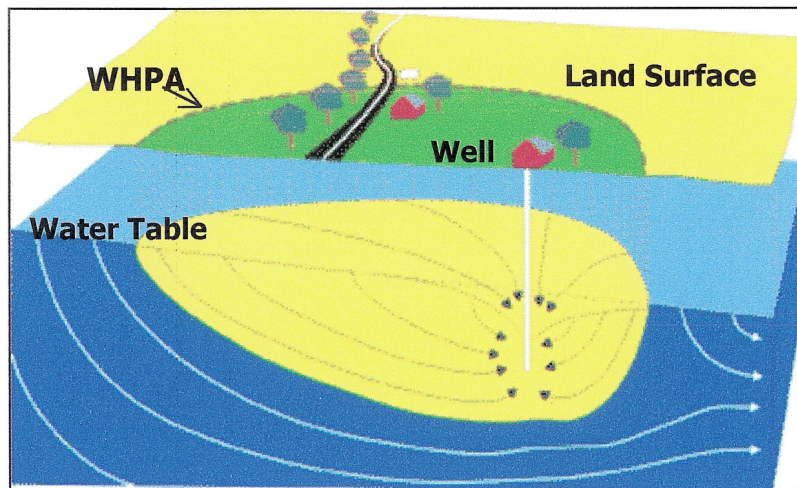


SOURCE WATER ASSESSMENT
FOR THE CITY OF TANEYTOWN
CARROLL COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
October 2000



TABLE OF CONTENTS

	Page
Summary	1
Introduction.....	2
Well Information.....	2
Table 1. Taneytown Well Information	
Hydrogeology.....	2
Source Water Assessment Area Delineation	3
Potential Sources of Contamination.....	3
Table 2. Potential Contaminant Point Sources within the Taneytown WHPA	
Table 3. Land Use Summary for the Taneytown WHPA	
Table 4. Sewer Service Area Summary for the Taneytown WHPA	
Water Quality Data	6
Table 5a. IOC results above 50% of the MCL for Taneytown Plant 1 (Well 8) finished water since 1993	
Table 5b. IOC results above 50% of the MCL for Taneytown Plant 2 (Well 9) finished water since 1993	
Table 5c. IOC results above 50% of the MCL for Taneytown Plant 3 (Wells 11 and 12) finished water since 1993	
Table 5d. IOC results above 50% of the MCL for Taneytown Plant 4 (Well 13) finished water since 1993	
Table 6a. VOC results above 50% of the MCL for Taneytown Plant 2 (Well 9) finished water since 1990	
Table 6b. VOC results above 50% of the MCL of Taneytown Plant 4 Well (13) finished water since 1992	
Table 6c. VOC results for Taneytown's finished water between May 1990 and September 1990	
Table 6d. VOC results for Taneytown's finished water between October 1990 and December 1992	
Table 6e. VOC results for Taneytown's finished water between February 1993 and October 1997	
Table 6f. VOC results for Taneytown's finished water between August 1998 and July 2000	

Table 7. Radionuclide results above 50% of the MCL for
Taneytown's finished water since 1993

Susceptibility Analysis	14
Management of the WHPA.....	16
References.....	18
Other Sources of Data.....	18
Figures	19
Figure 1. Location Map for Taneytown's Wells	
Figure 2. Taneytown Wellhead Protection Area with Potential Contaminant Sites	
Figure 3. Land Use Map of the Taneytown Wellhead Protection Area	
Figure 4. Sewer Service Area Map of the Taneytown Wellhead Protection Area	

SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for the City of Taneytown. 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 Taneytown's water supply is an unconfined fractured rock aquifer, known as the New Oxford Formation. The system uses six wells to obtain its drinking water. The Source Water Assessment Area was delineated by the Carroll County Bureau of Water Resources Management and the WSP 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 Taneytown's water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that Taneytown's water supply is susceptible to contamination by nitrates, volatile organic compounds, and radionuclides and not susceptible to synthetic organic compounds. Based on raw water sampling, Well No. 12 is susceptible to bacteria.

INTRODUCTION

The City of Taneytown is located about 10 miles northwest of Westminster in Carroll County (figure 1). The City owns and operates its water supply system that serves a population of 4750. Currently, the water is supplied by six wells located in various parts of the City (figure 1).

WELL INFORMATION

A review of well data and sanitary surveys of Taneytown's water system indicates that Well Nos. 8 and 9 were drilled prior to the implementation of the State's well construction regulations in 1973. All the other wells (Nos. 11 – 14) were drilled after 1973 in accordance with the well construction standards. Table 1 contains a summary of the well construction data.

PLANT	SOURCE NAME	PERMIT	TOTAL DEPTH	CASING DEPTH	AQUIFER
01	Taneytown 8	CL036379	393'	34'	New Oxford Formation
02	Taneytown 9	N/A	396'	31'	New Oxford Formation
03	Taneytown 11	CL737738	625'	53'	New Oxford Formation
03	Taneytown 12	CL738344	590'	56'	New Oxford Formation
04	Taneytown 13	CL811687	580'	165'	New Oxford Formation
05	Taneytown 14	CL881060	615'	61'	New Oxford Formation

Table 1. Taneytown Well Information.

The well yields range from 65 gallons per minute (gpm) to 195 gpm. All the wells have their own treatment plant except for Well Nos. 11 and 12, which share a treatment plant.

HYDROGEOLOGY

The Taneytown area is underlain by the New Oxford Formation which is Triassic in age (200 million years). This formation consists of interbedded layers and lenses of sandstone, siltstone and shale. These rock layers dip (are tilted) to the northwest. These dipping beds intersect the horizontal plane of the ground surface to have a northeast to southwest trend (strike) across the Taneytown area (R. E. Wright, 1988).

