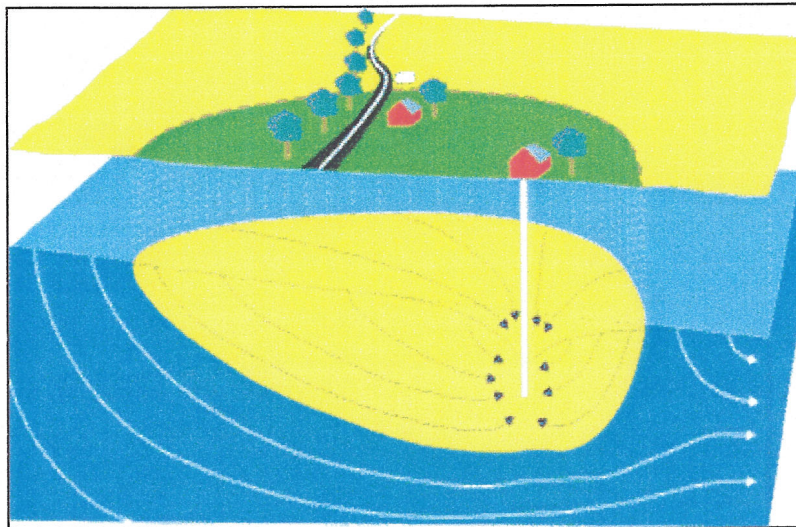


**SOURCE WATER ASSESSMENT**  
**FOR CONCORD ESTATES MOBILE HOME PARK**  
**FREDERICK COUNTY, MD**



**Prepared By**  
**Water Management Administration**  
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## SUMMARY

The Maryland Department of the Environment's (MDE's) Water Supply Program (WSP) has conducted a Source Water Assessment for Concord Estates Mobile Home Park located near Feagaville in Frederick County, Maryland. This report delineates the area that contributes water to the well, identifies potential sources of contamination within the area and determines the susceptibility of the water supply to contamination. Recommendations for protecting the water supply conclude the report.

The source of Concord Estates' public water supply is a fractured-rock aquifer known as the Harper Formation. The system uses two wells to obtain its water supply. The Wellhead Protection area was delineated using by the WSP using EPA-approved methods.

Point sources of contamination were identified within and near the assessment area from field inspections and MDE databases. The Maryland Office of Planning's 2002 land use map for Frederick County was used to identify non-point sources of contamination. Maps showing location of the well, potential sources of contamination, and land use are included at the end of this report.

The susceptibility analysis is based on a review of existing water quality data for the water system, the presence of potential sources of contamination, in the assessment area, well integrity and the inherent vulnerability of the aquifer. It was determined that Concord Estates Mobile Home Park's water supply is susceptible to naturally occurring radionuclides. It is not susceptible to volatile organic compounds, synthetic organic compounds, other inorganic compounds, fecal coliform or protozoans like *cryptosporidia* and *giardia*. To reduce the risk of bacterial contamination, the water system should evaluate the integrity of the casings for both wells and abandon any unused wells on the property.



## INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for Concord Estates Mobile Home Park, which owns and operates its own water and waste water treatment plant. The system uses two wells, which supply a single water treatment plant.

As defined as part of Maryland's Source Water Assessment Plan (SWAP), "large systems" are community and non-community water systems that have water appropriation and use permits with average annual appropriation permit exceeding 10,000 gpd. Concord Estate's water appropriation and use permit allows for an average annual water use of 13,100 gpd.

## HYDROGEOLOGY

Concord Estates Mobile Home Park is located in the Middletown Valley, a rolling upland between Mountain Ridges in the Blue Ridge Physiographic Province. This region is underlain by metamorphic rock.

The geologic formation underlying Concord Estates is known as the Harpers Formation. Maryland Geological Survey describes the formation as "Brown to dark bluish-gray banded shale, light bluish-gray finely laminated phyllite; distinctively pale purple in basal part; bedding obscured by cleavage; increasingly metamorphosed to east from shale to slate to phyllite; estimated thickness 2000 feet." In such rocks, water is stored in fractures and in the overlying saprolite and soils. The ground water is generally unconfined and the water table mimics the surface topography. Well yields are dependent on the number and nature of fractures penetrated by the well. Well depths in the Harpers Formation typically range from about 23 to 996 feet with median depth around 155 feet. Yields range from 0.5 to 103 gpm, with median yield around 5 gpm.

