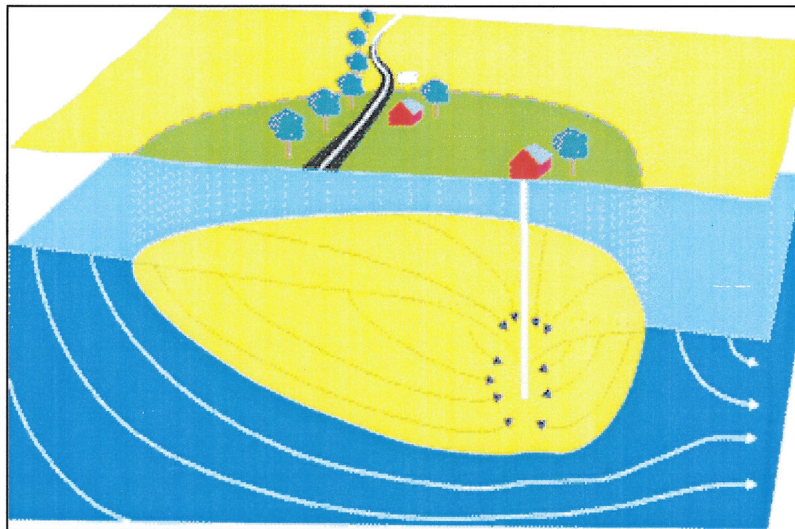


**SOURCE WATER ASSESSMENT
FOR THE CAMPUS HILLS WATER WORKS
HARFORD COUNTY, MD**



**Prepared By
Water Management Administration
Water Supply Program
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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted an assessment of the vulnerability of the Campus Hills Water Works ground water sources to contamination. 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 sources of the Campus Hills water supply draw water from unconfined fractured rock aquifers known as the Port Deposit Gneiss, and Wissahickon Formations respectively. Unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the wellhead protection area (WHPA). The system currently uses 5 wells to obtain their drinking water. The WHPA was delineated 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 Wellhead Protection Area and an aerial photograph of the well locations are enclosed at the end of the report.

The susceptibility analysis for the Campus Hills 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 the Campus Hills wells are susceptible to contamination by nitrate. Should the EPA adopt a drinking water standard for radon-222, the Campus Hills wells may also be susceptible to this naturally occurring contaminant. The Campus Hills water supply was determined not susceptible to volatile organic compounds, synthetic organic compounds, microbiological pathogens, and other regulated inorganic compounds and radionuclides.

INTRODUCTION

The Campus Hills Water Works is located about 1.2 miles southwest of Churchville in Harford County (Figure 1). The community water system serves a population of 250 with 75 connections. The properties served by the water company include the Campus Lakes residential subdivision, the Arena Athletic Club, the Campus Hills Shopping Center, fast-food restaurants, gas stations, a bank, and a movie theatre. The water system is privately owned by Dr. Charles Edwards, and is operated by the Maryland Environmental Service (MES). The water is supplied by five production wells that are pumped to a single water treatment plant located just to the west of Campus Hills Drive (Appendix A).

WELL INFORMATION

Well information was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary survey inspection reports and published reports. A review of well data and sanitary surveys of the Campus Hills water system indicates that Wells 1R, 4, 5, and the unused well meet current well construction standards for grouting and casing. Wells 2 and 3 were drilled prior to 1973 when regulations went into effect, and may not meet current construction standards. These wells are located in concrete vaults and their casings are several feet above the pit bottom, but only about 6 inches above ground level (Appendix A). Wells with casings that terminate below grade can be prone to flooding, which exposes the water supply to a variety of contaminants in storm water runoff.

During the site visit conducted on 12/13/04, water was observed in the bottom of the vault for Well 3, but not encountered in the vault for Well 2. Wells 1, 4, 5, and the unused well are located outside with casings extending at least two feet above ground surface. The unused well located within about 20 feet of a stream is permanently disconnected from the system due to low water yield. Unused wells with no planned future use should be properly abandoned and sealed as they may provide a direct route for ground water contamination to an aquifer. Table 1 contains a summary of the well construction data.

PLANT ID	SOURCE NAME	WELL PERMIT NO.	TOTAL DEPTH (ft.)	CASING DEPTH (ft.)	YEAR DRILLED	AQUIFER
01	WELL 1R	HA930410	200	62	1994	WISSAHICKON FORMATION
	WELL 2	HA690622	95	48	1969	PORT DEPOSIT GNEISS
	WELL 3	n/a	86	n/a	n/a	WISSAHICKON FORMATION
	WELL 4	HA941154	300	52	1998	PORT DEPOSIT GNEISS
	WELL 5	HA943704	375	60	2000	PORT DEPOSIT GNEISS
00	UNUSED	HA940938	400	24	1996	PORT DEPOSIT GNEISS

Table 1. Campus Hills Water Works Well Construction Information

Water Appropriation Permit No. HA1969G015 allows the system to use an average of 64,000 gallons per day (gpd) and 107,000 gpd in the month of maximum use. Based on reported pumpage from 2004, the system used an average of 59,484 gpd and 76,517 gpd during the month of maximum use. Average daily pumpage data reported over the past five years show a steady increase in useage each year from 31,361 gpd in 2000 to its current reported pumpage of 59,484 gpd.

HYDROGEOLOGY

Based on the Geologic Map of Harford County (MGS, 1968), the ground water wells used by Campus Hills Water Works are completed in the Port Deposit Gneiss Formation of early Paleozoic age, and the Wissahickon Formation of late Precambrian age. The Port Deposit Gneiss is described as a moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite quartz diorite, and biotite granodiorite. The rocks were sheared and re-crystallized by metamorphism thereby creating a strong, near-vertical foliation with fracturing in a northeast to southwest direction (REWEI, 1995).

The Wissahickon Formation is a foliated, micaceous schist with occasional beds of hard white quartzite (Dept. of Geology Bulletin 17, 1956). It occurs as an inclusion within the Port Deposit Gneiss in this area and is oriented in a northeast to southwest direction.

The primary porosity and permeability of these aquifers is small due to the crystalline nature of the rock. Ground water moves through secondary porosity, fractures, and joint openings, and is recharged by precipitation percolating through the overlying soils, and weathered bedrock called saprolite. The yield of a well in crystalline rock depends primarily on the number of fractures penetrated by the well. Typically, the water table in the aquifer mimics the surface topography. Local ground water flow patterns can be estimated by determining the location, aerial extent, and orientation of earth fractures, referred to as a fracture trace analysis.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered the source water assessment area for the system. Ground water flow in unconfined fractured rock aquifers is complex and cannot be accurately modeled by a homogeneous analytical model. The WHPA was originally delineated by R.E. Wright Environmental Inc. in 1995, and was revised by Atlantic Geoscience Corporation in 1998 based on the topographic watershed, fracture occurrence, and water balance criteria. The WHPA delineated in this report is based on the previous Wellhead Protection reports.

A Wellhead Protection Plan was implemented in 1999 for the Campus Lakes Subdivision and surrounding WHPA. This plan was included in the Harford County Master Water and Sewer Plan, and was adopted to provide protection of the ground

water resources for its water customers. A copy of this plan can be found in Appendix E, and its recommendations will be discussed later in this report.

The final delineation area was slightly modified to account for topography, ground water drainage divides from natural streams, an annual average recharge calculation, and a fracture trace map shown in Appendix B as interpreted by Nutter (MGS, 1977) and R.E. Wright. A fracture trace analysis identifies specific features on the surface that are expressions of near vertical closely spaced joints and fractures in the subsurface bedrock. Several linear features were determined near the Campus Hills well sites (Figure 2). The delineated WHPA encompasses these linear features and is considered the area in which any contaminant present could ultimately reach the wells.

The Campus Hills WHPA is irregularly shaped, and has an area of 160 acres. The boundaries of the WHPA extend outward from the wells to include the inferred fracture traces, stream boundaries, and topographic highs (Figure 2). In addition, the annual average recharge needed to supply the wells was also calculated. A drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground water contribution area required to supply the wells. The current Water Appropriation Permit for the Campus Hills Water Works is for an average daily withdrawal of 64,000 gallons. The total ground water contribution area was calculated from the following equation:

$$\text{Recharge Area (acre)} = \text{Average Use (gpd)} / \text{Drought Condition Recharge (gpd/acre)}$$

From the above equation, the total ground water contributing area during a drought is approximately 160 acres, which is consistent with the area delineated. The WHPA indicates a general ground water flow direction toward the northeast.

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks and lines, controlled hazardous substance generators, ground water discharge permit sites, and ground water contamination sites. These sites are generally associated with commercial or industrial facilities that use or store chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Non-point sources of contamination are associated with certain types of land use practices such as the use of pesticides, application of fertilizers, animal wastes, or septic systems that may lead to ground water contamination over a larger area.

The WSP met with Maryland Environmental Service operators in December 2004 to discuss water quality concerns, and to observe the integrity of the wells. Also, data was collected regarding the locations of the wells using Global Positioning System (GPS) equipment, and a windshield survey was conducted to locate and map potential sources of contamination located within and near the WHPA.

Point Sources

A review of MDE contaminant databases as well as the field surveys revealed some potential point sources of contamination in and adjacent to the Campus Hills WHPA. Facilities that have underground storage tanks (USTs), leaking underground storage tank lines (LUSTs), those classified as controlled hazardous substance generators (CHS), and sites with ground water discharge permits (GWDP) are located within or near the WHPA (Figure 3). In addition, miscellaneous sites (MISC) such as auto-body and repair shops, dry cleaners, and other commercial facilities that handle and use chemicals are also shown on Figure 3. 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), Synthetic Organic Compounds (SOC), Heavy Metals (HM), Nitrate/Nitrite (NN), and Microbiological Pathogens (MP).

ID	Type ¹	Site Name	Address	Potential Contaminant ¹
1	MISC	Metal Mechanics Automotive Center	302 Thomas Run Rd.	VOC, HM
2	UST, GWDP	Harford Technical High School	200 Thomas Run Rd.	VOC, MP, NN
3	UST	John Archer School	100 Thomas Run Rd.	VOC, HM
4	UST, LUST, CHS	Cross Campus BP	2201 E. Churchville Rd.	VOC, HM
5	GWDP, CHS	Harford Community College	401 Thomas Run Rd.	VOC, SOC, HM, MP, NN
6	GWDP	The Arena Club	2304 E. Churchville Rd.	MP, NN
7	UST	WAWA Gas Station	2300 E. Churchville Rd.	VOC
8	GWDP	Campus Hills Shopping Center	2400 E. Churchville Rd.	MP, NN
9	UST, LUST	Xtra Fuels / Mart	2476 E. Churchville Rd.	VOC
10	MISC	Food Lion	2458 E. Churchville Rd.	MP, NN
11	MISC	Dry Cleaners	2462 E. Churchville Rd.	VOC
12	MISC	Bearsch's United Auto Center	2468 E. Churchville Rd.	VOC, HM

Table 2. Potential Contaminant Point Sources within or near the Campus Hills Wellhead Protection Area (see Figure 3 for locations)

¹ UST = underground storage tanks, LUST = Leaking Underground Storage Tank Lines

CHS = controlled hazardous substance generators, GWDP = Ground Water Discharge Permit Sites, MISC = miscellaneous sites

VOC = volatile organic compounds, SOC = synthetic organic compounds

MP = microbiological pathogens, HM = Heavy Metals, NN = Nitrate/Nitrite

The MDE Oil Control Program reports two open cases located near the Campus Hills WHPA. Both sites had petroleum releases from underground line leaks resulting in ground water contamination. The sites are mapped as leaking underground storage tank lines (LUSTs) as shown on Figure 3. A summary of these cases can be found in Appendix C. The reader may contact the Oil Control Program for additional information.

Inspections of facilities located within and near the WHPA were completed by MDE staff to determine the potential of any unpermitted ground water discharges (e.g. open floor drains) to the unconfined aquifers. No violations have been reported.

Ground water discharge permits were issued to four facilities located within or near the Campus Hills Wellhead Protection Area. The facilities are shown on Figure 3 and listed in the preceding table. Summary reports and fact sheets discussing the general permit details and requirements are found in Appendix D. The reader may contact the specific programs within the MDE Waste and Water Management Administrations for additional information on any of the potential contaminant sites described in this report.

The storage of heating oil in underground tanks (e.g. site ID 2 & 3), and spills during the transportation of chemical products on MD Route 22, and Thomas Run Road are also potential sources of contaminants that could reach the water supply (Figure 3). The Campus Hills Wellhead Protection Area Implementation Plan specifies that home fuel heating tanks are not to be stored underground at the Campus Lakes Subdivision (Appendix E).

Non-Point Sources

The Maryland Office of Planning's 2002 digital land use map for Harford County was used to determine the predominant types of land use in the Campus Hills WHPA (Figure 4). The breakdown of land use types is shown on Table 3. Note that commercial followed by low-density residential make-up the largest portion of land use in the WHPA. As shown in Figure 4, the areas located directly south and southwest of the Water Treatment Plant that are designated in the land use map as cropland and orchards are now commercial lands.

LAND USE TYPE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	44.86	27.96
Commercial	49.08	30.59
Cropland	33.60	20.94
Orchards	9.38	5.85
Forest	16.95	10.56
Water	6.56	4.10
Total Area	160.43	100.00

Table 3. Land Use in the Campus Hills Water Works WHPA (See Figure 4)

The use of private septic systems, lawn maintenance and landscaping activities in residential areas, and agricultural and athletic fields at the Harford Community College are all potential non-point sources of nitrates, microbial pathogens, and SOC's to ground water. Commercial areas are associated with facilities that may have point sources of contamination as described in the previous section. Private

septic systems are commonly associated with nitrate loading of ground water and pose a potential risk to the aquifers that supply water to Campus Hills. Therefore, the wellhead protection plan stipulates that subsurface wastewater disposal systems within the Campus Lakes subdivision have advanced pre-treatment systems for the reduction of nitrate concentrations. The plan also stipulates restrictive covenants for the homeowners regarding the use of lawn fertilizers, pet waste management, and outdoor pesticide application (Appendix E).

Storm water runoff is also a concern since it may contain various contaminants that could infiltrate into the ground near the production wells. Therefore, storm water management design criteria was established in the wellhead protection plan that follows guidelines established by the Harford County Department of Public Works (Appendix E).