The sandstones and siltstones, where well-fractured and jointed, are highly transmissive. The interbedded shales tend to have very low transmissivities and act as confining or boundary layers. Drawdown from Taneytown production wells is thus concentrated in individual aquifer beds, which are penetrated and can leave other aquifer beds relatively unaffected. Overall aquifer storativity in the New Oxford Formation is very low. As a result of these geologic and hydraulic properties, water table drawdown from pumping wells may be areally elongate and very narrow.

The length of the resulting cone of water table depression may be 10 to 100 times greater than its width (R. E. Wright, 1988). Well Nos. 11 and 12 are located along strike of the same bed (stratum), and interfere with each other when pumped at the same time. Hence only one of these wells is used at a time.

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. The WHPA for Taneytown'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). Hydrogeologic mapping was the method used for the delineation. This is the methodology recommended for fractured rock aquifers in the EPA approved Maryland's Source Water Assessment Plan (1999).

The WHPA delineated represents the recharge area for the City's water supply wells. Ground water recharge areas to the New Oxford Formation can be defined regionally by topographic basins and aquifer outcrop areas. The actual aquifer outcrop area from which a supply well may receive recharge quickly becomes very large with pumping due to the high transmissivity of the beds along strike and low storativity of the aquifer. Recharge from adjacent area perpendicular to strike of bedding may be very low due to extremely low leakage rate through the shale beds (R. E. Wright, 1988).

The Taneytown WHPA is a combination of the recharge areas for each of the City's supply wells. storativity). Based on their location and the geology some of the wells had common recharge areas (Wells 11 and 12, and Wells 9 and 13). The recharge areas are parallel to each other along strike. The extent of the recharge areas along strike was based on pumping test data (transmissivity and storativity) for each well. The total area for the WHPA is about 5,400 acres.

POTENTIAL SOURCES OF CONTAMINATION

For this assessment, MDE Waste and Water Management databases and Carroll County's database were reviewed, staff consulted, and field inspections conducted, to identify potential contaminant sources in and around the Taneytown WHPA. In addition, MDE conducted a follow up field survey of the WHPA on June 28, 2000 and also interviewed Mr. Richard Weaver, the Water Superintendent for Taneytown, to discuss water quality concerns. Mr. Weaver indicated that volatile organic compounds in the water supply (Well No. 13) were a concern.

Several commercial establishments that have Underground Storage Tanks (USTs), Leaking Underground Storage Tanks (LUSTs), or are Pesticide Dealers (PD), Ground Water Discharge Sites (GWD), and Ground Water Contamination Sites (GWC), are identified in Figure 2. Table 2 lists the facilities identified and their potential sources of contaminants. This is 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), Synthetic Organic Compounds (SOC), Inorganic Compounds (IOC) and Heavy Metals (HM).

ID	TYPE	SITE NAME	ADDRESS	POTENTIAL CONTAMINANT
1	UST	Wantz Chevrolet	5255 Taneytown Pike	VOC
2	UST/GWD	Bob's Tire	5241 Taneytown Pike	VOC
3	UST	Chevron	West Baltimore St	VOC
4	UST	Fairs Service	107 W. Baltimore St	VOC
5	UST/GWD	Smith's Service	41 W. Baltimore St.	VOC
6	UST	Stanley W. King Plumbing	45 W. Baltimore St.	VOC
7	UST	Taneytown Lift Storage	York St and Rte 194	VOC
8	UST	Taneytown V. F. D.	34 E. Baltimore St	VOC
9	UST	Wantz Chevrolet	85 York St	VOC
10	UST	Van Hessen Lumber Co.	110 York St	VOC
11	UST	Taney Supply & Lumber	5130 Allendale Ln	VOC
12	UST	Exxon	Franklin & E. Baltimore	VOC
13	UST	Sheetz	226 E. Baltimore St	VOC
14	UST	Jim's Service Center	529 E. Baltimore St	VOC
15	UST	Citgo/High's	520 E. Baltimore St.	VOC
16	LUST	City Public Utility Building	Memorial Drive	VOC
17	PD/UST	Southern States	York and Commerce Sts	SOC, IOC, VOC
18	GWC	Cambridge Rubber	York and Blue Ridge	VOC, SOC
19	GWC	All State Welding	Allendale Lane	VOC

Table 2. Potential Contaminant Point Sources within the Taneytown WHPA (see figure 2 for locations).

Several of the listed UST sites had their tanks removed and replaced following investigation by MDE's Oil Control Program due to noncompliance with State standards for USTs. Currently all the listed UST sites are in compliance with State regulations with no reported contamination problems. The one LUST site (Case no 95-1131) had tanks that leaked petroleum products into the ground. The tanks were removed and monitoring wells installed to determine VOC concentrations in the ground water. Several years of monitoring data indicate that the VOC levels have decreased and currently below maximum contaminant levels. No impacts to Well Nos. 11 and 12, which are west of this site, have been noted. No further action is planned for this site.

Commercial establishments in the Taneytown WHPA were inspected by a Ground Water Permits inspector to determine whether any of these facilities had unpermitted or illegal discharges to the ground water. Seven sites, which had open floor drains for discharge of fluids into the ground, were each issued a Notice of

Violation to close up their floor drains. Six of the sites have complied with the NOV. One site, Bob's Tires, has not yet complied. Smith's Service (Site 5) is an abandoned property that has USTs and may have open floor drains that need to be closed. Commercial establishments within the City limits are served by the City's sewer system. Potential contamination could result from spills or improper disposal of chemicals. One of the VOC's detected in the City's water supply, tetrachloroethylene, is commonly used in dry cleaning.

