any given TOT, the distance will vary from well-to-well depending on the rate of pumping and aquifer characteristics such as the transmissivity, porosity, hydraulic gradient, and the aquifer thickness. Each WHPA is divided into three sequential tiers based on the TOT component. The tiers indicate the relative risk of contamination to the well, placing priority on pollution sources that pose an imminent threat to it.

Aquifers are recharged with water from precipitation that percolates through pervious land surfaces and becomes part of the flow of the ground water. It is within the WHPA that land uses, which introduce pollutants, are most likely to contaminate drinking water sources. Historically, the land uses and commercial and industrial facilities/activities that have been identified as major sources of ground-water contamination in New Jersey (NJ Water Quality Inventory Report, 1992) include, but are not limited to:

Underground Storage Tanks (UST's);
Septic Systems;
Surface Spills;
Unsecured Landfills;
Leaking Drums;
Above Ground Storage Tanks;
Road Salt Piles; and
Lagoons/Surface Impoundments

Once WHPA's are delineated, potential pollution sources may be managed in relation to their location within the WHPA. In addition, protective land uses, such as open space, may be pursued. In instances where a public supply well has already been contaminated, the WHPA provides investigators with an area in which to search for potential pollution sources and responsible parties.

The NJDEP delineated WHPA's for the approximately 2,405 existing CWS wells (689 confined & 1716 unconfined), 882 non-transient non-community systems with 1100 wells, and 2,663 transient non-community systems with 2793 wells in existence at the time.

For the 59 community water system intakes and 3 non-transient non-community intakes in New Jersey, the assessments were based on a delineation of the entire drainage area that flows past an intake (the intake delineation area). Delineations include the headwaters and the tributaries that flow past the intake as well as account for overland flow to the intake, controlling structures, and tidal considerations. Additionally, 5-year ground-water flow delineations are added to account for ground water contributions to base flow. Surface water delineations are based on USGS hydrologic unit code HUC 14.

Note: The term, "source water" is used throughout this report to represent ground water or surface water sources of public drinking water.

THE US ENVIRONMENTAL PROTECTION AGENCY, US DEPARTMENT OF AGRICULTURE & NEW JERSEY WATER ASSOCIATION

The United States Environmental Protection Agency (USEPA) mandated that New Jersey implement a Source Water Assessment Program (SWAP) after the Safe Drinking Water Act amendments of 1996. The SWAP delineated the source waters of all public drinking water systems in New Jersey, located certain potential contaminant sources that are within these delineations, and determined the susceptibility of these sources to contamination.

The United States Department of Agriculture (USDA) under the Farm Service Agency (FSA), in coordination with the USEPA, implemented a Source Water Protection Program to assist rural and small communities served by public water systems to reduce and/or eliminate potential risks to drinking water sources. Through the development of Source Water Protection Plans, no-cost assistance is provided to implement contamination prevention measures. Contamination prevention is the most cost-effective approach to protecting drinking water sources which benefits both water customers and municipalities alike.

The New Jersey Water Association (NJWA) is a New Jersey-based non-profit that provides technical, managerial, financial, and source water protection assistance and training services free of charge to help small water and wastewater utilities throughout the state. The NJWA is the state affiliate to the National Rural Water Association (NRWA). NRWA was formed in 1976 to give rural and small water and wastewater utilities, of populations with 10,000 or less, comprising 92% of all utilities, a voice in legislative and regulatory issues. NRWA currently has a state affiliate in every US state.

SOURCE WATER PROTECTION AREA DELINEATION METHODOLOGY

The WHPA delineations completed by the New Jersey Department of Environmental Protection (NJDEP), as touched on briefly in the Overview, consist of three tiers, each of which is based on the Time of Travel (TOT) of ground water to a pumping well. They are based on the need to assess and prioritize contamination risks to wells within the zone of contribution. The tiers are as follows:

- Tier 1 = 2 years
- Tier 2 = 5 years
- Tier 3 = 12 years

The outer boundary for Tier 1 is two years. This determination is based on findings that bacteria have polluted wells as far as 170 days away from wells and that viruses have been known to survive in ground water for up to 270 days (Canter, Knox, and Fairchild, 1987; USEPA, 1987). Because pollution does not move uniformly through ground water, TOTs represent an average. If a significant pollution plume is too close to a water supply well, containment of the plume is usually not feasible without having some effect on the well.

The boundary for Tier 2 is five years. For TOTs ranging from two to five years, NJDEP is not reasonably certain of its ability to ensure containment of a pollution plume. Even with expedited case management for pollution cases in vulnerable WHPAs, there will still remain a lag time between case identification and remediation of the area. Thus, the five year TOT was selected due to:

- Administrative lag time,
- The "smearing" effect in pollution plumes which is caused by variable rates of pollutant travel through pores and adsorption/desorption processes,
- Acceleration of ground water as it approaches a pumping well
- Complexity of groundwater pollution cases
- Estimates that 40% of all pollution cases must be handled by the NJDEP since willing responsible parties are often lacking.

NJDEP is reasonably sure that beyond Tier 2 a comprehensive pollution mitigation response would be able to be completed for significant pollution discharges. The boundary for Tier 3 could theoretically be expanded to include the entire zone of contribution; however, the WHP Technical Advisory Committee determined that such an area was not necessary in New Jersey. Through research of pollution cases it was determined that a TOT of 10-15 years encompasses the full length of most pollution plumes (most are less than one mile). The 10-15 year TOT would allow for sufficient dilution and reduction of the pollution to further diminish well pollution risks.

The delineation methods used differ based on the type of well, the hydrogeologic setting of the well, and the availability and reliability of data regarding the well. For all Community Water System (CWS) wells the combined model/CFR method was chosen as the minimum method. This method is low-cost and relatively accurate using the best available data. The combined model/CFR method combines the CFR (combined fixed radius) calculation method with a two-dimensional groundwater flow model that accounts for hydraulic gradient, aquifer transmissivity, aquifer saturated thickness, aquifer anisotropy, effective porosity, pumping rate of the well and TOT.

PURPOSE OF PLAN DEVELOPMENT

Source Water Protection Plans are designed to reduce and/or eliminate potential threats to drinking water sources. Regulatory or non-regulatory management activities may be employed to accomplish the Plan's recommendations. The communication, coordination, and collaboration that will occur between the community, water system operator and municipality, and local, county, state and/or federal agencies will ultimately allow for enhanced drinking water protections.

Source Water Protection Plans identify actual and potential sources of contamination to prevent costly treatment processes and avoid the need to obtain alternate drinking water sources. Secondly, they allow for public education on the importance of protecting their drinking water sources. In addition, the Plan may serve as a useful tool for municipalities to effectively implement sustainable planning for the future community.

High Bridge Borough has had major well field contamination issues in the not-so-distant past due to a paint stripper spill from a nearby business which reached superfund status and, although it has since been remediated, there remains a potential threat to the water supply if source water protection efforts are not installed. Over the past 29 years there have been 43 water main breaks throughout the Borough's aging distribution system for which minor replacements and repairs have been made. Michael Hann, licensed operator, has expressed concern over these "band-aid" approaches and the need for a more comprehensive and consistent infrastructure replacement schedule. The nature of the fractured bedrock aquifer from which High Bridge Borough draws its water also creates the potential for the rapid and sporadic spread of contamination events and lends itself well to a resident education awareness campaign as covered in this plan.

WELCOME TO HIGH BRIDGE BOROUGH

High Bridge Borough is located within the north central part of Hunterdon County, New Jersey. It is completely surrounded by Lebanon Township to the North and Clinton Township in all other directions. High Bridge Borough is conveniently nestled for its commuters just north of Interstate 78 and just east of State Highway 31. County Route 513 winds its way through the center of High Bridge Borough. It takes about 1 hour to drive to New York City from the Borough and about 1.5 hours to drive to Philadelphia. There are approximately 3,648 residents in High Bridge Borough according to the 2010 census.

The borough was officially formed in 1898 and is comprised of 2.431 square miles. It is located on the South Branch of the Raritan River whose waters provided the power source to the first ironworks in the United States (highbridge.org).

The High Bridge area was first settled by Lenape Indians around 1700. In 1742, William Allen and his partner Joseph Turner (from Philadelphia) established the first ironworks in colonial America. Both Allen and Turner were "Tories" and supported the English, but their successor was an Irishman named Robert Taylor who remained loyal to the patriots. During the Revolutionary War the ironworks provided the American army with cannonballs (highbridge.org).

In the 1800s the Central Railroad Company built a 112-foot high and 1,300 foot long bridge across the South Branch of the Raritan River, hence the name High Bridge. The bridge was too expensive to upkeep so it was turned into an earthen embankment instead, which still stands today. Into the 1900s the Taylor-Wharton Iron and Steel Company eventually closed in the 1960s and High Bridge became a community of commuters (highbridge.org).

The Townships surrounding High Bridge are historically agricultural communities and are charmingly mountainous. The areas are rich in forests, streams, rivers, and farmland. Voorhees State Park and Ken Lockwood Gorge Wildlife Management Area are located in Lebanon Township just north of High Bridge Borough. Spruce Run Recreation Area is located to the southwest of the Borough and Round Valley Reservoir is located to the southeast.

Voorhees State Park is 1400 acres of state land and is located on County Route 513. Former governor of New Jersey, Foster M. Voorhees, donated his farm as a park in 1929 and so began the State Park. In the 1930s, Voorhees State Park was utilized as a camp for the Civilian Conservation Corps (CCC). In 1965, the New Jersey Astronomical Association built an observatory on leased land and today offers sky-watch programs for the public throughout the year. Trailer and tent campsites and 3 cabins are available and open year-round for a fee (Division of Parks and Forestry).

Ken Lockwood Gorge Wildlife Management Area is a 260 acre property that was purchased by the New Jersey Division of Fish, Game and Wildlife in 1948. The New Jersey Monthly magazine has named it one of the "Ten Most Beautiful Places in New Jersey." The 2 ½ mile stretch of the Raritan River's south branch create the gorge named after Ken Lockwood, the late conservationist and journalist well-known for his column "Out in the Open." The Wildlife Management Area is well known for its trout fishing, steep slopes, boulders, Class III-IV rapids, and northern hemlocks. Hunting is allowed in season and black bears are often sighted (Division of Parks and Forestry).

Within the Borough limits there are many parcels of preserved land as well including:

- Taylor SteelWorks Historic Greenway,
- Union Forge Park,
- Springside Farm and woodlands,
- Komline property acquisition,
- Lake Solitude acquisition,
- South Branch Reservation,
- 7-mile Columbia trail which winds its way through High Bridge Borough.

High Bridge Borough students attend the High Bridge elementary school, the High Bridge Middle School, and finally, the regional Voorhees High School which is located just outside Borough limits in Lebanon Township.

Some of the local industries include Custom Alloy Corporation, Glassman High Voltage Inc., J&M Manufacturing Inc., High Bridge Stone Company Inc. and Independent Solar.

There are 2 local watershed associations near High Bridge Borough. The South Branch Watershed Association and the Musconetcong Watershed Association. The South Branch Watershed Association is part of the larger Raritan Headwaters Association. Both associations provide educational activities, informational websites about the watersheds, septic systems, well-testing, and more, and ways to actively volunteer and be a good water steward.

High Bridge Borough has an active and enthusiastic environmental commission. They have helped the Borough achieve Bronze-level Sustainable Jersey certification and have been involved in multiple Borough land acquisitions and environmental awareness activities. Lebanon Township also has an active and enthusiastic environmental commission. Their support for the Source Water Protection Plan is essential to its success due to 4 of 5 High Bridge wells existing within their township borders.

HYDROGEOLOGY OF HIGH BRIDGE BOROUGH SWP AREA

GEOLOGY

Hunterdon County falls within two physiographic provinces – the Highlands and the Piedmont. High Bridge Borough falls within the Highlands region which stretches across Pennsylvania to Connecticut and comprises 1/3 of Hunterdon County's land base.

The Highlands region is characterized by "broad flat-topped ridges and steep-sided valleys" (County Profile). The ridges rise to elevations of 1,000 ft. with many trending northeast-southwest. They are comprised of hard igneous and metamorphic rocks of the Precambrian era which include gneiss and granite and remain resistant to erosion; whereas, the valleys are comprised of softer carbonate rocks and shales.

Most of Hunterdon County's aquifers are not highly permeable or porous. The Northwest New Jersey Sole Source Aquifer is comprised of fractured bedrock where groundwater flows through joints, fractures, cleavage planes, and faults in the unconsolidated deposits. These fractures tend to be more open at the surface and progressively narrow and become less abundant with increasing depth. Rocks near faults tend to have the most highly fractured characteristics. Aquifer boundaries in the region coincide with surface water divides as there is no regional ground water flow system (Carswell and Rooney 1976).

The water table in the Northwest New Jersey Sole Source Aquifer area occurs at depths of 40 feet on the hilltops and intersects the land surface in valleys. It is contiguous with the upper surface of streams, lakes, and swamps (Carswell and Rooney 1976).

The Precambrian is a major source of ground water for domestic wells throughout the Pequannock and Wanaque basins, in both New Jersey and New York. Well yields range from 1-200 gpm (gallons per minute), with the highest yields in the larger valleys near surface water bodies.

The sandstone and quartzite of the Middle Paleozoic are also used for domestic supply. They characteristically yield 1-35 gpm, but can yield significant supplies on a localized basis, due to their friability and secondary porosity (Carswell and Rooney 1976). These Paleozoic rocks are hydraulically connected to the Precambrian by proximity and fracturing.

