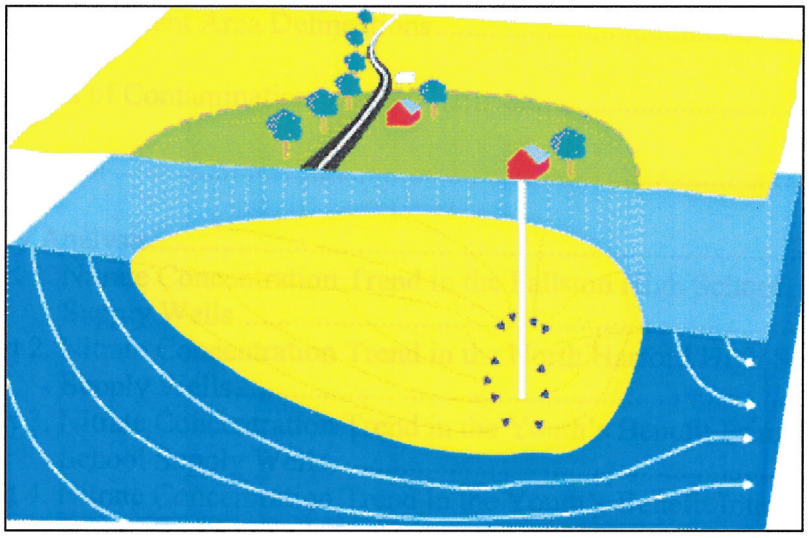
SOURCE WATER ASSESSMENTS

FOR SELECTED PUBLIC SCHOOL WATER SYSTEMS IN HARFORD COUNTY, MD



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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted source water assessments for four public school water systems in Harford County. The required components of this report as described in Maryland's Source Water Assessment Program (SWAP) are 1) delineation of areas that contribute water to each source, 2) identification of potential sources of contamination within the areas, and 3) determination of the susceptibility of each water supply to contamination. Recommendations for protecting the drinking water supplies conclude this report.

The sources of the nontransient noncommunity water systems in this report are unconfined fractured-rock aquifers of the Eastern Piedmont Physiographic Province. The four water systems are currently using seven wells that draw from the Lower Pelitic Schist Wissahickon and Metagraywacke Wissahickon Formations respectively. A third well at North Harford High School is to be placed on-line in the near future after a certificate of potability is issued by the WSP and after plant upgrades are completed. The Wellhead Protection Areas were delineated by the WSP using EPA approved methods specifically designed for these sources.

Potential point sources of contamination were identified within the assessment areas from field inspections, and contaminant inventory databases. The Maryland Office of Planning's 2002 Land Use and 2003 Sewerage Coverage Maps for Harford County were used to identify potential non-point sources of contamination. Well information and water quality data were also reviewed. Wells drawing from unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the respective wellhead protection areas. Therefore, managing these areas to minimize the risk to the aquifers and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. Figures showing land use, and potential contaminant sources within and near the wellhead protection areas, and aerial photographs of well locations are enclosed at the end of the report.

The susceptibility analysis is based on a review of the existing water quality data for each water system, the presence of potential sources of contamination in the individual assessment areas, well integrity, and aquifer characteristics. It was determined that the Fallston, and North Harford High Schools, and the Youth's Benefit Primary School are susceptible to contamination by nitrate. The Youth's Benefit Intermediate School was determined not susceptible to nitrate contamination. Should the EPA adopt a drinking water standard for radon-222, all of the water systems may be susceptible to this naturally occurring contaminant. The four water systems reviewed in this report were determined not susceptible to volatile organic compounds, synthetic organic compounds, regulated inorganic compounds other than nitrate, and microbiological pathogens. The susceptibility to other radionuclides could not be determined at this time due to the lack of sufficient sampling data for the four systems. It must be noted, however, that nontransient noncommunity water systems are currently not regulated for radionuclides.

INTRODUCTION

The Water Supply Program has conducted source water assessments for four selected public school water systems in Harford County. Fallston High School and the Youth's Benefit Primary and Intermediate Schools are each located on the north side of MD Route 152 near Fallston in southwestern Harford County (Figure 1a). North Harford High School is located on the south side of MD Route 165 near Pylesville in northwestern Harford County. It is currently undergoing major reconstruction and water plant upgrades (Figure 1b). State regulations designate these schools as nontransient noncommunity water systems, which are defined as public water systems that regularly serve at least 25 of the same individuals over 6 months per year. The four school systems serve a combined estimated population of 4,387 (Table 10). The Youth's Benefit Schools are considered "small" systems, defined in Maryland's Source Water Assessment Plan (MDE, 1999) as water systems that have a ground water appropriation permit of less than 10,000 gallons average daily use. In 2001, the permit limit for these two schools was reduced from an average daily useage of 13,200 gallons to 3,000 gallons based on yearly pumpage data reported since 1990. The two high schools use an average of greater than 10,000 gallons per day (gpd), and are therefore referred to as "large" nontransient noncommunity water systems (MDE, 1999). The four schools obtain their water supply from wells in unconfined fractured rock aquifers.

WELL INFORMATION

Well information for each system was obtained from the Water Supply Program's database, site visits, well completion reports, sanitary survey inspection reports, and published reports. The four schools assessed in this report use a total of seven wells. A third well at North Harford High School is to be placed on-line in the near future after a certificate of potability is issued by the WSP and after plant upgrades are completed. Five of the wells were drilled after 1973 and should comply with Maryland's well construction regulations for grouting and casing. The remaining three wells that were drilled prior to 1973 when current regulations went into effect may not meet the current construction standards. Well completion report data was not available for the North Harford High School Wells 1 and 2. Table 1 contains a summary of the well information for each of the nontransient water systems assessed in this report. Note that the well and casing depths for the North Harford High School Wells 1 and 2 are based on estimates from sanitary survey inspection reports. Each school treats the ground water at individual plants prior to distribution (Table 4). As shown in Table 1, the Youth's Benefit Intermediate School Well 1 was deepened in 1999 from its original completion depth of 400 feet to 545 feet.

Based on site surveys, the supply wells are generally in good to fair condition. The age of North Harford High School Wells 1 and 2 are unknown since there are no completion reports on file and no record of grout seals around their respective casings. Youth's Benefit Primary School Well 1 was drilled in 1953 also with no record of a grout seal around its respective casing. These three wells may have integrity issues due to their

age and construction, and could be more susceptible to contamination. Therefore, the casings of these older wells should be inspected. Also, there is a low yielding test well at the North Harford High School with no plans for future use (Appendix A & Table 1). Test wells that are not exercised regularly, have no pumps, or with no plans to be connected to the system may provide a direct pathway for ground water contamination to the aquifer. Such wells should be properly abandoned and sealed by a licensed well driller according to the current State regulations. During the site survey, it was observed that the electrical conduit for the Youth's Benefit Intermediate School Well 1 was cracked, and temporarily wrapped with duct tape (Appendix A). This may provide a pathway for bacteria, and other surficial contaminants to enter the well and ultimately reach the ground water aquifer. This issue was pointed out to Ms. Laura Paligo of the Harford County Public Schools, and she informed us that proper repairs would be made.

North Harford High School Wells 1 and 2 are located in pits within enclosed structures (Appendix A). The casings of these wells extend several feet above the pit bottom, but are still below ground surface. The casing of the Youth's Benefit Primary School Well 1 extends only to about four inches above ground surface (Appendix A). Wells cased at or below ground surface are more likely to be subject to flooding during heavy rains. This may allow contaminated surface water to enter through or around the casings and ultimately reach the aquifer. North Harford High School Wells 1 and 2 are inside enclosed structures, which may help to protect them from storm water runoff. Also, there was no water observed at the pit bottoms during the site survey. According to Ms. Laura Paligo, the North Harford High School Well 1 is to be abandoned and sealed after the plant and school reconstruction projects are completed. All other school wells in this report are located outside with casings extending at least one foot above ground surface (Appendix A).

Daily use averages reported from 1994 - 2004 indicate that the water systems of the four schools are all within the allocated Water Appropriation Permit limits.

HYDROGEOLOGY

The Harford County Public Schools assessed in this report are located in the eastern Piedmont Physiographic Province, which is characterized by strongly folded and faulted metamorphic rocks with granitic and mafic intrusions (Nutter, 1977). Based on the Geologic Map of Harford County (MGS, 1968), three geologic formations underlie the four public schools described in this report. The Lower Pelitic Schist of the Wissahickon Formation possibly of Late Precambrian Age underlies the Youth's Benefit Primary and Intermediate School's respectively. Fallston High School is located at the contact between the Lower Pelitic Schist, and Baltimore Gabbro Formations (MGS, 1968). Based on driller's log interpretations, the high school wells are both completed in the Lower Pelitic Schist-Wissahickon Formation. North Harford High School is underlain by Metagraywacke of the Wissahickon Formation possibly of late Precambrian Age. The Lower Pelitic Schist is described as a medium to coarse-grained biotite-oligoclase-muscovite-quartz schist with garnet, staurolite, and kyanite. The metagraywacke is described as a rhythmically interbedded chlorite-muscovite

metagraywacke and fine-grained chlorite-muscovite schist (Nutter & Otton, 1969). The rocks weather to form residual soils known as saprolite, which often retains the relic structure of the parent rocks. Significant structural features include the northeast-trending axial trace of the Peach Bottom Syncline located about 1,400 feet to the north of North Harford High School (MGS, 1968).

An aquifer is defined as any water-bearing formation of permeable material that will yield water in a usable quantity to a well (Heath, 1983). The primary porosity and permeability of these aquifers are 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 saprolite. The residual soils and decomposed rock overlying these formations function as ground water reservoirs that feed the fracture systems that supply water to the wells (GTA, 2000). The yield of a well in crystalline rock depends primarily on the number of fractures penetrated by the well. 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. Typically, the water table in the aquifer mimics the surface topography. The fractured rock aquifers described in this report are unconfined.

SOURCE WATER ASSESSMENT AREA DELINEATIONS

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. The WHPAs for the four public school water systems in this report were delineated by MDE based on the methodology described in Maryland's Source Water Assessment Plan (MDE, 1999). Ground water flow in unconfined fractured rock aquifers is complex and cannot be accurately modeled by a homogeneous analytical model. Consistent with the recommended delineations in the Maryland Plan, "large" water systems were delineated by hydrogeologic mapping of the watershed drainage area that contributes ground water to the supply wells. The delineation areas accounted for ground water drainage divides from natural streams, topography, significant land features, fracture trace maps (where available), and a conservative calculation of total ground water recharge during a drought. The Fallston, and North Harford High School WHPAs were delineated by this method.

The Fallston High School WHPA is irregularly shaped, and has an area of 67.3 acres (Figure 2a). The North Harford High School delineation area accounted for topography, ground water drainage divides from natural streams, and a fracture trace map shown in Appendix B as interpreted by Geo-Technology Associates, Inc. (GTA, 2000). 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. Some linear features were determined near the North Harford High School Wells (Figure 2b & Appendix B). The WHPA is irregularly shaped, and has an area of 63 acres. The boundaries of the WHPA extend outward from the wells to include the inferred fracture traces, stream boundaries, and topographic highs (Figure 2b).

In addition to the above, the annual average recharge needed to supply the wells was also calculated for each of the "large" systems. 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 each well. The current Water Appropriation Permits for the Fallston and North Harford High Schools are for average daily withdrawals of 18,000, and 15,000 gallons respectively (Table 1). The total ground water contribution areas were calculated from the following equation:

Recharge Area (acre) = Average Use (gpd) / Drought Condition Recharge (gpd/acre)

From the above equation, the total ground water contributing areas during a drought are approximately 45 acres at Fallston High School, and 37.5 acres at North Harford High School respectively. The delineated WHPAs of 67.3 acres at Fallston High School, and 63 acres for North Harford High School are therefore more than adequate to meet the average daily ground water usage during a drought. The WHPA for Fallston High School indicates a generalized ground water flow direction toward the southeast (Figure 2a). Ground water flow at the North Harford High School WHPA is also inferred to be to the southeast, toward an unnamed tributary to Broad Creek (Figure 2b).

As defined in Maryland's SWAP, source water protection areas for "small" public water systems using an average of less than 10,000 gallons per day (gpd) in unconfined fractured-rock aquifers, is a fixed radius of 1,000 feet around each well. The radius is based on calculating the land area needed to provide a yield of 10,000 gpd assuming a 400 gpd per acre recharge rate (drought year recharge conditions) and a safety factor. This methodology was used for delineating the Youth's Benefit Primary and Intermediate School WHPAs. The Primary and Intermediate School Wells' both withdraw ground water from the Lower Pelitic Schist-Wissahickon Formation. Since the delineated radial recharge areas around each well overlap, they were combined to form one larger WHPA for conservative purposes (Figure 2a). The delineated protection area is 94.8 acres.

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, controlled hazardous substance generators, and known 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 all that may lead to ground water contamination over a larger area.

The WSP met with Ms. Laura Paligo of the Harford County Public Schools on September 15, 2005 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 windshield surveys were conducted using the GPS to locate and map potential sources of contamination within and near the WHPAs.

Point Sources

A review of MDE contaminant databases as well as the field surveys revealed some potential point sources of contamination within and near the WHPAs. Facilities that have underground storage tanks (USTs), and leaking underground storage tanks (LUSTs) are located within or near the WHPAs (Figures 2a & 2b). Additionally, miscellaneous sites (MISC) such as wastewater treatment plants, volunteer fire companies, sawmills, and animal hospitals, that handle, use, or store chemicals are shown on Figures 2a and 2b. 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), Metals (M), Heavy Metals (HM), Nitrate/Nitrite (NN), and Microbiological Pathogens (MP).

Inspections of facilities located within and near the WHPAs have been 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. The reader may contact the MDE Ground Water Permits Program for information regarding the specific inspections performed.

The MDE Oil Control Program reported open cases within or near the Fallston High School and Youth's Benefit School's WHPAs respectively. With the exception of the Fallston High School UST, the sites had liquid petroleum constituent releases from underground storage tank or line leaks resulting in possible ground water contamination. The sites are located outside the WHPAs of the four schools. However, the 7-Eleven was mapped as a leaking underground storage tank (LUST) for awareness purposes due to its close proximity to the Youth's Benefit School's WHPA (Figure 2a). The school USTs described in this report store heating oil only. Heating oil is less mobile in ground water than gasoline constituents.

Fact sheets of the open cases within and near the WHPAs can be found in Appendix C. As described, heating oil cannot be discharged to the ground from the damaged remote fill riser of the Fallston High School UST. For precautionary reasons, however, repair-work is to be completed by year-end 2005 (as per Ms. Laura Paligo), to return the tank to full compliance status. The reader may contact the Oil Control Program for additional information on any of these open cases.

The storage of heating oil in residential underground tanks, and spills during the transportation of chemical products on MD Routes 152, 165, and 24 are also potential point sources of contaminants that could reach the water supplies (Figures 2a & 2b).

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 WHPAs (Figures 3a & 3b). The breakdown of land use types is shown on Tables 3a-3c. Note that commercial land (primarily school property) makes up the largest percentage of the WHPAs for the North Harford High School, and Youth's Benefit Schools respectively. Residential areas make up the largest portion of land use followed by commercial (school property) at Fallston High School (Table 3a & Figure 3a). Cropland and forested land make up the other land use types within the delineated protection areas (Tables 3a-3c).

Lawn and athletic field maintenance, and landscaping activities at the schools are all potential non-point sources of nitrates, microbial pathogens, and SOCs to ground water. Classroom activities could also pose a potential risk of contamination to the water supplies.

Cropland is commonly associated with nitrate loading of ground water and also represents a potential source of SOCs depending on farming practices and use of pesticides. Residential areas may be a source of nitrate loading or microbial pathogens to ground water through private septic systems. Additionally, residential areas may be a source of nitrate or SOCs depending on gardening and lawn care practices.

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. As shown in Table 2, the Fallston and North Harford High Schools have Wastewater Plants to treat their septic effluent, and sanitary drainage. The Youth's Benefit Schools, Fallston Middle School, and North Harford Elementary School all have on-site septic systems with leach fields for the discharge of their wastewater.

A surface water permit was issued to North Harford High School to discharge a maximum of 20,000 gallons per day (gpd) of treated wastewater from its treatment plant to a nearby-unnamed stream. The plant utilizes Imhoff Tanks to collect the wastewater, which then flows through sand bed filters, and then is exposed to ultraviolet disinfection prior to discharging into the stream. A photo of the wastewater treatment plant and sand bed filtration is shown in Appendix A. Since the supply wells at the high school were determined not to be under the direct influence of surface water, these discharges should not impact the ground water quality of the water system. Municipal discharge of treated wastewater or swimming pool backwash water to drain fields has taken place at the Fallston High School, and Fallston and North Harford Middle Schools respectively. Laura Paligo stated that the wastewater effluent from the Fallston High School, and the North Harford Middle School treatment plants has been pumped out and hauled off-site for the past three years due to failing drain fields at these schools. Database summaries of these permits are found in Appendix D. The reader may contact the MDE Wastewater Permits program for additional information.