Ground water contamination has been measured in wells on All State Welding property. Levels of trichloroethylene (TCE), tetrachloroethylene (PCE) and dichloroethane (DCA) have been detected in wells on the property above drinking water standards. TCE and PCE have been detected in Well No. 13 which is located about 500 ft. southwest of this site (see figure 2). MDE's Hazardous Waste Program has notified the property owner of this site to develop an assessment plan to address the contamination. Monitoring data indicate that the contaminant plume direction has changed from north to west probably due to pumpage of Well No. 13.

Ground water contamination was found on the property known as "Cambridge Rubber" from VOCs and SOCs as a result of past operating procedures and spills. This facility is no longer in operation. A detailed environmental investigation and assessment was conducted on the site under the direction of MDE. Ground water monitoring at the site indicated that there were no increasing trends in VOC or SOC levels and no contaminants were detected outside the site property. The site was granted a No Further Action status by MDE.

Based on the Maryland Office of Planning's 1997 Land Use Map, the land use within the Taneytown WHPA is as shown in table 3. Figure 3 shows the distribution of the land use in and around the WHPA. Some of the land use has changed since the publication of the 1997 Land Use Map, as was observed during the field survey of the WHPA. The cropland adjacent to Well No. 8 on the west side now has new commercial facilities (see figure 3). Cropland (63.4%) is the dominant land use in the WHPA.

LAND USE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	193.04	3.6
Medium Density Residential	377.04	7.0
High Density Residential	57.96	1.1
Commercial	118.46	2.1
Industrial	112.64	2.1
Open Urban Land	82.88	1.5
Cropland	3440.33	63.4
Pasture	490.02	9.0
Forest	516.90	9.5
Feeding Operations	34.95	0.7

Table 3. Land Use Summary for the Taneytown WHPA.

Based on the Maryland Office of Planning's Carroll County Sewer Map, the Sewer Service Area Categories are shown in table 4. Figure 4 shows the distribution of the Sewer Service Areas in and around the Taneytown WHPA. These categories are based on the 1995 map, and according to the City all the areas within the City limits have sewer service.

SEWER SERVICE AREA	TOTAL AREA (acres)	PERCENTAGE OF WHPA
No Planned Service	3853.11	70.7
Existing Service	1055.68	19.6
Service within 2 to 6 years	465.71	8.7
Service within 6 years	49.72	1.0

Table 4. Sewer Service Area Summary for the Taneytown WHPA.

Non-point sources of contamination are usually associated with land use activities in the area. Application of fertilizers and pesticides on cropland could result in potential source of nitrate and SOC's. Lawn maintenance and landscaping activities on residential, commercial and industrial land could also be potential sources of nitrate. Onsite septic systems in areas that have no sewer service may be potential sources of nitrate and microbial pathogens. In addition, wastes from livestock are potential sources of nitrate and microbial pathogens.

Well No 13 is located adjacent to railroad tracks and may be vulnerable to contamination due to spills from accidents.

WATER QUALITY

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 finished water. Treatment currently in use for Taneytown's water supply is gaseous chlorination for disinfection.

In accordance with Maryland's SWAP, data from the water sources and treatment plants were compared with the Maximum Contaminant Levels (MCLs). If the monitoring data is greater than 50% of a MCL, the written assessment will describe the source of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. A review of the monitoring data since 1990 for Taneytown's finished water indicates that the system's water supply meets the current drinking water standards. Nitrate, tetrachloroethylene, gross alpha and radium were the contaminants that were detected above 50% of the MCL. In addition, radon-222 was also detected above 50% of the proposed MCL. These are discussed in more detail below.

Inorganic Compounds (IOCs)

The only IOC detected above 50% of the MCL was nitrate. The MCL for nitrate is 10 ppm. The nitrate detections above 50% of the MCL in Taneytown's water supply are shown in Tables 5a, 5b and 5c.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT ppm)
1040	NITRATE	10	24-Feb-93	8.9
1040	NITRATE	10	14-May-93	6.1
1040	NITRATE	10	09-May-94	5.1
1040	NITRATE	10	16-May-95	5.15

Table 5a. IOC results above 50% of the MCL for Taneytown Plant 1 (Well 8) finished water since 1993.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppm0	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	24-Feb-93	5.7
1040	NITRATE	10	14-May-93	8.1
1040	NITRATE	10	12-Aug-93	5.01
1040	NITRATE	10	10-Jan-94	6.01
1040	NITRATE	10	09-May-94	6.7
1040	NITRATE	10	10-Aug-94	6.14
1040	NITRATE	10	15-Nov-94	7.31
1040	NITRATE	10	15-Feb-95	8.05
1040	NITRATE	10	22-Jan-96	7.45
1040	NITRATE	10	07-Feb-97	6.06
1040	NITRATE	10	11-Apr-00	5

Table 5b. IOC results above 50% of the MCL for Taneytown Plant 2 (Well 9) finished water since 1993.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	24-Feb-93	9.5
1040	NITRATE	10	14-May-93	9.1
1040	NITRATE	10	11-Jan-94	6.64
1040	NITRATE	10	09-May-94	6.08
1040	NITRATE	10	15-Nov-94	5.11
1040	NITRATE	10	15-Feb-95	6.84
1040	NITRATE	10	22-Jan-96	8.48
1040	NITRATE	10	09-Feb-98	5.75
1040	NITRATE	10	12-Jan-99	5.2

Table 5c. IOC results above 50% of the MCL for Taneytown Plant 3 (Wells 11 and 12) finished water since 1993.

CONTAMINANT ID	CONAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1040	NITRATE	10	24-Feb-93	5.6
1040	NITRATE	10	14-May-93	9.2
1040	NITRATE	10	12-Aug-93	5.06
1040	NITRATE	10	10-Jan-94	7.02
1040	NITRATE	10	09-May-94	6.85
1040	NITRATE	10	15-Nov-94	6.21
1040	NITRATE	10	15-Feb-95	7.02
1040	NITRATE	10	22-Jan-96	6.73

Table 5d. IOC results above 50% of the MCL for Taneytown Plant 4 (Well 13) finished water since 1993.