The activities at the Harford Community College within the western portion of the WHPA could also pose a potential risk of contamination to the Campus Hills water supply. The college should maintain a Best Management Practices (BMP) plan with emphasis on hazardous material handling, fertilizer and pesticide application, petroleum product storage, de-icing practices, and wastewater discharge within the WHPA. In addition, the college should adhere to all of the recommendations presented in its Source Water Assessment Plan (ALWI, 2001).

A review of the Maryland Office of Planning 2003 Harford County Sewerage Coverage Map indicates that there are no plans for public sewerage service in this area.

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 raw ground water is treated at the Campus Hills Plant with sodium hypochlorite for disinfection, and caustic soda for corrosion control prior to distribution.

A review of the monitoring data since 1993 indicates that the Campus Hills water supply meets the current drinking water standards. The water quality sampling results are summarized on Table 4.

PLANT ID	Nitrate		SOCs		VOCs		IOCs (except nitrate)		Radionuclides	
	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL	No. of Samples	No. of samples > 50% MCL
01	26	0	4	0	14	0	9	0	5	2*

Table 4. Summary of Water Quality Samples for the Campus Hills Water Supply

* Based on lower proposed MCL for radon-222

Inorganic Compounds (IOCs)

The regulated inorganic compounds detected in the Campus Hills ground water supply are listed on Table 5. Nitrate was the most common inorganic compound detected in the well, however the levels present are below 50% of the nitrate MCL of 10 parts per million (ppm). The other IOCs detected were at levels well below 50% of their respective MCL thresholds. Table 5 suggests that the installation of advanced pre-treatment sewer systems at the Campus Lakes Subdivision has been effective in maintaining nitrate concentrations below acceptable drinking water standards. The average nitrate detects since 1993 is 2.8 ppm.

CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
NITRATE	10	30-Dec-93	3.33
NITRATE	10	14-Dec-94	2.86
NITRATE	10	20-Nov-95	2.7
NITRITE	1	20-Nov-95	0.002
NITRATE	10	21-Nov-95	3.21
NITRATE	10	6-Aug-96	4.4
NITRATE	10	18-Dec-97	2.7
NITRATE	10	23-Jan-98	4.52
NITRATE	10	20-Oct-98	1.8
NITRATE	10	13-Jan-99	2
NITRATE	10	5-Jan-00	1.7
NITRATE	10	28-Jul-00	4.61
NITRATE	10	20-Oct-00	3.3
BARIUM	2	16-Nov-00	0.02
NITRATE	10	16-Nov-00	2.6
NITRITE	1	20-Nov-00	0.002
NITRATE	10	20-Nov-00	4.9
NITRATE	10	5-Jan-01	3
NITRATE	10	18-Dec-01	2.53
NITRATE	10	2-Jan-02	3.1
NITRATE	10	18-Oct-02	2.86
NITRATE	10	11-Aug-03	2.84
BARIUM	2	12-Aug-03	0.022
NITRATE	10	23-Oct-03	0.7

NITRATE	10	23-Oct-03	0.4
NITRATE	10	23-Oct-03	1.7
BARIUM	2	27-May-04	0.018
NITRATE	10	27-May-04	2.04
NITRATE	10	27-May-04	2.04
BARIUM	2	27-May-04	0.018
NITRATE	10	20-Oct-04	2.96

Table 5. Regulated IOC Detections in the Campus Hills Water Supply

Volatile Organic Compounds (VOCs)

The only VOCs detected from 14 sets of available sampling data were xylenes, toluene, ethylbenzene, and disinfection by-products known as trihalomethanes (THMs). Total xylenes were detected at 1.7 ppb in 1996 and at 3.6 ppb in 1998, but have not been detected since from 9 sets of subsequent sampling data. The MCL for total xylenes is 10,000 ppb. Toluene, and ethylbenzene were also detected at very low levels (1.1 ppb & 0.5 ppb respectively) from one set of sampling data in 1998 but also have not been detected since. The MCLs for these compounds are 1000 and 700 ppb respectively.

Disinfection byproducts known as trihalomethanes (THMs) were detected periodically in 6 sets of sampling data at low levels at the Campus Hills Plant from 1996 through 2001. The sum total of the four trihalomethanes (TTHM) detected ranged from 2.3 to 18.1 ppb. For regulated systems, the current MCL for TTHMs is 80 ppb. Disinfection byproducts are the result of a reaction between chlorine used for disinfection and organic material in the water supply. No THMS were detected since 2001 from the latest two sets of available sampling data.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl phthalate) was the only SOC detected from 4 sets of available sampling data since 1995. As shown in Table 6, the SOC was detected twice at levels below the MCL of 6 ppb. Phthalate was also detected in the laboratory blank samples and therefore the results are not interpreted to represent actual water quality.

CONTAMINANT	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
DI(2-ETHYLHEXYL) PHTHALATE	6	20-Oct-98	0.5
		3-Jun-02	4.7

Table 6. SOC Detections in the Campus Hills Water Supply

Radionuclides

Radiological contaminants detected in the Campus Hills ground water supply are shown in Table 7. Gross alpha was detected in three sets of sampling data at levels well below its MCL of 15 picoCuries/Liter (pCi/L). Gross alpha radiation

is a measure of alpha particle activity and is used as an indicator for the presence of other natural and man-made radionuclides. Radon-222 was detected in both sets of sampling data tested (Table 7). 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.

CONTAMINANT	MCL (pCi/L)	SAMPLE DATE	RESULT (pCi/L)
GROSS ALPHA	15	1-Apr-92	1.2
GROSS ALPHA	15	29-Apr-96	5
RADON-222	300*	4-Mar-97	1125
GROSS ALPHA	15	20-Nov-00	1
RADON-222	300*	27-May-04	1562

Table 7. Radionuclides Detected in the Campus Hills Water Supply

* Lower proposed MCL

Microbiological Contaminants

Raw water samples were collected and tested for bacteria for all of the supply wells to determine whether these sources are ground water under the influence of surface water (GWUDI). Well 5 was classified as moderate risk to surface water influence after it was discovered that the newly constructed Arena Athletic Club's storm water outfall pipe drained near the existing well. The protocol for moderate risk GWUDI sampling requires one raw water sample to be collected as soon as possible after a minimum of 0.5 inches of rainfall in 24 hours has occurred. The initial testing conducted on September 10, 2004 indicated the presence of total coliform bacteria at this well (Table 8). The WSP required the owner to re-grade the constructed swale to ensure that the storm-water drains away from the well to prevent flooding. The well was re-tested by determining the actual coliform concentration in the sample. The test results were negative for the presence of total and fecal coliform bacteria (Table 8). GWUDI tests were completed in 1998 and 2000 for the other supply wells and their test results were also negative for the presence of total and fecal coliform bacteria (Table 8).

SOURCE NAME	RAIN DATE	RAIN AMOUNT (inches)	REMARK	SAMPLE DATE	TEMP. (°C)	PH	TURBIDITY (NTU)	TOTAL COLIFORM (col/100 ml)	FECAL COLIFORM (col/100 ml)
Well 1R	n/a	0	DRY	22-Dec-98		6.8		0	0
Well 2	n/a	0	DRY	22-Dec-98		6.8		0	0
Well 3	n/a	0	DRY	22-Dec-98		6.8		0	0
Well 4	14-Jun-00	0.5	WET	14-Jun-00				0	0
Well 5	9-Sep-04	0.75	WET	10-Sep-04	12	5.8	0.19	present	absent
Well 5	19-Oct-04	1	WET	20-Oct-04				-1.1	-1.1

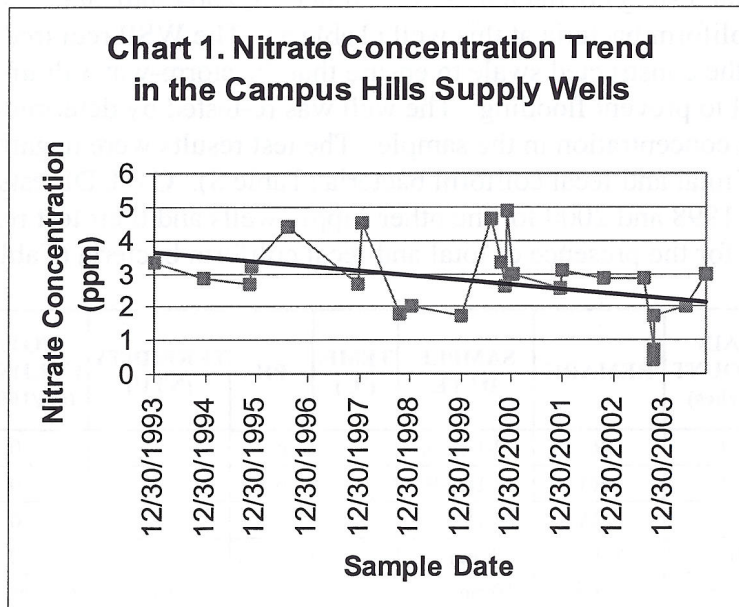
Table 8. Raw Water GWUDI Test Results for the Campus Hills Water Works Supply Wells

SUSCEPTIBILITY ANALYSIS

The Campus Hills wells obtain water from unconfined fractured rock aquifers. Wells in unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the WHPA. Therefore, managing this area to minimize the risk to the aquifer 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.

Inorganic Compounds (IOCs)

Nitrate is present in the ground water supply at levels below 50% of its MCL of 10 ppm. The available data shows that the trend of nitrate levels has been decreasing over the past eleven years with occasional spikes that approach the $\frac{1}{2}$ MCL threshold (Chart 1). Sources of nitrate can generally be traced back to land use. Fertilizer applied to agricultural and athletic fields, residential lawns, and effluent from residential and commercial on-site septic systems are non-point sources of nitrate in ground water. A review of Table 3 indicates that commercial and residential areas that utilize on-site septic systems cover 59% of the WHPA. The Harford Community College has a ground water discharge permit for their private septic systems (Figure 3), and their agricultural and athletic fields also cover a portion of the Campus Hills recharge area (Figure 1). Based on 2003 data, there are no plans for public sewer service in this area.



During the site visit, it was observed that individual Campus Lakes residential septic systems are located directly upgradient of Well 2, and the septic leach field for the Arena Athletic Club is located behind and about 100 feet from the Water Treatment Plant (Appendix A). The Arena Club has a permit to discharge its wastewater to the ground (Appendix D). It also must be noted that these systems have advanced pre-treatment for the reduction of nitrate concentrations as required by the statutes of the Campus Hills Wellhead Protection Area Implementation Plan (Appendix E). The sampling data illustrated in Chart 1 implies that the pre-treatment systems are effective in maintaining nitrate concentrations below acceptable drinking water standards.

Due to the presence of potential non-point sources within the WHPA coupled with the need for advanced pre-treatment systems to reduce nitrate concentrations, the Campus Hills well field is susceptible to nitrate contamination. Low levels of other inorganic constituents detected in the wells may likely represent the naturally occurring levels present in the aquifers from dissolving minerals in the bedrock. Therefore, the water supply is **not** susceptible to other regulated inorganic compounds other than nitrate, based on available water quality data.

Volatile Organic Compounds (VOCs)

The only volatile organic compounds that have been regularly detected at low levels from the 14 sets of available sampling data since 1991 are the disinfection by-products known as trihalomethanes (THMs). THMs are the result of a reaction between chlorine used for disinfection and organic material in the water supply. The sum total of the four trihalomethanes (TTHM) detected in 6 sets of sampling data ranged from 2.3 to 18.1 ppb. These levels are typical of levels measured at other ground water systems in Maryland. The MCL for TTHMs is 80 ppb. No THMs have been detected since 2001 from the latest two sets of available sampling data.

Xylenes were detected at low levels in 1996 and again in 1998 from 2 sets of sampling data. Xylenes are by-products of gasoline, paints, inks, and detergents. Toluene and ethylbenzene were also detected at very low levels from a single set of sampling results in 1998. Toluene is a gasoline additive, and a manufacturing solvent. Ethylbenzene is also found in gasoline, and may be a manufacturing waste by-product. These compounds were detected at levels well below their respective MCLs, and have not been detected again in 9 sets of sampling data since 1998. Potential VOC point sources were identified within and near the Campus Hills WHPA (Figure 3). However, these sources do not appear to have a significant impact on the wells based on the available water quality data. Therefore, the Campus Hills ground water supply is **not** susceptible to VOC contamination.

Synthetic Organic Compounds (SOCs)

The current land use suggests that the potential non-point sources of SOC's located within the WHPA are residential areas that account for 28 percent (Table 3), and the agricultural and athletic fields at the Harford Community College. Pesticides and chemicals used on residential lawns, gardens, agricultural land, and ball fields are a potential threat. However, as part of the Campus Hills Wellhead Protection Area Implementation Plan (Appendix E), the Campus Lakes homeowners are required to follow certain restrictive covenants regarding the use of lawn fertilizers and outdoor pesticide applications. Additionally, the college should adhere to a Best Management Practices (BMP) plan regarding the proper usage and storage of these chemicals in order to prevent ground water contamination.

No SOC's relating to water quality were detected from 4 sets of available sampling data at the plant. This indicates that synthetic chemicals are not being over-applied in the WHPA. The low-level phthalate detects in two samples were also detected in the laboratory blanks and therefore do not represent actual water quality. Based on this analysis, the ground water supply at Campus Hills Water Works is **not** susceptible to SOC contamination.

Radionuclides

There is currently no MCL for radon-222, however EPA has proposed an MCL of 300 pCi/L or an alternative of 4000 pCi/L if the State has a program to address the more significant risk from radon in indoor air. Based on two samples collected, the levels were well above the lower proposed MCL of 300 pCi/L (Table 7). The source of radon and other radiological contaminants in ground water can be traced back to the natural occurrence of uranium in rocks. Radon may be prevalent in ground water of crystalline rock aquifers due to the radioactive decay of uranium bearing minerals in the bedrock. Gross alpha radiation was detected at low levels from three sets of water samples (Table 7). The results are less than 50% of the 15 pCi/L MCL.

Based on the available sampling data, the Campus Hills wells may be susceptible to radon-222 based on the lower proposed MCL, but they are **not** susceptible to other radionuclides as detections were below levels of concern.

Microbiological Contaminants

Based on limited raw water bacteriological data (Table 8) the Campus Hills supply wells were determined not to be under the direct influence of surface water. Hence the supply wells are **not** susceptible to any microbiological contaminant present at the surface including *Giardia* and *Cryptosporidium*.