Commercial land uses without sewer service present a potential source of all types of contaminants if by-products and wastes are not disposed of properly. Storm water

runoff is also a concern since it may contain various contaminants that could infiltrate into the ground near the supply wells. The application of de-icing chemicals on MD Routes 152, 165, 24 on other nearby roads during the winter months may be a source of sodium and chlorides to the water supplies.

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, these assessments will describe the sources of such a contaminant and, if possible, locate the specific sources which are the cause of the elevated contaminant level. The data reported is from finished (treated) water unless otherwise noted. The four systems in this report all have water treatment. The methods currently used at each of the water treatment plants are summarized in Table 4.

A review of the monitoring data since 1993 indicates that the four water supplies in this report meet the current drinking water standards with a few exceptions as detailed in the following paragraphs (Table 5). Tables 6a-6d provide a list of all detections above 50% of the respective or proposed MCLs. Results exceeding an MCL are shown in bold.

Inorganic Compounds (IOCs)

A review of the available data shows that arsenic and nitrate were the only IOCs detected above 50% of their respective MCLs (Table 6a). Arsenic was detected above 50% of the MCL in one sample only collected on May 29, 2003 at North Harford High School (Table 6a). It was not detected in a subsequent sampling event conducted on June 16, 2003, nor has it ever been detected before from three previous data sets. The arsenic standard was recently lowered from 0.050 parts per million (ppm) to 0.010 ppm by the USEPA. Nitrate was detected repeatedly above 50% of the MCL of 10 ppm in samples collected at Fallston and North Harford high Schools, and the Youth's Benefit Primary School (Table 6a). The levels have been steadily decreasing at the Fallston High School since 1997, and have not exceeded the 50% MCL threshold since October 1996 (Table 6a). Nitrate has also been consistently below the 5-ppm threshold at the Youth's Benefit Intermediate School. Iron was detected at the secondary MCL of 0.3 ppm from a single raw water sample taken from the Fallston High School Well 2 (Table 6b). No other regulated IOCs were detected at levels of concern at the four school's water systems.

Radionuclides

Nontransient noncommunity water systems are currently not regulated for radionuclides. However, limited water quality data is available from the four school's water systems. Radon-222 was tested at each of the four schools (Table 6c), and one set of gross alpha and gross beta samples were collected at the North Harford High School on October 24, 1997. Gross alpha and beta radiation are measures of alpha and beta particle activity that are used as indicators for the presence of other natural and man-made radionuclides. Gross alpha was detected at 2.1 picocuries per liter (pCi/L), well

below its MCL of 15 pCi/L. The gross beta result of 17.5 pCi/L was also well below its MCL of 50 pCi/L. There is currently no MCL for Radon-222, however EPA has proposed an MCL of 300 picocuries per liter (pCi/L) or an alternate of 4000 pCi/L for community water systems if the State has a program to address the more significant risk from radon in indoor air. Since an MCL has not been finalized, this report considers the lowest proposed MCL of 300 pCi/L in an effort to be more conservative and protective of public health. Radon-222 has been detected at levels above this more conservative proposed MCL in each of the four schools assessed in this report (Table 6c).

Volatile Organic Compounds (VOCs)

No VOCs were detected at levels of concern from any of the sampling events conducted at the four schools since 1991. Toluene was detected in 2001 from a single raw water sample collected at the Fallston High Well 2 at 1 part per billion (ppb). The MCL for toluene is 1000 ppb. It was not detected again in 2 subsequent samples.

Synthetic Organic Compounds (SOCs)

Di(2-ethylhexyl phthalate) was the only SOC detected at levels above 50% of its MCL of 6 ppb at Fallston and North Harford High Schools respectively (Table 6d). It was also detected at low levels in sampling results of the Youth's Benefit Schools. Phthalate was also detected in the laboratory blank samples accompanying all of these data sets, and therefore the results are not interpreted to represent actual water quality. No other SOCs were detected from available sampling results at the four water systems.

Microbiological Contaminants

Raw water samples were collected and tested for bacteria to determine whether the sources are ground water under the influence of surface water (GWUDI). The North Harford High School supply wells were initially classified as moderate risk to surface water influence. This sampling protocol 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 remaining supply wells from the other three schools were initially classified as low risk to surface water influence, which requires one raw water bacteriological sample to be collected from each well at any time. The actual coliform concentrations in each sample were determined in the analyses. As shown on Table 7, the test results for each well were negative for the presence of total and fecal coliform bacteria.

The four water systems also have monthly or quarterly routine bacteriological samples that are collected as required by the Safe Drinking Water Act. The North Harford High School disinfects their water at the treatment plant prior to distribution. Therefore, the finished water data at this system is not indicative of the quality of raw water directly from the sources. The other three schools currently do not use disinfection treatment and therefore the results may be indicative of raw water (Table 8). Total coliform bacteria are not pathogenic, but are used as an indicator organism for other disease-causing microorganisms. The two high schools had positive total coliform results in two samples in 2004, but nine subsequent monthly samples were found to be free of total coliforms (Table 8). The Youth's Benefit Schools have not had any positive total or fecal coliform results from any of the routine samples collected quarterly since 1996.

SUSCEPTIBILITY ANALYSIS

The wells that supply the four school systems in this report obtain water from unconfined fractured rock aquifers. Wells drawing from unconfined aquifers are generally vulnerable to any activity on the land surface that occurs within the respective WHPAs. Therefore, managing these areas to minimize the risk to the aquifers and continued routine monitoring of contaminants is essential in assuring a safe drinking water supply. The susceptibility analysis of the water supplies to each group of contaminants has been completed based on the following criteria: (1) available water quality data, (2) presence of potential contaminant sources in and near the WHPAs, (3) aquifer characteristics, (4) well integrity, and (5) the likelihood of change to the natural conditions. Table 9 summarizes the susceptibility of the four systems covered in this report to each group of contaminants.

Inorganic Compounds

Nitrate is present in the ground water supplies of Fallston and North Harford High Schools, and the Youth's Benefit Primary School above 50% of its MCL of 10 ppm. The available data shows that the trend of nitrate levels has been decreasing over the past twelve years at the two high schools with occasional spikes that exceed the ½ MCL threshold (Charts 1 & 2). Interestingly, the nitrate data at the Youth's Benefit School's varies considerably, even though they utilize the same aquifer. While the nitrate levels have been steadily increasing at the Youth's Benefit Primary School Well over the past twelve years, they have consistently been below levels of concern at the Intermediate School Wells (Charts 3 & 4). This may be attributed to the differences in land use of the areas actually recharging the wells. Figure 3a indicates that there are more septic non-point sources (e.g. Fallston Recreation Complex and residential areas) closer to the Primary School Well than the areas recharging the wells supplying the Intermediate School. Additionally, the Youth's Benefit Primary School Well was drilled to a depth of 362 feet in 1953 and therefore may not meet the current construction standards. The Intermediate School Well 2 was drilled in 1989 to a depth of 500 feet, and Well 1 was deepened to a depth of 545 feet in 1999 (Table 1). These two wells each have grout seals around their respective casings and were drilled into deeper fracture zones that may be better protected from contamination at the ground surface.

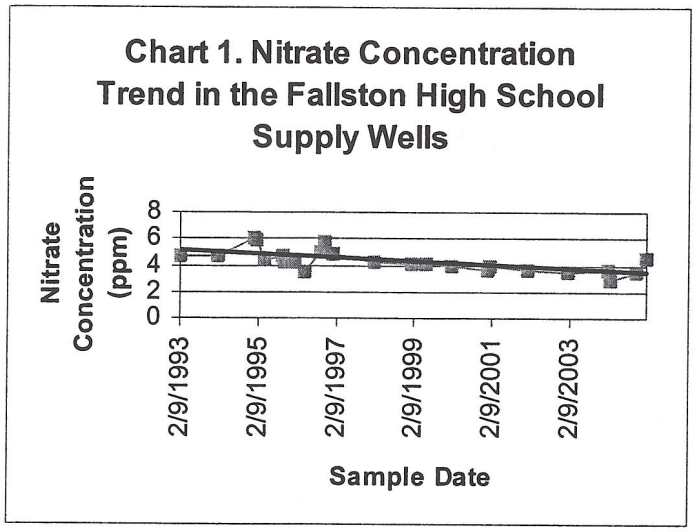


Chart 1. Nitrate Concentration Trend in the Fallston High School Supply Wells
Nitrate Concentration (ppm)
8
6
4
2
0
2/9/1993
2/9/1995
2/9/1997
2/9/1999
2/9/2001
2/9/2003
Sample Date

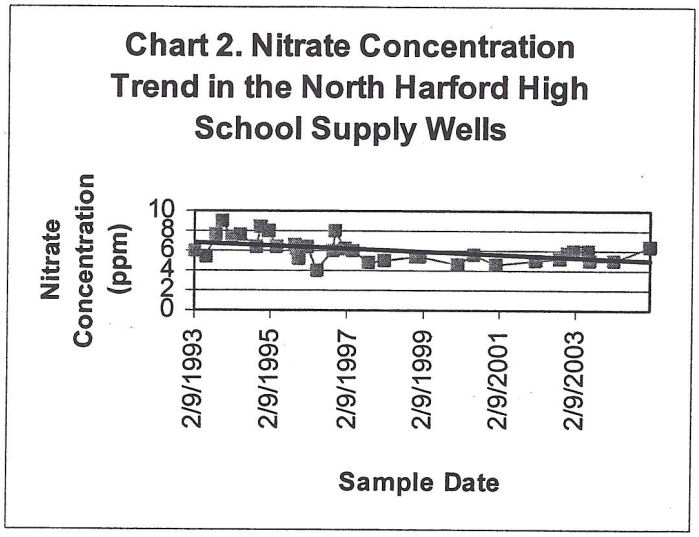


Chart 2. Nitrate Concentration Trend in the North Harford High School Supply Wells
Nitrate Concentration (ppm)
10
8
6
4
2
0
2/9/1993
2/9/1995
2/9/1997
2/9/1999
2/9/2001
2/9/2003
Sample Date

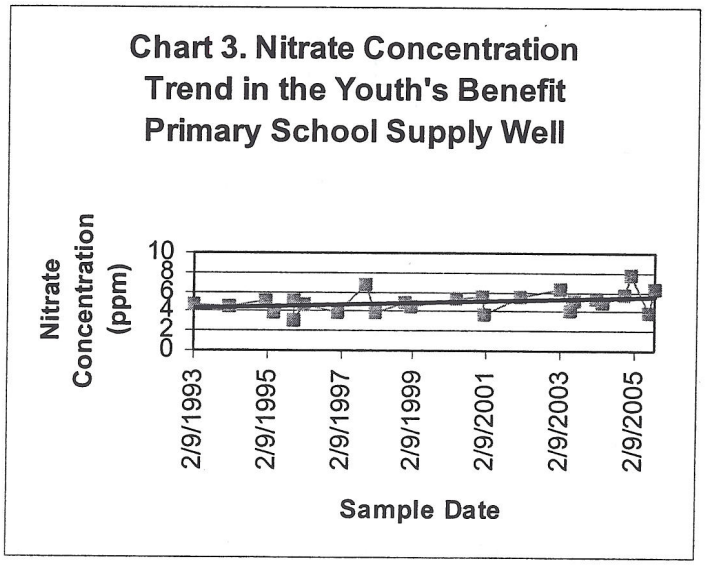
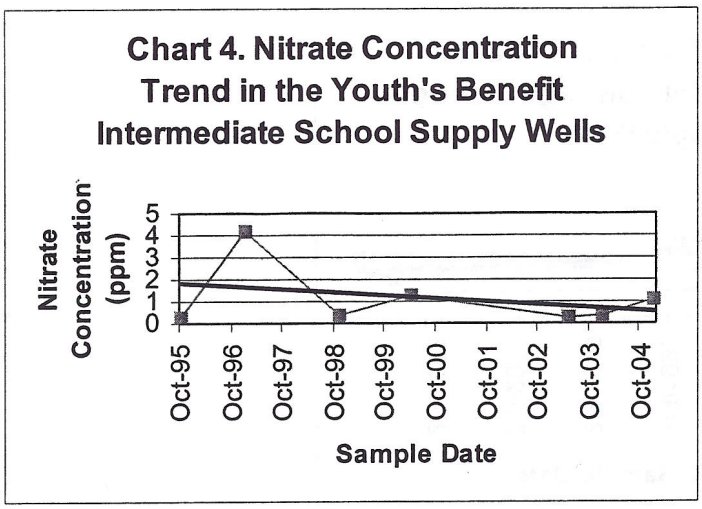


Chart 3. Nitrate Concentration Trend in the Youth's Benefit Primary School Supply Well
Nitrate Concentration (ppm)
10
8
6
4
2
0
2/9/1993
2/9/1995
2/9/1997
2/9/1999
2/9/2001
2/9/2003
2/9/2005
Sample Date



Sources of nitrate can generally be traced back to land use. Fertilizer applied to agricultural fields, residential lawns, and effluent from residential and commercial on-site septic systems are all non-point sources of nitrate loading in ground water. As shown in Tables 3a-3c, all of the schools have some percentage of cropland within their respective WHPAs. In addition, the four schools are in areas with no planned public sewerage service based on the 2003 Harford County Sewerage Coverage Map. Nitrate is present in wastewater effluent as a result of the conversion of organic nitrogen compounds to inorganic nitrate. Excess nitrate from manure and fertilizer that is not used by lawns or crops leaches into the ground water during recharge periods. The Fallston and North Harford High Schools, and Youth's Benefit Primary School **are** susceptible to nitrate due to the levels and persistence of this contaminant found, the vulnerability of the unconfined aquifers to land activity, and the presence of nitrate sources in their wellhead protection areas. Based on available water quality data, the Youth's Benefit Intermediate School water system is **not** susceptible to nitrate contamination (Table 9).

Arsenic is a naturally occurring element that was detected in one sample from the North Harford High School water system at 0.006 ppm in May 2003 (Table 6a). EPA lowered the MCL for arsenic from 0.050 ppm to 0.010 ppm on February 22, 2002. It was not detected in a subsequent sampling event conducted in June 2003, nor has it ever been detected before from three previous data sets. It also has not been detected in available sampling data from the other three schools in this report. The single arsenic detect at North Harford High School is considered an anomaly. Therefore, the four school's water systems are **not** susceptible to this contaminant.

Iron is a naturally occurring element that was detected in aquifer material at the secondary standard from a single raw water sample collected at the Fallston High School Well 2 in 2001 (Table 6b). Excessive iron levels can cause taste, color, and odor problems in drinking water as well as iron bacteria build-up around well casings. Iron is an unregulated constituent with a secondary MCL of 0.3 ppm.

The low levels of other inorganic constituents detected in the wells likely represent the naturally occurring levels present in the aquifers from dissolving minerals in the bedrock. Therefore, the four water supplies in this report are **not** susceptible to regulated inorganic compounds other than nitrate based on available water quality data (Table 9).

Radionuclides

An MCL for radon-222 has not yet been adopted. However, the U.S. EPA has proposed an MCL of 300 pCi/L or an alternative of 4000 pCi/L for drinking water if the State has a program to reduce the more significant risk from radon in indoor air, which is the primary health concern. Radon is present in the water systems of the four schools from this report at levels above the more conservative proposed MCL of 300 pCi/L (Table 6c). At the two high schools, radon was detected at levels above 50% of the higher proposed MCL of 4000 pCi/L (Table 6c). 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 the ground water of fractured rock aquifers due to the radioactive decay of uranium bearing minerals in the bedrock. EPA has information on proposed regulations for radon in indoor air and drinking water on their web site (http://www.epa.gov/safewater/radon.html).

Nontransient noncommunity water systems are currently not regulated for radionuclides. However, based on limited available sampling data, all four water systems **may be** susceptible to radon-222 if the more conservative MCL of 300 pCi/L is adopted (Table 9). The two high schools **may also be** susceptible to radon-222 if the higher MCL standard is used (Table 9). The susceptibility to other radionuclides cannot be determined for the four water systems at this time due to the lack of sufficient sampling data.

Volatile Organic Compounds

Toluene was detected at 1 ppb from a single set of raw water sampling results in 2001 at the Fallston High School Well 2. Toluene is a gasoline additive, and a manufacturing solvent. The MCL for toluene is 1000 ppb. It was not detected again in 2 subsequent sampling events. No other regulated VOCs were detected at the school's water systems from available sampling data collected since 1991. Potential VOC point sources were identified within and near the school's WHPAs (Figures 2a-2b, & Appendix C). However, all of the USTs located within the WHPAs store heating oil only, and not gasoline. Heating oil is less mobile in ground water than gasoline constituents, and therefore is less likely to impact the school wells in the event of a spill or leak. Therefore, these sources do not appear to have a significant impact on the wells as indicated by the historical water quality data. Based on this analysis, the water supplies of the four school's assessed in this report are **not** susceptible to VOC contamination (Table 9).

