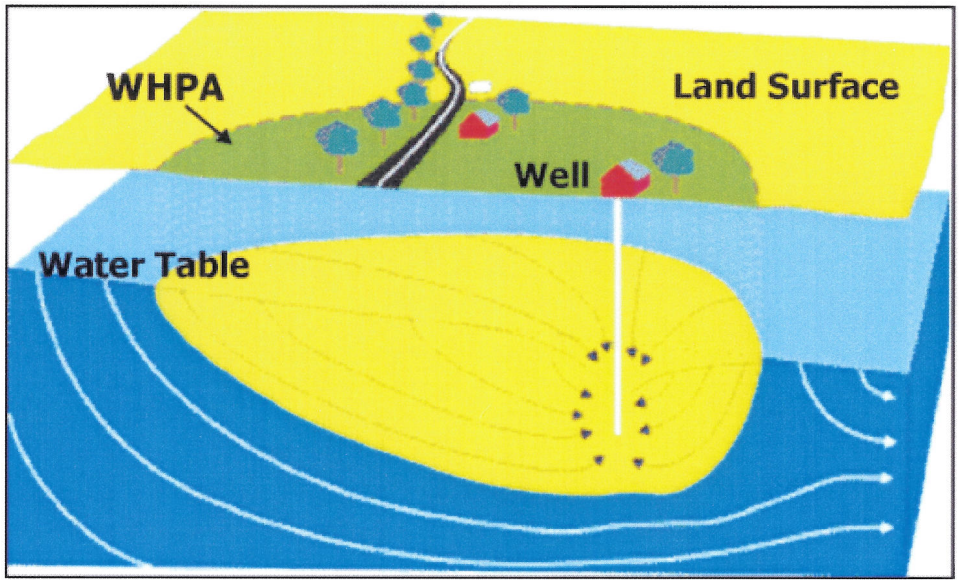
Source Water Assessment
for the El Rancho Mobile Home Park
Water System
Washington County, Maryland



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February 2004

MDE

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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the El Rancho Mobile Home Park water system. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of an area that contributes water to the source, 2) identification of potential sources of contamination, and 3) determination of the susceptibility of the water supply to contamination. Recommendations for protecting the drinking water supply conclude this report.

The sources of El Rancho Mobile Home Park's water supply are four wells in an unconfined fractured-rock aquifer. The source water assessment area was delineated by the WSP using U.S. EPA approved methods specifically designed for this source type.

Point sources of contamination were investigated within the assessment area from field inspections, contaminant inventory databases, and previous studies. The Maryland Office of Planning's 2000 digital land use map for Washington County was used to identify non-point sources of contamination. Well information and water quality data were also reviewed. An aerial photograph and maps showing land use within the source water assessment area are included in the report.

The susceptibility analysis is based on a review of the existing water quality data for the El Rancho MHP water system, the presence of potential sources of contamination in the source water assessment area, well integrity, and the inherent vulnerability of the aquifer. It was determined that Radon-222, a naturally occurring contaminant, may pose a risk to the El Rancho MHP water supply. The water supply is susceptible to total coliform bacteria. The water supply is not susceptible to contamination by inorganic compounds, other radionuclides, volatile organic compounds, synthetic organic compounds, or other microbiological contaminants.

karst-like aquifer. Duigon (2001) has identified sinkholes, wells that penetrate cavernous zones, and other karst features in the valley. The El Rancho MHP wells obtain water from the Elbrook formation, a gray and blue-gray shaly limestone (Edwards, 1978). This is a heterogeneous formation and can be karstic in some areas, and in others much more like a crystalline fractured-rock aquifer. The El Rancho MHP wells appear to be in the less soluble section of this aquifer where it is less likely to be influenced by karst features. Therefore, the primary porosity and permeability of this aquifer are small due to the dense nature of the metamorphosed rock. 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, large production wells are only common when significant, solution enlarged fractures or openings are encountered.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. The source water assessment area for public water systems with an average appropriation amount of less than 10,000 gpd and drawing from fractured-rock aquifers is a circle with a 1,000-foot radius (MD SWAP, 1999). The area should be modified to account for geological boundaries and ground water divides if appropriate. The 1,000-foot buffer around each of the wells was combined to delineate the WHPA. The WHPA is 98 acres and is illustrated in Figure 2.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, discharge permits, large-scale feeding operations, and CERCLA sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. 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

A review of MDE contaminant databases revealed no potential point sources of contamination within the WHPA.

