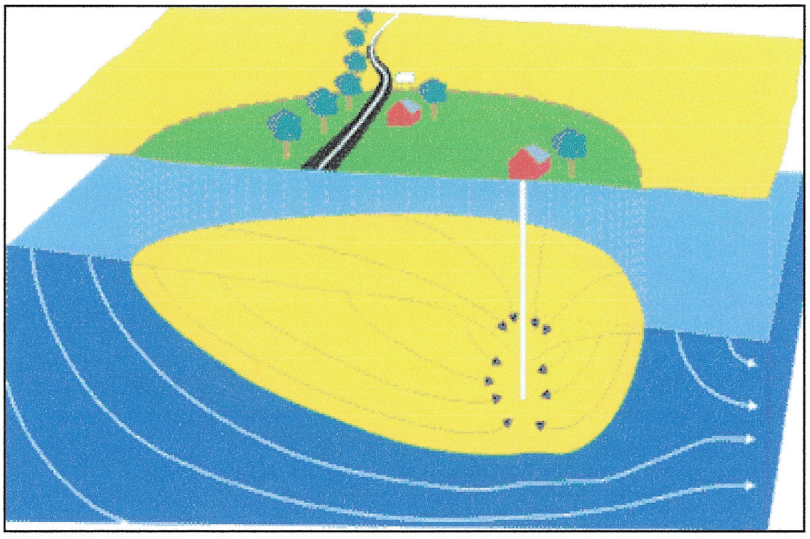
SOURCE WATER ASSESSMENT
for
THE TOWN OF UNION BRIDGE

CARROLL COUNTY, MD



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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the Town of Union Bridge. The required components of this report as described in Maryland's Source Water Assessment Plan (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 source of Union Bridge's water supply is an unconfined fractured rock aquifer, known as the Wakefield Marble. The system currently uses two wells to obtain its drinking water with a third well soon to come on line. The Source Water Assessment Area was delineated by the Carroll County Bureau of Water Resources Management using U.S. EPA approved methods specifically designed for each source.

Potential sources of contamination within the assessment area were identified based on site visits, database reviews and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and potential contaminant sources within the Source Water Assessment Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for Union Bridge's water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well and spring integrity. It was determined that all of Union Bridge's water supply sources are susceptible to contamination by nitrates and to protozoans like *Cyrptosporidia* and *Giardia.* The water supply is not susceptible to organic compounds, radionuclides or other inorganic compounds. The report provides recommendations for improving the safety of its supply. A key recommendation is for the Town to adopt an ordinance consistent with Carroll County's Water Resource Management Ordinance for the future protection of its water supply.

INTRODUCTION

The Town of Union Bridge is located about 8 miles west of Westminster in Carroll County (figure 1). The Town owns and operates its water supply system that serves a population of about 960 persons and has 300 connections. Currently, the water is supplied by two wells (Town Hall, and Whyte St.). The raw water from both these wells is treated at a new water treatment plant that came on line in August 2004. Both these wells were determined to be ground water under the influence of surface water (GWUDI) and required filtration of the raw water. As a result a new plant was constructed to install filtration treatment and came on line in August 2004. Another well (Phillips Lane) was also determined to be GWUDI and a treatment plant with a filtration unit is currently being completed to treat the raw water from this well. A new residential development located northwest of the Town is being planned and a new well has been drilled and tested for water supply to this project. At present, the water appropriation permit has not been issued as water balance criteria have not been met. We have been informed that the Town plans to annex the property and add the new well to its water system. This source water assessment does not include this new well.

SOURCE INFORMATION

Source information was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary surveys, and inspection reports and published reports. A review of well data and sanitary surveys of Union Bridge's water system indicates that the Whyte St. and Phillips Lane wells were drilled after 1973 when the State's well construction regulations went into effect and should meet construction standards for grouting and casing. The Whyte St. well has rubber packers set between 180 to 185 feet to seal off shallow turbid ground water leaking under the outer 8-inch casing that was observed during drilling. The Town Hall Well was drilled in 1913 and does not meet current well standards. A detailed inspection of the well casing using a TV camera revealed a hole in the casing that is likely a significant source of the fecal contamination in the well's raw water supply. MDE has mandated that the Town bring the well to current standards. The Town plans to rehabilitate the well once the Phillips Lane Well comes on line. A test well is present near the Phillips Lane Well. In addition a monitoring well was observed next the Phillips Lane Well. It is recommended that is these wells are not part of a monitoring plan that they should be abandoned and sealed to prevent surface contamination of the aquifer. Table 1 shows the well information for Union Bridge's water supply.

Union Bridge has a Water Appropriation Permit (WAP) that allows the Town to use an average of 166,000 gallons per day (gpd) and 200,000 gpd

during the month of maximum use from the Town Hall and Whyte St. Wells. In addition, it has a WAP for an average of 42,000 gpd and 82,200 gpd during the month of maximum use from the Phillips Lane.

PLANT ID	SOURCE ID	SOURCE NAME	PERMIT NO	TOTAL DEPTH (ft)	CASING DEPTH (ft)	YEAR DRILLED
04	01	Town Hall Well	N/A	170	111	1913
02	02	Phillips Lane Well	CL930124	375	100	1995
04	03	Whyte St. Well	CL940608	1025	132	1997
00	04	Test Well	CL88063	242	20	1989

Table 1. Union Bridge Well Information.

HYDROGEOLOGY

The Union Bridge area lies in the Piedmont physiographic province and is located on the northwestern edge of the Piedmont Upland portion of Carroll County. The confluence of Little Pipe Creek, Sam's Creek, Haines Branch, and Cherry Branch are located in this area (R. E. Wright, 1988). The Union Bridge area is overlain by the Wakefield Marble and the Sam's Creek Metabasalt. Union Bridge's wells are pumping water from then the Wakefield Marble. The Wakefield Marble is an unconfined fractured rock carbonate aquifer.