Synthetic Organic Compounds

The current land use suggests that the potential non-point sources of SOCs located within the WHPAs are cropland, residential areas, and the school properties that

include athletic fields. Pesticides and chemicals used on residential and school lawns and gardens, and athletic fields are a potential threat. However, typical lawn maintenance herbicides are very biodegradable and should not pose a significant SOC risk if applied properly. The Harford County Public Schools should adhere to a Best Management Practices (BMP) plan regarding the proper useage of lawn fertilizers, outdoor pesticide and herbicide applications, and the storage of hazardous chemicals in the WHPAs in order to prevent ground water contamination. A photo taken of the Fallston High School Well 1 reveals the possibility that an herbicide (e.g. Roundup®) may have been applied to the ground surface to prevent the growth of grass and weeds around the wellhead (Appendix A). This practice should never be done, as it puts the well and aquifer at a potential risk of SOC contamination.

No SOCs relating to water quality were detected from the sets of available sampling data at each school. This indicates that synthetic chemicals are generally not being over-applied in the WHPAs. The phthalate detects at the four schools were also detected in the laboratory blank samples and therefore do not represent actual water quality. Based on this analysis, the ground water supplies at the four schools are **not** susceptible to SOC contamination (Table 9).

Microbiological Contaminants

Based on limited raw water bacteriological data (Table 7) the public school supply wells assessed in this report were determined not to be under the direct influence of surface water. Hence the wells are **not** susceptible to any microbiological contaminant present at the surface including *Giardia & Cryptosporidium* (Table 9).

MANAGEMENT OF THE WHPAS

With the information contained in this report, the Harford County Public Schools as well as the Harford County government have a basis for protecting the drinking water supplies of the four public schools assessed in this report. Staying aware of the areas delineated for source water protection, keeping track of potential contaminant sources, and evaluating future development and land planning are examples of management practices that will protect the water supplies. Specific management recommendations for consideration are listed below.

Form a Local Planning Team

- The report indicates that three out of the four public school water systems in this report have nitrates at levels of concern. The Harford County Public Schools should take a leadership role in developing a plan to promote the protection of these important water supplies. County Health and Planning Departments along with agricultural interests would be logical partners in this effort. In addition, local businesses, developers, and residents located within and near wellhead protection areas should also take an active role in addressing the protection of the water supplies.

Public Awareness and Outreach

- Since large portions of the WHPAs lies within public school property, MDE recommends the implementation of a school-wide awareness program to minimize contamination occurrences within the WHPAs. The schools should provide letters and flyers to students, faculty, and maintenance personnel to inform them about environmentally conscientious waste management practices.
- Conduct educational outreach to commercial facilities and residences within and near the WHPAs where potential contaminant sources may be present. 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, (e) proper use and application of fertilizers, pesticides, and herbicides, and (f) proper maintenance of on-site septic systems.
- Road signs at the boundaries of wellhead protection areas are an effective way of keeping the relationship of land use and water quality in the public eye, and help in the event of spill notification and response.

Planning/ New Development

- Harford County Public Schools should stay in contact with the Harford County Health and Planning Departments regarding any proposed construction within or near the WHPAs to ensure that it will not have any adverse affects on water quality. Plans for new construction at the schools should stress the importance of adequate protection of the ground water sources.
- Harford County Public Schools should inform the County Health and Planning Departments of any concerns about future development or zoning changes for properties that are within the designated WHPAs.

Contingency Plan

- The Harford County Public Schools should develop a spill response plan in concert with the fire departments and other emergency response personnel.

Cooperative Efforts with Other Agencies

- Harford County Public Schools should request the assistance of the University of Maryland Agricultural Extension Service and the Soil Conservation Service to work with farmers to adopt Best Management Practices (BMPs) for cropland located in the WHPAs.
- The public schools may also want to participate in the New Conservation Reserve Program (CREP) applicable to the cropland located within the wellhead protection areas. Government funding is available to qualified farmers equal to the cost and financial benefit of farming the areas. The Natural Resources Conservation Service is responsible for determining the environmental benefits of each acre offered for participation.

Monitoring

- The public schools should continue to monitor for all Safe Drinking Water Act contaminants as required by MDE.

- Annual raw water sampling for microbiological contaminants is a good way to check the integrity of each well.
- The public schools should stay in contact with the MDE Oil Control Program for the latest updates regarding open cases near the WHPAs.

Contaminant Source Inventory Updates/ Inspections

- Harford County Public Schools should conduct their own field survey of their wellhead protection areas to ensure that there are no additional potential sources of contamination. Updated records of new development within the respective WHPAs should be maintained.
- Periodic inspections and a regular maintenance program of the supply wells will ensure their integrity and protect the aquifers from contamination.

Well Improvements

- Wells that do not meet current construction standards should be upgraded to protect them from contamination associated with poor or outdated construction. The casings of the North Harford High School Well 2, and the Youth's Benefit Primary School Well 1 should be inspected for integrity and replaced if necessary. Also, the wells should be upgraded with grout seals around their respective casings or replaced.
- Well 1 and the Test Well at North Harford High School with no planned future use should be properly abandoned and sealed by a certified well driller according to current State well construction standards (Appendix A). Unused wells may provide a direct route for ground water contamination to an aquifer.
- The electrical conduit on the Youth's Benefit Intermediate School Well 1 needs to be properly repaired as soon as possible. Damaged or improperly sealed electrical conduits may provide a pathway for bacteria, and other surficial contaminants to enter the well and ultimately reach the ground water aquifer.

Contaminant Source Management

- Guidelines should be developed to assist school facilities personnel in the proper handling and storage of hazardous materials including petroleum products, the proper application of fertilizers, herbicides, and pesticides on school grounds including athletic fields, de-icing of roads and parking lots, and wastewater discharge practices with emphasis on protecting ground water quality. Maintenance personnel should never apply herbicide products such as Roundup® around wellheads to control the growth of grass and weeds (Appendix A, Photo 1) as this practice may potentially contaminate the well and aquifer with SOCs.
- Harford County Public Schools should consider vaulting their existing heating oil USTs or replacing them with above ground or double-walled tanks that comply with current regulations due to their close proximity to the school's supply wells.

Changes in Use

- Any increase in pumpage or addition of new wells at the schools may require revisions to the WHPAs. The Harford County Public Schools are required to contact the Water Supply Program when an increase in pumpage is applied for and when new wells are being considered.

REFERENCES

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

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.

Geo-Technology Associates, Inc., 2000, Report of Hydrogeologic Investigation North Harford High School Harford County, Maryland: GTA Job No. 99362, 14 p.

Heath, Ralph C., 1983, Basic Ground-Water Hydrology: U.S. Geological Survey Water-Supply Paper 2220, 84 p.

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

Maryland Geological 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.

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

Nutter, Larry J., and Smigaj, Michael J., 1975, Harford County Ground-Water Information: Well Records, Chemical Quality Data, and Pumpage: Maryland Geological Survey Water Resources Basic Data Report No. 7, 89 p

OTHER SOURCES OF DATA

Water Appropriation and Use Permits: HA1972G011, HA1975G009, & HA1999G006
Public Water Supply Sanitary Survey Inspection Reports
MDE Water Supply Program Oracle® Database
MDE Waste Management Sites Database
MDE Environmental Permits Database
MD Dept. of Natural Resources Digital Orthophoto Quads for Jarrettsville SW & SE, and Fawn Grove SE & NE
MD Dept. of Planning 2002 Harford County Digital Land Use Maps
MD Dept. of Planning 2003 Harford County Digital Sewerage Coverage Maps
ADC® Digital Maps for Harford County
USGS Topographic 7.5-Minute Series Quadrangles for Jarrettsville and Fawn Grove
MD State Highway Administration Roads Map

Tables

PWSID [1]	PWS NAME	PLANT ID [2]	SRC. ID [3]	USE CODE [4]	SOURCE NAME	WAPID [5]	AVE. AMT. (gpd)	WELL PERMIT NO.	WELL DEPTH (ft.)	CASING DEPTH (ft.)	YEAR DRILLED	AQUIFER
1120012	FALLSTON HIGH SCHOOL	01	01	P	WELL 1	HA1975G009	18000	HA731746	216	78	1974	LWR PELITIC SCHIST WISSAHICKON**
		01	02	P	WELL 2	HA1975G009	18000	HA943865	275	50	2000	LWR PELITIC SCHIST WISSAHICKON
1120029	NORTH HARFORD HIGH SCHOOL	01	01	P	WELL 1	HA1999G006	15000	n/a	95	61	n/a	METAGRAYWACKE WISSAHICKON
		01	02	P	WELL 2	HA1999G006	15000	n/a	165	75	n/a	METAGRAYWACKE WISSAHICKON
		00	03	T	TEST WELL	HA1999G006	15000	HA946009	320	104	2003	METAGRAYWACKE WISSAHICKON
		01	04	F	WELL 3	HA1999G006	15000	HA946010	300	64	2003	METAGRAYWACKE WISSAHICKON
1120037	YOUTHS BENEFIT PRIMARY SCHOOL	01	01	P	WELL 1	HA1972G011	3000	HA011307	362	45	1953	LWR PELITIC SCHIST WISSAHICKON
1120038	YOUTHS BENEFIT INTERMEDIATE	01	01	P	WELL 1	HA1972G011	3000	HA943506*	545	75	1999	LWR PELITIC SCHIST WISSAHICKON
		01	02	P	WELL 2	HA1972G011	3000	HA880604	500	60	1989	LWR PELITIC SCHIST WISSAHICKON

Table 1. Well Information

[1] PWSID = Public Water System Identification

[2] PLANT ID = Plant Identification. The point of entry to a system from each source

[3] SRC. ID = Source Identification. Each ID is considered a unique water source

[4] P = Production Wells, F = Planned/Proposed Wells, T = Test Wells

[5] WAPID = Water Appropriation Permit Identification

n/a = not available * Original well drilled on 9/22/72 (Permit # HA-72-0695). Well deepened from 400' to 545' on 11/30/99

** Listed as Baltimore Gabbro in MGS Water Resources Basic Data Report No. 7, 1975

ID[1]	Type[2]	Facility Name	Address	[1]Reference Location	WHPA System Name	[3]Potential Contaminants
1	UST	Fallston Middle School	2303 Carrs Mill Rd.	Figure 2a	Fallston H.S.	VOC
2	MISC	Fallston High School Wastewater Treatment Plant	2301 Carrs Mill Rd.	Figure 2a	Fallston H.S.	MP, NN, VOC, SOC, M
3	UST	Fallston High School	2301 Carrs Mill Rd.	Figure 2a	Fallston H.S.	VOC
4	MISC	Fallston Volunteer Fire Co.	2201 Carrs Mill Rd.	Figure 2a	Fallston H.S.	VOC, HM
5	UST	Fallston Recreation Complex	1809 Fallston Rd.	Figure 2a	Youth's Benefit	VOC
6	UST	Youth's Benefit Primary School	1901 Fallston Rd.	Figure 2a	Youth's Benefit	VOC
7	UST	Youth's Benefit Intermediate School	1901 Fallston Rd.	Figure 2a	Youth's Benefit	VOC
8	MISC	Frank Thomas Saw Mill	Fallston Rd.	Figure 2a	Youth's Benefit	VOC, HM
9	UST, LUST	7-Eleven # 22281	2400 Pleasantville Rd.	Figure 2a	Youth's Benefit	VOC
10	MISC	Pleasantville Animal Hospital of Fallston	2128 Fallston Rd.	Figure 2a	Youth's Benefit	VOC, HM, M, SOC
11	UST	Citgo	4802 Rocks Rd.	Figure 2b	North Harford H.S.	VOC
12	UST	North Harford Middle School	112 Pylesville Rd.	Figure 2b	North Harford H.S.	VOC
13	MISC	North Harford Middle School Wastewater Treatment Plant	112 Pylesville Rd.	Figure 2b	North Harford H.S.	MP, NN, VOC, SOC, M
14	UST	North Harford Elementary School	120 Pylesville Rd.	Figure 2b	North Harford H.S.	VOC
15	UST	North Harford High School	211 Pylesville Rd.	Figure 2b	North Harford H.S.	VOC
16	MISC	North Harford High School Wastewater Treatment Plant	211 Pylesville Rd.	Figure 2b	North Harford H.S.	MP, NN, VOC, SOC, M

Table 2. Potential Contaminant Point Sources within or near Wellhead Protection Areas

[1] See referenced figure for location

[2] UST = Underground Storage Tanks, LUST = leaking underground storage tanks
MISC = Miscellaneous Sites

[3] VOC = volatile organic compounds, SOC = synthetic organic compounds
M = Metals, HM = Heavy Metals, NN = nitrate / nitrite, MP = Microbiological Pathogens

LAND USE TYPE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	22.11	32.85
Medium Density Residential	11.06	16.44
Commercial	30.96	46.00
Cropland	1.91	2.84
Forest	1.26	1.87
Total Area	67.30	100.00

Table 3a. Land Use in the Fallston High School WHPA (See Figure 3a)

LAND USE TYPE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	7.70	8.12
Commercial	47.93	50.54
Cropland	27.93	29.45
Forest	11.27	11.89
Total Area	94.83	100.00

Table 3b. Land Use in the Youth's Benefit School's WHPA (See Figure 3a)

LAND USE TYPE	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Commercial	53.44	84.84
Cropland	9.55	15.16
Total Area	62.99	100.00

Table 3c. Land Use in the North Harford High School WHPA (See Figure 3b)

PWSID	SYSTEM NAME	PLANT ID	TREATMENT METHOD	PURPOSE
1120012	FALLSTON HIGH SCHOOL	01	pH ADJUSTMENT	Corrosion Control
1120029	NORTH HARFORD HIGH SCHOOL	01	INHIB., ORTHOPHOSPHATE	Corrosion Control
			pH ADJUSTMENT, POST	Corrosion Control
			HYPOCHLORINATION, POST	Disinfection
1120037	YOUTHS BENEFIT PRIMARY SCHOOL	01	INHIB., ORTHOPHOSPHATE	Corrosion Control
			pH ADJUSTMENT, POST	Corrosion Control
1120038	YOUTHS BENEFIT INTERMEDIATE	01	pH ADJUSTMENT	Corrosion Control

Table 4. Treatment Methods

			IOCs (except nitrate)		NITRATE		RADIONUCLIDES		VOCs		SOCs	
PWSID	SYSTEM NAME	PLANT ID	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
1120012	Fallston H.S.	01	6	0	25	4	2	2*	8	0	3	1**
1120029	North Harford H.S.	01	6	1	34	30	2	1*	8	0	4	2**
1120037	Youth's Benefit Primary	01	6	0	25	12	1	1*	7	0	5	0
1120038	Youth's Benefit Intermed.	01	6	0	18	0	1	1*	8	0	6	0

Table 5. Summary of Water Quality Results

* Based on lower proposed MCL for radon-222

** Phthalate also detected in blank sample and is therefore not indicative of actual water quality

PWSID	PWS NAME	PLANT ID	CONTAMINANT	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1120012	FALLSTON HIGH SCHOOL	01	NITRATE	10	5-Jan-95	6.02
		01	NITRATE	10	23-Jan-95	5.89
		01	NITRATE	10	12-Sep-96	5
		01	NITRATE	10	21-Oct-96	5.81
1120029	NORTH HARFORD HIGH SCHOOL	01	ARSENIC	0.01	29-May-03	0.006
		01	NITRATE	10	9-Feb-93	6
		01	NITRATE	10	9-Jun-93	5.4
		01	NITRATE	10	8-Sep-93	7.52
		01	NITRATE	10	8-Nov-93	8.96
		01	NITRATE	10	31-Jan-94	7.11
		01	NITRATE	10	20-Apr-94	7.57
		01	NITRATE	10	15-Sep-94	6.31
		01	NITRATE	10	3-Nov-94	8.5
		01	NITRATE	10	12-Jan-95	7.98
		01	NITRATE	10	11-Apr-95	6.5
		01	NITRATE	10	13-Sep-95	6.65
		01	NITRATE	10	17-Oct-95	6.26
		01	NITRATE	10	26-Oct-95	5.2
		01	NITRATE	10	16-Jan-96	6.5
		01	NITRATE	10	16-Sep-96	6.07
		01	NITRATE	10	16-Oct-96	8.03
		01	NITRATE	10	7-Jan-97	6.21
		01	NITRATE	10	4-Apr-97	6.08
		01	NITRATE	10	3-Feb-98	5.09
		01	NITRATE	10	30-Nov-98	5.4
		01	NITRATE	10	6-Jan-99	5.48
		01	NITRATE	10	14-Jun-00	5.6
		01	NITRATE	10	10-Jan-02	5
		01	NITRATE	10	5-Sep-02	5.3
		01	NITRATE	10	25-Nov-02	5.9
		01	NITRATE	10	22-Jan-03	6
		01	NITRATE	10	29-May-03	6
		01	NITRATE	10	16-Jun-03	5
		01	NITRATE	10	30-Jan-04	5.1
		01	NITRATE	10	11-Jan-05	6.4
1120037	YOUTHS BENEFIT PRIMARY SCHOOL	01	NITRATE	10	23-Jan-95	5.17
		01	NITRATE	10	31-Oct-95	5.1
		01	NITRATE	10	20-Oct-97	6.7
		01	NITRATE	10	5-Apr-00	5.4
		01	NITRATE	10	4-Jan-01	5.6
		01	NITRATE	10	4-Jan-02	5.6
		01	NITRATE	10	6-Feb-03	6.4
		01	NITRATE	10	26-Jun-03	5.2
		01	NITRATE	10	30-Jan-04	5.3
		01	NITRATE	10	8-Nov-04	5.7
		01	NITRATE	10	11-Jan-05	7.8
		01	NITRATE	10	30-Aug-05	6.3

