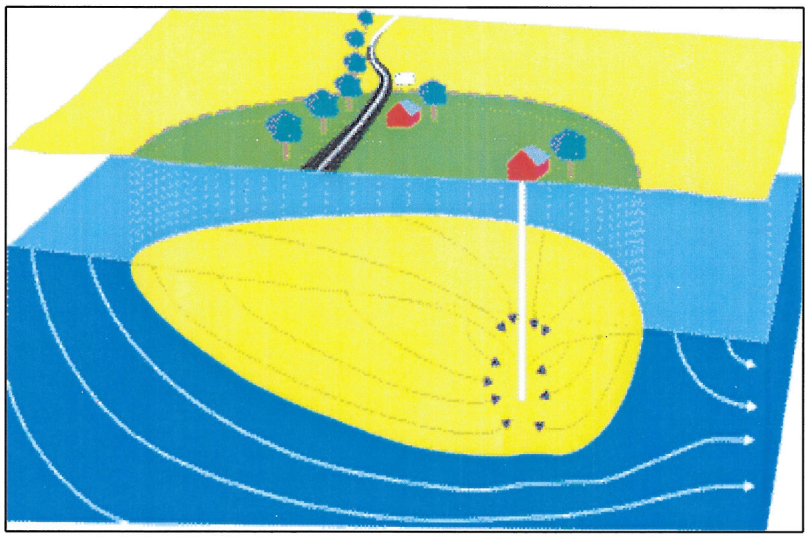
SOURCE WATER ASSESSMENT

FOR THE LAKESIDE VISTA WATER SUPPLY

HARFORD COUNTY, MD



Prepared By
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Water Supply Program
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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted an assessment of the vulnerability of the Lakeside Vista ground water sources to contamination. The required components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are: 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of the Lakeside Vista water supply draw water from an unconfined fractured rock aquifer known as the James Run Gneiss Formation. Unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area (WHPA). The system currently uses two production wells and one standby well to obtain their drinking water. The WHPA was delineated using U.S. EPA approved methods specifically designed for each source.

Potential sources of contamination within the assessment area were identified based on site visits, database reviews and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and potential contaminant sources within the Wellhead Protection Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for the Lakeside Vista water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that the Lakeside Vista wells are susceptible to contamination by nitrate. Should the EPA adopt a drinking water standard for radon-222, the Lakeside Vista wells may also be susceptible to this naturally occurring contaminant. The Lakeside Vista water supply was determined not susceptible to volatile organic compounds, synthetic organic compounds, microbiological pathogens, and other regulated inorganic compounds and radionuclides.

INTRODUCTION

The Lakeside Vista Water System is located about 3.2 miles south of Bel Air and 0.25 mile west of the Atkisson Reservoir Dam in Harford County (Figure 1). The community water system serves the residents of Lakeside Vista subdivision. The system serves approximately 220 persons through 81 service connections. The water system is privately owned and operated by Greenridge Utilities, a subsidiary of Utilities Incorporated of Maryland. The water is supplied by two production wells and one standby well that are pumped to a single water treatment plant located just north of Lake Vista Drive (Figure 1 and Appendix A).

WELL INFORMATION

Well information was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary survey inspection reports and published reports. A review of well data and sanitary surveys of the Lakeside Vista water system indicates that Well 3 meets current well construction standards for grouting and casing. Wells 1 and 2 were drilled prior to 1973 when regulations went into effect, and may not meet current construction standards. Well 2 is located in a concrete vault, but its casing was extended to about 2 feet above ground level. Wells 1 and 3 are located outside with casings extending about 1.5 to 2 feet above ground surface (Appendix A). Therefore, the three wells should not be prone to flooding from storm water runoff.

Well 1 is used as a backup supply only, and Wells 2 and 3 are the main production wells. A well application was submitted to MDE in 1983 to drill a fourth well for this system. However, the file indicates that this well was never drilled. Table 1 contains a summary of the well construction data.