Most public supply wells in the Highlands region are located within the 350 foot thick Quaternary glacial deposits in the lowlands, with reported yields ranging from 4-920 gpm. However, the upland glacial deposits are typically thin (less than 20 feet) discontinuous till and too impermeable to be considered productive.

Groundwater flow is down and toward the river valleys in the uplands, and up and toward the streams in the valley bottoms. The ground water discharges from the aquifer system by seepage into streams, lakes, and swamps, by evapotranspiration, and by flow to pumping wells.

SURFACE WATER

There are 2 major rivers in the High Bridge Source Water Protection Area. The Musconetcong River is located to the northwest of the Borough and the south branch of the Raritan River flows through Ken Lockwood Gorge Wildlife Management Area and right through the center of High Bridge Borough. A historic dam from the Taylor-Wharton Iron and Steel Company, which was rehabilitated recently, creates Lake Solitude on the South Branch of the Raritan River in the Borough.

There are also 2 large freshwater reservoirs close by: the Spruce Run Reservoir and the Round Valley Reservoir. The Spruce Run Reservoir was built by the New Jersey Water Supply Authority in 1964 for municipal water supply. It has a 93 foot earthen dam and a normal capacity of 33,670 acre-feet. At full capacity Spruce Run can hold 11 billion gallons of water (Division of Parks and Forestry).

Round Valley Reservoir reaches depths of 180 feet and can hold up to 55 billion gallons of water making it the largest reservoir in the state (Division of Parks and Forestry). During drought both dams feed into the south branch of the Raritan River. Both reservoirs are an essential source of water for much of northern New Jersey.

RECHARGE

Recharge in the area is almost entirely from precipitation. Due to removal of the overburden by glaciers, soils in the region are very thin. With the exception of some areas with impermeable till, the entire land surface in the drainage basin acts as a recharge area. The recharge area is also delineated by the Pequannock and Wanaque River drainage basin boundaries. All precipitation within these boundaries has the possibility of recharging the aquifer system. The area gets an estimated average of 50 inches of precipitation annually (The Weather Channel). However, due to the poor aquifer recharge associated with the crystalline rocks below most of Lebanon Township (Bunnvale Well Field) only about 4.6 inches per year recharge into the Northwest New Jersey Sole Source Aquifer (Lebanon Township Natural Resources Inventory).

Impervious surface impedes recharge of an aquifer and can increase stormwater runoff which causes additional water quality issues. Impervious surface within High Bridge Borough is itself high with 10-12% of the surface impervious. However, the Bunnvale well field in Lebanon Township is surrounded by 4.33-6.24% impervious surface while the remaining Lebanon Township only has 2.95-4.32%.

IMPLICATIONS

Due to the nature of the fractured bedrock Northwest New Jersey Sole Source Aquifer, High Bridge's drinking water wells are particularly susceptible to contamination. In addition, the thinness of the soils and high permeability of the stratified glacial deposits also contribute to the vulnerability and spread of contamination.

This problem is complicated by the fact that most of the bedrock wells in the area penetrate more than one water producing zone having different hydraulic heads. This causes the short circuiting of natural flow and swifter spread of contamination (Carswell and Rooney 1976).

According to the Lebanon Township Natural Resources Inventory (2003), most of Lebanon Township is underlain by soils of the Parker-Edneyville-Califon association. These soils are found on slopes and are known for being poorly drained. The Parker and Edneyville soils only form layers as thick as 6 feet above the bedrock surface while the Califon soils form layers as thin as 3 feet above the water table. Because of the thin soil layers and poor ability to drain, the Soil Conservation Service considers these soils inappropriate for septic systems. However, Lebanon Township surrounding the Bunnvale well field does not have a sanitary sewer system and instead utilizes private septic systems to dispose of waste. While septic systems are a great method for recharging an aquifer from which the water was originally extracted, they may pose a risk to the integrity of the wells in the form of viruses, bacteria, and any added chemicals. Especially those septic systems within the critical well head protection area tiers or those that are not properly maintained.

HIGH BRIDGE BOROUGH WATER SOURCES

High Bridge Borough has 5 interconnected wells that provide drinking water for the Borough and for a portion of Clinton Township. The wells are part of a fractured bedrock aquifer system which is unconfined. High Bridge water system is unique in that all 5 wells are located outside Borough limits. Wells 2, 3, 4 and 5 are located in Bunnvale in Lebanon Township and Well 8 is located in Clinton Township. Wells 2, 3, 4 and 5 do not serve any water customers in Lebanon Township as most residents have private wells as does the Voorhees High School. Most of High Bridge Borough is connected to a sanitary sewer system but the surrounding Lebanon Township is not and septic systems surround the Bunnvale well field.

Water from High Bridge's wells is chlorinated for disinfection but nothing further is added to the water for treatment. The pH is a little above 7. There is an air stripper for VOC contamination attached to the Bunnvale well field treatment facility due to a previous contamination event now remediated. Although the VOC air stripper is no longer needed the system cannot legally operate by disconnecting it and it thus requires a lot of unnecessary energy.

Finished drinking water is stored in a 1 million gallon tank which gravity feeds the entire water system. The stored water in the tank can supply the Borough for approximately 2.8 days with average daily water use. Annual water use for 2012 was 124.9 million gallons. Annual water use for 2013 was 122.7 million gallons. There is no emergency interconnection with any nearby water suppliers.

WELL INFORMATION

Well #2, Bunnvale Well Field	
Well Depth (feet)	287
Pump Depth (feet)	236
Depth of Casing (feet)	
Casing – Diameter (inches)	8
Capacity (permitted yield – gpd)	100
Surface Elevation (feet)	670
Year Developed	
Aquifer Name	Northwest New Jersey Sole Source Aquifer

Well #3, Bunnvale Well Field	
Well Depth (feet)	330
Pump Depth (feet)	236
Depth of Casing (feet)	72
Casing – Diameter (inches)	8
Capacity (permitted yield – gpd)	100
Surface Elevation (feet)	840
Year Developed	1938
Aquifer Name	Northwest New Jersey Sole Source Aquifer

Well #4, Bunnvale Well Field	
Well Depth (feet)	230
Pump Depth (feet)	194
Depth of Casing (feet)	83
Casing – Diameter (inches)	12
Capacity (permitted yield – gpd)	140
Surface Elevation (feet)	670
Year Developed	1945
Aquifer Name	Northwest New Jersey Sole Source Aquifer

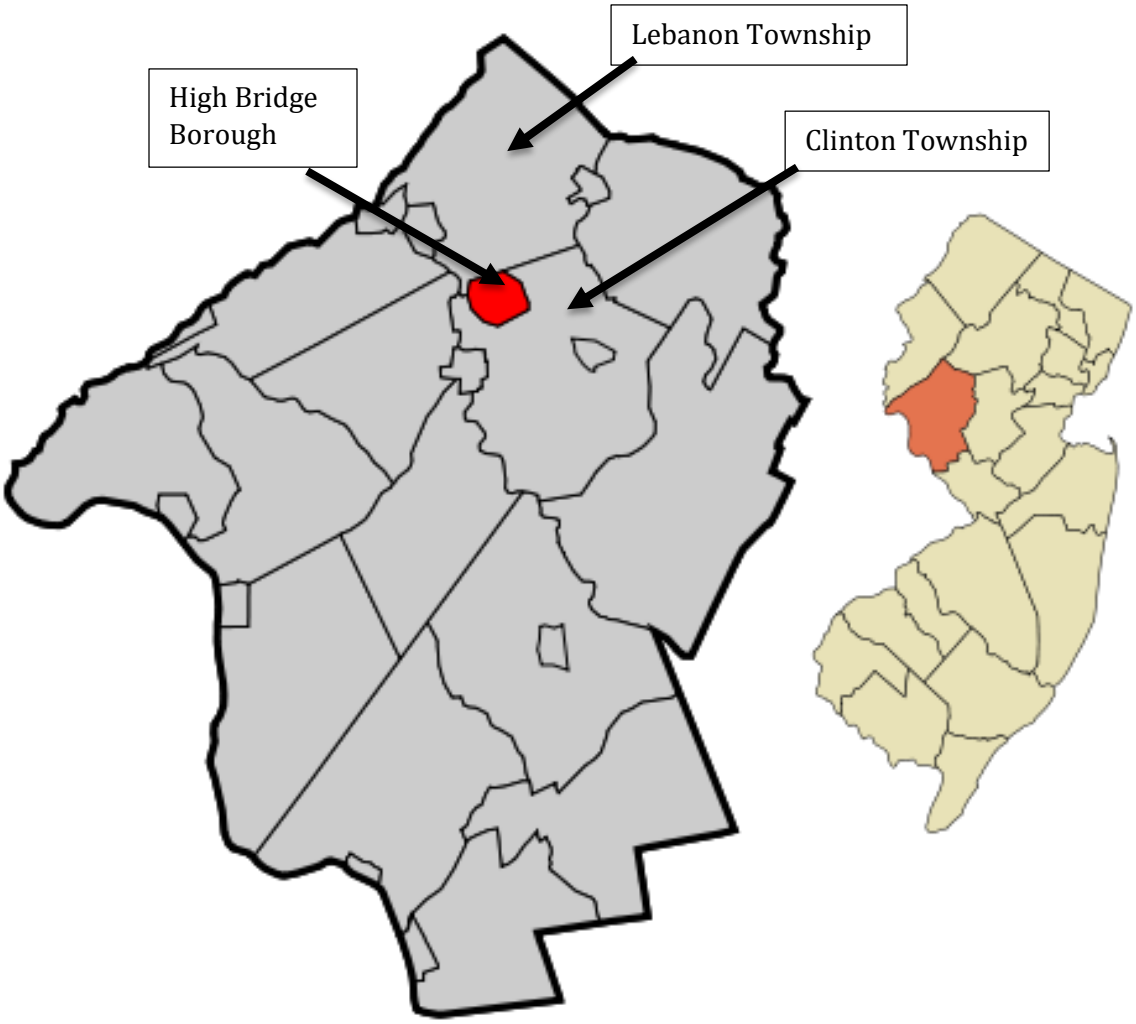
Well #5, Bunnvale Well Field	
Well Depth (feet)	239
Pump Depth (feet)	168
Depth of Casing (feet)	109
Casing – Diameter (inches)	8
Capacity (permitted yield – gpd)	160
Surface Elevation (feet)	670
Year Developed	1950
Aquifer Name	Northwest New Jersey Sole Source Aquifer

Well #8, Zellman's, Gray Rock Rd.	
Well Depth (feet)	115
Pump Depth (feet)	168
Depth of Casing (feet)	55
Casing – Diameter (inches)	10
Capacity (permitted yield – gpd)	500
Surface Elevation (feet)	205
Year Developed	1985
Aquifer Name	Northwest New Jersey Sole Source Aquifer

SOURCE WATER PROTECTION AREA MAPS

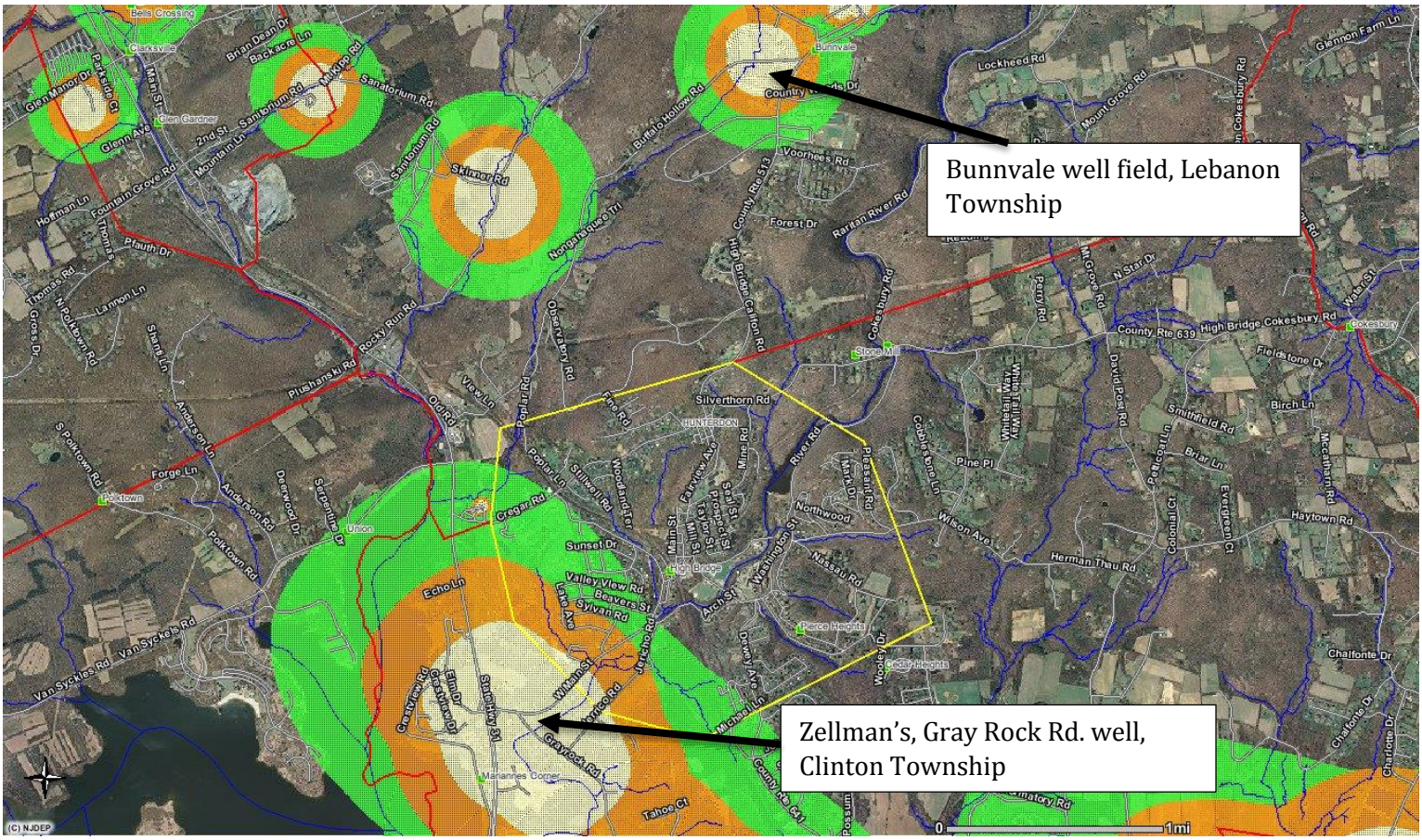
The following maps depicting High Bridge Borough's Source Water Protection Areas in Hunterdon County were created utilizing NJDEP i-Map software with 2007 aerial photos. High Bridge Borough is highlighted in yellow. Red stars depict active NJDEP contaminated sites, and Well Head Protection Areas are 3 tiered – white representing a 2 year TOT, orange a 5 year TOT, and green a 12 year TOT.

