S.S. Papadopulos & Associates, Inc.
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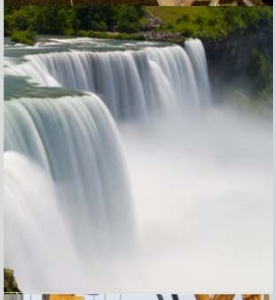


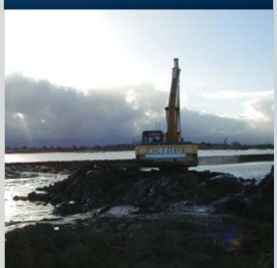

Source Water Protection Plan for the Fountaindale, Maryland Public Water System

October, 2013

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Source Water Protection Plan for the Fountaindale, Maryland Public Water System

Prepared for:
Maryland Department of the Environment
Water Supply Program
(Purchase Order # P2400301)

Prepared by:

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October, 2013

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List of Acronyms

AGPD	Average Gallons per Day
CEM	Chesapeake Environmental Management
DBR	Disinfection Byproducts Rule
DEM	Digital Elevation Model
ESD	Environmental Site Design
GHS	Generators of Hazardous Waste
GIS	Geographic Information Systems
GPD	Gallons per day
GPY	Gallons per year
GUDI	Groundwater Under Direct Influence of Surface Water
IOC	Inorganic Compounds
MCL	Maximum Contaminant Levels
MDE	Maryland Department of the Environment
MGPD	Maximum Gallons per Day
MSL	Mean Sea Level
MTBE	Methyl-tert-buytl ether
OCP	Oil Control Program
PCS	Potential Contaminant Source
PWS	Public Water Systems
SMCL	Secondary Maximum Contaminant Levels
SOC	Synthetic Organic Compound
SSP&A	S.S. Papadopulos & Associates
SWA	Source Water Assessment
SWAA	Source Water Assessment Area
SWPP	Source Water Protection Plan
TP	Treatment Plant
TTHM	Total Trihalomathanes
USEPA	United States Environmental Protection Agency
UST	Underground storage tanks
VOC	Volatile Organic Compounds
WAP	Water Appropriation Permit
WHPA	Wellhead Protection Area
WRE	Water Resource Element
WWTP	Waste Water Treatment Plant

REPORT

Section 1
Introduction

This Source Water Protection Plan (SWPP) was prepared for the Fountaindale Public Water System by S.S. Papadopulos & Associates (SSP&A) and Chesapeake Environmental Management (CEM). The plan was initiated and funded by the Maryland Department of the Environment (MDE) under Purchase Order # P2400301.

In the early 2000s, the MDE completed or contracted out completion of Source Water Assessments for public water systems (PWS) across the state. These reports were developed in accordance with Maryland's Source Water Assessment Plan (1999). The content of these reports included

- Designation of Source Water Assessment Areas (SWAAs)
- Identifying Potential Sources of Contamination, and
- Completing a Susceptibility Analysis for each PWS groundwater source.

A significant portion of this report is an update to the previous SWAA Report, including an update to the SWAAs. Recommendations included within the report, however, go beyond those in the original Source Water Assessment Report (MDE, 2002).

In completing this report, MDE provided assistance through access to files, databases, and GIS data, and provided comment on draft versions of the report. The report contents were also discussed with representatives of Frederick County, and public input was solicited to help ensure that recommendations for Source Water Protection were consistent with the County's needs and resources

1.1 Community Involvement

Opportunities for public involvement were provided during the course of this project. The goals and scope of the project were presented at a public meeting at the Middletown Methodist Church on March 29, 2012. Public notices prior to this meeting included a listing in the Meeting's agenda, and an announcement in the Frederick News Post.

Section 2
Background

The Fountaindale Public Water System (PWS) is located in the western part of Frederick County, approximately 4 miles west of Frederick, MD. Two systems, the Fountaindale North and Fountaindale South PWS were combined in the 1990s to form the current water system. The PWS is operated by Frederick County, and serves both the Fountaindale and Braddock Heights Communities. The Fountaindale area is unincorporated, although Frederick County has designated a "Fountaindale Community Growth Area" (Figure 1) in the County Comprehensive Plan (Frederick County, 2010). These Community Growth Areas serve as boundaries for development of water and sewer service for targeted planning options.

The Fountaindale area is situated at an elevation of approximately 600 to 700 ft MSL. The Braddock Heights area rises to an elevation of more than 1,000 feet to the east. All of the PWS' sources are located within the Catoctin Creek watershed. Catoctin Creek is part of the larger Middle Potomac River watershed.

Currently the Fountaindale/Braddock water service area obtains its drinking water supply entirely from wells. This water is supplied to approximately 1,105 residential units, serving roughly 2,700 individuals (Frederick County, 2011).

2.1 Groundwater and Surface Water Sources; System Operations

Currently the Fountaindale Public Water System (PWSID 0100013) is permitted to withdraw 280,000 gallons per day (gpd) on average from 10 sources under a single Water Appropriation Permit (WAP; Table 1). Well 1 (Fountaindale 1) has been abandoned. At the current time, only 7 wells are in use, however, with plans to abandon Well 7.

Generally speaking, the Fountaindale PWS relies on a large number of sources with limited capacity. Three locations – the Fountaindale 5, Well A Beech Tree East and Well B Beech Tree West locations - have been categorized by MDE as groundwater under the direct influence of surface water (GUDI). This designation requires additional monitoring, and is an indication of greater susceptibility to surface water impacts than most groundwater sources.

Water storage for the Fountaindale System is provided by gravity storage tanks with a nominal capacity of 625,000 gallons.

Data provided by MDE indicate that since 1979 the Fountaindale PWS's total water use has increased by a factor of at least four (Figure 2). In the past ten years (2002 to 2011), the Fountaindale PWS has appropriated between 46 million gallons and 76 million gallons per year, averaging about 57 million gallons a year. This is equivalent to an extraction rate of about 107 gpm on average.

2.2 Previous Source Water Assessment and Protection Reports

The previous Source Water Assessment Report was completed by MDE in 2002. This report concluded that the Fountaindale PWS was susceptible to contamination from volatile

organic compounds (VOCs) released at the surface, and that three wells (Well 5, A and B) were potentially susceptible to microbiological contaminants. These are the same three wells currently classified as GUDI.

The 2002 SWAP report (MDE, 2002) also made recommendations including

- Implementation of a County wellhead protection ordinance
- Digitzing GIS layers useful for wellhead protection
- Improving public outreach and education re: wellhead protection
- Continued monitoring of the wells for key contaminants
- Use of existing financial mechanisms for purchase of land or easements
- Updating of the Contaminant Source Inventory, and
- Notification of MDE regarding changes in system use or infrastructure.

2.3 Water System Infrastructure

As noted above, the Fountaindale PWS currently has the ability to obtain water from up to 9 wells, although only 7 are currently in use. The Dogwood well (Well 1) was abandoned several years ago due to issues with site access and low yield. All the sources except Wells 7 and 8 are routed to a central treatment plant (Plant 1). Wells 7 and 8 are fitted with individual treatment (pH adjustment and chlorination). Both of these wells are intended primarily for backup supply. Plans currently exist to abandon Well 7 and connect Well 8 to the main water treatment plant.

Section 3
Source Water Assessment

This section of the report provides the updated Source Water Assessment for the Fountaindale PWS.

3.1 Hydrogeology and Hydrology

The Fountaindale area is situated in the Blue Ridge physiographic province of Maryland (Reager and Cleaves, 2008). This Province consists of two prominent ridges (the Catoctin and South Mountains) separated in the southern half by the rolling to hilly Middletown Valley. The Fountaindale area is situated on the eastern edge of the Middletown Valley which rises in elevation northward from the Potomac River before Merging with South and Catoctin Mountains (Figure 3)

Bedrock in the Fountaindale area consists of Precambrian gneiss and metamorphic rocks, principally, and the Catoctin Formation metabasalt (Brezinski and Fauth, 2009). All of the Fountaindale PWS sources are open to the Catoctin metabasalt at depths ranging from 150 feet to 675 feet (Table 1). This aquifer, consisting of metamorphosed basaltic rocks, has a limited primary porosity, but provides useable amounts of groundwater through fractures (secondary porosity; Duigan and Dine, 1987)). In this area, groundwater occurs primarily under unconfined or semiconfined conditions in fractures in metamorphic and sedimentary rocks, and its circulation is generally controlled by local topography (Duigon & Dine, 1987).

3.2 Review of Water Quality Data

Maryland's Water Supply Program provided SSP&A with compiled analytical data reported for the Fountaindale PWS from 1990 to 2011. For the purposes of this analysis, the most recent full ten (10) years' worth of data are reviewed (2001 to 2010). Data discussed here are compared to the US Environmental Protection Agency (USEPA)'s Maximum Contaminant levels (MCLs) and Maryland groundwater cleanup standards (MDE, 2008).

3.2.1 Volatile Organic Compounds (VOCs)

For the period from 2001 through 2010, 2,421 VOC analyses were reported for the Fountaindale PWS, from all three treatment plants. During this time period, four (4) VOCs were detected (Table 2):

- Methyl-tert-butyl ether (MTBE) (in TP-01 only)
- Trihalomethanes (in TP 01 and 04)
    - Bromodichloromethane
    - Chloroform
    - Dibromochloromethane

Trihalomethanes are formed when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. These are regulated as a group – the Total Trihalomehtanes (TTHM). The USEPA has established a Maximum Contaminant Level (MCL) of 80 ug/l for the TTHMs. Under USEPA's Stage 2 Disinfection Byproducts Rule (DBR), compliance with this standard is based upon an annual average value at each location. As shown in Table 2, for the period from 2001 to 2010, there have been no exceedances of the TTHM level; the annual averages have been lower than one-half the MCL (40 ug/l).

Methyl-tert-butyl ether (MTBE) is a man-made compound that is often associated with releases of contaminants from underground tanks or surface releases. Detection of MTBE was reported at Plant 01 on a single date in 2001, with a maximum concentration of 0.7 ug/l. Earlier data suggest a pulse of MTBE contamination, with concentrations decreasing from a maximum of 17 ug/l in 1996. MTBE was reported for TP-01, 02, and 03. The State of Maryland's remediation standard and action level for MTBE is 20 ug/l. The USEPA does not currently have an MCL for MTBE.

3.2.2 Synthetic Organic Contaminants (SOCs)

Synthetic organic compounds detected in the Fountaindale Public Water System are summarized in Table 3. The only contaminant detected was:

- Di(2-Ethylhexyl) Phthalate

Di (2-Ethylhexyl) phthalate is a common plasticizer and laboratory contaminant and may not be indicative of water quality in the aquifer. This compound was not detected in excess of relevant groundwater standards.