## WELL INFORMATION

Well information for the system was obtained from the Water Supply Program's database, site visits, well completion reports and sanitary survey inspection reports. Appendix A consists of copies of the applications to drill the wells and the well completion reports. Appendix B shows pictures of the wells. The mobile home park is served by two wells that are listed in Table 1. There was a third well on the property. It is not known if it has been abandoned.

**TABLE 1. WELL INVENTORY**

WELL #	PERMIT #	TOTAL DEPTH	CASING DEPTH	YEAR DRILLED	COMMENTS
WELL 1	FR733302	350'	51'	1976	Woods 1
WELL 2	FR680070	203'	61'	1967	Building 2



## SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment for the system. As defined by Maryland's SWAP, the wellhead protection area for a public water system using more than 10,000 gallons per day whose wells are completed in fractured crystalline rock is the drainage area that contributes water to the wells. This area is then modified by accounting for surface water bodies, topography, significant land features and by using a conservative calculation of total ground water recharge during a drought. For conservative purpose a drought condition of 400 gpd per acre was used to estimate the total ground water contribution area required to supply the wells. Figure 2 shows the 195-acre Wellhead Protection Area (WHPA) that was delineated, which is more than adequate to meet the daily average ground water recharge for this system.

## POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination can be classified as either point or non-point sources. Examples of point sources are underground storage tanks, ground and surface water discharges, landfills, animal feeding operations, and ground water contamination sites. These sites are usually associated with commercial or industrial facilities that use chemicals that may, if handled inappropriately, contaminate ground water via a discrete point location. Non-point sources are associated with land use practices, such as use of pesticides, fertilizer, animal wastes or septic systems, that lead to ground water contamination over a larger area.

Point sources of contamination were identified within and near the assessment area from field inspections and from MDE Water and Waste Management databases. Figure 2 is a topographic map showing potential sources of contamination within and near the WHPA. Only one potential contamination source was found. Wastewater from Concord Estates wastewater treatment plant is discharged to Ballenger Creek. The wastewater treatment plant is located near well 1.

The Maryland Office of Planning's 2002 land use map for Cecil County was used to identify non-point sources of contamination (Figure 3). Several land use categories were identified within the delineated WHPA (Table 2), however, the predominant land use within the WHPA is forest.

**TABLE 2. LAND USE SUMMARY FOR THE WELLHEAD PROTECTION AREA**

Land Use Categories	Total Area (acres)	Percentage of WHPA
Forest	187.3	96.0
Cropland	5.0	2.6
Commercial	2.6	1.0
Pasture	0.4	0.4

A review of Maryland Office of State Planning's Frederick County Sewer Map (Figure 4) shows that Concord Estates operates a private sewer system with a surface water

discharge to Ballenger Creek, and that there is no planned sewer service to any homes within the WHPA or to any of the surrounding area (Table 3). The wastewater treatment plant is located on the edge of the WHPA. Any domestic wells are served by private septic systems.

**TABLE 3. SEWER SERVICE SUMMARY FOR THE WELLHEAD PROTECTION AREA**

<b>Sewage Service Area</b>	<b>Total Area (acres)</b>	<b>Percentage of WHPA</b>
Area Served by Concord Estates	15.6	8
No Planned Service	179.4	92

### **WATER QUALITY DATA**

Water quality data from the Water Supply Program's (WSP) database was reviewed for Safe Water Drinking Act (SWDA) contaminants. In accordance with Maryland's SWAP, data submitted by the owner/operator of the system was compared with the Maximum Contaminant Levels (MCLs). If monitoring data is greater than 50% of the MCL, the assessment will describe the typical sources of that contaminant and locate the possible sources of the contaminant for this site. Concord Estates' only water treatment is filtration and hypochlorination.

#### Inorganic Compounds (IOCs)

No inorganic compounds were detected in quantities greater than 50% of the MCL.

#### Radionuclides

Radionuclides have been measured several times since 1999. Gross alpha, gross beta and radium were detected at or above 50% of the MCL. Radon was also detected at levels of concern. There is currently no MCL for radon 222, however, EPA has proposed a MCL of 300 picocuries per liter (pCi/L) or an alternate of 4,000 pCi/L for community systems if the State has a program to address the more significant risk from radon in indoor air. The high radionuclides are attributed to decay of naturally occurring minerals, like uranium and thorium, in the surrounding rocks.