Table 6a. Inorganic Compounds Detected Above 50% of their Respective MCLs

PWSID	PWS NAME	PLANT ID	CONTAMINANT	SMCL (ppm)	SAMPLE DATE	RESULT (ppm)	COMMENTS
1120012	FALLSTON HIGH SCHOOL	01	IRON	0.3	10-Jan-01	0.3	Raw Water Well 2

Table 6b. Inorganic Compounds Detected Above 50% of their Respective Secondary MCLs

PWSID	PWS NAME	PLANT ID	CONTAMINANT	Proposed MCL (pCi/L)	SAMPLE DATE	RESULT (pCi/L)
1120012	FALLSTON HIGH SCHOOL	01	RADON-222	300	23-Apr-96	490
					10-Jan-01	2429
1120029	NORTH HARFORD HIGH SCHOOL				25-Mar-97	4035
1120037	YOUTH'S BENEFIT PRIMARY				1-Jul-96	725
1120038	YOUTH'S BENEFIT INTERMEDIATE				1-Jul-96	1015

Table 6c. Radon-222 Results Above 50% of its Lower Proposed MCL

PWSID	PWS NAME	PLANT ID	CONTAMINANT	MCL (ppb)	SAMPLE DATE	RESULT (ppb)
1120012	FALLSTON HIGH SCHOOL	01	DI(2-ETHYLHEXYL) PHTHALATE	6	25-Mar-02	4.2*
1120029	NORTH HARFORD HIGH SCHOOL				**26-Oct-95**	**16.84***
					31-Jul-02	4.6*

Table 6d. Synthetic Organic Compounds Detected Above 50% of the MCL

* Result also detected in blank sample and is therefore not indicative of actual water quality
Results in bold are greater than their respective MCL

PWSID	SOURCE NAME	RAIN DATE	RAIN AMOUNT (inches)	REMARK	SAMPLE DATE	TEMP. (^{0}C)	pH	TURBIDITY (NTU)	TOTAL COLIFORM (col/100 ml)	FECAL COLIFORM (col/100 ml)
1120012	Well 1	25-Jun-02	0	DRY	25-Jun-02	15.4	6.14	0	-1.1	-1.1
	Well 2	25-Jun-02	0	DRY	25-Jun-02	15.3	5.8	1.2	-1.1	-1.1
1120029	Well 1	12-Dec-02	0.5	WET	12-Dec-02	12.8	6.7	6.69	-1	-1
	Well 2	12-Dec-02	1.61	WET	12-Dec-02	12.7	5.8	0.76	1	-1
	Well 2	12-Dec-02	1.61	RE-TEST	18-Dec-02	12.1	6		-1	-1
	Well 3	29-Oct-03	3.01	WET	30-Oct-03	13.3	6.9	2.6	-1	-1
1120037	Well 1	25-Jun-02	0	DRY	25-Jun-02	14.7	4.8	0.9	-1	-1
1120038	Well 1	25-Jun-02	0	DRY	25-Jun-02	19.8	6	55.2	-1	-1
	Well 2	25-Jun-02	0	DRY	25-Jun-02	14	6.1	2.1	-1	-1

Table 7. Raw Water GWUDI Test Results

PWSID	PWS NAME	No. of Samples	No. of Positive Samples	Disinfection Treatment?
1120012	FALLSTON HIGH SCHOOL	95	2	No
1120029	NORTH HARFORD HIGH SCHOOL	95	2	Yes
1120037	YOUTHS BENEFIT PRIMARY SCHOOL	35	0	No
1120038	YOUTHS BENEFIT INTERMEDIATE	37	0	No

Table 8. Routine Bacteriological Monitoring Results from System Distributions Since 1996

PWSID	SYSTEM NAME	PLANT ID	Is the Water System Susceptible to....					
			Regulated Inorganic Compounds (except nitrate)	Nitrate	Radionuclides	Volatile Organic Compounds	Synthetic Organic Compounds	Microbiological Contaminants
1120012	FALLSTON HIGH SCHOOL	01	NO	YES	YES**	NO	NO	NO
1120029	NORTH HARFORD HIGH SCHOOL		NO	YES	YES**	NO	NO	NO
1120037	YOUTH'S BENEFIT PRIMARY		NO	YES	YES*	NO	NO	NO
1120038	YOUTH'S BENEFIT INTERMEDIATE		NO	NO	YES*	NO	NO	NO

Table 9. Susceptibility Analysis Summary

* Based on the lower proposed MCL of 300 pCi/L for radon-222

** Based on the lower (300 pCi/L) and higher (4000pCi/L) proposed MCLs for radon-222

PWSID	SYSTEM NAME	POPULATION
1120012	FALLSTON HIGH SCHOOL	1808
1120029	NORTH HARFORD HIGH SCHOOL	1466
1120037	YOUTH'S BENEFIT PRIMARY	563
1120038	YOUTH'S BENEFIT INTERMEDIATE	550
	TOTALS	4387

Table 10. System Population Estimates

Figures

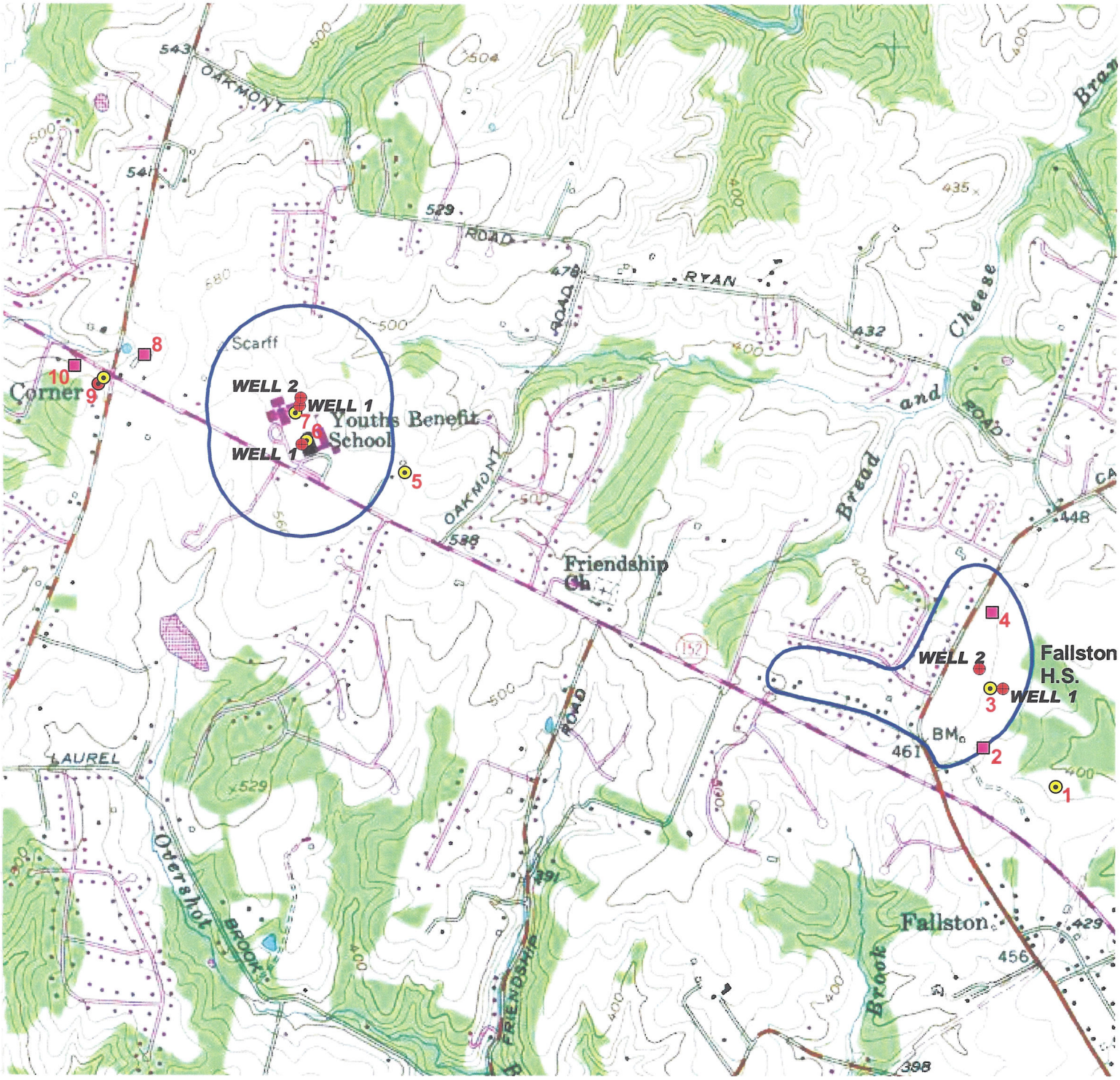


Figure 2a. Fallston High School, & Youth's Benefit Primary & Intermediate School's Wellhead Protection Areas with Potential Contaminant Sources

LEGEND

- Supply Wells
- Underground Storage Tanks (USTs)
- Leaking USTs
- Miscellaneous Sites
- Wellhead Protection Areas

N

1500 0 1500 Feet

Base Map: USGS 7.5 Minute Series Quad for Jarrettsville

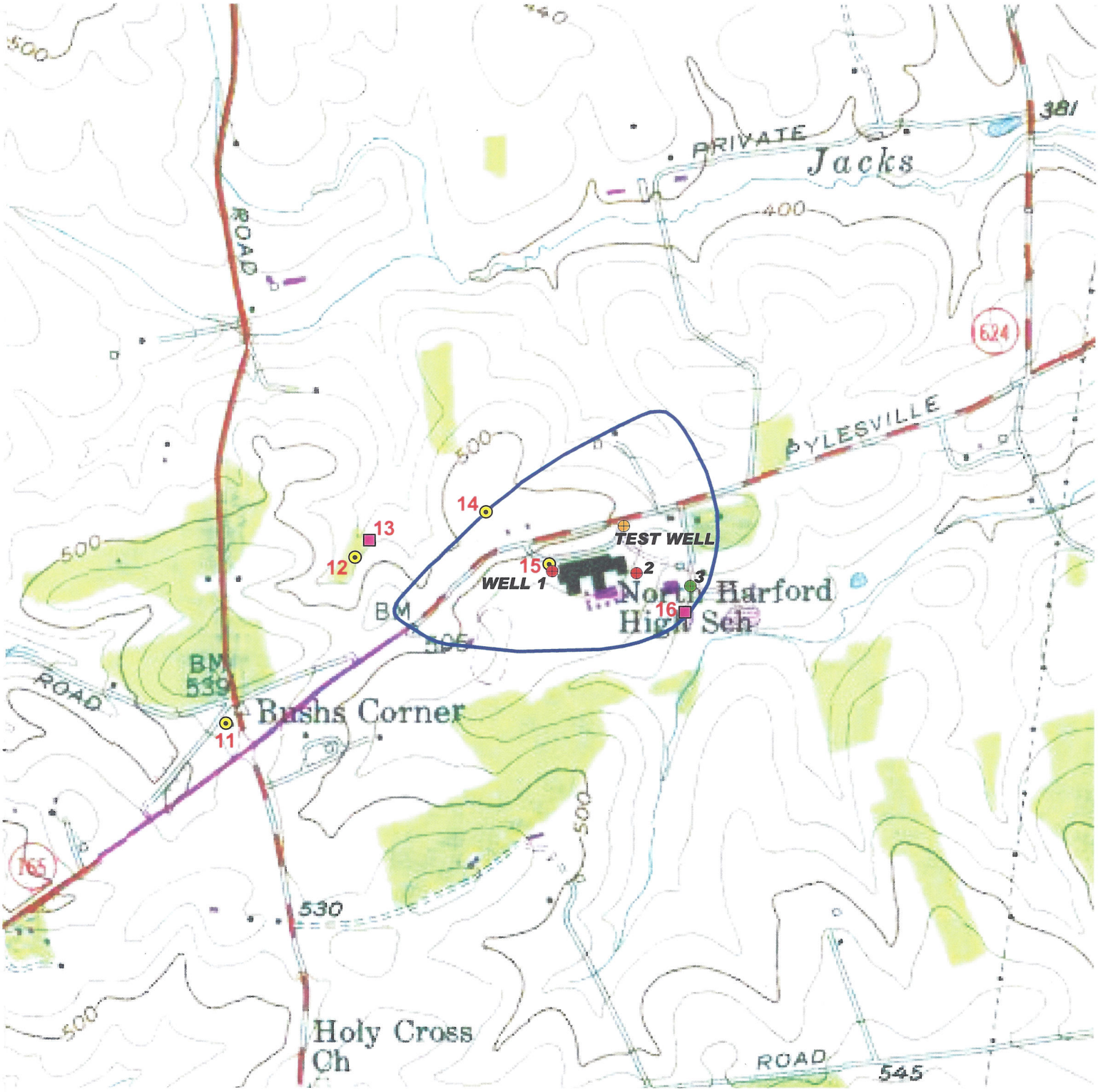


Figure 2b. North Harford High School Wellhead Protection Area with Potential Contaminant Sources

LEGEND

North Harford H.S. Wells

- Planned/Proposed Wells
- Supply Wells
- Test Wells
- Underground Storage Tanks (USTs)
- Miscellaneous Sites
- Wellhead Protection Areas

N

1000 0 1000 Feet

Base Map: USGS 7.5 Minute Series Quad for Fawn Grove

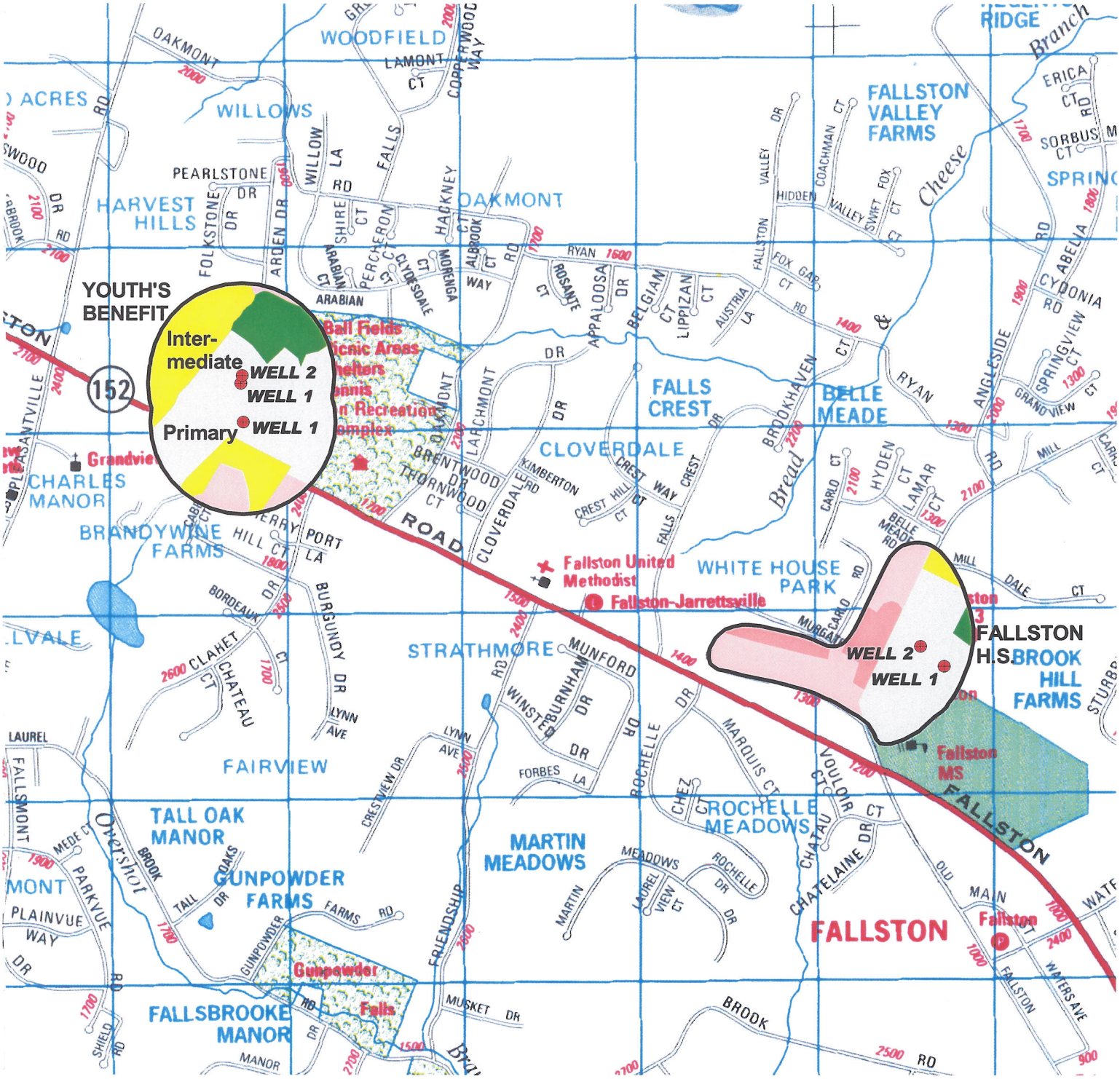


Figure 3a. Land Use in the Fallston H.S. & Youth's Benefit School's Wellhead Protection Areas