PLANT ID	SOURCE NAME	WELL PERMIT NO.	TOTAL DEPTH (ft.)	CASING DEPTH (ft.)	YEAR DRILLED	AQUIFER
01	WELL 1 (LAKE VISTA DRIVE)	HA047743	120	47	1962	JAMES RUN GNEISS
	WELL 2 (CORNUS WAY)	HA047742	152	59	1962	
	WELL 3 (VERBENA DRIVE)	HA813096	250	26	1986	

Table 1. Lakeside Vista Well Construction Information

Water Appropriation Permit No. HA1962G006 allows the system to use an average of 24,000 gallons per day (gpd) and 40,000 gpd in the month of maximum use. Based on reported pumpage from 2004, the system used an average of 14,734 gpd and 16,969 gpd during the month of maximum use. The average pumpage data reported over the past ten years shows daily averages of 14,912 gpd, and 17,379 gpd for the month of maximum use. According to the operator, standby Well 1 pumps at a rate of 7 gallons per minute (gpm), whereas the combined pump rate of production Wells 2 and 3 is between 72 to 75 gpm.

HYDROGEOLOGY

Based on the Geologic Map of Harford County (MGS, 1968), two geologic formations underlie the Lakeside Vista subdivision. They are the Port Deposit Gneiss of early Paleozoic age, and the James Run Gneiss possibly of late Precambrian age. The James Run Gneiss is described as a sharply layered, thin to thick bedded gneiss composed of biotite-quartz-plagioclase gneiss, and quartz amphibolite. It occurs as volcaniclastic inclusions within the Port Deposit Gneiss that are oriented in a northeast to southwest direction in this area (Southwick, 1968). The Port Deposit gneiss is described as a moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite, quartz diorite, and biotite granodiorite. The rocks were re-crystallized by low-grade metamorphism and are foliated and strongly sheared (Nutter & Otten, 1969). The MDE Water Appropriation Permit places the Lakeside Vista wells in the James Run Gneiss Formation. Since the two formations behave similarly from a hydrogeologic standpoint, this report will remain consistent with designations used in the permit.

The primary porosity and permeability of these aquifers is small due to the crystalline nature of the rock. Ground water moves through secondary porosity, fractures, and joint openings, and is recharged by precipitation percolating through the overlying soils, and weathered bedrock called saprolite. The yield of a well in crystalline rock depends primarily on the number of fractures penetrated by the well. Typically, the water table in the aquifer mimics the surface topography. The fractured rock aquifers in this area are unconfined.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. Ground water flow in unconfined fractured rock aquifers is complex and cannot be accurately modeled by a homogeneous analytical model. Consistent with the recommended delineation in the Maryland Source Water Assessment Plan (MDE, 1999), the watershed drainage area that contributes ground water to the supply wells methodology was used. The delineation area accounted for ground water drainage divides from natural streams, topography, significant land features, and a conservative calculation of total ground water recharge during a drought.

The Lakeside Vista WHPA is irregularly shaped, and has an area of 96.8 acres. The boundaries of the WHPA extend outward from the wells to include stream boundaries, and topographic highs (Figure 2). In addition, the annual average recharge needed to supply the wells was also calculated. A drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground water contribution area required to supply the wells. The current Water Appropriation Permit for the Lakeside Vista Water Works is for an average daily withdrawal of 24,000 gallons. The total ground water contribution area was calculated from the following equation:

Recharge Area (acre) = Average Use (gpd) / Drought Condition Recharge (gpd/acre)

From the above equation, the total ground water contributing area during a drought is approximately 60 acres. The delineated WHPA of 96.8 acres is therefore more than adequate to meet the average daily ground water usage during a drought. The WHPA indicates a general ground water flow direction toward the southeast.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, controlled hazardous substance generators, ground water discharge permit sites, and ground water contamination sites. These sites are generally associated with commercial or industrial facilities that use or store chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as the use of pesticides, application of fertilizers, animal wastes, or septic systems that may lead to ground water contamination over a larger area.

The WSP met with a Greenridge Utilities operator on 1/25/05 to discuss water quality concerns, and to observe the integrity of the wells. Also, data was collected regarding the locations of the wells using Global Positioning System (GPS) equipment, and a windshield survey was conducted to locate and map potential sources of contamination located within and near the WHPA.

Point Sources

A review and consultation with MDE Waste and Water Management Administration Program databases and personnel was conducted. Currently, there is no record of any registered underground storage tanks (USTs), hazardous waste sites, ground water contamination sites, solid waste facilities, ground water discharge permitted sites, and pesticide dealers within the Lakeside Vista WHPA.