MANAGEMENT OF THE WHPA

Local Planning Team

- At the request of MDE and the Harford County Health Department, a Wellhead Protection Area Implementation Plan was adopted in 1999 in conjunction with the development of Campus Lakes subdivision. Representatives from the Health Department, MDE, Campus Hills Water Works, Campus Lakes LLC, and the Harford Community College reviewed and approved this plan. MDE requires that the strategies in the plan continue to be implemented in order to protect the Campus Hills well field from contamination. The details of the plan are included in Appendix E.

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 Maryland Environmental Service or MDE.
- Conduct educational outreach to commercial facilities within the WHPA that may present potential contaminant sources. Important topics include: (a) compliance with MDE and federal guidelines for USTs, (b) best management practices, (c) proper chemical storage practices, (d) reporting chemical and petroleum spills, and (e) proper 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.

Planning/New Development

- Campus Hills Water Works should stay in contact with the Harford Community College and Campus Lakes Home Owners Association regarding any proposed construction of additional improvements within the WHPA to ensure that they will not have any adverse affects to water quality. It is imperative that the college adhere to all of the recommendations presented in its Source Water Assessment Plan (ALWI, 2001), and that the college and Campus Lakes Subdivision follow the requirements of the Campus Hills Wellhead Protection Area Plan to ensure adequate protection of the ground water sources.
- Since the adoption of the Wellhead Protection Area Plan in 1999, the addition of the Arena Athletic Club with its on-site wastewater disposal system (Appendix A), and paved surface area poses yet another potential threat of elevated nitrate levels, and storm water runoff, and further reduces the available aquifer recharge in the WHPA.

Monitoring

- Continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.
- Annual raw water bacteriological testing of each well is a good check on well integrity.

Contingency Plan

- COMAR 26.04.01.22 regulations require all community water systems to have 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 to the WHPA. The system is required to contact the Water Supply Program when an increase in pumpage is applied for and when new wells are being considered.

Recommendations for Campus Hills Water Works

- Campus Hills Water Works should review the potential sources of contaminants within the WHPA and update them if necessary.
- Periodic inspections and a regular maintenance program for the supply wells will ensure their integrity and protect the aquifer from contamination.
- The unused well near Well 4 that is disconnected from the system should be properly abandoned and sealed according to current State well construction regulations. Unused wells may provide a direct route for ground water contamination to an aquifer.
- The ground surface around the wellheads should be graded such that positive drainage away from the wells is maintained at all times to prevent surface water ponding that may occur after precipitation events. This will help prevent any surface water infiltration into the wells. Depressions around Well 4 were observed during the field survey.

REFERENCES

- Advanced Land and Water, Inc. (ALWI), 2001, Source Water Assessment Plan for Harford Community College, Harford County, Maryland: ALWI Project No. HA7E014, 18 p.
- Atlantic Geoscience Corporation (AGC), 1998, Wellhead Protection Plan Update Campus Hills Water Service Area, Harford County, Maryland: AGC Project No. MD0022, 27 p.
- Campus Lakes, LLC, 1999, Campus Hills Wellhead Protection Area Implementation Plan, 9 p.
- Dingman, R.J., Ferguson, H.F., and Martin, R.O.R., 1956, The Water Resources of Baltimore and Harford Counties: Maryland Department of Geology, Mines and Water Resources Bulletin 17, 233 p.
- Earth Data Inc. (EDI), 1996, Hydrogeologic Evaluation For Groundwater Appropriation Permit Application HA69G015/3 for the Campus Hills Waterworks Harford County, Maryland: EDI Project No. 1993, 36 p.
- Earth Data Inc. (EDI), 2001, Hydrogeologic Evaluation For Groundwater Appropriation Permit Application HA69G015/5 for the Campus Hills Waterworks Harford County, Maryland: EDI Project No. 2742, 21 p.
- Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.
- Maryland Geologic Survey, 1968, Geologic Map of Harford County
- Nutter, L.J., 1977, Ground -Water Resources of Harford County Maryland: Maryland Geological Survey Bulletin No. 32, 44 p.
- R.E. Wright Environmental, Inc. (REWEI), 1995, Campus Hills Development Wellhead Protection and Nitrate Loading Re-Assessment: REWEI Project M95147, 13 p.

OTHER SOURCES OF DATA

Water Appropriation and Use Permit: HA1969G015
Public Water Supply Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
Department of Natural Resources 1998 Digital Orthophoto Quarter Quadrangles for Bel Air
USGS 7.5 Minute Series Topographic Map, Bel Air Quadrangle
Maryland Office of Planning 2002 Harford County Digital Land Use Map
Maryland Office of Planning 2003 Harford County Digital Sewerage Coverage Map
Maryland State Highway Administration Roads and Streams Map

FIGURES

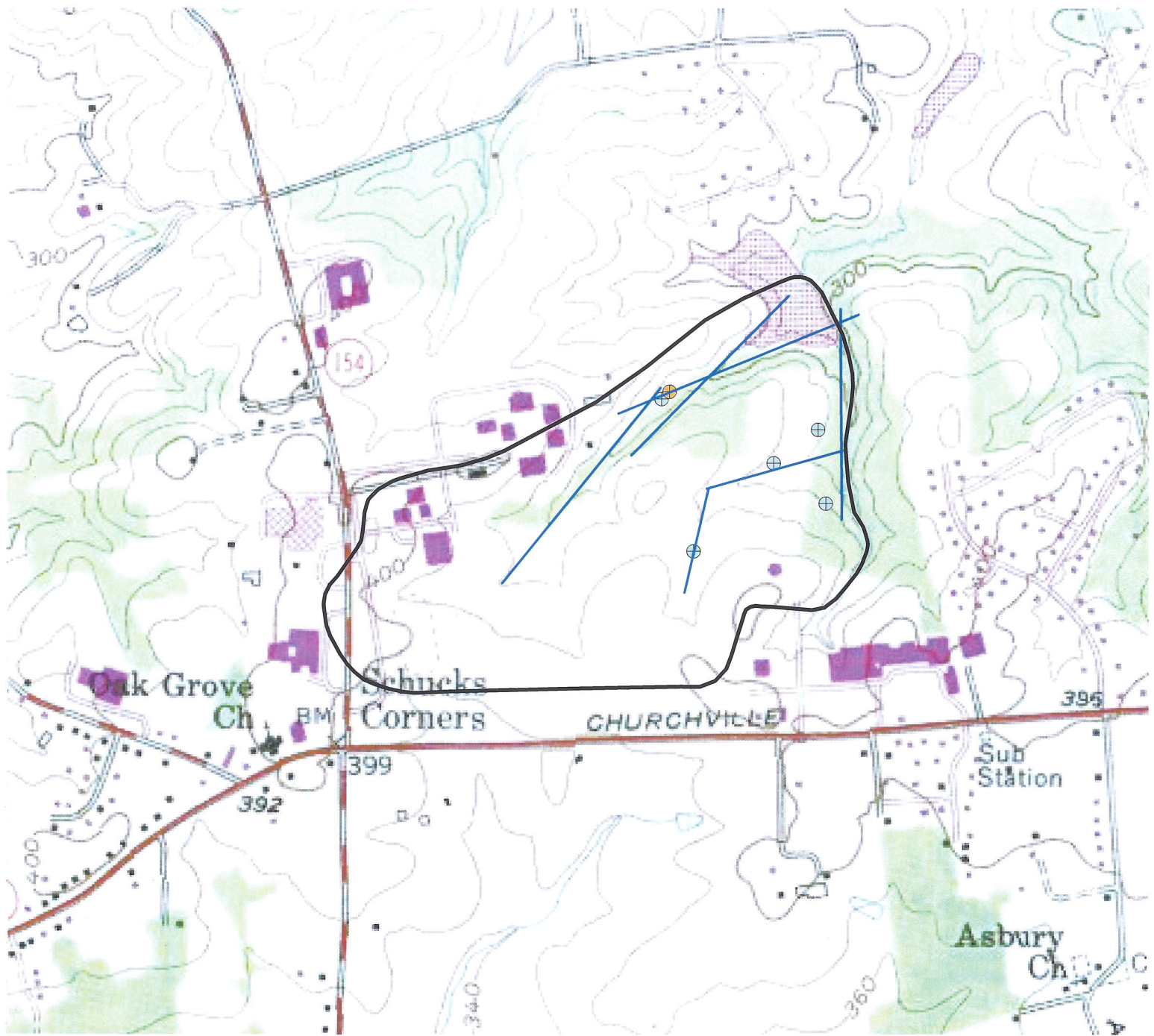
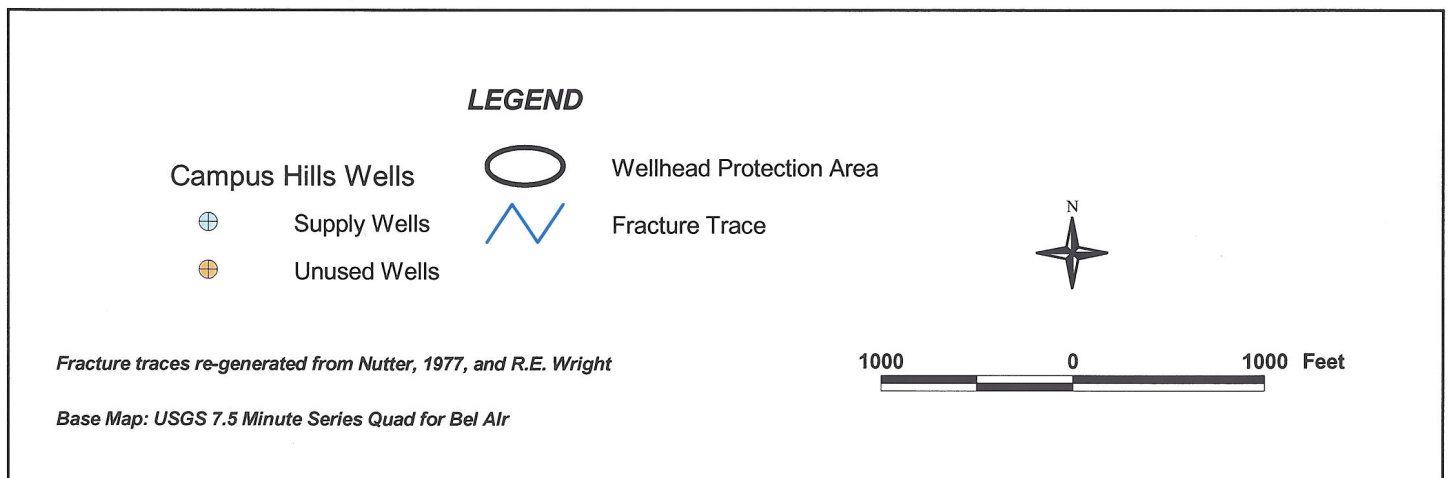


Figure 2. Campus Hills Water Works Wellhead Protection Area



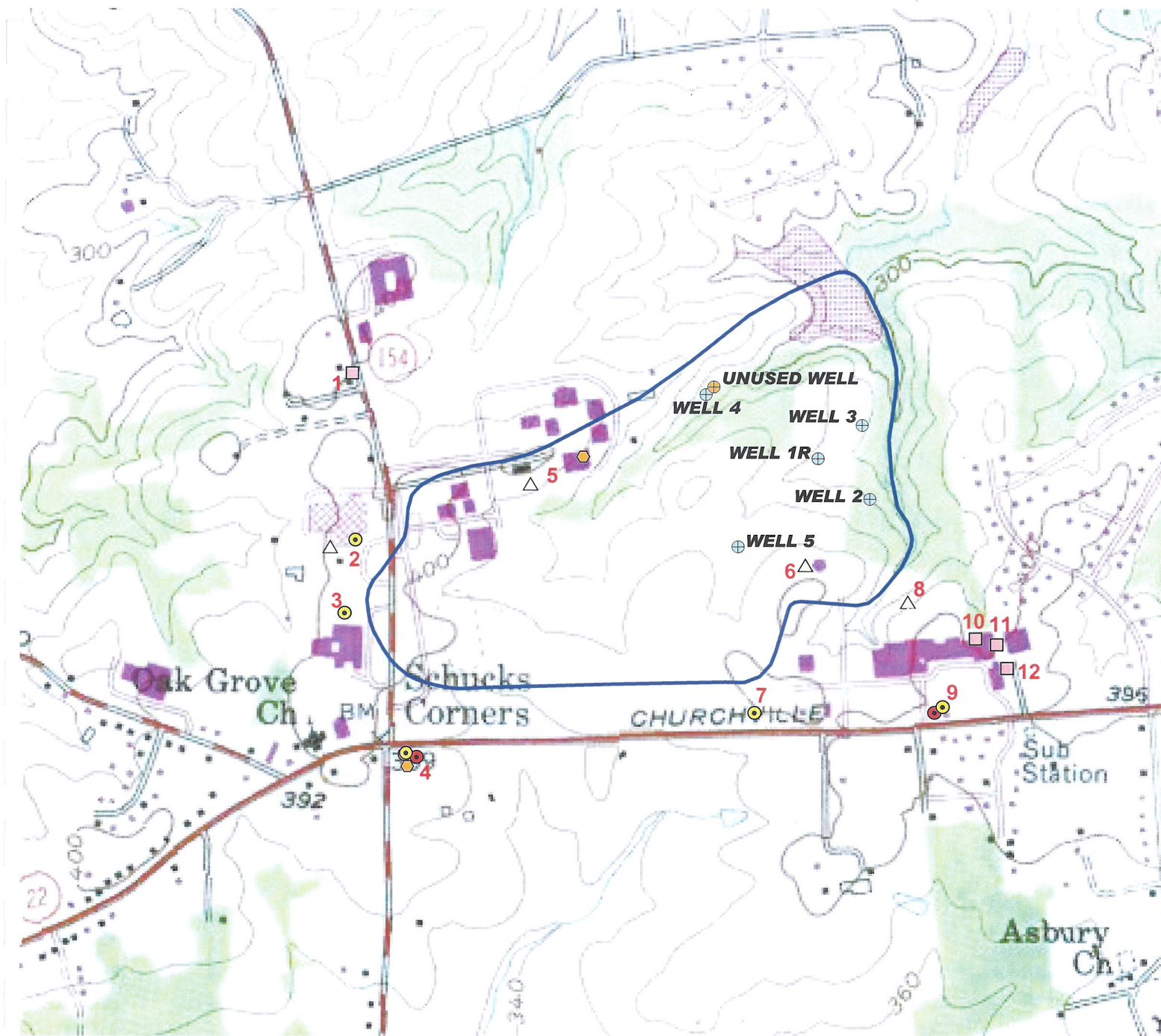
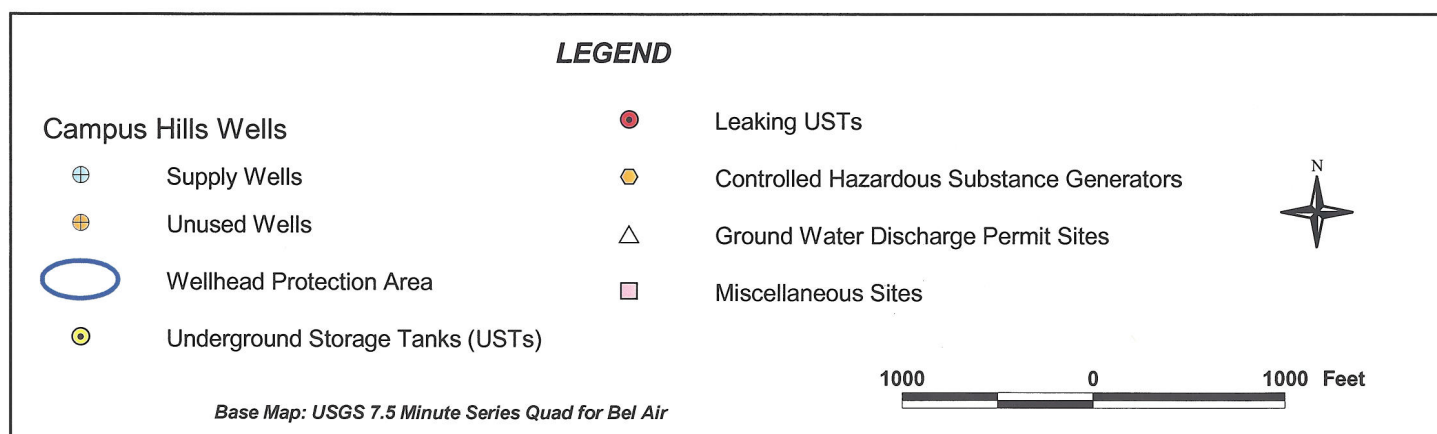