LEGEND

- Supply Wells
- Wellhead Protection Areas

Harford County Land Use

- Low Density Residential
- Medium Density Residential
- Commercial
- Cropland
- Forest

N

1500 0 1500 Feet

Base Maps: MD Dept. of Planning 2002 Digital Land Use Map, and ADC Digital Map for Harford County

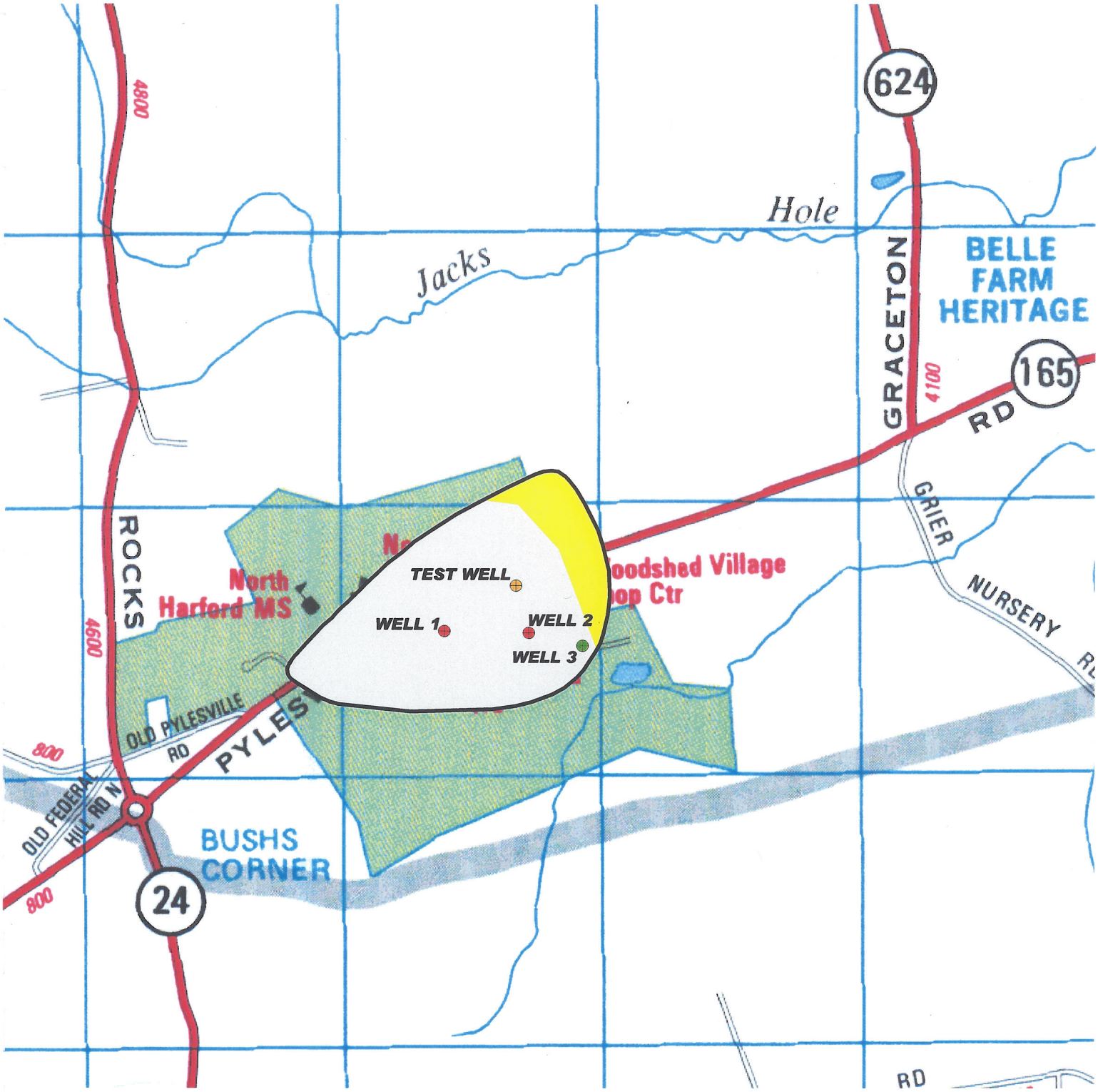


Figure 3b. Land Use in the North Harford High School Wellhead Protection Area

LEGEND

North Harford H.S. Wells

- Planned/Proposed Wells
- Supply Wells
- Test Wells

Harford County Land Use

- Commercial
- Cropland
- Wellhead Protection Areas

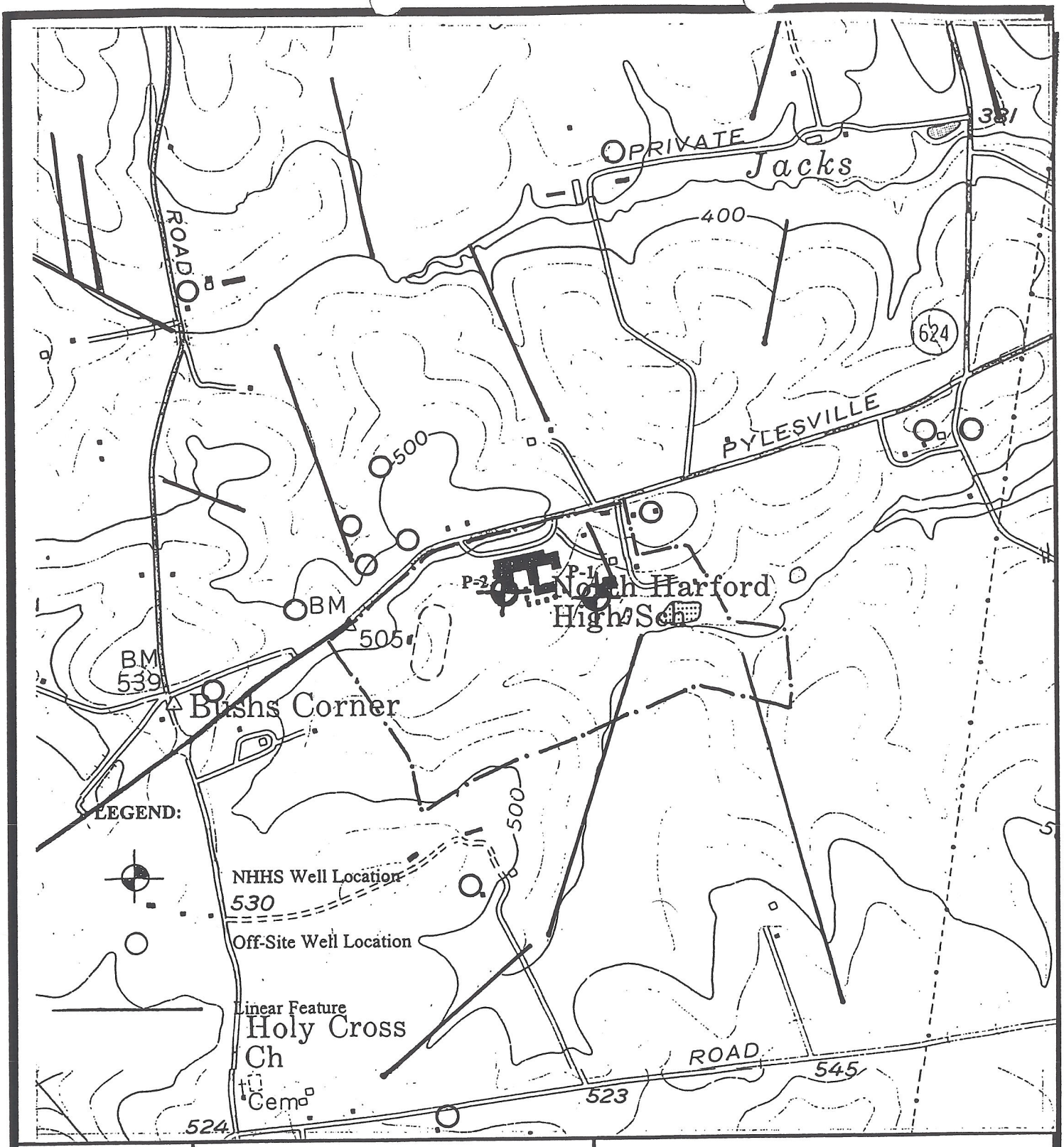
N

1000 0 1000 Feet

Base Maps: MD Dept. of Planning 2002 Digital Land Use Map, and ADC Digital Map for Harford County

Appendix B

Fracture Trace Map Showing Linear Features near North Harford High School



GEO-TECHNOLOGY ASSOCIATES, INC.
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HYDROGEOLOGIC FEATURES
NORTH HARFORD HIGH SCHOOL
HARFORD COUNTY, MARYLAND

SCALE	DATE	DRAWN BY	DESIGN BY	REVIEW BY	JOB NO.
1" = 1,000'	SEPT., 1999	PSS	ADC	GTA	99632

Appendix C

Reports of MDE Oil Control Program Open Cases within or near Wellhead Protection Areas

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

Fallston High School
2301 Carrs Mill Road
Fallston, MD 21047
MDE Case No. 2005-1077HA

Status as of October 2005:

An air pressure compliance test performed on the 20,000-gallon heating oil UST at Fallston High School failed. This test is conducted every 5 years on registered heating oil USTs. An investigation revealed a hole in the remote fill riser located in the upper portion of the tank. Liquid phase product cannot escape from this area of the tank, as it is above the tank's fill capacity, however, VOC vapors may be released. Repair-work on the fill riser is scheduled in order to restore the tank to compliance status.

MARYLAND DEPARTMENT OF THE ENVIRONMENT

1800 Washington Boulevard • Baltimore Maryland 21230-1719
1-800-633-6101 • http://www.mde.state.md.us

Drinking Water Well Impact
7-Eleven Store No. 22281/Citgo
2400 Pleasantville Road, Fallston
Harford County, Maryland
(MDE - Case 1990-0801 HA; Case 1995-2622 HA; Case 2005-0120HA)

The Maryland Department of the Environment (MDE) is continuing its evaluation of the methyl tertiary-butyl ether (MTBE) contamination of the water supply well and gasoline retail activities 7-Eleven/Citgo service station located at 2400 Pleasantville Road in Harford County. The Oil Control Program (OCP) has coordinated the investigation in with the Harford County Health Department (HCHD).

Gasoline retail activities have been ongoing for over twenty years at the 7-Eleven/ Citgo, under several business entities namely Ewing Oil, Southland Corporation and currently 7-Eleven Inc. This active gas station currently operates three (3) 12,000-gallon gasoline underground storage tank systems (USTs). These USTs are cathodically protected steel tanks with piping material comprising of flexible plastic, double walled with secondary containment. The site has Stage I & II vapor recovery systems. Three monitoring wells are located on-site. A carbon treatment system is currently in-place on the non-community supply well to eliminate petroleum constituents from the drinking water that serves the 7-Eleven convenience store.

Chronology:

- October 27, 1989. MDE-OCP opens case (1990-0801 HA) in response to a notification concerning drill cuttings in seven (7) 55-gallon drums stored next to the building. Southland Corp. installed the wells in conjunction with Ewing Oil because Southland Corporation is involved in operations at this gasoline retail facility. OCP checked drums no odors detected. MDE-OCP requested samples collected form each of the 3 monitoring well locations.

- May 31, 1991. Monitoring Well Sampling Report-May 21, 1991 prepared by Nutshell Enterprises Ltd. on behalf of Ewing Oil. No product in wells. Groundwater present in two (MW1, MW3) of three monitoring wells, sampled and analyzed for benzene, toluene, xylene, ethylbenezene (BTEX) and total petroleum hydrocarbons (TPH) yielded non-detects except for toluene which had trace amounts.

- April 24,1991. Letter from HCHD concerning sampling results from the non-community supply well at the 7-Eleven Citgo.
  - August 1990. MTBE detected at 259 ppb
  - September 1990. MTBE detected at 250 ppb.
  - March 1991. Carbon filtration system installed. MTBE at 11 ppb in post-treatment sample.

- October 18, 1991. Letter from HCHD concerning sampling results from the non-community supply well at the 7-Eleven Citgo, four supply wells serving business entities and a residential property in close proximity to the station.
  - 1990-1991
    - 2402 Pleasantville Road (Pleasantville Professional Building) – trace amounts of solvents below drinking water standards.
    - 2410 Pleasantville Road (Josef's Restaurant) – no petroleum constituents detected.
    - 2108 Fallston Road (Abe's Place) – no petroleum constituents detected.
    - Aldo's Restaurant – no petroleum constituents detected.
    - 2019 Fallston Road – no petroleum constituents detected.

- November 6, 1991. MDE letter to HCHD stating that no active investigation trace levels of solvents detected a supply well to be conducted because this constituent is not found in petroleum UST systems.

- December 11, 1991. Letter from HCHD concerning sampling results from the non-community supply well at the 7-Eleven Citgo.
  - November 1991. MTBE detected at 39 ppb.

- March 16, 1992. Monitoring Well Sampling Report-March 10, 1992 prepared by Nutshell Enterprises Ltd. on behalf of Ewing Oil. No product in wells. Groundwater collected from one of three monitoring wells (insufficient quantities). MW3 analyzed for BTEX and TPH yielded trace amounts (<3 ppb).

- March 4, 1992. Letter from HCHD regarding expansion plans of a nearby restaurant.

- July 9, 1992. Letter to HCHD from MDE. Based on trace levels of petroleum constituents from the downgradient monitoring well (MW3), no further action being considered.

- May 18, 1994. Monitoring Well Sampling Report-May 13, 1994 prepared by Nutshell Enterprises Ltd. on behalf of Ewing Oil. No product in wells. Groundwater collected from two of three monitoring wells (insufficient quantities). MW1 and MW3 both analyzed for BTEX and TPH yielded trace amounts (<2 ppb).

- October 1992. OCP inspected site and evaluated pump test data. Groundwater flow presumably north.

- March 9, 1994. MDE closed case (1990-0801 HA).

- June 6, 1995. New case opened *1995-2622HA*. MDE-OCP observed retrofitting of existing tanks for Stage II vapor recovery. 20 tons of contaminated soils disposed off-site. MDE closed case April 1, 1997.

Ownership of UST Systems:

- 1991. Three 12, 000 gallon gasoline coated steel tanks with galvanized steel piping registered to Ewing Oil Inc.

- March 1995. MDE received written notification that the Southland Corporation purchased the tanks from Ewing Oil Co. on February 6, 1995.

- 1996. Tanks registered to Southland Corporation with financial responsibility secured through a letter of credit. Three (3) 12,000 gallon gasoline cathodically protected steel tank. Piping material comprises flexible plastic, double walled with secondary containment. Stage I & II vapor recovery.

- 2000- Present. Tanks registered to 7-Eleven Inc. and commercially insured.