The Wakefield Marble is a closely folded white finely crystalline marble consisting of calcite or dolomite, with few impurities (Meyer and Beall, 1958). Near its contact with the overlying volcanic rocks, like Sam's Metabasalt, it is white or blue mottled with pink and green. It thickness in the vicinity of Union Bridge is estimated to be 150 feet. Carbonate rocks form the most productive and environmentally sensitive aquifers in Carroll County (R.E. Wright, 1988). The carbonate minerals in this aquifer are readily soluble in ground water, and joints and fractures are may be greatly enlarged to form cavities. Solution channels are generally controlled by fracture, fault and joint discontinuities in the rock, and may occur to depths greater than 400 feet blow the ground surface. The aquifer is recharged through infiltration of precipitation. Ground water storage occurs primarily in the more permeable overburden and weathered bedrock zones and is supplied to wells through the secondary porosity features of the bedrock like solution cavities, fractures and joints.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. Union Bridge's wells were determined to be GWUDI based on the presence of total and fecal coliform in the raw water. For fractured-rock carbonate aquifers the

Maryland's Source Water Assessment Plan (SWAP) recommends delineating the watershed drainage area that contributes to the wells and modifying this area by geological boundaries, ground water divides and annual average recharge needed to supply the well. In addition, for those wells determined to be GWUDI, locating and mapping sinkholes, and conducting a dye trace study will help define the assessment area for the supply well. In February 1996, MDE informed the Town of Union Bridge that the Town Well was determined to be GWUDI (letter attached at back of report). Prior to that in late 1995, MDE initiated a dye study (Steinfort et al, 1995) to determine whether, there was a hydraulic connection between the Town Hall Well and either of the two major streams that run through and adjacent to the Town. Dye was placed in both Sam's Creek and Little Pike Creek under low flow conditions. After monitoring the well supply for three weeks no dye was detected in the well. Dye was later injected into the Town's sewer collection system through several manholes. Again no dye was found in the Town Hall Well after a long period of testing. No open sinkholes in the well recharge area could be located for possible dye injection points. Based on the dye study results, there does not appear to be any hydraulic connection between the two streams and the Town Hall Well.

The WHPA for Union Bridge's water supply was delineated by the Carroll County Bureau of Water Resource Management as part of the County Water Resources Ordinance development (R. E. Wright, 1989). The WHPAs are based on the watershed drainage area in which the wells are located. The delineated WHPA represents the area which contributes ground water to the wells. These areas are based on "capture areas" as estimated from available field testing data, hydrologic flow systems, and ground water availability estimates, in combination with the hydrogeological characteristics of the aquifer (R. E. Wright, 1989). The total area of the Union Bridge WHPA is 1,338 acres and is about three times larger than the recharge area needed during a drought.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point of non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, ground water discharge permits, large scale feeding operations and CERCLA (Superfund) sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as the 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 and Carroll County contaminant databases as well as the field survey revealed several potential point sources of contamination in the WHPA. Figure 2 identifies Underground Storage Tanks (UST) sites, Automobile Services and Sale Centers (AUTO), a CERCLA site, a Pesticide Dealer (PD), and Dischargers (DISCH) to surface water as potential point sources of contamination. A fact sheet of the CERCLA site is attached at the end of the report. The fact sheet indicates that regulatory levels of any contaminants were not observed at the site and that no further remedial action is needed. Table 2 lists the facilities identified and their potential types of contaminants. The contaminants are based on generalized categories and often the potential contaminant depends on the specific chemicals and processes being used or which had been used at the facility. The potential contaminants are not limited to those listed. Potential contaminants are grouped as Volatile Organic Compounds (VOC) and Heavy Metals (HM), Microbial Pathogens (MP).

ID	Type	Site Name	Location	Potential Contaminant	Status
1	UST*	Union Bridge Service Ctr	47 N. Main St	VOC	5 tanks
2	UST	7-Elevne #28956	120 N. Main St	VOC	2tanks
3	UST	Kilfadda Farm	536 Green Valley Rd	VOC	1 tank
4	UST	Southern States	E. Elger St	SOC	
5	AUTO	B&F Auto& Light Truck Service	3 Whyte St	VOC, HM	
6	DISCH	Town of Union Bridge	Little Pipe Creek	MP	Wastewater Treatment Plant
7	AUTO*	Steele's Sales and Service	122 S. Main St	VOC, HM	
8	UST	Lehigh Portland Cement Co	117 S. Main St	VOC	1 Tank
9	DISCH	Lehigh Portland Cement Co	Sam's Creek	PH, turbiditiy	
10	UST	Lehigh Portland Cement Co	117 S. Main St	VOC, SOC, HM	No Further Action

Table 2. Potential Contaminant Point Sources within the Union Bridge WHPA (see fig. 2 for locations).

Non-Point Sources

The Maryland Department of Planning's 2002 digital land use map for Carroll County was used to determine the predominant types of land use in the WHPA (figure 3). Agricultural land (cropland, pasture and feeding operations) makes up the largest portion of the WHPA (71%) followed by by residential land (13%) and forested land (7%).. The land use categories in the WHPA are listed in table 3 below.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	30.02	2.2
Medium Density Residential	141.93	10.6
High Density Residential	6.49	0.5
Commercial/Institutional	39.31	2.9
Cropland	852.95	63.8
Pasture	83.90	6.3
Forest	94.77	7.1
Feeding Operations	12.31	0.9
Total	1337.90	100.00

Table 3. Land Use Summary for the Union Bridge WHPA.

Agricultural land is commonly associated with nitrate loading of ground water. Cropland also represents a potential source of SOCs depending on the use of herbicides and pesticides. In addition, pasture and feeding operations may be potential sources of microbiological pathogens due to animal wastes. Residential areas may be a source of nitrates and SOCs if fertilizers and pesticides are not used carefully for lawns and gardens. Commercial areas are associated with facilities that may have point sources of contamination as described earlier.

The Maryland Department of Planning's 2002 Carroll County Sewer Map, shows that 26.5% of the Union Bridge WHPA is not planned for sewer service, with 36% slated for priority service (figure 4). Table 4 summarizes the sewer service categories in the WHPA. Categories showing future services (within 2 to 6 years) may now have service, since the map is based on 1995 data.