Volatile Organic Compounds (VOCs)

The only VOC detected above 50% of the MC was tetrachloroethylene. The MCL for tetrachloroethylene in 5 ppb. The tetrachloroethylene detections above 50% of the MCL in Taneytown's water supply are shown in Tables 6a and 6b.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
2987	TETRACHLOROETHYLENE	5	25-Sep-90	4.4
2987	TETRACHLOROETHYLENE	5	25-Aug-92	2.7
2987	TETRACHLOROETHYLENE	5	17-Nov-92	4
2987	TETRACHLOROETHYLENE	5	23-Feb-93	2.8
2987	TETRACHLOROETHYLENE	5	02-Jun-93	2.6
2987	TETRACHLOROETHYLENE	5	16-Nov-93	2.7
2987	TETRACHLOROETHYLENE	5	15-Feb-94	2.5
2987	TETRACHLOROETHYLENE	5	08-Nov-94	3.7
2987	TETRACHLOROETHYLENE	5	17-Oct-96	4.6
2987	TETRACHLOROETHYLENE	5	11-Aug-98	4
2987	TETRACHLOROETHYLENE	5	13-Jul-99	4.2
2987	TETRACHLOROETHYLENE	5	06-Apr-00	3.7
2987	TETRACHLOROETHYLENE	5	11-Apr-00	3.5
2987	TETRACHLOROETHYLENE	5	13-Jul-00	3.3

Table 6a. VOC results above 50% of the MCL for Taneytown Plant 2 (Well 9) finished water since 1990.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
2987	TETRACHLOROETHYLENE	5	30-Jun-92	3
2987	TETRACHLOROETHYLENE	5	14-Sep-92	3
2987	TETRACHLOROETHYLENE	5	07-Dec-92	3
2987	TETRACHLOROETHYLENE	5	10-Mar-93	3
2987	TETRACHLOROETHYLENE	5	17-Oct-96	3.4
2987	TETRACHLOROETHYLENE	5	11-Aug-98	4
2987	TETRACHLOROETHYLENE	5	13-Jul-99	3.6
2987	TETRACHLOROETHYLENE	5	13-Jul-00	2.6

1992, Table 6b. VOC results above 50% of the MCL for Taneytown Plant 4 (Well 13) finished water since 1992.

Since 1990 several other VOCs have also been detected, but at levels below 50% of their MCLs. Tables 6c, 6d, and 6e, 6f show the levels of these detections.

PLANT ID	CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
2	2981	1,1,1-TRICHLOROETHANE	200	17-May-90	0.3
2	2987	TETRACHLOROETHYLENE	5	17-May-90	1.5
2	2989	MONOCHLOROBENZENE	100	17-May-90	0.3
3	2977	1,1-DICHLOROETHYLENE	7	17-May-90	1.2
3	2981	1,1,1-TRICHLOROETHANE	200	17-May-90	1.5
3	2987	TETRACHLOROETHYLENE	5	17-May-90	0.3
4	2987	TETRACHLOROETHYLENE	5	17-May-90	1.2
4	2984	TRICHLOROETHYLENE	5	17-May-90	0.4
3	2981	1,1,1-TRICHLOROETHANE	200	17-May-90	1.9
3	2987	TETRACHLOROETHYLENE	5	17-May-90	0.2
3	2977	1,1-DICHLOROETHYLENE	7	17-May-90	0.3
2	2981	1,1,1-TRICHLOROETHANE	200	25-Sep-90	1.3
2	2987	TETRACHLOROETHYLENE	5	25-Sep-90	4.4
3	2981	1,1,1-TRICHLOROETHANE	200	25-Sep-90	2.5
4	2984	TRICHLOROETHYLENE	5	25-Sep-90	0.3
4	2987	TETRACHLOROETHYLENE	5	25-Sep-90	1.3
3	2981	1,1,1-TRICHLOROETHANE	200	25-Sep-90	2.1
3	2987	TETRACHLOROETHYLENE	5	25-Sep-90	0.2
3	2987	TETRACHLOROETHYLENE	5	25-Sep-90	0.3

Table 6c. VOC results for Taneytown's finished water between May 1990 and September 1990.