Non-Point Sources

The Maryland Office of Planning's 2000 digital land use coverage of Washington County was used to determine the predominant types of land use in the WHPA (Fig. 3). The land use summary is given in Table 2. The majority of the WHPA is made up of agricultural land, with a smaller proportion of forested and residential areas.

Land Use Type	Total Acres	Percent of WHPA
Low Density Residential	3	2.7
High Density Residential	10	10.3
Cropland	57	58.5
Pasture	14	14.4
Forest	14	14.1
Total	98	100

Table 2. Land Use Summary

Agricultural land (cropland and pasture) is commonly associated with nitrate loading of ground water and also represents a potential source of SOCs depending on fertilizing practices and use of pesticides. Pasture areas are also a source of microbiological pathogens from animal wastes. Residential areas without sewer service may be a source of nitrate from septic systems. Additionally, residential areas may be a source of nitrate and SOCs if fertilizers, pesticides, and herbicides are not used carefully in lawns and gardens.

The Maryland Office of Planning's 1996 digital sewer map of Washington County shows that entire WHPA is in an area of the county that is not planned for service.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) contaminants. The State's SWAP defines a threshold for reporting water quality data as 50% of the Maximum Contaminant Level (MCL). If a monitoring result is greater than 50% of an MCL, this assessment will describe the sources of such a contaminant and if possible, locate the specific sources that are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The El Rancho MHP water system currently uses ultraviolet radiation for disinfection and ion exchange for softening.

A review of the monitoring data for El Rancho MHP's water system indicates that the water supply meets drinking water standards. Contaminants have not been detected above 50% of an MCL, with the exception of one synthetic organic compound. Radon-222 was the only contaminant present at a level of concern. The water quality sampling results are summarized in Table 3.

Inorganic Compounds (IOCs)

Inorganic compounds were not detected above 50% of an MCL. Nitrate levels range from 1.9 to 4.8 ppm, and are consistently below 5 ppm.

Radionuclides

A review of the data shows that the only radionuclide detected at a level of concern was Radon-222. There is currently no MCL for Radon-222, however EPA has

proposed an MCL of 300 pCi/L or an alternate of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air. The EPA received many comments in response to their proposed rule, and promulgation may be delayed. Radon-222 was detected at 255 pCi/L in the water supply, which is greater than 50% of the lower proposed MCL.

Contaminant Group	No. of Samples Collected	No. of Samples over 50% of an MCL
Inorganic Compounds (except Nitrate)	91	0
Nitrate	16	0
Radiological Contaminants	5	1*
Volatile Organic Compounds	10	0
Synthetic Organic Compounds	4	1

Table 3. Summary of Water Quality Samples
*Proposed MCL for Radon-222

Volatile Organic Compounds (VOCs)

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

Synthetic Organic Compounds (SOCs)

A review of the data shows that SOCs have not been detected above 50% of an MCL, with the exception of Di(2-Ethylhexyl)Phthalate for which the highest level reported was 3.8 ppb. This contaminant is commonly found in laboratory blank samples and it was confirmed to be present at ten times the level in the blank for this sample.

Microbiological Contaminants

Raw water bacteriological data is available from evaluation for ground water under the direct influence of surface water (GWUDI). A review of the data shows that the wells were free of fecal coliform bacteria, but did have low concentrations of total coliform bacteria (up to 23 colonies/100 ml) in two of ten samples.

SUSCEPTIBILITY ANALYSIS

The wells serving the El Rancho MHP water supply draw water from unconfined fractured-rock aquifers. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area. Therefore, continued monitoring of contaminants is essential in assuring a safe drinking water supply. The *susceptibility* of the source to contamination is determined for each group of contaminants based on the following criteria: 1) the presence of potential contaminant

sources within the WHPA, 2) water quality data, 3) well integrity, and 4) the aquifer conditions. Table 4 summarizes the susceptibility of El Rancho MHP's water supply to each of the groups of contaminants.

