

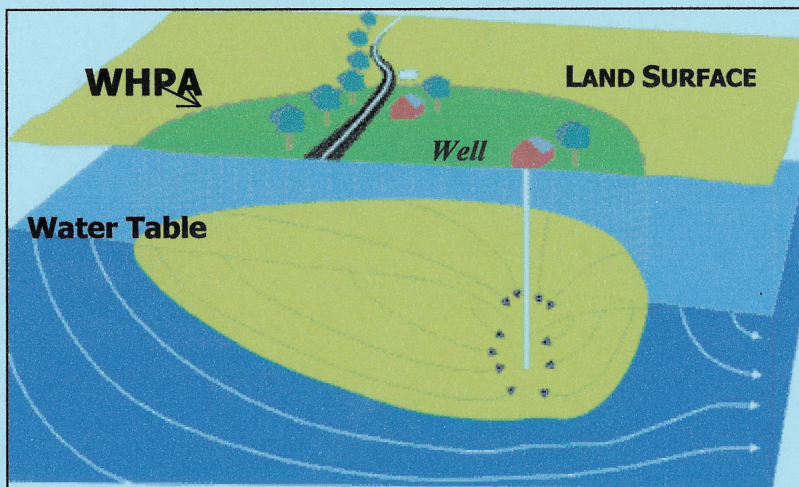
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SOURCE WATER ASSESSMENT

for

SCENIC VIEW TRAILER PARK

Washington County, MD



Prepared By

WATER MANAGEMENT ADMINISTRATION

Water Supply Program

June, 2005



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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the Scenic View Trailer Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (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 source of Scenic View Trailer Park's water supply is one well in an unconfined fractured-rock aquifer, the Tomstown Formation. The Source Water Assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for this source type.

Point sources of contamination were investigated within the assessment area from field inspections, contaminant inventory databases, and previous studies. The Maryland Department of Planning's 2002 digital land use map for Washington County was used to identify non-point sources of contamination. Well information and water quality data were also reviewed. An aerial photograph and maps potential contaminant sources and land use within the Source Water Assessment area are included in the report.

The susceptibility analysis is based on a review of the existing water quality data for the Scenic View Trailer Park water system, the presence of potential sources of contamination in the source water assessment area, well integrity, and the inherent vulnerability of the aquifer. It was determined that the Scenic View Trailer Park water supply is susceptible to nitrates and microbiological contaminants including *Cryptosporidia* and *Giardia*. The water supply may also be susceptible to naturally occurring Radon-222, if the lower proposed MCL for this contaminant is adopted by the EPA. This water supply is not susceptible to volatile organic compounds, synthetic organic compounds, other radionuclides, or other inorganic compounds.

INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for the Scenic View Trailer Park water system in Washington County. The Scenic View Trailer Park is located approximately 1 mile north of the Town of Boonsboro in Washington County. The water system serves a population of 35 and has 20 service connections. The water system is owned and operated by Mr. Lionel Abbott, owner of the Scenic View Trailer Park.

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. Scenic View Trailer Park presently obtains its water supply from one well (Fig. 1). A review of the well completion reports for the supply well indicates that it was drilled in 1989 and should meet the State's well construction standards which were implemented in 1973. The total depth of the well is 375 feet and casing depth is 69 feet. The well has been grouted to 68 feet using cement. A recent site inspection revealed that the well cap is loose and that electric wires were exposed.

Scenic View Trailer Park has an appropriation permit to pump water from the Tomstown Formation for an average use of 4,600 gallons per day (gpd) and an average of 7,700 gpd in the month of maximum use.