SEWER SEVICE AREA	TOTAL AREA (acres)	PERCENTAGE OF WHPA
No Planned Service	354.13	26.5
Existing Service	262.48	19.6
Priority Service (0-6 years)	486.66	36.4
Future Service (7- 10 years)	234.63	17.5
Total	1,337.90	100

Table 4. Sewer Service Area Summary for the Union Bridge WHPA.

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 State's SWAP defines a threshold for reporting water quality data as 50% of the Maximum Contaminant Level (MCL). If a monitoring result is at or greater than 50% of a MCL, this assessment will describe the sources of such a

contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. All data reported is from the finished (treated) water unless otherwise noted. The Union Bridge water system currently is using one treatment plant (04) for the Town Hall and Whyte St. Wells. Prior to August 2004 raw water from the Town Hall Well was treated at the original plant (01) and the Whyte St. Well was not in service. As mentioned earlier the Phillips Lane Well is not on line yet and is awaiting completion of a new plant (02) for its water treatment. The water treatment at this active plant includes, chlorination for disinfection, ion exchange for nitrate removal and pressure sand filtration for treating surface water.

A review of the monitoring data since 1993 for Union Bridge's water supply indicates that it currently meets the drinking water standards for chemical constituents. The water quality sampling results are summarized in Table 5. Please note Plant 1 represents water quality for the Town Hall Well, plant 2- Phillips Lane Well, plant 3- Whyte St. Well, and plant 4- Town Hall and Whyte St. Wells combined.

	Nitrate		SOCs		VOCs		IOCs (except nitrate)		Radionuclides	
PLANT ID	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL	No. of Samples Collected	No. of samples > 50% MCL
01	72	72	13	1*	13	0	6	0	4	0
02	9	9	1	0	1	0	1	0	3	1
03	1	1	0	0	0	0	1	0	1	0
04	4	1	2	0	6	0	1	0	1	0

Table 5. Summary of Water Quality Samples for Union Bridge's Water Supply

- *found in laboratory blank

Inorganic Compounds (IOCs)

Nitrate has been detected above 50% of the MCL in all the three wells. The MCL for nitrate is 10 ppm. The nitrate detections above 50% of the MCL in Union Bridge's water supply are shown in table 6 and levels above the MCL are shown in bold print.

PLANT ID	SAMPLE DATE	RESULT (ppm)
01	11-FEB-93	9.8
01	19-MAY-93	11.7
01	12-AUG-93	7.73
01	09-NOV-93	8.1
01	10-JAN-94	10.3
01	26-FEB-94	9.9
01	18-APR-94	10.5
01	16-MAY-94	11.7
01	13-SEP-94	9.37
01	02-NOV-94	8.1
01	14-DEC-94	8.89
01	21-DEC-94	8.4
01	30-JAN-95	8.9
01	13-FEB-95	9.2
01	27-FEB-95	8.5
01	26-APR-95	8
01	15-MAY-95	7.9
01	11-JUN-95	6.9
01	20-JUN-95	6.7
01	08-AUG-95	6.8
01	12-SEP-95	7.2
01	03-OCT-95	6.1
01	07-NOV-95	6.3
01	11-JAN-96	6.5
01	07-MAY-96	7.2
01	10-DEC-96	7.5
01	25-MAR-97	6.3
01	17-JUN-97	8.2
01	02-DEC-97	8.7
01	05-MAY-98	7.5
01	23-JUN-98	7.3
01	04-AUG-98	9.8
01	29-SEP-98	8.9
01	08-DEC-98	7
01	08-DEC-98	7
01	30-MAR-99	8
01	20-SEP-99	9.26
01	22-OCT-99	10
01	28-JAN-00	7.11
01	06-JUN-00	8.1
01	09-JUN-00	8.4
01	05-JUL-00	9.6
01	05-JUL-00	9.6
01	05-OCT-00	9.06
01	07-DEC-00	7.7
01	10-JAN-01	8.53
01	10-JAN-01	8.53
01	18-APR-01	8.72
01	18-APR-01	8.72
01	04-MAY-01	9.96
01	04-MAY-01	9.96
01	09-JUL-01	9.1
01	18-OCT-01	9.62
01	18-OCT-01	9.62
01	24-JAN-02	8.52
01	24-JAN-02	8.52
01	17-APR-02	8.96
01	26-JUL-02	9.81
01	09-OCT-02	9.96
01	13-JAN-03	9.06
01	01-APR-03	9.8
01	16-JUL-03	8.06
01	17-OCT-03	8.87
01	17-OCT-03	8.87
01	05-JAN-04	9.21
01	05-JAN-04	9.21
01	05-APR-04	9.19
01	05-APR-04	9.19
01	26-JUL-04	8.51
02	15-JUN-95	8.2
02	11-SEP-96	8.5
02	16-OCT-96	9.5
02	15-NOV-96	8.8
02	18-DEC-96	6.8
02	19-FEB-97	8.8
02	27-MAR-97	9.4
02	16-MAY-97	9.5
02	29-DEC-00	8.46
03	16-JAN-01	7.9
04	20-JAN-05	7.52

Table 6. Nitrate levels above 50% of the MCL in Union Bridge's Water Supply

Volatile Organic Compounds (VOCs)

No VOCs have been detected above 50% of a MCL. Trihalomethanes (THMS) have been detected in the water supply. THMS are disinfection by-products formed due to the reaction between chlorine used for disinfection and organic matter in the raw water. The THMS were found at levels well below the MCL of 80 ppb for the total of the THMS. Methyl-tert-butyl ether (MTBE) was detected at 3.2 ppb in the latest round of sampling conducted on January 18, 2005. MTBE does not currently have an MCL but has a secondary standard of 20 ppb based on taste and odor problems. MTBE is used as an oxygenate to burn gasoline more efficiently to reduce smog.

Synthetic Organic Compounds (SOCs)

The only SOC detected at or above 50% of the MCL was di (2-ethylhexyl) phthalate. A review of the SOC results indicated that the phthalate was also found in the laboratory blank on the same day. Therefore these results are not interpreted to represent actual water quality. Very low levels of simazine, atrazine and metolachlor were detected one time in the water supply for the Town Hall. Simazine and atrazine are herbicides and metolachlor is a byproduct of alochlor which is also an herbicide.