**TABLE 4. RADIONUCLIDE DETECTS AT CONCORD ESTATES**

CONTAMINANT NAME	MCL (Pci/L)	SAMPLE DATE	RESULT (pCi/L)
RADON-222	300	3-Sep-97	9135
GROSS ALPHA	15	25-Mar-03	11
COMBINED RADIUM (226 & 228)	5	25-Mar-03	14.3
RADIUM-226	5	25-Mar-03	4.3
RADIUM-228	5	25-Mar-03	10
GROSS ALPHA (SHORT TERM)	15	25-Mar-03	37
GROSS ALPHA	15	12-Sep-03	10
COMBINED RADIUM (226 & 228)	5	12-Sep-03	7.5
GROSS ALPHA (SHORT TERM)	15	12-Sep-03	64
GROSS BETA (SHORT TERM)	50	12-Sep-03	39
RADIUM-228	5	12-Sep-03	4.6
RADIUM-226	5	12-Sep-03	2.9
GROSS ALPHA	15	25-Feb-04	9
COMBINED RADIUM (226 & 228)	5	10-Aug-04	6.9
RADIUM-228	5	10-Aug-04	4.7
GROSS ALPHA	15	10-Mar-05	25

Volatile Organic Compounds (VOCs)

A review of the data indicates that no VOCs have been detected above 50% of the MCL.

Synthetic Organic Contaminants (SOCs)

A review of the data indicates that no SOC's have been detected above 50% of the MCL.

Microbiological Contaminants

Raw water samples were collected from both wells and tested for bacteria to determine whether those sources are ground water under the influence of surface water (GWUDI). The wells are classified as medium risk to surface water influence based on age of the well, using depth and distance from surface water bodies. One raw water bacteriological sample after a minimum of 0.5" of rainfall was required to be collected for each well. The results of the GWUDI testing indicate that none of the wells had any fecal coliform.



Routine bacteriological monitoring, which measures total coliform bacteria, is conducted in the finished water for each community water system on a monthly basis. Total coliform bacteria are not pathogenic but are used as indicator-organisms for other disease-causing microorganisms.

**TABLE 5. GROUND WATER UNDER THE INFLUENCE OF SURFACE WATER**

SOURCE NAME	RAIN DATE	RAIN AMOUNT (INCHES)	REMARK	SAMPLE DATE	TEMP. C	pH	TURBIDITY (NTU)	TOTAL COLIFORM (col/100ml)	FECAL COLIFORM (col/100ml)
WELL 1	8-Dec-98	0.5	WET	8-Dec-98	14.4	6.8	1.12	-1.1	-1.1
WELL 2	8-Dec-98	0.5	WET	8-Dec-98	14.4	6.8	1.12	-1.1	-1.1

## SUSCEPTIBILITY ANALYSIS

The wells serving Concord Estates are completed in an unconfined crystalline rock aquifer. Wells completed in unconfined aquifers are generally more susceptible to contamination from surface sources. The susceptibility of source water to contamination is based on the following criteria: 1) the presence of natural and anthropogenic contaminant sources within the WHPA; 2) water quality data; 3) well integrity and 4) aquifer conditions. The susceptibility of Concord Estates' water supply to various contaminants is shown in Table 6

**TABLE 6. SUSCEPTIBILITY CHART FOR CONCORD ESTATES WATER SUPPLY**

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?
Inorganic Compounds	NO	NO	NO	YES	NO
Volatile Organic Compounds	NO	NO	NO	YES	NO
Synthetic Organic Compounds	NO	NO	NO	YES	NO
Radon	YES	YES	NO	YES	MAYBE*
Radionuclides	YES	YES	NO	YES	YES
Microbiological Contaminants	YES	NO	YES	YES	NO

\*depending on the MCL selected for adoption by EPA

No Volatile Organic Compounds (VOCs) were detected at levels that would be considered a concern at any of Concord Estates'. The water supply is considered not vulnerable contamination of VOCs at this time.

Repeated samples have been collected for SOC's from the Concord Estates' water sources. No detections have been at levels of concern.

Total coliform bacteria were not detected in Concord Estates's raw water. Based on the water quality data, the mobile home park does not appear to be susceptible to fecal coliform or protozoans like *Cryptosporidium* or *giardia*, but the proximity of the waste water treatment plant cannot be ignored.