Residential underground heating oil tanks, and other household hazardous chemicals are potential point sources of contaminants that could enter the water supply if they are not properly maintained, handled, and stored.

Non-Point Sources

The Maryland Office of Planning's 2002 digital land use map for Harford County was used to determine the predominant types of land use in the Lakeside Vista WHPA (Figure 3). The breakdown of land use types is shown on Table 2. Note that residential followed by forested lands make-up the largest portion of land use in the WHPA.

LAND USE TYPE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	17.24	17.80
Medium Density Residential	33.02	34.09
Cropland	10.07	10.40
Forest	36.52	37.71
Total Area	96.85	100.00

Table 2. Land Use in the Lakeside Vista WHPA (See Figure 3)

The use of private septic systems, lawn maintenance and landscaping activities in residential areas, and agricultural fields are all potential non-point sources of nitrates, microbial pathogens, and SOCs to ground water. Private septic systems are commonly associated with nitrate loading of ground water and pose a potential risk to the aquifer that supplies water to Lakeside Vista.

Storm water runoff is also a concern since it may contain various contaminants that could infiltrate into the ground near the production wells.

A review of the Maryland Office of Planning 2003 Harford County Sewerage Coverage Map indicates that there are no plans for public sewerage service in this area.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database and system files for Safe Drinking Water Act contaminants. The State's SWAP defines a threshold for reporting water quality data as 50% of the Maximum Contaminant Level (MCL). If a monitoring result is at or greater than 50% of a MCL, this assessment will describe the sources of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The raw ground water is treated at the Lakeside Vista Plant with sodium hypochlorite for disinfection, and caustic soda for corrosion control prior to distribution.

A review of the monitoring data since 1990 indicates that the Lakeside Vista water supply meets the current drinking water standards. The water quality sampling results are summarized on Table 3.

PLANT ID	Nitrate		SOCs		VOCs		IOCs (except nitrate)		Radionuclides	
	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL
01	30	24	7	0	17	0	6	0	5	2*

Table 3. Summary of Water Quality Samples for the Lakeside Vista Water Supply

* Based on lower proposed MCL for radon-222

Inorganic Compounds (IOCs)

The only IOC detected above 50% of its MCL is nitrate. Table 4 summarizes the nitrate detects above 50% of its MCL of 10 parts per million (ppm). The average nitrate level since 1993 is 5.7 ppm. Nitrite was detected once in 1995 at 0.003 ppm, well below its MCL of 1 ppm. It was not detected again in two subsequent rounds of testing. Chromium was detected once in 2001 at a very low level of 0.002 ppm. The MCL for chromium is 0.1 ppm. The contaminant was not detected again from the latest set of sampling results in 2004.

CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	20-Jan-97	5.8
		7-Apr-97	5.18
		7-Jul-97	6.23
		14-Jan-98	6.26
		13-Mar-98	5.7
		22-Apr-98	8.72
		8-Jul-98	5.74
		4-Nov-98	7.39
		21-Apr-99	5.6
		9-Aug-99	5.8
		19-Apr-00	6.3
		5-Jul-00	6
		11-Dec-00	6.2
		17-Jan-01	5.4
		18-Apr-01	5.3
		11-Jul-01	6
		2-Jan-02	6.2
		3-Apr-02	5.8
		17-Jul-02	5.8
		22-Jan-03	5.8
		7-Jan-04	6.5
		14-Apr-04	5.6
		7-Jul-04	5.4
		7-Sep-04	6

Table 4. IOC Detects above 50% of the MCL in the Lakeside Vista Water Supply

Volatile Organic Compounds (VOCs)

The only VOCs detected at very low levels from 17 sets of available sampling data since 1990 are 1,1,1-trichloroethane, monochlorobenzene, carbon tetrachloride, trichloroethylene (TCE), and disinfection by-products known as trihalomethanes (THMs). With the exception of 1,1,1-trichloroethane and THMs, the other compounds were only detected once in 1990 at very low levels well below their respective MCLs and have not been detected since from several rounds of sampling data. Monochlorobenzene was detected once at 0.4 ppb and has an MCL of 100 ppb. Carbon tetrachloride and TCE each have an MCL of 5 ppb, and both were detected once at 1 ppb respectively. The compound 1,1,1-trichloroethane was detected three times in 1990 at levels of 0.3 ppb, 0.2 ppb, and 0.8 ppb respectively. It has not been detected since in 13 subsequent data sets. The MCL for this VOC is 200 ppb.