LANT ID	CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULTS (ppb)
2	2981	1,1,1-TRICHLOROETHANE	200	24-Oct-90	1.2
3	2981	1,1,1-TRICHLOROETHANE	200	24-Oct-90	2.8
3	2981	1,1,1-TRICHLOROETHANE	200	24-Oct-90	2.5
2	2989	MONOCHLOROBENZENE	100	24-Oct-90	2.1
3	2987	TETRACHLOROETHYLENE	5	24-Oct-90	0.2
3	2987	TETRACHLOROETHYLENE	5	24-Oct-90	0.2
4	2984	TRICHLOROETHYLENE	5	24-Oct-90	0.2
4	2987	TETRACHLOROETHYLENE	5	24-Oct-90	1
3	2977	1,1-DICHLOROETHYLENE	7	24-Oct-90	0.9
3	2977	1,1-DICHLOROETHYLENE	7	24-Oct-90	1.3
3	2981	1,1,1-TRICHLOROETHANE	200	21-Jan-91	1.3
3	2981	1,1,1-TRICHLOROETHANE	200	21-Jan-91	1.1
4	2987	TETRACHLOROETHYLENE	5	11-Sep-91	1
2	2981	1,1,1-TRICHLOROETHANE	200	12-Nov-91	3.3
4	2987	TETRACHLOROETHYLENE	5	12-Dec-91	1
4	2984	TRICHLOROETHYLENE	5	12-Dec-91	0.3
2	2981	1,1,1-TRICHLOROETHANE	200	11-Feb-92	2.1
3	2981	1,1,1-TRICHLOROETHANE	200	11-Feb-92	3.9
3	2981	1,1,1-TRICHLOROETHANE	200	11-Feb-92	3.6
2	2981	1,1,1-TRICHLOROETHANE	200	19-May-92	0.6
3	2981	1,1,1-TRICHLOROETHANE	200	19-May-92	1.1
3	2981	1,1,1-TRICHLOROETHANE	200	19-May-92	1.5
4	2981	1,1,1-TRICHLOROETHANE	200	30-Jun-92	3
4	2984	TRICHLOROETHYLENE	5	30-Jun-92	1
4	2987	TETRACHLOROETHYLENE	5	30-Jun-92	3
2	2987	TETRACHLOROETHYLENE	5	25-Aug-92	2.7
4	2987	TETRACHLOROETHYLENE	5	14-Sep-92	3
4	2981	1,1,1-TRICHLOROETHANE	200	14-Sep-92	4
4	2984	TRICHLOROETHYLENE	5	14-Sep-92	0.6
2	2987	TETRACHLOROETHYLENE	5	17-Nov-92	4
4	2987	TETRACHLOROETHYLENE	5	07-Dec-92	3
4	2984	TRICHLOROETHYLENE	5	07-Dec-92	0.6
4	2981	1,1,1-TRICHLOROETHANE	200	07-Dec-92	3

Table 6d. VOC results for Taneytown's finished water between October 1990 and December 1992.

PLANT ID	CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULTS (ppb)
2	2987	TETRACHLOROETHYLENE	5	23-Feb-93	2.8
3	2987	TETRACHLOROETHYLENE	5	23-Feb-93	0.6
4	2987	TETRACHLOROETHYLENE	5	10-Mar-93	3
4	2984	TRICHLOROETHYLENE	5	10-Mar-93	0.6
4	2981	1,1,1-TRICHLOROETHANE	200	10-Mar-93	2
4	2987	TETRACHLOROETHYLENE	5	01-Jun-93	2.1
4	2981	1,1,1-TRICHLOROETHANE	200	01-Jun-93	1.1
4	2984	TRICHLOROETHYLENE	5	01-Jun-93	0.6
2	2987	TETRACHLOROETHYLENE	5	02-Jun-93	2.6
3	2981	1,1,1-TRICHLOROETHANE	200	02-Jun-93	1
3	2981	1,1,1-TRICHLOROETHANE	200	03-Jun-93	1.4
2	2987	TETRACHLOROETHYLENE	5	24-Aug-93	2.3
4	2987	TETRACHLOROETHYLENE	5	24-Aug-93	1.4
2	2987	TETRACHLOROETHYLENE	5	16-Nov-93	2.7
4	2987	TETRACHLOROETHYLENE	5	16-Nov-93	1.1
3	2981	1,1,1-TRICHLOROETHANE	200	14-Feb-94	1.1
2	2987	TETRACHLOROETHYLENE	5	15-Feb-94	2.5
2	2981	1,1,1-TRICHLOROETHANE	200	15-Feb-94	0.7
3	2981	1,1,1-TRICHLOROETHANE	200	15-Feb-94	1
4	2981	1,1,1-TRICHLOROETHANE	200	15-Feb-94	0.8
4	2987	TETRACHLOROETHYLENE	5	15-Feb-94	1.9
2	2981	1,1,1-TRICHLOROETHANE	200	10-May-94	0.6
4	2981	1,1,1-TRICHLOROETHANE	200	10-May-94	0.7
4	2987	TETRACHLOROETHYLENE	5	10-May-94	2.2
2	2987	TETRACHLOROETHYLENE	5	10-May-94	2.4
2	2987	TETRACHLOROETHYLENE	5	08-Nov-94	3.7
4	2987	TETRACHLOROETHYLENE	5	08-Nov-94	1.9
2	2987	TETRACHLOROETHYLENE	5	17-Oct-96	4.6
4	2987	TETRACHLOROETHYLENE	5	17-Oct-96	3.4
4	2981	1,1,1-TRICHLOROETHANE	200	17-Oct-96	0.6
4	2984	TRICHLOROETHYLENE	5	17-Oct-96	0.8
2	2987	TETRACHLOROETHYLENE	5	26-Nov-96	1
2	2969	p-DICHLOROBENZENE	75	24-Oct-97	1.1
2	2955	XYLENES, TOTAL	10000	24-Oct-97	0.7
2	2968	o-DICHLOROBENZENE	600	24-Oct-97	1.4
2	2987	TETRACHLOROETHYLENE	5	24-Oct-97	2.2

Table 6e. VOC results for Taneytown's finished water between February 1993 and October 1997.

PLANT ID	CONTAMINANT ID	CONTAMINANT NAME	MCL (ppb)	SAMPLE DATE	RESULTS (ppb)
2	2987	TETRACHLOROETHYLENE	5	11-Aug-98	4
4	2984	TRICHLOROETHYLENE	5	11-Aug-98	2
4	2987	TETRACHLOROETHYLENE	5	11-Aug-98	4
3	2981	1,1,1-TRICHLOROETHANE	200	11-Aug-98	0.6
4	2981	1,1,1-TRICHLOROETHANE	200	11-Aug-98	0.4
5	2982	CARBON TETRACHLORIDE	5	11-Aug-98	0.6
2	2987	TETRACHLOROETHYLENE	5	13-Jul-99	4.2
5	2977	1,1-DICHLOROETHYLENE	7	13-Jul-99	0.8
4	2987	TETRACHLOROETHYLENE	5	13-Jul-99	3.6
2	2987	TETRACHLOROETHYLENE	5	06-Apr-00	3.7
4	2987	TETRACHLOROETHYLENE	5	06-Apr-00	2.2
2	2977	1,1-DICHLOROETHYLENE	7	11-Apr-00	0.8
4	2987	TETRACHLOROETHYLENE	5	11-Apr-00	2.4
2	2987	TETRACHLOROETHYLENE	5	11-Apr-00	3.5
2	2977	1,1-DICHLOROETHYLENE	7	13-Jul-00	0.6
2	2987	TETRACHLOROETHYLENE	5	13-Jul-00	3.3
4	2987	TETRACHLOROETHYLENE	5	13-Jul-00	2.6
5	2977	1,1-DICHLOROETHYLENE	7	13-Jul-00	0.9

