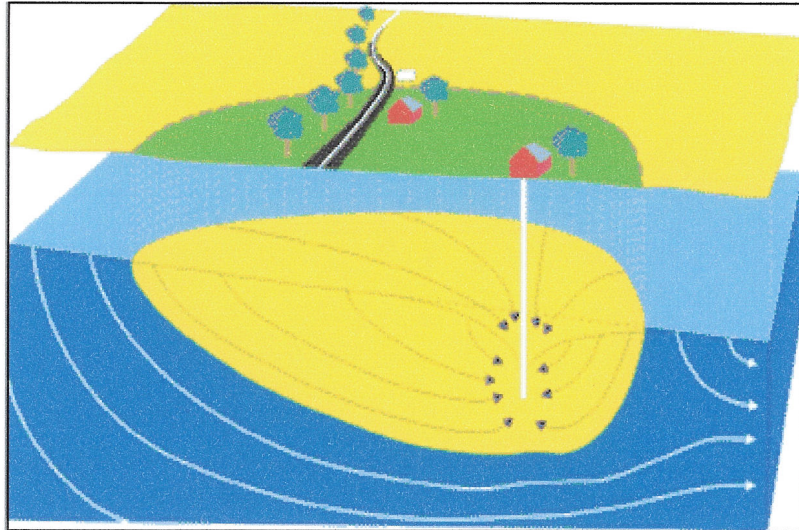


SOURCE WATER ASSESSMENT
for
BON SECOURS SPIRITUAL CENTER
HOWARD COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for Bon Secours Spiritual Center. 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 source of Bon Secours Spiritual Center's water supply is an unconfined fractured rock aquifer, known as the Baltimore Gneiss. The system currently uses three wells to obtain its drinking water. The Source Water Assessment Area was delineated by the Water Supply Program 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 Source Water Assessment Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for Bon Secours Spiritual Center's 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 Bon Secours Spiritual Center water supply is not susceptible to contamination by inorganic compounds, volatile organic compounds, synthetic organic compounds, or microbiological contaminants. It is susceptible to naturally occurring radon which is currently not regulated for noncommunity nontransient water systems.

INTRODUCTION

The Water Supply Program has conducted a source water assessment for the Bon Secours Spiritual Center water supply in Howard County (figure 1). The Bon Secours Spiritual Center water supply is considered a nontransient noncommunity (NTNC) water system, which is defined as a public water system that regularly serves at least 25 of the same individuals over six months per year. The facility and operates its water supply system and serves water to population of approximately 50 persons.

WELL INFORMATION

Bon Secours Spiritual Center is served water by three wells (Nos. 1, 2 and 3). 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 Bon Secours Spiritual Center water system indicates that all Well 1 was drilled prior to 1973, when the State's well construction regulations went into effect, and may not be in compliance with current construction standards. Wells 2 and 3 were drilled in 1987 and should meet current standards. Well information is shown in Table 1 below.

SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH (ft)	CASING DEPTH (ft)	YEAR DRILLED
01	Bon Secours 1	HO710054	150	20	1970
02	Bon Secours 2	HO811753	300	45	1987
03	Bon Secours 3	HO812018	300	68	1987

Table 1. Bon Secours Spiritual Center Well Information.

Bon Secours Spiritual Center has a Water Appropriation Permit that allows it to use an average of 17,000 gallons per day (gpd) and 22,000 gpd in the month of maximum use. Based on reported pumpage for the past three years, the facility has pumped an average of 9,336 gpd.

HYDROGEOLOGY

The Bon Secours Spiritual Center area lies in the Piedmont physiographic province and is underlain by the Baltimore Gneiss. This formation is an unconfined, fractured rock aquifer and is composed of primarily banded gneiss consisting of light pink to pale tan gneiss, interlayered with schistose, dark gray to black biotite-microcline-quartz-plagioclase gneiss. In this type of setting, the underlying crystalline rocks have negligible primary porosity and permeability and ground water is stored in and moves through fractures in the rocks. Ground water flow rates depend upon the openness of the fractures and their degree of interconnection. Unconsolidated overburden (saprolite) above the crystalline rock frequently has much greater primary porosity and permeability than the rock has, allowing

additional ground water to be stored (Duigon, 1994). Ground water systems in crystalline rock tend to be localized and flow is within topographic divides towards the nearest perennial streams. (Bolton, 1998).