Disinfecton byproducts known as trihalomethanes (THMs) were detected periodically in 4 sets of sampling data at very low levels at the Lakeside Vista Plant since 1990. The sum total of the four trihalomethanes (TTHM) detected ranged from 0.5 to 4.3 ppb. For regulated systems, the current MCL for TTHMs is 80 ppb. Disinfection byproducts are the result of a reaction between chlorine used for disinfection and organic material in the water supply.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl phthalate) was the only SOC detected from 7 sets of available sampling data since 1994. As shown in Table 5, the SOC was detected twice at levels below the MCL of 6 ppb. Phthalate was also detected in the laboratory blank samples and therefore the results are not interpreted to represent actual water quality.

CONTAMINANT	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
DI(2-ETHYLHEXYL) PHTHALATE	6	19-Nov-01	5.1
		7-Sep-04	1.1

Table 5. SOC Detections in the Lakeside Vista Water Supply

Radionuclides

Radiological contaminants detected in the Lakeside Vista ground water supply are shown in Table 6. Gross alpha was detected in one set of sampling data at a level well below its MCL of 15 picoCuries/Liter (pCi/L). Gross alpha radiation is a measure of alpha particle activity and is used as an indicator for the presence of other natural and man-made radionuclides. Radon-222 was detected in both sets of sampling data tested (Table 6). At present, there is no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L and an alternate MCL of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air.

CONTAMINANT	MCL (pCi/L)	SAMPLE DATE	RESULT (pCi/L)
RADON-222	**300***	**9-May-94**	**1900**
GROSS ALPHA	15	29-Apr-96	4
RADON-222	**300***	**14-May-97**	**1980**

Table 6. Radionuclides Detected in the Lakeside Vista Water Supply

* Lower proposed MCL

Microbiological Contaminants

Raw water samples were collected and tested for bacteria for the three wells to determine whether these sources are ground water under the influence of surface water (GWUDI). All of the wells were initially classified as moderate risk to surface water influence and required one raw water sample to be collected as soon as possible after a minimum of 0.5 inches of rainfall in 24 hours had occurred. As shown in Table 7, the test results were negative for the presence of total and fecal coliform bacteria. Backup Well 1 is low yielding (7 gpm), and is used only when Wells 2 and 3 are temporarily out-of-service for maintenance, and during emergencies. Since this well is not regularly pumped for extended periods, this may explain the high turbidity result shown in Table 7.

SOURCE NAME	RAIN DATE	RAIN AMOUNT (inches)	REMARK	SAMPLE DATE	TEMP. (^{0}C)	PH	TURBIDITY (NTU)	TOTAL COLIFORM (col/100 ml)	FECAL COLIFORM (col/100 ml)
WELL 1	9-Dec-98	0.6	WET	9-Dec-98	13.5	5.77	25	-1.1	-1.1
WELL 2					13.3	5.66	1.8	-1.1	-1.1
WELL 3					13.3	5.61	1.8	-1.1	-1.1

