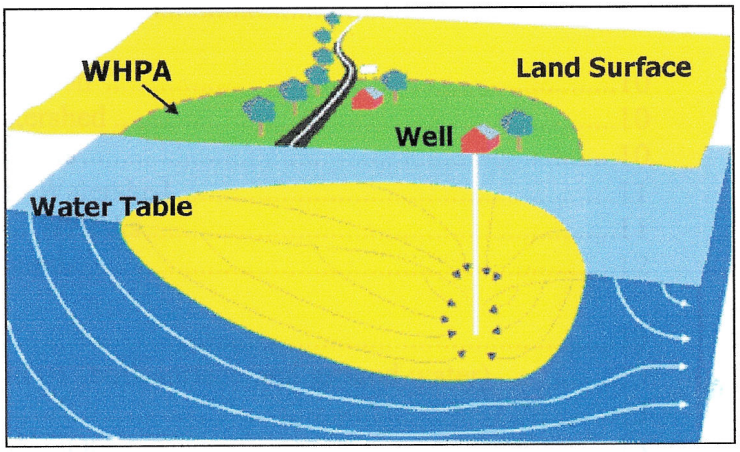
Source Water Assessment

for the Town of Myersville
Frederick County, MD

(Cover changed due to opening in cover.)



Prepared By
Maryland Department of the Environment
Water Management Administration
Water Supply Program
January 2002

MDE

Susceptibility Analysis....19
Surface Water Supply....19
Turbidity....19
Inorganic Compounds....20
Radionuclides....20
Synthetic Organic Compounds....20
Ground Water Supply....20
Inorganic Compounds....21
Radionuclides....22
Volatile Organic Compounds....22
Synthetic Organic Compounds....22
Microbiological Contaminants....23

Recommendation for Source Water Protection Plan....23
Form a Local Planning Team....23
Public Awareness and Outreach....24
Monitoring....24
Planning/New Development....24
Land Acquisition/Easements....24
Contingency Plan....24
Changes in Use....24
Contaminant Source Inventory Updates....24

References....26

Other Sources of Data....26

Figures....27
Figure 1. General Area
Figure 2. Town of Myersville Water Supply Sources
Figure 3. Myersville – Little Catoctin Creek Intake 1997 Land Use
Figure 4a. Myersville Wellhead Protection Areas
Figure 4b. Myersville Spring and Wellhead Protection Areas
Figure 5. Land Use in Myersville Wellhead Protection Area
Figure 6. Myersville Wellhead Protection Area with Potential Contaminant Sources
Figure 7. Sewer Service Coverage in the Myersville WHPA

SUMMARY

The 1996 Safe Drinking Water Act Amendments require states to develop and implement source water assessment programs to evaluate the safety of all public drinking water systems. A Source Water Assessment (SWA) is a process for evaluating the vulnerability to contamination of the *source* of a public drinking water supply. The assessment does not address the treatment processes, or the storage and distribution aspects of the water system, which are covered under separate provisions of the Safe Drinking Water Act. The Maryland Department of the Environment (MDE) is the lead state agency in this source water assessment effort.

There are three main steps in the assessment process: (1) *delineating* the watershed drainage area that is likely to contribute to the drinking water supply, (2) *identifying* potential contaminants within that area and (3) *assessing* the vulnerability of the system to those contaminants. This document reflects all of the information gathered and analyzed required by those three steps. MDE looked at many factors to determine the vulnerability of this water supply to contamination, including the size and type of water system, available water quality data, the characteristics of the potential contaminants, and the capacity of the natural environment to attenuate any risk.

Myersville's source water supply is comprised of ground water from a combination of wells and springs and surface water from Little Catoctin Creek. The ground water sources draw water from unconfined fractured rock aquifers. Wells and springs' unconfined aquifer conditions are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area. The consistent presence of fecal coliform bacteria in the springs indicates their susceptibility to pathogenic microorganisms. The water from wells is free of fecal coliform bacteria. The detection of several contaminants such as inorganic compounds, synthetic organic compounds and volatile organic compounds (detected in the Ashley wells only) also indicate that Myersville's ground water supply is susceptibile to those contaminants. The surface water source is from Little Catoctin Creek that receives runoff from a 3,026 acre watershed that is vulnerable to land use activities occurring within the watershed. The watershed has a significant amount of agricultural land use, without any commercial or industrial land use or major roads through it. It's susceptibility is limited to agricultural chemicals, turbidity and microbial pathogens. Continued monitoring of contaminants is essential in assuring safe drinking water. Furthermore, in order to maintain and/or improve the quality of the water supply, the Town is encouraged to implement the recommendations for an active source water protection plan as included in Section VII of this report.

I. INTRODUCTION

The Town of Myersville is located in the western part of Frederick County, approximately 10 miles northwest of the City of Frederick (Figure 1). The Town owns and operates the water system that serves an estimated population of approximately 1500 persons (568 service connections) according to the Town's records. Currently, the raw water is supplied by nine wells, seven springs and Little Catoctin Creek. A summary of updated water appropriation and use permits for these surface and ground water supplies are shown in Table I below.

Permits No. Source	Drainage Basin or Aquifer	Daily Average (GPD)	Daily Maximum (GPD)
FR1964S003 (06) Little Catoctin Creek	Catoctin Creek Drainage	40,000	150,000
FR1987G020 (04) Seven Springs	Weverton Formation	40,000	60,000
FR1987G004 (06) Well in WTP Site	Catoctin Metabasalt	13,000	26,000
FR1987G104 (03) Wells #2 and #3 in Ashley Hills	Catoctin Metabasalt	22,500	37,600
FR1987G204 (02) Well in Deer Woods	Catoctin Metabasalt	15,600	17,300
Fr1988G035 (05) Wells #1 and #2 in Canada Hill	Catoctin Metabasalt	42,200	46,800
FR1995G022 (001) Wells #1 and #2 in Town Park Site (Doubs Meadow)	Catoctin Metabasalt	38,000	57,000
FR1997G034 (01) Reservoir Well	Catoctin Metabasalt	10,000	15,000

Table 1. Myersville's Water Appropriation and Use Permits.

A. SURFACE WATER SUPPLY SOURCE

Approximately eighteen percent (18%) of the potable water supplied to the Town of Myersville is appropriated from Little Catoctin Creek. A low head concrete dam is located in the Little Catoctin Creek approximately 1.5 miles north of the Town's water treatment plant along Easterday Road. This dam was constructed for the purpose of supplying raw water for the Town of Myersville.

Little Catoctin Creek watershed lies in the upper Catoctin Creek drainage basin, between Middle Creek and South Mountain. Soils in the watershed

predominantly are Myersville and Fauquier Silt or gravelly loams, 0 to 25 percent slope.

The Myersville Series consist of deep, well drained medium-textured soil that developed on materials weathered from metabasalt, or greenstone. Nearly all of Myersville soils, except in the steepest and most stony areas, are in cultivated crops or high-quality pastures. The Fauquier soils are associated with the Myersville soil (U.S. Department of Agriculture, *Soil Survey of Frederick County*, 1960).

Frederick County's location in two physiographic regions (Piedmont and Blue Ridge) provides a topography which ranges from the gently rolling to the rugged and mountainous. This creates a variety of local climates. The variation in elevation has a major effect on the average temperature. Myersville is located in the Middletown Valley, between the Catoctin and South Mountains with an average annual temperature of 50° and the average precipitation ranges between 44 and 46 inches (*Frederick County Comprehensive Plan*, 1977).

B. GROUND WATER SUPPLY SOURCES

The remaining eighty-two percent of Myersville's water supply is from a combination of wells and springs.

Source Information

The nine wells are located throughout the residential subdivisions within and just outside the town limits, with the exception of the Reservoir Well which is adjacent to the intake on Little Catoctin Creek (Fig. 2). A review of the well completion reports indicates that all of the wells were installed after the 1973 well construction regulations went into effect and should meet construction standards. A September 2000 inspection by water supply staff revealed sanitary deficiencies in four of the wells. Specifically, Ashley #3 and the Deer Woods wells had holes in their casing, the Reservoir Well had an unscreened opening, and Ashley #2 and #3 had loose caps. There is no record as to whether these deficiencies have been corrected as requested in an October 2000 letter addressed to the water system operator. Table 2 contains a summary of the well construction data.

The nine wells enter the water distribution system through one of three water treatment plants. The Reservoir Well, the Town Well, and the Canada Hill wells enter through the surface water treatment plant (Plant 01). The Ashley wells enter the wellhouse (Plant 03) located in the Ashley subdivision and the Deerwood and Doubs Meadow wells enter the wellhouse (Plant 04) located in the Deerwoods subdivision.

There are seven springs on the eastern slope of South Mountain from which water is collected and brought together at the Spring Collection Box. The spring box is approximately 3.5 miles northwest of Town (Fig. 2). A water line carries the spring water from the collection box to the raw surface water reservoir. The springs were determined under the direct influence of surface water based on raw water testing conducted in 1992 and are treated as a surface water source.

Plant Id	Source Name	Well Permit No.	Well Depth	Casing Depth	Construction Date
01	TOWN WELL (PLANT WELL)	FR814337	410	41	Jul-87
01	RESERVOIR WELL	FR882380	600	31	Sep-92
03	ASHLEY 1 (ABANDONED)	FR880774	475	63	Oct-89
03	ASHLEY 2	FR880904	775	63	Oct-89
03	ASHLEY 3	FR941494	500	45	Aug-99
04	DEERWOOD WELL	FR883046	425	63	Aug-92
04	DOUBS MEADOW 1	FR884606	300	40	Jul-95
04	DOUBS MEADOW 2	FR884605	500	34	Jul-95
05[1]	CANADA HILL 1	FR883098	450	63	Sep-92
05[1]	CANADA HILL 2	FR883400	300	51	Mar-93

Table 2. Well Construction Information.
[1]The Canada Hill wells enter Plant 01, however water quality data collected separately from these wells is included in this report and is listed under Plant 05.

Hydrogeology

The Catoctin Metabasalt, a dense green crystalline rock believed to be a series of metamorphosed lava flows (Meyer and Beall, 1958) underlies the Town of Myersville and the surrounding area. The Myersville wells obtain water from the Catoctin Metabasalt formation, which is an important aquifer in the Middletown Valley between Catoctin and South Mountains due to its aerial extent. The primary porosity and permeability of this aquifer are small due to the dense nature of the metabasalt. Ground water moves principally through secondary porosity, fractures and joint openings, and is recharged by precipitation percolating through soil and saprolite. Due to the low primary porosity of this aquifer, large production wells are not common in this formation unless significant, water-bearing fractures are encountered. A fracture trace analysis has not been completed in the area, however fracture orientations were inferred from linear stream segments in support of the application for the Town's ground water appropriation permits. Streams in crystalline rock tend to follow zones of weakness in the rock caused by fracture and joint sets. A statistical analysis of 176 measured linear stream segments indicated that major fracture zones were likely to be oriented at N30E, N50E, and N50W.