Radionuclides

Radium –226 was the only radionuclide detected above 50% of an MCL. A sample collected from the Phillips Lane Well on June 15, 1995 measured 2.8 picoCuries/Liter (pCi/L). The MCL for radium-226 is 5 (pCi/l). Gross alpha and gross beta also have been detected, but at levels well below 50% of the MCL. Radon-222 was detected at levels between 10 and 85 pCi/L in the three wells. At present there is no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L and an alternate MCL 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

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Microbiological Contaminants

Raw water samples were collected and tested for bacteria from all the wells to determine whether these sources are ground water under the influence of surface water (GWUDI). Based on the presence of total and fecal coliform in the raw water it was determined that all the Town Hall, Whyte St. and Phillips Lane Wells are all GWUDI. The Phillips Lane Well did not appear to be GWUDI when it was tested in 1995. But retesting in 2003 showed presence of total and fecal coliform in the raw water samples. It is possible that new sinkholes may have opened up in the vicinity of the well resulting in fecal contamination of the well. The results of the bacteriological tests are shown in Table 7. Negative values in this table indicate absence of any coliform in the sample.

SOURCE NAME	RAIN DATE	RAIN AMOUNT (INCHES)	REMARK	SAMPLE DATE	TOTAL COLIFORM (MPN/100)	FECAL COLIFORM (MPN/100)
TOWN HALL WELL	14-MAY-95	.9	WET SET 1	15-MAY-95	500	500
TOWN HALL WELL	14-MAY-95	.9	WET SET 1	16-MAY-95	500	500
TOWN HALL WELL	14-MAY-95	.9	WET SET 1	17-MAY-95	500	500
TOWN HALL WELL	14-MAY-95	.9	WET SET 1	18-MAY-95	-1	-1
TOWN HALL WELL	25-MAY-95	0	DRY	25-MAY-95	170	8
TOWN HALL WELL	30-MAY-95	.5	WET SET 2	31-MAY-95	110	13
TOWN HALL WELL	30-MAY-95	.5	WET SET 2	01-JUN-95	80	2
TOWN HALL WELL	30-MAY-95	.5	WET SET 2	02-JUN-95	80	8
TOWN HALL WELL	30-MAY-95	.5	WET SET 2	03-JUN-95	900	8
TOWN HALL WELL	31-OCT-95		SAME DAY S	31-OCT-95	33	13
TOWN HALL WELL	31-OCT-95		SAME DAY S	31-OCT-95	33	-1.8
TOWN HALL WELL	31-OCT-95		SAME DAY S	31-OCT-95	130	6.8
TOWN HALL WELL	31-OCT-95		SAME DAY S	31-OCT-95	110	17
TOWN HALL WELL	02-NOV-95		SAME DAY S	02-NOV-95	49	4.5
TOWN HALL WELL	02-NOV-95		SAME DAY S	02-NOV-95	49	33
TOWN HALL WELL	02-NOV-95		SAME DAY S	02-NOV-95	23	13
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	05-JUN-95	4	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	06-JUN-95	1	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	07-JUN-95	48	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	08-JUN-95	0	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	09-JUN-95	0	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	12-JUN-95	1	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	13-JUN-95	0	0
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	14-JUN-95	-1.1	-1.1
PHILLIPS LANE WELL	05-JUN-95		PUMP TEST	15-JUN-95	1.1	-1.1
PHILLIPS LANE WELL	12-DEC-03	0.75	WET SET 1	12-DEC-03	>200.5	59.1
PHILLIPS LANE WELL	12-DEC-03	0.75	WET SET 1	13-DEC-03	>2419.6	20.9
PHILLIPS LANE WELL	12-DEC-03	0.75	WET SET 1	14-DEC-03	>2419.6	11
PHILLIPS LANE WELL	12-DEC-03	0.75	WET SET 1	15-DEC-03	1732.9	6.3
WHYTE ST WELL	22-JUL-97		PUMP TEST	22-JUL-97	50	-2
WHYTE ST WELL	22-JUL-97		PUMP TEST	22-JUL-97	50	-2
WHYTE ST WELL	22-JUL-97		PUMP TEST	22-JUL-97	23	-2
WHYTE ST WELL	16-OCT-97		PUMP TEST	16-OCT-97	4	2
WHYTE ST WELL	13-NOV-97	.6	PUMP TEST	17-NOV-97	-2	-2
WHYTE ST WELL	13-NOV-97	.6	PUMP TEST	18-NOV-97	8	2
WHYTE ST WELL	13-NOV-97	.6	PUMP TEST	19-NOV-97	-2	-2
WHYTE ST WELL	13-NOV-97	.6	PUMP TEST	20-NOV-97	80	-2
WHYTE ST WELL	15-DEC-97	0	PUMP TEST	15-DEC-97	-2	-2
WHYTE ST WELL	12-MAR-01	.79	WET SET	13-MAR-01	4.2	3.1
WHYTE ST WELL	12-MAR-01	.79	WET SET	14-MAR-01	8.7	6.4
WHYTE ST WELL	12-MAR-01	.79	WET SET	15-MAR-01	6.4	5.3
WHYTE ST WELL	12-MAR-01	.79	WET SET	16-MAR-01	15	9.9

Table 7. Raw water bacteriological test results for Union Bridge's Wells.