Table 7. Raw Water GWUDI Test Results for the Lakeside Vista Supply Wells

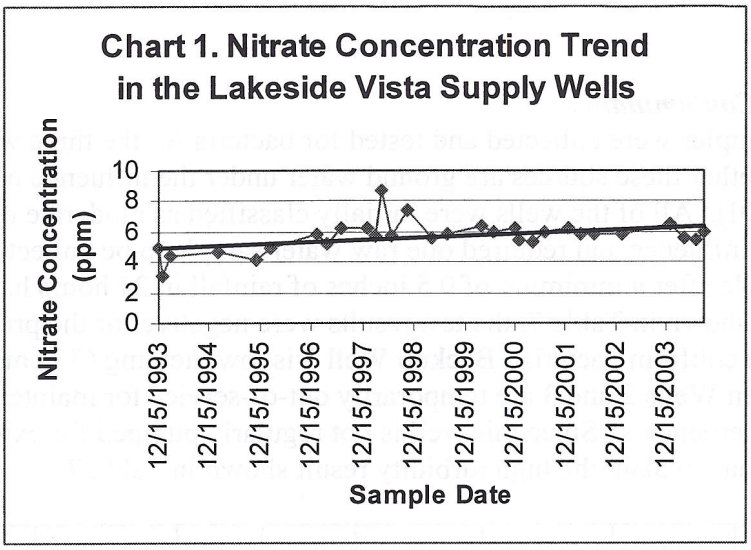
SUSCEPTIBILITY ANALYSIS

The Lakeside Vista wells obtain water from an unconfined fractured rock aquifer. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the WHPA. Therefore, managing this area to minimize the risk to the aquifer and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The susceptibility of the wells to contamination is determined for each group of contaminants based on the following criteria: (1) available water quality data, (2) presence of potential contaminant sources in the WHPA, (3) aquifer characteristics, (4) well integrity, and (5) the likelihood of change to the natural conditions.

Inorganic Compounds (IOCs)

Nitrate is present in the ground water supply at levels above 50% of its MCL of 10 ppm. The available data shows that the trend of nitrate levels has been slightly increasing over the past eleven years (Chart 1). Sources of nitrate can generally be traced back to land use. Fertilizer applied to agricultural fields,

residential lawns, and effluent from residential on-site septic systems are non-point sources of nitrate in ground water. A review of Table 2 indicates that residential areas that utilize on-site septic systems cover 51.9%, and cropland makes up 10.4% of the Lakeside Vista recharge area respectively. Based on 2003 data, there are no plans for public sewer service in this area.



Nitrates are present in domestic wastewater as a result of the conversion of organic nitrogen compounds to inorganic nitrate. Excess nitrate from manure and fertilizer that is not used by lawns or crops leaches into the ground water during recharge periods. Nitrates present in the Lakeside Vista water source are likely related to private septic systems, residential lawns and gardens, and agricultural practices. Based on this analysis, the Lakeside Vista water supply **is** susceptible to nitrate contamination.

The low levels of other inorganic constituents detected in the wells may likely represent the naturally occurring levels present in the aquifers from dissolving minerals in the bedrock. Therefore, the water supply **is not** susceptible to other regulated inorganic compounds other than nitrate, based on available water quality data.

Volatile Organic Compounds (VOCs)

The only volatile organic compounds that have been periodically detected at low levels in 13 sets of available sampling data since 1991 are the disinfection by-products known as trihalomethanes (THMs). THMs are the result of a reaction between chlorine used for disinfection and organic material in the water supply. The sum total of the four trihalomethanes (TTHM) detected in 4 sets of sampling data ranged from 0.5 to 4.3 ppb. These levels are typical of levels measured at other ground water systems in Maryland. The MCL for TTHMs is 80 ppb.

The compound 1,1,1-trichloroethane was detected at low levels in three samples collected in 1990, and has not been detected since. This compound is used in adhesives, aerosols, textiles, paints, inks, and metal degreasers. Monochlorobenzene, carbon tetrachloride, and TCE were detected once at low levels from single data sets conducted in 1990. These compounds are used as waste solvents for metal degreasing processes. The detections were at levels well below their respective MCLs, and they have not been detected again from numerous sets of sampling data since 1990.

There are currently no commercial facilities located within the WHPA that pose any VOC threats to the wells (Figure 2). Since 51.9% of the WHPA is residential land, leaking home heating oil tanks could be a potential risk. However, petroleum-related contaminants have not been detected from the available sampling data. Therefore, the Lakeside Vista ground water supply is **not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

The current land use shown in Figure 3 suggests that the potential non-point sources of SOCs located within the WHPA are residential areas that account for 51.9%, and agricultural lands (10.4%). Pesticides and chemicals used on residential lawns, gardens, and agricultural fields are a potential threat. However, typical lawn maintenance herbicides are very biodegradable and should not pose a significant SOC risk if applied properly.

No SOCs relating to water quality were detected from 7 sets of available sampling data at the plant. This indicates that synthetic chemicals are not being over-applied in the WHPA. The phthalate detects in two samples were also detected in the laboratory blanks and therefore do not represent actual water quality. Based on this analysis, the ground water supply at Lakeside Vista is **not** susceptible to SOC contamination.