LOCATION OF HIGH BRIDGE BOROUGH, HUNTERDON COUNTY, NEW JERSEY



Map courtesy of Wikipedia.com

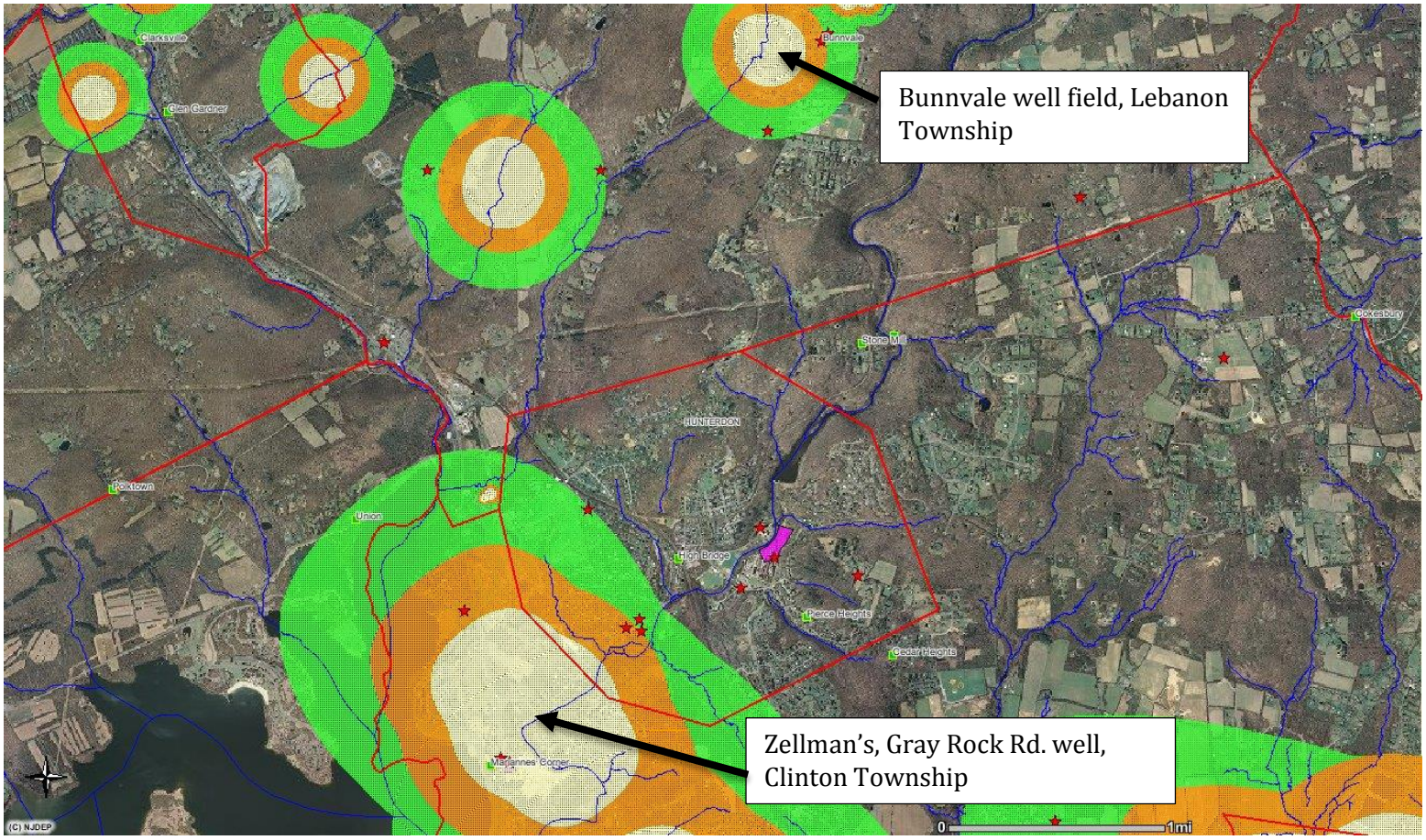
HIGH BRIDGE BOROUGH WITH DRINKING WELLS



Disclaimer: Map images are courtesy of NJDEP i-Map software. Images are dependent upon information provided by the software

HIGH BRIDGE SOURCE WATER PROTECTION AREAS WITH NJDEP KNOWN CONTAMINATED SITES

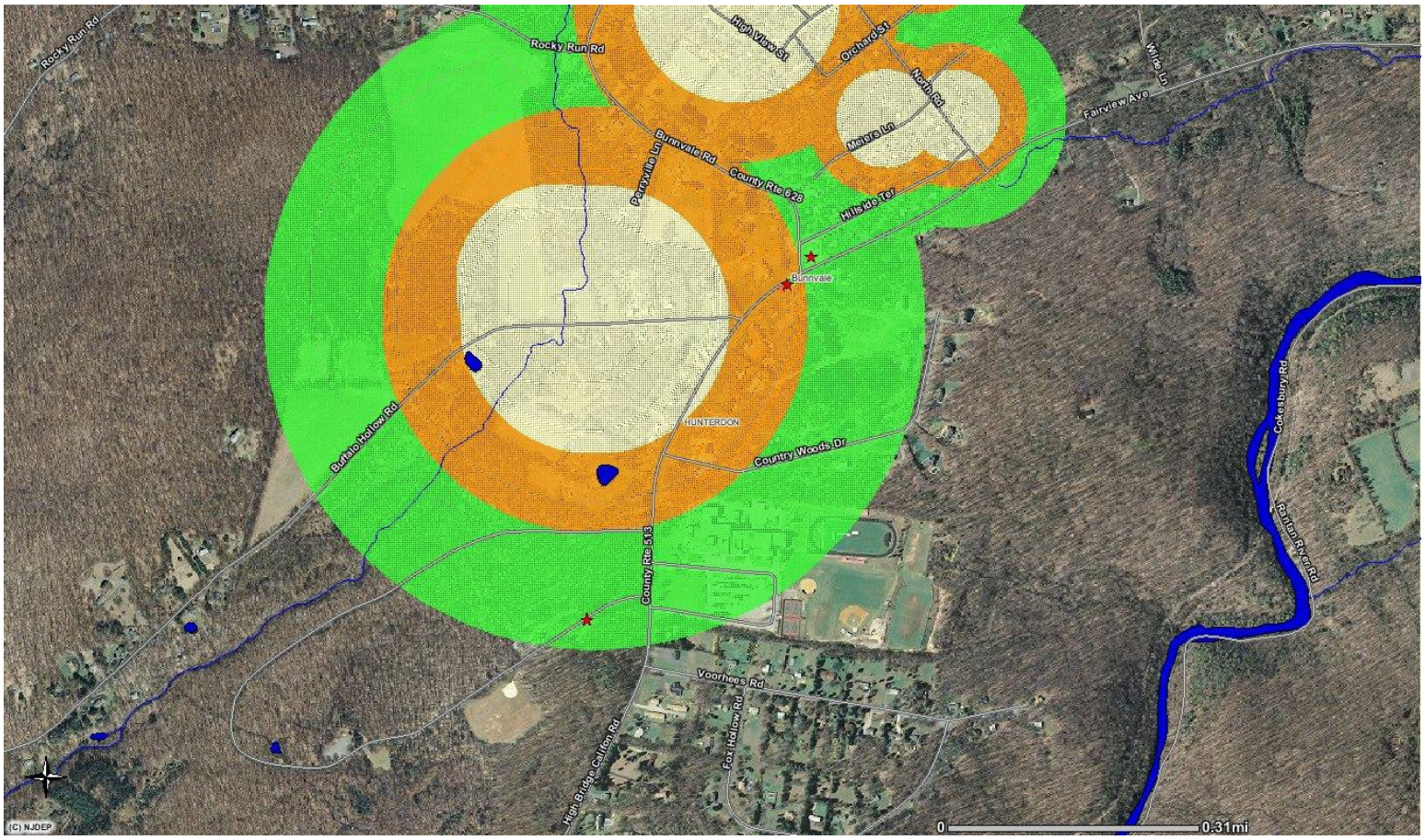
Red stars indicate NJDEP known contaminated sites and pink areas represent known groundwater contamination.



Disclaimer: Map images are courtesy of NJDEP i-Map software. Images are dependent upon information provided by the software.

BUNNVALE WELL FIELD WITH NJDEP KNOWN CONTAMINATED SITES

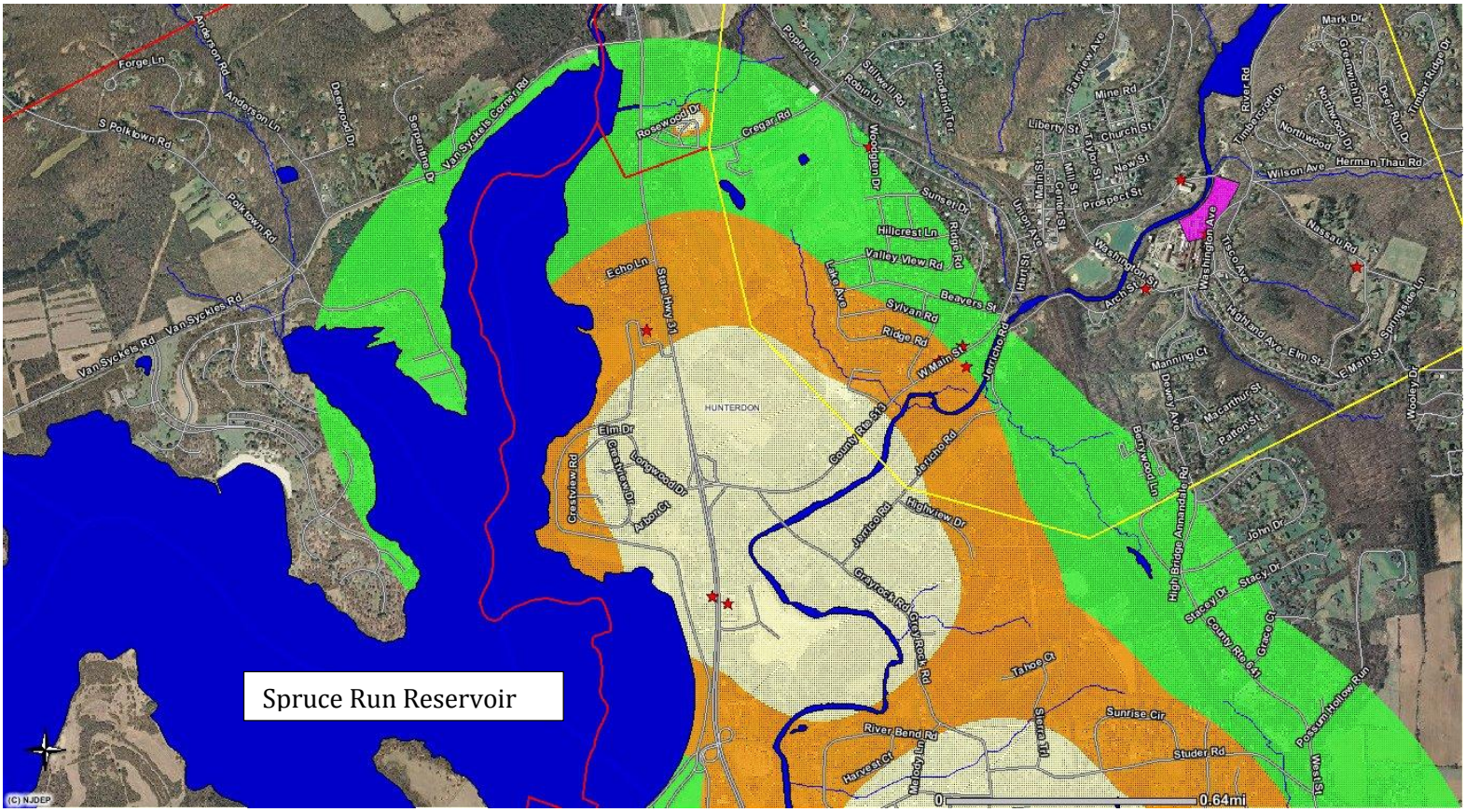
Red stars indicate NJDEP known contaminated sites.



Disclaimer: Map images are courtesy of NJDEP i-Map software. Images are dependent upon information provided by the software.