Figure 3. Campus Hills Wellhead Protection Area with Potential Contaminant Sources



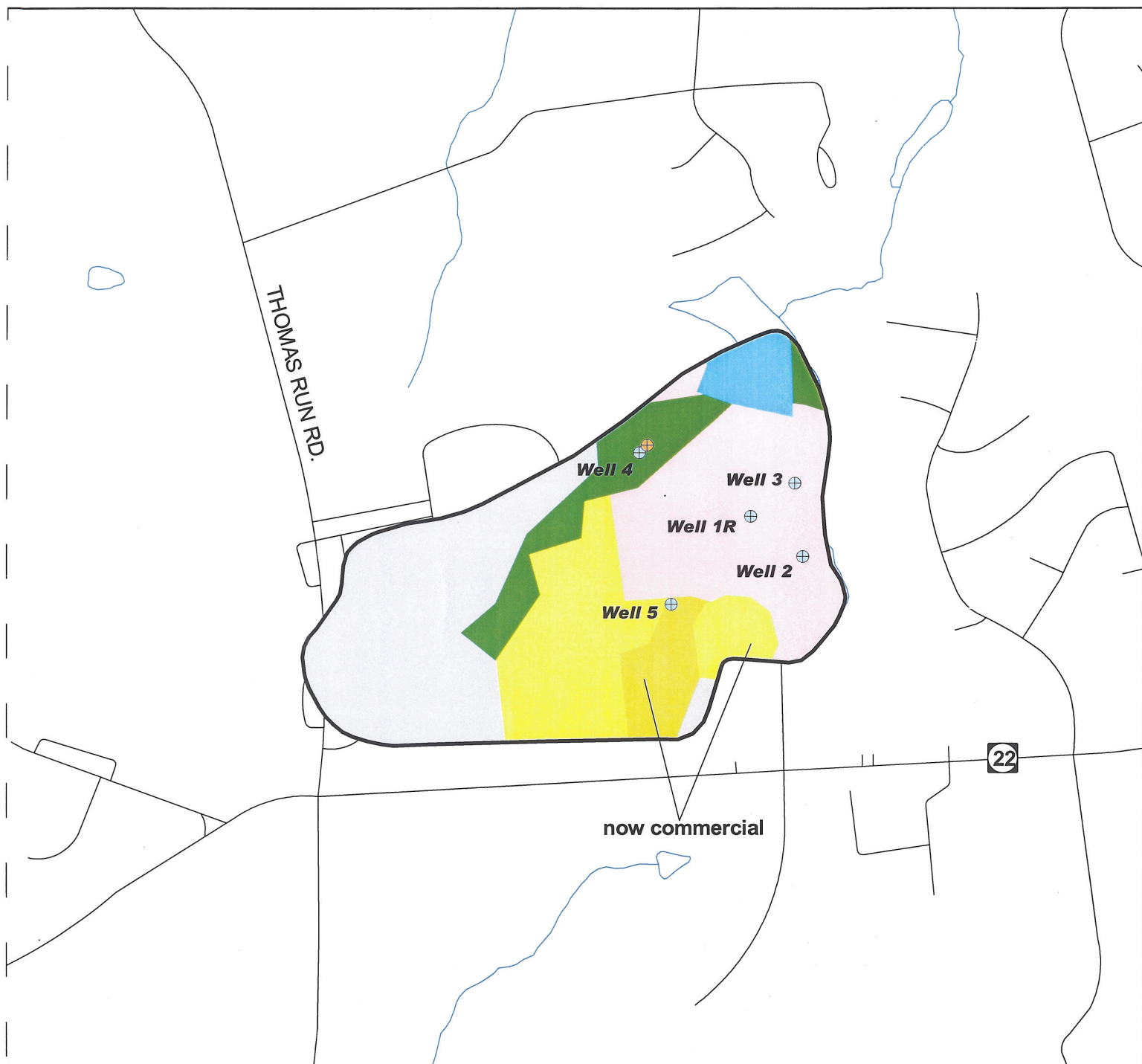
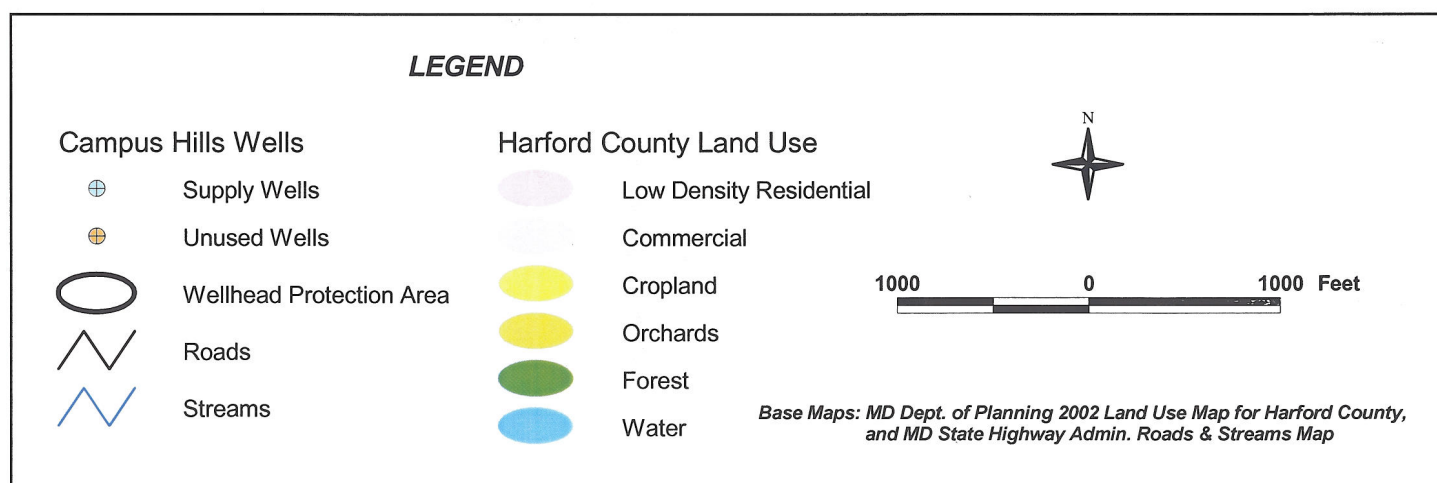
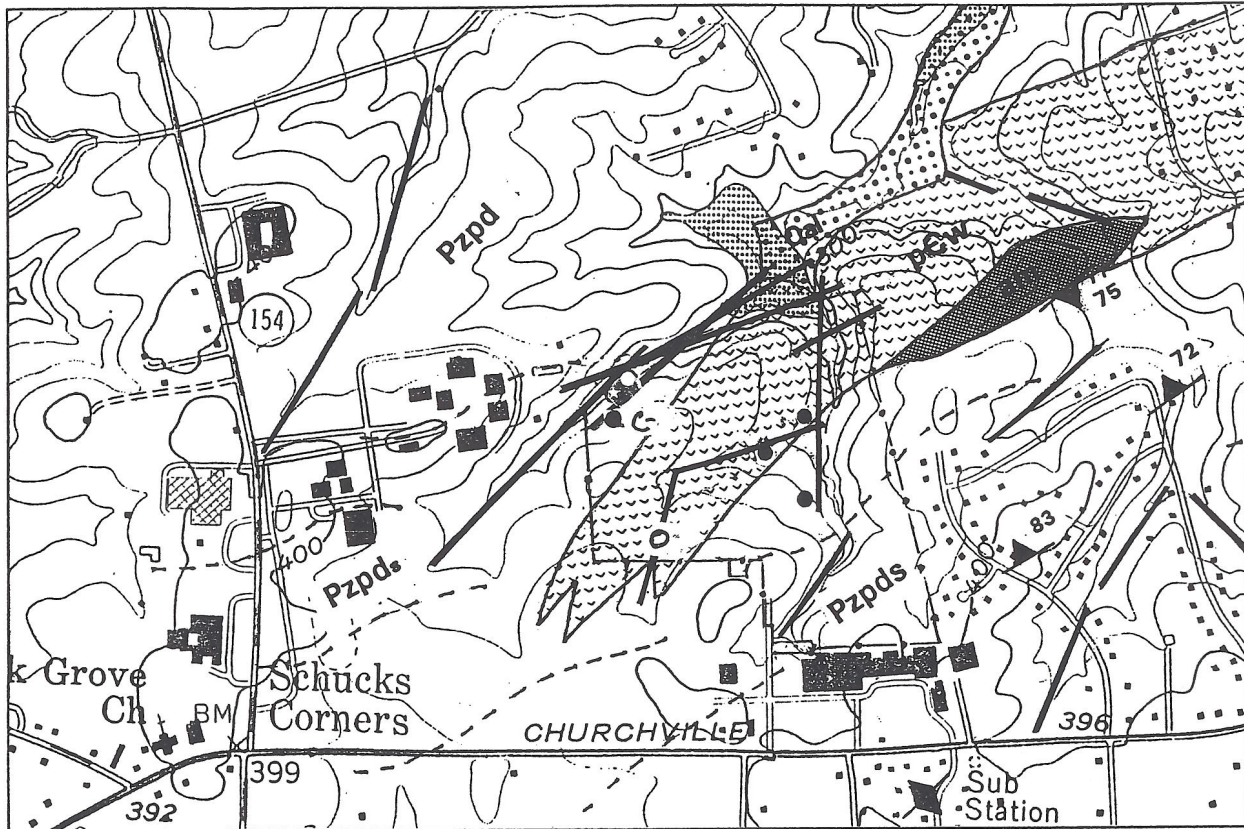


Figure 4. Land Use in the Campus Hills Water Works Wellhead Protection Area



APPENDICES

APPENDIX B
Fracture Trace Map



LEGEND

- Test Well
- Pumping Well

— Waterworks Wellfield Property

Linear Feature
Planar Feature (schistosity)
strike and dip shown

Qal Alluvium

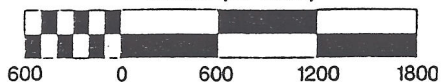
Pzpd Port Deposit Gneiss

Pspds Port Deposit Gneiss, strongly sheared
schistose facies

pcw Wissahickon Formation

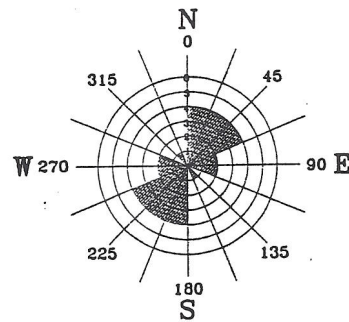
am amphibolite facies of Wissahickon Fm

Scale (in feet)



(1 inch = 1,200 feet)

Base map from USGS 7.5-minute topographic quadrangle for Bel Air (photorevised, 1986).
Geology from Southwick and Owen, 1968;
Linear features from Nutter, 1977, and R. E Wright.



Rosette diagram

FIGURE 3

LOCAL GEOLOGIC MAP
Showing Linear Features

FROM HYDRO EVALUATION REPORTS FOR CAMPUSTHILLS WATERWORKS BY EARTH DATA
INC., 1996, 2001.

APPENDIX C

Summary of MDE Oil Control Program Open Cases Near WHPA

CASE NO.	NAME	LOCATION	STATUS AS OF JANUARY 2005
02-1231HA	Cross Campus BP (formerly Amoco)	2201 E. Churchville Rd.	BP was recently sold to Ocean Petroleum. Line leak occurred during excavation for upgrading the gas lines. MTBE was detected in nearby well. Two inch monitoring wells were installed. Geo-probe investigation was conducted. Initial monitoring results were inconclusive. Oil Control Program is overseeing ongoing monitoring efforts.
9-0972HA	Xtra Fuels/Mart (formerly Uncle Marvin's Oasis)	2476 E. Churchville Rd.	Ground water contamination from a line leak spill. Pump and treat system and monitoring wells network were installed. Oil Control Program is coordinating on-going remediation efforts, and they have required monitoring of treated water effluent.

MDE Oil Control Program Open Cases near the Campus Hills Wellhead Protection Area

APPENDIX D

Summary of MDE Ground Water Discharge Permits Within or Near WHPA

**Department of The Environment
Groundwater Discharge Permit
Summary Report and Fact Sheet**

Project Type: Absorption Trench System

State Application No.: 99-DP-3285

Facility Name: Harford Technical High School

Address: 200 Thomas Run Road
Bel Air MD 21015

County: Harford

Contact (name,title): Christopher Morton, Assitant Supervisor

Phone: (410) 638-3165

Applicant is engaged in: Operation of a public school

Legal Name of Applicant: Board of Education of Harford County

Address: 45 East Gorden Street, Bel Air MD 21014

Basin Code: ??-??-??-??