HYDROGEOLOGY

Scenic View Trailer Park lies within the Hagerstown Valley physiographic province, which is underlain by a sequence of metasedimentary limestones and shales that have eroded away to form the valley bound by South Mountain and the Bear Pond Mountains west of Clear Spring. In some areas the carbonate rock formations have developed into a karst-like aquifer. Duigon (2001) has identified sinkholes, wells that penetrate cavernous zones, and other karst features in the valley. Scenic View's wells obtain water from the Tomstown Formation, a sequence of interbedded light gray white and pink, thick-bedded limestone, light gray to yellow-gray, thin-bedded to massive dolomite, and thin-bedded calcareous shale (Edwards, 1978). This is a heterogeneous formation and can be very karstic in some areas, and in others much more like a crystalline fractured-rock aquifer. The Scenic View well appears to be in an area surrounded by karstic features like sinkholes (Figure 2) and may be influenced by them. Ground water moves principally through secondary porosity, like solution enlarged fractures and sinkholes, and is recharged by precipitation percolating through soil and saprolite.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. The source water assessment area for public water systems with an average appropriation amount of less than 10,000 gpd and drawing from fractured-rock aquifers is a circle with a 1,000-foot radius (MD SWAP, 1999). Scenic View Trailer Park's well was determined to be ground water under the influence of surface water (GWUDI) based on the presence of fecal coliform bacteria in its raw water samples. For those wells that are determined to be GWUDI, the MDE's SWAP (1999) recommends locating and mapping sinkholes and conducting a dye trace study to define the contributing area (WHPA) for the well.

Duigon (2001) conducted a study of the karst hydrogeology of the Hagerstown Valley in which he located and mapped the sinkholes in the area. MDE completed a dye trace study to determine the source of bacterial contamination to several public water systems (including Scenic View) in the Boonesboro area (Evans and Holt, 2003). The study can be found at the end of this report (Attachment I). Fluorescent dyes were injected at several sinkholes in the vicinity of Scenic View's well as well as six septic systems located on the Scenic View property. The sinkholes selected for dye injection were located west, northwest and southwest of the Scenic View well. A sinkhole west of the well into which a stream disappeared into, could not be used for this study since the the property owner did not permit accesses to it. The results of the study were inconclusive with regard to determine the area contribution to the well. No dye from the septic systems or from the sinkhole to the northwest were found. Rhodamine dye which was found in the first charcoal receptor but not in subsequent charcoal receptors. As a result no definitive conclusions regarding contributing areas for the well can be made.

Since the well was determined to be GWUDI due to high levels of fecal coliform in its raw water, one of the likely sources for this contamination may be the sinkhole located in the stream channel west of the well. The well may be drawing water from this stream that disappears into the sinkhole and recharges the aquifer. As a result, the WHPA delineated for this well is the drainage area of the unnamed stream that flows west and disappears into the sinkhole. The area of the delineated WHPA is about 370 acres (Figure 2).

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, landfills, discharge permits, large-scale feeding operations, and CERCLA sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. In addition, in karst areas (areas underlain by limestone), sinkholes are also considered point sources of contamination. Non-point sources of contamination are associated with certain types of land use practices such as use of

pesticides, application of fertilizers or animal wastes, or septic systems that may lead to ground water contamination over a larger area.

Point Sources

Sinkholes are the main potential point sources of contamination in and around the WHPA and are their locations based on the Duigon (2001) report and verified during the dye tracer study (Evans and Holt, 2003). The only other potential contaminant point source is a facility that auctions farm equipment (Figure 2).

Non-Point Sources

The Maryland Office of Planning’s 2003 digital land use coverage of Washington County was used to determine the predominant types of land use in the WHPA (Figure 3). The land use summary is shown in Table 1. The majority of the WHPA is made up of agricultural land (cropland, pasture and feeding operations) with a smaller proportion of forested, and residential and commercial areas.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	42.69	11.5
Medium Density Residential	0.4	0.1
Commercial	7.00	1.9
Cropland	221.64	59.8
Pasture	20.96	5.6
Forest	70.61	19.1
Water	0.71	0.2
Feeding Operations	6.36	1.8
Total	370.37	100

Table 1. Land Use Summary

Agricultural land is commonly associated with nitrate loading of ground water and also represents a potential source of SOC’s depending on use of pesticides. Feeding operations and pasture areas may also be a source of microbiological pathogens from animal wastes. There are several large dairy farms in and around the WHPA. Residential areas without sewer service can be a source of nitrate from septic systems and microbial pathogens if systems are not constructed in accordance with regulations. Additionally, residential areas may be a source of nitrate and SOC’s if fertilizers, pesticides, and herbicides are not used carefully in lawns and gardens.

A review of the Maryland Department of Planning’s 2003 Sewer Map for Washington County indicates that there is no planned sewer service for the entire WHPA. There 7-9 onsite septic systems serving the Scenic View Trailer Park with the closest on about 300 feet downgradient of the well. Other properties in the WHPA also have onsite septic systems. The onsite septic systems are sources of nitrate and microbiological contaminants.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) 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 greater than 50% of a MCL, this assessment will describe the sources of such a contaminant and if possible, locate the specific sources that are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The only treatment that the Scenic View Trailer Park water system currently has is hypochlorination for disinfection.

