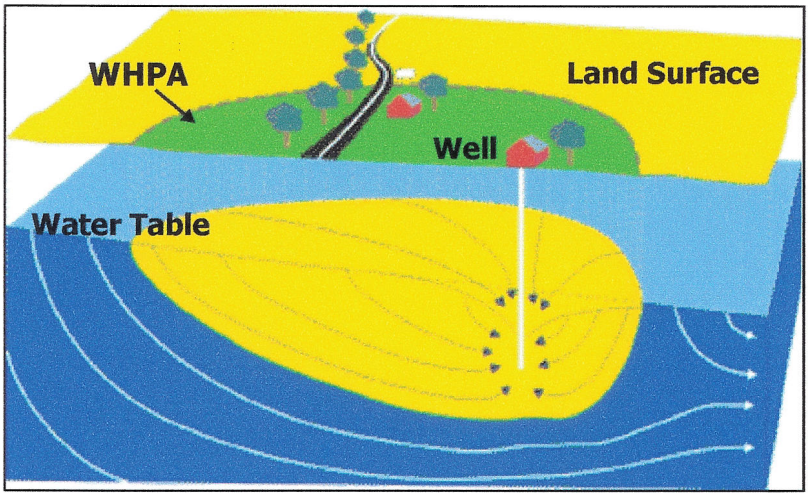
SOURCE WATER ASSESSMENT

FOR THE CITY OF FRUITLAND

WICOMICO COUNTY, MD



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MDE

INTRODUCTION

The City of Fruitland is located approximately 3.5 miles south of Salisbury in Wicomico County. The City's water supply system serves a population of 3511 and has about 1200 connections.

WELL INFORMATION

A review of the well completion reports and field inspection reports indicate that the supply wells meet the State's well construction standards. The water is supplied by two wells (Nos. 1 & 2B) each with an average capacity of 600 gallons per minute (gpm). Table 1 is a summary of the well construction data.

PLANT	SOURCE NAME	PERMIT	TOTAL DEPTH	CASING DEPTH	AQUIFER
1	Well 1	WI-73-3730	70	30	Quaternary System
1	Well 2B (New)	WI-93-0105	95	48	Quaternary System

Table 1. City of Fruitland Well Information

HYDROGEOLOGY

Fruitland's wells draw water from the Quaternary aquifer, also referred to as the Columbia aquifer (Bachman & Wilson, 1979). The Quaternary sediments in Maryland are of fluvial and estuarine origin and are composed predominately of sand and gravel with some layers of silty clay and clay (Setzer et al, 1987). Both wells are screened within these permeable sand and gravel layers. The Quaternary aquifer is unconfined in the Fruitland area and has a thickness of approximately 80 feet. An average transmissivity of 13,400 square feet per day was determined for this aquifer (Boggess & Heidel, 1968). The ground water flow direction is to the east with at a gradient of 0.0005 (Wilson, 1993). Based on the type of geologic material, a porosity of 30% was assumed for this aquifer (Fetter, 1988).

SOURCE WATER ASSESSMENT AREA DELINEATION

The Wellhead Protection Area (WHPA) for ground water systems is considered to be the source water assessment area for the system. According to Maryland's Source

Water Assessment Plan document approved by EPA (MDE, 1999), systems using >10,000 gallons per day (gpd) located in unconfined Coastal Plain aquifers are to be delineated using the EPA's WHPA Code ground water model. WHPAs were originally delineated in 1994 by MDE as part of a Wellhead Protection Plan for the City of Fruitland (MDE, 1994). The pumpage used for the delineations is 500,000 gpd or 66,845 cubic feet per day. This amount is based on the daily average quantity from the current Water Appropriation and Use Permit issued by the MDE Water Rights Division. Since the wells are within 300 feet of each other, the central point between the wells was selected as the pumping center for the modeling.

Delineation Zones **(see Figure 2)**

Zone 1: Zone 1 is the WHPA delineated using a 1-year time-of travel (TOT) criterion. Zone 1 serves as the first zone of protection. The one-year criterion was based on the maximum survival times of microbial organisms in ground water.

Zone 2: Zone 2 is the WHPA delineated using a 10-year TOT criterion. Contaminants that reach the Zone 2 boundary would take 10 years to reach the pumping center (if they move at the same rate as the ground water), using the permitted quantity. Zone 2 provides adequate time for facilities outside the WHPA to address chemical contamination before it reaches the wells.