SUSCEPTIBILITY ANALYSIS

Union Bridge's wells obtain water from an unconfined fractured-rock carbonate aquifer. Wells in unconfined aquifers are generally vulnerable to contaminants present on the land surface that occurs within a WHPA. In addition areas underlain by carbonate aquifers are susceptible to surface water contamination due to development of sinkholes, and solution channels in the bedrock. Therefore, managing this area to minimize the risk to the supply and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The susceptibility of the wells to contamination is determined for each group of contaminants based on the following criteria: (1) available water quality data, (2) presence of potential contaminant sources in the WHPA, (3) aquifer characteristics, (4) well integrity, and (5) the likelihood of change to the natural conditions. Table 7 summarizes the susceptibility of Union Bridge's water supply to each of the groups of contaminants

Inorganic Compounds (IOCs)

Nitrate has been detected in all of Union Bridge's wells above 50% of the MCL. Sources of nitrate can generally be traced to land use. Fertilization of cropland and residential properties are non-point sources in ground water. Onsite septic systems are also sources of nitrate in ground water. A large portion of the WHPA is agricultural land which includes dairy farms where animal wastes are generated and spread on cropland for fertilizer. It is believed that high nitrate levels in the ground water are primarily from agricultural sources. The Town has addressed the nitrate issue by installing nitrate removal treatment in the new plant. Nitrate removal treatment is also being installed in the Phillips Lane treatment plant. Nitrate levels in the finished water for the Town Hall and Whyte St. Wells have dropped below 50% of the MCL since August 2004 when the new plant came on line, except for one time in January 2005.

Based on the above analysis, Union Bridge's water supply **is** susceptible to nitrate, but **not** to other inorganic compounds.

Volatile Organic Compounds (VOCs)

No VOCs above 50% of the MCL have been detected in Union Bridge's water supply. There are several potential sources of VOCs in the WHPA and currently there are no active ground water contamination cases in the area. Very low levels of MTBE were detected for the first time in the last VOC sampling conducted in January 2005. While the potential for VOC contamination is present the location of the underground storage tanks are not directly upgradient of the supply wells.

Based on the above analysis, Union Bridge's water supply **is currently not** susceptible to contamination by VOCs.

Synthetic Organic Compounds (SOCs)

The only SOC detected above 50% of the MCL in Union Bridge's water supply was phthlate, which was also found in the laboratory blank. Cropland and residential land make up a large portion of the Union Bridge WHPA (table 3) and improper application of pesticides for crop production or landscaping can be potential non point sources of SOC contamination. Sampling data has shown one time detections of simazine, atrazine and metolachlor at levels well below 50% of the MCL. Apparently the use of these compounds has not had significant impacts on ground water quality due to the ability of the native soils to adsorb and breakdown such compounds.

Based on the above analysis Union Bridge's water supply **is not** susceptible to contamination by SOCs.

Radionuclides

Radium-226 was the only radionuclide detected above 50% of an MCL. This occurred in sampling for the Phillips Lane Well's water supply. Gross alpha and gross beta and radon-222 have been detected at low levels in Union Bridge's water supply. The source of these radionuclides can be traced to the natural occurrence of uranium and thorium in the bedrock.

Based on the above analysis, Union Bridge's water supply **is** currently not **susceptible** to radionuclides, but may be susceptible to radium when the Phillips Lane water treatment plant comes on line.

Microbiological Contaminants

Based on raw water bacteriological data (table 10) the Town's three wells (Town Hall, Whyte St. and Phillips Lane) were determined to be GWUDI. Union Bridge's water supply **is** susceptible microbiological contaminant present at the surface including *Giardia* and *Cryptosporidium.*

CONTAMINANT TYPE	Are Contaminant Sources present in the WHPA?	Are Contaminants detected in WQ samples at 50% of the MCL?	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible to the Contaminant?
Nitrate	YES	YES	YES*	YES	YES
Inorganic Compounds (except nitrate)	NO	NO	YES*	YES	NO
Volatile Organic Compounds	YES	NO	YES*	YES	NO
Synthetic Organic Compounds	YES	NO	YES*	YES	NO
Radionuclides	NO	NO	NO	YES	NO
Radium (Phillips Lane Well only)	YES**	YES	NO	YES	YES
Microbiological Contaminants	YES	YES	YES*	YES	YES

Table 7. Susceptibility Chart for Union Bridge's Water Supply
*Town Hall Well Only
** Naturally occurring

MANAGEMENT OF THE WHPA

Carroll County has adopted a Water Resources Management Ordinance that governs all the wellhead protection area outside of the Town limits. The Town should continue to work with the County to develop a coordinated approach on stormwater management review as this is particularly important for carbonate rock areas. In particular, the Town is encouraged to adopt a local ordinance for the protection of its water supply consistent with the Water Resource Management Ordinance adopted by Carroll County. Other recommendations for reducing contaminant risk are outlined below:.

Public Awareness and Outreach

- The Consumer Confidence Report should include a summary of this report and information that this report is available to the general public through their county library, or by contacting the Town or MDE.
- Conduct educational outreach to facilities that may present potential contaminant sources. Important topics include: (a) compliance with MDE and federal guidelines for USTs, (b) best management practices, (c) chemical storage and (d) appropriate use and application of fertilizers and pesticides.

- Placing signs at the WHPA boundaries is a good way to make the public aware of protecting their source of water supply. The County has placed signs at WHPA boundaries along county roads.

Cooperative Efforts with Other Agencies

- Farmers can participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within the WHPA. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the area. The Natural Resources Conservation Service is responsible for determining the relative environmental benefits of each acre offered for participation.

Contaminant Source Inventory/Well Construction

- The Town should rehabilitate the Town Hall Well to meet current well standards to reduce surface water contamination. This well repair is long overdue.
- Wells that are not planned for use or monitoring should be abandoned and sealed according to State well construction standards.
- The Town should review the potential sources of contaminants within the WHPA and update them if necessary, including a consideration of historical uses

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Carefully monitor MTBE sampling results to determine whether there is an increase in levels.

Land Acquisition/Easements

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

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 Use

Any increase in pumpage or addition of new wells to the system may require revision of the WHPA. The system is required to contact the Water Supply Program when an increase pumpage is applied for or when new wells are being considered.

REFERENCES

Bolton, David 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 p.

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

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

Nutter, L. J., and Otton, E. G., 1969, Ground-Water Occurrence in the Maryland Piedmont: Maryland Geological Survey Report of Investigations No. 10, 56p.

R. E. Wright Associates, Inc., 1988, Phase II Report Carroll County Water Resources Study Volumes I and II.

R. E. Wright Associates, Inc., 1989, Recommended Water Resource Management Standards, Criteria, and Administrative Procedures.