Gross alpha, gross beta, combined uranium, radium 226, radium 228, and radon have all been detected in excess of 50% of the MCL and a few times in excess of the MCL. Their presence is most likely due to naturally occurring uranium and thorium minerals in the underlying bedrock. Radon was detected at levels above the higher proposed MCL of 4,000 pCi/L. Concord Estates water supply is susceptible to radionuclides that are naturally present in the ground water.

## MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

The wells serving Concord Estates Mobile Home Park appear to be in good condition. Water quality testing indicated the presence of naturally occurring radionuclides. Recommendations for maintaining the integrity of this system are listed below:

- Continue maintenance and protection of the wells.
- Abandon all wells that are not in use according to State regulations.
- Continue monitoring for VOCs, IOC's, SOC's and radionuclides in accordance with MDE's requirements.
- Annual sampling for microbiological contaminants is recommended. It is a good indicator of the integrity of the wellhead. The Consumer Confidence Report should list that this report is available to the general public through their public library or by contacting MDE.
- Any increase in pumpage or addition of new wells to the system may require extension of the WHPA. The system is required to contact the Water Supply Program when an increase in pumpage is applied for or when new wells are being considered.
- All water systems should have a Contingency Plan for their water system. COMAR 26.04.91.22 requires all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water under emergency conditions.

## REFERENCES

Duigon, M.T. and J.R. Dine, 1987, Water Resources of Frederick County, Maryland, Maryland Geological Survey Bulletin 33, 106p.

Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36p.

Meyer, G. and R.M. Beall, 1958, The Water Resources of Carroll and Frederick Counties, Maryland Geological Survey Bulletin 22, 355p.