ZELLMAN'S GRAY ROCK ROAD WELL FIELD WITH NJDEP KNOWN CONTAMINATED SITES

Red stars indicate NJDEP known contaminated sites and pink areas represent known groundwater contamination. High Bridge is outlined in yellow.



Disclaimer: Map images are courtesy of NJDEP i-Map software. Images are dependent upon information provided by the software.

CONTAMINATED SITES IDENTIFIED BY NJDEP IN HIGH BRIDGE WATER DEPARTMENT SOURCE WATER PROTECTION AREA

Disclaimer: The information contained in this report is limited to that available from public records and the water supplier. Other potential contaminated sites or threats to the water supply may exist within the source water protection area that are not identified in this plan. Classification of a site as a potential contaminated site should not imply that this site has or will cause contamination of the water supply.

The list of active and pending contaminated sites are assumed to be working hand in hand with the NJDEP to remediate any issues that still/may exist on their properties.

ACTIVE CONTAMINATED SITES IN HIGH BRIDGE AND SWP AREAS

Site ID (MasterFile)	Address	Name
458919	**Nassau Rd, Borough of High Bridge**	**A R Casella Estate Property *(now owned by Borough)***
6734	**3 Washington Ave, Borough of High Bridge**	**Custom Alloy Corp**
6731	**100 W Main St, Borough of High Bridge**	**Exact Level & Tool Manufacturing Co Inc. *(currently for sale)***
6751	**1 Washington Ave, Borough of High Bridge**	**Komline Sanderson Tract *(now owned by Borough)***
6749	**104 W Main St, Borough of High Bridge**	**R & K Petro LLC *(currently Sunoco Station)***
47202	**291 Route 513, Lebanon Twp**	**Bunnvale Sunoco**
39072	**251 Route 513, Lebanon Twp**	**Voorhees State Park**
61011	**1747 Route 31, Clinton Twp**	**APM Management Inc. *(Valero gas station)***

Site 458919, A R Casella Estate Property, now owned by High Bridge Borough had a C3 level multi-phased remediation for unknown or uncontrolled discharge to soil or groundwater back in 2001.

Site 6734, Custom Alloy Corp is located in High Bridge Borough and is the reason for the pink groundwater contamination spot on the known contaminant maps of the Borough. The site was designated a Classification Exception Area (CEA) and well restriction area due to the use of the well

for potable water use. Contaminants included 1 part per billion (ppb) #4 fuel oil (the maximum contaminant level for groundwater quality standards is 1 ppb), 156 ppb dichloroethane (the MCL is 50 ppb), 3.76 ppb dichloroethene (the MCL is 2 ppb), 100 ppb tetrachloroethylene (the MCL is 1 ppb), 257 ppb trichloroethane (the MCL is 30 ppb), and 3.50 ppb trichloroethylene (the MCL is 1 ppb).

Site 6731, Exact Level & Tool Manufacturing Co Inc., now for sale, had a level D remedial level which is characteristic of a "multiple source or release to multi-media including groundwater" and is associated with federal superfund sites. The shop was one of the first tool companies in New Jersey and opened in the 1930s. In 1985 operations ceased. Remediation began in 1986. There are 22 areas of concern identified by NJDEP including underground storage tanks, historic fill, waste storage areas, fuel oil contamination, etc. Test pits were installed across Main St to determine the extent of the contamination and remediation is still ongoing.

Site 6731, Komline Sanderson Tract, which is now owned by the Borough, had a C3 multi-phased unknown/uncontrolled discharge to soil or groundwater identified in 2001.

Site 6749, R & K Petro LLC, now the Sunoco Station on Main St in High Bridge, had a C1 level remediation identified in 2006 due to an underground storage tank with potential groundwater contamination.

Site 47202, Bunnvale Sunoco had a known contaminant release from a UST with soil contamination. It was a C2 remedial level. The spill occurred in 1999 and is still listed as active with the NJDEP. It is located within Bunnvale well field's 5 year TOT tier.

Site 39072, Voorhees State Park had a known contaminant release from a UST. It was C2 remedial level – associated with more complex contaminant discharges**,** multiple spills/discharges, multiple contaminants, and with both soil and groundwater impacted and/or threatened. Though the spill occurred in 1998, it is still listed as active with the NJDEP and remains important as it is within the 12 year TOT tier of High Bridge Borough's Bunnvale well field SWP area.

Site 61011, APM Management Inc. is listed as an active contaminated site in Clinton Township and is within the 2 year critical tier for High Bridge Borough's Well #8. The location of the site houses a Valero gas station. It had a C2 level remediation event due to a known release with groundwater contamination by UST in 2006. It has been remediated but is still listed as active by the NJDEP.

PENDING CONTAMINATED SITES

There are no pending sites listed for Lebanon Township or Clinton Townships where the High Bridge SWP areas are located.

CLOSED CONTAMINATED SITES

There are many closed contaminated sites listed on the NJDEP database for Lebanon Township and Clinton Township, Hunterdon County. Though there are many listed, they are closed cases, meaning that they have been deemed sufficiently remediated by the NJDEP, and are not listed in this report. The majority of those cases involved both homeowners and businesses with storage tank leaks – many of which were oil tanks for heating.

It is important to note, however, that there were 2 significant contamination events at the High Bridge Water Department well field and Bunnvale Water Systems Inc. which is now named Bunnvale AQUA. Both had C3 multi-phased remedial level contamination events in 1992. C3 level remediation events are usually designated Superfund sites. Both sites were publicly-funded remediations. Because of the trichloroethylene (TCE) paint thinner contamination, which according to operator Mike Hann originated from an auto body business located on Route 513, a VOC air-stripper was installed by the High Bridge Water Department to properly manage the chemicals in 1997 under a third party contract with NJDEP.

ADDITIONAL POTENTIAL CONTAMINANT SITES (IDENTIFIED BY NJWA)

There are additional potential contaminant sites that were identified by the NJWA Source Water Protection Specialist in the SWP areas for High Bridge water department wells.

The following business is located within Bunnvale well field's 5 year TOT tier. This is the site of previous contamination to the wells and its activities could be monitored to ensure the potential for contamination to groundwater is not a threat.

1. Michael Brothers Auto Repair 270 Route 513 Glen Gardner, NJ 08826

The following list of 5 businesses are within the critical 2 year TOT tier for High Bridge Water Department Well #8. It will be important to make sure that no large-scale contamination events occur as their proximity and hydrological connection to the Well 8 unconfined aquifer could be detrimental to the security of the water supply.

2. B&B Auto Body Shop 1810 Route 31 Clinton, NJ 08809
3. Hess Express Gas Station 1746 Route 31 Clinton, NJ 08809
4. Valero Gas Station 1747 Route 31 Clinton, NJ 08809
5. US Fuel Gas Station 1689 Route 31 Clinton, NJ 08809
6. Glassman High Voltage Inc. 124 W Main St High Bridge, NJ 08829

CONTAMINANT SOURCE INVENTORY

In addition to the contaminated sites listed on the NJDEP database that are currently being managed, there are other types of common contaminants that can often contaminate drinking water sources.

RESIDENTIAL

While most residential contamination threats to surface or groundwater are minimal in comparison to more commercial contamination cases, citizens should remain aware of the potential hazards to drinking water that even small amounts of common household products contain. Their proper usage, storage and disposal can prevent unnecessary contamination.

Some of these potential contaminants include:

- **Household cleaning products**
- **Automotive products** such as oil, gasoline, and antifreeze
- **Paints and solvents**
- **Battery acid and lead**
- **Fertilizers and pesticides** used on lawns and gardens
- **Fuel storage systems** such as underground storage tanks for household heating oil
- **Septic systems** if not properly maintained can introduce bacteria into a water supply
- **Abandoned wells** which can introduce contaminants directly into an aquifer if not correctly closed

Lebanon Township residents have individual septic systems. Proper maintenance of these systems is important so as not to introduce bacteria into the unconfined nature of the Northwest New Jersey Sole Source Aquifer. Because most of Lebanon Township is underlain by thin soils, shallow bedrock, and steep slopes, the Soil Conservation Service has identified severe limitations for the region's subsurface sewage disposal abilities (Septic Suitability NJAC 7:9A via Lebanon Township Natural Resources Inventory). Eighty percent of water removed from the aquifer is returned via septic systems as recharge. With that recharge often comes high nitrate levels which are highly mobile and not readily removed. Additional recharge may be necessary to dilute nitrate concentrations within the aquifer before consumption. Lebanon Township could consider including helpful information and tips for septic system owners for proper maintenance of their systems to avoid health issues and water contamination. The Hunterdon County Health Departments provide informational packets concerning proper use of septic systems to new residents with on-site septic systems.

Several times a year the Hunterdon County complex on County Route 12 holds a hazardous waste disposal day. All county residents are welcome and no pre-registration is required. According to the website "leftover household products may contain corrosive, ignitable, reactive, or toxic ingredients and are considered to be household hazardous waste. Improper disposal of these wastes (pouring down drain, storm sewers or in some cases putting them out with the trash) are unlawful and will pollute the environment and pose a threat to human health" (Hunterdon County Hazardous Waste). Paint, batteries, motor oil, smoke detectors, refrigerators, air conditioners, and dehumidifiers, asbestos, electronics, and televisions are all accepted during these drives. Medications can be disposed of at the Hunterdon County Justice Center in a permanent drop-off

box. Lebanon Township website and High Bridge Borough website could include a link to this website for further promotion of hazardous waste disposal days.

According to the EPA, leaking underground storage tanks are the single largest source of groundwater contamination in the United States (Horsley & Witten, 1995). To prevent contamination to ground and surface water by residential underground storage tanks, removal of old tanks and prohibition of new tank installations (except for replacements with protective measures) in the source water protection area are beneficial solutions to the issue.

AGRICULTURAL

Fertilizers, pesticides, and fungicides when improperly applied to agricultural lands can pose threats to surface and groundwater via runoff especially in places where riparian buffers and Best Management Practices are not in place.

There is not much agricultural activity in the area around High Bridge Borough Water Department's wells although the use of residential fertilizers and pesticides could pose potential threats to the water quality of the wells.

COMMERCIAL

Many commercial businesses use toxic, hazardous materials in their processes. The storage, use, and disposal of these chemicals can pose potential threats to drinking water since even small amounts of the materials can contaminate large tracts of surface and groundwater. Leaks can be common when storage tanks are not maintained properly over time. Examples of commercial applications can include:

- Auto repair shops
- Gas stations
- Road maintenance depots and salt storage for de-icing roads
- Railroad tracks, boat yards, and airports
- Construction areas
- Dry cleaners and Laundromats
- Medical institutions and research labs
- Photography establishments and printers

Regulation of these commercial activities through zoning ordinances that prohibit these land uses within the source water protection area is a great first step towards comprehensive source water protection.

As mentioned under the Residential section of contaminants, underground storage tanks (USTs) pose a huge threat to drinking water. Gasoline storage tanks have caused numerous problems throughout the United States due to their common leakages which pose serious health risks for the community. Again, zoning is a beneficial tool in preventing these tanks within critical drinking water protection areas.

Lebanon Township, Clinton Township, and High Bridge Borough have had contamination from homeowners and businesses alike in the past. The unconfined nature of the Northwest New Jersey Sole Source Aquifer system poses potential for future contamination if ill-practices are not properly addressed in advance. Well #8 in Clinton Township is especially prone to the possibility of major UST leaks (some have occurred in the not so distant past) due to the large number of gas stations located within its 2 year critical TOT tier.

STORMWATER MANAGEMENT

Impervious surface can be detrimental to the recharge of the aquifers because it prevents rain and surface runoff from infiltrating soils as well as allows pollutants to accumulate. According to the NJDEP, stormwater and non-point pollution are thought to comprise about 60% of our water pollution problems.

While Lebanon Township has large tracts of open space within its boundaries, Clinton Township is highly commercialized along the Route 31 corridor which transverses the entire length of the SWPA for Well #8. Stormwater runoff increases directly with increasing impervious cover. The hydrological setting for Well #8 also puts it at higher risk than exists for the Bunnvale well field.

Stormwater runoff and management education is a simple, cost-effective way to reduce contaminants entering our waterways. Public education, awareness, and a sense of responsibility is a great way to engage residential participation in a non-regulatory manner.

Source Water Protection Plan Meetings:

- 8/20/2014 Initial meeting with operator Michael Hann at High Bridge Water Department
- 9/17/2014 Meeting with Mike Hann for plan details and information
- 11/11/2014 Contaminated site inventory check
- 11/11/2014 High Bridge Borough environmental commission meeting
- 11/12/2014 High Bridge water system tour and discussion of concerns and solutions
- 11/17/2014 Lebanon Township environmental commission meeting

Steering Committee:

Michael Hann	(908) 638-6588	High Bridge Borough Water Operator	mhannhbdpw@comcast.net
Todd Honeycutt	(908) 627-2461	High Bridge environmental commission	toddhoneycutt@gmail.com
John Moskway	(908) 638-5195	High Bridge environmental commission planning board rep	jnmoskway@embarqmail.com
Diane Seals	(908) 638-4532	High Bridge environmental commission	TSDragonfly01@gmail.com
Lisa Zambito	(908) 268-5340	High Bridge environmental commission & Sustainable Jersey green team lead	lisazambito@embarqmail.com
Audry Burnett	(908) 887-3983	High Bridge environmental commission	ab121507@gmail.com
Lynne Hughes		High Bridge environmental commission	lhughes@highbridge.org
Warren Newman	(908) 763-6094	Lebanon Twp environmental commission	newmanwj@cdmsmith.com
Nancy Roberts-Lawler	(908) 246-9431	Lebanon Twp environmental commission & Musconetcong Watershed Association Water Quality Monitoring Coordinator	nerlawler@comcast.net

Debbie Goodsite	(908) 638-5244	Lebanon Twp environmental commission	picturesleuth@mindspring.com
Marc Laul	(732) 580-2208	Lebanon Twp environmental commission	mlaul@sanmec.com
Adam Duckworth	(732) 616-5181	Lebanon Twp environmental commission	Adam.duckworth@gmail.com
Drew DePalma	(201) 841-0287	Lebanon Twp environmental commission	Ddepalma17@gmail.com
Erik Jan Henriksen	(908) 537-7060	Lebanon Twp environmental commission & Musconetcong Watershed Association Trustee	ehenriksen@comcast.net
Bonnie McDevitt	(609) 242-7111	New Jersey Water Association Source Water Protection Specialist	bonnie@njwater.org

PREVENTATIVE MEASURES DISCUSSED & SUGGESTED

The following list of preventative measures to protect High Bridge Borough's drinking water sources include both suggestions by the NJWA Source Water Protection Specialist and measures discussed during meetings with Michael Hann, High Bridge environmental commission, and Lebanon Township environmental commission.