In fractured-rock areas, 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 has been detected consistently below 5 ppm in the water supply. There are sources of nitrate present in the WHPA, but based on water quality data, they are not having a major impact on the water supply. Other inorganic compounds have not been detected and potential sources of these contaminants were not found in the WHPA. Therefore, the water supply is **not** susceptible to inorganic compounds.

Radionuclides

The water supply **may be** susceptible to Radon-222. The source of radionuclides in ground water is the natural occurrence of uranium in rocks. The concentration of constituents such as Radon-222, Radium-226, and Radium-228 can vary considerably in the same aquifer to due to many factors such as pH, exposed surface area of minerals, and other natural conditions. The Radon-222 level is higher than 50% of the lower proposed MCL of 300 pCi/L. Therefore, the system will be determined susceptible to this contaminant if the lower MCL is adopted. Based on available data, the water supply is **not** susceptible to other radionuclides.

Volatile Organic Compounds

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

Synthetic Organic Compounds

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

Microbiological Contaminants

The wells did not have fecal coliform bacteria in their raw water samples and were determined not under direct influence of surface water. Therefore, the wells are **not** susceptible to microbiological contaminants that may be present in surface water, such as *Giardia* and *Cryptosporidium*. Total coliform bacteria were detected, which are ubiquitous in the environment, and may be indicators of organisms with longer survival rates such as viruses. Without additional data however, it is not possible to

determine whether or not the water supply is susceptible to viral contamination. The wells **are** susceptible to total coliform.

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

Table 4. Susceptibility Analysis Summary.
*Proposed MCL for Radon-222

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

With the information contained in this report the El Rancho MHP is in a position to protect the El Rancho MHP 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

- The El Rancho MHP should contact the County Water and Sewer Department and the County Planning Department to form a local planning team to begin to implement a wellhead protection plan. The team should represent all the interests in the community, such as the water supplier, home association officers, the County Health Department, local business, developers, and property owners, and residents within and near the WHPA. The team should work to reach a consensus on how to protect the water supply.
- A management strategy adopted by the County should be consistent with the level of resources available for implementation. MDE remains available to assist in anyway we can help the process.
- MDE has grant money available for Wellhead Protection projects.

Public Awareness and Outreach

- The Consumer Confidence Report should list that this report is available to the general public through their county library, by contacting the Owner or MDE.
- Conduct educational outreach to residents on potential contaminant sources. Important topics include (a) appropriate use and application of fertilizers and pesticides, and (b) chemical storage.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Annual raw water bacteriological samples are a good test for well integrity.

Planning/ New Development

- Review the State's model wellhead protection zoning ordinances for potential adoption. Coordinate with Washington County Department of Planning to adopt a wellhead protection ordinance.

Land Acquisition/Easements

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

Contingency Plan

- El Rancho MHP should have a Contingency Plan for its water system. COMAR 26.04.01.22 requires all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water supply under emergency conditions.
- Develop a spill response plan in concert with the Fire Department and other emergency response personnel.

Contaminant Source Inventory Updates/ Inspections

- The El Rancho MHP should conduct their own field survey of the source water assessment area to ensure that there are no additional potential sources of contamination.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.

Changes in Use

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

REFERENCES

Bolton, D.W., 1996, Network Description and Initial Water-Quality Data from a Statewide Ground-Water-Quality Network in Maryland: Maryland Geological Survey Report of Investigations No. 60, 167 pp.

Committee on Health Risks of Exposure to Radon, 1999, Health Effects of Exposure to Radon: BEIR VI, (http://www.epa.gov/iaq/radon/beirvi1.html).

Duigon, M.T., 2001, Karst Hydrogeology of the Hagerstown Valley, Maryland, MGS Report of Investigations 73, 128 pp.

Duigon, M.T., and J.R. Dine, 1991, Water Resources of Washington County, Maryland, MGS Bulletin 36, 109 pp.

MDE, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.

U.S. Environmental Protection Agency, 1991, Delineation of Wellhead Protection Areas in Fractured Rocks: Office of Ground Water and Drinking Water, EPA/570/9-91-009, 144 pp.