Receiving Water Name(class): Groundwater Type I Aquifer??

MD Coordinates: East: 1,000,500 North: 629,000

Public Notice Issue Date: November 11 and 18, 1998

Application Received: October 14,1998 **Assigned:** October 21, 1998

Project Manager: Ching-Tzone Tien/ Jay Prager

Phone: (410) 631-3779

Date Completed:

Reviewed By:

Date Reviewed on:

Wastewater Characteristics

Average Flow: 11,022gpd Peak Flow:22,044 gpd

Proposed Discharge Period: Year round

Flow Diagram

septic tank --> gravity absorption trenches

Groundwater System

Aquifer Name:

Port Deposit Gneiss/Gabbro/Peter's Creek Quartzite

Other Properties:

Transmissivity ranges from 650 to 6100 gpd/ft based on tests performed at two near-by community wells.

Projected Impact:

The nitrogen balance analysis indicates the nitrogen level in the percolate will be diluted to less than 10 mg/l before exiting the property.

Present Use:

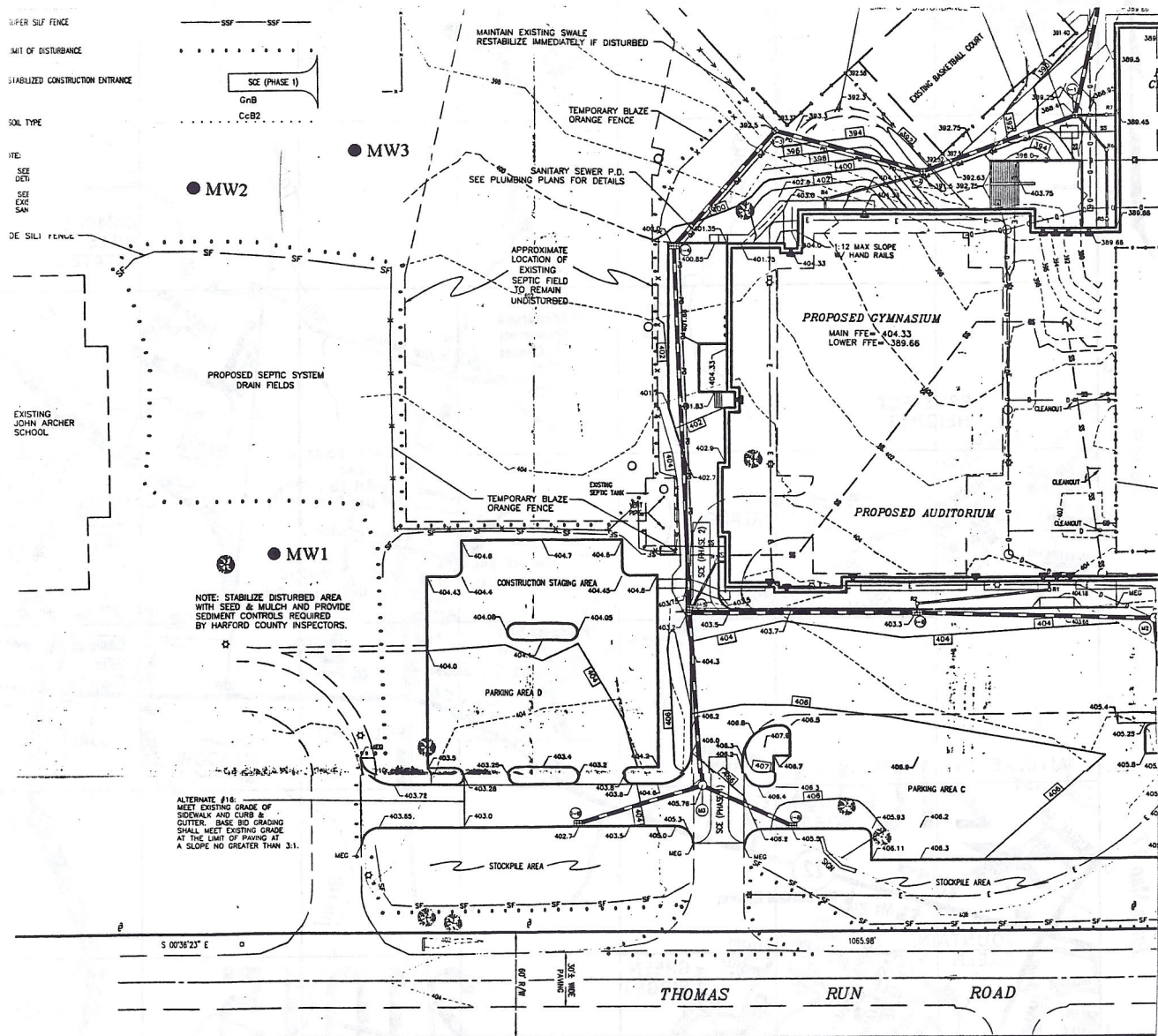
Both the present and proposed use is for a High School. This permit is for a small expansion of the existing use.

Fact Sheet

The applicant has applied for a permit to discharge septic tank effluent to the land and subsequently to groundwaters of the State. Significant information involving the application, additional data and determinations made by the State may be summarized as follow:

Description of the Facility:

The Harford Technical High School system is planned to receive sewage effluent from a high school. The septic tank discharges by gravity to a series of five cells of drainfields. As existing, there are three cells with 600 feet of trench per cell. As proposed, two additional cells will be added with 600 feet of trench each. The cells can be managed so that one or more cells is always at rest.



Map B. Locations of Monitoring Wells (●) and Subsurface Systems
(not to scale)

Permit Information

Facility: HARFORD COMMUNITY COLLEGE

6786



General Information

Permit Type: **WMA** **GROUNDWATER MUNICIPAL DISCHRG**

App. #: **04DP3274** Permit #: **98DP3274**

Permit Category: **SUBSURFACE SYSTEM**

App. Description: **3000 GPD TO SEPTIC SYSTEM**

NPDES #: Project Manager: **TIEN** **CHINGTZONE**

Date Received: **03/23/2004** ☒ **Admin. Procedures** Permit Revised: **03/23/2004**

Permit Detail

Billing/Pymnts

Status Information

Permit Status: **PR** **PENDING-RENEWAL**

Date Status Changed: **03/23/2004**

Acknowledgement Sent:

Initial Projected Issuance: **12/23/2004**

Revised Projected Issuance: **06/12/2005**

Last Permit Issued:

Permit Expiration:

Prev Permit Expiration: **08/01/2004**

HB9 Refund Request

Complete Application: **04/12/2004**

Renewal Notice Sent:

Total Processing Delay (Initial Issuance): **1qst/Subm**

Total Processing Delay (Rev Issuance): **2roc Delay**

First Est. Tentative Determination:

Revised Est. Tentative Determination:

Tentative Determination Complete:

ancel-Return Li

Cancel

Ok

**Department of The Environment
Groundwater Discharge Permit
Summary Report and Fact Sheet**

Project Type: Absorption Trench System

State Application No.: 98-DP-3274

Facility Name: Harford community College
Address: 401 Thomas Run Road
Bel Air MD 21015

County: Harford

Contact (name,title): Stephen Gary, Associate Director

Phone: (410) 836-4156

Applicant is engaged in: Operation of a Community College

Legal Name of Applicant: Harford Community College

Address: 401 Thomas Run Road, Bel Air MD 21015

Basin Code: ???.???.??.

Receiving Water Name(class): Groundwater Type I Aquifer??

MD Coordinates: East: 1,001,800 North: 630,000

Public Notice Issue Date: June 17 and 18, 1998

Application Received: June 4, 1998 **Assigned:** ???

Project Manager: Ching-Tzone Tien/ Jay Prager

Phone: (410) 631-3779

Date Completed:

Reviewed By:

Date Reviewed on:

Wastewater Characteristics

Average Flow: 5,500gpd Peak Flow: 11,000 gpd

Proposed Discharge Period: Year round

Flow Diagram

septic tank --> pump chamber --> siphon chamber -->
pressure manifold --> gravity absorption trenches

Groundwater System

Aquifer Name:

Port Deposit Gneiss/Gabbro/Peter's Creek Quartzite

Other Properties:

Transmissivity ranges from 650 to 6100 gpd/ft based on tests performed at two near-by community wells.

Projected Impact:

The nitrogen balance analysis indicates the nitrogen level in the percolate will be diluted to less than 10 mg/l before exiting the property.

Present Use:

Both the present and proposed use is for a Community College. This permit is for a small expansion of the existing use.

Fact Sheet

The applicant has applied for a permit to discharge septic tank effluent to the land and subsequently to groundwaters of the State. Significant information involving the application,

additional data and determinations made by the State may be summarized as follow:

Description of the Facility:

The Harford Community College system is planned to receive sewage effluent from a community college. The system described herein receives only that portion of effluent produced from Edgewood Hall, the new library, Maryland Hall, the Book Store, Aberdeen Hall, Havre de Grace Hall, The Barn, and Bel Air Hall. Sewage effluent is collected by gravity sewer and transported to a 16,000 gallon septic tank. The septic tank discharges by gravity to a pump chamber that is interconnected to a storage/overflow tank. The pump chamber will discharge effluent to a dosing siphon chamber. The siphon chamber discharges to three 50% drainfields; two alternating one resting. A pressure manifold is to be used so that all trenches receive an equal flow. The subsurface disposal system consists of three treatment cells which each contains 900 linear feet of disposal trench. The disposal trenches are three feet wide, 6.5 feet deep, and spaced 12.5 feet apart center to center.

PUBLIC NOTICE

Harford County

State Discharge Permit 98-DP-3274 Harford Community College, 401 Thomas Run Road, Bel Air, Maryland 21015-1698 submitted an application for a permit to discharge a maximum of 8,320 gallons per day of septic tank effluent from the college campus located at the same address to groundwater via a subsurface soil absorption system.

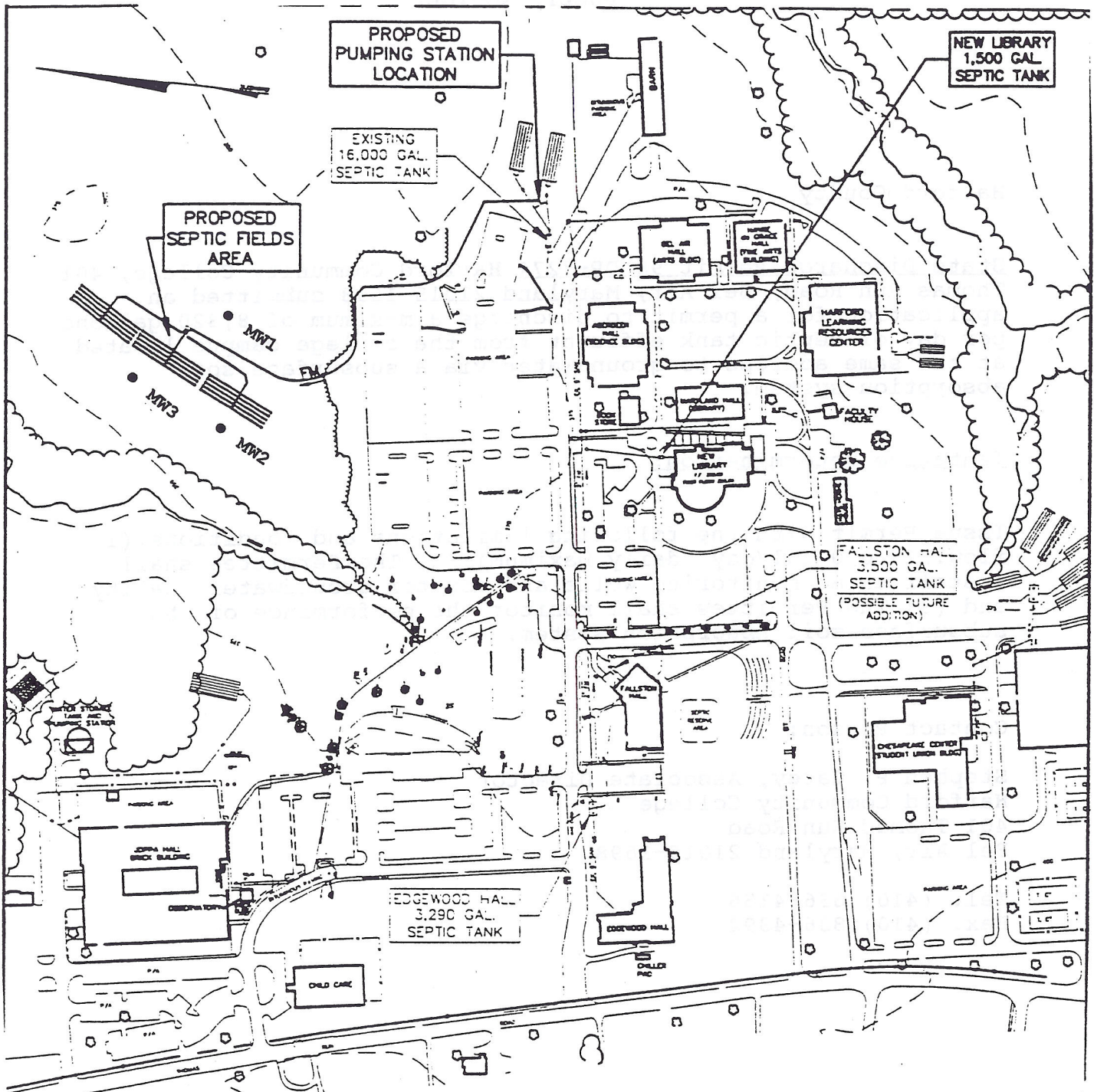
Tentative Determination:

Issue Permit with the following limitations and conditions: (1) flow: 11,000 gal/day (daily maximum); (2) The Permittee shall install three monitoring wells and monitor groundwater quality and (3) The Permittee shall monitor the performance of the subsurface soil absorption system.