A review of the monitoring data for the Scenic View Trailer Park water system indicates that the water supply well has had fecal contamination and exceeded nitrate standards on numerous occasions. The system has agreed to connect to the Boonesboro water system and is awaiting final approval for the project to be initiated. The water quality sampling results are summarized in Table 2.

Contaminant Group	No. of Samples Collected	No. of Samples over 50% of an MCL
Inorganic Compounds (except Nitrate)	5	0
Nitrate	109	109
Radiological Contaminants	4	1*
Volatile Organic Compounds	8	0
Synthetic Organic Compounds	4	0

Table 2. Summary of Water Quality Samples

*Proposed MCL of 300 pCi/L for Radon-222

Inorganic Compounds (IOCs)

Nitrate was the only IOC detected above 50% of an MCL in all the samples collected since 1993. The MCL for nitrate is 10 ppm. The nitrate levels have exceeded the MCL several times in the past and these values are shown in bold in Table 3. The only other IOC detected was fluoride at very low levels

CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	18-OCT-93	5.3
NITRATE	10	11-APR-94	11.8
NITRATE	10	21-APR-94	12
NITRATE	10	09-JAN-95	13.3
NITRATE	10	06-MAR-95	7.9
NITRATE	10	14-MAR-95	11.2
NITRATE	10	04-APR-95	7.9
NITRATE	10	01-MAY-95	7.7
NITRATE	10	06-JUN-95	8.6
NITRATE	10	09-JUL-95	10.4
NITRATE	10	30-AUG-95	12.4
NITRATE	10	02-SEP-95	12.4
NITRATE	10	30-OCT-95	13.2
NITRATE	10	30-NOV-95	13.2
NITRATE	10	08-DEC-95	17
NITRATE	10	03-JAN-96	9.1
NITRATE	10	19-FEB-96	11.6
NITRATE	10	06-MAR-96	8.8
NITRATE	10	01-APR-96	10.4
NITRATE	10	03-JUN-96	7.77
NITRATE	10	16-SEP-96	9.2
NITRATE	10	02-OCT-96	8.3
NITRATE	10	05-DEC-96	14.8
NITRATE	10	09-DEC-96	16.8
NITRATE	10	02-JAN-97	14.1
NITRATE	10	05-FEB-97	5.35
NITRATE	10	10-MAR-97	18.1
NITRATE	10	13-MAY-97	16.3
NITRATE	10	04-JUN-97	8.89
NITRATE	10	10-SEP-97	9.58
NITRATE	10	05-NOV-97	15.3
NITRATE	10	11-DEC-97	9.79
NITRATE	10	11-DEC-97	8.4
NITRATE	10	08-FEB-98	12.3
NITRATE	10	15-FEB-98	10.02
NITRATE	10	01-APR-98	9.9
NITRATE	10	04-MAY-98	9.85
NITRATE	10	03-JUN-98	13
NITRATE	10	01-JUL-98	8.6
NITRATE	10	12-OCT-98	15.2
NITRATE	10	15-OCT-98	11
NITRATE	10	09-NOV-98	7.81
NITRATE	10	07-JAN-99	9.31