POTENTIAL SOURCES OF CONTAMINATION

The wells at Fruitland are located just east of the City line adjacent to Morris Mill pond (see Figure 1). The WHPA Zones that stretch out toward Business Route 13 appear relatively free of potential ground water contamination sources (see Figure 2). Based on the Maryland Office of Planning's 1997 Land Use Map, the land use within the WHPA is as follows:

LAND USE	TOTAL AREA (Acres)	PERCENTAGE OF WHPA
Low Density Residential	10.8	6
Medium Density Residential	28.1	15
Commercial	19.8	11
Open Urban Land	8.6	5
Cropland	73.1	40
Pasture	1.3	1
Mixed Forest	41.3	22

Table 2. Land Use Summary for WHPA Zones 1 and 2

The total area within WHPA Zone 2 is 183 acres. The breakdown of land use within the WHPA Zones is shown in Figure 3. Note that the largest percentage of land use within Zone 2 is cropland (40%) followed by forest (22%) and residential land (21%). Based on the original MDE Wellhead Protection report completed in 1994, two past poultry

operations and a cornfield along Cedar Lane were listed in the contamination source inventory. A field survey conducted on December 15, 1999 revealed that the abandoned chicken houses are still present and that the current agricultural land use within the WHPA is consistent with Figure 3. The Land Use map also shows the Water Treatment Plant and adjoining properties as commercial land. However, there are no commercial activities occurring on these properties.

A review of the Maryland Office of Planning 1995 Sewerage Coverage Map combined with the field survey indicates that present and future development within the WHPA will be sewered. Field observation revealed that a new 15.4 acre residential development to the north of the existing supply wells has public sewerage and water service present (see Figure 1). Table 3 shows the approximate breakdown of sewerage coverage within WHPA Zones 1 and 2. A review of Figure 3 indicates that forested and agricultural areas account for more than 96% of the unsewered land within the WHPA.

SEWERAGE COVERAGE	TOTAL AREA (Acres)	PERCENTAGE OF WHPA
No Current Service Area	120.2	66
Existing/Planned Service Area	62.8	34

Table 3. Sewerage Coverage Summary for WHPA Zones 1 & 2

A field inspection of the area within and near the WHPA was conducted to determine the potential of any ground water discharges to the Quaternary aquifer. Review of the MDE Ground Water Discharge Permits database indicate that a discharge permit was issued for the City of Fruitland Water Treatment Plant to discharge an average of 60,000 gallons per week of filter backwash water containing iron via an infiltration basin (see Figure 2). Several commercial facilities located near the WHPA were inspected – 4 construction materials and supply companies, 2 automotive service garages, auto and motorcycle dealerships, a pool chemicals/ cleaning products company, 2 hydraulics companies, trucking and rental companies, a volunteer fire department, Fruitland's Waste Water Treatment Plant, a beer distributor, and a manufacturing company. One Notice of Violation (NOV) was issued to the manufacturing company for an open floor drain. The facility's drain was closed, sealed and re-inspected the next day.

An Underground Storage Tank (UST) located at the Fruitland Water Treatment Plant, identified in the MDE 1994 Wellhead Protection report, was removed with no further concerns. No other registered USTs are located within the WHPA. Along and near Business Route 13, outside the WHPA, there are several commercial establishments and USTs that could potentially impact the wells if Fruitland's pumpage is increased or if new supply wells are drilled to the west of the existing production wells.

A review and consultation with other MDE Waste Management Administration Program files and databases was conducted. There is no record of any ground water contamination sites, solid waste facilities, or hazardous waste sites within or near the WHPA.

On December 15, 1999, MDE personnel completed a field survey of the Fruitland area and interviewed the Director of Utilities, Mr. Joseph Derbyshire, regarding any water quality concerns and potential ground water contamination sources within the WHPA. The primary water quality concern cited by Mr. Derbyshire was high nitrate levels. Table 2 indicates that cropland and pasture makes up 41% of the WHPA.

Iron is a natural constituent of the aquifer and ground water at Fruitland. High iron levels periodically cause iron bacteria problems at the wells. Typically the wells are cleaned annually with an acid treatment that removes iron bacteria.

New and existing development adjacent to the WHPA boundary can also present a risk to the water supply. As shown on Figure 3, previous cropland to the northwest is being converted to commercial development. In addition to introducing the storage of gasoline, the facilities will increase the amount of paved surface in the area. State regulations addressing underground storage tanks and storm water management will help to offset the increased risk from this activity. The field survey also revealed that public sewerage and water service was installed for the current commercial development under construction.

Other non-point sources that could potentially affect water quality are the usage of pesticides and lawn chemicals within the growing residential and existing agricultural areas. Public awareness and community outreach is an important component in reducing the risks of Synthetic Organic Compounds (SOCs) from entering the water supply.

WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database and system files for Safe Drinking Water Act contaminants. The data described is from the finished (treated) water unless otherwise noted. The treatment currently used at Fruitland is disinfection, pH adjustment for corrosion control, greensand filtration for iron removal, and fluoridation.