Table 6f. VOC results for Taneytown's finished water between August 1998 and July 2000.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl) phthalate was detected in January 1995 at plant 2 (Well 9) and plant 5 (Well 14) at 2.5 ppb and 4.65 ppb, respectively. The MCL for this SOC is 6 ppb. It was also detected in November 1998 at plant 1 (Well 8) at 0.7 ppb. A review of these results indicated that the phthalate was found in the laboratory blanks and therefore these results are not interpreted to represent actual water quality.

The only other SOC that was detected in Taneytown's water supply is atrazine. It was detected at 0.2 ppb on November 1995 at plant 4 (Wells 11 and 12). The MCL for atrazine is 3 ppb.

Radionuclides

Gross alpha and radium were detected in Taneytown's water supply at greater than 50% of the MCL. Currently, the MCL for gross alpha is 15 picoCuries/Liter (pCi/L) and 5 pCi/L for radium as measured in the distribution system. At present there is no MCL for radon-222. EPA has proposed an MCL of 300 pCi/L and an alternate MCL of 4000 pCi/L. Table 7 shows the results of radon-222 gross alpha and radium at or above 50% of the existing and proposed MCLs.

PLANT ID	CONTAMINANT ID	CONTAMINANT NAME	MCL (pCi/L)	SAMPLE DATE	RESULT (pCi/L)
00	4000	GROSS ALPHA	15	3-MAR-85	17
04	4010	COMBINED RADIUM	5	3-MAR-89	5.8
02	4010	COMBINED RADIUM	5	4-APR-89	13.5
01	4000	GROSS ALPHA	5	6-APR-00	8.1
01	4004	RADON-222	300/4000	6-APR-00	1742
02	4004	RADON-222	300/4000	6-APR-00	1397
03	4004	RADON-222	300/4000	6-APR-00	1423
04	4000	GROSS ALPHA	15	6-APR-00	57
04	4004	RADON-222	300/4000	6-APR-00	1917
04	4010	COMBINED RADIUM	5	6-APR-00	4.9
01	4004	RADON-222	300/4000	11-APR-00	1610
01	4000	GROSS ALPHA	15	11-APR-00	19
02	4004	RADON-222	300/4000	11-APR-00	1650
04	4004	RADON-222	300/4000	11-APR-00	1985
04	4000	GROSS ALPHA	15	11-APR-00	36
01	4000	GROSS ALPHA	15	13-JUL-00	31.1
01	4004	RADON-222	300/4000	13-JUL-00	1710
02	4000	GROSS ALPHA	15	13-JUL-00	27.3
02	4004	RADON-222	300/4000	13-JUL-00	1260
03	4000	GROSS ALPHA	15	13-JUL-00	25.3
03	4004	RADON-222	300/4000	13-JUL-00	1390
04	4000	GROSS ALPHA	15	13-JUL-00	107
04	4004	RADON-222	300/4000	13-JUL-00	1810
05	4000	GROSS ALPHA	15	13-JUL-00	67.7
05	4004	RADON-222	300/4000	13-JUL-00	2230

Table 7. Radionuclide results above 50% of the MCL for Taneytown's finished water since 1985.

The combined radium is the sum of radium-226 and radium-228 levels. It must be noted that gross alpha and combined radium levels shown above are one time point of entry measurements. For a system to exceed the MCLs for gross alpha or radium, an average of four quarterly samples or four quarterly measurements must be compared and be greater than the MCL. In addition, the contribution from uranium to the gross alpha measurements must be deducted prior to comparing the results with the 15 pCi/l standard. The samples are required to be taken in the distribution system and not at the point of entry. A distribution sample collected at the McDonald's in November 1998 was less than the 15 pCi/l gross alpha standard (result 8 pCi/l).

In anticipation of EPA's new monitoring requirements for radionuclides MDE has begun monitoring systems as the water that leaves the individual treatment plants. The radium and gross alpha levels taken at the entry points indicate that all the Taneytown plants may exceed the gross alpha and/or combined radium standards of the new radionuclide rule.

Microbiological Contaminants

Raw water samples were collected and tested for bacteria from Well Nos. 8, 9, 11, 13 and 14 on 10/13/98 to determine whether these sources are ground water under the influence of surface water (GWUDI). Since Well Nos. 12 and 14 are within 500 feet of streams, raw water samples for bacteria testing were collected after rainfall on 8/10/98 (Well No.12) and 7/11/00 (Well No. 14). The results were negative for the presence of total and fecal coliform for all the wells except for Well No. 12, which had a total coliform count of 8.1 colonies/100 ml.

SUSCEPTIBILITY ANALYSIS

Taneytown's wells obtain water from an unconfined aquifer. In general, water supplies in unconfined aquifers are susceptible to contamination from land use activities. In addition, the geology of the New Oxford Formation makes this aquifer vulnerable to activities along the strike of the formation. 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) 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.