Radionuclides

There is currently no MCL for radon-222, however EPA has proposed an MCL of 300 pCI/L or an alternative of 4000 pCi/L if the State has a program to address the more significant risk from radon in indoor air. Based on two samples collected, the levels were well above the lower proposed MCL of 300 pCi/L (Table 6). The source of radon and other radiological contaminants in ground water can be traced back to the natural occurrence of uranium in rocks. Radon may be prevalent in ground water of crystalline rock aquifers due to the radioactive decay of uranium bearing minerals in the bedrock. Gross alpha radiation was detected at 4 pCi/L in one sample (Table 6). The result was less than 50% of the 15 pCi/L MCL.

Based on the available sampling data, the Lakeside Vista wells **may be** susceptible to radon-222 based on the lower proposed MCL, but they are **not**

susceptible to other radionuclides as detections were below levels of concern.

Microbiological Contaminants

Based on raw water bacteriological data (Table 7) the Lakeside Vista supply wells were determined not to be under the direct influence of surface water. Hence the wells are **not** susceptible to any microbiological contaminant present at the surface including *Giardia and Cryptosporidium*.

MANAGEMENT OF THE WHPA

Form a Local Planning Team

- Teams should represent all of the interests in the community. The water supplier, home association officers, the County Health Department, local planning agencies, developers, farmers and residents within and near the WHPA should work together to reach a consensus on how to protect the water supply.

Public Awareness and Outreach

- The Consumer Confidence Report should include a summary of this report and information that this report is available to the general public through their county library, or by contacting Greenridge Utilities or MDE.
- Conduct educational outreach to residents living within the WHPA. Important topics include: (a) proper chemical storage practices, (b) proper vehicle maintenance practices, (c) reporting chemical and petroleum spills, and (d) proper use and application of fertilizers and pesticides.
- Pamphlets, flyers and bill stuffers sent to local residents, and farmers will help to educate the general public about Wellhead Protection. An MDE pamphlet entitled Gardening in a Wellhead Protection Area is such an example.
- Placing signs at the WHPA boundaries is a good way to make the public aware of protecting their source of water supply.

Cooperative Efforts with Other Agencies

- The farming community should continue to work with the Soil Conservation District to develop Best Management Practices (BMPs) for the farms located in the WHPA. The Cooperative Extension Service is available to develop nutrient management plans for farmers to match crop needs with fertilizer application. In particular, fall/winter cover crop practices can keep excess nitrogen from leaching into the ground water.
- The nearby farmers can also participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within the WHPA. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the area. The Natural Resources Conservation Service is responsible for determining the relative environmental benefits of each acre offered for participation.

Planning/New Development

- The subdivision should work with Harford County to adopt a local land use ordinance to protect future water quality. The State of Maryland Wellhead Protection Ordinance may be used as a template.
- Planners should address future land use and recharge preservation with consideration to Wellhead Protection.
- The preservation of the existing forested recharge area will help to protect the wells from adverse land use activities. Currently, 37.7% of the WHPA is forestland.
- Homeowners in the WHPA should ensure that their septic systems are functioning properly to maintain nitrate levels below safe drinking water standards.

Monitoring

- Continue annual nitrate sampling and note any increase in concentrations of nitrate.
- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Annual raw water bacteriological testing of each well is a good check on well integrity.

Contingency Plan

- COMAR 26.04.01.22 regulations require all community water systems to have a plan for providing a safe and adequate drinking water supply under emergency conditions. The system can operate with generators supplying power to the wells in the event of an emergency power outage. Water can also be purchased, hauled in by tankers, and directly injected into the distribution system during an emergency.

Changes in Use

- Any increase in pumpage or addition of new wells to the system may require revision to the WHPA. The system is required to contact the Water Supply Program when an increase in pumpage is applied for and when new wells are being considered.

Contaminant Source Inventory/Well Inspection

- Greenridge Utilities should conduct its own detailed survey to ensure that there are no other potential sources of contamination within the WHPA. Updated records of new development within the WHPA should be maintained.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

REFERENCES

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Nutter, Larry J., and Smigaj, Michael J., 1975, Harford County Ground-Water Information: Well Records, Chemical Quality Data, and Pumpage: Maryland Geological Survey Water Resources Basic Data Report No. 7, 89 p.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit: HA1962G006
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
Department of Natural Resources 1998 Digital Orthophoto Quarter Quadrangles for Edgewood
USGS 7.5 Minute Series Topographic Map, Edgewood Quadrangle
Maryland Office of Planning 2002 Harford County Digital Land Use Map
Maryland Office of Planning 2003 Harford County Digital Sewerage Coverage Map
Maryland State Highway Administration Roads and Streams Map