Current Status:

- July 30, 2004. Case re-opened *(Case 2005-0120HA)*. MDE-OCP conducted a compliance assistance inspection at the facility. MDE-OCP required the following tasks to be completed;
  - Submit copies of the pollution liability insurance, last two inspection results for the cathodic protection system, copy of the assessment of the impressed current system performed by a corrosion expert when the UST aged at 5 years, precision tests at the time of installation and upgrade, latest line leak detection test and the latest precision test of pressurized piping.
  - Maintain spill buckets and properly anchor shear valves
  - Remove oily water from submersible pumps
  - Investigate the source of vapor in the tank field
  - Submit Vapor Assist System –Type I Leak test.

- August 2, 2004. MDE-OCP collected groundwater sample from the non-community well; MTBE at 22.7 ppb - pre-treatment sample, post-treatment sample – non-detect. Groundwater samples collected from two (2) of 3 on-site monitoring wells.

- August 2004. Lab results provided by HCHD summarizing historic sampling data from the 7-Eleven Citgo service station water supply well.
  - November 1999. MTBE at 109.5 ppb - pre-treatment sample.

- December 1999. MTBE at 122.5 ppb - pre-treatment sample.
- January 2001. MTBE at 99.1 ppb- pre-treatment sample, post-treatment sample –102.1 ppb.
- March 2001. MTBE at 128 ppb- pre-treatment sample, post-treatment sample -125 ppb. Re-sampling of post-treatment sample showed 1.6 ppb –MTBE several days later.
- May 2001. MTBE at 89 ppb- pre-treatment sample, post-treatment sample -35 ppb.
- July 2001. MTBE at 66 ppb- pre-treatment sample, post-treatment sample –69.5 ppb.
- September 2001. MTBE 80 ppb- pre-treatment sample, post-treatment sample -83 ppb.
- October 2001. MTBE at 60 ppb- pre-treatment sample, post-treatment sample -29 ppb. Retested several days later - MTBE at 72 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- January 2002. MTBE at 118 ppb- pre-treatment sample, post-treatment sample –4.3 ppb.
- February 2002. MTBE at 64 ppb- pre-treatment sample, post-treatment sample –40 ppb.
- April 2002. MTBE at 56 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- May 2002. MTBE at 67 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- August 2002. MTBE at 75 ppb- pre-treatment sample, post-treatment sample –7.2 ppb.
- September 2002. MTBE at 97 ppb- pre-treatment sample, post-treatment sample –25 ppb. Resampling showed MTBE at 74 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- November 2002. MTBE at 99 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- January 2003. MTBE at 94 ppb- pre-treatment sample, post-treatment sample –4 ppb.
- March 2003. MTBE at 60 ppb- pre-treatment sample, post-treatment sample –22 ppb.
- May 2003. MTBE at 55 ppb- pre-treatment sample, post-treatment sample –49 ppb.
- July 2003. MTBE at 37 ppb- pre-treatment sample, post-treatment sample –49 ppb. Resampling showed MTBE at 32 ppb- pre-treatment sample, post-treatment sample –0.5 ppb.
- December 2003. MTBE at 31 ppb- pre-treatment sample, post-treatment sample –29 ppb.
- January 2004. MTBE at 17 ppb- pre-treatment sample, post-treatment sample –8.6 ppb.
- February 2004. MTBE at 17 ppb-pre-treatment, post treatment 8.6 ppb.
- April 2004. MTBE at 21 ppb-pre-treatment, post treatment 15 ppb.
- July 2004. MTBE at 19 ppb-pre-treatment, post treatment 11 ppb.
- August 9, 2004. MTBE at 28 ppb-pre-treatment, post treatment 17.3 ppb.
- August 19, 2004. MTBE at 28 ppb-pre-treatment, post treatment non-detect.
- August 23, 2004. MTBE at 26 ppb-pre-treatment, post treatment non-detect

■ August 12, 2004. 7-Eleven submit facility records related to the operational compliance of the UST systems which were requested during the MDE-OCP July 30, 2004 compliance inspection.

■ August 13, 2004. MDE-OCP received *Hydrostatic Testing Results Sumps – August 11, 2004.*

■ August 17, 2004. MDE-OCP site inspection . Three monitoring wells identified on-site (MW1, MW2 and MW3).
- MW1 located near a gasoline submersible pump was hand bailed and a sample collected for analysis.
- MW2 was dry.
- MW3 located on the property boundary was hand bailed and a sample collected for analysis.
- MDE identified several non-compliant issues related to the previous site inspection concerning the operational compliance of the USTs.

■ September 7, 2004. MDE letter to 7-Eleven Inc. requesting the following;
- Enhanced leak detection test to be performed no later than Oct. 8, 2004. Waiting for report.
- Submit a *Subsurface Investigation Work Plan* no later than Sept. 27, 2004.
- Submit an *Environmental Assessment Report* no later than November 30, 2004.
- Guidance on monitoring, operation and maintenance of the treatment system deferred to HCHD.

■ September 14, 2004. MDE-OCP received sampling results
- August 17, 2004 sampling results.
  - MW1 - MTBE at 32.3 ppb
  - MW3 - MTBE at 2091 ppb; tertiary amyl methyl ether (TAME) at 69.5 ppb

- MDE identified several non-compliant issues related to the previous site inspection concerning the operational compliance of the USTs.

- September 29, 2004. MDE received the *Subsurface Investigation Work Plan – September 27, 2004.* The *Work Plan* proposed the following activities;
  - Six to eight geoprobe locations on-site.
  - Soil and groundwater samples to be collected from each location
  - Sampling of the on-site drinking water supply well.

- November 18, 2004. MDE approved the *Subsurface Investigation Work Plan – September 27, 2004* contingent upon the following;
  - Install an additional seven (7) geoprobe points for a total of 15 points.
  - Collect soil and groundwater samples for full suite petroleum analyses.
  - Conduct a well survey and submit well completion reports within a 0.5 mile radius.
  - Describe hydrogeologic conditions on-site an off-site.
  - Submit the *Environmental Assessment Report* no later than March 1, 2005.

Contacts:

- Maryland Department of the Environment (MDE)
  - Susan Bull: 410-537-3499 (Oil Control Program)
  - Yolande Norman: 410-537-3443 (Oil Control Program)
- Harford County Health Department (HCHD)
  - Gary Browning: 443-643-0322
  - Fred Faulkner: 443-643-0307

MARYLAND DEPARTMENT OF THE ENVIRONMENT
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Groundwater Investigations for Falls Crest, Bellvale and Glen Elyn
Harford County Maryland

Falls Crest (Formally Crest Way) Groundwater Investigation
Case No. 2005-0318HA

- September 2004 case opened. 1410 Crest Way, Buchanan residence, independent lab results 160 ppb of MtBE.

- September 9, 2004. MDE-OCP collected confirmatory samples from the Buchanan residence.
  - MTBE at 270 ppb;
  - Tertiary amyl methyl ether (TAME) at 13 ppb
  - Tertiary butyl alcohol (TBA) at 80 ppb

- September 9, 2004. MDE targeted 16 homes excluding the Buchanan's Home for sampling to determine whether the MTBE impact was localized in the Falls Crest area.
  - 2209, 2211, 2213, 2215, 2217, 2301 Cloverdale Drive
  - 1400, 1402, 1403, 1405 Crest Hill Court
  - 1403, 1404, 1405, 1407, 1412, 1414 Crest Way Court

- September 15, 2004. MDE-OCP contractor installed carbon filtration unit at 1410 Crest Way Court.

- October 1-26, 2004. MDE-OCP sampled seven (7) homes in the area.
  - 1403,1404,1405,1407, and 1412 Crest Way Court
  - 2209 Cloverdale Drive
  - 1407 Crest Hill Court

- October 7, 2004MDE/OCP discovered a rusty drum in the stream located behind the Buchanan residence. Two stream samples collected.
  - Surface water sample results non-detect.

- October 20, 2004. MDE-OCP contractor performed carbon filtration exchange at 1410 Crest Way Court due to low water pressure.

- October 25, 2004. MDE-OCP samples results from 1412 Crest Way Court received.
  - MTBE at 27.0 ppb
  - Tertiary amyl methyl ether (TAME) at 0.98 ppb

- October 26, 2004. MDE-OCP sent reminder notices to eight (8) property owners who were unresponsive to the Department's initial request to sample. One property owner requested a delay in sampling well.

- October 27, 2004. MDE-OCP contractor installed carbon filtration unit at 1412 Crest Way Court.

- October 29-November 17, 2004. MDE-OCP sampled four (4) additional homes in the area.
  - 1414 Crest Way Court
  - 2215 Cloverdale Drive
  - 1403 and 1400 Crest Hill Court

- October 2004. Lab results for the early October sampling events received from the State Laboratory and mailed to residents.
  - 1403 Crest Way Court - Non-detect for petroleum constituents
  - 1407 Crest Way Court - Non-detect for petroleum constituents

- 1405 Crest Hill Court - Non-detect for petroleum constituents
- 1404 Crest Way Court - MTBE at 5.04 ppb
- 2209 Cloverdale Court - Non-detect for petroleum constituents

- November 2004. Lab results for the late- October sampling events received from the State Laboratory and mailed to residents.
  - 1412 Crest Way Court - MTBE at 27.0 ppb; Tertiary amyl methyl ether (TAME) at 0.98 ppb
    (Carbon system installed October 27, 2004)
  - 1405 Crest Way Court - MTBE at 0.86 ppb
  - 1414 Crest Way Court - Non-detect for petroleum constituents
  - 1400 Crest Hill Court - Non-detect for petroleum constituents
  - 1403 Crest Hill Court - MTBE at 5.04 ppb
  - 2209 Cloverdale Court - Non-detect for petroleum constituents

- December 2004. Lab results for the December sampling events received from the State Laboratory and mailed to residents.
  - 1410 Crest Way Court - MTBE at 134.0 ppb

- January 2005. Lab results for the January sampling events received from the State Laboratory and mailed to residents.
  - 1410 Crest Way Court - MTBE at 230.0 ppb; TAME at 13.0 ppb; TBA at 95.0 ppb
  - 1412 Crest Way Court - MTBE at 42.0 ppb; TBA at 17.0 ppb

- May 2005. Lab results for the May sampling events received from a Private Laboratory and mailed to the residents.
  - 1410 Crest Way Court - Before filter - MTBE at 160.0 ppb; TAME at 9.0 ppb; TBA at 90.0 ppb
  - 1410 Crest Way Court - Mid filter - MTBE at 170.0 ppb; TAME non-detect; TBA at 72.0 ppb
  - 1410 Crest Way Court - After filter - MTBE at 9.0 ppb
  - 1412 Crest Way Court - MTBE at 36.0 ppb

- June 2005. Lab results for the June Sampling events received from a Private Laboratory and mailed to the residents.
  - 1410 Crest Way Court - MTBE at 140.0 ppb; TAME at 9.0 ppb; TBA at 77.0 ppb
  - 1412 Crest Way Court - MTBE at 33.0 ppb
  - 1414 Crest Way Court - Non-detect for petroleum constituents
  - 1405 Crest Way Court - MTBE at 0.8 ppb
  - 1405 Crest Way Court - Non-detect for petroleum constituents
  - 1403 Crest Way Court - Non-detect for petroleum constituents
  - 1403 Crest Way Court - MTBE at 4.3 ppb
  - 1404 Crest Way Court - MTBE at 3.9 ppb

Current Status

- A total of 17 domestic wells were targeted for sampling in the Falls Crest area including the Buchanan residence (1410 Crest Way) which had initial reports of MTBE above the State's action level. Fourteen domestic wells have been sampled to date.

  - The Buchanan residence (1410 Crest Way Court) and the Hallett residence (1412 Crest Way Court) are the only homes with MTBE above the action level of 20 ppb. Both homes have carbon treatment systems which have been in place since September and October 2004. Currently these systems are being maintained by MDE at no cost to the residents. These systems have been very successful in removing petroleum constituents. The Hallett residence carbon treatment system was changed-out on November 1, 2004. The Buchanan residence carbon treatment system was changed-out on February 14, 2005.

  - MTBE was detected in three additional domestic wells at very low levels. The drinking water wells at 1404 and 1405 Crest Way Court, and 1403 Crest Hill Court, located adjacent to the Buchanan residence had MTBE at 5.04 ppb, 0.86 ppb, and 2.60 ppb respectively.

- The MTBE impact appears to be a localized and remains under investigation.

Date	Sampler/Lab	Location	MTBE ppb	TAME ppb	TBA ppb
8/23/04	Private Lab	1410 Crestway Court	160	Not tested	No Analysis
9/9/04	MDE/Private Lab	1410 Crestway Court	270	13	80
12/10/04	MDE/State Lab	1410 Crestway Court	134	Not tested	No Analysis
01/26/05	MDE/Private Lab	1410 Crestway Court	230	13	95
02/24/05	MDE/Private Lab	1410 Crestway Court	210 (estimated)	13	78
03/23/05	MDE/Private Lab	1410 Crestway Court	240 (mid-filter 11 ppb)	0.0	13
5/12/05	MDE/Private Lab	1410 Crestway Court	160 (mid-filter 170, after-filter 9)	9	90 (mid-filter 72)
6/10/05	MDE/Private Lab	1410 Crestway Court	140	9	77
10/1/04	MDE/State Lab	1412 Crestway Court	27.0	0.98	No Analysis
01/26/05	MDE/State Lab	1412 Crestway Court	42	0.0	17
02/24/05	MDE/Private Lab	1412 Crestway Court	36	0.0	0.0
03/23/05	MDE/Private Lab	1412 Crestway Court	28	0.0	0.0
5/11/05	MDE/Private Lab	1412 Crestway Court	36	0.0	0.0
6/10/05	MDE/Private Lab	1412 Crestway Court	33	0.0	0.0
6/10/05	MDE/Private Lab	1414 Crestway Court	0.0	0.0	0.0
6/10/05	MDE/Private Lab	1403 Crestway Court	4.3	0.0	0.0
6/10/05	MDE/Private Lab	1403 Crestway Court	0.0	0.0	0.0
6/10/05	MDE/Private Lab	1404 Crestway Court	3.9	0.0	0.0
6/10/05	MDE/Private Lab	1405 Crestway Court	0.8	0.0	0.0
6/10/05	MDE/Private Lab	1405 Crestway Court	0.0	0.0	0.0

- July 2004 case opened. 2104 Hampton Court, Ryan residence, independent lab results showing MTBE at 20 ppb.

- July 26, 2004. MDE-OCP collected confirmatory samples from the Ryan residence. Heating oil tank in the basement of home but remote fill port is located less than 30 yards from impacted domestic well.
  - MTBE at 22.8 ppb
  - Tertiary amyl methyl ether (TAME) at 2 ppb
  - Tertiary butyl alcohol (TBA) at 5 ppb

- July 30, 2004. MDE targeted 14 homes excluding the Ryan's Home for sampling to determine whether the MTBE impact was localized in the Bellvale area.
  - 2103, 2105, 2106, 2107, 2108 Hampton Court
  - 2512, 2516, 2518, 2520, 2522, 2600 Pleasantville Road
  - 2104, 2105, 2107 Bellvale Road

- August 2, 2004. MDE-OCP contractor installed carbon filtration unit at 2104 Hampton Court.

- August 4-27, 2004. MDE-OCP sampled ten (10) homes in the area.
  - 2103, 2105, 2106, 2108 Hampton Court
  - 2520, 2522, and 2600 Pleasantville Road
  - 2104, 2105, and 2107 Bellvale Road

- August 11, 2004. MDE-OCP sampled the carbon treatment system on the 2104 Hampton Court drinking water supply. Non-detect in finished water for all petroleum constituents.

- September 9, 2004. MDE-OCP send reminder notices to four (4) property owners who were unresponsive to the Department's initial request to sample.

