Final

Source Water Assessment

for the

Darlington Mobile Home Park Water System

Harford County, Maryland

Prepared for:

Maryland Department of the Environment
Water Management Administration
Water Supply Program
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230-1719

Prepared by:

EA Engineering, Science, Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

May 2003

Project No. 61726.01

Final

Source Water Assessment

for the

Darlington Mobile Home Park Water System

Harford County, Maryland

Prepared for:

Maryland Department of the Environment
Water Management Administration
Water Supply Program
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230-1719

Prepared by:

EA Engineering, Science, Technology, Inc.
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

5/30/03

Mike Hertz, P.G.
Task Manager

5/30/03

Kevin Sharpe, P.G.
Project Manager

May 2003

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
CCL	Contaminant Candidate List
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CHS	Controlled Hazardous Substances
COMAR	Code of Maryland Regulations
CREP	Conservation Reserve Program
DWEL	Drinking Water Equivalent Level
ft	Foot/Feet
gal	Gallon(s)
gpd	Gallon(s) Per Day
gpm	Gallon(s) Per Minute
GPS	Global Positioning System
GWUDI	Ground Water Under Direct Influence
IOC	Inorganic Compound
L	Liter(s)
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
mg	Milligram(s)
MGS	Maryland Geological Survey
MHP	Mobile Home Park
MTBE	Methyl-Tert-Butyl-Ether
PCB	Polychlorinated Biphenyls
pCi	Picocurie(s)
PWSID	Public Water System Identification
SDWA	Safe Drinking Water Act
SDWR	Secondary Drinking Water Regulations
SOC	Synthetic Organic Compound
SWAP	Source Water Assessment Plan
SWPA	Source Water Protection Area

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

µg	Microgram(s)
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHPA	Wellhead Protection Area

EXECUTIVE SUMMARY

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the Darlington Mobile Home Park (MHP) water system in Harford County, Maryland. This water system is identified as Public Water System Identification (PWSID) 0120214 by the Maryland Department of the Environment (MDE). EA has performed this study under Purchase Order No. U00P3200205, as authorized by the MDE.

The required components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are:

- Delineation of the area that contributes water to the source
- Identification of potential sources of contamination
- Determination of the susceptibility of the water supply to contamination
- Recommendations for protecting the drinking water supply

The source of the Darlington MHP's water supply is the Baltimore Gabbro Complex, which is an unconfined crystalline rock aquifer. The Source Water Protection Area (SWPA) for the five ground-water supply wells was delineated using the watershed delineation method for fractured bedrock wells. The area for the SWPA is based on land topography and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 120 acres.

Potential point and non-point sources of contamination within the assessment area were identified based on site visits, a review of MDE's databases, and a review of sewer service area and land use maps. Potential polychlorinated biphenyl (PCB) containing electricity transformers, septic systems, and above ground heating oil tanks were observed within the SWPA. An Underground Storage Tank (UST) site, a vehicle repair shop, and a motorcycle repair shop were observed adjacent to the SWPA. Non-point sources of contamination such as croplands were also identified. Well information and water quality data were also reviewed.

The susceptibility analysis for the Darlington MHP water supply is based on a review of the water quality data, potential sources of contamination, aquifer characteristics, and well integrity. It was determined that the Darlington MHP water supply is moderately susceptible to volatile organic compounds and radon-222, and has a low susceptibility to synthetic organic compounds, inorganic compounds, other radionuclides, and microbiological contaminants.

Recommendations to protect the ground-water supply include creating a SWPA protection team, resident awareness, and communication with county officials about future planning and land use.

1. INTRODUCTION

EA Engineering, Science, and Technology was tasked to perform a Source Water Assessment for the Darlington Mobile Home Park (MHP) water system in Harford County, Maryland. EA has performed this study under Purchase Order No. U00P3200205, as authorized by the Maryland Department of the Environment (MDE).