FIGURES

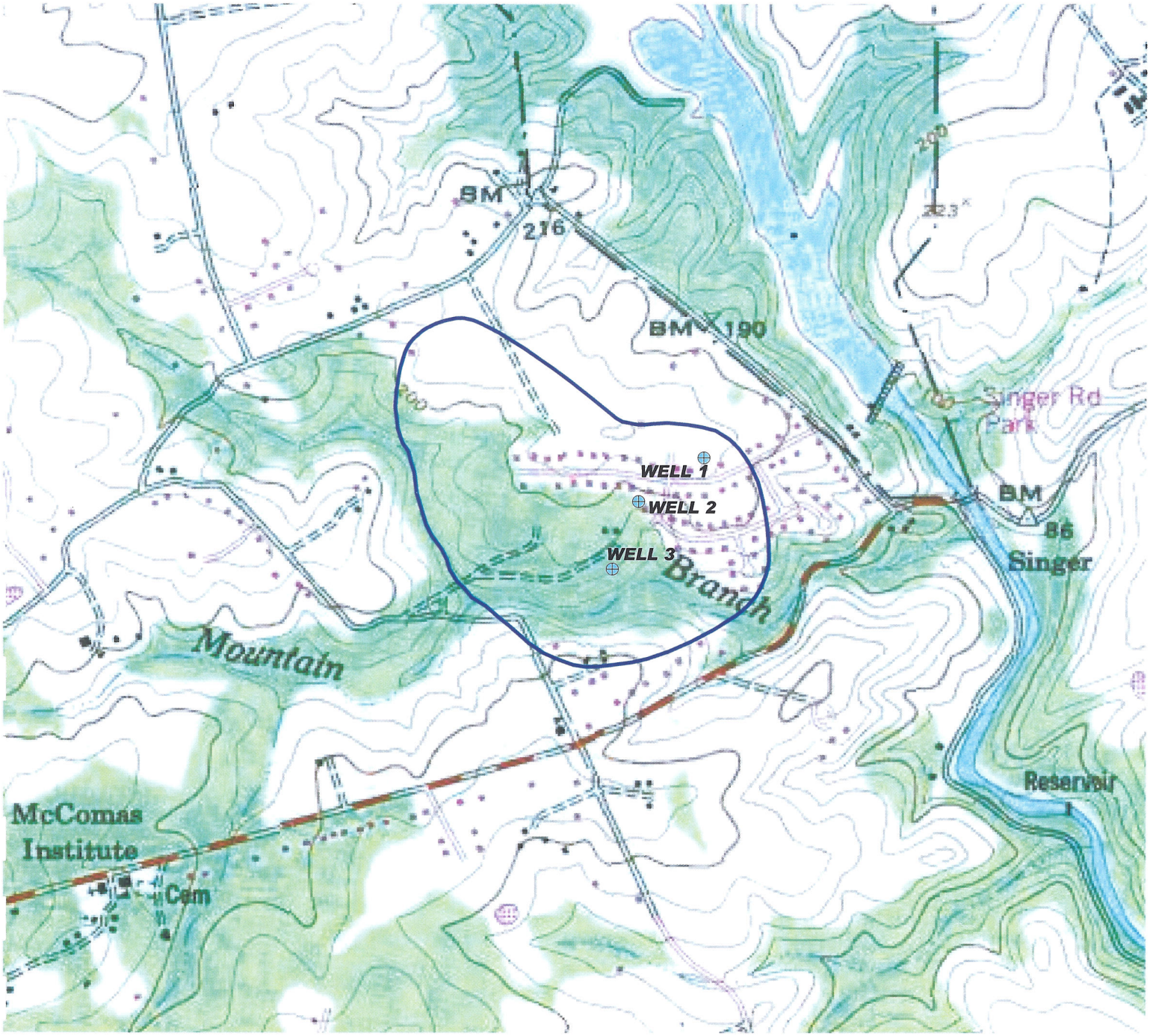

Figure 2. Lakeside Vista Wellhead Protection Area with Potential Contaminant Sources

LEGEND

Lakeside Vista Wells

Wellhead Protection Area

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Base Map: USGS 7.5 Minute Series Quad for Edgewood