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. The source water assessment area for public water systems with an average appropriation amount of greater than 10,000 gpd and drawing from fractured-rock aquifers is the watershed area that contributes to the well. This area is modified by geological boundaries, ground water divides and by annual average recharge needed to supply the well (MD SWAP, 1999). The delineated WHPA represents the areas which contribute ground water to the wells. The total area of the Bon Secours Spiritual Center about 44 acres, which is more than sufficient to support the daily permitted average even under drought conditions.

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, ground water discharge permits, large scale feeding operations and Superfund sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via 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 or animal wastes, or septic systems that may lead to ground water contamination over a larger area.

Point Sources

A review of MDE contaminant databases as well as a field survey revealed three point sources of contamination in the WHPA. Figure 2 identifies a Maintenance Shop (MNT) a Controlled Hazardous Site (CHS) where a transformer with a transformer oil drum is located, and an Above Ground Tank (AST) site. The wells are located at the bottom of a steeply sloping hill downgradient of all the potential contaminants sources. Table 2 lists the facilities identified and their potential types of contaminants. Potential contaminants are grouped as Volatile Organic Compounds (VOC), and Synthetic Organic Compounds (SOC).

ID	Type	Site Name	Address	Potential Contaminant	Comments
1	MNT	Bon Secours	1525 Marriottsville Rd	VOC	Maintenance Shop
2	CHS	Bon Secours	1525 Marriottsville Rd	SOC	Transformer Oil drum at site
4	AST	Bon Secours	1525 Marriottsville Rd	VOC	On concrete slab

Table 2. Potential Contaminant Point Sources within Bon Secours Spiritual Center's WHPA (see figure 2 for locations).

Non-Point Sources

The Maryland Department of Planning's 2002 digital land use map for Howard County was used to determine the predominant types of land use in the WHPA (figure 3). Table 3 shows the land use categories within the Bon Secours Spiritual Center WHPA. The largest portion of the WHPA is forested land followed by commercial land and cropland.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Commercial	15.51	35.3
Cropland	9.95	22.6
Forest	18.52	42.1
Total	43.98	100.00

Table 3. Land Use Summary for the Bon Secours Spiritual Center WHPA.

Cropland is commonly associated with nitrate loading of ground water. Cropland represents a potential source of SOCs depending on fertilizing practices and use of pesticides. Commercial properties may be a source of nitrates and SOCs if fertilizers and pesticides are not used carefully for landscaping activities.

A review of the Maryland Department of Planning's 2002 Howard County Sewer Map indicates that there is no planned sewer service for the entire WHPA. Bon Secours Spiritual Center has a septic system for wastewater disposal which is located just outside the WHPA on the north side. Onsite septic systems may be potential sources of the nitrates to the supply wells.

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 may be the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The only treatment that the Bon Secours Spiritual Center water system currently has is ph adjustment is for corrosion control.

A review of the monitoring data since 1993 for the Bon Secours Spiritual Center water supply indicates that it meets the current drinking water standards. The water quality sampling results are summarized in Table 4. It must be noted that the radionuclide numbers used in this table include detections of radon-222 using proposed MCLs for community water systems.

PLANT NO	Nitrate		SOCs		VOCs		IOCs (except nitrate)		Radionuclides*	
	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL
01	20	1	3	0	11	0	5	0	2	2** +

Table 4. Summary of Water Quality Samples for the Bon Secours Spiritual Center Water Supply.

*not regulated

**based on proposed MCLs for community systems

Inorganic Compounds (IOCs)

The only IOC detected above 50% of the MCL was nitrate. The MCL for nitrate is 10 ppm and it was detected one time above 50% of the MCL at 5.3 ppm in a sample collected on February 7, 1996. The nitrate has been detected in the water supply since 1994 at levels below 50% of the MCL. The average of these detections is 2.85 ppm. A review of the nitrate data shows no increasing trends in the nitrate levels. A review of the sodium data shows that levels in 2005 were 35 ppm or three times the levels measured in 2002. The EPA recommends that for persons on restricted sodium restricted diets levels in drinking water be less than 20 ppm.