3.2.3 Inorganic Compounds

Inorganic compounds reported in Fountaindale groundwater are summarized in Table 4. Many of these compounds can have both natural and man-made (anthropogenic) sources. None of the parameters listed in Table 4 have exceeded the relevant standard - MCL or secondary MCL during the time period from 2001 to 2010.

Nitrate is a naturally-occurring ion that is also a contaminant associated with agricultural fertilizers and septic systems/sewage. None of the nitrate measurements reported for Fountaindale exceeded the MCL (10 mg/l) or one-half the MCL (5 mg/L). In parts of Frederick County, increasing nitrate concentrations in groundwater are a concern. There is no indication of increasing concentrations with time in the Fountaindale PWS.

3.2.4 Coliform Bacteria

Total coliforms are a group of closely related, mostly harmless bacteria that live in soil and water as well as the gut of animals. The extent to which total coliforms are present in source water can indicate the general quality of that water and the likelihood that the water is contaminated with fecal matter from animals or humans. Total coliforms are currently controlled in drinking water regulations (Total Coliform Rule) because their presence above the standard

indicates problems in treatment or in the distribution system. EPA requires all PWS to monitor for total coliforms in distribution systems. If total coliforms are found, then the PWS must further analyze that total coliform-positive sample to determine which specific types of coliforms (i.e., fecal coliforms or *E. coli*) are present.

Table 5 summarizes the coliform results for the Fountaindale system for the years 2001 to 2010. During this period, no positive detections for total coliform or fecal coliform were reported. In the previous SWAP Report (MDE, 2002), positive total coliform detections had been reported in untreated (raw) water for Wells 5, A and B, and the three GUDI wells through the first half of 2001. That report indicates, however, that after minor report work, subsequent samples tested negative in all samples.

3.3 Source Water Assessment Areas

The Source Water Assessment Area describes the geographic boundary of areas providing water to public water systems. As per Maryland's Source Water Assessment Program Guidance (MDE, 1999), the primary tool to be used for delineating SWAAs for groundwater sources in areas of fractured bedrock is hydrogeologic mapping.

The following steps were used to define each SWAA for the Fountaindale system:

1. Each source location was visually inspected in the field, and then mapped in a Geographic Information System (GIS);
2. Based upon the permitted daily average value permitted for each source, the total annual volume of recharge required was calculated;
3. Using MDE's drought annual recharge value for the Catoctin Creek watershed, the surface area required to meet the permitted annual withdrawal values was calculated;
4. Geologic maps of the area were reviewed, and stereo-pairs of air photos were reviewed to delineate any lineaments that might be related to local geologic structures
5. A digital elevation model (DEM) and topographic maps of the area were reviewed for topographic and hydrologic constraints on surface water flow; and
6. This information was combined to determine the minimum geographic extent and shape of the SWAA for each well that corresponded to the calculated recharge area.

The new SWAAs for the Fountaindale PWS wells are delineated on Figure 4. Because the individual SWAAs for each well overlap, and because the SWAA is based upon a single permitted extraction rate, there is only a single, composite SWAA represented.

3.4 Land Use

Figure 6 and Table 7 illustrate the land use within the Fountaindale SWAA. More than half (~60%) of the SWAA consists of low, medium, or high density residential areas, plus commercial and institutional properties. The remaining land use is largely forested and agricultural. Portions of the Hollow Creek Golf Club (classified as open, urban land) are within the southwest corner of the SWAA.

Almost the entire Fountaindale Community Growth Area is within the Fountaindale PWS SWAA. This Community Growth Area is largely "built-out", with little room for new development. Currently, development is limited, at least in part, by capacity of the WWTP. The northwestern corner of the SWAA, however, is within agricultural zones both within and adjacent to the Middletown Community Growth Area.

Zoning from the Frederick County Comprehensive Plan is shown in Figure 7. The zoning largely replicates the current land use for the Fountaindale area. Sewer Service is represented in Figure 8, and follows the land use divisions. Most of the residential areas within the SWAA are currently included in the "Existing Service (S-1)" category. No sewer service is currently planned for the low-density residential areas outside the Fountaindale Community Growth Area, but within the eastern edge of the SWAA. The Braddock Heights area is entirely on septic systems.

3.5 Potential Contaminant Sources

In August, 2012, staff of Chesapeake Environmental Management (CEM) completed a survey of the Fountaindale area to identify any Potential Contaminant Sources (PCS) that might be located within or near the SWAAs. Identification and description of these PCS will assist in understanding current conditions with regard to threats to groundwater quality and contribute to the susceptibility analysis. Prior to the field survey, SSP&A obtained database and shape file layers from MDE and USEPA to assist in identifying existing and new PCS. These layers include MD Oil Control Program (OCP) sites, registered generators of hazardous waste (GHS), registered pesticide dealers, existing and out-of-service underground storage tanks, and Land Remediation Program sites. These were used to create preliminary maps and tables from which CEM staff worked to identify existing PCS.

Nine (9) PCS were identified in the area (Table 6, Figure 5). These include underground storage tanks (USTs) at gas stations, above-ground salt storage and diesel tanks associated with diesel generators and gas stations, a car wash, and a dry cleaning establishment. In addition, the Fountaindale WWTP is located within the SWAA boundary.

3.6 Susceptibility Analysis

As outlined in MDE's Source Water Assessment Program Plan (1999), the goal of a Susceptibility Analysis is to assess the potential for a water supply source to be contaminated at concentrations that would pose a concern or be affected in a way that is detrimental to the operation, health of consumers, or long-term viability of the supply. The methodology relies on existing water quality data, and an evaluation of potential contaminants of concern and their sources. Specifically, if any potential contaminant of concern exceeds ½ the Federal MCL for 10% of the results, a more detailed evaluation is warranted.

Potential routes for contamination of groundwater include infiltration through bedrock as well as infiltration through poorly constructed or maintained wellheads. During the site inspections, none of the wells appeared to be in poor condition, or improperly maintained. Issues with the existing sanitary seals or wellhead maintenance are therefore not a primary concern. General land use, control of naturally and anthropogenic contaminants, and infiltration through natural pathways are the primary concerns for these wells.

Because the Fountaindale PWS relies on wells open to fractured bedrock and surface water for its water supplies, all of these sources are potentially susceptible to contamination from surface sources. Three of the sources are classified as under the direct influence of Surface Water (Table 1). The point sources previously identified in or near the SWAAs include potential sources of gasoline, motor oil, other man-made chemicals, and biological contaminants and nitrates (from wastewater discharge).

The only chemical to exceed ½ of the relevant groundwater standard in more than 10% of the analyses reviewed were the total Trihalomethanes. Trihalomethanes are generally a product of water treatment, not surface use, and thus reflect chemical interactions in the three Treatment Plants.

As noted above, the only anthropogenic VOC to be detected in reported water quality data was MTBE, which appears to be the tail end of an earlier pulse of contamination that has not reappeared. Nonetheless, this occurrence affirms the potential for contamination of wells from gasoline-related sources.

Based upon the land use described above, the history of contamination and geologic setting of these wells, they are likely susceptible to surficial sources of contamination, including

- Point Sources of anthropogenic chemicals
- Nitrate and bacterial contamination from WWTP and private Sewer systems
- Pesticides and fertilizers from Golf Courses
- Similar PCS from Portions of Middletown CGA

Section 4
Existing Provisions to Protect Groundwater

This section addresses existing provisions in place to protect Fountaindale's water supply,

4.1 Frederick County Wellhead Protection Ordinance

In 2007, Frederick County adopted a Wellhead Protection ordinance (Ordinance 07-16-456) which applies to Frederick County jurisdiction. The ordinance established wellhead protection areas for all community groundwater supply systems, amended a section of the county code to include new regulations for hazardous substance storage tanks, and prohibited certain land uses and activities within designated wellhead protection areas. The ordinance includes a number of provisions, including

- Wellhead Protection Areas (WHPAs) are defined so that they conform to the Source Water Assessment areas developed by the MDE
- Hazardous substance storage tanks shall not be located within 500 feet of a community water supply system
- Hazardous substance storage tanks within any WHPA shall be placed above ground and be outfitted with a 100% catchment basin or double-walled containment and a spill protection overfill alarm
- Requirements for review of permits regarding placement of storage tanks within WHPAs
- Prohibited land uses within the WPAs include
    - Farm equipment sales or service
    - Dry cleaning and laundromat
    - Photography studios
    - Carpet or rug cleaning
    - Petroleum products storage
    - Industrial laundry and dry cleaning
    - Automobile filling and service station
    - Automobile repair or service shop
    - Salvage yard
    - Storage tanks, gasoline
    - Truck stop and filling station service activity
    - Motor freight terminal
    - Golf course and country club
    - Airports, public
    - Industrial waste landfill

The entire SWAA for Fountaindale, as revised in this report, also falls within the Middletown WHPA as delineated by Frederick County. The eastern margin of the WHPA is roughly Ridge Road, which is also the eastern boundary of the Fountaindale SWAA.

4.2 Frederick County Water Resources Element (WRE)

The Water Resources Element of Frederick's Comprehensive Plan was adopted in 2010. There are numerous aspects of the WRE that pertain to management of surface and groundwater water resources. These include general water resource policies, drinking water policies, drinking water action items, waste water action items and stormwater action items. Selected items relevant to the Fountaindale area are summarized in Table 8.

In addition to the other items outlined in Table 8, stormwater management facilities for new development are required by the latest Maryland Stormwater Design Manual to treat stormwater using small-scale Environmental Site Design (ESD) facilities to the maximum extent practical. The County can provide feedback to the developers to ensure that the stormwater features are designed and installed appropriately to have the greatest benefit for water quality and quantity. Stormwater management plans should contain specifications for scheduled maintenance, which should be followed to ensure proper function.

Section 5
Recommendations for Source Water Protection

This section provides recommendations for further protecting Fountaindale's public water supply. Because the Source Water Assessment Areas for the Fountaindale PWS extends into the Middletown Community Growth Area, we recommend that all the items listed below be considered for both community growth areas to protect groundwater users in both communities.

5.1 Contingency Planning for Emergency Spill Response

General Emergency response is managed at the County level through the Division of Emergency Management. Fire and Rescue operations are provided by the County through the Division of Fire and Rescue Services. The Frederick County Local Emergency Planning Committee (LEPC) provides citizens with information about hazardous materials that are used, stored, manufactured, released or spilled in their communities and maintains an emergency plan in cooperation with the facilities and local responders.