The springs lie on the contact between the Weverton formation and a formation of Metarhyolite and associated Pyroclastics at an elevation of approximately 1200 feet. A broad definition of a spring is a concentrated discharge of ground water issuing from a more or less defined opening (Otton and Hilleary, 1985). Springs can be classified by many characteristics and in Maryland a common type of spring is known as a "contact" spring, in which ground water discharges at the surface due to the difference in permeability between two formations. A "scree" spring is found where ground water moves downslope along a mountainside at the base of boulders and cobbles of scree and emerges at a change in slope, or at the base of a slope (Otton and Hilleary, 1985). The Myersville springs may be classified as both contact springs and scree springs, which are commonly found on the slopes of Catoctin and South Mountains.

Reported yields for the Town wells ranges from 5 to 25 gallons per minute (gpm). Otton and Hilleary (1985) estimated discharge for the springs at 75-100 gpm. However, estimates of the spring's sustained yield in the water appropriation permit are significantly lower. The Town's water use is summarized in Table 3 based on the most recent annual pumpage reports for each of the ground water appropriation permits.

Water Appropriation Permit No.	1999 Daily Average (gpd)	1999 Highest Month Average (gpd)	2000 Daily Average (gpd)	2000 Highest Month Average (gpd)
FR1987G020	18,058	28,517	23,383	35,483
FR1987G004	11,814	13,736	17,897	45,487
FR1987G104	4,881	7,547	11,834	14,827
FR1987G204	10,543	13,644	12,053	19,627
FR1988G035	14,759	31,166	33,796	46,850
FR1995G022	18,152	29,188	28,467	47,803
FR1997G034	11,014	12,984	91,705	124,379
Totals	**89,221**	**136,782**	**219,135**	**334,456**

Table 3. Water Use for 1999 and 2000 Ground Water Sources.

C. WATER SUPPLY DEVELOPMENT

The Town of Myersville water system is one of 14 regional water service areas in Frederick County and serves a population of approximately 1500. A review of population change in Myersville from 1990 to 1997 indicates a 90% increase from the 1990 figure of 464 persons to the 1997 population of 883 persons. Future customers of the Myersville water system is expected to increase to 2,400 by year 2017 (According to Town's revised Comprehensive Plan).

Water Treatment Plant

The Town of Myersville's original water treatment plant was constructed in 1964. The plant consisted of a 15-ft diameter sedimentation basin with

a volume of 18,000 gallons, two 6-ft diameter automatic valveless gravity dual media filters. The capacity of the plant was limited to a flow rate of (100 gpm) 144,000 gpd, not capable to meet present and future daily water demands. In order to address Myersville's water system problems, the Town hired engineering firms to evaluate alternatives for future water system improvements.

An engineering report recommended the construction of a new water treatment plant, complete with building, chemical feed equipment and controls to meet the present and future water demands.

The construction of the new plant (Microfloc Model 2TM-175A) with a design capacity of 200 gpm was completed. The plant has been in operation since October 1999. Maryland Environmental Services, an agency of the State of Maryland, currently operates the water treatment facility and submits monthly operating reports to MDE on behalf of the Town of Myersville.

Two separate plants exist as the points of entry for the Ashley wells (Plant 03) and the Deerwood and Doubs Meadows wells (Plant 04). Hypochlorination is used as the disinfection mechanism at both wellhouses. In addition, the Ashley plant has pressure sand filtration for particulate removal and the Deerwoods plant uses greensand filtration with the addition of permanganate for iron removal.

II. RESULTS OF SITE VISIT(S)

Water Supply Program personnel conducted a site survey of the Town's raw water sources and other raw water facilities in order to accomplish the following tasks:

- To collect information regarding the locations of raw water sources and intakes by using Global Positioning System (GPS) equipment.
- To determine the general condition and structural integrity of intakes and other raw water facilities.
- To discuss source water issues and concerns with the Town's water system operators.
- To conduct a windshield survey of the watershed and to document potential problem areas. (Photographs of raw water system obtained during the site survey appear in APPENDIX A.)

Little Catoctin Creek raw water facilities consist of a low level dam, an 8-inch screened intake line to a 400,000 gallon holding pond, a "lower reservoir" 7,800 gallon wet well, a 50 gpm pump and 60 gpm pump which pumps the raw water through approximately 7,000 feet of 6" diameter cast iron pipe from an elevation

of 725.0 ft MSL to an elevation of 840.0 ft MSL at the 500,000 gallon "upper reservoir." The "upper reservoir" is filled by water from the Little Catoctin Creek, four wells (Reservoir, Canada Hills, plant), and spring water. The raw water collection system is operated to maintain a full upper reservoir at all time. The water from upper reservoir flows by gravity to WTP. The intake at the Little Catoctin Creek is subject to accumulation of debris and sediments and requires periodic cleaning and maintenance.

The natural springs that serve the Town of Myersville are located off Pleasant Walk Road along the eastern ridge of South Mountain, at an elevation of about 1,200 MSL. The spring fed portion of the raw water system consists of seven spring boxes and a raw water flow meter with totalizer. The spring water flows by a 3-inch gravity line from the spring boxes, travels south through a wooded area and eventually along a portion of Scravel Road to Easterday Road and traverses along Easterday Road and finally discharging into the upper reservoir. Prior to 1998, 11 homes on Easterday Road were supplied directly with chlorinated spring water and did not receive water from the treatment plant. Now, these homes receive treated water from the treatment plant.

During the field survey of the raw water line from the springs to the treatment plant and discussions with the Town's personnel, it was noted that the exact routing of the raw water line (horizontal and vertical alignments) that extends approximately 3 to 4 miles is not known. The existence of an easement for the entire length of the raw water is also not known. At the time of the site visit, no apparent leak was detected in the raw water line but there were some leaks that occurred in the past, according to Mr. Hinkle. The maintenance of the raw water line is the responsibility of the Town of Myersville.

The major concerns of the Town officials and Maryland Environmental Services operators were a shortage of water during dry months, aging raw water pumps and high turbidity of raw water from Little Catochin Creek during heavy rainfall. In order to address the water shortage and to keep up with the future demand, the Town is exploring the feasibility of a large surface water impoundment in the north side of Town.

III. SOURCE WATER ASSESSMENT AREA CHARACTERIZATION

Source Water Assessment Area Delineation Method (Surface Water)
An important aspect of the source water assessment process is to delineate the watershed area that contributes to the source of drinking water. A source water protection area is defined as the whole watershed area upstream from a water plant's intake (MDE, 1999). Delineation of the source water area was performed by using ESRI's Arc View Geographic Information Software (GIS), utilizing existing GIS data, and by collecting location data using a Global Positioning System (GPS). GPS point locations were taken at the water source intake and

differentially corrected (for an accuracy of +/-2 meters) at MDE. Once the intake location was established, the contributing area was delineated based on existing Maryland Department of Natural Resources digital watershed data and Maryland State Highway Administration digital stream coverage. Digital USGS 7.5 topographical maps were also used to perform "heads up" digitizing, or editing, of watershed boundaries.

The source water protection area for the Little Catoctin Creek watershed encompasses 3,026 acres of forested and cropland with small areas of low density residential use and pastures. The watershed map (Figure 3) shows the land use summary of the drainage area.

Source Water Assessment Area Delineation Method (Ground Water)
For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. A WHPA was originally delineated in 1996 for the wells and springs based on long term aquifer tests and fracture trace interpretations from the ground water appropriation permits together with topographic features and drainage divides. Drought year recharge is estimated to be 400 gallons per day per acre, and each WHPA covers an area that would provide enough land to supply the appropriated amounts.

A fracture trace analysis identifies specific features on the surface that are expressions of vertical, closely spaced joints and fractures in the bedrock below. As discussed above, a fracture trace analysis has not been completed in the Myersville area. However, some information has been gathered that is useful in interpreting possible fractures that may intersect the Town Wells. A well intercepting a fracture, or fracture zone, will demonstrate a drawdown pattern that is greatest along the trace of the fracture(s). Thus, the WHPAs were delineated based in part on inferred fracture traces (Fig. 4a).

The WHPA for the Town Well and Canada Hills Wells is an oval shaped area covering approximately 250 acres. Pumping tests indicate that ground water flow to these wells is influenced by fractures trending north-northeast, northwest, and north-south. The boundaries of the WHPA extend outward from the wells to include these inferred fracture traces and the western boundary extends to the nearest topographic high which is presumed to be the ground water divide (Fig. 4a).

A WHPA covering approximately 150 acres was delineated for the Deer Woods and Doubs Meadows wells and is bounded by Route 40 to the east and Canada Hills Road to the west (Fig. 4a). A north-south fracture trace was identified in this WHPA which appears to have some influence of ground water flow to the Doubs Meadows wells but not the Deer Woods well which is located approximate 400 feet to the west of the fracture trace. The western and northern boundary extends to the topographic highs and the southern boundary follows the Catoctin

Creek watershed to a point approximately 500 feet downstream of the Doubs wells.

A third area was delineated around the Ashley wells that covers approximately 60 acres mostly within the Ashley subdivision. The low yield of these wells indicates that ground water flow to the Ashley wells is not influenced heavily by fractures, thus a roughly radial area buffering between 600 and 1200 feet around the wells was delineated as the WHPA. The western boundary of this area corresponds with the topographic high along Main Street.

The spring protection area was delineated as the recharge area upgradient of the spring collection box (Fig. 4b). The uppermost boundary is the top of South Mountain and down gradient limit was extended to Pleasant Walk Road. The spring protection area is completely encompassed by the source water assessment area for the surface water intake on Catoctin Creek.

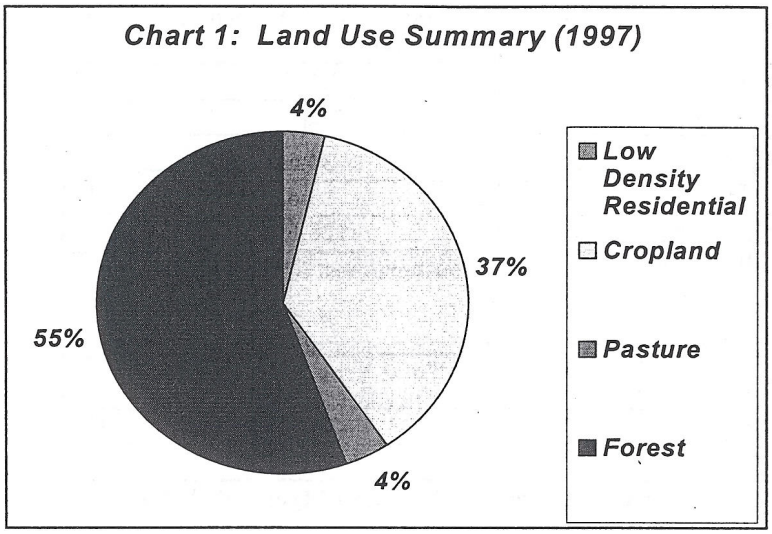
A separate WHPA was delineated for the Reservoir Well for this report. The Reservoir Well is located within the source water assessment area delineated for the Catoctin Creek intake. The Town is currently limited to an appropriation of 10,000 gpd for this well, due to its potential impact on nearby users, which equates to an average pumping rate of 7 gpm. This low pumping rate is not likely to induce significant drawdown in any direction. Therefore, the WHPA for this well is bound by the intake watershed boundary to the south and a 500-foot radial buffer in the northern direction (Fig. 4b)

Land Use Characteristics

Based on the Maryland Department of Planning's 1997 land use data, the land use distribution in the Little Catoctin Creek Watershed that contributes into the Town of Myersville intake is shown in Table 4 and Chart 1.