Volatile Organic Compounds (VOCs)

No VOCs above 50% of the MCL have been detected in Bon Secours Spiritual Center's water supply.

Synthetic Organic Compounds (SOCs)

No SOC above 50% of the MCL have been detected in Bon Secours Spiritual Center's water supply. The only SOC detected one time was di(ethylhexyl)phthalate in a sample collected on March 22, 2005 at 0.8ppb. The MCL for this SOC is 10 ppb. This SOC was also detected in the laboratory blank on the same date and does not represent Bon Secours Spiritual Center's water quality.

Radionuclides

Nontransient noncommunity systems are currently not regulated for radionuclides. The only radionuclide detected in samples collected in 1996 and 1997 was radon-222 at 8830 and 5995 picoCuries/Liter, respectively. 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.

Microbiological Contaminants

Ground water under the influence of surface water (GWUDI) testing was conducted for the Bon Secours Spiritual Center wells. GWUDI testing requires collection and analysis of raw water samples for bacteria (total and fecal coliform). No coliform bacteria were detected in the raw water samples. All

nontransient noncommunity systems are required to conduct quarterly routine bacteriological sampling for their water supply as required by the Safe Drinking Water Act. These samples are generally collected from finished (treated) water, which may not be indicative of the source water conditions. None of the thirty-six routine bacteriological samples collected for Bon Secours Spiritual Center's water supply have shown any coliform detection.

SUSCEPTIBILITY ANALYSIS

Bon Secours Spiritual Center's 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 supply 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.

In the non-carbonate rocks of the Piedmont region, if a well is constructed properly with the casing extended to competent rock and with sufficient grout, the saprolite serves as a natural filter and protective barrier from microbial contamination. Properly constructed wells with no potential sources of contamination in their WHPA should be well protected from contamination. The susceptibility of the water supply to the various types of contaminants is summarized in Table 5.

Inorganic Compounds (IOCs)

Nitrate was the only IOC detected above 50% of the MCL in Bon Secours Spiritual Center's water supply. Out of 20 samples analyzed, only one sample (February, 1996) had results above 50% of the MCL. A review of the nitrate data shows no increasing or decreasing trends in nitrate levels. Sources of nitrate can generally be traced to land use. Fertilizer applied to agricultural fields, and the Bon Secours property for landscaping, are source of nitrate loading in ground water. The entire WHPA is in an area not planned for public sewer and has onsite septic systems for wastewater disposal. Onsite septic systems in the WHPA are also sources of nitrate in ground water.

Based on above analysis Bon Secours Spiritual Center's water supply **is not** susceptible to inorganic compounds.

Volatile Organic Compounds (VOCs)

No VOCs above 50% of the MCL have been detected in Bon Secours Spiritual Center's water supply since 1993. There are two potential sources of VOC contamination in the WHPA (figure 2), but water quality data indicates that these sources have not had an impact on the water supply.

Based on the above discussion, Bon Secours Spiritual Center's water supply is **not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

No SOC's have been detected in Bon Secours Spiritual Center's water supply. One potential point source of contamination is located in the WHPA (figure 2). Application of pesticides on Bon Secours property and cropland can be potential nonpoint sources of SOC's. But so far, due to combination of proper application, aquifer and well characteristics no SOC's have been detected in the water supply.

Based on the above analysis, Bon Secours Spiritual Center's water supply is **not** susceptible to SOC contamination.

Radionuclides

Nontransient noncommunity systems are currently not regulated for radionuclides. . The only radionuclide detected was radon-222 at levels above the higher proposed MCL for radon for community water systems. Radon is a naturally occurring compound and is prevalent in ground water due to the radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996). High levels of radon are prevalent in fractured rock aquifers like Baltimore Gneiss.