Table 3. Inorganic Compounds detected above 50% of the MCL

CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	03-MAR-99	8.36
NITRATE	10	01-JUN-99	8.44
NITRATE	10	04-AUG-99	10.6
NITRATE	10	16-SEP-99	17.6
NITRATE	10	13-OCT-99	25.4
NITRATE	10	06-JAN-00	9.3
NITRATE	10	06-MAR-00	7.49
NITRATE	10	08-MAY-00	8.52
NITRATE	10	17-JUL-00	9.34
NITRATE	10	15-AUG-00	8
NITRATE	10	15-AUG-00	8.04
NITRATE	10	13-SEP-00	8.52
NITRATE	10	13-SEP-00	8.52
NITRATE	10	21-DEC-00	8.02
NITRATE	10	07-JAN-01	7.28
NITRATE	10	17-JAN-01	8.02
NITRATE	10	17-JAN-01	7.28
NITRATE	10	17-JAN-01	7.28
NITRATE	10	01-FEB-01	7.8
NITRATE	10	08-MAR-01	7.09
NITRATE	10	19-APR-01	7.5
NITRATE	10	07-MAY-01	7.36
NITRATE	10	14-JUN-01	7.2
NITRATE	10	05-JUL-01	8.05
NITRATE	10	22-AUG-01	8.17
NITRATE	10	04-OCT-01	9.04
NITRATE	10	04-DEC-01	9.07
NITRATE	10	28-JAN-02	9.61
NITRATE	10	05-FEB-02	10.12
NITRATE	10	26-MAR-02	13.34
NITRATE	10	30-APR-02	15.4
NITRATE	10	15-MAY-02	11.94
NITRATE	10	11-JUN-02	13.62
NITRATE	10	23-JUL-02	11.72
NITRATE	10	23-JUL-02	11.56
NITRATE	10	03-SEP-02	11.92
NITRATE	10	14-OCT-02	14.64
NITRATE	10	13-NOV-02	27.2
NITRATE	10	16-DEC-02	36.05
NITRATE	10	13-JAN-03	9.02
NITRATE	10	11-FEB-03	8.09
NITRATE	10	13-MAR-03	9.2
NITRATE	10	22-APR-03	7.59

Table 3 (contd). Inorganic Compounds detected above 50% of the MCL

CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	21-MAY-03	21.6
NITRATE	10	04-JUN-03	8.4
NITRATE	10	01-JUL-03	10.3
NITRATE	10	04-AUG-03	8
NITRATE	10	02-SEP-03	8.1
NITRATE	10	13-OCT-03	9.1
NITRATE	10	07-NOV-03	8.3
NITRATE	10	01-DEC-03	9
NITRATE	10	14-JAN-04	9.1
NITRATE	10	17-FEB-04	9.7
NITRATE	10	01-MAR-04	8.7
NITRATE	10	01-APR-04	7.8
NITRATE	10	03-MAY-04	8.5
NITRATE	10	07-JUN-04	7.5
NITRATE	10	01-JUL-04	7.4
NITRATE	10	25-AUG-04	7.2
NITRATE	10	01-SEP-04	7.3
NITRATE	10	01-OCT-04	8.6
NITRATE	10	01-DEC-04	7.1
NITRATE	10	26-JAN-05	7.4
NITRATE	10	01-FEB-05	7.3
NITRATE	10	14-MAR-05	7.1

Table 3 (contd). Inorganic Compounds detected above 50% of the MCL

Radionuclides

A review of the data shows that the only radionuclide detected at a level of concern was Radon-222. There is currently no MCL for Radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternate 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. Radon-222 was detected at 500 pCi/L in the water supply, which is above the lower proposed MCL, but well below 50% of the higher proposed MCL. In addition, very low levels of gross beta radiation was detected in the water supply

Volatile Organic Compounds (VOCs)

A review of the data shows that VOCs have not been detected above 50% of an MCL.

Synthetic Organic Compounds (SOCs)

A review of the data shows that SOC's have not been detected above 50% of an MCL.

Microbiological Contaminants

Raw water bacteriological data is available from evaluation for ground water under the direct influence of surface water (GWUDI). A review of the data shows that

fecal coliform bacteria was detected in raw water from the well in samples collected during dry weather and as well as a significant number following a rainfall (Table 4). Negative numbers in the table indicate absence of coliform bacteria.

SOURCE NAME	RAIN DATE	RAIN AMOUNT (INCHES)	CONDITIONS	SAMPLE DATE	PH	TOTAL COLIFORM (MPN/100ml)	FECAL COLIFORM (MPN/100ml)
WELL 3	30-JUN-03	0	DRY SAMPLE	30-JUN-03	9.1	29	3
WELL 3	11-AUG-03	.5	WET SET	11-AUG-03	7.3	-1	-1
WELL 3	11-AUG-03	.5	WET SET	12-AUG-03	7.3	3	-1
WELL 3	04-SEP-03	3.94	WET SAMPLE	04-SEP-03	7.2	69.7	4.2
WELL 3	23-SEP-03	1.3	WET SET	23-SEP-03	7.2	>200.5	>200.5
WELL 3	23-SEP-03	1.3	WET SET	24-SEP-03	7.2	>200.5	>200.5
WELL 3	23-SEP-03	1.3	WET SET	25-SEP-03	7.1	>200.5	>200.5
WELL 3	23-SEP-03	1.3	WET SET	26-SEP-03	N/A	>200.5	>200.5