There is currently no site-specific Contingency Plan for addressing threats to the water supply for the Fountaindale PWS. A number of potential contaminant sources, however, were identified within the Fountaindale SWAA, including gas stations and the Fountaindale WWTP. In addition, Route 40 traverses the SWAA, and thus there is the potential for releases associated with traffic accidents.

It is therefore recommended that Frederick County develop an addendum to its County-wide emergency response plan to address potential contaminant releases within the SWAA. Because of the proximity of several key PCS to the community wells, a rapid and well-coordinated response will be essential to ensuring that public water supply is not adversely impacted by contaminant releases.

This plan should include emergency contact lists, community notification, PCS background and mapping. This plan should identify the key personnel responsible for emergency management and their specific responsibilities, the process and personnel responsible for communicating the issues to the affected public, and provisions for alternate water supplies or treatment needs should one or more water source become contaminated. The contents are outlined below.

5.1.1 General Contents

The Fountaindale PWS Contingency Plan can assume an all-hazard approach to emergency planning, and address the general functions that need to be addressed during any emergency. It should be designed so that emergency response responsibilities are closely aligned to the day-to-day responsibilities of each responsible entity. Because the Fountaindale WWTP is not required to maintain a site-specific stormwater pollution prevention plan, it is recommended that the Fountaindale Contingency Plan be suitable for use in responding to unexpected release from both commercial facilities within the SWAA and this WWTP.

Recommended Designations for addressing incidents relative to this SWPP are:

Type of Incident	Designated Department
Hazardous Material Spill	Frederick County Div. of Emergency Mgmt
Fire or Explosion	Frederick County Div. of Fire and Rescue Services
Water distribution / Water Quality	Frederick County Div. of Utilities & Solid Waste Management

Under scenarios that might pose a risk of contamination to groundwater or surface water supplies (spill, explosion, leak) any immediate threat to human health will be most appropriately addressed by the Fire and Rescue Services. The longer-term, potential threats to drinking water supplies are appropriately addressed by the Division of Utilities & Solid Waste Management, including maintenance of water and sewer infrastructure, and ensuring the continued supply of potable water.

It is recommended that the PWS Contingency Plan include the following items:

5.1.2 Emergency Contact Lists

- Frederick County Division of Fire and Rescue Services (Fire, flood, building collapse, hazardous material release [including gasoline or other substances stored in tanks])
- Director, Division of Utilities & Solid Waste Management (responsible for overseeing water supply and water quality)
- Director, Division of Utilities & Solid Waste Management (responsible for communicating with public)

5.1.3 Known PCS and Associated Chemicals

- Figure 5 and Table 6 from this report, and similar figures, as updated in future Source Water Protection Plans

5.1.4 Contamination Response Resources

- Director, Division of Utilities & Solid Waste Management (responsible for overseeing water supply and water quality)
- Water Supply Consultants (for expert assistance on water quality evaluation)

5.1.6 Steps for Alerting the Public

Steps necessary to alert the public to water quality or water supply issues will be outlined. These will include existing measures currently used for public notification including

- Electronic signs in public areas,
- Frederick County reverse-dial call notification,
- Media Releases
- Door-to-door notification.

5.1.7 Alternate Water Supply for Impacted Source(s)

- The local storage capacity for this PWS is 625,000 gallons, or approximately twice the average daily permitted withdrawal of water.
- Concrete provisions for alternate water supplies should be outlined, to include a combination of
    - Interconnection with the Middletown PWS (discussed, but not implemented; Frederick County, 2011)
    - Imposition of water use restrictions
    - Modification of systems operation to use un-impacted wells.

5.2 Physical Protection of Sources

Six (6) of the wells within the Fountaindale system are unprotected from physical damage or vandalism: wells 2, 3, 4, 6, 7 and B. In particular, accidental collisions with the wellheads by motor vehicles may decrease the effectiveness of the surface seal, providing a pathway to bacterial contamination of the wells. It is recommended that for those water sources that are currently unprotected or minimally protected, Frederick County should take steps to protect the components from accidental or intentional damage. This would include installation of bollards around wells, fencing the wellheads off from unpermitted activity, and marking the area with no trespassing signs.

5.3 Digital Information/Mapping Resources

The County should continue to develop mapping and Geographic Information Systems (GIS) resources. This effort will allow the County government to maintain and update high-precision geographic information related to SWAAs, water resources, PCS locations, potential effluent sources, and also provides the ability to generate custom maps. It is recommended that the SWAAs' (as currently defined and subsequently updated) GIS layers be incorporated into the development review process to identify potential impacts to groundwater resources during the planning phase.

SWAA maps can be very useful in communicating information to the public and decision makers as it regards water policy and emergency response. At a minimum, the County should maintain maps that depict the boundaries of the SWAAs, PCS, critical infrastructure, emergency transportation options, and areas of high vulnerability at specific locations including fire stations, government offices, and water facilities in the area.

5.4 Source Water Assessment Areas and Source Water Protection Planning

It is recommended that Frederick County update the delineation of SWAAs for Fountaindale, and complete a new inventory of Potential Contaminant Sources, and a new Susceptibility Analysis at a regular interval, consistent with the schedule for updating the regional comprehensive plan. This interval will be sufficient to account for identifying new trends in groundwater monitoring data and will account for changes in zoning and land use. An

updated Source Water Protection Plan should be completed and retained by the County Planning Department after each review.

Between the completion of each new SWPP, the Division of Utilities and Solid Waste Management and the Community Development Division should work together to implement the recommendations of the most current SWPP, particularly as recommendations change that affect land use.

Coincident with this review of water supply susceptibility, continue to review the Wellhead Protection Ordinance regulations approximately every five years. This will provide the County with the opportunity to adjust items such as the prohibited land uses and will help to ensure that the Wellhead Protection regulations remain viable to implement.

5.5 Planning/ New Development

The following recommendations address possible changes to zoning and permitting requirements that may improve source water quality.

Some Land Uses and Potential Contaminant Sources within the Fountaindale SWAA are currently non-compliant with the existing wellhead protection ordinance. These include

- Gasoline stations within 500 feet of wellheads
- Golf course

For the gas station, it appears that one utilizes above-ground tanks, and surface containment, whereas the other utilizes below-ground tanks (USTs). It is recommended that should substantial changes to these properties occur through change of owner or sale of property, that only land uses compliant with the wellhead protection ordinance be permitted. No additional non-compliant uses should be permitted within the WHPA.

5.6 Transfer on-Site Septic to Regional System

Growth within the Fountaindale area is currently limited, at least in part, by wastewater treatment capacity. It is recommended, however, that future development within the SWAA utilize connection with regional wastewater treatment facilities within Fountaindale, rather than septic systems. This will help to reduce the potential for bacterial and chemical contamination of groundwater resources. Any future expansion of the Fountaindale service area should attempt to transition new parcels into the regional wastewater treatment facility.

5.7 Land Acquisition and Easements

Land within the Fountaindale SWAA is largely built-out, but about one quarter of the included acreage is agricultural land, of which about half is outside of the Middletown Community Growth area (Figure 6).

5.7.1 Acquisition of Land

It is recommended that Frederick County and/or state agencies pursue the acquisition of additional lands within the SWAAs and/or watersheds of concern. The return on investment for these sources should be measured by proximity to the sources, relative size of the parcel, and by the opportunity to create or preserve natural areas on that site. Obvious targets for such purchase includes agricultural land within the SWAA, but outside the Fountaindale Community Growth area, and the current non-compliant properties with potential contaminant sources within 500 feet of well heads.

5.7.2 Creation of Easements

It is also recommended that Frederick County consider the creation of conservation easements on parcels that offer opportunities to improve water quality. These conservation easements could be offered with terms similar to agricultural easements offered by the Maryland Department of Agriculture in that they have a 25 year life-span and offer tax incentives to the property owner for their creation and maintenance. These easements should prohibit the development of any structures or utilities within the preserved areas. The existing land use should be considered when evaluating potential properties since those with inherent water quality risks, such as Agricultural use with high nutrient and/or bacteria concerns (e.g. prohibited uses in the Frederick County wellhead protection ordinance), are not preferred. Obvious targets for easements includes agricultural land within the SWAA, but outside the Fountaindale Community Growth area

5.8 Funding Opportunities

Frederick County should pursue means of outside funding for water quality improvement and community outreach efforts to offset additional costs incurred by protection measures and recommended actions identified. EPA and MDE provide opportunities for grants and loans through various programs targeted for specific purposes. Table 9 provides information pertaining to each funding opportunity and contact information to pursue funding.

5.9 Implementation Matrix

Table 10 is a matrix summarizing the results of this report. It includes a listing of possible threats to water quality and supply, recommended actions, together with estimated costs, sources of funding, and schedule.

Section 6
Conclusions and Summary

The Source Water Assessment for Fountaindale's Public Water System has been updated to account for the current permitted water withdrawals. New Source Water Assessment Areas have been delineated, using MDE's prescribed method of hydrogeologic mapping. These comprise 922 acres associated with 9 groundwater sources.

The susceptibility analysis for the Fountaindale PWS finds that all of the groundwater and surface water sources are potentially susceptible to surface contamination, including VOCs, IOCs, and SOCs. During the past 10 years, however, there have been no exceedances of natural or man-made contaminants. Phthalates detected at greater than one-half the MCL are likely related to laboratory contamination and do not necessarily indicate contamination at the source.

Recommendations to the Frederick County regarding the Fountaindale PWS include the following:

- Implementing contingency planning for emergency spill response
- Physical protection of the 6 sources for which no protective devices are currently in place to prevent vandalism or accidental damage
- Incorporation of the Source Water Assessment Areas (SWAAs), as delineated here and in future updates, into the County's digital information/mapping resources
- Periodic updates to the SWAAs and Source Water Protection Plan, to coincide with updates to the County's Comprehensive Plan and
- For non-conforming uses within the SWAAs, upon transfer of the property, or substantial changes in land use, only land uses compliant with Frederick County's wellhead protection ordinance be permitted
- Transfer of on-site septic systems to the regional sewer system
- Use of land acquisition and easements, if possible to attain land use goals within SWAA, as land becomes available.

An implementation matrix showing source water protection goals, proposal schedules, funding sources, cost ranges and implementation agencies is included.

Section 7
References

Brezinski, David K., and John L. Fauth. 2009. Geologic Map of the Myersville Quadrangle and Maryland Portions of the Smithsburg Quadrangle, Frederick and Washington Counties, Maryland. Digital Quadrangle Map.