## FIGURES

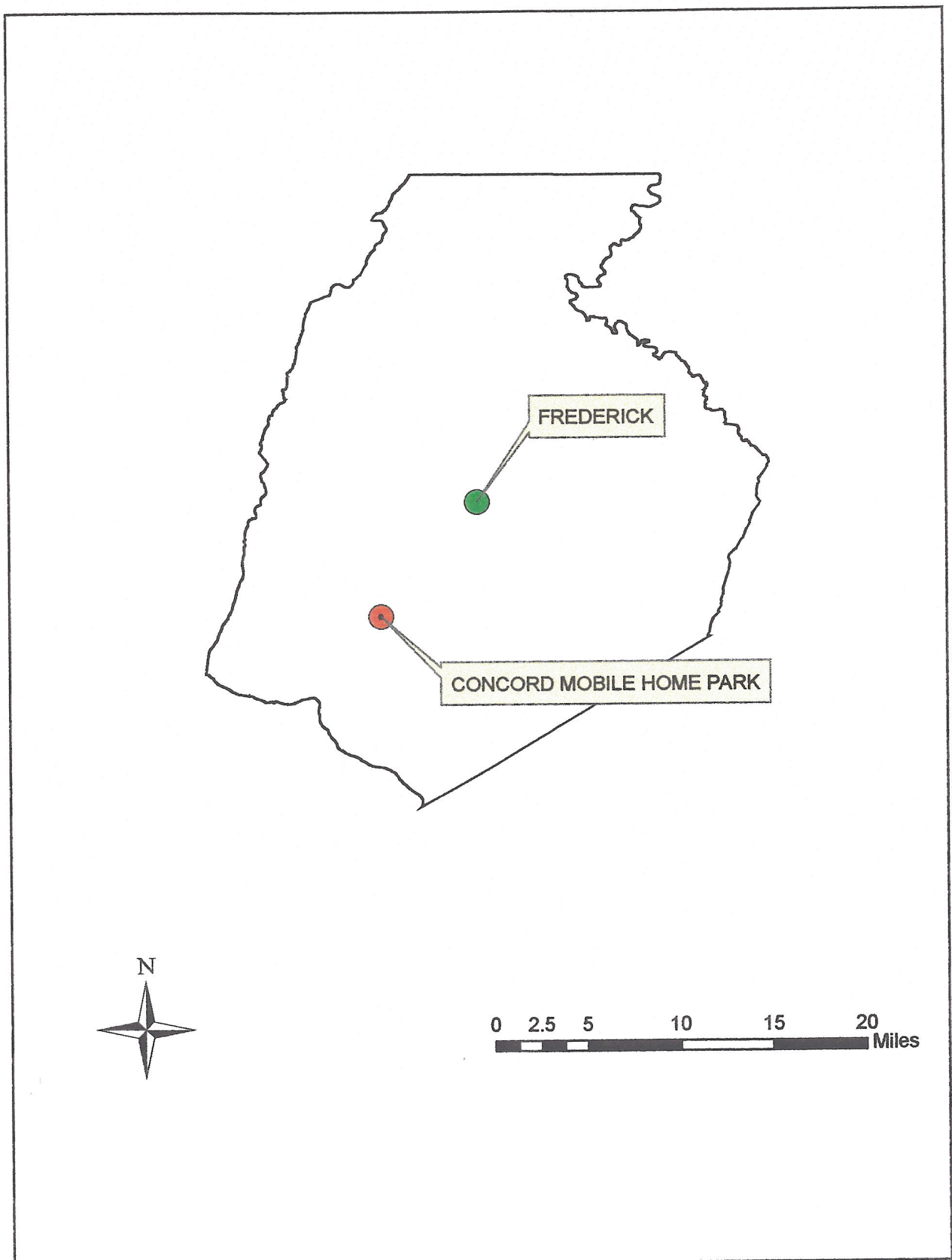


Figure 1. Location Map