Land Use	Total Area in Acres	Percent of Total Watershed
Low Density Residential	109	3.6%
Cropland	1116	36.9%
Pasture	120	4.0%
Forest	1681	55.6%

Table 4. Land Use in the Watershed.



Localized Characteristics

The Town of Myersville owns a very small portion of land in the watershed of Little Catoctin Creek and Seven Springs, two acres along the creek and approximately 11 acres at the springs (Table 5 and Chart 2. Easterday Road and Pleasant Walk Road are the major transportation corridors in the watershed extending in a north-south direction. There are three large residences located along Easterday Road within close proximity to the Little Catoctin Creek intake.

Property	Type	Approximate Total Area in Acres	Percent of Total Watershed
Town of Myersville	Municipal	13	0.4%
South Mountain Recreation Area	State Land	396	13%
Private	Private Property	2616	86%

Table 5. Property Ownership in the Watershed.

* There are approximately 217 property parcels in the Myersville watershed

The Maryland Department of Planning's 1997 Land Use map for Frederick County was used to determine the predominant types of land use in the WHPA (Fig. 5). The WHPAs encompassing the Town, Ashley, Canada Hills, and Doubs Meadows wells have a significantly different range of land uses than the WHPAs north of Town which cover the springs and the Reservoir well. Therefore, the land use types were summarized separately for the southern WHPAs and the northern WHPAs (Tables 6 and 7). The largest type of land area covering the southern WHPAs is cropland, with smaller areas split between residential and pasture lands and minor areas of forest and commercial land. In contrast, the northern WHPAs are predominantly covered by forested lands (97%), with minor residential areas covering the remainder of the WHPAs.

Land Use Type	Total Area (Acres)	Percent of WHPA
Commercial	13.4	2.9
Cropland	219.6	47.5
Forest	34.5	7.5
Pasture	66	14.3
Residential	128.6	27.8

Table 6. Land Use in the Southernmost Myersville WHPAs.

Land Use Type	Total Area (Acres)	Percent of WHPA
Forest	262.8	97.3
Residential	7.2	2.7

Table 7. Land Use in the Northernmost Myersville WHPAs.

IV. SIGNIFICANT 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 may be associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Also permitted discharges to surface streams or directly to the ground within a source water assessment area are considered potential 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 in the Watershed

No point sources of contamination were identified in Meyersville's watershed upstream of the intake. The sewer service map shows that there is no planned service areas within the watershed.

Point Sources in the WHPAs

Several potential point sources of contamination were identified during the original mapping of Myersville's WHPA. The list of point sources has been revised in this report based on field inspections by MDE employees and updated databases. A few commercial establishments have Underground Storage Tanks (USTs) and are classified as Controlled Hazardous Substance Generators (CHS) and are identified on Figure 6. These sites are just outside of the WHPA for Myersville's wells and springs and therefore do not impose an immediate threat to the Town's water supply, but do represent a potential threat for contamination to the local aquifer. Some miscellaneous (MISC) potential contaminant sites have been identified within the WHPA. The State Highway facility stores road salt and

stormwater management ponds may introduce contaminants from stormwater runoff into the ground water system (Fig.6). Table 8 lists the facilities identified and their potential contaminants. This list is based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used at the facility. The potential contaminants for an activity may not be limited to those listed. Potential contaminants are grouped as Inorganic Compounds (IOC), Volatile Organic Compounds (VOC), Heavy Metals (HM), and Microbiological pathogens (MB).

ID	Type	Site Name	Address	Potential Contaminant
1	UST, CHS	Sunoco	9630 Myersville Rd	VOC
2	UST, CHS	Exxon #6174	9625 Myersville Rd	VOC
3	MISC	SHA Maintenance Shed	US Route 40	VOC, IOC
4	CHS	C&P Telephone Co	US Route 40	VOC
5	MISC	Stormwater Infiltration Pond	Ashley Subdivsion	HM, MB
6	MISC	Stormwater Infiltration Pond	Canada Hills Subdivsion	HM, MB

Table 8. Potential Contaminant Point Sources in Myersville. (See Figure 6 for locations).

Non-Point Sources in the Watershed

According to the 1997 Maryland Department of Planning Land Use data, 41% of the watershed is used for agricultural purposes (37% cropland, 4% pasture). Cropland can be a source of nutrients from fertilizer and a source of synthetic organic compounds from applications of pesticides. The majority of agricultural land is concentrated east of Catoctin Creek. The main stem of the creek is mostly buffered by forested land and helps to reduce the threat of agricultural runoff. Almost 55% of the watershed is forested and protected from urban non-point pollutant runoff. The forested land is generally located west of Catoctin Creek along South Mountain. Less than 4% of the watershed is low density residential and located along Easterday and Pleasant Walk Roads. Houses in the watershed are not in a public sewer service area and rely on septic systems. Information on the condition of these septic systems is unknown, but failing on-site septic systems can be a potential source of contamination.

Non-Point Sources in the WHPAs

Agricultural land use (cropland and pasture) is commonly associated with nitrate loading of ground water and also represents a potential source of SOCs depending on farming practices and use of pesticides. Residential areas may present a source of nitrate due to septic systems or lawn care practices. Forested areas within the WHPA serve as protective buffers for the water supply as they do not contribute contaminants and may reduce nitrogen loading that is added to the ground water system via other types of land use. Commercial areas make up a very small proportion of the WHPA and are more commonly associated with point source contamination.

The Maryland Office of Planning's Frederick County sewer service map was reviewed to determine the area in the WHPA covered by sewer service (Table C).

The northern WHPAs are wholly within an area that is not planned for service. The WHPAs in Town are split between areas with future existing service, planned service, and areas not planned for sewer service (Fig. 7). Most of the area in the WHPAs that is in areas not planned for sewer service are covered by either forested or agricultural land.

Sewer Service Type	Total Area (Acres)	Percent of WHPA
Existing Service	61.1	13.2
3 Year Planned Service	55.4	12.0
4 to 6 Year Planned Service	116	25.1
No Planned Service	229.5	49.7

Table 9. Sewer Service Coverage in the Southernmost Myersville WHPAs.

Land Use Planning Concerns

A comparison between 1990 and 1997 Maryland Department of Planning land use data shows the recent changes in watershed land development. Land use percentages are shown below:

Land Use Type	Percent of Watershed in 1990	Percent of Watershed in 1997
Low Density Residential	NA	3.6%
Cropland	39.1%	36.9%
Pasture	3.3%	4.0%
Forest	57.6%	55.6%

Table 10. Comparison of Land Use Changes, 1990 versus 1997.

There has been a small change in land use activity in the watershed. The change in the low density residential land use suggests a potential trend toward future residential development in the watershed. This land use trend is similar to the current land use activities for the rest of Frederick County. According to Frederick County Comprehensive Plan of 1997, the upward changes in residential development is higher than other major land use categories countywide. Table 11 shows a comparison between 1988 and 1994 for major land use categories for Frederick County.

Land Use Category	1988 (Acres)	1994 (Acres)	% Difference 1988-1994
Agricultural/Rural	284,324	279,348	-1.8%
Woodlands	66,798	66,072	-1.1%
Residential	36,825	41,168	+11.8%
Parkland	20,981	22,575	+7.6%
Commercial/Industrial	8,136	8,496	+4.4%

Table 11. Comparison of Acreage for Major Land Use Categories, 1988 versus 1994; Source: Frederick County Department of Planning and Zoning (January 1994).

V. REVIEW OF WATER QUALITY DATA

Water quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) contaminants. Data from the water source (combined ground and surface, ground water only) and treated water from the water plants will be compared with Maximum Contaminant Levels (MCLs). If any monitoring data is greater than 50% of an MCL, a detailed susceptibility analysis will be performed for that contaminant and its probable source. Due to the absence of an active water quality monitoring program for Catoctin Creek and lack of adequate raw water data, this review will rely mostly on plant data.

Data from Plant 01 reflects the quality of the mixed supply of ground and surface water sources at this point of entry, while Plants 03 and 04 represent ground water quality from the wells entering these respective points of entry (Table 2). The Canada Hill wells are currently pumped to the surface water treatment plant (01), however some raw water data has been collected from these wells, and where available is listed under Plant 05. In the past, a line directly from the springs served several homes prior to entering the raw water reservoir and therefore monitoring data from this former point of entry is also available and is listed as Plant 02. This connection has since been terminated. For the purpose of this review, all contaminant detects from the plant data will be listed below. Most data is from finished (treated) water unless otherwise noted.

Water Quality from Plant 01 (both surface and ground water)

Existing Plant Data

The Town of Myersville is required to perform water quality tests on the drinking water produced from the water treatment plant in order to ensure compliance with the SDWA requirements.

They are also required to submit operating reports to MDE which includes daily testing of some raw water quality parameters such as turbidity (cloudiness of the water), alkalinity and pH. Review of the Town's monthly operating reports from January 2000 to December 2000 indicates that the average turbidity of the raw water (mixed supply of ground and surface water) fluctuates from 0.3 NTU to 1.30 NTU. The average pH of the raw water is from 7.2 to 7.8 and within the 6.5 – 8.5 range as recommended by secondary standard for drinking water.

Inorganic Compounds (IOCs)

The Town of Myersville plant regularly tests for the presence of nitrate and other inorganic compounds in finished drinking water. Below is a summary of testing results for IOCs detected in finished water. No IOCs exceeded our 50% level.

CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	03/02/93	1
NITRATE	10	05/13/93	0.7
NITRATE	10	08/30/93	0.1
NITRATE	10	12/20/94	1.2
NITRATE	10	03/28/95	0.11
NITRATE	10	05/31/95	0.43
NITRATE	10	02/29/96	1.2
NITRATE	10	08/26/96	0.8
NITRATE	10	01/27/97	0.9
NITRATE	10	07/29/97	0.3
NITRATE	10	03/10/98	0.77
NITRATE	10	04/13/98	0.8
NITRATE	10	08/05/98	1.9
NITRATE	10	08/05/98	2.06
NITRATE	10	08/15/98	0.357
NITRATE	10	03/17/99	0.635
NITRATE	10	08/10/99	0.43
NITRATE	10	03/14/00	0.826
NITRATE	10	05/30/00	0.86
NITRATE	10	05/31/00	0.6

Table 12. Nitrate Detects (ground and surface sources).

CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
ARSENIC	0.05	03/28/95	0.001
BARIUM	2	03/28/95	0.017
BARIUM	2	08/05/98	0.012
BARIUM	2	08/15/98	0.016
BARIUM	2	08/10/99	0.023
CHROMIUM	0.1	03/28/95	0.002
FLUORIDE	4	05/29/96	0.04
NITRITE	1	05/31/95	0.01
NITRITE	1	04/13/98	0.002

Table 13. Other IOC Detects.

Radionuclides

Radionuclides results detected in finished water are shown below.

RADON-222	300	12/20/99	145
GROSS BETA	50	12/20/99	1

Table 14. Radiological Detects.

Synthetic Organic Compounds (SOCs)

SOC samples are collected by MDE. Below is a summary of SOCs for the years 1990-2000. The Di(2-Ethylhexyl) Phthalate appears in laboratory blanks and is not reflective of the level in the environment.

CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
DI(2-ETHYLHEXYL) PHTHALATE	6	09/26/94	1.1
DI(2-ETHYLHEXYL) PHTHALATE	6	05/31/00	7.7
DI(2-ETHYLHEXYL) PHTHALATE	6	05/31/00	1
DI(2-ETHYLHEXYL) ADIPATE	400	05/31/00	0.8
HEXACHLOROCYCLOPENTADIENE	50	01/17/95	0.029
DALAPON	200	08/26/96	0.434
DALAPON	200	05/31/00	0.6
DALAPON	200	05/31/00	0.42

Table 15. SOC Detects.

Microbiological Contaminants

MDE with cooperation of the Town of Myersville water plant operators is currently conducting a raw water bacteriological monitoring study for a period of two years, which started in October 2000. The raw water samples are collected weekly and delivered to the Maryland Department of Health and Mental Hygiene central lab for testing of E.Coli and fecal coliform. Upon completion of the study, the data will be reviewed to further understand the microbiological quality of the raw water.

Ground Water Quality

A summary of the water quality data available for the other ground water supply sources is provided in Table 16. A review of the monitoring data shows that the ground water supply for the Town meets drinking water standards. Some contaminants were detected above 50% of an MCL, and are discussed further in the text below.

Contaminant Group	Plant 02 (Spring Collection Box)		Plant 03 (Ashley Wells)		Plant 04 (Doubs and Deerwood Wells)		Plant 05 (Canada Hills Raw Water)	
	No. of Samples Collected	No. above 50% of an MCL	No. of Samples Collected	No. above 50% of an MCL	No. of Samples Collected	No. above 50% of an MCL	No. of Samples Collected	No. above 50% of an MCL
Inorganic Compounds	16	0	13	0	11	1	5	0
Radiological Contaminants	0	0	3	0	1	0	1	0
Volatile Organic Compounds	5	0	9	1	6	0	4	0
Synthetic Organic Compounds	12	0	7	0	3	0	2	0

Table 16. Summary of Water Quality Samples from the Ground Water Supply.

Inorganic Compounds (IOCS)

Several inorganic compounds have been detected below maximum contaminant levels (MCL) in Myersville's ground water sources and are listed in Table 17. In Plant 04, Cadmium was present at 0.003 parts per million (ppm) which is above 50% of the MCL, however it was not detected in three subsequent samples collected at this point of entry. Nitrate was the most common inorganic compound detected in all wells, however the levels present were consistently below 50% of the Nitrate MCL.

Plant Id	Contaminant	MCL	Sample Date	Result (ppm)
02	BARIUM	2	28-Mar-95	0.029
02	CHROMIUM	0.1	28-Mar-95	0.001
02	FLUORIDE	4	29-May-96	0.02
02	NICKEL	0.1	28-Mar-95	0.001
02	NITRATE	10	03-Mar-93	0.3
02	NITRATE	10	13-May-93	0.3
02	NITRATE	10	30-Aug-93	0.1
02	NITRATE	10	28-Mar-95	0.8
02	NITRATE	10	31-May-95	0.1
02	NITRATE	10	29-Feb-96	0.2
02	NITRATE	10	26-Aug-96	0.2
02	NITRITE	1	31-May-95	0.01
03	BARIUM	2	20-Dec-94	0.02
03	BARIUM	2	05-Aug-98	0.012
03	CHROMIUM	0.1	25-Aug-99	0.003
03	CHROMIUM	0.1	25-Aug-99	0.003
03	COPPER	1.3	25-Aug-99	0.011
03	FLUORIDE	4	20-Dec-94	0.08
03	FLUORIDE	4	25-Aug-99	0.01
03	FLUORIDE	4	25-Aug-99	0.1
03	LEAD	0.015	25-Aug-99	0.007
03	NITRATE	10	21-Sep-94	3.1
03	NITRATE	10	20-Dec-94	1.4
03	NITRATE	10	17-Jan-95	1.5
03	NITRATE	10	29-Feb-96	0.5
03	NITRATE	10	29-Dec-97	1.55
03	NITRATE	10	31-Dec-97	1.55
03	NITRATE	10	05-Aug-98	2.06
03	NITRATE	10	11-Aug-99	0.88
03	NITRATE	10	25-Aug-99	1.7
03	NITRATE	10	25-Aug-99	1.7
03	NITRATE	10	11-Jul-00	1.5
03	NITRATE	10	26-Sep-00	2.1
03	NITRITE	1	17-Jan-95	0.002
04	CADMIUM	0.005	15-Sep-92	0.003
04	COPPER	1.3	15-Sep-92	0.032
04	FLUORIDE	4	15-Sep-92	0.12

04	FLUORIDE	4	29-May-96	0.09
04	FLUORIDE	4	26-Sep-00	0.1
04	LEAD	0.015	15-Sep-92	0.003
04	NITRATE	10	15-Sep-92	1.8
04	NITRATE	10	29-Feb-96	1.7
04	NITRATE	10	27-Jan-97	2.3
04	NITRATE	10	29-Jul-97	2.3
04	NITRATE	10	05-Aug-98	1.9
04	NITRATE	10	10-Aug-99	0.5
04	NITRATE	10	11-Jul-00	1.37
04	NITRATE	10	26-Sep-00	1.3
05	COPPER	1.3	25-Sep-92	0.002
05	FLUORIDE	4	25-Sep-92	0.17
05	FLUORIDE	4	25-Sep-92	0.17
05	NITRATE	10	25-Sep-92	1.4
05	NITRATE	10	25-Sep-92	1.4
05	NITRATE	10	10-May-99	2.3
05	NITRATE	10	10-May-99	2.2

Table 17. IOC Detections in Myersville's Ground Water Sources.

Radionuclides

There is currently no MCL for Radon-222, however EPA has proposed a MCL of 300 picoCuries/Liter (pCi/L) or an alternate of 4000 pCi/L. MDE is currently waiting for the EPA to promulgate a final rule to determine which standard it will adopt. Two sample results are available for Radon-222 from Plant 03 and are reported at 40 pCi/L and non-detected (Table 18). These results are likely to be representative of radon levels in the other wells, since they all draw water from the same aquifer. Gross Beta radiation is a measure of beta particle activity and is used as an indicator for the presence of other man-made radionuclides. Gross Beta was detected in two samples, but levels were too low to necessitate further testing.

Plant ID	Contaminant	MCL	Sample Date	Result (pCi/L)
03	RADON-222	300	20-Dec-99	40
03	GROSS BETA	50	20-Dec-99	1
04	GROSS BETA	50	26-Sep-00	4

Table 18. Radionuclide Detections in Myersville's Ground Water Sources.

Volatile Organic Compounds

One volatile organic compound (1,2-Dichloroethane) has been detected in the Ashley wells (Table 19) at 5 parts per billion (ppb), but has not been detected in six subsequent samples. A total of nine composite VOC samples have been collected from this plant since 1991 and no other VOCs have been detected in these wells. VOCs have not been detected in the other ground water sources.

Plant ID	Contaminant	MCL	Sample Date	Result (ppb)
03	1,2-DICHLOROETHANE	5	17-Jan-95	5

Table 19. VOC Detections in Myersville's Ground Water Sources.

Synthetic Organic Compounds

A list of synthetic organic compounds that have been detected in the ground water supply is included in Table 20. All of the contaminants detected were at levels below 50% of an MCL. The most prevalent contaminant found, Di(2-Ethylhexyl)Phthalate, is a contaminant that is commonly detected in laboratory blank samples and false positives are common.

Plant Id	Contaminant	MCL	Sample Date	Result (ppb)
02	DI(2-ETHYLHEXYL) PHTHALATE	6	26-Sep-94	1.1
02	HEXACHLOROCYCLOPENTADIENE	50	17-Jan-95	0.035
02	ATRAZINE	3	20-Jun-96	0.4
02	DALAPON	200	26-Aug-96	0.434
03	DI(2-ETHYLHEXYL) PHTHALATE	6	20-Dec-99	1.8
03	PENTACHLOROPHENOL	1	26-Sep-00	0.02
03	PICLORAM	500	26-Sep-00	0.2
03	DI(2-ETHYLHEXYL) PHTHALATE	6	26-Sep-00	1.1
03	2,4,5-TP (SILVEX)	50	26-Sep-00	0.1
04	PENTACHLOROPHENOL	1	26-Sep-00	0.02
04	PICLORAM	500	26-Sep-00	0.2
04	2,4,5-TP (SILVEX)	50	26-Sep-00	0.1
04	DI(2-ETHYLHEXYL) PHTHALATE	6	26-Sep-00	1.2

Table 20. SOC Detections in Myersville's Ground Water Sources.

Microbiological Contaminants

The Town was notified in 1992 that the springs were classified as a "Ground Water Under the Direct Influence of Surface Water" (GWUDI) source as defined in COMAR and the Surface Water Treatment Rule. The determination was based on raw water bacteriological data and physical inspection of the spring collection areas. Both total and fecal coliform were present in the raw water from the springs (Table 21). Raw water bacteriological data shows that fecal coliform bacteria was not detected in the other the sources for which data is available. The Town Well and Reservoir Well have not been tested because they are treated through the surface water plant.