Seinfort, J.F., Kamens, T., and Hennessey, M.L., 1995, An Investigation of Surface Water Influence upon the Municipal Well of Union Bridge, Employing Fluorometric Methods and Other Investigative Techniques, Maryland Department of the Environment, 10p.

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

OTHER SOURCES OF DATA

Water Appropriation and Use Permits: CL1979G048, CL1979G148,
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Carroll County WHP Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles: Union Bridge
USGS Topographic 7.5 Minute Union Bridge Quadrangle
Maryland Department of Planning 2002 Carroll County Land Use Map
Maryland Department of Planning 2002 Carroll County Sewer Map

FIGURES

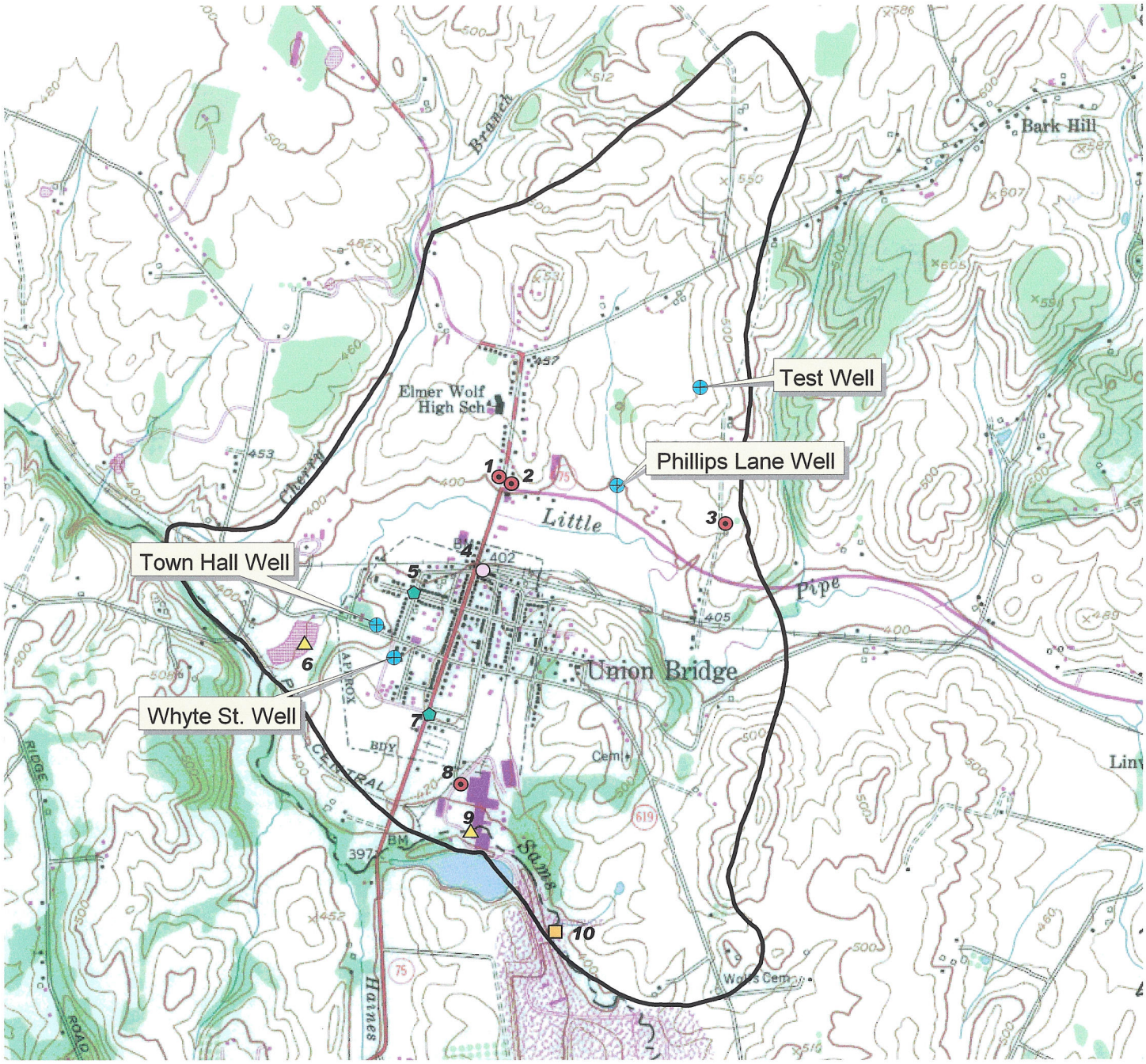

Figure 2. Union Bridge Wellhead Protection Area with Potential Contaminant Sources

LEGEND

- Underground Storage Tank
- Surface Discharge
- Business- Auto
- Supply Well
- CERCLA Site
- Wellhead Protection Area
- Pesticide Dealer