Table 4. Raw Water Bacteriological Test results

SUSCEPTIBILITY ANALYSIS

The well serving the Scenic View Trailer Park water supply pumps water from an unconfined carbonate, fractured-rock aquifers. Wells in unconfined aquifers especially in carbonate rock, are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area. Therefore, continued monitoring of contaminants is essential in assuring a safe drinking water supply. The *susceptibility* of the source to contamination is determined for each group of contaminants based on the following criteria: 1) the presence of potential contaminant sources within the WHPA, 2) water quality data, 3) well integrity, and 4) the aquifer conditions. Table 5 summarizes the susceptibility of Scenic View Trailer Park's water supply to each of the groups of contaminants.

Inorganic Compounds

Nitrate has been detected at or above 50% of the MCL in all samples taken from Scenic View Trailer Park's water supply since 1993. The nitrate levels have also exceeded the MCL in the past, but have not done so in the last two years.

Agricultural land (cropland, pasture and feeding operations) comprises a major portion of the WHPA (68%). Fertilization of agricultural fields and residential lawns, and Scenic View's onsite septic systems as well as other residential septic systems are all sources of nitrate loading in ground water. In addition, there are several large dairy operations within the WHPA and around it. Animal waste generated from these operations when applied to cropland is a source of nitrate to the ground water. Based on these factors, Scenic View Trailer Park's water supply is susceptible to nitrate. The water supply is **not** susceptible to other inorganic compounds, based on water quality data.

Radionuclides

The water supply **may be** susceptible to Radon-222. The source of radionuclides in ground water is the natural occurrence of uranium in rocks. The Radon-222 level is higher than 50% of the lower proposed MCL of 300 pCi/L. Therefore, the system **may be** susceptible to this contaminant, if the lower MCL is adopted. Based on available data, the water supply is **not** susceptible to other radionuclides.

Volatile Organic Compounds

The water supply is **not** susceptible to volatile organic compounds, based on water quality data and the lack of potential contaminant sources within the WHPA.

Synthetic Organic Compounds

The wells are **not** susceptible to synthetic organic compounds. SOC's were not detected in the water supply. A potential source of SOC's in the WHPA may be pesticide or herbicide use in the agricultural or residential areas. However, because these contaminants have not been detected, it appears that any chemicals that may be used in the WHPA are degrading or being attenuated in the soil and are not reaching the wells.

Microbiological Contaminants

Fecal coliform was detected in Scenic View Trailer Park's raw water. The system's well was determined to be GWUDI. As a result the water supply is susceptible to protozoans like *Cryptosporidia* and *Giardia*. The well cap is not secure and conduit wires exposed. As a result, insects could also enter the well and become sources of coliform bacteria. Based on the raw water quality data, well construction and aquifer type, Scenic View Trailer Park's water supply is susceptible to coliform bacteria.

Contaminant Group	Are Contaminant Sources Present in WHPA?	Are Contaminants Detected Above 50% of MCL?	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible?
Nitrate	YES	YES	NO	YES	YES
Inorganic Compounds (except nitrate)	NO	NO	NO	YES	NO
Radon -222	YES (aquifer)	YES*	NO	YES	MAYBE
Other Radionuclides	NO	NO	NO	YES	NO
Volatile Organic Compounds	NO	NO	NO	YES	NO
Synthetic Organic Compounds	YES	NO	NO	YES	NO
Microbiological Contaminants	YES	YES	YES	YES	YES

Table 9. Susceptibility Analysis Summary.

*Proposed lower MCL for Radon-222

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

While we note that Scenic View water supply wells may not be needed in the future due to the potential for connection to the Town of Boonsboro water system, we still offer specific management recommendations.

Public Awareness and Outreach

- The Consumer Confidence Report should list that this report is available to the customers through their county library or by contacting the Water Supply Program.

Monitoring

- The system should continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

Planning/ New Development

- Washington County Department of Planning is encouraged to adopt a wellhead protection ordinance that provides protection for all community water systems relying on ground water. (MDE has a model ordinance that can be used as a starting point. Grant funding is available.)