Based on the above analysis, Bon Secours Spiritual Center's is susceptible to radon but not to other radionuclides.

Microbiological Contaminants

Based on raw water bacteriological data Bon Secours Spiritual Center's wells were determined not to be GWUDI. In addition, no bacteria have been detected in any of the routine bacteriological samples collected for Bon Secours Spiritual Center's water supply.

Based on the above discussion, Bon Secours Spiritual Center's water supply is **not** susceptible to microbiological contaminants.

CONTAMINANT TYPE	Are Contaminant Sources present in the WHPA?	Are Contaminants detected in WQ samples at 50% of the MCL	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible to the Contaminant
Nitrate	NO	YES	NO	YES	NO
Inorganic Compounds (except nitrate)	NO	NO	NO	YES	NO
Volatile Organic Compounds	YES	NO	NO	YES	NO
Synthetic Organic Compounds	YES	NO	NO	YES	NO
Radionuclides (except radon)	NO	NO	NO	YES	NO
Radon	YES	YES	NO	YES	YES*
Microbiological Contaminants	NO	NO	NO	YES	NO

Table 5. Susceptibility Summary for Bon Secours Spiritual Center's water supply.

*based on proposed MCL for community systems

MANAGEMENT OF THE WHPA

Contaminant Source Inventory/Well Inspection

- The system owners should review the potential sources of contaminants within the WHPA and update them if necessary, including a consideration of historical uses.
- Since all the potential point sources of contamination are upgradient of the wells, ensure that best management practices are being implemented to prevent contamination of the wells.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

Cooperative Efforts with Other Agencies

- Work closely with Howard County Health Department to identify any unused wells in the WHPA and to ensure that they are abandoned and sealed in compliance with the State's well construction standards.

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Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

Changes in Use

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

REFERENCES

- Bolton, David W., 1996, Network Description and Initial Water-Quality Data from a Statewide Ground-Water Quality Network in Maryland: Maryland Geological Survey Report of Investigations No. 60, 167 p.
- Dine, J. R., Adamski, J. C., and Tompkins, M. D., 1992, Hydrologic Data for Howard County: Maryland Geological Survey Basic Data Report No. 19 240 p.
- Dingman, R. J., and Meyer G. M., 1954, The Water Resources of Howard and Montgomery Counties: Maryland Department of Geology, Mines and Water Resources Bulletin 14, 260p.
- Edwards, Jr., J., 1993, Geologic Map of Howard County, Maryland, Maryland Geological Survey, 1:62,500.
- Maryland Department of the Environment, 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 Water and Drinking Water, EPA/570/9-91-009, 144 p.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit: HO1963G008
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles:
Woodbine
USGS Topographic 7.5 Minute Woodbine Quadrangle
Maryland Department of Planning 2002 Howard County Land Use Map
Maryland Department of Planning 2002 Howard County Sewer Map