1000 0 1000 2000 Feet

N

Base Map: USGS 7.5 minute Topographic Quadrangle - Union Bridge

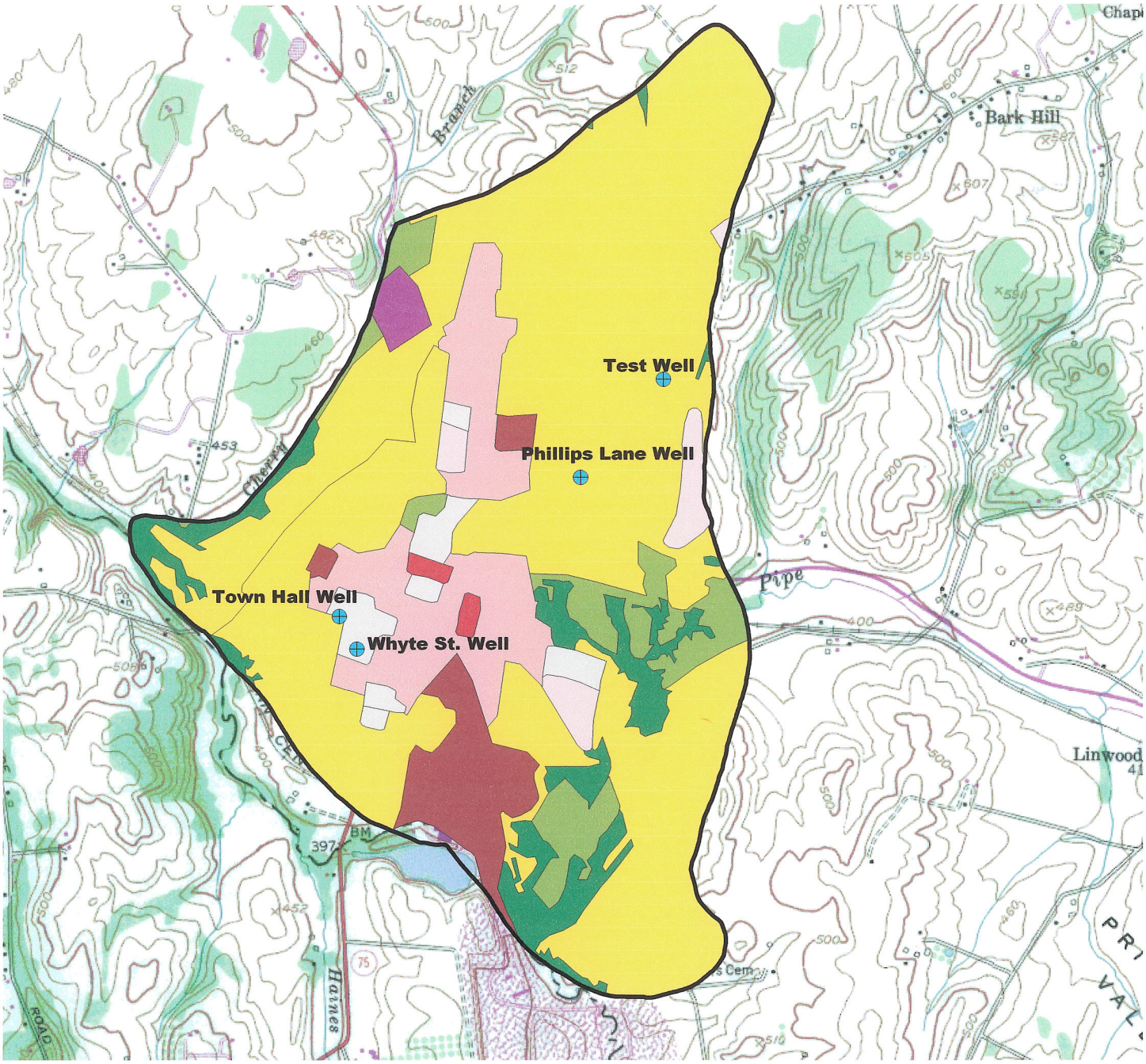

Figure 3. Land Use Map of the Union Bridge Wellhead Protection Area

Base Map: USGS 7.5 minute Topographiic Quadrangle - Union Bridge

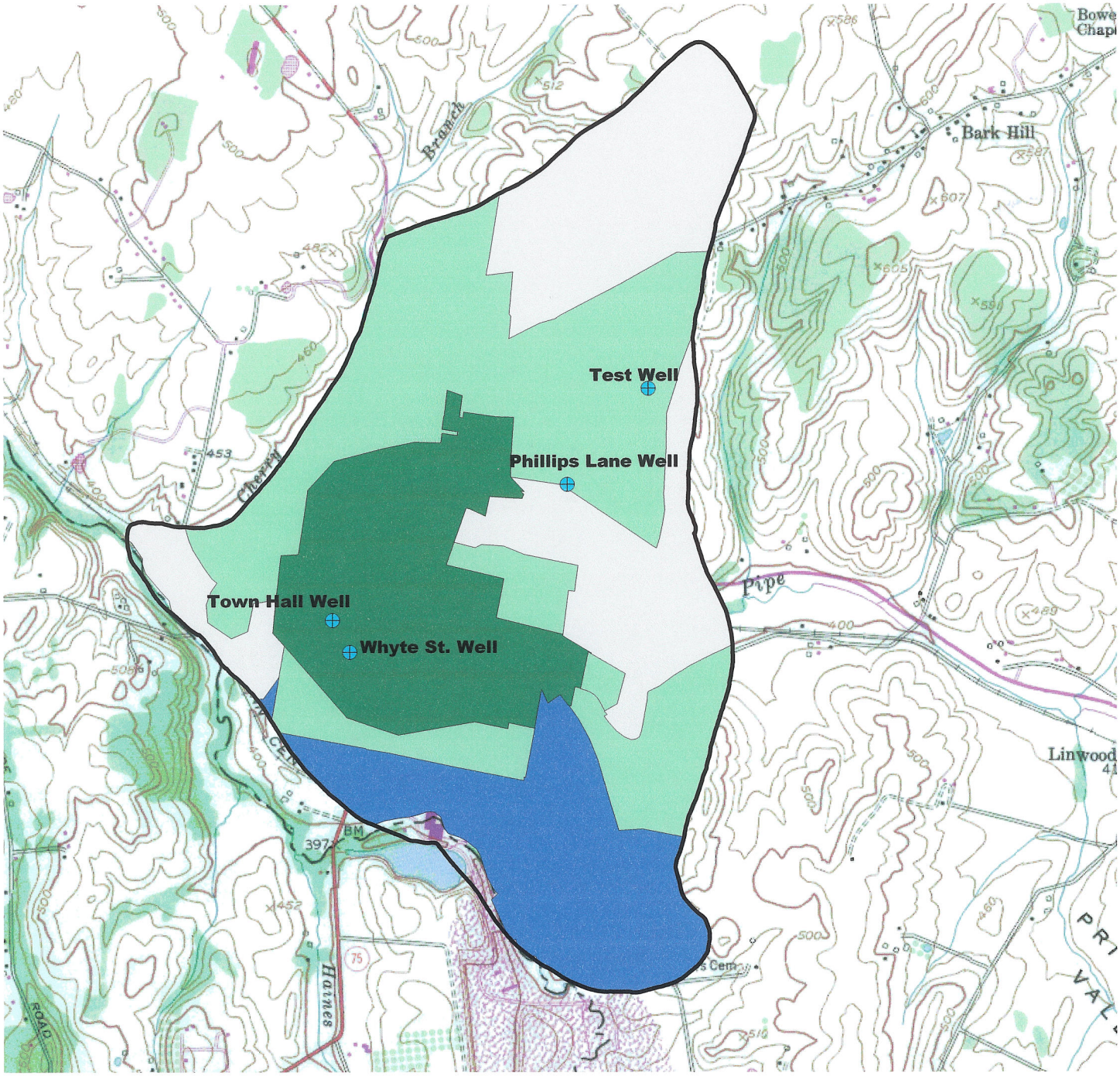

Figure 4. Sewer Map of the Union Bridge Wellhead Protection Area

Base Map: USGS 7.5 minute Topographic Quadrangle - Union Bridge

APPENDIX

Lehigh Portland Cement Company Site
Carroll County, Maryland
(MD-437)

Site Location

The Lehigh Portland Cement Company site is a 1,200-acre property located on Route 75 immediately south of the town of Union Bridge, in rural western Carroll County.

Site History

The Lehigh Portland Cement Company is an active facility, and has been operating at this location since 1910.

In December 1992, after allegations from citizens that the company had been dumping hazardous waste products on-site, the Maryland Department of the Environment/Waste Management Administration (MDE/WAS) conducted a Preliminary Assessment (PA) of the site. During the PA, MDE/WAS personnel identified an eight-acre landfill/dump pile consisting of ash and various domestic and industrial debris. Leachate was observed draining from this area into a drainage swale that empties into Sam's Creek, a small creek that flows through the site.

In June 1993, Halliburton NUS Corporation/Gannett Fleming, Incorporated, under contract with the U.S. Environmental Protection Agency (EPA), conducted a Site Inspection (SI) at the site. The SI included the collection of soil, surface water, and sediment samples. These samples revealed that regulatory levels were not exceeded in soils or in the surface water and sediments of Sam's Creek.

In March 1994, the EPA assigned a "No Further Remedial Action Planned" (NFRAP) status to the site.

Current Status

Based on the NFRAP status, no remedial or removal actions have been taken or are planned for the site.

Contact

Art O'Connell Maryland Department of the Environment (410) 537-3493

MDE
MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway ● Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

Rdr

complete pkg. w/ copies of all enc. in file #006-0013

February 29, 1996

Mayor Perry L. Jones, Jr.
Town of Union Bridge
104 W. Locust Street
Union Bridge, MD 21791

Dear Mayor Jones:

As we have discussed in previous meetings, the Maryland Department of the Environment (MDE) is required to make a determination if the Town of Union Bridge's water supply is subject to contamination by surface water. MDE has undertaken this effort because of the disease causing potential of certain protozoan organisms found in surface waters. These organisms (*giardia lamblia, and cryptosporidium parvum*) are resistant to chlorine disinfection and can only be effectively removed by filtration.

MDE's study of the Union Bridge supply has included reviewing and collecting sampling data for total and fecal coliform bacteria, turbidity, temperature and pH of the untreated supply, and using specialized dye to determine the source(s) of coliform organisms in the well.