1000 0 1000 Feet

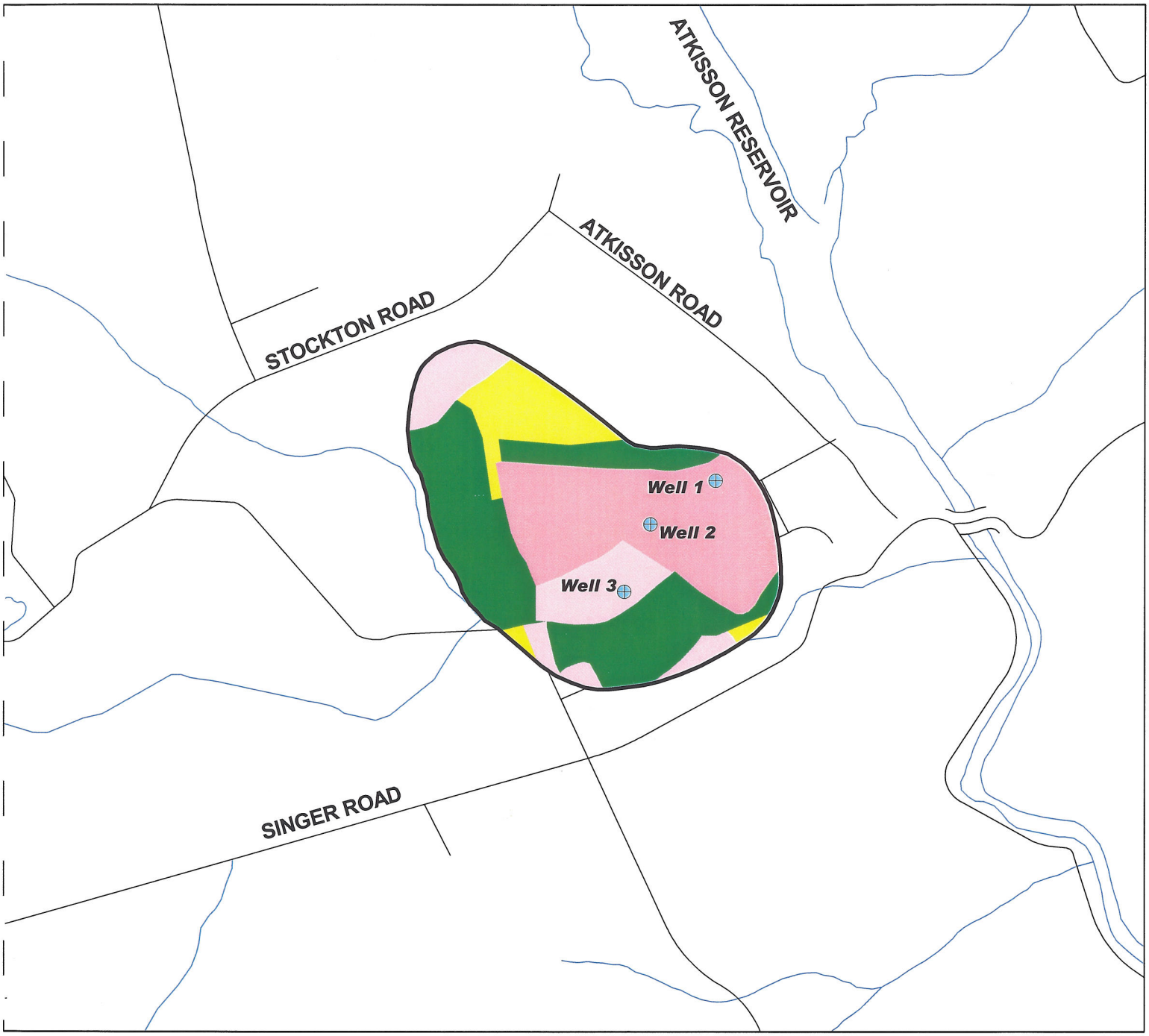

Figure 3. Land Use in the Lakeside Vista Wellhead Protection Area

LEGEND

Supply Wells

Wellhead Protection Area

Roads

Streams

Harford County Land Use

Low Density Residential

Medium Density Residential

Cropland

Forest

N

1000 0 1000 Feet

Base Maps: MD Dept. of Planning 2002 Land Use Map for Harford County, and MD State Highway Admin. Roads & Streams Map