Contact Person:

Stephen P. Garey, Associate Director
Harford Community College
401 Thomas Run Road
Bel Air, Maryland 21015-1698

Tel. (410) 836-4156
Fax. (410) 836-4392



Map B. Locations of Monitoring Wells (●) and Subsurface Systems

Scale 1" = 300'

Permit Information

Facility: THE ARENA CLUB

12909

General Information

Permit Type: WMA4 GROUNDWATER MUNICIPAL DISCHRG

App. #: 02DP3414

Permit #: 02DP3414

Permit Category: WASTEWATER TREATMNT PLANT

App. Description: 4600 GPD AVERAGE, 7538 MAX TO DRAIN DIELD

NPDES #:

Project Manager: TIEN

CHINGTZONE

Date Received: 04/18/2002

☒ Admin. Procedures Act

Permit Revised: 04/22/2002

Status Information

Permit Status: IN ISSUED NEW

Date Status Changed: 06/12/2002

Acknowledgement Sent:

Initial Projected Issuance: 01/16/2003

Revised Projected Issuance: 01/26/2003

Last Permit Issued: 08/01/2002

Permit Expiration: 08/01/2007

Prev Permit Expiration:

☐ HB9 Refund Requested?

Complete Application: 04/26/2002

Renewal Notice Sent:

Total Processing Delay (Initial Issuance): Rqst/Submt

Total Processing Delay (Rev Issuance): Proc Delays

First Est. Tentative Determination:

Revised Est. Tentative Determination:

Tentative Determination Complete: 04/26/2002

Permit Detail

Billing/Pymnts

Cancel-Return List

Cancel

Ok

**Department of The Environment
Groundwater Discharge Permit
Summary Report and Fact Sheet**

Executive Summary

Municipal Ground Water Discharge Permit

State Application No.: 02-DP-3414

Facility Name and Location: The Arena Club
Lot 2 - Isgood Property
2304 Churchville Road
Churchville, Maryland 21028

Description of Facility: Health Club

Facility Discharges: Domestic quality wastewater from the health club facility is conveyed by building sewer to an aerobic pretreatment system and then discharged to drainfields.

Pollutants Limited: 30ppm BOD5; 30ppm suspended solids; 10ppm total nitrogen.

Changes From Previous Permit: None; new Permit

Controversial Provisions: None.

Unusual Conditions: The designated discharge area is in the Campus Hills wellhead protection zone. Accordingly, the proposed groundwater discharge permit stipulates treatment for nitrate concentration equal to drinking water standards prior to discharge of the effluent.

Major Facility: No.

Summary of Wastewater Facility

The applicant has applied for a permit to discharge aerobically treated effluent to drainfields, and subsequently to groundwater of the State. Information regarding the sewerage facility is summarized as follows:

The Arena health Club on-site system receives sewage effluent from the Health Club building. Wastewater from the club house is collected by building sewer and transported to an aerobic treatment unit. The treated effluent is pumped through a PVC force main to the drainfields. The effluent level will build up in the dosing tank until the selected dosing volume is reached at which point the dose volume will be pumped to the appropriate drainfield. The subsurface disposal system consists of three sets drainfields which each contain 1050 linear feet of disposal trench. The disposal trenches are two feet wide, and sufficiently deep to provide a minimum of 3 foot of porous sidewall that remains at least 4 feet above the projected mounded, seasonal water table. Trench spacing is twelve feet on center.

Ground Water Discharge Permit
Summary Report and Fact Sheet
Page 2

Project Type: Absorption Trench System

State Application No.: 02-DP-3167

Facility Name: The Arena Health Club

Address: 2304 Churchville Road
Churchville, Maryland 21028

County: Harford

Contact (name, title): Robert Ward
Isgood, LLC
2700 Philadelphia Road
Edgewood, MD 21040

Phone: (410) 641-3820

Applicant is engaged in: Commercial retail development

Legal Name of Applicant: Isgood LLC

Address: Isgood LLC, 2700 Philadelphia Road, Edgewood, Maryland 21040

Basin Code: 02.13.07.04

SIC Code: 1531

Receiving Water Name(class): Port Deposit Gneiss formation, Groundwater Type
I Aquifer

MD Coordinates: East: 1,004,000 North: 628,000

Public Notice Issue Date: 5/1/02 and 5/8/02

Application Received: April 22, 2002

Project Manager(s): Craig Williams Phone: (410) 631-3783
Ching-Tzone Tien Phone: (410) 631-3662

Wastewater Characteristics

Average Flow: 4,600 gpd

Peak Flow: 7,538 gpd

Proposed Discharge Period: Year round

Parameter	Raw Concentration & Loading*	Treated* Concentration
BOD5	200 mg/l	30 mg/l
T.S.S.	200 mg/l	30 mg/l
Total nitrogen	70 mg/l	10 mg/l

Characteristics of raw and treated wastewater are estimated values based on information provided in the EPA On-Site System Design Manual.

Pretreatment Flow Diagram

Health Club wastewater ----> Aerobic treatment unit ----> Dosing Tank ----> Absorption Trenches**

** Provide 3 Treatment Cells, each cell has 1050 linear feet of disposal trench (2' wide) which provide at least 3' of penetration into permeable soil.

Assimilative Capacity

Limiting Parameter (s)	Loading Rate
Hydraulic Loading for Trench Design	1.2 gpd/ft ²

Groundwater System

Aquifer Name: Piedmont Aquifer, Type I, Port Deposit formation

Estimated Aquifer Transmissivity: n/a

Estimated Aquifer Permeability: n/a

Estimated Total Dissolved Solids Concentration: n/a

Other Properties:

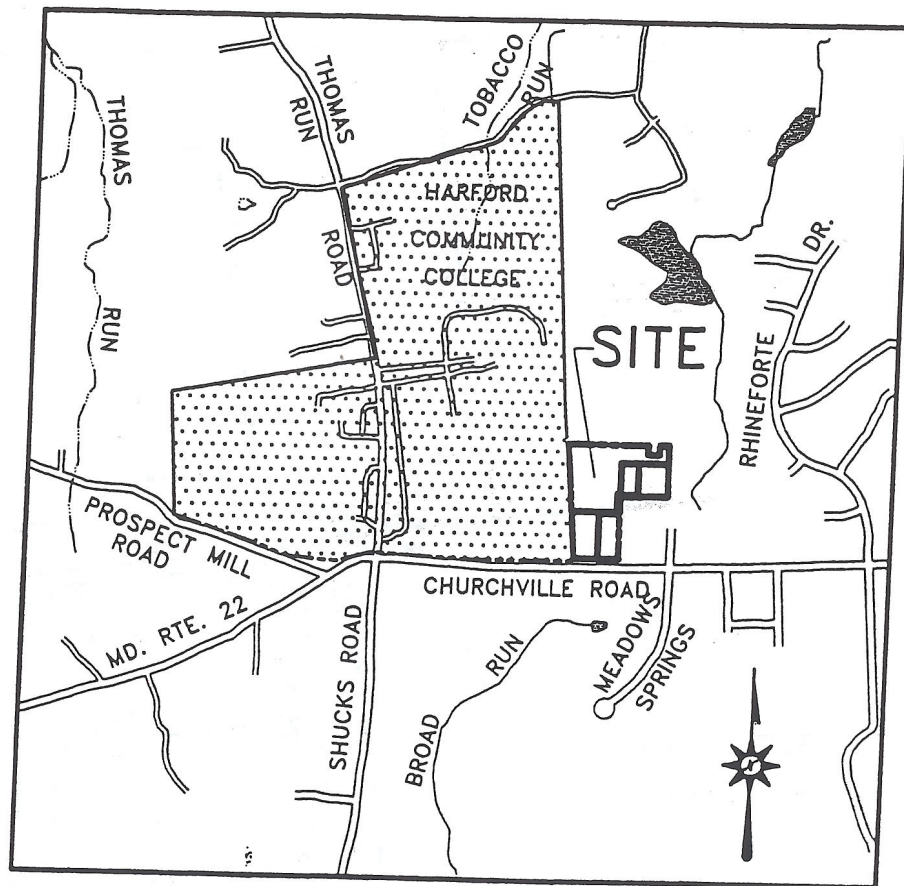
The site is underlain by the soils and rock of the Port Deposit Gneiss rock formation. This formation is described by the Maryland Geologic Survey as: "strongly sheared schistose rocks containing secondary muscovite, recrystallized sodic plagioclase, and epidote along with chlorite or biotite and quartz." Soils in this formation are typically described as silty and sandy locally micaceous soils.

Projected Impact:

No noticeable impact on the downslope community drinking water supply is anticipated as pretreatment for nitrate-nitrogen is specified to be to less than the drinking water standard of 10 ppm.

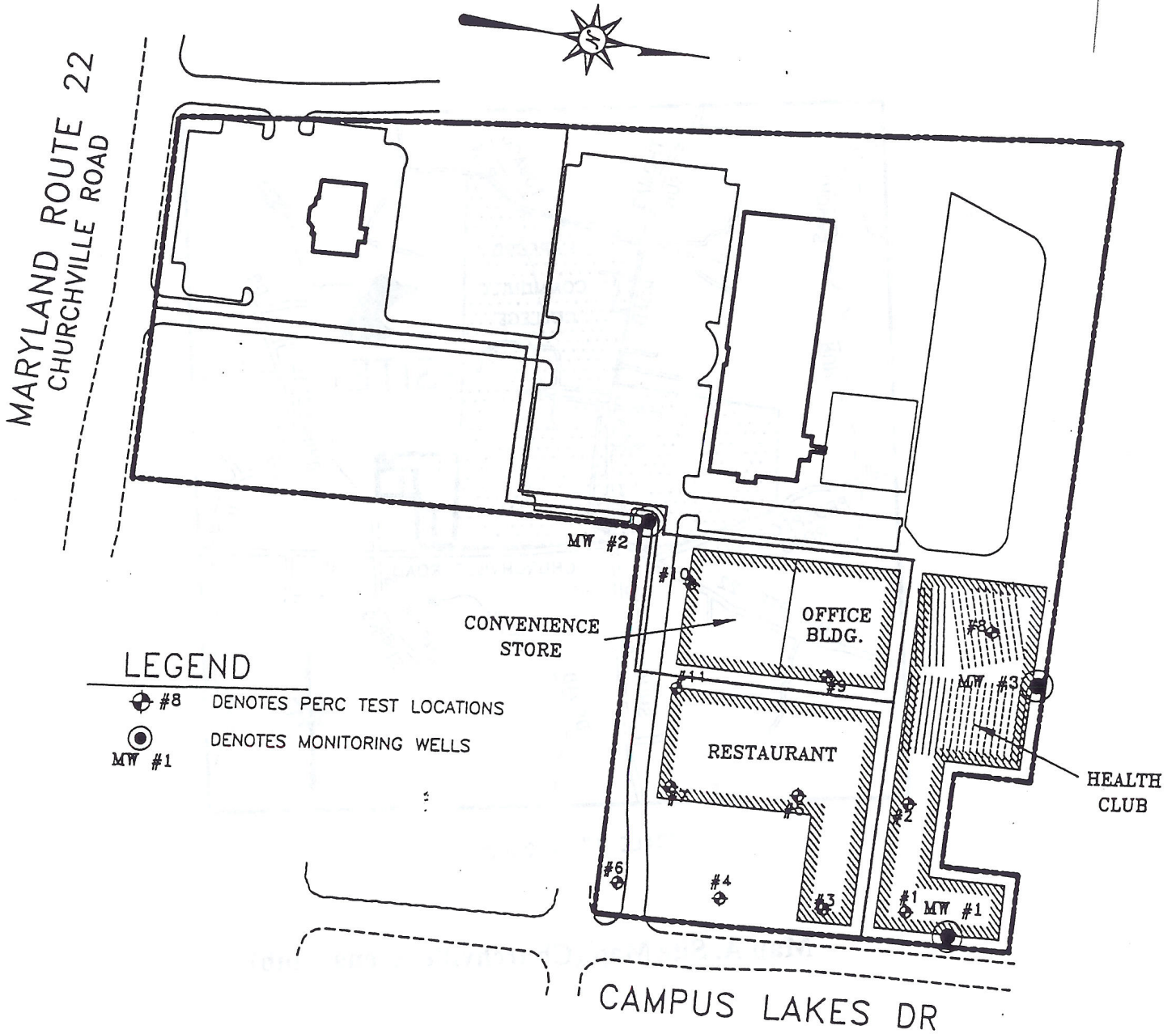
Present Use:

The Port Deposit Formation of the Piedmont Aquifer is an important water bearing formation which covers a large portion of Harford County served by drinking water wells.



SCALE 1" = 2000'

Map A. Site Map (Churchville Arena Club)



Map B. Locations of Monitoring Wells (⊙), and Subsurface Absorption System (▣)

Permit Information

Facility:

1350

NPDES # (will auto-fill for Stormwater permits).

General Information

Permit Type:

App. #:

Permit #:

Permit Category:

App. Description:

NPDES #:

Project Manager:

Date Received:

☒ Admin. Procedures Act

Permit Revised:

Status Information

Permit Status:

Date Status Changed:

Acknowledgement Sent:

Initial Projected Issuance:

Revised Projected Issuance:

Last Permit Issued:

Permit Expiration:

Prev Permit Expiration:

☐ HB9 Refund Requested?

Complete Application:

Renewal Notice Sent:

Total Processing Delay (Initial Issuance):

Total Processing Delay (Rev Issuance):

First Est. Tentative Determination:

Revised Est. Tentative Determination:

Tentative Determination Complete:

Permit Detail

Billing/Pymnts

Cancel-Return List

Cancel

Ok



MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101

Robert L. Ehrlich, Jr.
Governor

Kendl P. Philbrick
Secretary

Michael S. Steele
Lt. Governor

GROUND WATER DISCHARGE PERMIT

Permit Number: 03-DP-3243

Effective Date: June 1, 2004

Expiration Date: June 1, 2009

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, the Department of the Environment, hereinafter referred to as "the Department," hereby authorizes:

Campus Hills Maryland Associates L.P.
C/o Rosen Associates Management Corporation
33 South Service Road
Jericho, NY 11753-1006

hereinafter referred to as "Permittee," to discharge primary and secondary treated sewage by absorption trenches as described herein, from:

Campus Hills Shopping Center
2300-2400 Churchville Road
Churchville, MD 21015

to ground waters of the State in accordance with the following special and general conditions, including the attached maps made a part hereof.

I. Special Conditions

A. Waste and Wastewater Limitations

1. The Permittee is authorized to discharge septic tank and secondary effluent via absorption trenches to ground waters of the State at the site shown on Map A. The Permittee is not authorized to discharge any treated or untreated industrial waste waters to waters of the State.
2. Accumulative flow to the absorption trenches shall be limited to 10,284 gallons per day average from the Campus Hills Shopping Center. Flow to the absorption trenches from the Food Lion shall be limited to an average daily flow of 2,246 gallons. Locations of the absorption trenches are shown on attached Map B.
3. Prior to discharge to absorption trenches, wastewater from the Food Lion shall be treated to produce an effluent which does not exceed the following maximum limitations.