Because of the fecal coliform detected in the Town's well (see attached report), MDE believes that the Town's supply has the potential for being contaminated by *giardia lamblia* or *cryptosporidium parvum*. This finding has been made in accordance with State drinking water regulations (a copy of the relevant portions are attached). These requirements stipulate that a water supplier has 18 months to either install filtration treatment or meet specific federal criteria to avoid filtration. Our review of the data indicates that Union Bridge's raw water quality would not meet the federal avoidance criteria. Two other options available to Union Bridge are to find an alternative supply or find and eliminate the source of fecal coliform in its well water. From our study it did not appear that finding and eliminating the source of fecal coliform was likely to be successful.

Additional routine raw water monitoring will be required at the Town's well. Starting in July of 1996 a monthly raw water bacteriological sample is to be collected for total and fecal coliform concentrations.

TOWN OF UNION BRIDGE
STUDY OF WELL WATER SUPPLY
FOR DIRECT SURFACE WATER INFLUENCE

On twelve different days in the spring and fall of 1995 the well water at Union Bridge was analyzed for total and fecal coliform bacteria. On each day both kinds of coliform were found in the well water. Actual concentrations were measured on seven days. The median concentrations in the well were 80 colonies/100 ml of total coliform and 8 colonies/100 ml of fecal coliform. (Copies of lab results are attached). These concentrations cannot be discarded as trivial; they indicate a real potential for *giardia lamblia* or *cryptosporidium* to be present in the Town's supply. There was no pattern of changes in concentration following precipitation events, nor did the temperature, turbidity or pH fluctuate significantly. These results point toward a ground water dominated source with source(s) of contamination entering the flow system.

Water quality from the Town's well (high hardness and alkalinity) indicates that the well water is in contact with carbonate rock (Wakefield Marble of Sam's Creek Formation). The Wakefield Marble is susceptible to infiltration of storm water from sinkholes and fractured rock outcrops. Such stormwater may contain high concentrations of pathogenic microbiological contaminants from diffuse sources. Without a sufficient natural soil cover in place, microorganisms will enter the aquifer. Cattle are a documented source of *cryptosporidium*. Animal waste from cows is widely present in the Town's wellhead protection area.

MDE initiated a dye study looking for a hydraulic connection between the Town's well and either of the two major streams that run through and adjacent to the Town. Dye was placed in both Sam's Creek and Little Pipe Creek under low flow conditions. After monitoring the well supply for three weeks no dye was detected in the well.

Dye was later injected into the Town's sewer collection system through several manholes. Again no dye was found in the Town's well after a long period of testing.

We also looked for open sinkholes in the well recharge area for possible dye injection points. We were not able to find any.

In summary, the probable source is stormwater infiltration, which is difficult to control. Either treatment of current source or replacement of existing source are the most promising improvements to protect the Town's water quality.