Inorganic Compounds (IOCs)

Nitrate has been detected in Taneytown's water supply above 50% of the MCL in all the wells except No. 14 (tables 5a-d). A review of the sampling data shows that no levels of nitrate above 50% of the MCL have been detected since 1995 in Well No. 8, since 1996 in Well Nos. 11 and 12, and since 1997 in Well No. 9. There appears to be no increasing levels in Well No. 13. 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. Cropland and pasture make up about 72% of the WHPA (table 3). In addition, 70% of the WHPA does not have planned sewer service.

Based on the above analysis, Taneytown's water supply is susceptible to nitrate contamination.

Volatile Organic Compounds (VOCs)

Tetrachloroethylene (PCE), an industrial and commercial solvent with a variety of uses like degreasing metals and dry cleaning has been detected above 50% of the MCL at Well No. 9 since 1990 and Well No. 13 since 1992 (table 6a and 6b). Other VOCs have been detected since 1990 at all the wells except No. 14 (tables 6c-f). Taneytown's WHPA extends right through the City's commercial and industrial areas. Several industrial and commercial facilities have had known ground water contamination by VOCs. After several years of investigation, the

Cambridge Rubber site was issued a "no further action" status by MDE's Waste Management Administration. Well No. 13 is located about 500 feet southwest of All State Welding. This site has been known to have ground water contamination since the late 1980s. MDE's Hazardous Waste Management Program has requested the property owner to conduct a site assessment. Onsite monitoring well data from 1987 showed the ground water flow direction to be towards the northeast. Recent data (1999, 2000) shows the flow direction has changed towards the west, probably due to pumping of Well No. 13. It is possible that the levels of PCE and TCE may increase with time. The City will need to consider treatment or a new source of water supply if the VOCs exceed the MCL.

Based on the above analysis, Taneytown's water supply is susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

Atrazine was the only SOC detected in November 1995 at Plant 1 (Wells 11 and 12) at a level 0.2 ppb which is well below the MCL of 3 ppb. Atrazine is a herbicide that is applied prior to the planting season.

A pesticide survey conducted in 1994 by MDE and subsequent sampling of SOC's in 1995 and 1998 have shown no other detections. Cropland makes up a large portion of the Taneytown WHPA and improper application of pesticides can be a potential source of SOC contamination.

Based on SOC sampling data and analysis, Taneytown's water supply is **not** susceptible to SOC contamination.

Radionuclides

Gross alpha and combined radium-226 and radium-228 have been detected at above 50% of the MCL in Taneytown's water supply. In addition, radon-222 has also been detected at levels ranging from 1610 pCi/L to 1985 pCi/L. The source of these radionuclides can be traced to the natural occurrence of uranium and thorium in the bedrock. Radon is prevalent in ground water due to the radioactive decay of uranium bearing minerals in the bedrock (Bolton, 1996). A study of radium and radon in ground water (Senior and Vogel, 1995) indicated that occurrence of radium in ground water is related to low pH and high concentration of dissolved solids.

Based on the above analysis, Taneytown's water supply is susceptible to radionuclides.

Microbiological Contaminants

Raw water bacteriological testing indicates that Well Nos. 8, 9, 11, 13 and 14 are **not** susceptible to protozoans and bacteria. The presence of total coliform in Well No. 12 indicates that this well is susceptible to bacteria and viruses. Viruses

are much smaller, can survive longer, and may not be effectively filtered out by the aquifer as protozoans and bacteria.

MANAGEMENT OF THE WHPA

Form a Local Planning Team

- The team should represent all the interests in the community. The City Council, the City Utilities Department, Carroll County Planning and Health Departments, residents, farmers, local businesses, and developers should work to reach a consensus on how to protect the water supply.

Public Awareness and Outreach

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

- A large portion of the WHPA is in the Piney Creek Targeted Watershed and most of the farmers in this area have participated in this initiative to protect water quality. Cost share monies have been provided to participating farmers for implementing Best Management Practices.
- The farmers can also 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.

Planning/New Development

- Taneytown should work closely with the Carroll County Bureau of Water Resource Planning to conduct site review of new developments prior to approval of the developments to ensure water supply source protection.
- Taneytown should encourage and support County adoption of the Performance Standards and Management Criteria for Water Resource Management that was developed by the County and approved by MDE.

Monitoring

- Continue quarterly VOC sampling for Well 13 and note any increase in concentrations of VOCs. If levels reach the MCL treatment for VOC removal or drilling a new well will have to be considered.
- Monitor for radon-222, gross alpha and radium 226 and 228 at each treatment plant and review results to determine if each plant will be in compliance with upcoming regulations.

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Additional bacteriological samples are recommended for well No. 12 to determine if they are consistently present, and if they are limited to total coliform as was found in the initial sample.

Land Acquisition/Easements

- The availability of loans for purchase of and/or easements for the purpose of protecting the water supplies is available from MDE. Loans are currently being 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 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.

Contaminant Source Inventory/Well Inspection

- The City should review the potential sources of contaminants within the WHPA and update them if necessary, including a consideration of historical uses.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination. The integrity of Well No. 12 and the service line should be carefully reviewed if subsequent sampling shows continued bacteriological contamination.