Parameter	Monthly Maximum	Monitoring Frequency	Sample Type
-----	-----	-----	-----
BOD ₅	30 mg/l	Monthly	Grab
Suspended Solids	30 mg/l	Monthly	Grab
Total Nitrogen	10 mg/l	Monthly	Grab
-----	-----	-----	-----

4. Discharge of treated wastewater shall not cause the natural (background) ground water quality, as measured in the observation wells, to exceed standards for Type I aquifers as specified in COMAR 26.08.02.09.C, "Ground Water Quality Standards" or to deteriorate the existing ground water quality. Additional pretreatment requirements may be imposed to protect the groundwater quality in the Campus Hill Wellhead Protection Area if results of sample analysis from the groundwater quality monitoring wells are not satisfactory.

B. Treatment Plant and Absorption Trenches System Monitoring Requirements and Limitations

1. Design and installation of the sewage effluent pre-treatment unit shall be reviewed and approved by the Department. The treatment plant and absorption trenches shall be monitored by a certified operator during the period of operation. In addition, the facility engineer or a duly authorized representative shall inspect and check the trenches periodically to determine the efficiency and adequacy of the system.

2. Flow meters shall be installed for measuring the daily sewage flow discharging to the treatment plant.
3. The water quality of each existing unconfined individual well serving any property within a 1/4 mile radius downgradient from the disposal site shall be sampled to provide baseline water quality. The water samples shall be analyzed for nitrates and fecal coliform. Results of the sample analysis shall be submitted to the Harford County Environmental Health Department prior to the issuance of a construction permit for the on-site sewage disposal system.
4. The Permittee shall operate the treatment and disposal system in accordance with the revised O & M Manual dated April 21, 2000.
5. A means of flow measurement shall be installed on the disposal system for measuring the daily accumulative sewage flow discharging to the absorption trenches from the shopping center and the daily flow from the Food lion discharging to the absorption trenches.
6. The Permittee shall record the daily sewage flow from the septic tank and secondary treatment unit discharging to the absorption trenches at least once a month.
7. The Permittee shall provide a minimum of ten inspection ports within the absorption fields receiving effluent from, the Food Lion. The ten inspection ports shall be extended to the trench bottoms.
8. Once every three months, the Permittee shall measure and record the water level in the observation pipes installed in the trenches to check the uniformity of effluent distribution.
9. The initial and reserve areas of the disposal system must be properly maintained and mowed regularly. No trees are permitted to grow on the active drain field areas.
10. The Permittee is responsible for the installation, operation and maintenance of three monitoring wells to be used for obtaining samples of groundwater. Locations of the groundwater monitoring wells are shown on Map B. Installation of the three monitoring wells shall be in compliance with COMAR 26.04.04, Well Construction Regulations.

11. After the disposal system is put into operation, the Permittee shall analyze one water sample every six months from each monitoring well.
 - a. Water samples may be obtained by either pumping or bailing the monitoring wells. Prior to taking the sample, a volume of water equal to 300% of the wetted volume of the casing and screen shall be removed.
 - b. Each water sample shall be analyzed for pH, nitrates, total dissolved solids, total Kjeldahl nitrogen (TKN), chlorides and fecal coliforms.

C. Measurements and Reporting Requirements

1. Monitoring data required by this permit shall be summarized on a yearly report. Each report shall be submitted on or before the 28th day of the month following the end of each calendar year to:

Maryland Department of the Environment
Compliance Program
1800 Washington Boulevard
Baltimore, Maryland 21230

A copy of the yearly report shall also be submitted to Environmental Health, Harford County Health Department, P.O. Box 797, Bel Air, Maryland 21014.

2. The methods used for analyzing the water sample shall conform to the test procedures specified in "Standard Methods for the Examination of Water and Wastewater" by the American Public Health Association, American Water Works Association, and Water Pollution Control Federation, latest edition, or as identified in "Guidelines Establishing Test Procedures for the Analysis of Pollutants" (40 CFR 136), and published in the Federal Register, Volume 51, No.125, Monday, June 30, 1986 or as amended.

II. GENERAL CONDITIONSA. Management Requirements1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of a pollutant not identified in this permit or in the application submitted for this permit, including any formally submitted application revisions that are not authorized, applied for or specifically identified in this permit, shall constitute a violation of the terms and conditions of this permit. Any anticipated facility expansion, production increases, or process modifications which will result in new, different, or increased discharge of pollutants shall be reported by the Permittee by submission of a new application at least one year prior to the commencement of the changed discharge or, if such changes will not violate the effluent limitations specified in this permit, by notice to the Department. Following such notice, the permit may be modified by the Department to specify and limit any pollutants not previously limited.

2. Operational Restrictions

The operation of a waste treatment or disposal facility shall at no time create: (1) a direct discharge to surface waters of the State; (2) any standing or ponded water condition on adjacent properties; or (3) a persistent standing or ponded water condition on the Permittee's property, excluding actual storage lagoons.

3. Noncompliance Notification

- a. If, for any reason, the Permittee does not comply with or will be unable to comply with the special and general conditions of this permit, the Permittee shall, within 24 hours, notify the Department by telephone at (410) 537-3510 during work hours and at (410) 537-3937 during evenings, weekends and holidays and provide the Department with the following information in writing within five days of such notification:
 - i. a description of the noncompliance, including its impact upon the receiving ground or surface waters;
 - ii. cause of noncompliance;
 - iii. anticipated time the condition of noncompliance is expected to continue or if such condition has been corrected, the duration of the period of noncompliance;
 - iv. steps taken by the Permittee to reduce and eliminate the noncompliance discharge;

II. GENERAL CONDITIONS

3. Noncompliance Notification...continued

- v. steps to be taken by the Permittee to prevent recurrence of the condition of noncompliance; and
 - vi. a description of the accelerated or additional monitoring by the Permittee to determine the nature and impact of the noncompliance.
- b. In the case of any discharge subject to any toxic pollutant effluent standard under Section 307 (a) of the Clean Water Act of 1987, the Department shall be notified within 24 hours of the time the Permittee becomes aware of the noncomplying discharge. Notification shall include information as described in paragraph 3.a. above. If such notification is made orally, a written submission must follow within five days of the time the Permittee becomes aware of the noncomplying discharge.

4. Facility Operation and Quality Control

All waste collection, control, treatment, monitoring, and disposal facilities shall be maintained in good working order and operated at all times as efficiently as possible and in a manner which will minimize upsets and discharges of excessive pollutants.

5. Adverse Impact

The Permittee shall take all reasonable steps to minimize any adverse impact to the ground water quality resulting from noncompliance with any limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

6. Removed Substances

The Permittee shall comply with all existing State and federal laws and regulations that apply to sewage sludge monitoring requirements and utilization practices, and with any regulations promulgated pursuant to Environment Article, Section 9-230 et seq. The Permittee is responsible for ensuring that its sewage sludge is utilized in accordance with a valid sewage sludge utilization permit issued by the Department.

II. GENERAL CONDITIONS

B. Responsibility

1. Right of Entry

The Permittee shall allow the Secretary of the Department, or authorized representatives, upon the presentation of credentials:

- a. to enter upon the Permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit;
- b. to have access to and to copy, at reasonable times, any records required to be kept under the terms and conditions of this permit;
- c. to inspect, at reasonable times, any monitoring equipment or monitoring method required in this permit;
- d. to sample at reasonable times any discharge of pollutants;
- e. to inspect, at reasonable times, any collection, treatment, pollution management or discharge facilities required under this permit; or
- f. to drill and install observation wells at a reasonable time and with a prior notice to the permittee for the purposes of obtaining samples of ground water.

2. Property Rights/Compliance with Other Requirements

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, State or local laws or regulations.

3. Availability of Reports

Except for data determined to be confidential under COMAR 26.08.04. 01.F., all reports, plans, maps, or other specifications submitted for review shall be available for public inspection at the Department.

4. Transfer of Ownership or Control

This permit is not transferable to any person except after notice to the Department. The Department may require modification or revocation and reissuance of the permit to change the name of the Permittee and may incorporate other requirements as may be necessary. The written notice to the Department shall include at least the following information:

II. GENERAL CONDITIONS

B. Responsibility.....continued

- a. the legal name, address and telephone number of the new owner or operator;
- b. a statement, signed by the new owner or operator, indicating that the new owner or operator has read, understands and accepts the terms and conditions of the existing permit; and
- c. the date that the new owner or operator took control or expects to take control of the facility. In the event that new ownership or control is expected in the future, the current Permittee and the anticipated new owner or operator both must sign the written notice to the Department.

5. Reapplication for a permit

At least one year before the expiration date of this permit, unless permission for a later date has been granted by the Department, the Permittee shall submit an application for renewal of the permit or notify the Department of the intent to cease discharging by the expiration date. In the event that a timely and sufficient reapplication has been submitted and the Department is unable, through no fault of the Permittee, to issue a new permit before the expiration date of this permit, the terms and conditions of this permit are automatically continued and remain fully effective and enforceable.

6. Permit Modification

A permit may be modified by the Department upon the written request of the Permittee and after notice and opportunity for a public hearing in accordance with the reasons set forth in COMAR 26.08.04.10.

7. Permit Modification, Suspension, or Revocation

A permit may be modified, suspended, or revoked by the Department in the event of a violation of the terms or conditions of the permit, or federal or State laws and regulations and in accordance with the procedures set forth in COMAR 26.08.04.10.

8. Civil and Criminal Liability

Environment Article, Sections 9-342 and 9-343 provide that any person who violates a permit condition implementing Environment Article, Section 9-322 et seq. is subject to a civil penalty in an amount not to exceed \$ 10,000 per day for such violation; and to criminal penalties of a \$25,000 fine or imprisonment not exceeding one year or both for a first offense, and a \$50,000 fine or imprisonment not exceeding two years or both for subsequent offense.

II. GENERAL CONDITIONS

B. Responsibility....continued

9. Waterway Construction and Obstruction

This permit does not authorize the construction or placing of physical structures, facilities, debris, or the undertaking of related activities in any waters of the State including the 100-year flood plain.

10. Severability

If any provision of this permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect, and such invalid provisions shall be considered severed and deleted from this permit.

11. Nuisance and Odor Restrictions

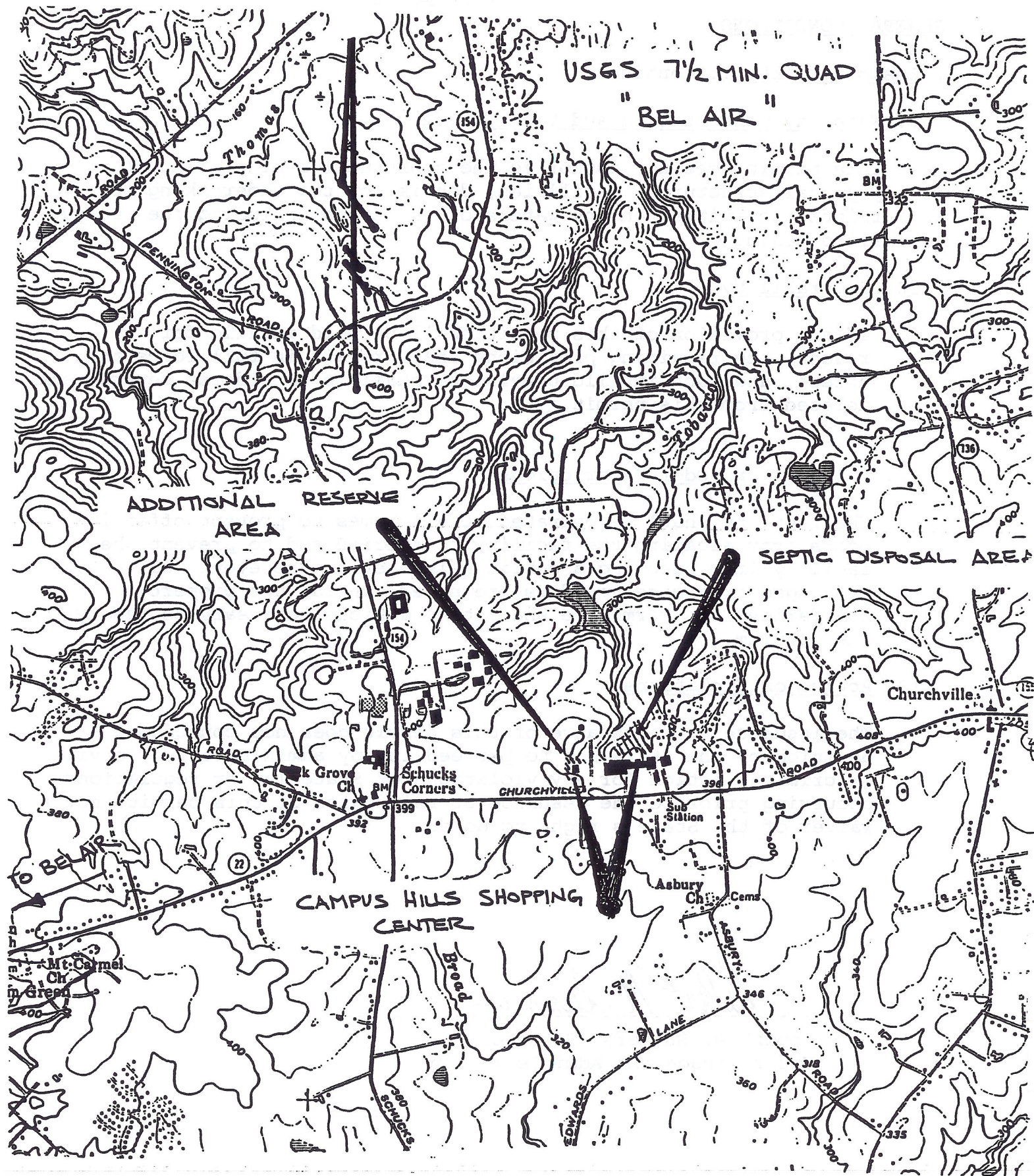
The facility shall be operated at all times to prevent offensive odors from escaping the facility boundaries and to prevent the facility from becoming a public nuisance. In the event that prolonged or excessive odors are noted outside the property boundaries, the Permittee shall take actions necessary to remedy the problem.