A review of the monitoring data since 1993 for Fruitland's finished water indicates that the system's water supply meets the drinking water standards. The only contaminant that has been detected above the 50% Maximum Contaminant Level (MCL) since 1993 is nitrate. Table 4 summarizes the nitrate detects above the 50% MCL since 1993.

Inorganic Compounds (IOCs)

CONT. ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	26-Apr-93	5.8
1040	NITRATE	10	16-Sep-93	5.9
1040	NITRATE	10	19-Nov-93	5.4
1040	NITRATE	10	28-Sep-94	5.4
1040	NITRATE	10	08-Nov-94	5.4
1040	NITRATE	10	27-Aug-96	6.2
1040	NITRATE	10	08-Jan-97	5.8
1040	NITRATE	10	08-Jan-97	6.3
1040	NITRATE	10	08-Jan-97	6.2
1040	NITRATE	10	12-Jan-98	5
1040	NITRATE	10	12-Jan-98	5

Table 4. IOC results above 50% MCL for wells 1 & 2B, finished water since 1993

The MCL for nitrate is 10 ppm. There is no discernible increase in the levels detected over the past seven years, and in fact, monitoring data from January 4, 1999 and March 8, 1999 show nitrate values of 4.0, 4.3 and 4.1 ppm respectively.

Typical raw water data for iron ranges from 1 to 3 ppm for wells 1 and 2B. A raw water iron sample taken on 3/8/99 was 4.15 ppm. Iron is a naturally occurring element that is present within the Quaternary sediments in the Fruitland area. Well completion reports verify the presence of iron ore at various depths. There is currently no MCL for iron, as it is considered a secondary constituent. However, iron can cause severe damage to a water system if not properly controlled. Iron bacteria can build up around well screens thereby restricting the water supplies' potential. Taste, color and odor problems in drinking water can also result from excessive iron levels. Fruitland is well aware of these problems and is currently using filtration for iron removal. According to the EPA Drinking Water Regulations, a finished water Secondary Maximum Contaminant Level (SMCL) was established for iron at 0.3 ppm.

Other elements that have been detected periodically in finished water sampling are as follows: Sulfate was detected on 2/6/96 at 5.1 ppm. The SMCL for sulfate is 250 ppm. Barium was detected on 2/8/99 at 0.16 ppm. The MCL for barium is 2 ppm. Sodium was detected on 3/8/99 at 10.4 ppm. There is no MCL or SMCL established for sodium at this time.

Volatile Organic Compounds (VOCs)

No VOC detects have been reported over the past five years of sampling data.

Synthetic Organic Compounds (SOCs)

The sample collected on 2/6/96 was free of pesticides, herbicides, and industrial compounds. The reported 2.28 ppb of a phthalate ester is not believed to represent actual water quality, as this compound was also found in the laboratory blank.

Radionuclides

Gross alpha was not detected. Radon-222 was detected on 8/3/99 at 140 pCi/L. There is currently no MCL for radon-222, however EPA has proposed a MCL of 300 pCi/L or an alternate of 4000 pCi/L. MDE is currently evaluating which MCL to adopt into State regulations.

Microbiological Contaminants

Ground Water Under Direct Influence of Surface Water (GWUDI) sampling was conducted for Well 1 on 2/5/99 and for Well 2B on 2/8/99. All results were negative for the presence of total and fecal coliform.

SUSCEPTIBILITY ANALYSIS

Fruitland's wells draw water from an unconfined aquifer. In general, water supplies in unconfined aquifers are susceptible to contamination from land use activities. Therefore, continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The criteria that was used to conduct the susceptibility analysis is as follows: (1) evaluation of available water quality data, (2) review of the contaminant sources within the WHPA, (3) evaluation of the aquifer characteristics, (4) evaluation of the well integrity, and (5) evaluation of the likelihood of change to the natural conditions.

Inorganic Compounds (IOCs)

The City of Fruitland's water supply is susceptible to nitrate contamination. Nitrate levels have periodically exceeded the 50% MCL threshold since 1993 (Table 4). Sources of nitrate can generally be traced back to land use. Fertilization of agricultural fields and residential lawns, and on-site septic systems are non-point sources of nitrate in ground water. Nitrates present in the water source are more likely related to fertilizers rather than from septic systems because developed land is sewered in this area.