Source Name	Sample Date	Total Coliform (MPN^2/100 ml)	Fecal Coliform (MPN^2/100 ml)
SPRINGS COLLECTION BOX	06-Sep-93	23.1	16.1
SPRINGS COLLECTION BOX	07-Sep-93	23.1	16.1
SPRINGS COLLECTION BOX	08-Sep-93	23.1	9.2
SPRINGS COLLECTION BOX	09-Sep-93	9.2	6.9
SPRINGS COLLECTION BOX	01-Sep-93	16.1	5.1
SPRINGS COLLECTION BOX	04-Sep-93	23.1	23.1
SPRINGS COLLECTION BOX	05-Sep-93	23.1	16.1
SPRINGS COLLECTION BOX	20-Jul-93	23.1	23
SPRINGS COLLECTION BOX	21-Jul-93	23	23
SPRINGS COLLECTION BOX	22-Jul-93	16.1	6.9
SPRINGS COLLECTION BOX	23-Jul-93	23	23

SPRINGS COLLECTION BOX	30-Jul-93	23.1	9.2
SPRINGS COLLECTION BOX	31-Jul-93	23.1	5.1
SPRINGS COLLECTION BOX	01-Aug-93	23.1	6.9
ASHLEY 2	08-Jan-99	-2	-2
ASHLEY 3	25-Aug-99	-1.1	-1.1
DEERWOOD WELL	08-Jan-99	-2	-2
DEERWOOD WELL	08-Jul-98	-2	-2
DOUBS MEADOW 1	08-Jul-98	-2	-2
DOUBS MEADOW 1	09-Jul-98	-2	-2
DOUBS MEADOW 1	10-Jul-98	-2	-2
DOUBS MEADOW 1	11-Jul-98	-2	-2
DOUBS MEADOW 2	08-Jul-98	-2	-2
DOUBS MEADOW 2	09-Jul-98	4	-2
DOUBS MEADOW 2	10-Jul-98	-2	-2
DOUBS MEADOW 2	11-Jul-98	-2	-2
CANADA HILL 1	10-May-99	-2	-2
CANADA HILL 2	10-May-99	4	-2

Table 21. Raw Water Bacteriological Data from Myersville's Ground Water Sources. [2]MPN = Most Probable Number, negative values indicate not detected

VI. SUSCEPTIBILITY ANALYSIS

A. SURFACE WATER SUPPLY

The surface water source supplying the Myersville water system is from Little Catoctin Creek intake that receives runoff from a 3,026 acre watershed, 86 percent of which is privately owned. The water quality of the Catoctin Creek is depended upon the activities and land use practices that occurs within the watershed that consists of approximately 217 property parcels.

The susceptibility of the Little Catoctin Creek will be determined by analysis of each group of contaminants that were detected in water quality data submitted by the Town's monthly operating reports and/or self-monitoring reports collected by MDE for plant 01. The analysis also will identify suspected sources of contaminants, evaluate the natural conditions in watershed that may increase the likelihood of a contaminant entering the Catoctin Creek intake.

Turbidity

Average turbidity in the "upper reservoir" that receives raw water from Little Catoctin Creek, springs and wells over the last year (2000) is approximately 0.6 NTU. About ½ of the water is from the springs and wells. This value indicates a high quality source water and sediment and turbidity removal in the "lower" and "upper reservoirs." However, like any other surface water source, Little Catoctin Creek is subject to higher turbidity during heavy storms or snow melts. Because of its relatively

small size of watershed and steep slopes, the storm water travels quickly, transporting sediment to the intake. High turbidity can interfere with treatment processes and can carry harmful microorganisms into drinking water supplies.

Future land use changes in the Little Catoctin Creek watershed could increase the potential of higher turbidity in the intake. Alteration of forested land could increase the amount exposed surfaces that can lead to excessive erosion. Changes of cropland and pasture to low density residential in the watershed is another factor which can contribute to increased turbidity in the Catoctin Creek.

Inorganic Compounds

Nitrates can enter the water supply from fertilizer use, leaching from septic tanks, atmospheric deposition and erosion of natural deposits. Although nitrate has been found in the finished water, no detects were close to the 50% of the nitrate MCL. Potential sources of nitrate also include the approximately 41% of the watershed that is used for agricultural purposes, as cropland and pasture. Unless livestock numbers, agricultural land in number of homes using on-site disposal increases, it is unlikely that nitrate concentration will increase in the future.

Several other inorganic compounds have been detected in the surface water supply (Table 16). However, none has been greater than 50% of the MCL.

Radionuclides

Radon 222 and Gross Beta were detected in the surface water with levels significantly lower than 50% MCL, therefore the surface source is not susceptible to contamination by radionuclides.

Synthetic Organic Compounds

There are several SOC detects at the Myersville water plant, but all results are less than 50% of the MCL, with the exception of Di(2-Ethylhexyl) Phthalate. This contaminant is a resin commonly found in plastics, and is classified as a probable human carcinogen by the EPA. Its prevalence in plastics makes it a hard substance to sample and test. Because this compound commonly appears in laboratory blanks, the reported quantities are not likely reflective of levels in the environment, but rather laboratory artifacts.

B. GROUND WATER SUPPLY

The ground water sources supplying the Myersville water system draw water from unconfined fractured-rock aquifers. Wells and springs in unconfined aquifer conditions 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 and springbox integrity, and 4) the aquifer conditions.

In fractured rock aquifers, 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. Properly constructed wells with no potential sources of contamination in their WHPA should be well protected from contamination.

Inorganic Compounds

Nitrate is present in the water supply but at levels well below the MCL. Sources of nitrate can generally be traced back to land use. Fertilization of agricultural fields and residential lawns, as well as residential septic systems are all sources of nitrate loading in ground water. Agricultural and residential areas cover a majority of the southernmost WHPAs. Much of this area has since been subdivided into residential areas and it is unclear whether these areas will eventually be connected to sanitary sewer or have individual septic. Based on the available data for the wells, it does not appear that agricultural practices in the WHPAs have had a major impact to nitrate concentrations in the ground water. If individual septic systems are used in future subdivisions, they could have an impact if they are not constructed in accordance with strict standards to prevent nitrate contamination to the ground.

In the northernmost areas, the WHPAs are predominantly covered by forested areas and are free of potential contaminant sources. Nitrate data from the springs show levels are consistently below 1 ppm.

Due to the low levels of nitrate found and the minimal impact potential contaminant sources have had on the water supply, the water supply is considered **not** susceptible to nitrate.

Several other inorganic compounds have been detected in the ground water supply (Table E). However, none has been present above 50% of an MCL, with the exception of Cadmium, which was only at a significant level once. The stormwater infiltration ponds may present a source of these contaminants to the water supply, but thus far their impact has apparently been minimal. The presence of a potential IOC source coupled with the presence of contaminants in the water supply indicates that the wells (Town Well, Ashley wells, Deer Woods, Doubs Meadow wells and

Canada Hills wells) in the southernmost WHPAs **are** susceptible to other inorganic compounds.

Very low levels of other inorganic constituents have been detected in the spring supply and may likely represent the naturally occurring levels present in the aquifer from erosion of minerals in the bedrock. There are no potential contaminant sources within the spring and Reservoir Well WHPAs and therefore these sources are **not** susceptible to contamination by inorganic compounds.

Radionuclides

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 if the State has a program to address the more significant risk from radon in indoor air. The EPA received many comments in response to their proposed rule, and promulgation may be delayed. A minimal amount of radon data is available for the ground water supply, however levels reported are well below the lower proposed MCL of 300 pCi/L (Table 18). 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 radioactive decay of uranium bearing minerals in the bedrock.

Based on the available data it does not appear that radionuclides are present at levels of concern in the ground water and thus the ground water supply is considered **not** susceptible to radionuclides.

Volatile Organic Compounds

Volatile organic compounds have not been detected in the ground water supply with the single exception noted in Table G. However, potential VOC sources were identified within the southernmost WHPAs and do present a threat to the water supply. Due to the vulnerable nature of fractured rock aquifers and the presence of potential contaminant sources in the southernmost WHPAs, the wells (Town Well, Ashley wells, Deer Woods, Doubs Meadow wells and Canada Hills wells) in these areas **are** susceptible to volatile organic compounds.

In the northernmost WHPAs, potential VOC sources are not present and therefore, the springs and the Reservoir Well are **not** susceptible to VOC contamination.

Synthetic Organic Compounds

Synthetic organic compounds have been detected in the ground water supply, although none have been detected above 50% of an MCL. Agricultural land use within the WHPAs may be a source of SOCs. Due to the presence of some contaminants, the land use characteristics in the

WHPA, and the vulnerable nature of fractured rock aquifers, the wells **are** considered susceptible to these contaminants. The land use in the WHPA for the springs is completely forested, and thus the springs are considered **not** susceptible to SOCs.

Microbiological Contaminants

The consistent presence of fecal coliform bacteria in the springs indicates their susceptibility to pathogenic microorganisms. Water entering the springs does not have enough natural filtration or travel time as it moves from the surface and eventually discharges at the springs. Therefore, pathogenic protozoa, viruses, and bacteria normally associated with surface water can contaminate the springs. Sources of these pathogens are generally improperly treated wastewater, waste material from mammals, and urban runoff in developed areas. Most of these potential sources are absent in the spring WHPA, however animal waste is a source and the springs **are** considered susceptible to microbiological contaminants.

Raw water from the wells is free of fecal coliform bacteria. However, several sanitary deficiencies have been noted in inspections by MDE staff. The wells may be susceptible to contamination from microbiological organisms that can enter through stormwater runoff through damaged well casing, or with insects through loose well caps or unscreened vents. The Town should address these deficiencies in order to ensure that the proven ground water quality is not compromised.

VII. RECOMMENDATION FOR SOURCE WATER PROTECTION PLAN

With the information contained in this report the Town of Myersville is in a position to protect its water supply by staying aware of the area delineated for source water protection and evaluating future development and land planning. Specific management recommendations for consideration are listed below:

Form a Local Planning Team

- Myersville should continue to work with Frederick County to implement a source water protection plan. The Town might want to recruit volunteers from the community.
- A management strategy adopted by Myersville should be consistent with the level of resources available for implementation. By consulting with other jurisdictions involved in this process, the Town can benefit from lessons learned by others.
- MDE has grant money available for Wellhead Protection projects. The Town may want to consider having a fracture trace analysis or other hydrogeologic study to define Zone 1 for the wells. This would allow the Town to know the most critical areas for wellhead protection.

- Myersville should work with Maryland Department of Natural Resources (DNR) to develop a forest management plan for SWAA.

Public Awareness and Outreach

- The Consumer Confidence Report should provide a summary of this report and any maps in addition to notifying that this report is available to the general public through their county library, by contacting the town office or MDE.
- Road signs at the SWAA boundaries is an effective way of keeping the relationship of land use and water quality in the public eye, and help in the event of spill notification and response.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE including raw water reservoir when feasible. MDE remains available to assist the Town to establish a water quality monitoring plan for Little Catoctin Creek intake.
- Continue monitoring for fecal coliform and E. Coli in the raw water after the two-year MDE sponsored monitoring program is over.

Planning/New Development

- Review the State's model wellhead protection zoning ordinances for potential adoption. MDE recommends that water supply owners encourage the County to adopt a wellhead protection ordinance.

Land Acquisition/Easements

- Loans for purchase of land or easements to protect water supplies is available to Myersville from MDE. Loans are offered at zero percent interest and zero points. Eligible lands must be in the source water assessment area.

Contingency Plan

- Myersville 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.

Changes in Use

- Myersville is required to notify MDE when new wells are to be put into service. Drilling a new well outside the current SWAA would modify the area, therefore Myersville should contact the Water Supply Program if a new well is being proposed.

Contaminant Source Inventory Updates

- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

- The Town should survey the source water assessment area periodically and note any new potential sources of contamination. The Town of Myersville should continue to conduct its own detailed field survey of the watershed to ensure that there are no new potential sources of contamination in the future.
- The Town will update MDE on potential land use changes that may increase the susceptibility of water supplies.