OTHER SOURCES OF DATA

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

FIGURES

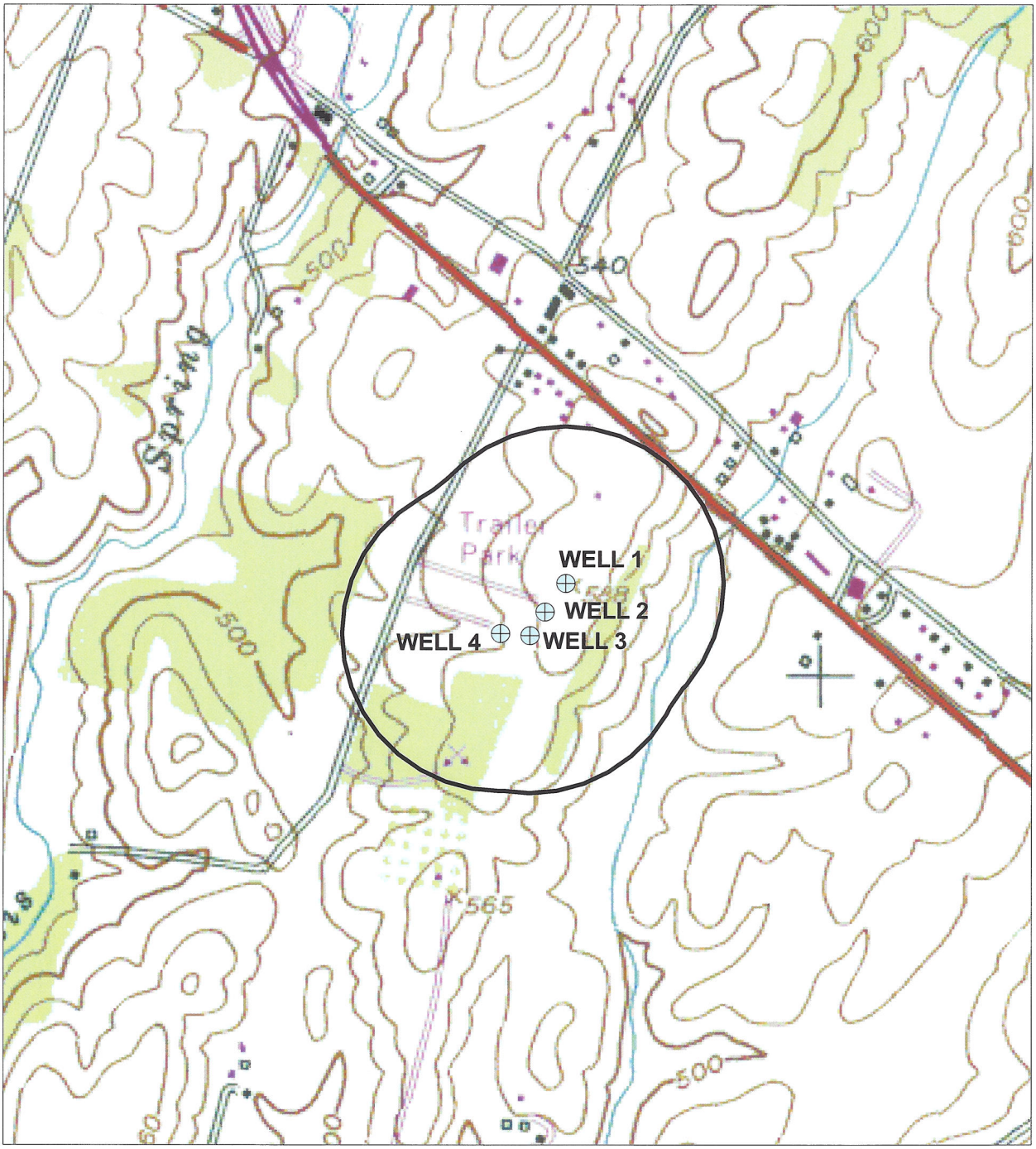

Figure 2. El Rancho MHP Wellhead Protection Area

Legend

⊕ Wells

Wellhead Protection Area

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500 0 500 1000 Feet

Base Map: USGS 7.5' Quadrangle for Funkstown