FIGURES

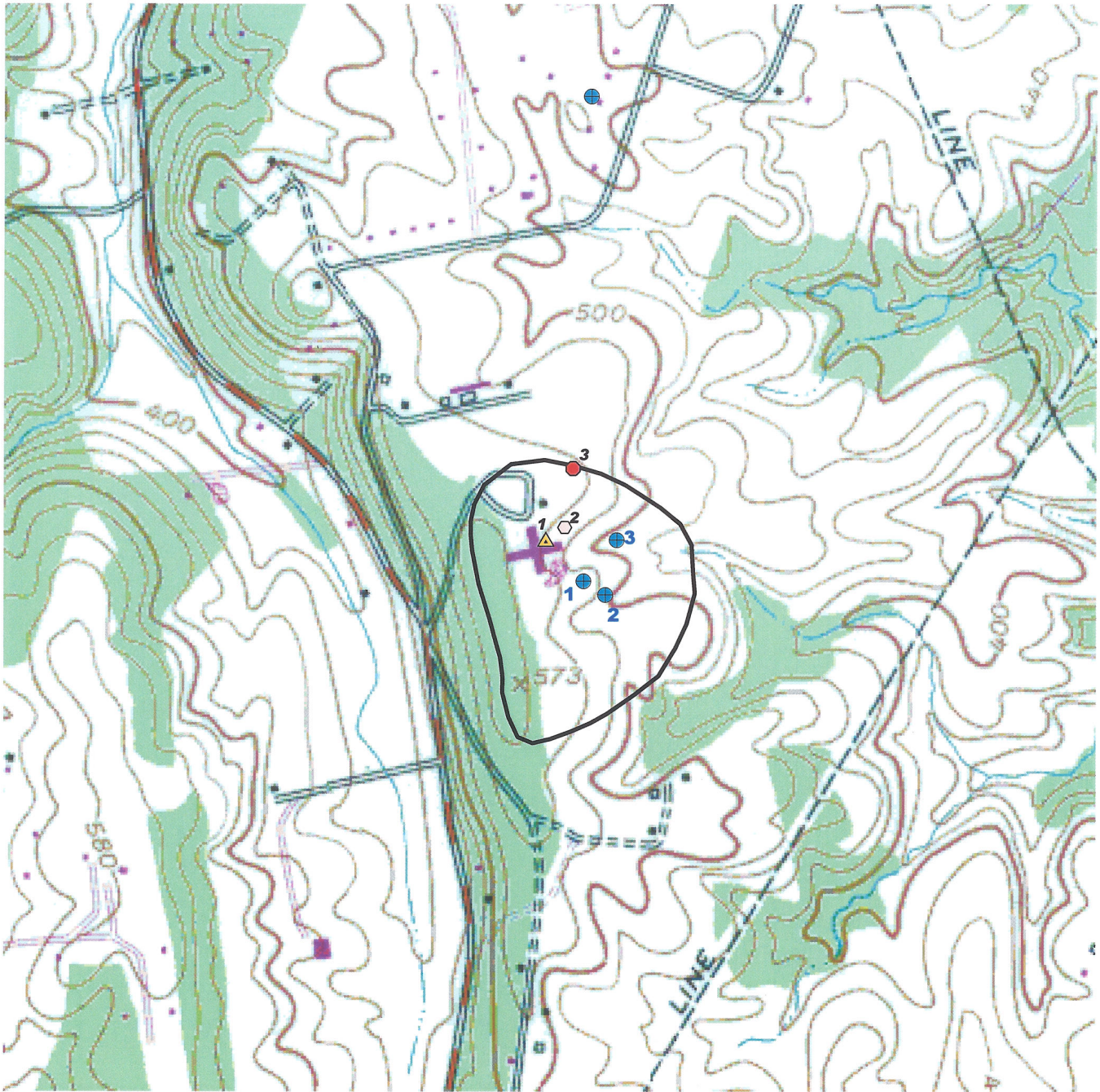


Figure 2. Bon Secours Spiritual Center's Wellhead Protection Area with Potential Contaminant Sources

LEGEND

- | | | | |
|---|---------------------------|----|--------------------------|
| ▲ | Maintenance Shop | ●+ | Supply Well |
| ○ | Transformer | ○ | Wellhead Protection Area |
| ● | Above Ground Storage Tank | | |