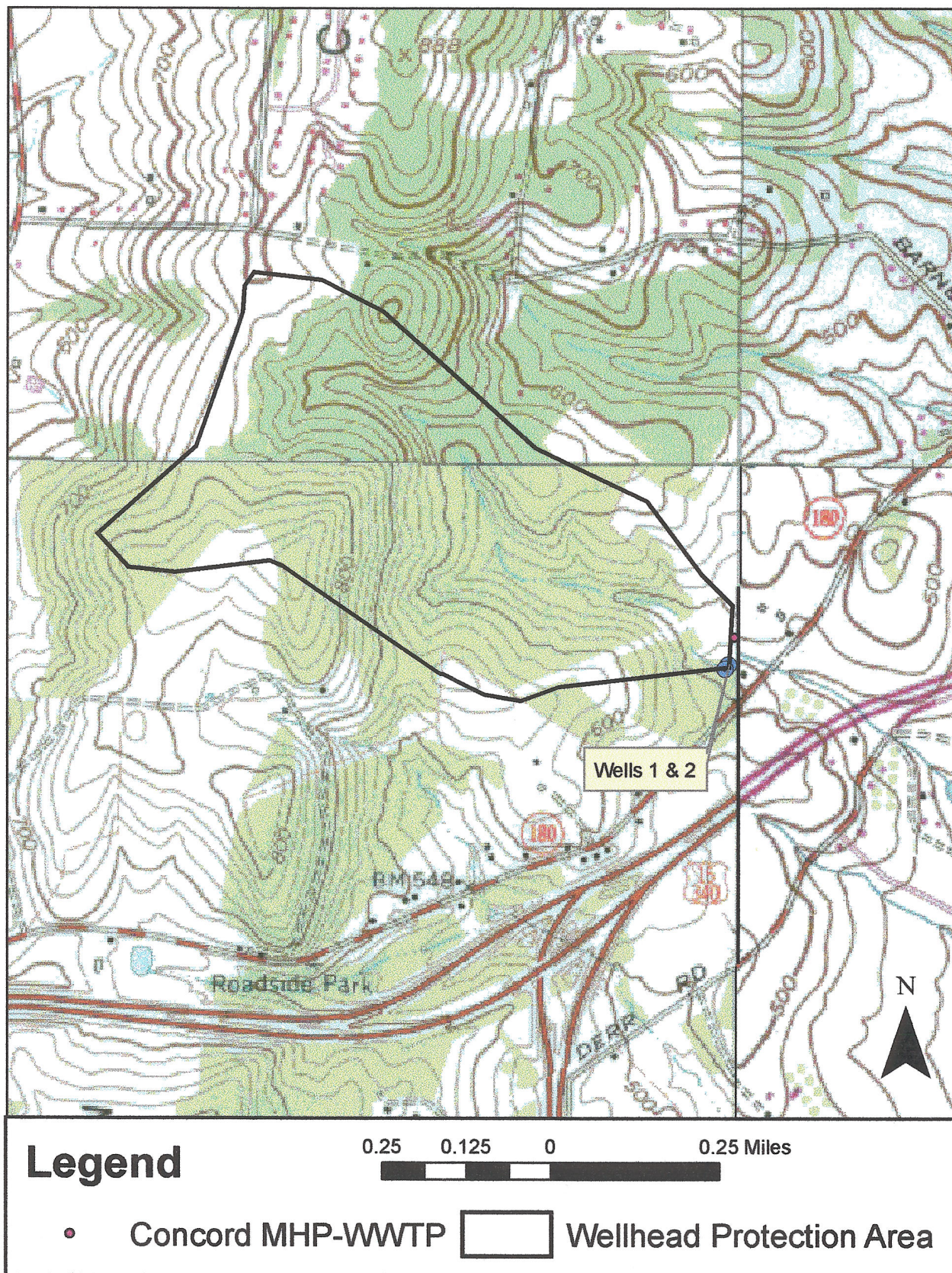
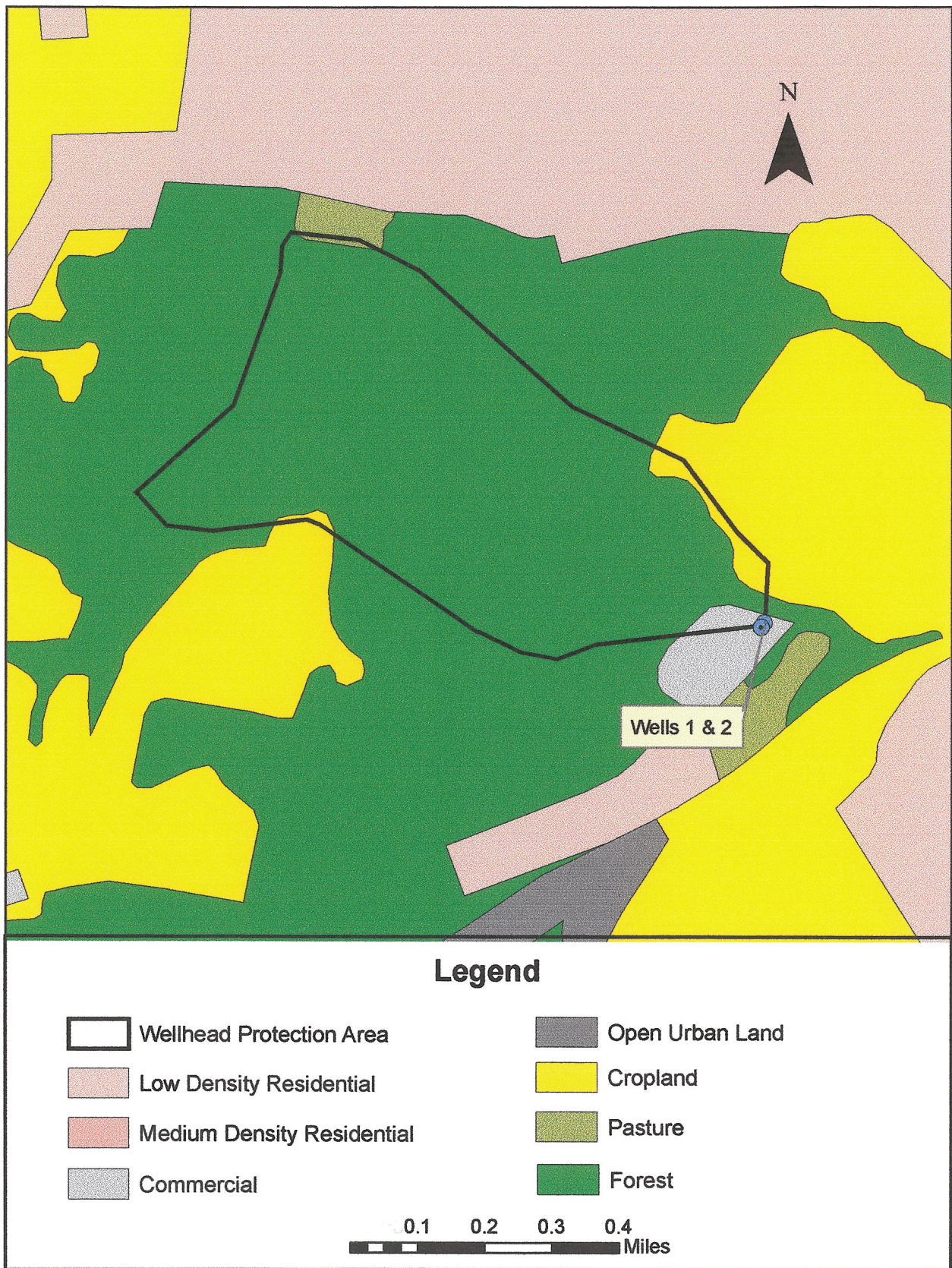