REFERENCES

MDE, Water Supply Program, 1999, *Maryland's Source Water Assessment Plan* (SWAP), 36 p.

Meyer G. and R.M. Beall, 1958, *The Water Resources of Carroll and Frederick Counties: Department of Geology, Mines and Water Resources Bulletin 22*, 355 pp.

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.

McCrone, Inc., 1996, *Feasibility Study for Myersville Water Treatment Plant.*

Myersville Planning Commission, 1999, *Myersville Comprehensive Plan.*

Frederick County Comprehensive Plan, 1997, *A Countywide Plan for Frederick Co., Maryland.*

U.S. Environmental Protection Agency, 1990, *Results of the Comprehensive Performance Evaluation of the City of Myersville Water Treatment Plant.*

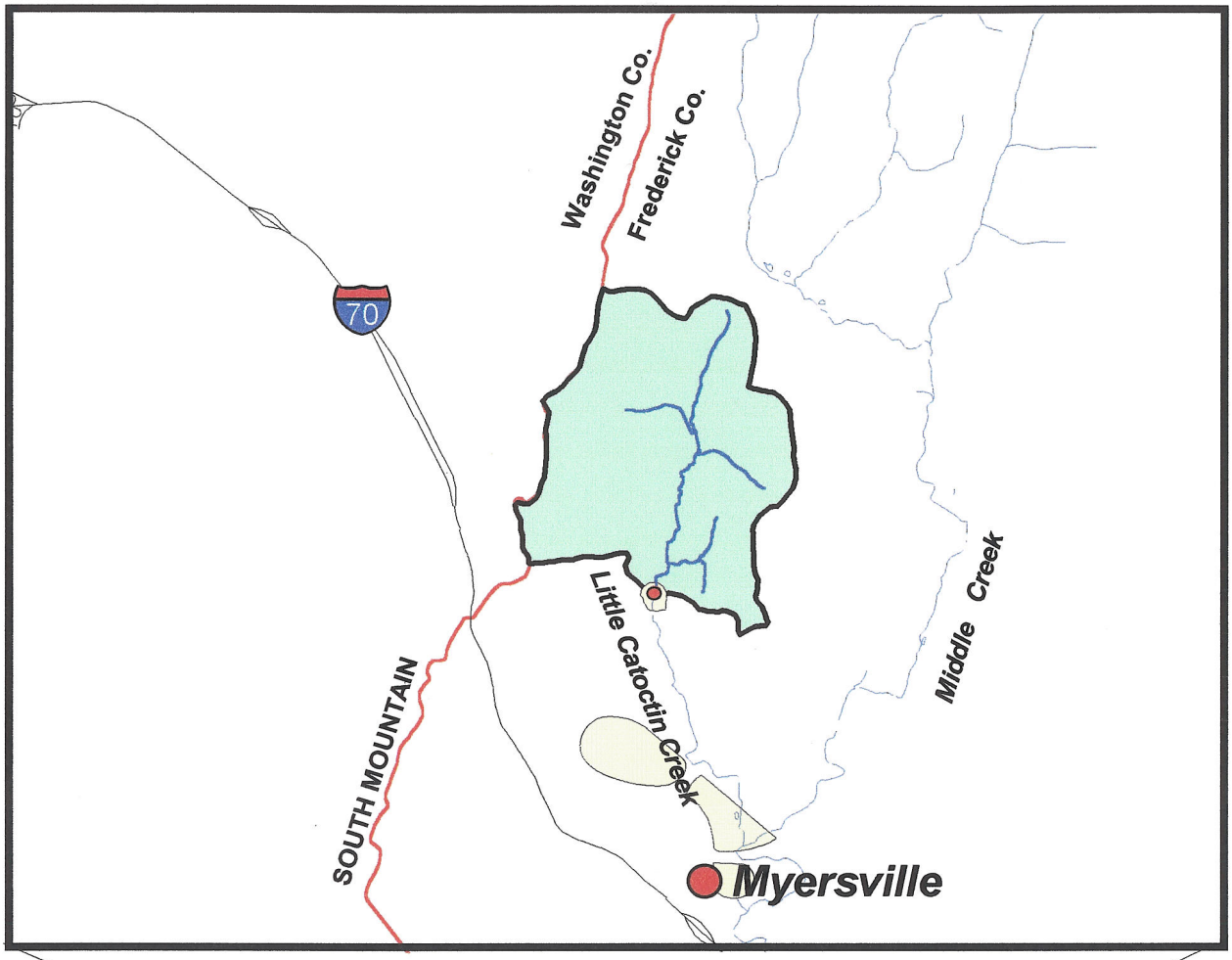
U.S. Department of Agriculture, Soil conservation Service, 1960, *Soil Survey Frederick County.*

OTHER SOURCES OF DATA

Public Water Supply Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles for Emmitsburg NW and Blue Ridge Summit NE and SE
USGS Topographic 7.5 Minute Quadrangles
Maryland Office of Planning 1997 Frederick County Digital Land Use Map
Maryland Office of Planning 1996 Frederick County Digital Sewer Map

FIGURES

Figure 1. General Area



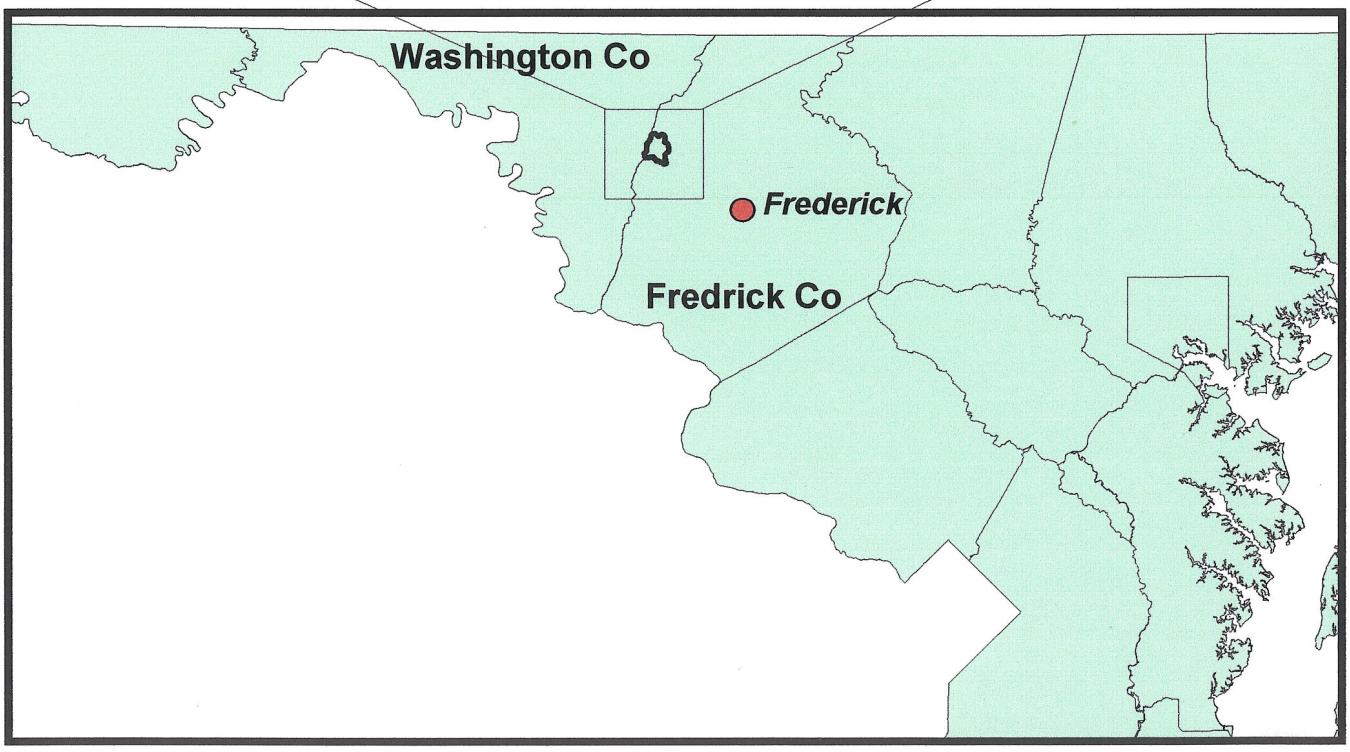
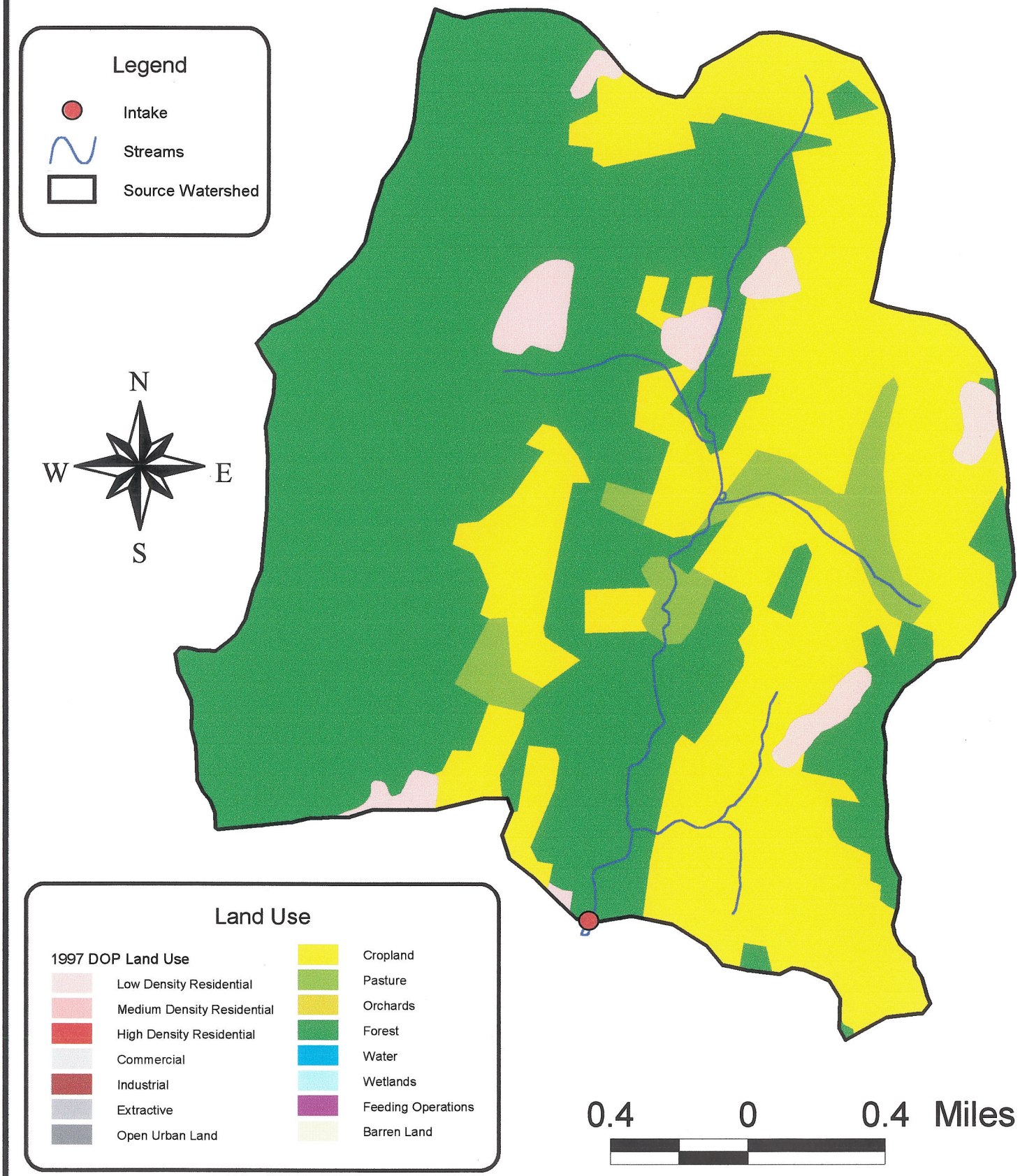