Base Map: USGS 7.5 minute Topographic Quadrangle - Sykesville

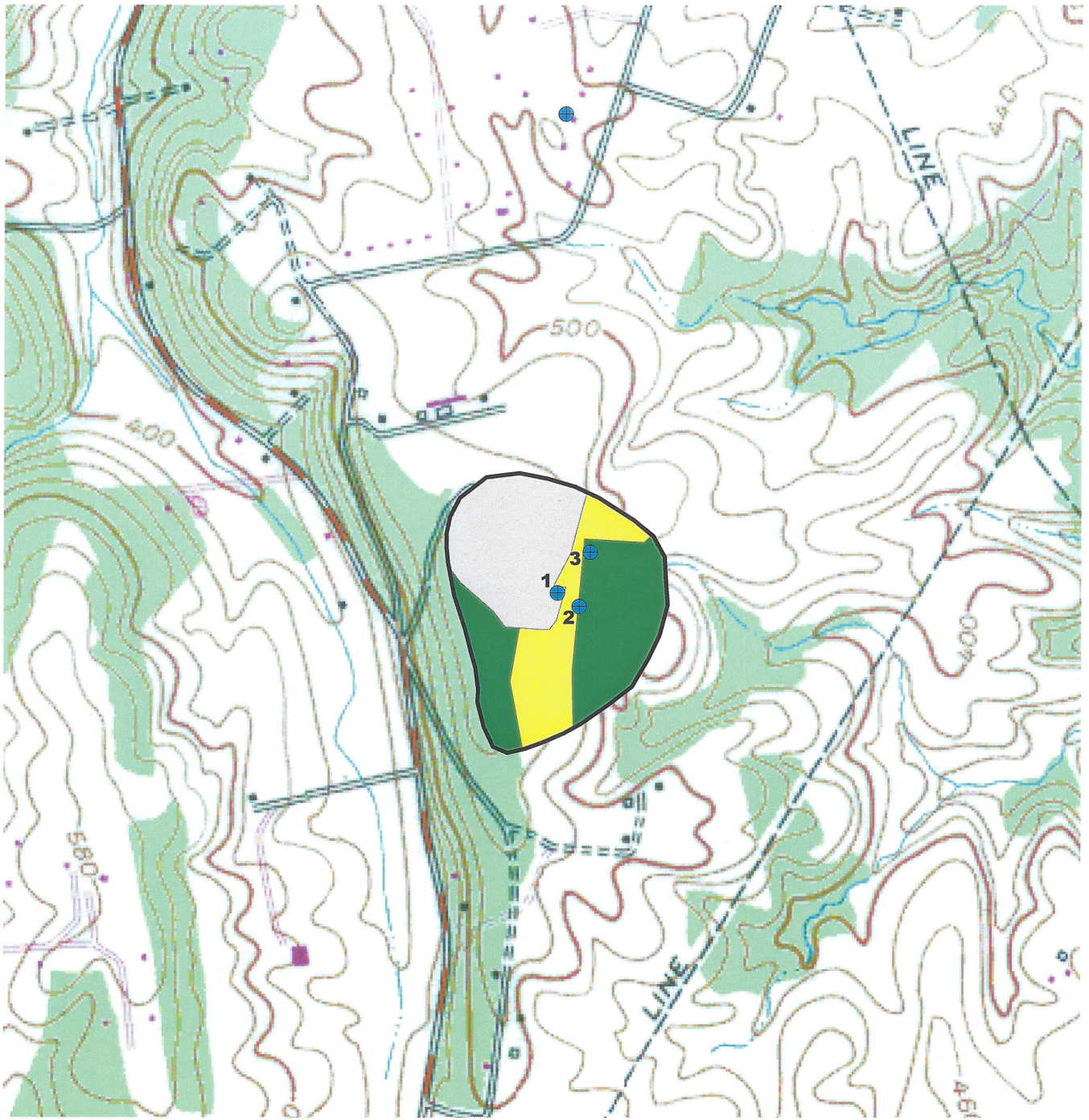
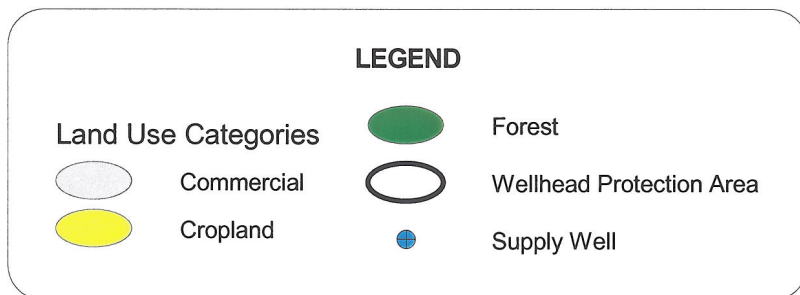


Figure 3. Land Use Map for Bon Secours Spiritual Center's Wellhead Protection Area



Base Map: USGS 7.5 minute Topographic Quadrangle - Sykesville