Figure 2. Wellhead Protection Area With Potential Contamination Source





**Figure 3. Land Use Map of Concord Estates Mobile Home Park Wellhead Protection Area**



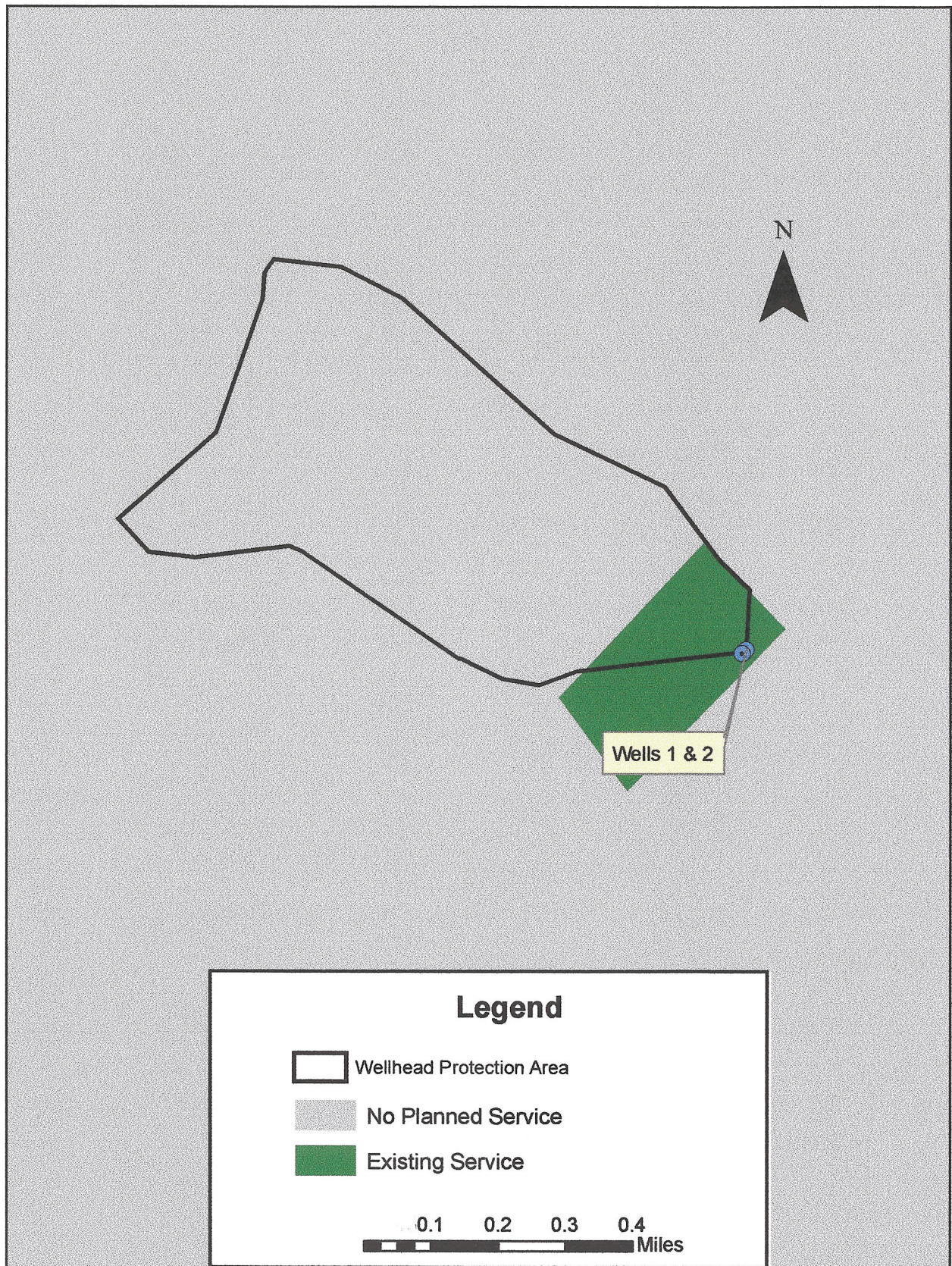


Figure 4. Sewer Service Areas