Figure 3. Myersville - Little Catoctin Creek Intake 1997 Land Use



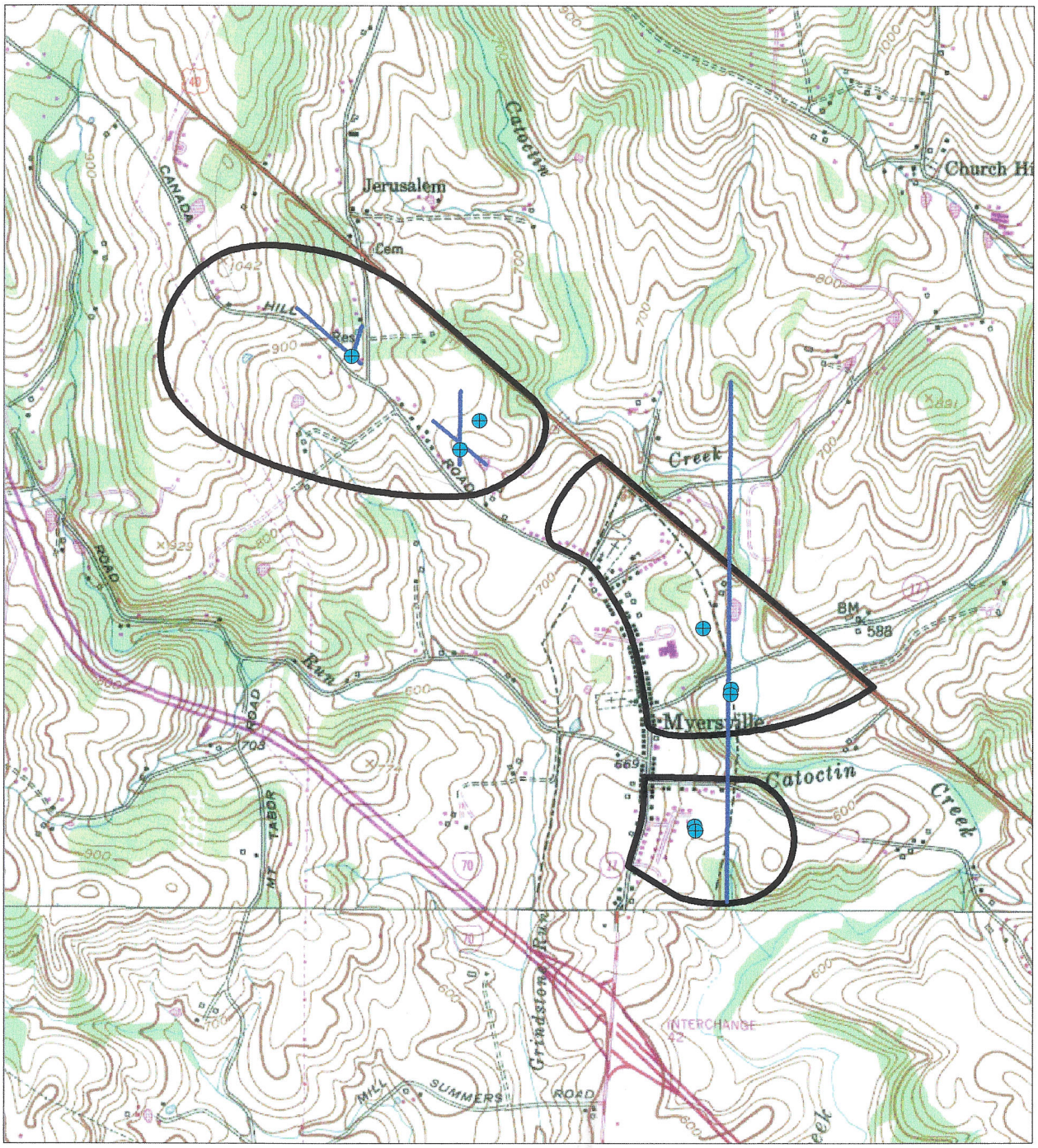


Figure 4a. Myersville Wellhead Protection Areas

Legend

Wells

Wellhead Protection Area

Fracture Trace*

(* Fracture traces are inferred and have not been field checked or verified from aerial photographs or other methods.)