1. **Infrastructure updates & long-term investments into the water system**

High Bridge Borough Department of Public Works would benefit greatly by investing more money in new water meters as outlined by minor water rate hikes in March 2014. With better technology to track water use and more efficiently bill customers for their water use, more money will be available to invest back into the water system.

A percentage of the even small profit that the water utility makes could be set aside in a separate fund solely for the purpose of infrastructure replacement. Mike Hann reported that in the past 29 years there have been 43 water main breaks throughout the system. In order to protect the source of drinking water we must first begin with infrastructure. *We have to approach infrastructure updates as an investment for long term sustainability and not approach it as a cost.* Road construction is a wasteful use of generated Borough funds if the pipes underground are in bad shape as the road will constantly need to be dug up for "band-aid" repairs.

2. **Zoning options/ tool for future development (regulatory or non-regulatory)**

While a more difficult preventative measure to implement in a small town with zoning ordinances in effect, proper zoning that takes source water protection areas and well head protection areas into account is the most efficient way (other than land conservation/acquisition) to prevent drinking water contamination. The source water protection delineation maps can provide municipalities with an excellent tool for future planning and development.

Restricting future underground storage tanks for commercial operations such as gas stations and dry cleaners within 2 year critical TOT tiers would be one example of sustainable development regarding the health and safety of the community. Well #8 is especially threatened by increasing development along the Route 31 corridor which passes directly through the 2 year TOT tier. Not only is that well prone to contamination from potential highway hazardous waste and oil spills (as has happened in Clinton Township in the past with tanker overturns), but it is also prone to the extensive list of gas stations with USTs that line Route 31 (quite a few of which have had contamination events in the past). The same can be deemed true for the Bunnvale well field which is closely aligned with County Route 513 which also passes through both the 2 and 5 year TOT tiers of the 4 wells located there.

High Bridge Borough Water Department's water sources' location, all outside the Borough limits and jurisdiction, complicate the situation of land acquisition and sense of responsibility by surrounding residents who mainly have their own private wells and septic systems. At the Lebanon Township environmental commission meeting it was discussed that for future land acquisitions it might be a possibility to overlay potential open space with Bunnvale well field's WHPAs. It was also discussed that landowners within the WHPA for Bunnvale well field also be given friendly reminders of proper septic system maintenance of 3-5 year pumping schedules and Best Management Practices for lawn maintenance etc. Prohibiting wastewater from basement sump

pumps and water softeners from being discharged into the septic system to prevent hydraulic loading could also be addressed.

Due to previous contamination at the Bunnvale well field, zoning within the WHPA should seem an obvious solution to potential issues. The expense of installing the VOC air stripper that was required to treat the drinking water to NJDEP standards as well as continued operation and maintenance, electricity, and chemical analysis is tangible evidence of the efficiency zoning can bring a municipality to best protect its drinking water sources. Prevention is cheap relative to the approximately $200,000 it cost to react to contamination in this case.

3. Education/Outreach – runoff, conservation, oil & septic tanks, hazardous wastes etc.

On January 5, 2011 Governor Chris Christie signed one of the most restrictive fertilizer standards for nitrogen and phosphorous into law. Phase I at signing included implementation of BMPs (best management practices) and public education on correct fertilizer application, Phase II included the creation of a certification program for professional fertilizer applicators, and Phase III requires manufacturers to reformulate fertilizers – decreasing the total amount of nitrogen in fertilizer and increasing the amount of slow release nitrogen to 20%. Increasing awareness of this relatively new standard could positively benefit the community as well as the local environment.

Awareness tables with the groundwater model provided by the NJWA Source Water Protection Specialist (all no-cost) set up in High Bridge, Lebanon Township, and Clinton Township as well as other local community events will provide education for both children and adults on well protection and the impacts of runoff to our watersheds. The High Bridge Borough farmer's market takes place from June to October on Saturday mornings and could provide a good outlet for awareness activities. Boy and Girl Scout meetings may be great opportunities for educational activities in the area as well. Teaming up with the local Musconetcong and South Branch Watershed Associations in the area will be a great resource for further promotion of the drinking water protection message.

Readily available information regarding underground storage tanks for heating oil – both residential and commercial – could prove useful at awareness events. Information such as proper maintenance and signs and symptoms of a problem before serious contamination could provide answers to many common questions or address any gaps in consumer knowledge. Information for septic system upkeep and maintenance would also prove useful especially for the residents of Lebanon Township.

Hunterdon County and High Bridge Borough do have the links to information for hazardous waste collection days on their website. However, Lebanon Township could provide the link on their webpage as well and send out informational emails for the dates and locations. The link and list of wastes included in the drop-off could be included in the educational pamphlets etc.

4. Inventory of businesses in High Bridge Borough's SWPAs

High Bridge Borough with the help of the local Boards of Health and possibly environmental commissions could complete an inventory of the commercial operations within the source water protection areas to ensure proper storage and disposal of hazardous materials and substances. This information is important for the upkeep of the Borough's contingency plan and knowledge in case

of an emergency. Many businesses do exist within the critical 2 year TOT tier for the Borough's drinking wells.

5. **Promote Farm Service Agency & Natural Resources Conservation Service farm programs to local producers**

The Farm Service Agency and Natural Resources Conservation Service, under the USDA, have many innovative farm programs in effect to protect water resources from runoff and degradation. One such program is the Conservation Reserve Enhancement Program (CREP) which was launched in 2004 to provide incentive for farmers to take riparian lands out of production and plant buffer strips of grasses and native trees along them. This win-win voluntary program prevents nutrients, eroded soil, fertilizers, and pesticides from washing into adjacent waterways. Signing incentive payments of $100/acre, annual rental payments, cost-share assistance and practice incentive payments are possibilities for participants in this program.

6. **Water Supply Area Signs**

Water supply area signs notify the traveling public that they will be traveling through a water supply area, the number of miles they will be traveling through the area, and the spill response number to call if a hazardous spill or accident occurs. Signs could be located along Route 31 and Route 513 for High Bridge Water Department's source water protection areas. New Jersey Department of Transportation would have to approve such signs and designate approved locations. Signage for this purpose has been funded by League of Women Voters in certain areas of New Jersey in the past. Drinking water protection area signs can be posted around all 5 wells.

CONTINGENCY PLAN FOR HIGH BRIDGE BOROUGH

The Borough of High Bridge has five wells that are supplied electricity by GPU. All of the wells have backup power supplied by diesel generators in the event of a power outage. Finished drinking water is stored in a 1 million gallon tank located on Fairview Avenue which can gravity feed the entire water system. A mechanical float in the tank controls the operation of the well pumps. The stored water in the tank is capable of supplying the Borough for approximately 2.8 days at normal average daily water use.

The Borough wells are interconnected. Should a problem arise with any single well it can be isolated from the system and the remaining wells could supply sufficient drinking water to the system. System maps and records are located in the High Bridge Department of Public Works maintenance office.

All connections are metered and individual connections could be shut off from the distribution system as necessary. Mandatory water conservation measures would be put into effect in event of an emergency. Mailers, flyers, and information to the Borough website (highbridge.org) would be used to institute non-mandatory water conservation measures. Residents can also be notified through the bi-annual newsletter put out by High Bridge Borough. In the event of a state-wide emergency the Borough would follow the state-instituted water conservation program guidelines.

High Bridge Borough has its own Emergency Management Plan and is also part of Hunterdon County's Emergency Management Plan which addresses contingency plans for drinking water in case of local emergencies and the need for adequate water supply for fire safety.

EMERGENCY CONTACT LIST

Michael Hann
Director of Public Works and Utilities
Work Phone: (908) 638-6588
Cell Phone: (908) 892-7218
Fax: (908) 638-6772
Email: mhannhbdpw@comcast.net

Rick Roll
Public Works and Utilities
Cell Phone: (908) 399-3307

Scott Hammel
Public Works and Utilities
Cell Phone: (908) 235-8722

Joe Trilone
Emergency Management Coordinator
Office Phone: (908) 638-6455
Home Phone: (908) 638-5220

Brett Bartman
Chief of Police
Emergencies dial 911
Non-emergency phone: (908) 638-6500

Brian Labuta
High Bridge Fire Department Chief
Emergencies dial 911
Home phone: (908) 638-8922

John T. Silliman
High Bridge Emergency Squad Chief
Emergencies dial 911
Office phone: (908) 638-4441

Debra Vaccarella
Hunterdon County Health Department
Office Phone: (908) 788-1351
Website: www.co.hunterdon.nj.us

Hunterdon County Office of Emergency Management: (908) 788-1196

Lebanon Township Emergency Management: (908) 835-8889

NJDEP 24-hour hotline: 1-877-WARNDEP

LOCAL MEDIA CONTACT LIST

Newspapers:

Hunterdon Review	(908) 735-4081
Hunterdon County Democrat	(908) 735-7173
The Trenton Times	(609) 396-3232
The Trentonian	(609) 989-7800
Courier News	(609) 722-8800

Radio Stations:

NJFM Radio – Trenton	(609) 882-4600
WHWH – Princeton	(609) 924-3600
WPST – Trenton	(609) 896-2112

RESOURCES

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The Weather Channel. Monthly averages for Clinton, NJ. <http://www.weather.com/weather/wxclimatology/monthly/graph/08809>.

NJDEP Regional Contact Information

State of New Jersey
Department of Environmental Protection
401 E. State St
Trenton, NJ 08625-0420

NJDEP website: www.state.nj.us/dep/
Emergency phone number: 1-877-WARNDEP

Bureau of Safe Drinking Water

Sandra Krietzman
Bureau Chief
609-292-5550

EPA Regional Contact Information

U.S. Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866

EPA Safe Drinking Water Hotline: 1-800-426-4791
EPA website for small systems: http://water.epa.gov/type/drink/pws/smallsystems/index
EPA Emergency/Incident Information: http://water.epa.gov/drink/emerprep/index

EPA Water Programs

Stephen Gould
Source Water Coordinator
212-637-3822

New Jersey Water Association Contact Information

New Jersey Water Association (NJWA)
54 Main St
Waretown, NJ 08758

NJWA website: www.njwater.org

Bonnie McDevitt
Source Water Protection Specialist
bonnie@njwater.org
609-242-7111

APPENDIX B: NJDEP SOURCE WATER ASSESSMENT SUMMARY FOR HIGH BRIDGE WATER DEPARTMENT

High Bridge Water Department- PWSID # 1014001

High Bridge Water Department is a public community water system consisting of 5 well(s), 0 wells under the influence of surface water, 0 surface water intake(s), 0 purchased ground water source(s), and 0 purchased surface water source(s).