Land Acquisition/Easements

- Loans are available for the purchase of property or easements for protection of the water supply. Eligible property must lie within the designated WHPA. Loans are currently offered at zero percent interest and zero points. Contact the Water Supply Program for more information.

Nutrient Management

- Agricultural producers within the wellhead protection area should be encouraged to apply for MDA Cost Share money for cover crop implementation. Cover crops have been shown to reduce nitrate levels in ground water.

Animal Waste Management

- Given the sensitivity of the aquifer to contaminants on the land surface and the number of dairy herds in the area, successful management of animal wastes is necessary to protect the ground water resources.

Sinkhole Repair

- One sinkhole is noted to be down gradient of an animal feeding operation just west of Route 66. It is recommended that a severe graded backfill method be used to re-establish filtration of the surface water runoff entering this sinkhole.

Contingency Plan

- Scenic View should have a Contingency Plan for its water system. COMAR 26.04.01.22 requires all community water systems to prepare and submit for approval

a plan for providing a safe and adequate drinking water supply under emergency conditions.

- Develop a spill response plan in concert with the Fire Department and other emergency response personnel.

Changes in Use

- The Scenic View Trailer Park is required to notify MDE if new wells are to be put into service. Drilling a new well outside the current WHPA would modify the area; therefore the Water Supply Program should be notified if a new well is being proposed.

REFERENCES

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- Evans, W.N. and Holt, J.D., 2003, *An Investigation to Determine the Source and Bacterial Contamination of Multiple Community Drinking Water Systems near Boonsvoro, MD, Using Fluoromatic Methods*, report submitted to Water Management Administration, Water Supply Program, 36 pp.
- MDE, Water Supply Program, 1999, *Maryland's Source Water Assessment Plan*, 36 p.
- U.S. Environmental Protection Agency, 1991, *Delineation of Wellhead Protection Areas in Fractured Rocks: Office of Ground Water and Drinking Water*, EPA/570/9-91-009, 144 pp.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit WA1955G002
Public Water Supply Sanitary Survey Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles for Smithsburg
USGS Topographic 7.5 Minute Quadrangles for Smithsburg
Maryland Office of Planning 2000 Washington County Digital Land Use Map
Maryland Office of Planning 1996 Washington County Digital Sewer Map