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FIGURES

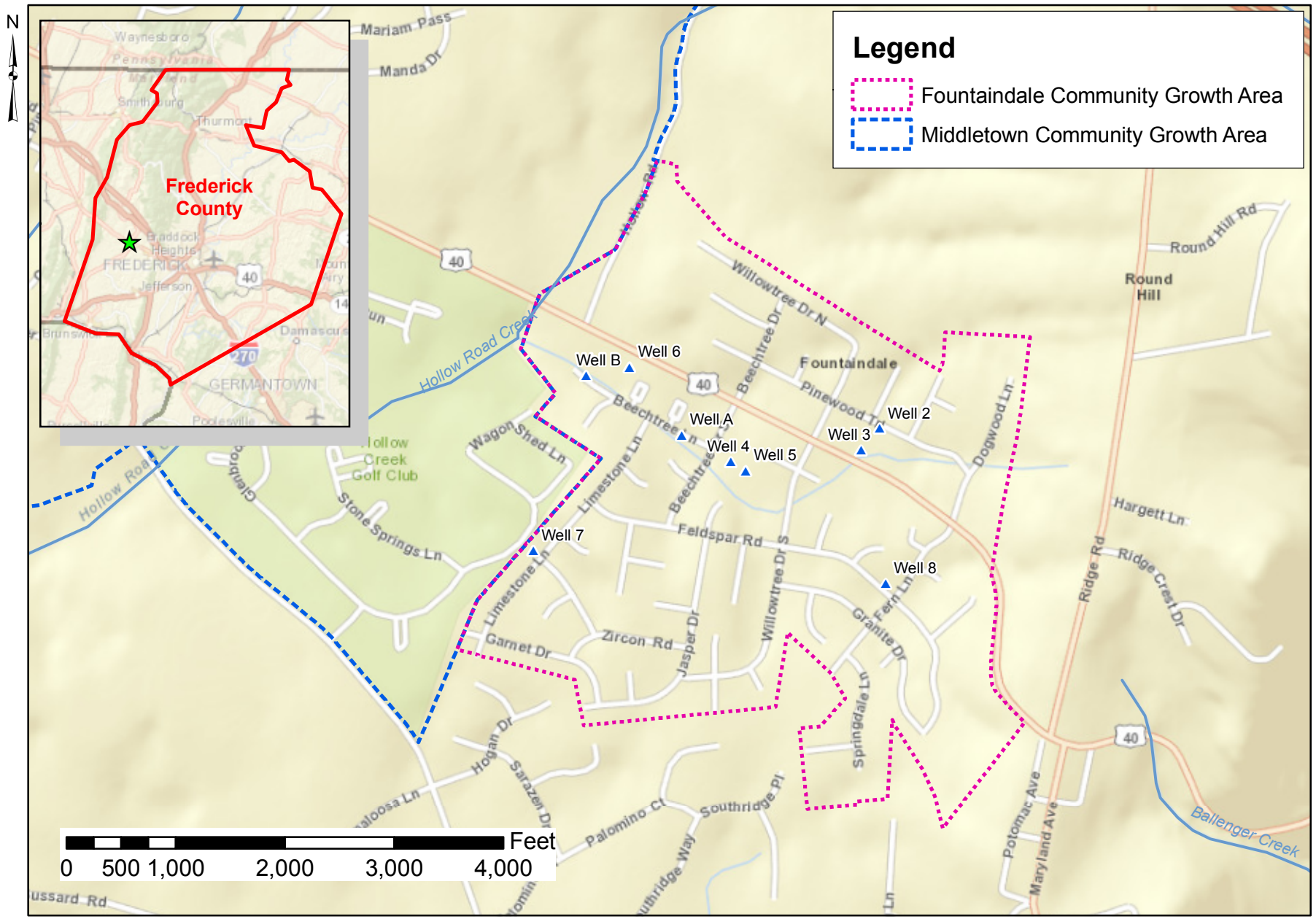


Figure 1 Location of Fountaindale, MD

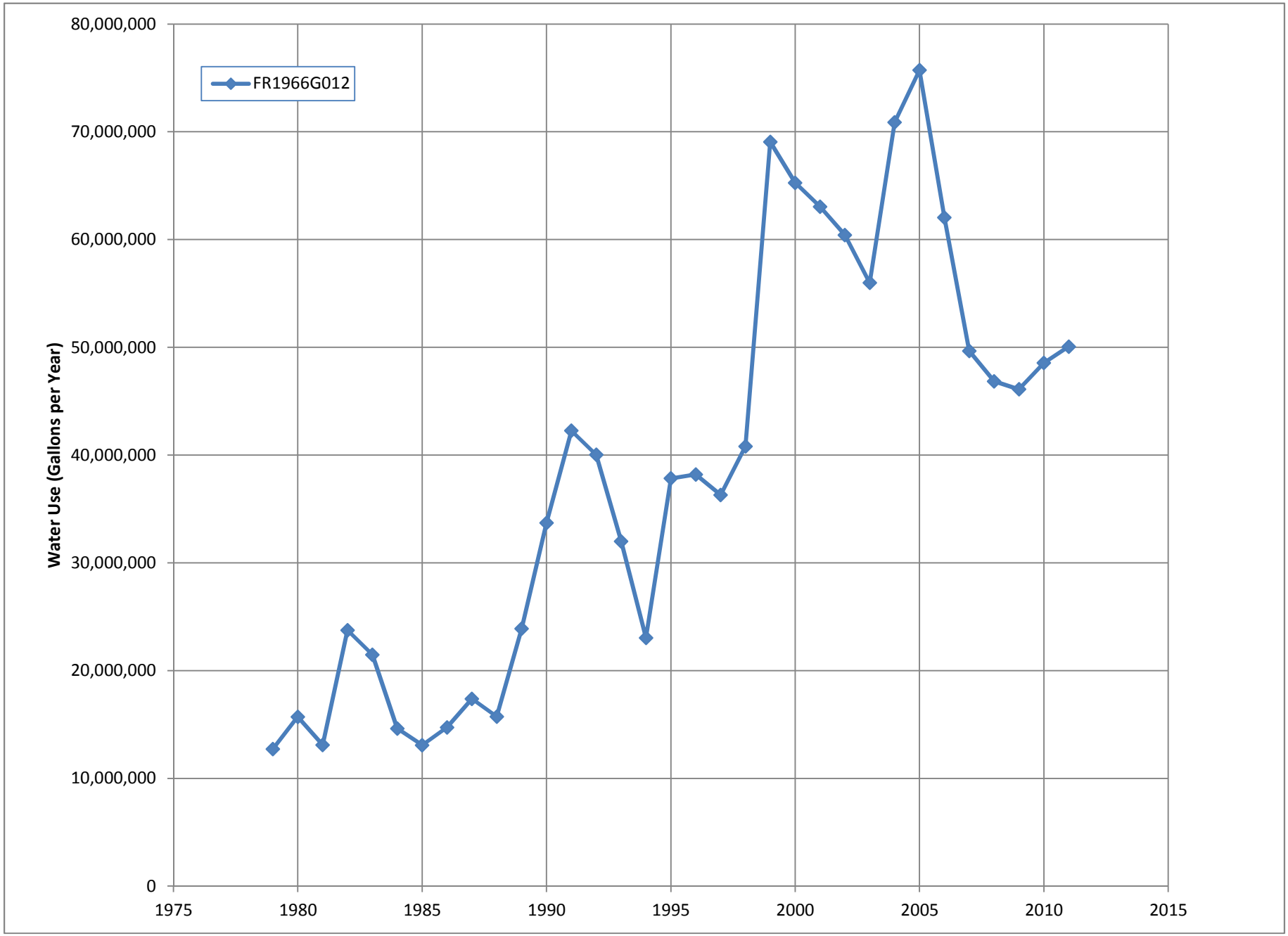
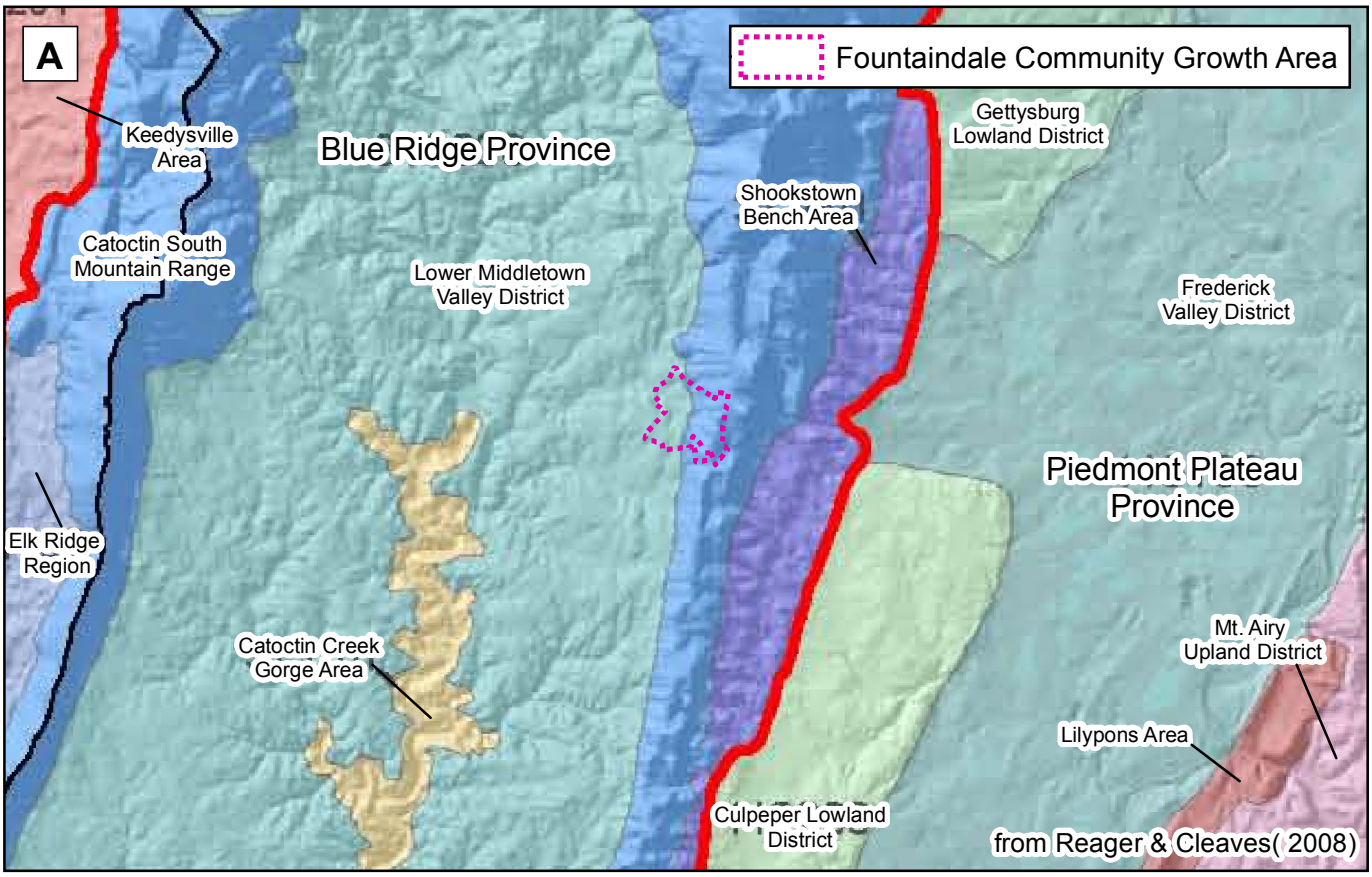