Volatile Organic Compounds (VOCs)

Review of sampling data reported since 1993 indicates that no VOCs have ever been detected at Fruitland. However, as mentioned earlier, a number of UST sites exist outside WHPA Zone 2 along the commercial strip of Business Route 13. Also, the new commercial development currently under construction to the northwest of the existing production wells just outside of Zone 2 plans to install additional USTs (see Figure 3). With the increase in residential and commercial development in the Fruitland area evidenced during the site visit, increased water demands at the Water Treatment Plant will undoubtedly occur. An increase in

pumpage will also increase the WHPA Zone boundaries west toward Business Rt. 13. This may result in the system becoming susceptible to VOCs. Currently, Fruitland's water supply is **not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

The current land use indicates that non-point sources exist within the WHPA that could potentially contaminate the water supply with SOCs. Pesticides and chemicals used in agricultural operations and residential lawns are a potential threat. The wells at Fruitland draw from an unconfined aquifer in the Coastal Plain. Based on data since 1993, no SOC detects related to water quality have been reported for Fruitland. A review of the well logs for Wells 1 and 2B indicates that thin clay layers are present in the upper sections of the aquifer. The clay layers may inhibit the infiltration of SOCs from entering the water supply. Based on the limited data available, Fruitland's water supply is **not** susceptible to SOC contamination.

Radionuclides

No gross alpha radiation was detected in water samples at Fruitland. Radon-222 was detected for Fruitland's water supply on 8/3/99 (see Water Quality Section). However, this result is less than 50% of the more conservative MCL proposed by the USEPA. The source of radon in ground water can be traced back to the natural occurrence of uranium in rocks. Based on existing sampling data, Fruitland's water supply is **not** susceptible to radiological contaminants.

Microbiological Contaminants

The WHPA indicates that Morris Mill Pond is within the one-year time-of-travel Zone (see Figure 2). This indicates the potential for microorganisms found in surface waters to migrate toward the wells. Based on coliform sampling data, the wells were determined **not** to be susceptible to protozoans or bacteriological contaminants. The wells may be susceptible to viral contaminants, as these are much smaller, can survive longer, and may not be as effectively filtered by the aquifer as protozoans and bacteria. Future monitoring will be needed to determine susceptibility to viruses.

MANAGEMENT OF THE WHPA

Form a Local Planning Team

- Teams should represent all of the interests in the community. The water supplier, elected officials, the County Health Department, local planning agencies, local businesses, developers, farmers and residents within and near the WHPA should work together to reach a consensus on how to protect the water supply.

Public Awareness and Outreach

- The City of Fruitland has already taken some positive steps to protect their water supply. After the original Wellhead Protection Study was completed, the City

notified all its water customers about the study and placed signs at the WHPA boundaries.

- Pamphlets, flyers and bill stuffers sent to local residents, businesses, and farmers will help to educate the general public about Wellhead Protection. An MDE pamphlet entitled Gardening in a Wellhead Protection Area is such an example.

Aquifer Protection

- It is important that the City continue protecting its current water supply source (the Quaternary aquifer) from contamination. Raw water quality testing of the deeper Manokin aquifer in the Fruitland area showed high levels of iron that would require expensive treatment to use this source as a potable water supply.

Monitoring

- Installation of monitoring wells at UST sites not regulated by MDE may be considered to ensure that VOC contamination does not migrate to the supply wells.
- Cropland currently makes up 40% of the land use within the WHPA. It is recommended that the City monitor the nitrate values closely and resume sampling for nitrates annually.
- Continue to monitor for all Safe Drinking Water Act Contaminants as required by MDE.
- Annual sampling for microbiological contaminants is a good check on well integrity.

Planning / New Development

- Adopt a local land use ordinance in cooperation with Wicomico County to protect future water quality. The State of Maryland Wellhead Protection Ordinance may be used as a template.
- Planners should address future land use and recharge preservation with consideration to Wellhead Protection.
- Continuing to stress the importance of a Comprehensive Water and Sewer plan to ensure that new residential development in the WHPA is sewered. Serving future development within the WHPA by a community sewerage system will protect the quality of the City's water supply from excessive nitrates.

Land Acquisition

- The availability of loans for purchasing land or easements for the purpose of protecting a designated WHPA is available from MDE. Loans are offered at zero percent interest and zero points.

Contingency Plan

- COMAR 26.04.01.22 regulations require all community water systems to prepare and submit for approval a plan for providing a safe and adequate drinking water supply under emergency conditions.

Changes in Uses

- Any increase in pumpage at the Water Treatment Plant or the addition of new wells will require revision of the WHPA since it is affected by pumpage. The City is required to contact the MDE Water Supply Program when an increase in pumpage is applied for and when proposed new wells are being considered.

Contaminant Source Inventory Updates / Well Inspections

- The City should conduct its own detailed survey to ensure that there are no other potential sources of contamination within the WHPA. Updated records of new development within the WHPA should be maintained.
- The City should have a regular inspection and maintenance program for the supply wells to ensure their integrity and to protect the aquifer from surficial contamination.