12. Action on Violations

The issuance or reissuance of this permit does not constitute a decision by the State not to proceed in any administrative, civil or criminal action for any violations of State law or regulations occurring prior to the issuance or reissuance of this permit, nor a waiver of the State's right to do so.



Robert M. Summers, Director
Water Management Administration



Map A. Site Map (Campus Hills Shopping Center)

APPENDIX E
Campus Hills Wellhead Protection Area Implementation Plan

CAMPUS HILLS WELLHEAD PROTECTION AREA IMPLEMENTATION PLAN

May 1, 1999

1.0 INTRODUCTION

Campus Lakes, LLC, ("Campus Lakes"), a Maryland limited liability company, has prepared and submitted this Implementation Plan. In preparing this Plan, Campus Lakes has reviewed: materials prepared by Advanced Land and Water, Inc. ("AL&W"); a Wellhead Protection Plan prepared by Atlantic Geoscience Corporation ("AGC") in June, 1998; and information and comments provided by the Maryland Department of the Environment ("MDE") and the Harford County Health Department ("HCHD"). This Implementation Plan is provided at the request of MDE, in connection with the development of a residential subdivision known as "Campus Lakes", in Harford County, Maryland (the "Project").

During preliminary planning for the Project, Campus Lakes, LLC engaged AGC for the preparation of a wellhead protection plan, which was submitted in June, 1998 (the "AGC Plan"). The AGC Plan, which has been made available to all parties hereto delineates a wellhead protection area ("WHPA") in the vicinity of the production wells which provide water to Campus Hills Waterworks, Inc. ("Campus Hills"), a private water treatment facility. The WHPA identified in this AGC study is accepted and will be used as the basis for this implementation plan. The WHPA is attached as Figure 1. This water treatment facility currently provides water to other commercial and residential occupants in and around the WHPA and will provide water to residents within the Campus Lakes subdivision.

The purposes of this Implementation are to adopt certain recommendations described within the AGC Plan, to highlight protective measures that will be taken to assure the best quality of water within the protected area, and to protect water production from existing and future wells within the WHPA. It documents the understandings and actions that all property owners within the WHPA and users of water supplied by Campus Hills will have to implement.

Based upon the AGC investigation and discussions among Campus Lakes, LLC, Campus Hills Waterworks, Inc. and MDE, it is understood that "nitrate loading" poses a potential risk to water quality for the Project of the groundwater aquifer that supplies water to Campus Hills. Additionally, storm water runoff, excessive soil fertilization and imprudent waste management practices also represent a significant secondary concern.

2.0 CAMPUS LAKES SUBDIVISION

2.1 Protective Measures to Be Taken Before and During Development Stage

Campus Lakes, LLC will achieve the following pre-development objectives:

1. Storm Water Design - The proposed storm water management and surface drainage system plan for the Project will, within guidelines established by the Harford County Department of Public Works, be designed to reduce the potential for infiltration within 100 feet of the production wells within the Campus Lakes Subdivision. In order to maintain ground water levels, rooftop drainage will be infiltrated and all roads in the development will be open shoulder roads.

2. Signage - Signs will be posted at regular intervals within the Project, particularly near the production wells, in order to discourage inappropriate refuse disposal (i.e., "No Dumping - Protection Area" or "No Dumping - Drinking Water Protection Area" or "Protect Our Drinking Water").

3. Open Space Areas - A minimum 100 foot circular buffer of open space shall be maintained around each water supply well. No chemical fertilizers, insecticides or herbicides will be used within a 100 foot radius of any water supply well without the express permission of MDE or the HCHD.

4. Home Fuel Heating Tanks - Home fuel heating tanks will not be stored underground.

5. Use of Chemical Fertilizers - Chemical fertilizers (ammonia, nitrate or urea) will not be used by the developer to establish lawns or shrubbery.

2.2 Wastewater Pre-Treatment Systems

The MDE and HCHD have jointly determined that future subsurface wastewater disposal systems within the Campus Lakes subdivision shall be equipped with advanced pre-treatment systems for the reduction of nitrate concentrations. Such systems typically incorporate pumps and/or blowers and this equipment requires periodic service and maintenance. MDE and HCHD have required that a plan for the ongoing maintenance of this equipment be submitted for their approval (see Section 2.3).

2.3 Formation of Homeowners Association

Campus Lakes, LLC will create a homeowners association ("HOA") within the Campus Lakes subdivision. Membership in the HOA will be mandatory and the HOA shall assess fees (against each home in the subdivision) to cover the costs associated with its obligations and duties relative to wellhead protection. These obligations and duties shall include: the administration of service and maintenance contracts for the wastewater pre-treatment systems; the erection and maintenance of signs with the Campus Lakes subdivision warning against dumping in a watershed or wellhead protection area; triennial pumpouts of each household's septic tank; and the periodic distribution of flyers and other reminders regarding the sensitivity of the area to imprudent waste practices, imprudent pet practices and continuous and extensive chemical fertilization practices.

The HOA shall set standards and distribute literature regarding the use of pesticides and fertilizers and ways to minimize spillage of petroleum and de-icing compounds within the subdivision.

2.4 Home Purchase Disclosure Statement: Covenants

Campus Lakes, LLC shall develop a disclosure statement for persons buying homes within the subdivision, informing each such purchaser of the wellhead protection plan and describing safe practices for homeowners to complement the plan, emphasizing the importance of protecting the source of the drinking water used by these homeowners. Materials prepared by the MDE or the U.S. Environmental Protection Agency regarding wellhead protection will be included with the disclosure statement and distributed to all home purchasers.

There shall be certain restrictive covenants recorded in the Land Records of Harford County (as part of the documents forming and governing the HOA), which will provide guidelines for certain activities which may affect the water quality within the WHPA, such as lawn fertilization, outdoor pesticide applications, commercial vehicle maintenance and repair, pet waste management and the use of chemical compounds for de-icing purposes. The restrictive covenants shall prohibit garbage disposal units in individual homes served by septic systems.

In addition, there shall be requirements for residents in the subdivision to make periodic pump-outs of their septic tanks, at least every three (3) years.

Homeowners shall be notified that:

(a) their septic systems have non-conventional components that require a higher level of maintenance with increased operating expenses, and

(b) MDE or Harford County Health Department reserves the right to inspect or collect samples from septic systems at reasonable times. Garbage disposal units are not allowed in Harford County for individual homes on septic systems.

3.0 OTHER AREAS WITHIN THE WHPA

The following approaches will be undertaken with respect to portions of the WHPA other than the Campus Lakes subdivision.

3.1 Existing Homes Within the WHPA: East and Southeast of Campus Lakes

There are twelve (12) existing homes in the Campus Hills Farms and Park Campus subdivisions within the WHPA, other than in the Campus Lakes subdivision, which receive their water from Campus Hills. The owners of these homes shall receive periodic mailings from Campus Hills and the HOA explaining the wellhead protection plan and its particular importance to all those living within the WHPA. The mailing shall request their (voluntary) cooperation with the plan and all preventive measures recommended by the HOA. In addition, the HOA shall keep these homes on their mailing list for any protective or informational materials sent to its members. If these existing homes have to repair their septic system, they should be upgraded to meet the performance criteria (i.e., nitrogen reduction) for the homes in Campus Lakes.

3.2 Proposed Homes within the WHPA: North of Campus Lakes

A portion of the existing subdivision which includes five (5) lots in Campus Hills Estates and one (1) lot in Campus Hills Farms located North of Campus Lakes is included within the WHPA. The developers of these lots will be required by Harford County Health Department to install advanced pre-treatment systems for reduction of nitrate concentrations. The homeowners will be encouraged to follow the same practices as outlined in Section 2.4. The water supplier will provide this information to them.

3.3 Undeveloped Commercial Property Within WHPA

A single, undeveloped commercial property is located west of Campus Hills Shopping

Center and within the southern portion of the WHPA. The developer of this parcel will be required to install advanced pre-treatment systems(s) for reducing nitrate concentrations. The developer will consider all other landscape and storm water measures being taken by Campus Lakes and in developing this site, will prevent contamination of the well and maintain ground water recharge in the Wellhead Protection Area.

3.4 Harford Community College

A portion of the Harford Community College ("HCC") is within the WHPA, currently including athletic fields, school buildings, parking lots, open space and wastewater disposal areas. HCC's turf fertilization, storm water management and wastewater disposal practices are all pre-existing this plan. The water quality sampling results from Campus Hills Well No. TW-4 do not suggest an adverse impact from HCC. Therefore, HCC's continuation of its current practices should not affect the Campus Lakes subdivision.

HCC has a long-term capital facilities development and improvement plan that includes the proposed construction of additional improvements within portions of its property currently used for athletic fields and open space. None of the technical data developed by Campus Lakes, LLC's consultants (AL&W and AGC) suggests any limitation or restriction on these possible future uses. Any potential effect on water quality will be discussed in a wellhead protection plan now being prepared by HCC.

HCC's facilities management has been advised that a portion of the HCC property (campus) is within the WHPA. A review by HCC of its facilities is in progress, with emphasis on both existing and proposed hazardous material handling, fertilizer and pesticide application, petroleum product storage, de-icing practices and waste water discharged within the WHPA. HCC will likely develop and maintain a Best Management Practices ("BMP") plan for mitigation of any potential contamination occurrences.

HCC shall consider and evaluate the measures taken by Campus Lakes to protect the WHPA and water supply.

3.5 Campus Hills Shopping Center

Although the Shopping Center is outside the WHPA, several issues may indirectly impact the WHPA and should be noted.

1. It is recognized that a supermarket located in the Campus Hills shopping center is be equipped with a pre-treatment system for the reduction of nitrate concentrations.

2. Storm Water Discharge - Discharge from the ground water remediation system at the Oasis Service Station currently runs to an on-site storm drain. The MDE Oil Control Program requires frequent monitoring of treated water effluent from this system and controls petroleum hydrocarbons in the remediation discharge water.

3. Tenant Awareness - It is recommended that the owner of the Campus Hills Shopping Center inform its tenants about the existence of the WHPA and the importance of environmentally safe waste management practices.

4.0 CONTINGENCY PLANNING

The well field at Campus Hills should provide a safe supply of acceptable water to those in its service area. Regular monitoring shall help provide early warning of any potential quality or quantity problems that could develop. Provided below are scenarios for two possible problems: (1) gradual development of unacceptable water quality conditions due to known sources (i.e., a slow and steady rise in nitrate or VOC concentrations; and (2) the gradual development of supply inadequacies.

4.1 Ground Water Monitoring

A regular program for nitrate-nitrogen and petroleum hydrocarbon sampling and analysis will be adopted for the four (4) community production wells by Campus Hills.

It shall be noted that the MDE ground water discharge permit issued with respect to septic effluent from the Campus Hills Shopping Center contains various monitoring requirements, which are deemed to be adequate by MDE.

4.2 Potential Rises in Contaminant Levels

The results of site monitoring should be evaluated regularly by Campus Hills to verify the adequacy of existing water treatment measures.

In the event that nitrate or other contaminant concentrations become excessive in any one of the production wells, blending shall be pursued as a first option in minimizing nitrate or other contaminant concentrations (particularly in the case where elevated concentrations are disproportionately occurring in one or two of the production wells). The signatories, as well as those issuing approval letters pursuant to Section 6.1 (or representatives) of this plan will agree to review possible causes and will recommend action to reduce levels at the source(s). The signatories may request assistance of MDE in identifying the cause of

increased levels.

If these remedies do not prove feasible or effective, then further plans for nitrate or other contaminant removal should be considered.

4.3 Potential Supply Shortfalls

The following measures can help protect against the possibility of future supply shortfalls:

1. Use Restrictions - As may be necessary from time to time based on drought conditions or future supply/distribution issues of a transient nature, a means to place Campus Hills water customers under reasonable water use restrictions should be developed. This plan could involve various conservation methods, depending on the severity of the supply situation.

2. Plan for Additional Supply Development - Campus Hills has developed contingency plans for developing additional ground water supply wells, should additional supply become needed. The location of any new wells would depend on the technical circumstances requiring their development. Campus Lakes subdivision contains over 30 acres of open space (to be owned by the HOA), including the fracture trace that follows the unnamed stream near TW-4. The HOA shall grant Campus Hills any necessary easements within open spaces to develop the additional wells.

4.4 Financial and Logistical Contingency Planning

MES and the owner of Campus Hills shall endeavor to remain informed about MDE grant programs regarding water supply and protection. In addition, its contingency plans should include a program to contact all interested parties should any serious problem or emergency situation occur. Copies of the contact list (with contact persons, telephone and fax numbers, etc.) should be provided to all parties on the list. The list should include all property owners as well as appropriate State and local governmental authorities, and should be updated regularly.

5.0 SUMMARY

In preparing this Implementation Plan, Campus Lakes has obtained and relied upon the recommendations of AL&W, which were made on the basis of the available data, their professional experience and the advice of representatives from MDE and Harford County.

Campus Lakes believes that the adoption of this plan and the faithful performance of the measures described herein will provide reasonable and adequate protection for the ground water resources in the Campus Lakes area.

6.0 RATIFICATION AND LIMITATION

6.1 Ratification

Ratification of this plan will be effected by Campus Hills, HCC, MDE and Harford County by the issuance of approval letters which specifically reference this plan. By issuing the said approval letters, Campus Hills, HCC, MDE and Harford County agree:

1. That the WHPA delineation within the AGC Plan has been reviewed and accepted;
2. That this Implementation Plan has been reviewed, understood and accepted by all the parties;
3. That all parties acknowledge that there are various uncertainties in the technical work and data used to develop this Plan and that future conditions may differ from predictions or estimates which are contained herein or upon which elements of this Plan have been based; and
4. If the Wellhead Protection Implementation Plan does not protect the water source, the signatures or representatives (Homeowners Association to represent Campus Lakes) will meet and modify the WHP plan, to protect this source of supply.

6.2 Limitation

As set forth in paragraph 6.1 above, ratification of this Plan shall occur by Campus Lakes executing the Plan below and by Campus Hills, HCC, MDE and Harford County issuing approval letters. By executing this Plan, Campus Lakes shall only be responsible for the performance of its own undertakings and obligations under the Plan. Campus Lakes shall specifically not be obligated to perform the undertakings or obligations of others required hereby, nor shall Campus Lakes by the execution hereof be obligated to procure or enforce the performance by other parties of such other parties' responsibilities hereunder. The parties affected by this Plan understand and agree that governmental bodies and agencies may consider the obligations created by this Plan in the issuance of future permits and approvals.

CAMPUS LAKES, LLC

Richard H. Kress

By: **Richard Kress**
Authorized Member