Figure 2 Reported Water Use by the Fountaindale PWS, 1979 to 2011



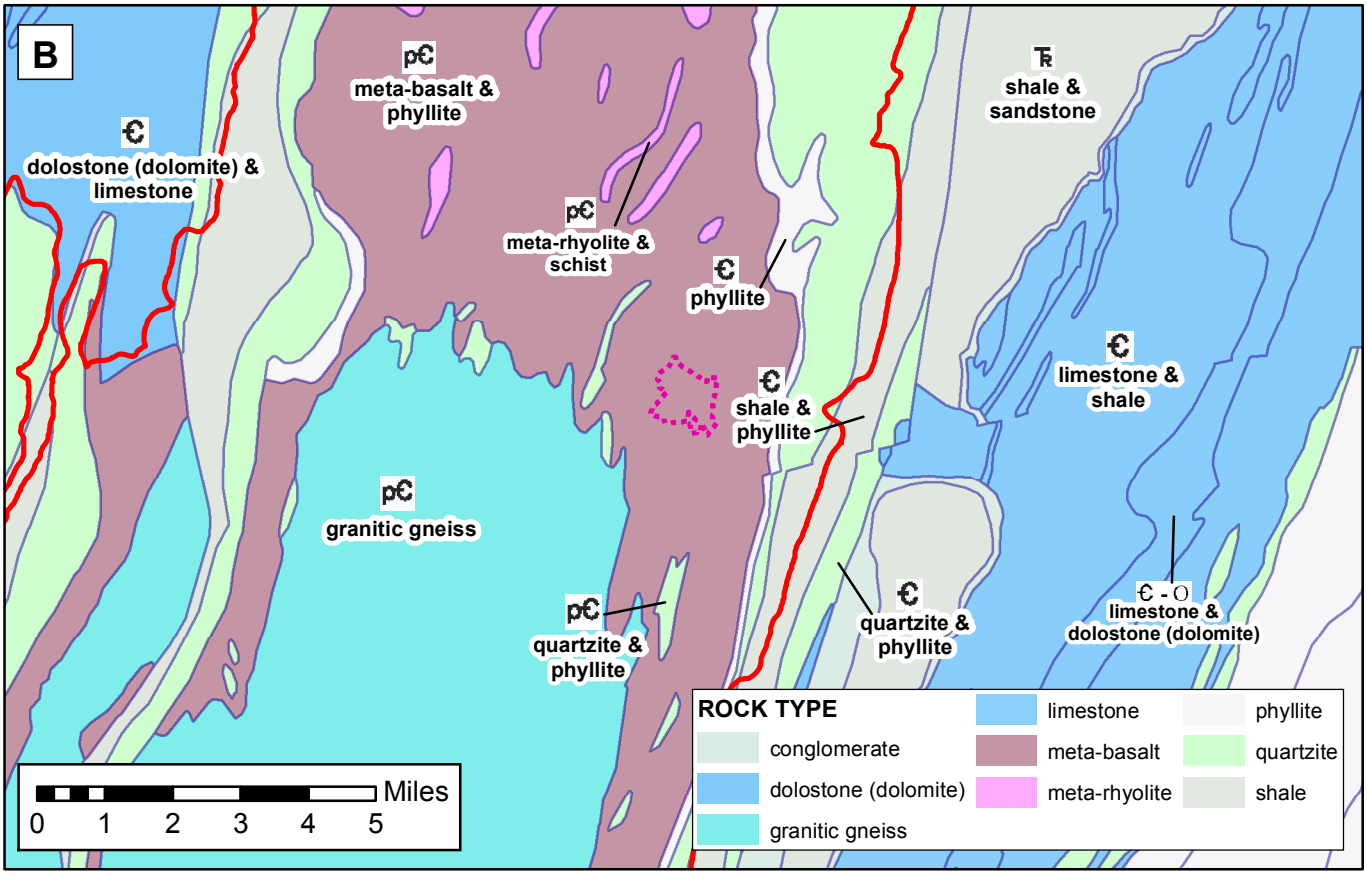


Figure 3 Physiographic Provinces of Maryland (A) and Bedrock Geology (B) in the Fountaindale Area

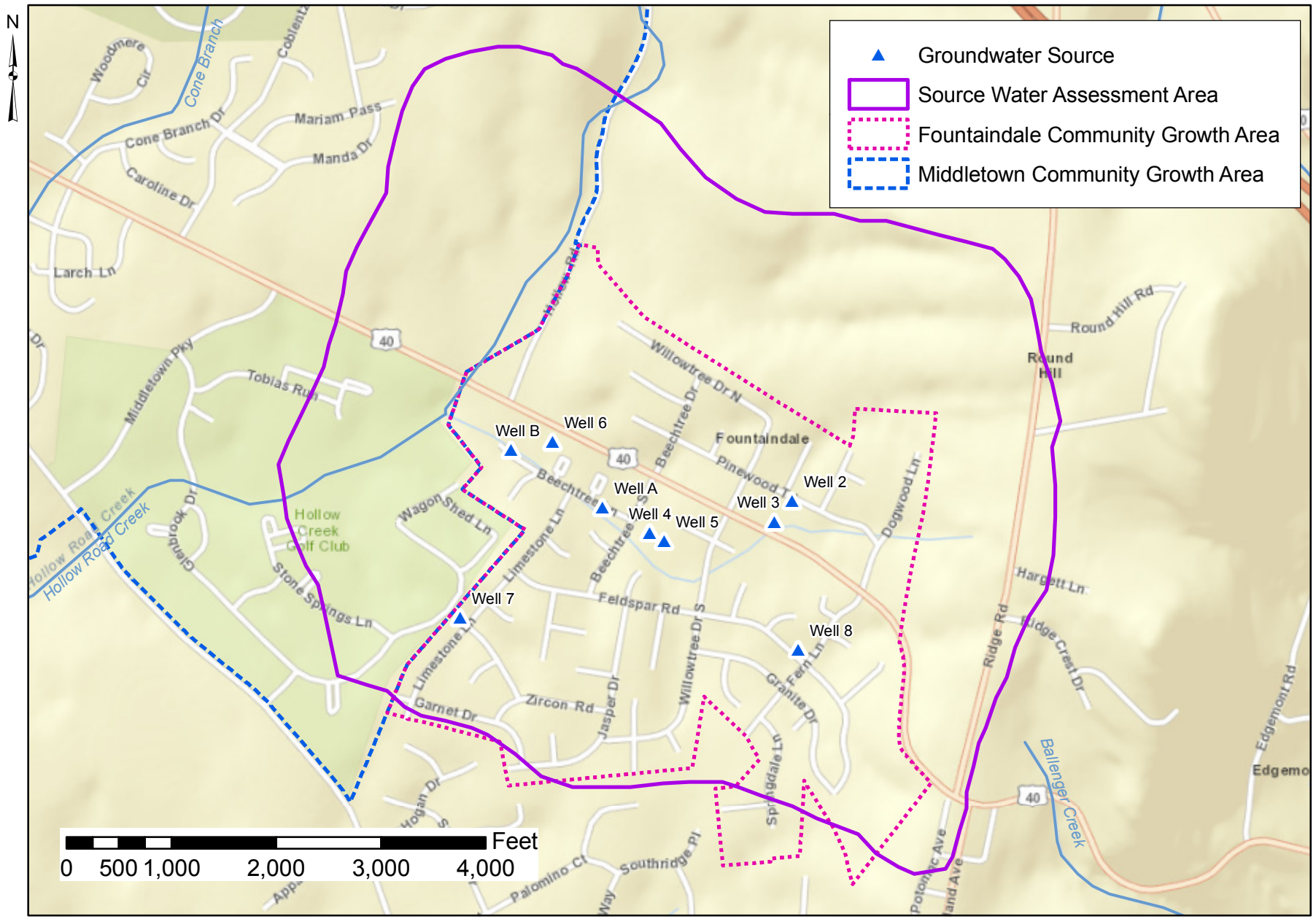


Figure 4 Source Water Assessment Area (SWAA) for the Fountaindale Public Water System