- September 2004. Lab results for August 11, 2004 Sampling event received from the state laboratory and mailed to nine (9) residents.
  - 2103 Hampton Court - Non-detect for petroleum constituents
  - 2105 Hampton Court - Non-detect for petroleum constituents
  - 2106 Hampton Court - MTBE at 0.82 ppb
  - 2520 Pleasantville Road - Non-detect for petroleum constituents
  - 2522 Pleasantville Road - Non-detect for petroleum constituents
  - 2600 Pleasantville Road - Non-detect for petroleum constituents
  - 2104 Bellvale Road - Non-detect for petroleum constituents
  - 2105 Bellvale Road - Non-detect for petroleum constituents
  - 2107 Bellvale Road - Non-detect for petroleum constituents

- September 17-22, 2004. Three additional domestic wells sampled.
  - 2516 Pleasantville Road
  - 2518 Pleasantville Road
  - 2107 Hampton Court

- September 29, 2004. MDE-OCP collected samples from 2104 Hampton Court.
  - Pre-treatment sample MTBE at 14.3 ppb
  - Mid-Treatment sample MTBE at 0.84 ppb
  - Post treatment sample MTBE non-detect

- October 2004. Lab results for the September 17-24 and August sampling events received from the State Laboratory and mailed to residents.
  - 2516 Pleasantville Road - Non-detect for petroleum constituents
  - 2518 Pleasantville Road - Non-detect for petroleum constituents

- 2108 Hampton Court - Non-detect for petroleum constituents

- January 26, 2005. MDE-OCP collected samples from 2104 Hampton Court.
  - Pre-treatment sample MTBE non-detect
  - Mid-Treatment sample MTBE non-detect
  - Post treatment sample MTBE at 2.6 ppb

- February 24, 2005. MDE-OCP collected samples from 2104 Hampton Court.
  - Pre-treatment sample MTBE at 7 ppb
  - Mid-Treatment sample MTBE non-detect
  - Post treatment sample MTBE at 2 ppb

Current Status

- A total of 15 domestic wells were targeted for sampling in the Bellvale area including the Ryan home, which had the initial reports of MTBE impact. Fourteen (14) of these drinking water wells were sampled in the study area.

  - The Ryan residence (2104 Hampton Court) was the only home, which had MTBE above the action level of 20 ppb. Carbon treatment system has been in place since July 2004 and is currently being maintained by MDE at no cost to the resident. This system has been very successful in removing petroleum constituents. Carbon treatment system was changed-out on December 1, 2004.

  - The drinking water well at 2106 Hampton Court, adjacent to the Ryan residence had trace levels of MtBE at 0.82 ppb.

  - The MTBE impact appears to be a localized issue in the study area of Bellvale. MDE-OCP proposes no further action at this time.

Date	Sampler/Lab	Location	MTBE ppb	TAME ppb	TBA ppb
7/09/04	Private Lab	2104 Hampton Court	20	Not tested	No Analysis
7/26/4	MDE/Private Lab	2104 Hampton Court	22.8	2.0	5.0
9/29/04	MDE/State Lab	2104 Hampton Court	14.3	Non detect	No Analysis
1/26/05	MDE/Private Lab	2104 Hampton Court	14.3	Non detect	No Analysis
02/24/05	MDE/Private Lab	2104 Hampton Court	7	Non detect	Non detect
5/12/05	MDE/Private Lab	2104 Hampton Court	8.0 (after filter 2.0)	0.0	0.0
6/6/05	MDE/Private Lab	2104 Hampton Court	15 (after filter 1.8)	0.0	0.0

Glen Elyn Groundwater Investigation
MDE Case No. 2005-0318HA

- August 2004 MDE-OCP opened case . 2708 Shady Grove Drive, Haynes residence, independent lab results showing MTBE at 64 ppb & TAME at 6.9 ppb.

- August 13, 2004. MDE-OCP collected confirmatory sample.
  - MTBE at 63 ppb
  - Tertiary amyl methyl ether (TAME) at 9 ppb
  - Tertiary butyl alcohol (TBA) at 36 ppb

- August 30, 2004. MDE targeted 14 homes excluding the Haynes's Home for sampling to determine whether the MTBE impact was localized in the Glen Elyn area.
  - 2703, 2704, 2706, 2710, 2800, 2801 Shady Grove Road
  - 2757, 2759 Greene Lane
  - 3009, 3015, 3016 Moores Road
  - 2921, 2923, 2926 Placid Drive

- September 3, 2004. MDE-OCP contractor installed carbon filtration unit at 2708 Shady Grove Drive. System being maintained by MDE at no cost to resident.

- September 3-19, 2004. MDE-OCP sampled twelve (12) homes in the area.
  - 2703, 2704, 2706, 2800, and 2801 Shady Grove Road
  - 2757 and 2759 Greene Road
  - 3015 and 3016 Moores Road
  - 2921,2923, and 2926 Placid Drive

- October 26, 2004. MDE-OCP sent reminder notices to two (2) property owners who were unresponsive to the Department's initial request to sample. The targeted area was also expanded to include to four (4) additional homes.
  - 3000, 3001, 3003, 3005 Moores Road

- October 26-November 12, 2004. MDE-OCP sampled five (5) homes in the area.
  - 3000, 3001, 3003, and 3009 Moores Road
  - 2755 Greene Lane

- November 2004. Lab results for September sampling event received from the State laboratory and mailed to twelve (12) residents.
  - 2757 Greene Lane - Non-detect for petroleum constituents
  - 3016 Moores Road - MTBE at 1.22 ppb
  - 2706 Shady Grove Road - MTBE at 1.13 ppb
  - 2703 Shady Grove Road - MTBE at 2.63 ppb
  - 2704 Shady Grove Road - Non-detect for petroleum constituents
  - 3015 Moores Road - Non-detect for petroleum constituents
  - 2926 Placid Drive - MTBE at 7.91 ppb
  - 2923 Placid Drive - MTBE at 4.17 ppb
  - 2921 Placid Drive - MTBE at 1.57 ppb
  - 2800 Shady Grove Road - MTBE at 0.80 ppb
  - 2801 Shady Grove Road - MTBE at 2.92 ppb
  - 2759 Greene Lane - MTBE at 0.94 ppb

- November 16, 2004. MDE-OCP sampled the carbon treatment system on the Haynes property.
  - Pre-treatment sample MTBE at 4.22 ppb
  - Mid-Treatment sample MTBE at 2.04 ppb
  - Post treatment sample MTBE at 3.04 ppb

- December 2004. Lab results for November sampling event received from the State laboratory and mailed to Four (4) residents.
  - 300 Moores Road - Non-detect for petroleum constituents
  - 3001 Moores Road - Non-detect for petroleum constituents
  - 3003 Moores Road - Non-detect for petroleum constituents
  - 3009 Moores Road - Non-detect for petroleum constituents
  -
- January 26, 2005. MDE-OCP collected samples from 2708 Shady Grove Road.
  - Pre-treatment sample MTBE at 12.0 ppb
  - Mid-Treatment sample MTBE at 36.0 ppb
  - Post treatment sample MTBE at 33.0 ppb

- February 14, 2005. Carbon treatment system was changed out.

Current Status

- A total 23 domestic wells were targeted for sampling in the Glen Elyn area including the Haynes home which had the initial reports of MTBE impact above the action level of 20 ppb. To date 21 homes have been sampled.

  - The Haynes residence (2704 Shady Grove Road) was the only home, which had MTBE above the action level of 20 ppb. Carbon treatment system has been in place since September 2004 and is currently being maintained by MDE at no cost to the resident. This system has been very successful in removing petroleum constituents. Carbon treatment system was changed-out on February 14, 2005.

  - Very low levels of MTBE were detected in other domestic wells targeted for sampling in the area ranging between 0.8 and 7.91 ppb.

  - The MTBE impact appears to be a localized issue in the small study area of Glen Elyn.

  - Two 30-year-old underground home heating oil tanks were observed at 2704 Shady Grove Court and 2757 Greene Lane properties.

Date	Sampler/Lab	Location	MTBE ppb Pre-filter	TAME ppb Pre-filter	TBA ppb Pre-filter
7/14/04	Private Lab	2708 Shady Grove Drive	64	6.9	No Analysis
8/13/4	MDE/Private Lab	2708 Shady Grove Drive	63.0	9.0	36.0
11/17/04	MDE/State Lab	2708 Shady Grove Drive	4.22	No Analysis	No Analysis
1/26/05	MDE/Private Lab	2708 Shady Grove Drive	12 (36 mid-filter) (33 after-filter)	0.0	0.0 (13 mid-filter) (15 after-filter)
2/23/05	MDE/Private Lab	2708 Shady Grove Drive	30	0.0	130 (13 after-filter)
03/23/05	MDE/Private Lab	2708 Shady Grove Drive	59	0.0	21
6/6/05	MDE/Private Lab	2708 Shady Grove Drive	2.0	0.0	0.0

- **Fallston Recreation Complex, 1809 Fallston Rd., Fallston, MD 21047**
  MDE Case No. 2005-0776HA

  MDE-OCP conducted a compliance assistance inspection at this facility in December 2004. In April and May 2005, MDE-OCP witnessed the removal a 500-gallon used oil and a 1000-gallon #2 heating oil UST. This facility currently operates a 3,000-gallon diesel and a 3,000-gallon gasoline UST system. These systems have been proven to be fully compliant. Three groundwater monitoring wells will be installed by late September 2005 in accordance with the MDE's emergency regulations.

Contacts:

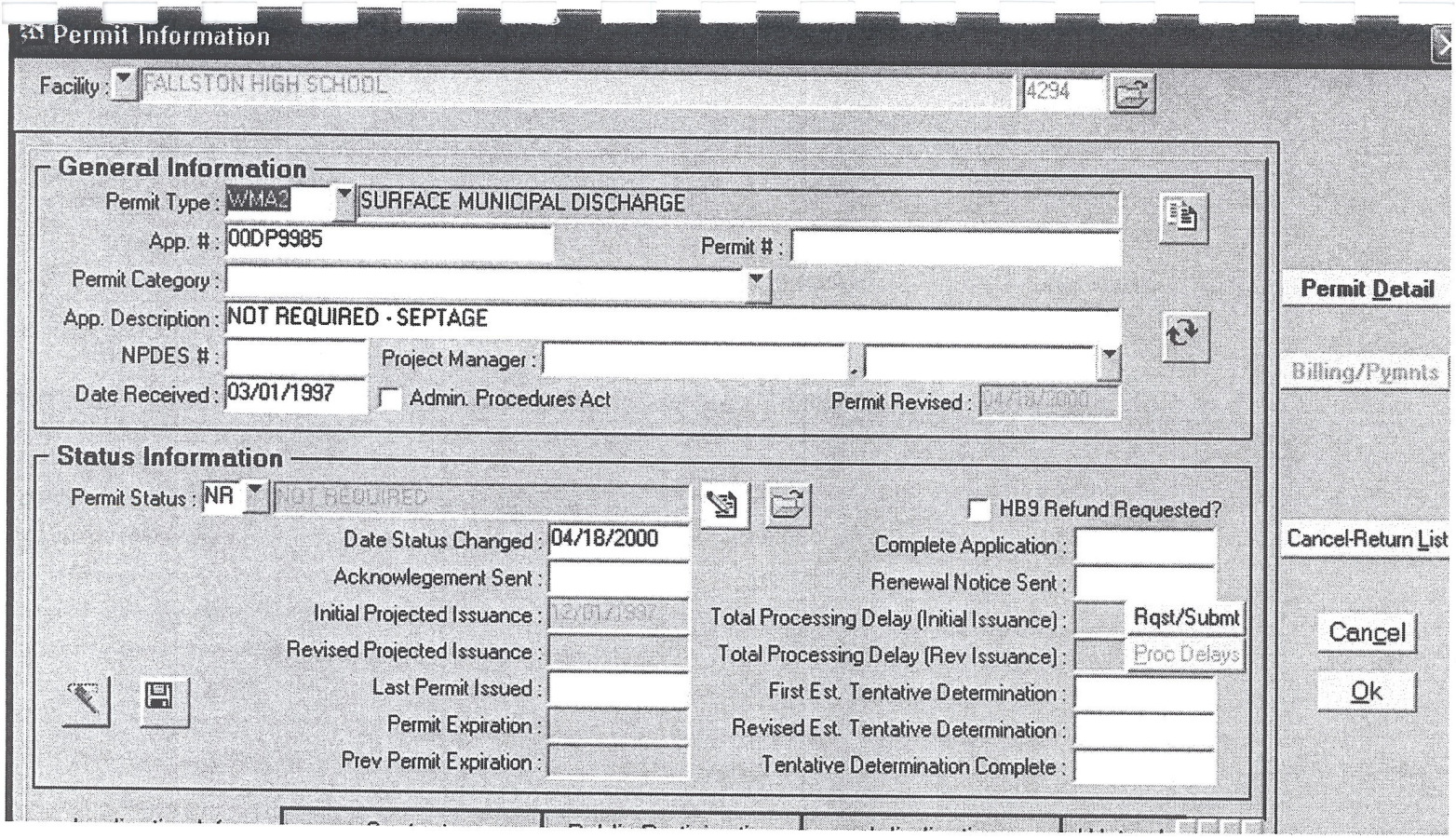
- Maryland Department of the Environment, Oil Control Program 410-537-3442
- Harford County Health Department 443-643-0301

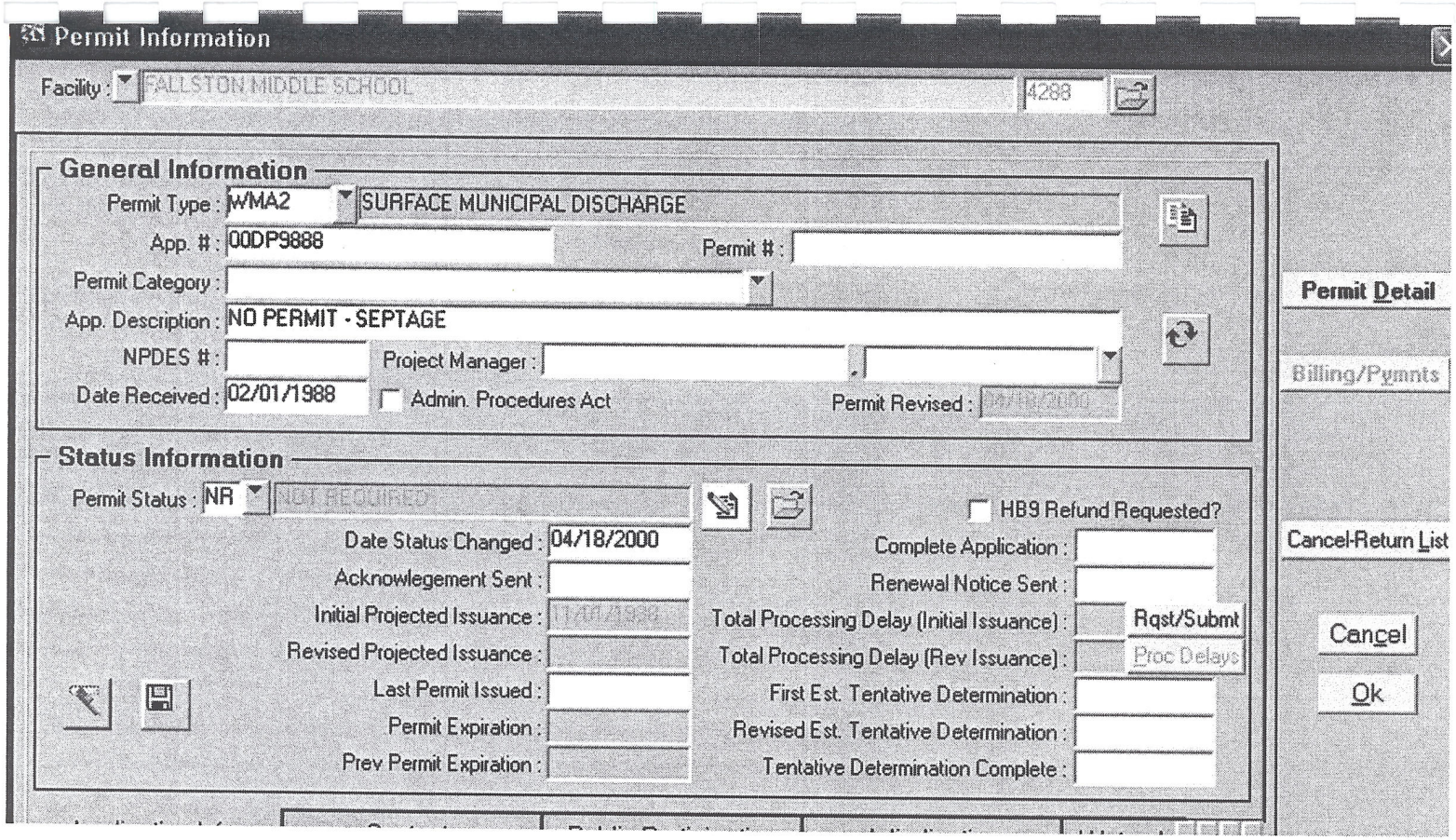
Disclaimer

The intent of this fact sheet is to provide the reader a summary of site events as they are contained within documents available to MDE. To fully understand the site and surrounding environmental conditions, MDE recommends that the reader review the case file that is available at MDE through the Public Information Act. The inclusion of a person or company's name within this fact sheet is for informational purposes only and should not be considered a conclusion by MDE on guilt, involvement in a wrongful act or contribution to environmental damage.