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, 199, 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.
- Senior, L. A., and Vogel K. L., 1995, Radium and Radon in Ground Water in the Chickies Quartzite, Southeastern Pennsylvania, U. S. Geological Survey Water-Resources Investigations Report 92-4088, 145 p.
- 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 Permit: CL1978G079
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: NE, NW, SE, and SW
USGS Topographic 7.5 Minute Taneytown Quadrangle
Maryland Office of Planning 1997 Carroll County Land Use Map
Maryland Office of Planning 1995 Carroll County Sewer Map

FIGURES
(in the pocket)

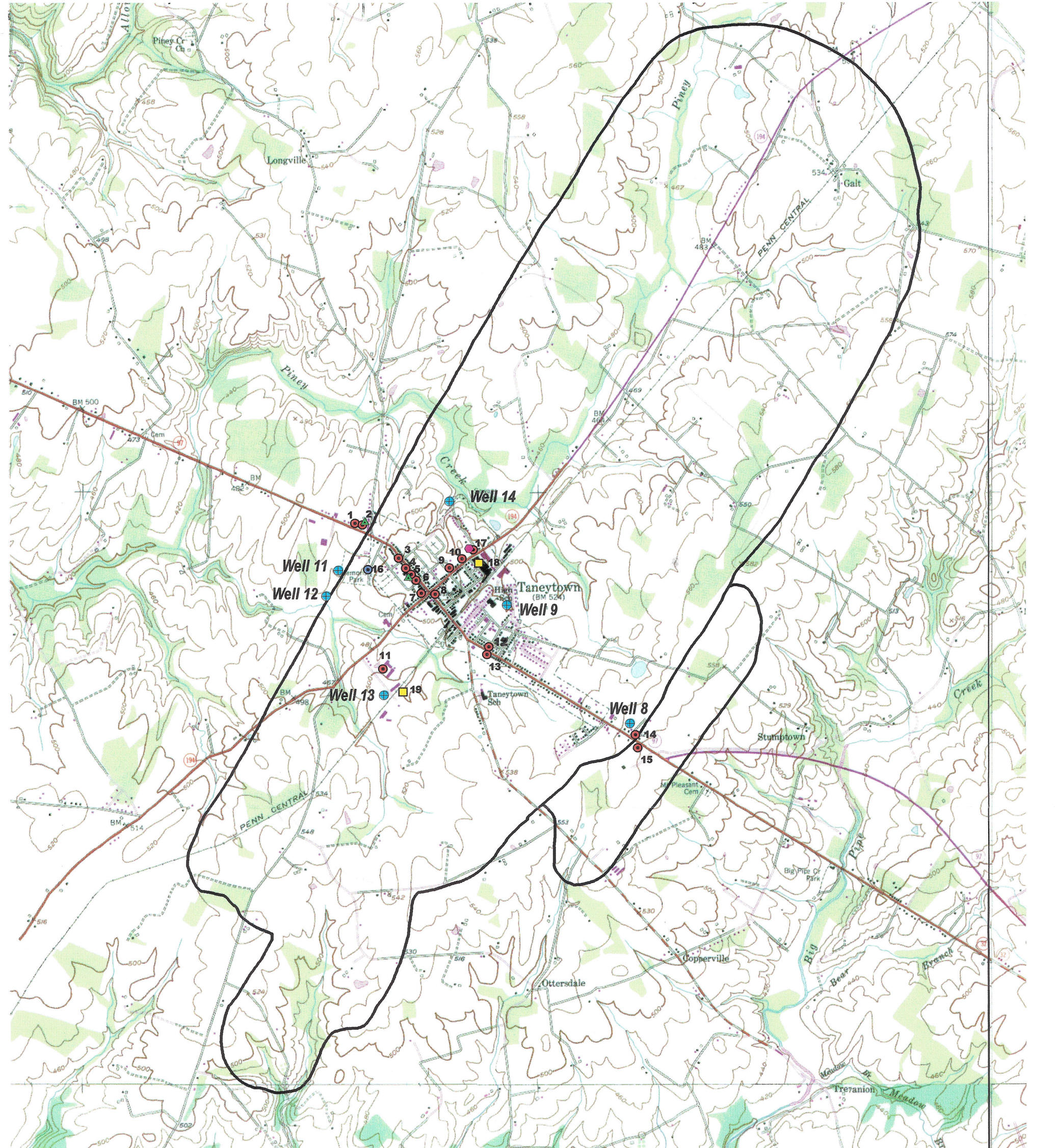
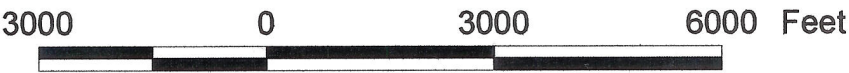
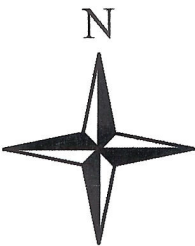


Figure 2. Taneytown Wellhead Protection Area with Potential Contaminant Sites



LEGEND

	Pesticide Dealer		Leaking Underground Storage Tank
	Ground Water Discharge		Taneytown Wellhead Protection Area
	Ground Water Contamination		Supply Well
	Underground Storage Tank		



Base Map: USGS Topographic 7.5 minute Taneytown Quadrangle



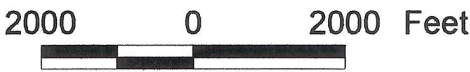
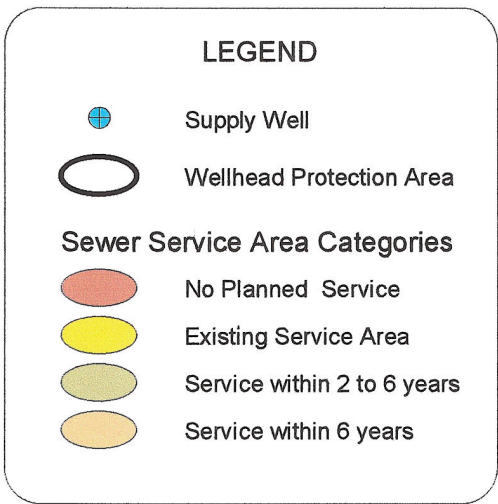
Figure 3. Land Use Map of the Taneytown Wellhead Protection Area



Source: Mayland Office of Planning 1997 Carroll County Land Use Map



Figure 4. Sewer Service Area Map of the Taneytown Wellhead Protection Area



Source: Maryland Office of Planning 1995 Carroll County Sewer Map