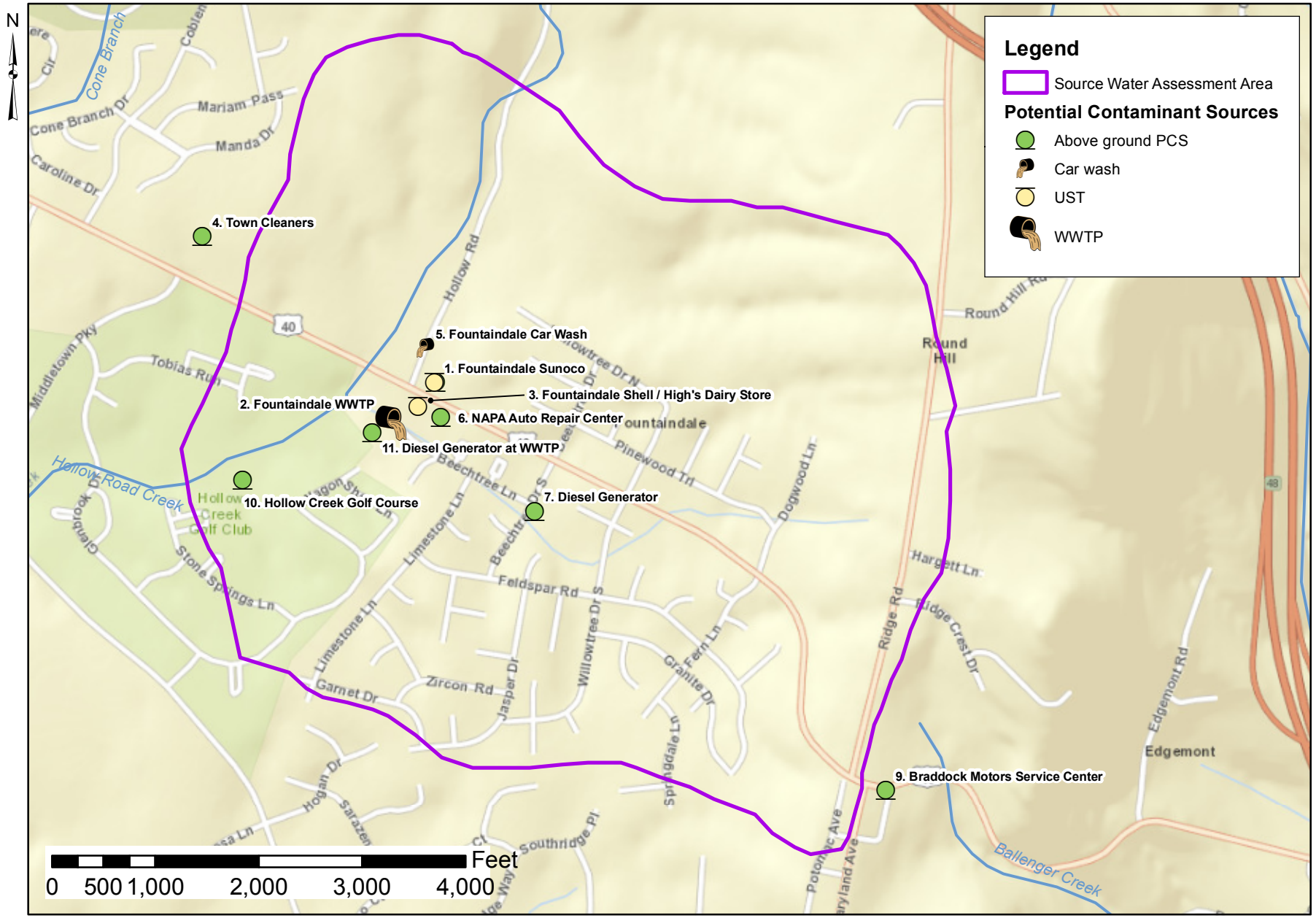


Figure 5 Potential Contaminant Sources in the Fountaindale Area

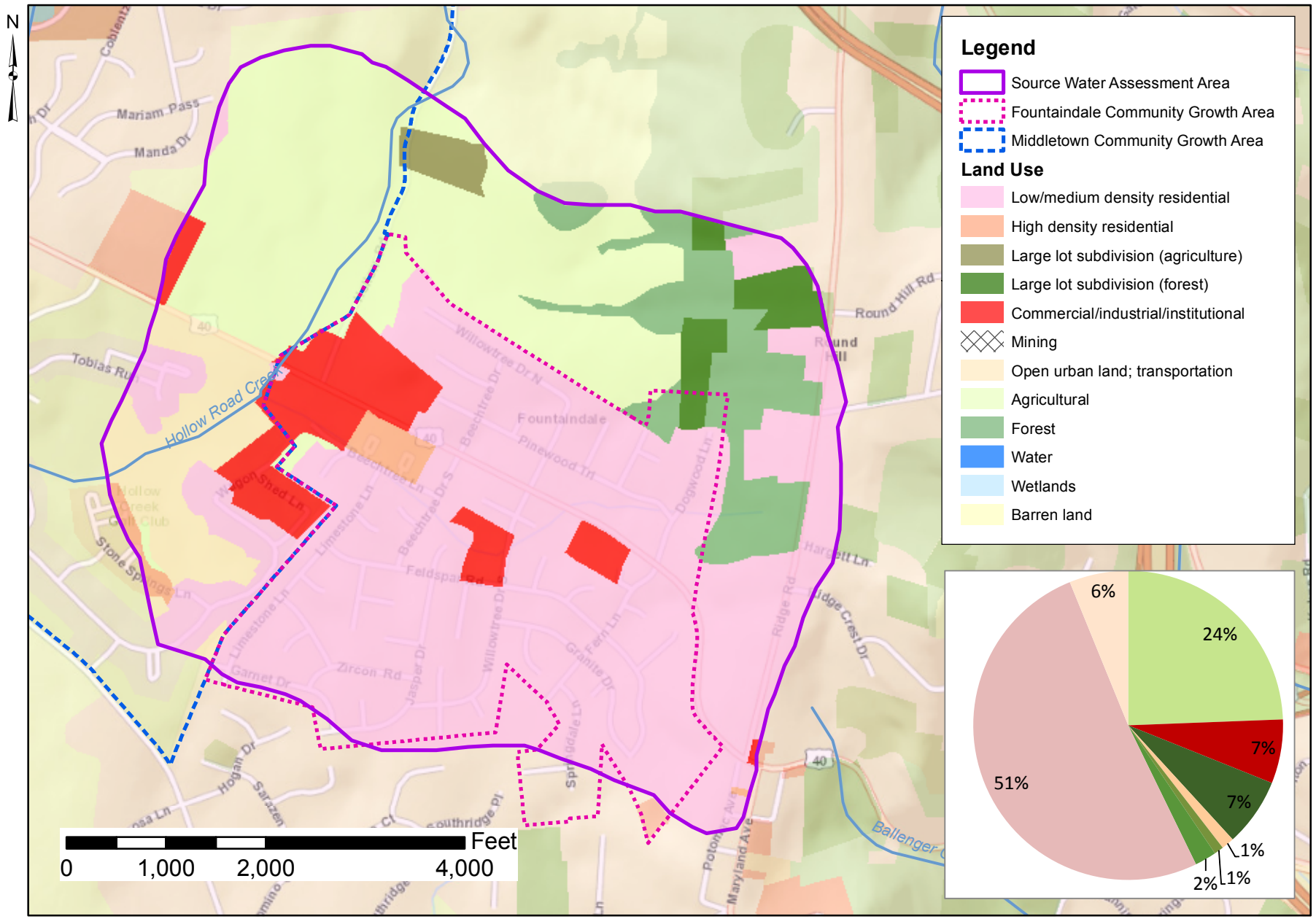


Figure 6 Land Use in the SWAA for Wells in the Fountaindale Public Water System

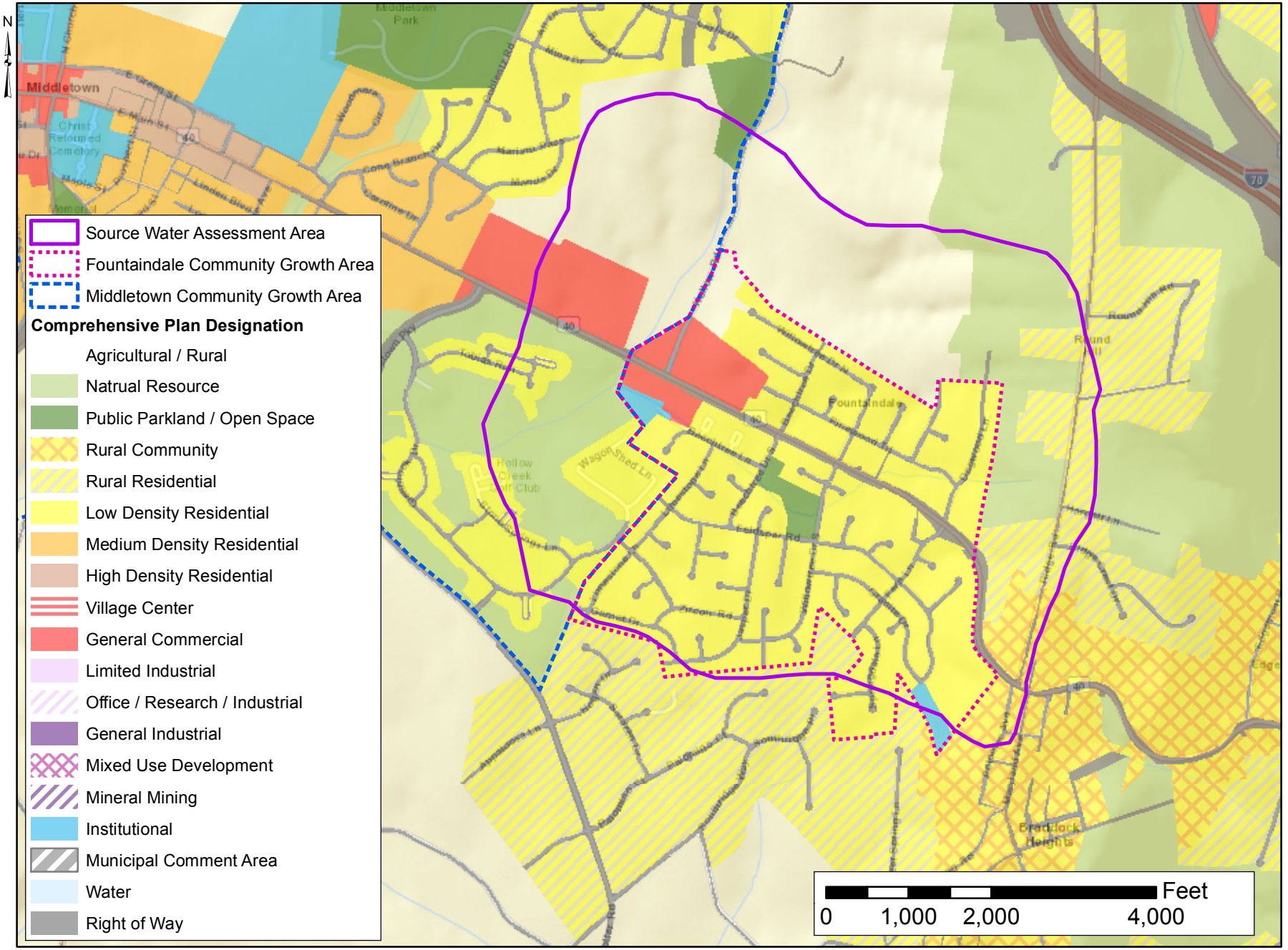


Figure 7 Land Use Designations from the Frederick County Comprehensive Plan

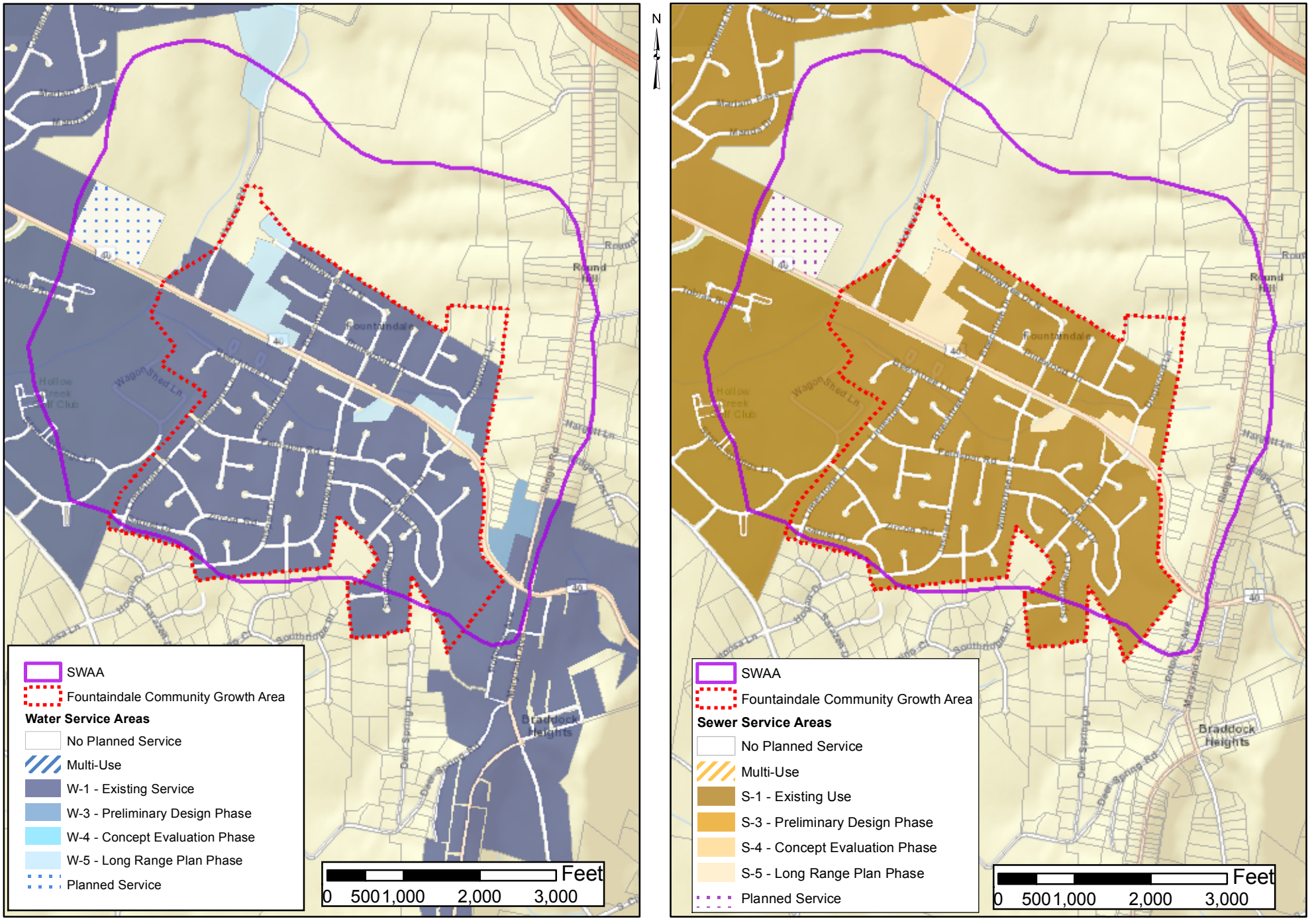


Figure 8 Water Service (A) and Sewer Service Areas (B) in the Vicinity of Fountaindale

TABLES

TABLE 1 Water Appropriation Permits and Sources of the Fountaindale Public Water System

	SOURCES ADDRESSED IN THIS REPORT*										SOURCES IN 2002 SWAP REPORT
	Source Type	Source ID	Plant ID	Source Name	Well Permit	Total Depth (ft)	Casing Depth (ft)	Completion Date	GUDI? **	Screened Interval	Source Name
1	GW	1	---	---	---	---	---	---	---	---	Fountaindale 1 #
2	GW	2	1	Fountaindale 2	FR690207	220	70	November-68		70-220	Yes
3	GW	3	1	Fountaindale 3	FR730070	300	77	June-73		77-300	Yes
4	GW	4	1	Fountaindale 5	FR732824	150	55	August-75	Yes	55-150	Yes
5	GW	5	1	Fountaindale 4	FR732825	300	98	August-75		98-300	Yes
6	GW	6	1	Fountaindale 6	FR733729	205	37	July-76		37-205	Yes
7	GW	7	3	Fountaindale 7	FR737558	675	71	April-80		71-675	Yes
8	GW	8	4	Fountaindale 8	FR738045	642	106	February-81		106-642	Yes
9	GW	9	1	Well A Beech Tree East	FR884859	500	65	December-95	Yes	65-500	Yes
10	GW	10	1	Well B Beech Tree West	FR884860	500	44	December-95	Yes	44-500	Yes

* All sources are covered under Water Appropriation Permit FR1966G012 with an Average Daily appropriation of 280,000 gpd, and a Maximum Daily appropriation of 420,000 gpd

** Groundwater under the direct influence of surface water

Fountaindale 1 has been abandoned

TABLE 2 Volatile Organic Compounds (VOCs) and Total Trihalomethanes (TTHM) Reported for the Fountaindale PWS

A. Non - Trihalomethanes

Contaminant	Plant ID	Earliest Detect Date	Most Recent Detect Date	Number of Analyses	Count of Detections	Max Concentration (ug/L)
METHYL-TERT-BUTYL-ETHER	1	May-01	May-01	16	2	0.7

B. Individual Trihalomethanes

Contaminant	Plant ID	Earliest Detect Date	Most Recent Detect Date	Number of Analyses	Count of Detections	Max Concentration (ug/L)
BROMODICHLOROMETHANE	1	November-01	August-07	8	4	12
CHLOROFORM	1	May-01	August-07	8	6	52
CHLOROFORM	4	August-04	September-10	4	2	1
DIBROMOCHLOROMETHANE	1	November-01	August-07	8	4	2.7

C. Total Trihalomethanes

Contaminant	Plant ID *	Number of Samples	Exceedances of One-Half MCL (40 ug/l)	Exceedances of MCL (80 ug/l)
TOTAL TRIHALOMETHANES	0	42	8	
TOTAL TRIHALOMETHANES	1	15		
TOTAL TRIHALOMETHANES	2	1		

* TTHM Samples collected from the distribution system for regulatory compliance are assigned a Plant ID of "0"; other samples may be associated with specific treatment plants (TP)

TABLE 3 Synthetic Organic Compounds (SOCs) Reported in Fountaindale Public Water System

Contaminant	Plant ID	Earliest Detect Date	Most Recent Detect Date	Number of Analyses	Count of Detections	Max Concentration (ug/L)	MCL *
DI(2-ETHYLHEXYL) PHTHALATE	1	October-01	June-05	24	6	5.3	6
DI(2-ETHYLHEXYL) PHTHALATE	4	March-02	September-09	32	8	3.6	6

* Same as State of Maryland Groundwater Standards for Type I and Type II Aquifers

TABLE 4 Inorganic Compounds (IOCs) Reported in Fountaindale Public Water System

Contaminant	Number of Detections	Earliest Detect Date	Most Recent Detect Date	Min Concentration	Max Concentration	MCL	SMCL	Units
BARIUM	10	May-01	April-11	0.025	0.362	2		mg/L
CHROMIUM	1	August-04	August-04	0.0026	0.0026	0.1		mg/L
COMBINED RADIUM (226 & 228)	1	August-07	August-07	0.2	0.2	5		pCi/L
FLUORIDE	4	May-01	May-05	0.1	0.16	4	2	mg/L
GROSS ALPHA	2	August-07	August-07	1	2	15		pCi/L
GROSS BETA	2	August-07	August-07	4	5	50		pCi/L
MERCURY	1	July-07	July-07	0.0004	0.0004	0.002		mg/L
NITRATE	27	February-01	January-11	0.3	3.5	10		mg/L