This system's source water comes from the following aquifer(s) and/or surface water body(s) (if applicable): igneous and metamorphic rocks,Jacksonburg limestone, Kittatinny Supergroup and H

This system purchases water from the following water system(s) (if applicable):

Susceptibility Ratings for High Bridge Water Department Sources

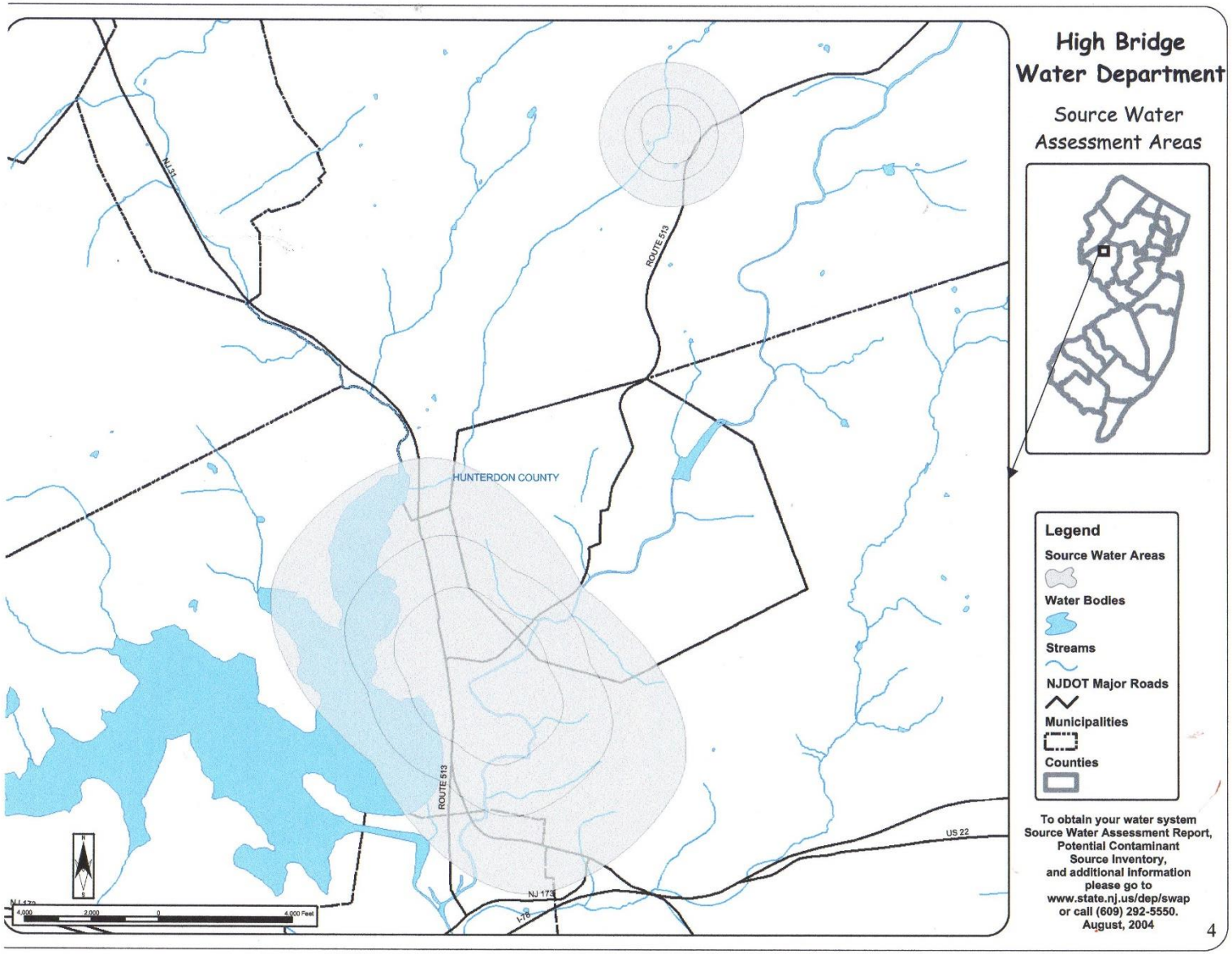
The table below illustrates the susceptibility ratings for the seven contaminant categories (and radon) for each source in the system. The table provides the number of wells and intakes that rated high (H), medium (M), or low (L) for each contaminant category. For susceptibility ratings of purchased water, refer to the specific water system's source water assessment report.

The seven contaminant categories are defined at the bottom of this page. DEP considered all surface water highly susceptible to pathogens, therefore all intakes received a high rating for the pathogen category. For the purpose of Source Water Assessment Program, radionuclides are more of a concern for ground water than surface water. As a result, surface water intakes' susceptibility to radionuclides was not determined and they all received a low rating.

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. As a result of the assessments, DEP may customize (change existing) monitoring schedules based on the susceptibility ratings.

	Pathogens			Nutrients			Pesticides			Volatile Organic Compounds			Inorganics			Radio-nuclides			Radon			Disinfection Byproduct Precursors		
Sources	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
Wells - 5		5		4	1			2	3	1		4		1	4	1	4		5			1	4	
GUDI - 0																								
Surface water intakes - 0																								

- **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.


High Bridge
Water Department
Source Water
Assessment Areas
HUNTERDON COUNTY
ROUTE 513
ROUTE 513
NJ 31
NJ 173
US 22
Legend
Source Water Areas
Water Bodies
Streams
NJDOT Major Roads
Municipalities
Counties
To obtain your water system
Source Water Assessment Report,
Potential Contaminant
Source Inventory,
and additional information
please go to
www.state.nj.us/dep/swap
or call (609) 292-5550.
August, 2004
4

APPENDIX A - ATTACHMENT 6

Source Water Assessment Maps

This attachment consists of several source water assessment maps and a key. A separate map has been created for each ground water and surface water susceptibility model. The key describes the symbols used on all of the source water assessment maps.

In the case of ground water, there are seven source water assessment maps, one for each of the contaminant categories: pathogens, nutrients, pesticides, volatile organic compounds (VOCs), inorganics, radionuclides/radon, and disinfection byproduct precursors (DBPs).

For surface water, five source water assessment maps were developed: nutrients, pesticides, volatile organic compounds (VOCs), inorganics, and disinfection byproduct precursors (DBPs). As a result of not developing a pathogen or radionuclide susceptibility model for surface water, maps were not created for these contaminant categories.

The source water assessment maps illustrate the source water assessment area and the potential contaminant sources used in determining a source's susceptibility. Only the intensity explanatory variables are illustrated. For example, for the Nutrient Surface Water Susceptibility Model map, 1995 land use (agricultural and urban) and sewage treatment plants are shown.

The source water assessment maps show the potential sources of contamination that are within and outside of the source water assessment area. DEP decided to include the potential contaminant sources outside of the source water assessment area because there may be mapping inaccuracies. Including potential contaminant sources outside of the assessment area will illustrate those sites that fall within a close proximity to the assessment area and provide additional information. The Geographic Information System datasets were obtained from the appropriate DEP programs.

The sites in the maps were not labeled however information such as DEP program and site name can be found in Appendix A-Attachment 2 for sites in the source water assessment areas. Additional information for sites outside of source water assessment areas can be found on DEP's I-Map available at http://www.state.nj.us/dep/. For questions pertaining to specific sites please contact the appropriate program. Please refer to Appendix C - Attachment 1 for contact information.

Key For New Jersey Source Water Assessment Maps

Public Community Source Types
- Wells

Groundwater Source Water Assessment Area
- Tier 1-2 Year Time of Travel (TOT)
- Tier 2-5 Year Time of Travel (TOT)
- Tier 3-12 Year Time of Travel (TOT)

Surface Water Source Water Assessment Area

Compliance & Enforcement Program
- Discharge Prevention & Countermeasures Plans & Discharge Cleanup & Removal Plans (DPCC)

NJ Pollutant Discharge Elimination System Facilities (NJPDES)
- Discharge to Groundwater Permits
- Discharge to Surface Water Permits
- Stormwater Permits
- Sewerage Treatment Plants

Site Remediation Program Facilities
- Known Contaminated Sites List 2001
- Underground Storage Tanks (UST)

Solid & Hazardous Waste Facilities
- Class B Recycling Facilities
- Compost Facilities
- Solid Waste Landfills
- Solid Waste Resource Recovery Facilities
- Solid Waste Transfer Facilities

Miscellaneous
- DOT Roads
- Golf Courses
- Lakes
- NJ County Boundaries
- NJ Municipal Boundaries
- Railroads
- Streams

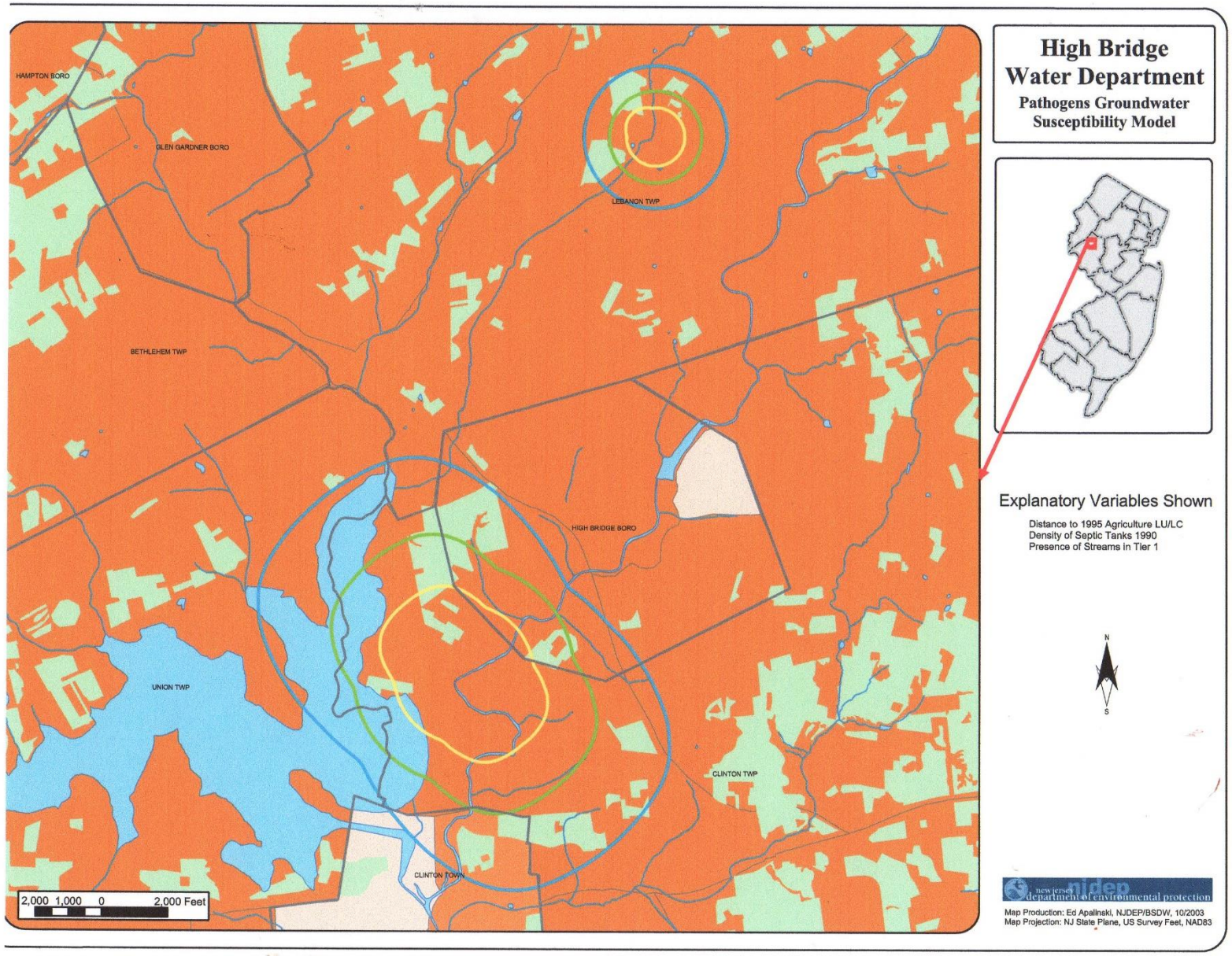
1990 Census (Population/sqmi)
- 0 - 1,000
- >1,000 - 5,000
- >5,000 - 10,000
- >10,000 - 50,000
- >50,000 - 150,220

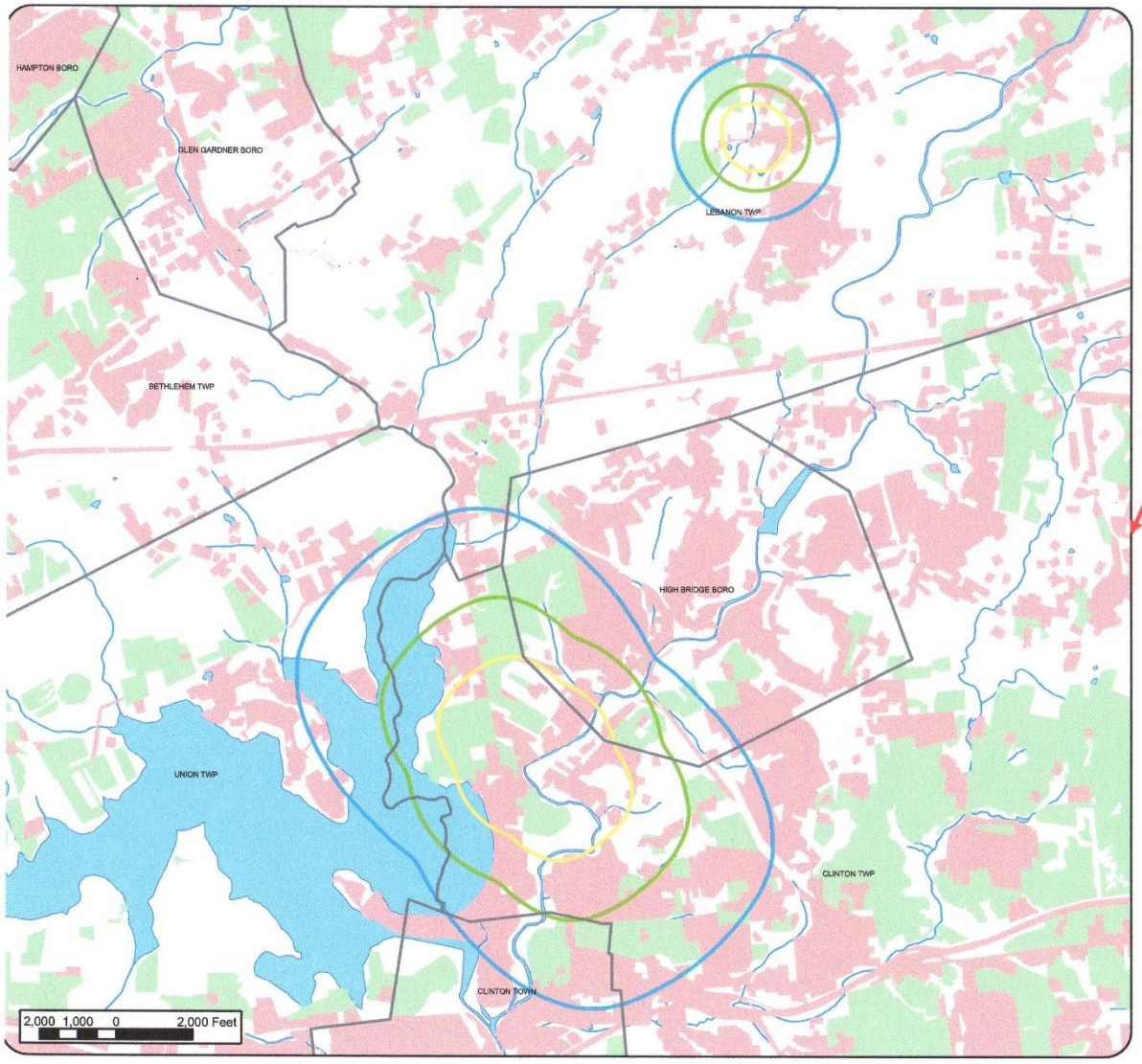
1995 Impervious Surface (%)