FIGURES

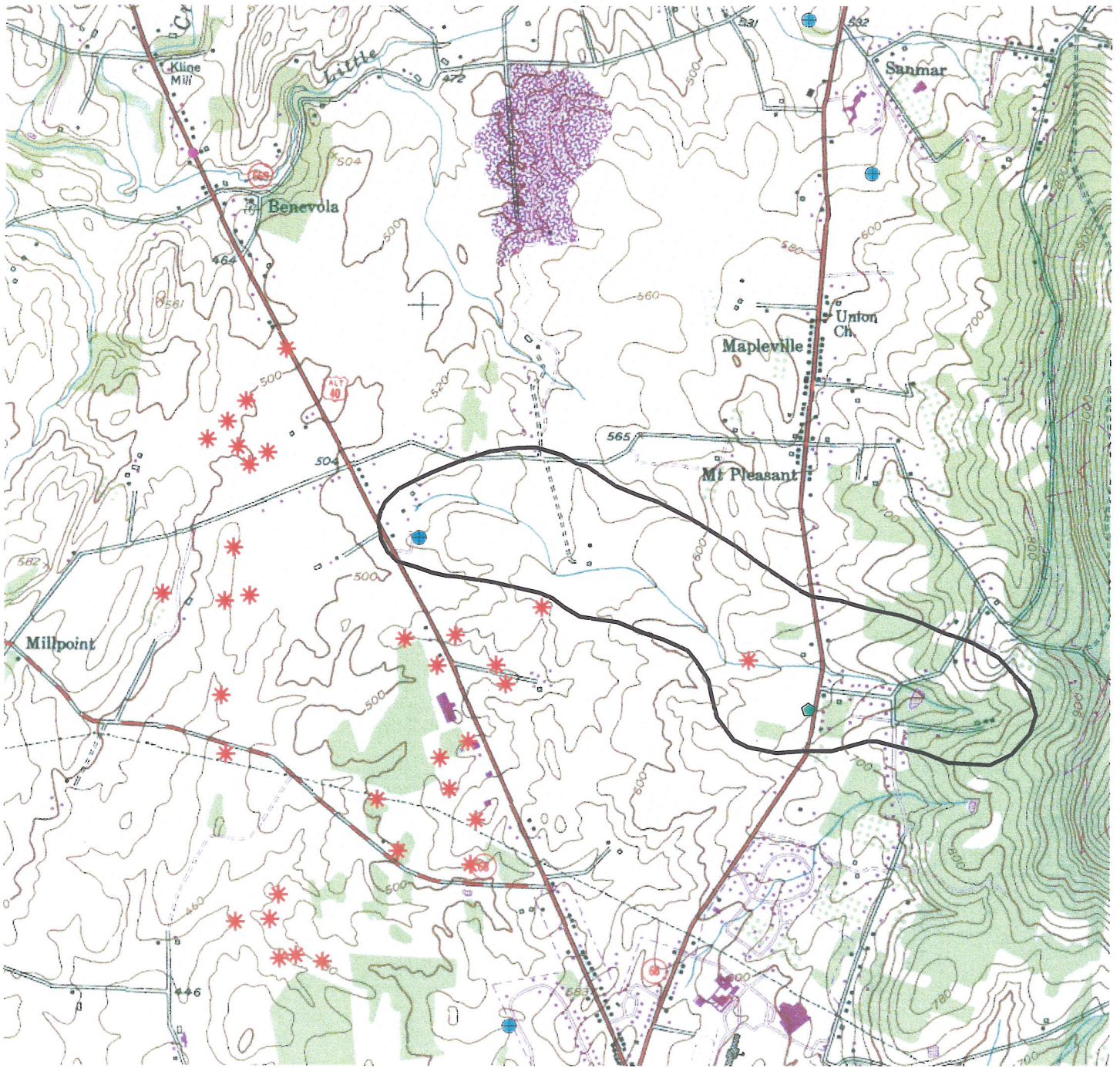
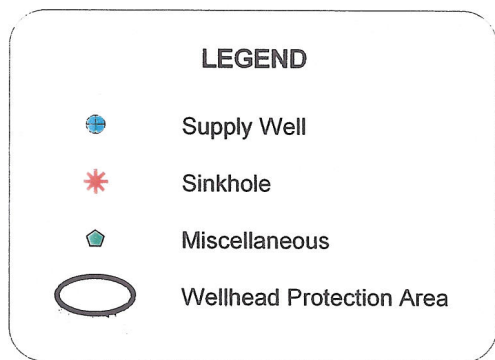


Figure 2. Scenic View Trailer Park's Wellhead Protection Area with Potential Contaminant Sources