NITRITE	1	March-02	March-02	0.005	0.005	1		mg/L
RADIUM-226	1	August-07	August-07	0.2	0.2			pCi/L
SODIUM	11	May-01	April-11	5.02	103			mg/L
SULFATE	10	May-01	April-11	19.7	30.4		250	mg/L

TABLE 5 Total and Fecal Coliform Results Reported for the Fountaindale Public Water System

Routine Samples				Repeat Samples			
Number of Samples Collected	Number Positive for Total Coliform	Number Positive for Fecal Coliform	Number Indeterminate	Number of Samples Collected	Number Positive for Total Coliform	Number Positive for Fecal Coliform	Number Indeterminate
319	0	0	0	0	0	0	0

TABLE 6 Potential Contaminant Sources in the Fountaindale Area

	Name / Location	Type
1	Fountaindale Sunoco	UST / AST
2	Fountaindale WWTP	WWTP
3	Fountaindale Shell / High's Dairy Store	UST
4	Town Cleaners	Dry Cleaners
5	Fountindale Car Wash	Car wash
6	NAPA Auto Repair Center	Above ground PCS
7	Diesel Generator	Above ground PCS
8	Fire Dept. Diesel Generator	Above ground PCS
9	Braddock Motors Service Center	Above ground PCS
10	Hollow Creek Golf Course	Above ground PCS
11	Diesel Generator at WWTP	Above ground PCS

TABLE 7 Land Use in the Fountaindale SWAA

Land Use	Acres	% of SWAA Acreage
Agricultural	224.8	24%
Commercial / Industrial / Institutional	61.7	7%
Forested	65.7	7%
High-Density Residential	12.3	1%
Large lot subdivision (agriculture)	9.1	1%
Large lot subdivision (forest)	20.8	2%
Low / Medium Density Residential	470.5	51%
Open Urban Land / Transportation	56.7	6%
Total Acres	**921.5**	**100%**

TABLE 8 Selected Elements of Frederick County's Water Resources Element (2010)

Key General Water Resource Policies
WR-P-01 Provide community water/sewer service only within Community Growth Areas.
WR-P-02 Stage development within Community Growth Areas according to the adequacy of drinking water and wastewater treatment capacities.
WR-P-03 Consider including developed properties on well and septic within adjacent Community Growth Areas to facilitate connections to community water/sewer service.
WR-P-04 Minimize new development utilizing individual well and septic systems to protect the quality and quantity of ground water resources
Key Drinking Water Policies
WR-P-07 Protect community groundwater-based systems and individual wells in karst (limestone) areas.
WR-P-08 Support compatible land uses within designated wellhead protection areas.
Key Drinking Water Action Items
DW-A-01 Explore the application of water recharge easements as a complement to existing agricultural and land preservation easement programs.
DW-A-02 Explore the use of impoundments to supplement other drinking water sources.
DW-A-06 Develop a water conservation education program for residents and businesses of Frederick County.
DW-A-07 Develop a water-resources-based GIS database for staff to review in regard to development plans and proposals.
DW-A-11 Coordinate the development of GIS mapping and drinking water data with the municipalities.
DW-A-12 Identify means to keep pharmaceuticals and endocrine disruptors out of the County‘s waste stream and wastewater treatment systems.
Key Waste Water Policies Action Items
WW-A-01 Explore funding sources and programs to address inflow and infiltration problems in wastewater collection systems.
WW-A-02 Identify and prioritize retrofitting failing septic systems using the Bay Restoration Fund (flush tax) and other programs.
WW-A-03 Require that new septic systems use the best technologies available to reduce nitrogen pollution.
WW-A-04 Identify means to reduce pharmaceuticals and other components believed to be endocrine disrupters out of the County‘s wastewater streams and/or develop treatment strategies, which have been demonstrated to remove or
Key Stormwater Policies and Action Items
SW-A-02 Develop an action plan to improve watershed health in watersheds where impervious cover is reaching or exceeding 10%.