Base Map: USGS 7.5' Quads for Myersville and Middletown

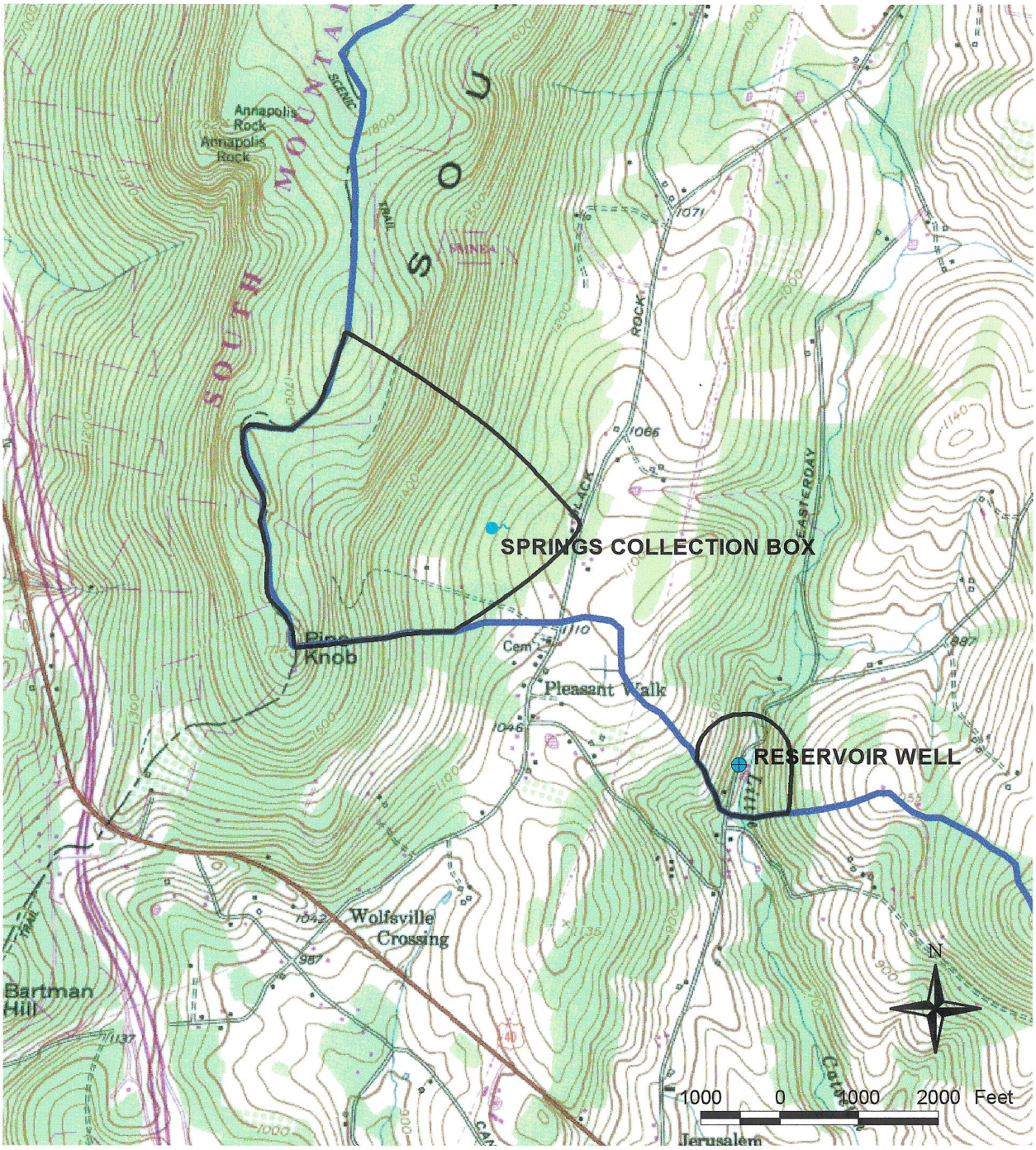


Figure 4b. Myersville Spring and Wellhead Protection Areas

Legend

- Wells
- Spring
- Wellhead Protection Area
- Surface Watershed

Base Map: USGS 7.5' Quads for Myersville and Middletown

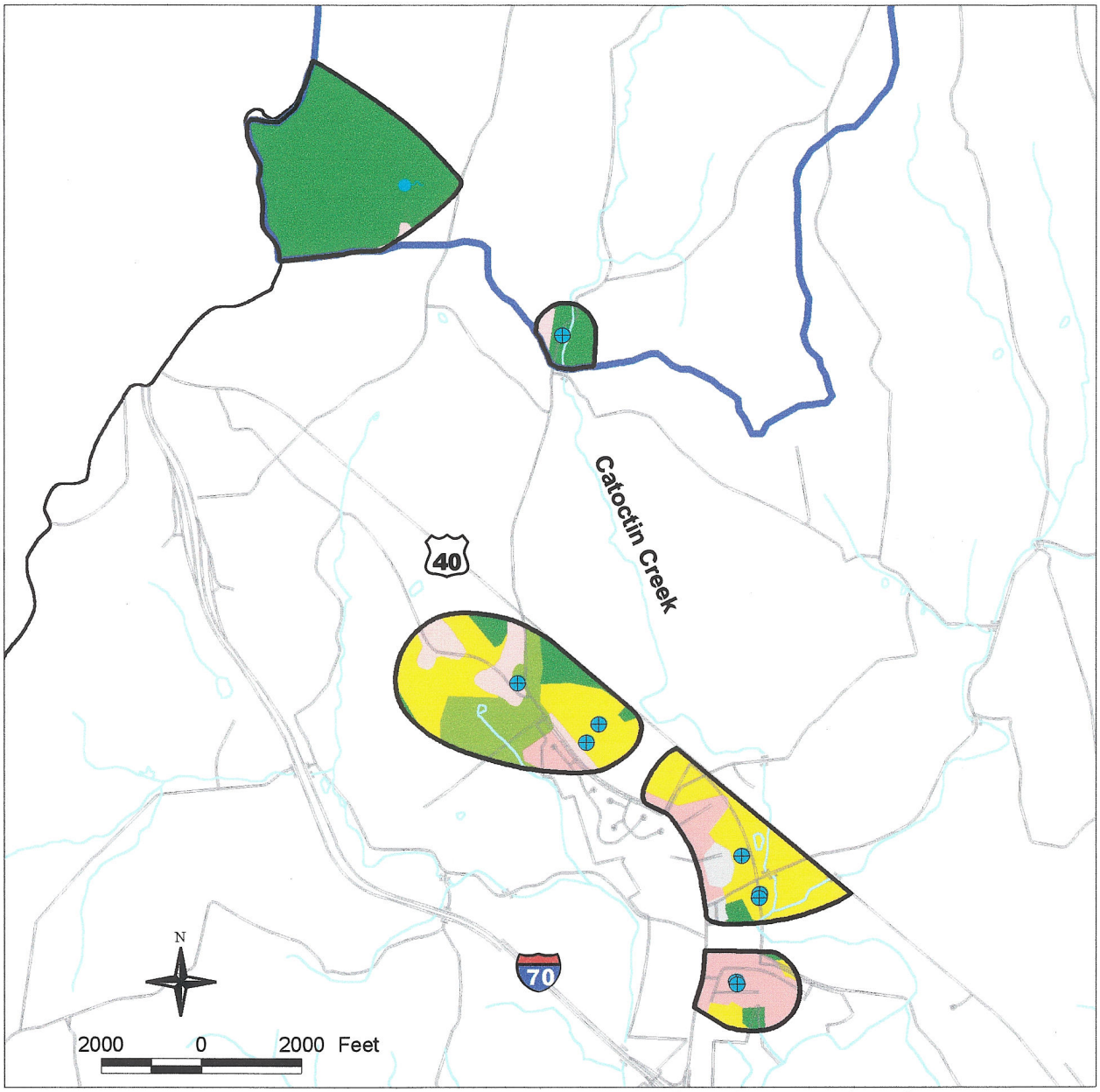


Figure 5. Land Use in Myersville Wellhead Protection Area

Legend

Springs

Wells

Wellhead Protection Area

Streams

Roads

Frederick County Land Use

Low Density Residential

Medium Density Residential

Commercial

Cropland

Pasture

Orchards

Forest

Feeding Operations

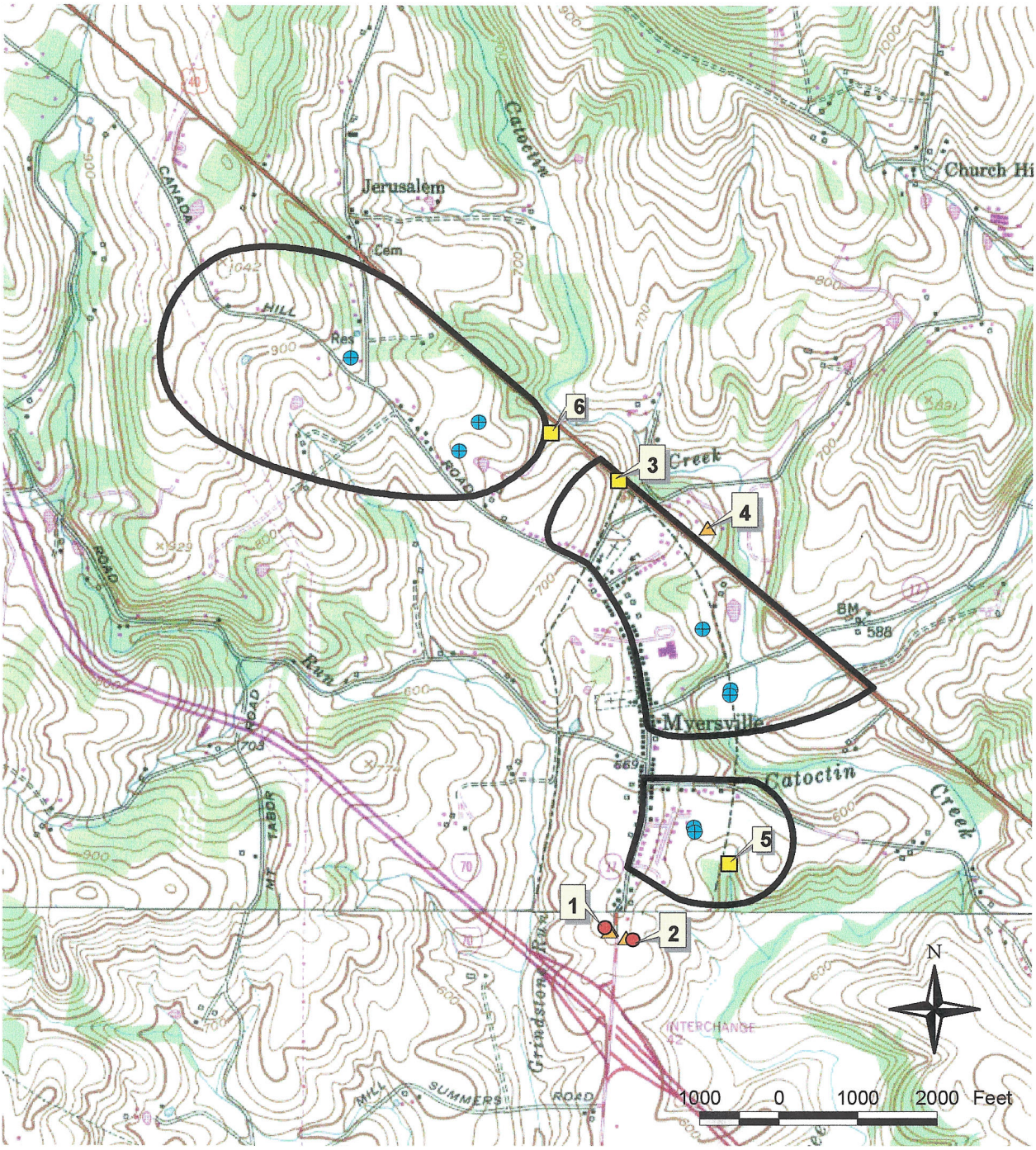


Figure 6. Myersville Wellhead Protection Areas with Potential Contaminant Sources

Legend

Wells

Wellhead Protection Area

Potential Contaminant Sources

UST

CHS

MISC

1 Sunoco
2 Exxon
3 SHA Maintenance Shed
4 C & P Telephone Co.
5 Stormwater Pond (Ashley Sub.)
6 Stormwater Pond (Canada Hills Sub.)

Base Map: USGS 7.5' Quads for Myersville and Middletown

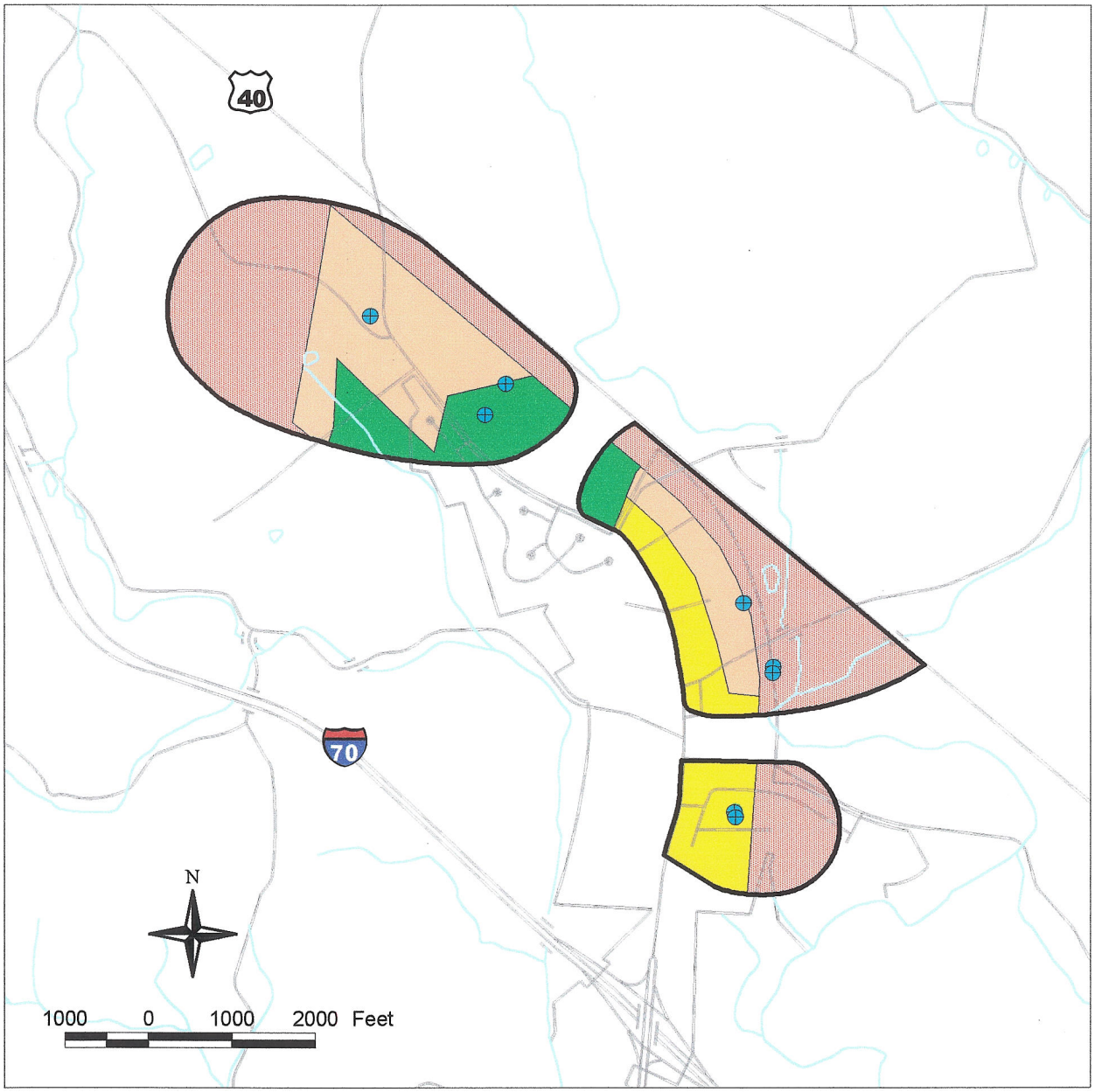


Figure 7. Sewer Service Coverage in the Myersville WHPAs.

Legend

Wells

Wellhead Protection Area

Streams

Roads

Sewer Service Areas

Existing Service

3 Year Planned Service

4 to 6 Years

Not Planned for Service