Appendix D

Database Summaries of Discharge Permit Sites within or near WHPAs


Permit Information
Facility : FALLSTON HIGH SCHOOL 4234
General Information
Permit Type : W/MA2 SURFACE MUNICIPAL DISCHARGE
App. # : 00DP9985
Permit # :
Permit Category :
App. Description : NOT REQUIRED - SEPTAGE
NPDES # :
Project Manager :
Date Received : 03/01/1997
Admin. Procedures Act
Permit Revised :
Status Information
Permit Status : NR NOT REQUIRED
HB9 Refund Requested?
Date Status Changed : 04/18/2000
Complete Application :
Acknowlegement Sent :
Renewal Notice Sent :
Initial Projected Issuance :
Total Processing Delay (Initial Issuance) :
Rqst/Submt
Revised Projected Issuance :
Total Processing Delay (Rev Issuance) :
Proc Delays
Last Permit Issued :
First Est. Tentative Determination :
Permit Expiration :
Revised Est. Tentative Determination :
Prev Permit Expiration :
Tentative Determination Complete :
Permit Detail
Billing/Pymnts
Cancel-Return List
Cancel
Ok


Permit Information
Facility : FALLSTON MIDDLE SCHOOL 4288
General Information
Permit Type : WMA2 SURFACE MUNICIPAL DISCHARGE
App. # : 00DP9888
Permit # :
Permit Category :
App. Description : NO PERMIT - SEPTAGE
NPDES # :
Project Manager :
Date Received : 02/01/1988
Admin. Procedures Act
Permit Revised :
Status Information
Permit Status : NR NOT REQUIRED
HB9 Refund Requested?
Date Status Changed : 04/18/2000
Complete Application :
Acknowlegement Sent :
Renewal Notice Sent :
Initial Projected Issuance :
Total Processing Delay (Initial Issuance) :
Rqst/Submt
Revised Projected Issuance :
Total Processing Delay (Rev Issuance) :
Proc Delays
Last Permit Issued :
First Est. Tentative Determination :
Permit Expiration :
Revised Est. Tentative Determination :
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Tentative Determination Complete :
Permit Detail
Billing/Pymnts
Cancel-Return List
Cancel
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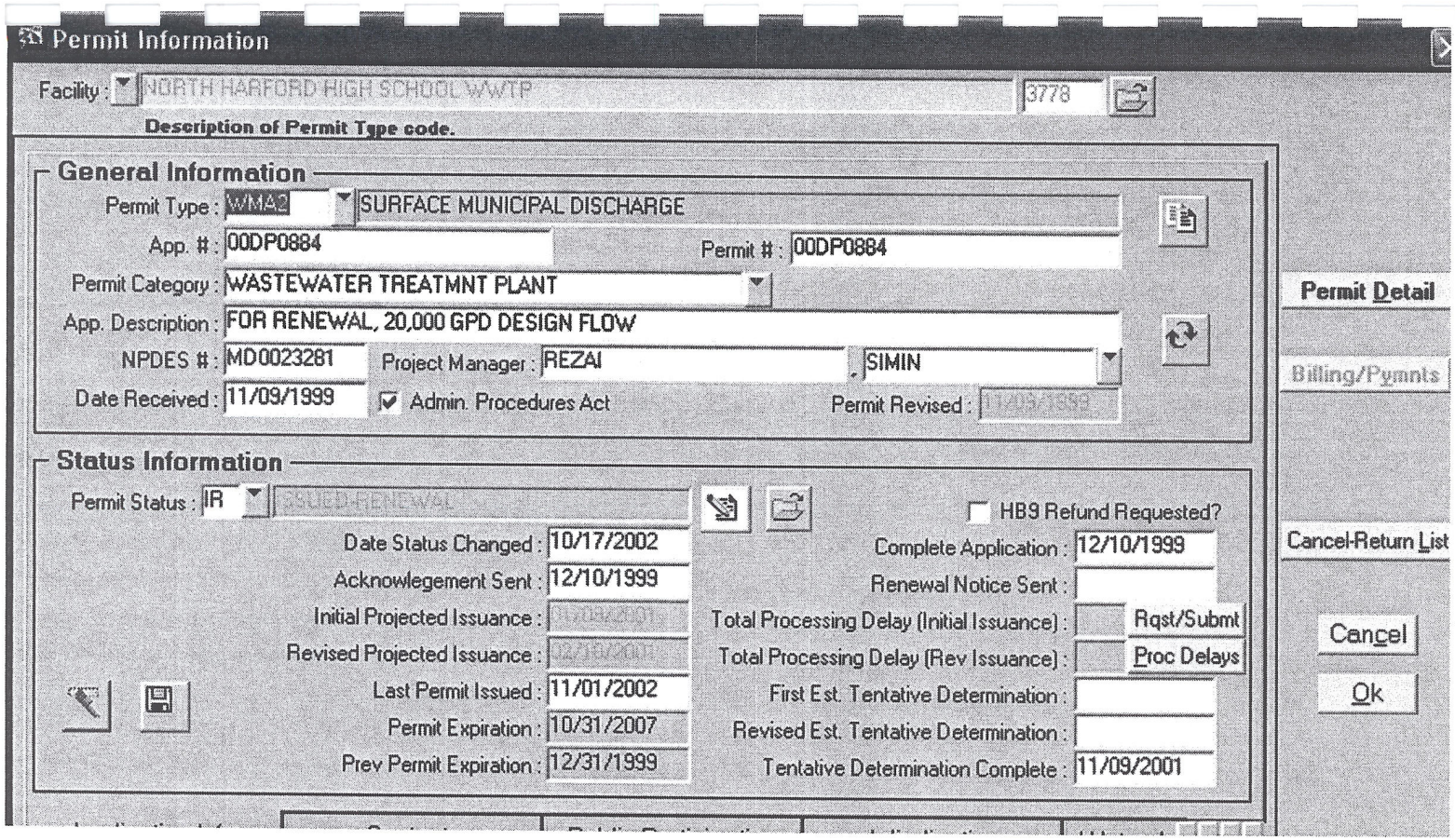
Permit Information
Facility : NORTH HARFORD HIGH SCHOOL WWTP
3778
Description of Permit Type code.
General Information
Permit Type : WMA2 SURFACE MUNICIPAL DISCHARGE
App. # : 00DP0884
Permit # : 00DP0884
Permit Category : WASTEWATER TREATMNT PLANT
App. Description : FOR RENEWAL, 20,000 GPD DESIGN FLOW
NPDES # : MD0023281
Project Manager : REZAI SIMIN
Date Received : 11/09/1999
Admin. Procedures Act
Permit Revised :
Status Information
Permit Status : IR ISSUED-RENEWAL
HB9 Refund Requested?
Date Status Changed : 10/17/2002
Acknowlegement Sent : 12/10/1999
Initial Projected Issuance :
Revised Projected Issuance :
Last Permit Issued : 11/01/2002
Permit Expiration : 10/31/2007
Prev Permit Expiration : 12/31/1999
Complete Application : 12/10/1999
Renewal Notice Sent :
Total Processing Delay (Initial Issuance) :
Rqst/Submt
Total Processing Delay (Rev Issuance) :
Proc Delays
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Revised Est. Tentative Determination :
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Billing/Pymnts
Cancel-Return List
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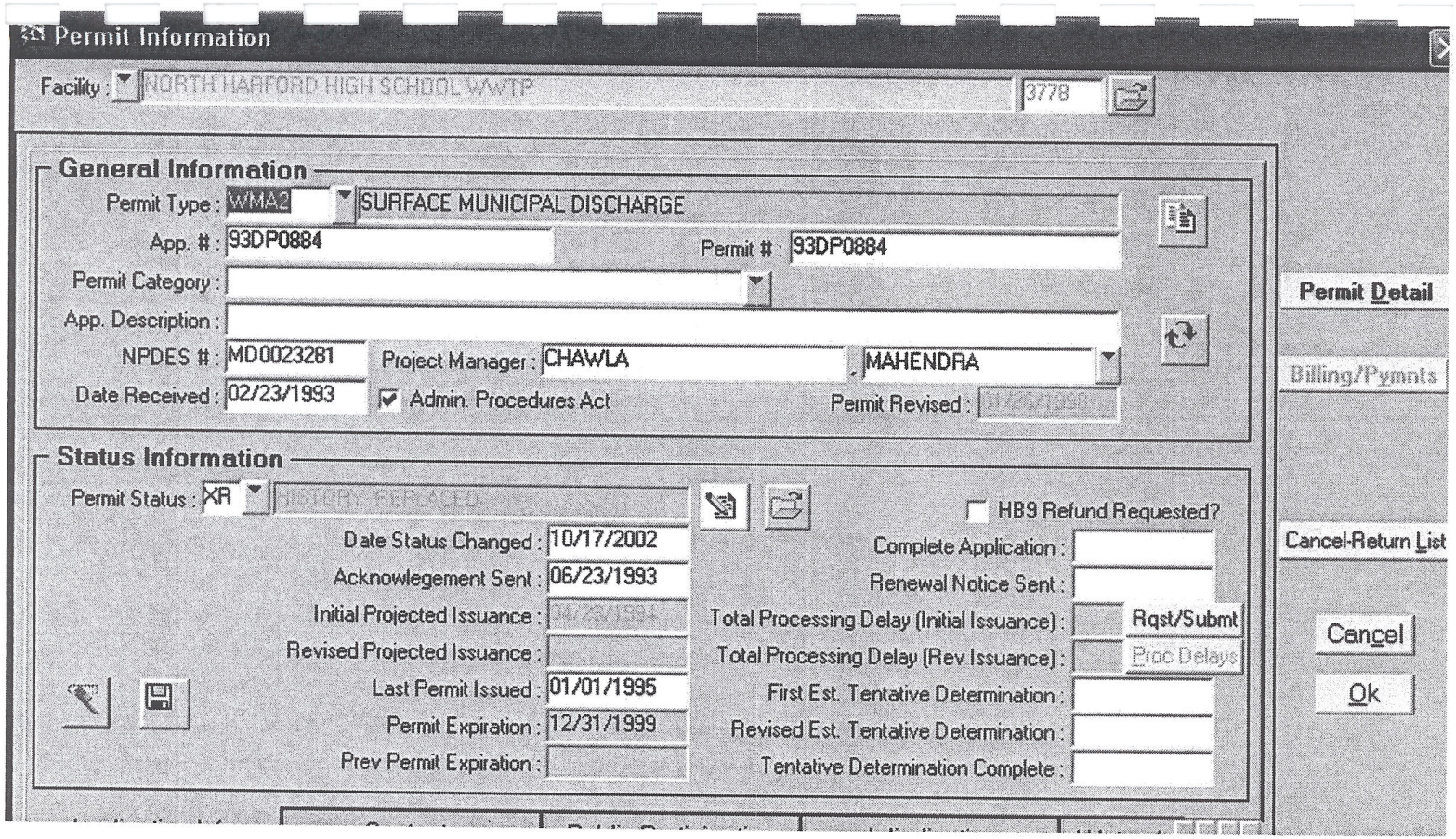
Permit Information
Facility : NORTH HARFORD HIGH SCHOOL WWTP
3778
General Information
Permit Type : WMA2 SURFACE MUNICIPAL DISCHARGE
App. # : 93DP0884
Permit # : 93DP0884
Permit Category :
App. Description :
NPDES # : MD0023281
Project Manager : CHAWLA MAHENDRA
Date Received : 02/23/1993
Admin. Procedures Act
Permit Revised :
Status Information
Permit Status : XR
HB9 Refund Requested?
Date Status Changed : 10/17/2002
Acknowlegement Sent : 06/23/1993
Initial Projected Issuance :
Revised Projected Issuance :
Last Permit Issued : 01/01/1995
Permit Expiration : 12/31/1999
Prev Permit Expiration :
Complete Application :
Renewal Notice Sent :
Total Processing Delay (Initial Issuance) :
Rqst/Submt
Total Processing Delay (Rev Issuance) :
Proc Delays
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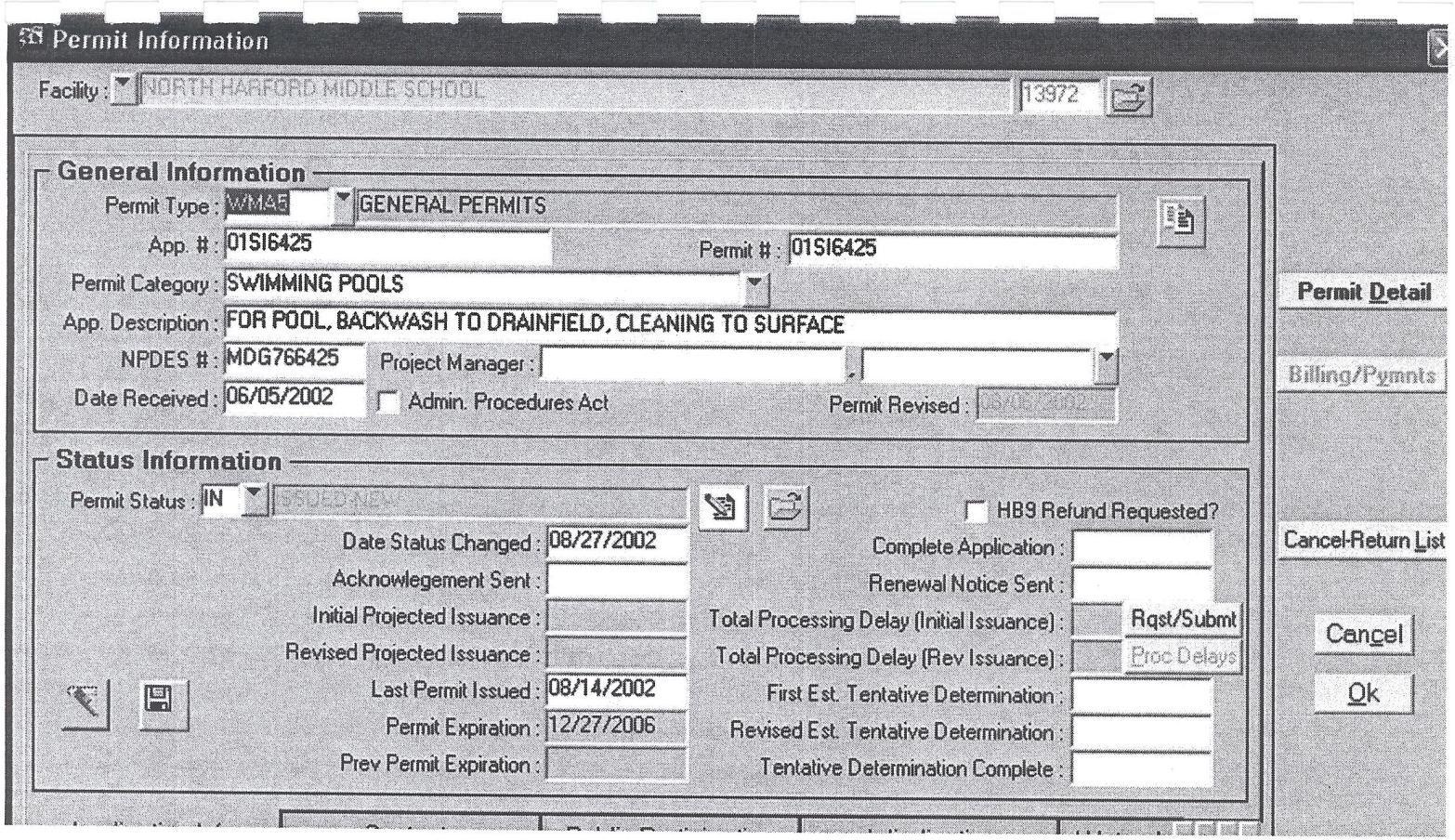
Revised Est. Tentative Determination :
Tentative Determination Complete :
Permit Detail
Billing/Pymnts
Cancel-Return List
Cancel
Ok


Permit Information
Facility : NORTH HARFORD MIDDLE SCHOOL 13972
General Information
Permit Type : WMAG GENERAL PERMITS
App. # : 01SI6425
Permit # : 01SI6425
Permit Category : SWIMMING POOLS
App. Description : FOR POOL, BACKWASH TO DRAINFIELD, CLEANING TO SURFACE
NPDES # : MDG766425
Project Manager :
Date Received : 06/05/2002
Admin. Procedures Act
Permit Revised :
Status Information
Permit Status : IN ISSUED-NEW
HB9 Refund Requested?
Date Status Changed : 08/27/2002
Complete Application :
Acknowlegement Sent :
Renewal Notice Sent :
Initial Projected Issuance :
Total Processing Delay (Initial Issuance) :
Rqst/Submt
Revised Projected Issuance :
Total Processing Delay (Rev Issuance) :
Proc Delays
Last Permit Issued : 08/14/2002
First Est. Tentative Determination :
Permit Expiration : 12/27/2006
Revised Est. Tentative Determination :
Prev Permit Expiration :
Tentative Determination Complete :
Permit Detail
Billing/Pymnts
Cancel-Return List
Cancel
Ok