TABLE 9 Source Water Protection Funding Opportunities

S.S. PAPADOPULOS & ASSOCIATES, INC.

Organization/ Funding Opportunity	Contact	Description	Website
MDA			
Conservation Reserve Enhancement Program (CREP)	Dawn Early (301) 695-2803 ext. 3	Offers financial assistance above the rates offered by the traditional Conservation Reserve Program. Program places land in conservation reserve or provides cost-share assistance for BMPs.	http://mda.maryland.gov/resource_conservation/Pages/crep.aspx
MDE			
Drinking Water Supply Assistance Program	Deborah Thomas (410)537-3722	Provides financial assistance for the acquisition, construction, rehabilitation and improvement of publicly owned water supply facilities to protect against health problems and meet federal SDWA requirements.	http://www.mde.maryland.gov/programs/water/qualityfinancing/saterqualityfinancehome/pages/programs/waterprograms/water_quality_finance/wqfa_ws.aspx
319 Nonpoint Source Program	Eric Ruby (410) 537-3685 (800) 633-6101	Provides financial assistance for the implementation of nonpoint source best management practices and program enhancements as a means of controlling the loads of pollutants entering the State's waterways.	http://www.mde.state.md.us/programs/Water/319NonPointSource/Pages/Programs/WaterPrograms/319nps/index.aspx
Bay Restoration Fund Enhanced Nutrient Removal	Rajiv Chawla (410)537-3770 (800) 633-6101	Provides up to 100 percent grant funding to upgrade wastewater treatment plants to enhanced nutrient removal (ENR) technologies.	http://www.mde.state.md.us/programs/Water/BayRestorationFund/Pages/water/cbwrf/enr.aspx
Maryland's Nitrogen-Reducing Septic Upgrade Program	Shan Abeywickrama 410-537-3921	Onsite Disposal Systems (OSDS) Fund: Provides up to 100 percent in grant funding for upgrades of existing systems to best available technology for nitrogen removal or for the marginal cost of using best available technology instead of conventional technology. Priority given to failing OSDS in Critical Areas	http://www.mde.state.md.us/PROGRAMS/WATER/BAYRESTORATIONFUND/ONSITEDISPOSALSYSTEMS/Pages/Water/cbwrf/index.aspx
Biological Nutrient Removal Cost-Share Program	Ms. Elaine Dietz (410) 537-3908 (800) 633-6101	Provides grants to local municipalities and agencies for upgrading WWTPs with biological nitrification/denitrification facilities to achieve a goal of annual average effluent concentration of 8 mg/l total nitrogen.	http://www.mde.state.md.us/programs/Water/QualityFinancing/SaterQualityFinanceHome/Pages/programs/waterprograms/water_quality_finance/wqfa_bnr.aspx
Linked Deposit Water Quality Revolving Loan Fund (WQRLF) and Drinking Water Revolving Loan Fund (DWRLF)	Mr. Jag Khuman (410) 537-3119 (800) 633-6101	Provides a source of low-interest financing for certain water quality and drinking water capital projects. Below market interest rates are passed on to borrowers by participating commercial lenders with investment agreements with MDE	http://www.mde.state.md.us/programs/Water/QualityFinancing/LinkedDeposit/Pages/programs/waterprograms/water_quality_finance/link_deposit/index.aspx
Sewerage Facilities Supplemental Assistance Program	Ms. Heather Fleming (410) 537-3327 (800) 633-6101	Provides financial assistance to local governmental entities in the form of grants, supplementing the Water Quality Loan funds, where affordability is a problem and to correct public health or water quality problems	http://www.mde.state.md.us/programs/Water/QualityFinancing/SaterQualityFinanceHome/Pages/programs/waterprograms/water_quality_finance/wqfa_supplemental.aspx
State Revolving Loan Fund/ Water Quality Financing	Mr. Jag Khuman (410) 537-3119 (800) 633-6101	Provides a source of low interest financing to encourage private landowners, and water system owners to implement capital improvements that will protect or improve the quality of Maryland's water resources and provide safe drinking water.	http://www.mde.state.md.us/programs/Water/QualityFinancing/Pages/Programs/WaterPrograms/water_quality_finance/index.aspx
Water Supply Program/ Drinking Water Supply Assistance Program	Ms. Debbie Thomas (410) 537-3722 (800) 633-6101	Provides financial assistance to local governments or to water supply systems for wellhead protection projects and direct loans to local governments or to water supply systems for land acquisition for source water protection.	http://www.mde.state.md.us/programs/Water/QualityFinancing/SaterQualityFinanceHome/Pages/programs/waterprograms/water_quality_finance/wqfa_ws.aspx
UST Loan Program/ Linked Deposit WQRLF & DWRLF	Mr. Greg Sonberg (410) 537-3412 (800) 633-6101	A program through the Water Management Administration, known as Linked Deposit, may provide owners of underground oil storage tanks (UST) a way to replace those tanks.	http://www.mde.state.md.us/programs/Water/QualityFinancing/LinkedDeposit/Pages/programs/waterprograms/water_quality_finance/link_deposit/index.aspx
UST Reimbursement Program (Oil Contaminated Site Environmental Cleanup Fund)/ The Oil Control Program	Mr. Christopher Ralston (410) 537-3443 (800) 633-6101	Provides financial assistance to owners or operators of USTs by reimbursing them for costs incurred as a result of an oil-contaminated site environmental cleanup project.	http://www.mde.state.md.us/programs/Land/OilControl/OilControlProgram/Pages/programs/landprograms/oil_control/pollution_management/index.aspx
Environmental Benefits Districts	Lisa Nissley (410) 537-3812 (800) 633-6101	Offers financial, technical, and other appropriate resources to benefit targeted communities. This is a new initiative developed by MDE to foster sound environmental practices, healthy and safe communities, and proactive economic development for all Marylanders.	http://www.mde.state.md.us/programs/crossmedia/EnvironmentalJustice/EJImplementationinMaryland/Pages/programs/multimediaprograms/environmental_justice/implementation/details.aspx#ebd
USDA			
Funding for Rural Communities	Brad King 301-797-0500 ext. 5	Provides assistance for rural businesses, housing and community facilities, and utilities through direct or guaranteed loans, grants, technical assistance, research and educational materials.	http://www.rurdev.usda.gov/RD_Loans.html
Conservation Reserve Program (CRP)	Brad King 301-797-0500 ext. 5	Agricultural producers receive cost-share assistance to plant resource-conserving cover crops (improving water quality, controlling soil erosion and enhancing wildlife habitat) and receive annual rental payment for the contract term (10-15 years). Acts as an incentive to safeguard environmentally sensitive land.	http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp-sp
Conservation Innovation Grant (CIG) Program	Gregorio Cruz (703) 235-8065	Provides grants for the development and adoption of innovative conservation approaches and technologies. Provides more options for environmental enhancement and compliance with agricultural regulations.	http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044413.pdf
USEPA			
Assessment and Watershed Protection Program Grants (CFDA 66.480)	Federal Service Desk (866) 606-8220	Provides financial assistance for studies relating to water pollution, specifically for watershed management actions and policies.	https://www.cfda.gov/index?s=program&mode=form&tab=step1&id=8f560648f1725cee11f88ee3c25452ea
Environmental Education Regional Grants	Federal Service Desk (866) 606-8220	Provides financial assistance for environmental education projects that increase public awareness.	http://www.epa.gov/education/grants/index.html
Pollution Prevention Grants Program (CFDA 66.708)	Federal Service Desk (866) 606-8220	Provides financial assistance for pollution prevention technical assistance and projects for businesses.	https://cfda.symplicity.com/index?s=program&mode=form&tab=step1&id=15438a8058b068197cc298e0234f8695

TABLE 10 Fountaindale Source Water Protection Plan Implementation Matrix

Threat to Source Water	Recommended Action (See Section 5 of Report)	Suggested Responsible Agency	Estimated Cost [1]	Funding Sources	Schedule [2]
Releases of Contaminants	Contingency Planning	Emergency Management Division	<$10,000	General Fund	within 6 months
	Transfer On-Site Septic to Regional System	Health Department	>$6,912 + septic system abandonment and plumbing modifications [3]	Individual Property Owner	ongoing
Inappropriate Land Use	Elimination of non-conforming Land Use	Community Development Division	Nominal	General Fund	future Comprehensive Plan Updates [4]
	Digital Information/Mapping Resources	Community Development Division	Nominal	General Fund	within 30 days
	Periodic Updates of Source Water Protection Plan	Community Development Division	$15,000 -$30,000	General Fund	every 6 years [5]
	Land Acquisition and/or Easement	Agency-Dependent	Site specific [6]	General FundGrants/Loans see Table 9	As opportunities arise
GUDI / Surface Water Infiltration	Physical Protection of Sources (7)	Division of Utilities and Solid Waste Mangement	<$20,000	Enterprise (Water and Sewer) Fund	within 1 year

[1] Cost Estimates are based upon current implementation, and do not account for changes in costs over time (see schedule).

[2] Any schedule shown is a suggestion (not a mandate) that is funding-dependent and based on other competing needs as prioritized by the County via the responsible agency.

[3] Represents FY 2014 Wastewater capacity fee, which is subject to yearly increases and would be borne by the property owner if required to connect to public sanitary sewer system.

[4] The notion of eliminating non-conforming uses upon a property transfer may not be supported locally.

[5] Contemporaneous with updates to the County Comprehensive Plan and Water Resources Element.

[6] Could be very expensive, which depends largely on the size of property to be acquired and the willingness of the property owner to sell.