0	35	70
5	40	75
10	45	80
15	50	85
20	55	90
25	60	95
30	65	100

Land Use/Land Classification Types
- 1995 Agriculture LU/LC
- 1995 Barren LU/LC
- 1995 Commercial/Industrial LU/LC
- 1995 Developed LU/LC
- 1995 Residential LU/LC
- 1995 Urban LU/LC
- 1995 Wetlands LU/LC
- 1986 Agriculture LU/LC
- 1970 Agriculture LU
- 1970 Urban LU

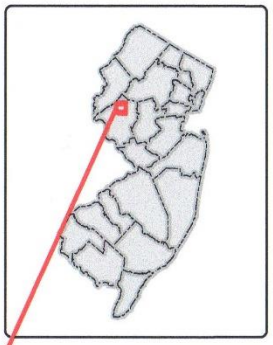
1990 Septic Tank Density (per sqmi)
- 0.0 - 0.9
- >0.9 - 1.8
- >1.8 - 2.7
- >2.7 - 3.6
- >3.6 - 7.5
- >7.5 - 4859.6


High Bridge
Water Department
Pathogens Groundwater
Susceptibility Model
HAMPTON BORO
GLEN GARDNER BORO
LEBANON TWP
BETHLEHEM TWP
HIGH BRIDGE BORO
UNION TWP
CLINTON TWP
CLINTON TOWN
2,000 1,000 0 2,000 Feet
Explanatory Variables Shown
Distance to 1995 Agriculture LU/LC
Density of Septic Tanks 1990
Presence of Streams in Tier 1
N
S
new jersey department of environmental protection
Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83



High Bridge Water Department

Nutrient Groundwater Susceptibility Model

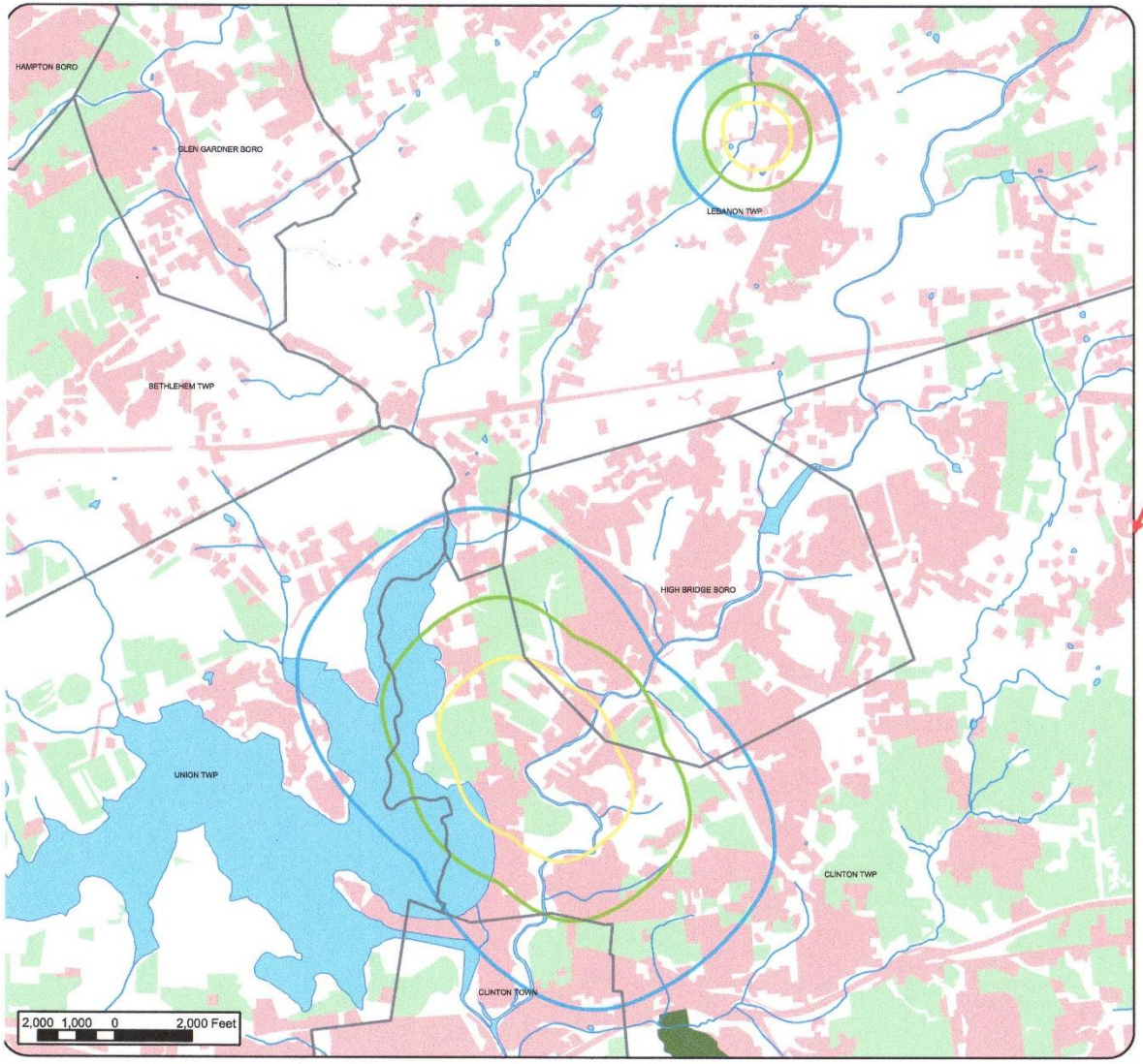


Explanatory Variables Shown

Percent 1995 Urban LU/LC
Percent 1986 Agriculture LU/LC

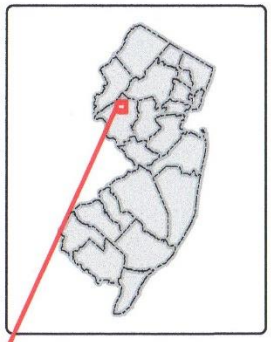
new jersey department of environmental protection

Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83



High Bridge Water Department

Pesticide Groundwater Susceptibility Model

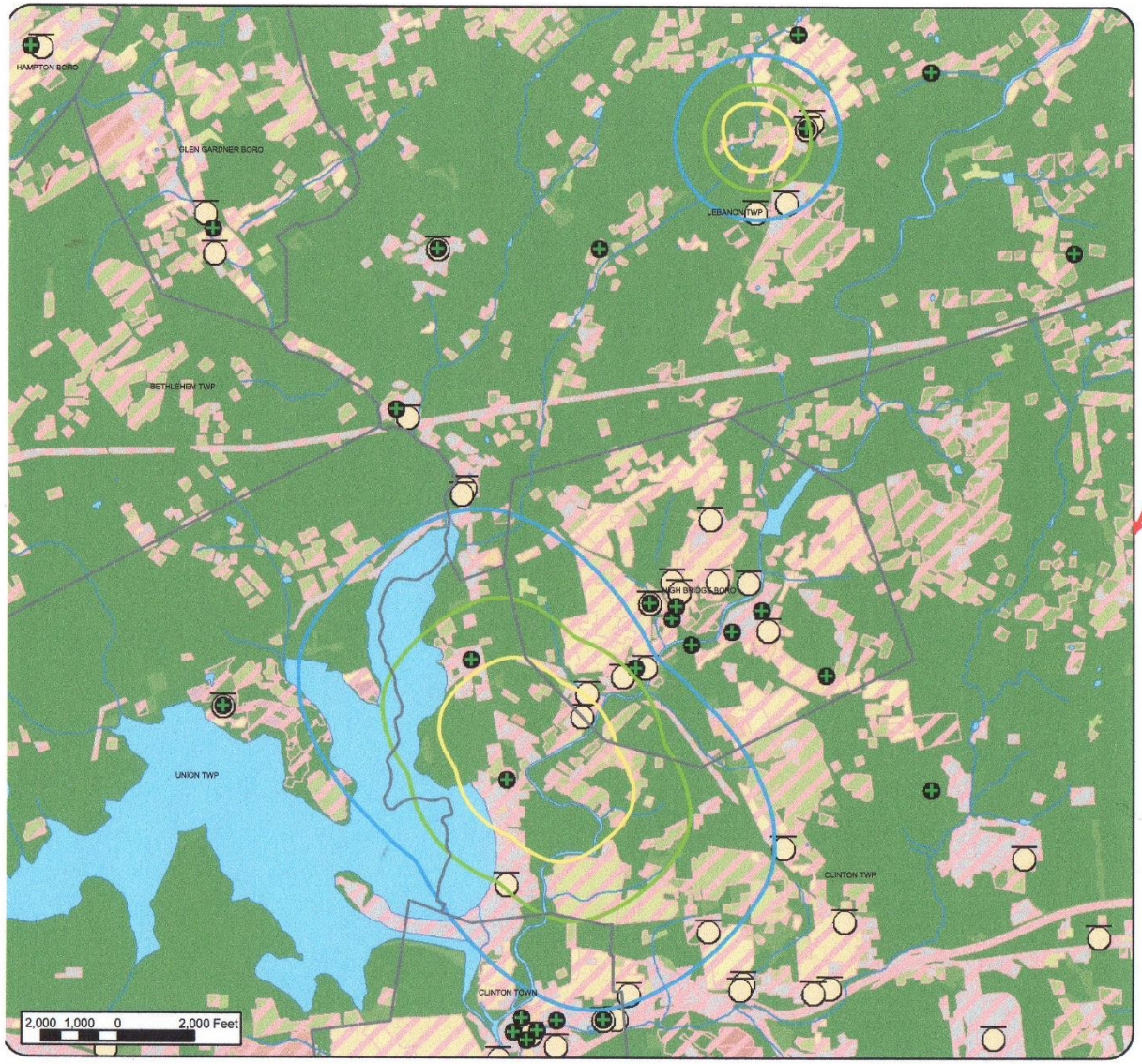


Explanatory Variables Shown

Distance to 1995 Agriculture LU/LC
Percent of 1995 Urban LU/LC
Percent of 1986 Agriculture LU/LC
Distance to Golf Courses

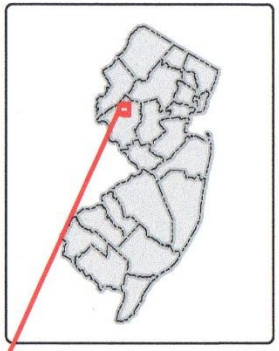
new jersey department of environmental protection

Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83



High Bridge Water Department

VOCs Groundwater Susceptibility Model

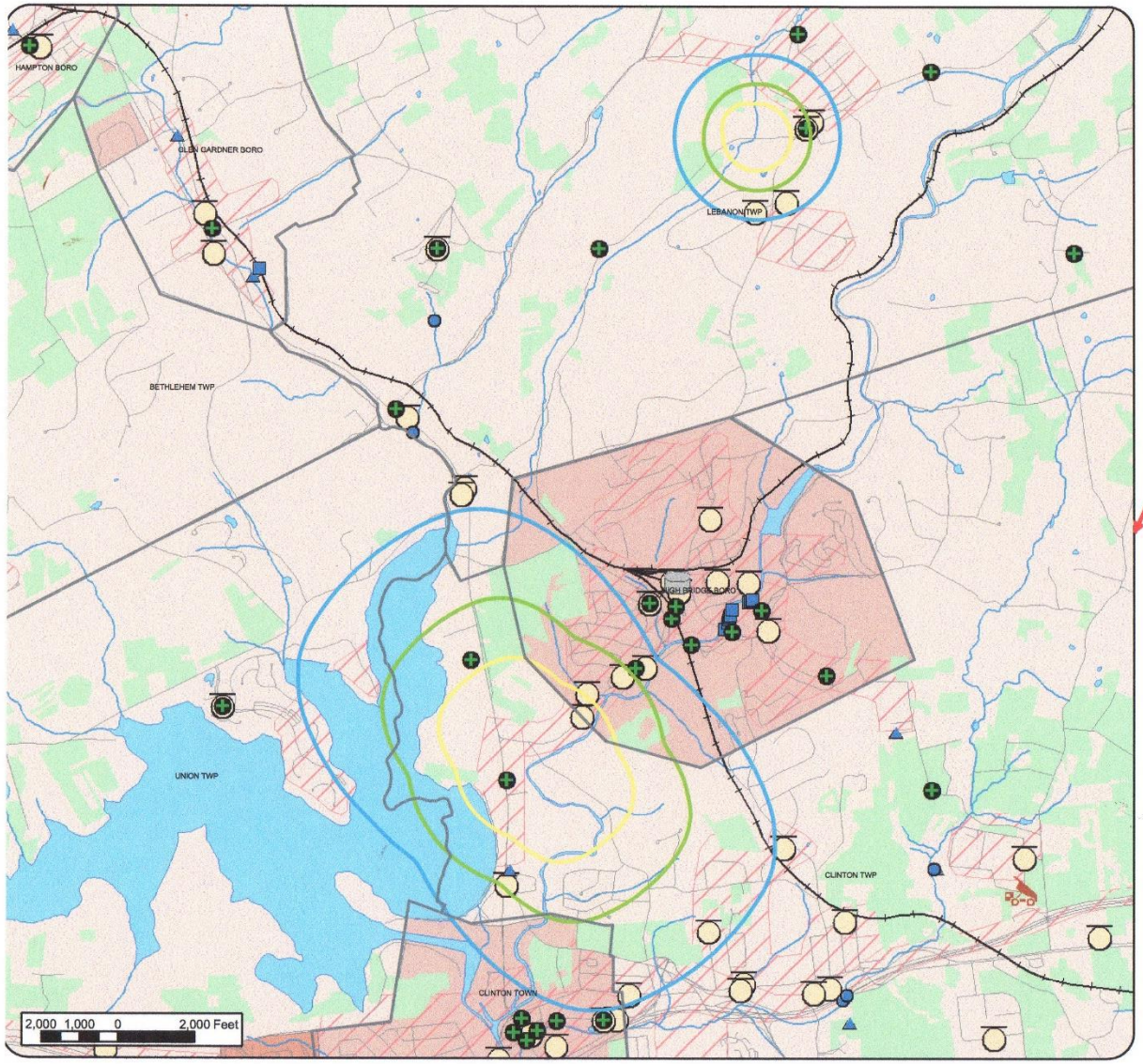


Explanatory Variables Shown

Percent 1995 Impervious Surface
Percent 1995 Commercial/Industrial LU/LC
Square Miles 1995 Urban LU/LC
Density Known Contaminated Sites 2001,
Solid Waste Landfills,
Underground Storage Tank Registrations