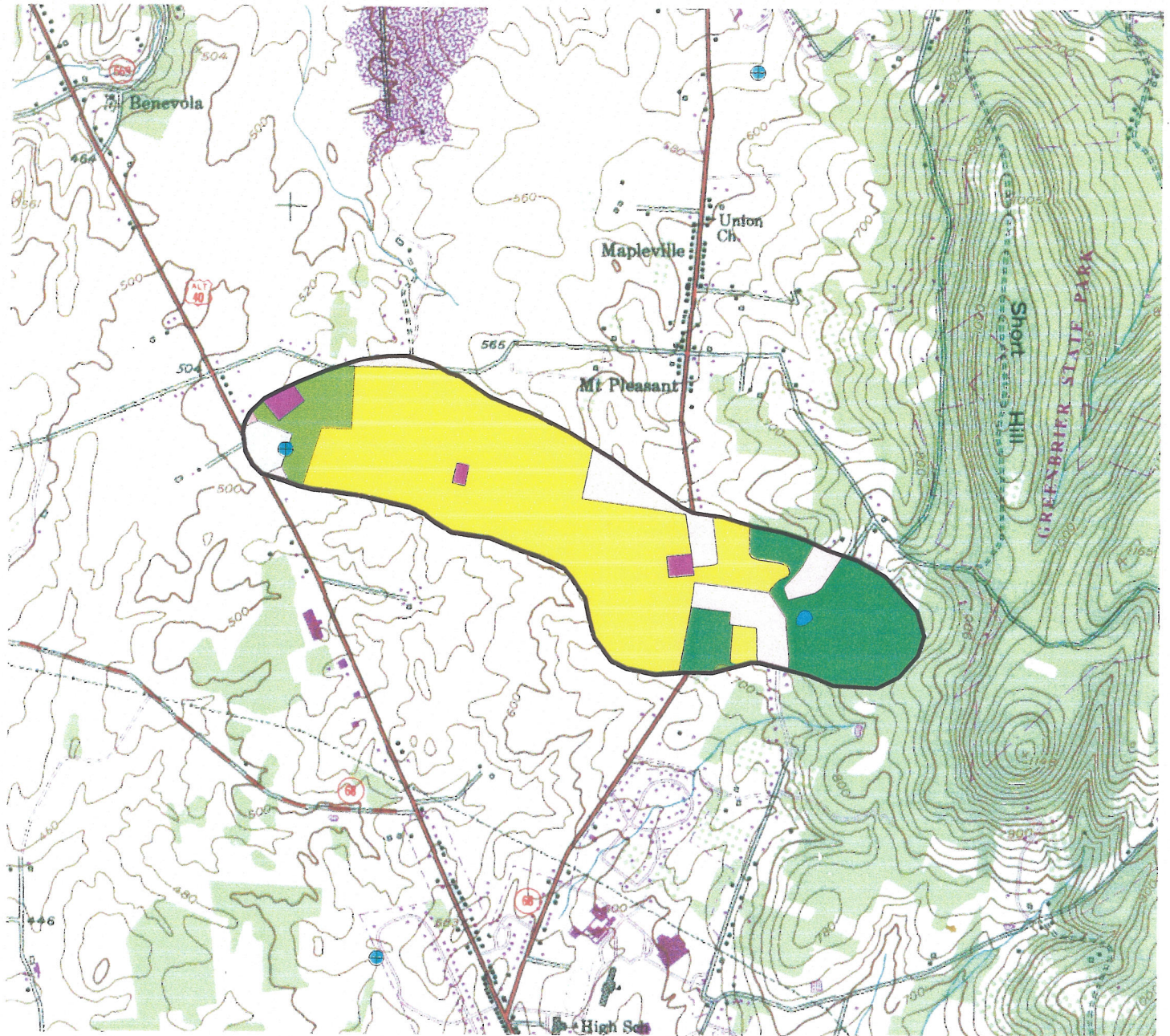
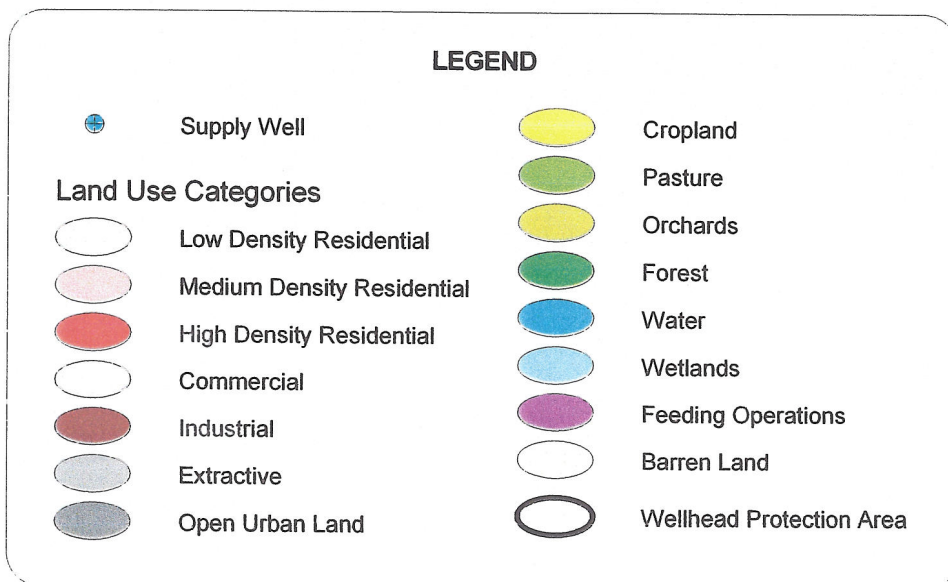


Figure 3. Land Use Map of the Scenic View Trailer Park Wellhead Protection Area



Base Map: USGS 7.5 Minute Topographic Quadrangle- Funkstown

Source: Washington County Land Use Map (2002)