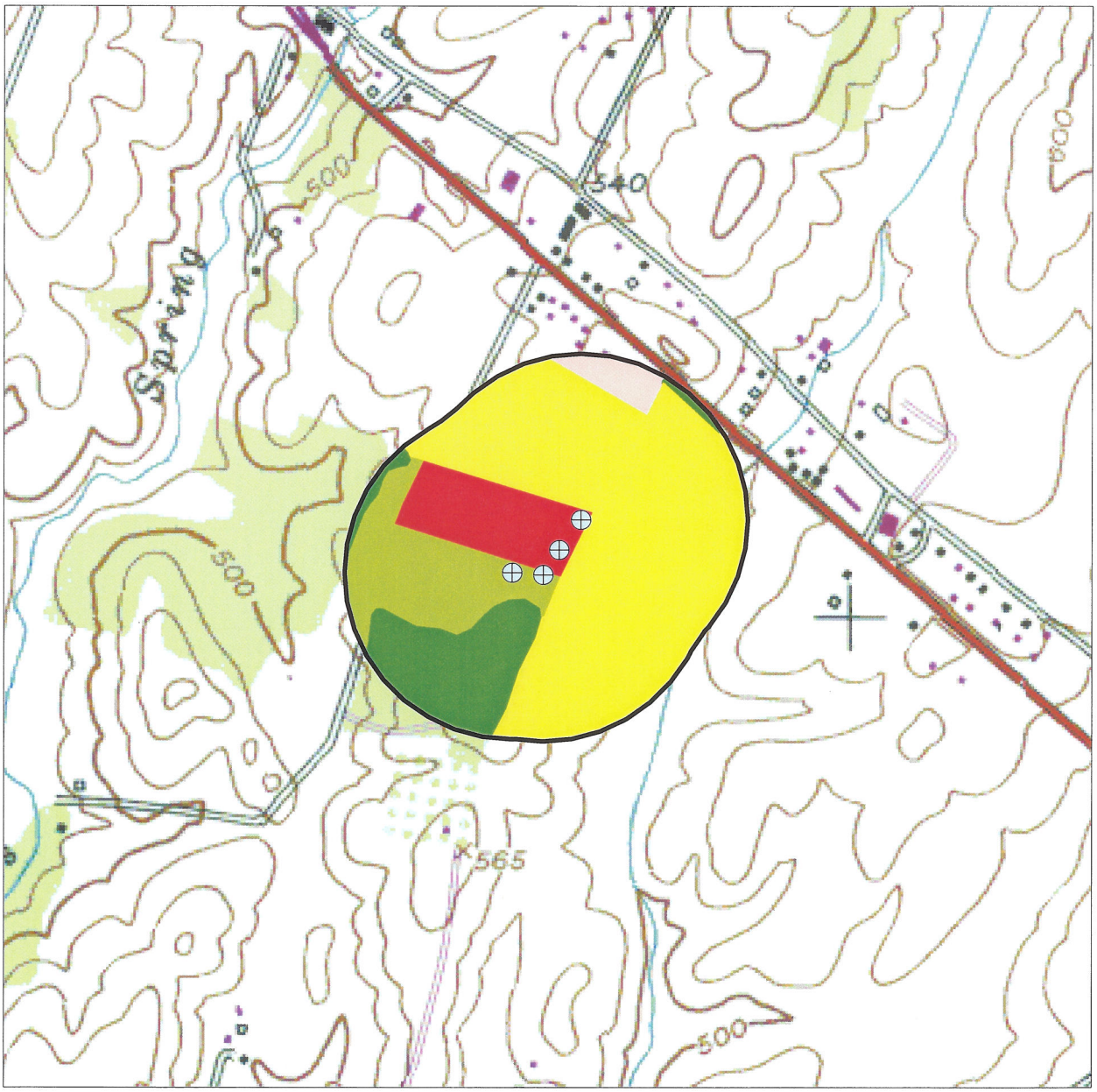

Figure 3. El Rancho MHP Wellhead Protection Area with Land Use

Legend

Washington County 2000 Land Use

- Low Density Residential
- High Density Residential
- Cropland
- Pasture
- Forest

- Wells
- Wellhead Protection Area

N

500 0 500 1000 Feet

Base Map: USGS 7.5' Quadrangle for Funkstown