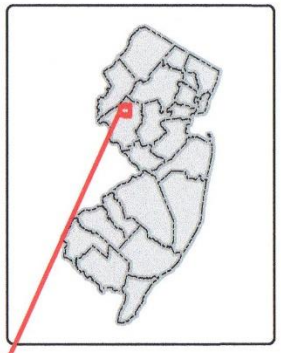
new jersey department of environmental protection

Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83



High Bridge Water Department

Inorganic Groundwater Susceptibility Model



Explanatory Variables Shown

Distance to 1995 Agriculture LU/LC
Percent 1995 Barren LU/LC
Percent 1970 Urban LU
Population Density 1990 Census (Tier 1)
Distance to NJ DOT Roads
Length of Railroads
Distance to Sewerage Treatment Plants
Density of Sewerage Treatment Plants
Density of Class B Recycling Facilities,
Compost Facilities, DPCC Facilities,
Known Contaminated Sites 2001,
NJPDES Discharge to Groundwater,
NJPDES Discharge to Surface Water,
NJPDES Storm Water,
Solid Waste Landfills,
Solid Waste Resource Recovery Facilities,
Solid Waste Transfer Facilities,
Underground Storage Tank Registrations

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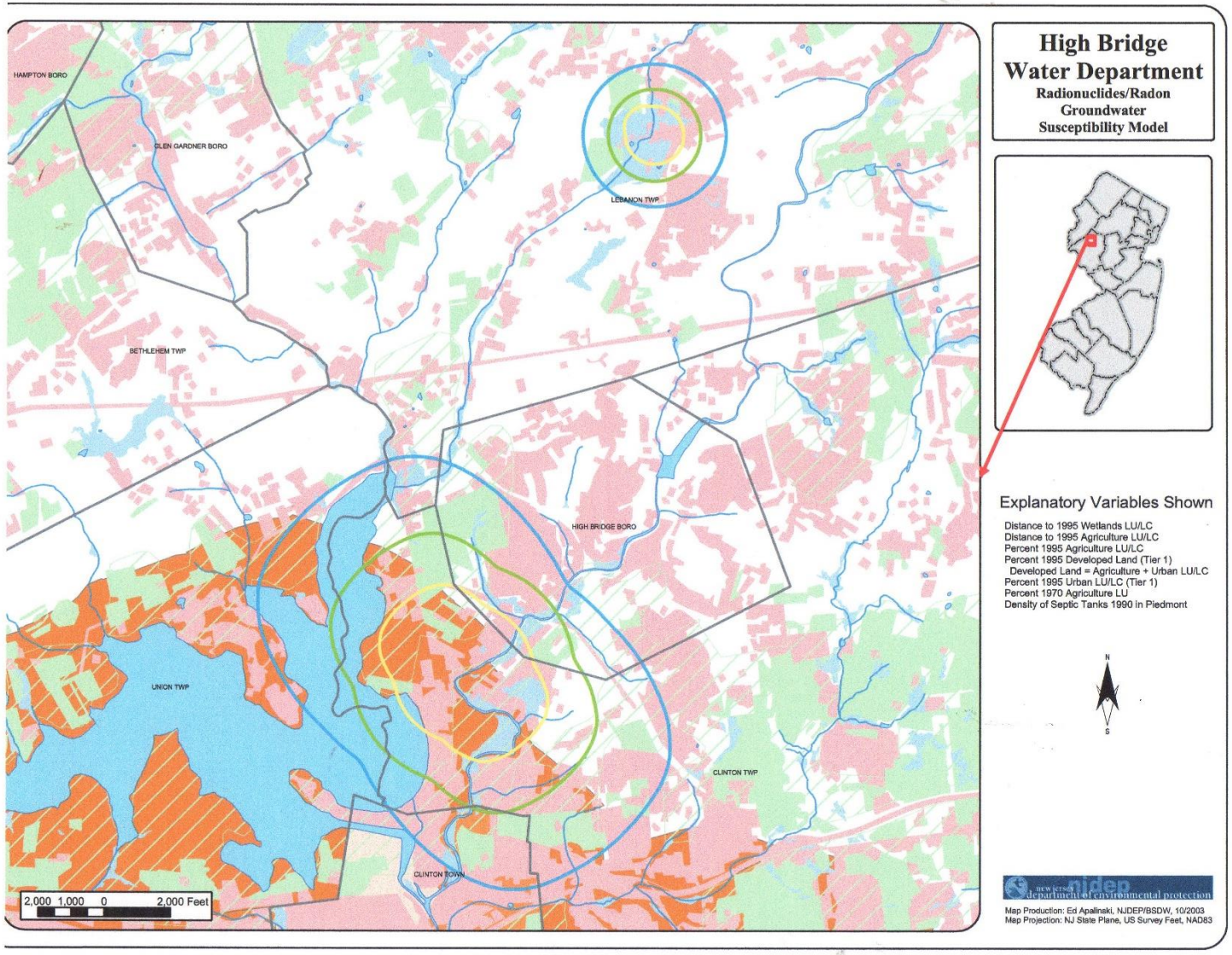
new jersey department of environmental protection

Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83


HAMPTON BORO
GLEN GARDNER BORO
LEBANON TWP
BETHLEHEM TWP
HIGH BRIDGE BORO
UNION TWP
CLINTON TWP
CLINTON TOWN
2,000 1,000 0 2,000 Feet
High Bridge
Water Department
Radionuclides/Radon
Groundwater
Susceptibility Model
Explanatory Variables Shown
Distance to 1995 Wetlands LU/LC
Distance to 1995 Agriculture LU/LC
Percent 1995 Agriculture LU/LC
Percent 1995 Developed Land (Tier 1)
Developed Land = Agriculture + Urban LU/LC
Percent 1995 Urban LU/LC (Tier 1)
Percent 1970 Agriculture LU
Density of Septic Tanks 1990 in Piedmont
N
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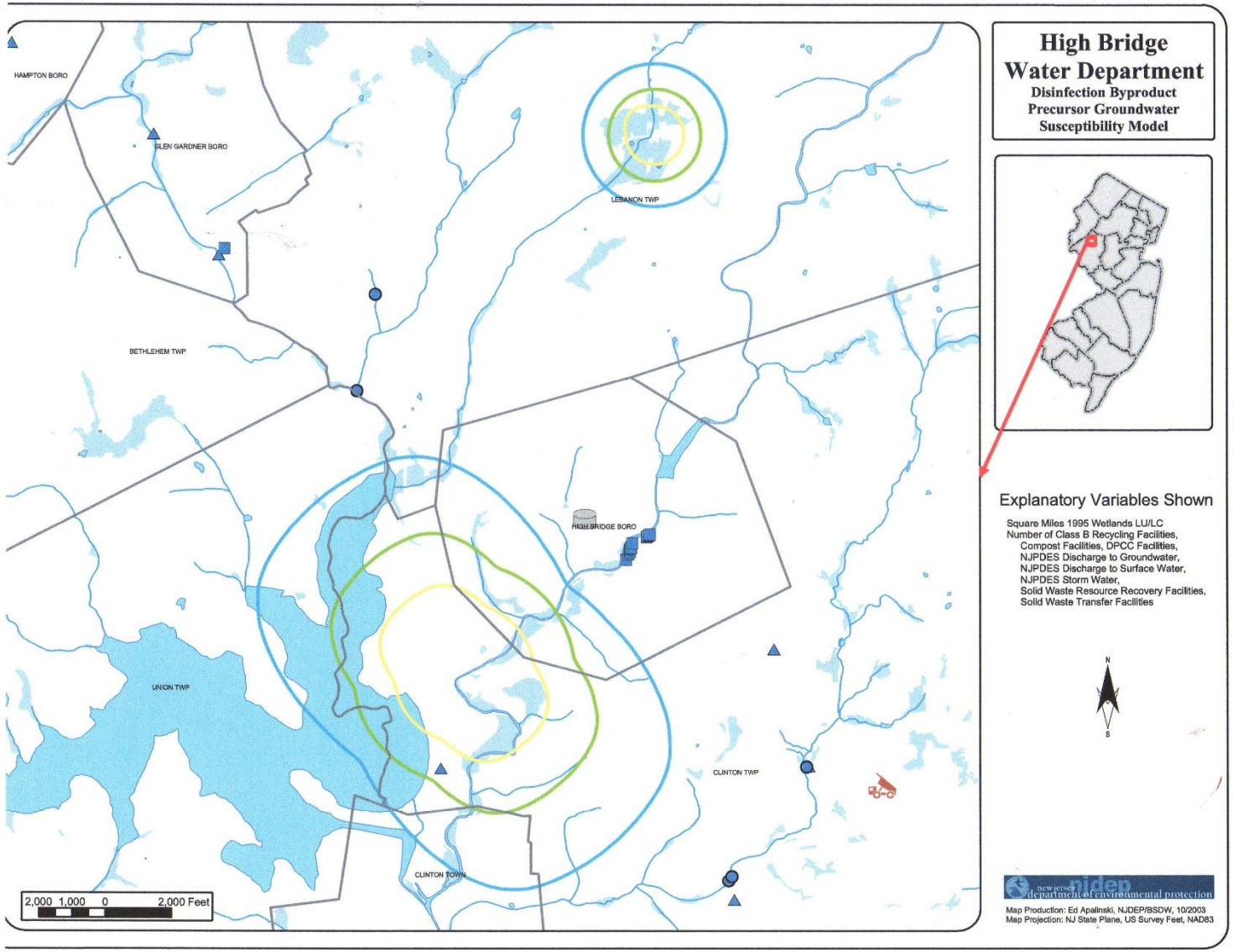
NEW JERSEY
department of environmental protection
Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83


High Bridge
Water Department
Disinfection Byproduct
Precursor Groundwater
Susceptibility Model
Explanatory Variables Shown
Square Miles 1995 Wetlands LU/LC
Number of Class B Recycling Facilities,
Compost Facilities, DPCC Facilities,
NJPDES Discharge to Groundwater,
NJPDES Discharge to Surface Water,
NJPDES Storm Water,
Solid Waste Resource Recovery Facilities,
Solid Waste Transfer Facilities
N
S
HAMPTON BORO
GLEN GARDNER BORO
LEBANON TWP
BETHLEHEM TWP
HIGH BRIDGE BORO
UNION TWP
CLINTON TWP
CLINTON TOWN
2,000 1,000 0 2,000 Feet
new jersey department of environmental protection
Map Production: Ed Apalinski, NJDEP/BSDW, 10/2003
Map Projection: NJ State Plane, US Survey Feet, NAD83

APPENDIX D: GLOSSARY OF ACRONYMS AND ABBREVIATIONS

BSDW – Bureau of Safe Drinking Water

EPA – Environmental Protection Agency

ERP – Emergency response Plan

FEMA – Federal Emergency Management Agency

GIS – Geographic Information Systems

GPD – Gallons per day

GPM – Gallons per minute

GPS – Global Positioning System

NRCS – National Resources Conservation Service

NJDA – New Jersey Department of Agriculture

NJDEP – New Jersey Department of Environmental Protection

NJ DOT – New Jersey Department of Transportation

NJGS – New Jersey Geological Survey

NJWA – New Jersey Water Association

PCE – tetrachloroethene (volatile organic compound)

PG – Professional Geologist

SDWA – Safe Drinking Water Act

SOC – Synthetic Organic Compounds

SWP – Source Water Protection

SWPA – Source Water Protection Area

USDA – United States Department of Agriculture

USEPA – United States Environmental Protection Agency

USGS – United States Geologic Survey

VOC – Volatile Organic Compound

WHP – Well Head Protection

WHPA – Well Head Protection Area

WSP – Watershed Protection