The Darlington MHP water system serves the community of Darlington MHP in Harford County. The water treatment plant and the supply wells for the system are located in within development. The Darlington MHP water serves a population of 150 with 63 connections. The water is supplied by five wells (Figure 1).

1.1 GROUND-WATER SUPPLY SYSTEM INFORMATION

A review of the well data and sanitary surveys of the system indicates that well numbers 2, 3, and 4 were drilled in 1983, 1978, and 2002, respectively, in accordance with the State's current well construction standards, which were implemented in 1973. Wells 1, 2, 3, and 4 have pumping rates of 7, 8, 8, and 7 gallons per minute (gpm), respectively. During the site visit, it was observed that a well was recently constructed (Well 5). The pumping rate of Well 5 is unknown. According to an MDE database, there are also two additional wells that are not in use. The status of these wells is unknown. Table 1 below contains a summary of the well construction data.

TABLE 1. WELL INFORMATION

Source ID	Source Name	Permit No.	Total Depth (ft)	Casing Depth (ft)	Aquifer
01	Darlington MHP 1	HA700279	42	30	Balto. Gabbro Complex
02	Darlington MHP 2	HA810457	175	45	Balto. Gabbro Complex
03	Darlington MHP 3	HA735016	100	65	Balto. Gabbro Complex
04	Darlington MHP 4	HA736445	500	52	Balto. Gabbro Complex
05	Darlington MHP 5	HA945415	340	51	Balto. Gabbro Complex

Well 1 was observed within a subsurface pit. No standing water was observed in the pit. Each of the other four wells was completed 1 to 2 ft above grade. Each of the wells was observed secure and in good repair. Wells 2, 3, and 4 were observed to have an older looking screw-down steel cap. Well 5 was observed to have a newer looking screw-down cap.

According to the MDE Public Water Supply Inspection Report for the water system dated September 2002, the operators of the water system are Daniel R. Shields and Gene Carrier (temporary).

Currently, the raw ground water is treated with sodium hypochlorite (bleach) for disinfection. The finished water is stored in four approximately 150-gal bladder tanks prior to distribution.

1.2 HYDROGEOLOGY

Harford County has two distinct physiographic provinces, the Piedmont and the Atlantic Coastal Plain, divided by the Fall Line. In the northern third of the county, Precambrian to early Paleozoic crystalline igneous and metamorphic rock of the Piedmont province is exposed at the surface. In the southern two-thirds of the county, the crystalline rocks are overlain by Coastal Plain deposits consisting largely of unconsolidated pebbly sand, sand, sandy clay, and clay. The deposits form a wedge-shaped mass of materials that range in thickness from inches along the Fall Line to as much as 1,600 ft in the southeastern corner of the County (Nutter 1977).

The ground water used by the Darlington MHP is from production wells drilled into the Baltimore Gabbro Complex. The Baltimore Gabbro Complex formation is described as "hypersthene gabbro with subordinate amounts of olivine gabbro, norite, anorthositic gabbro, and pyroxenite with igneous minerals and textures well preserved in some rocks, other rocks exhibit varying degrees of alteration and recrystallization, and still others are completely recrystallized with a new metamorphic mineral assemblage" [Maryland Geological Survey (MGS) 1968].

The source of the ground water in Harford County is from precipitation in the form of rainfall or snow melt. The water table in the aquifer generally mimics the surface topography. The availability of ground water in the crystalline rock of the area depends on the nature and distribution of secondary openings resulting from fracturing and weathering. The yield of a well in crystalline rock depends primarily on the amount of fracture openings penetrated by the well. The well yield range of 35 wells in the Gabbro Complex ranges from 3 to 100 gallons per minute (gpm) with 30 percent of the wells having well yields greater than 10 gpm. The range of specific capacity, which relates well yield to drawdown, of 27 wells range from less than 0.1 to 17 gallons per minute per foot of drawdown (Otton et al. 1988).

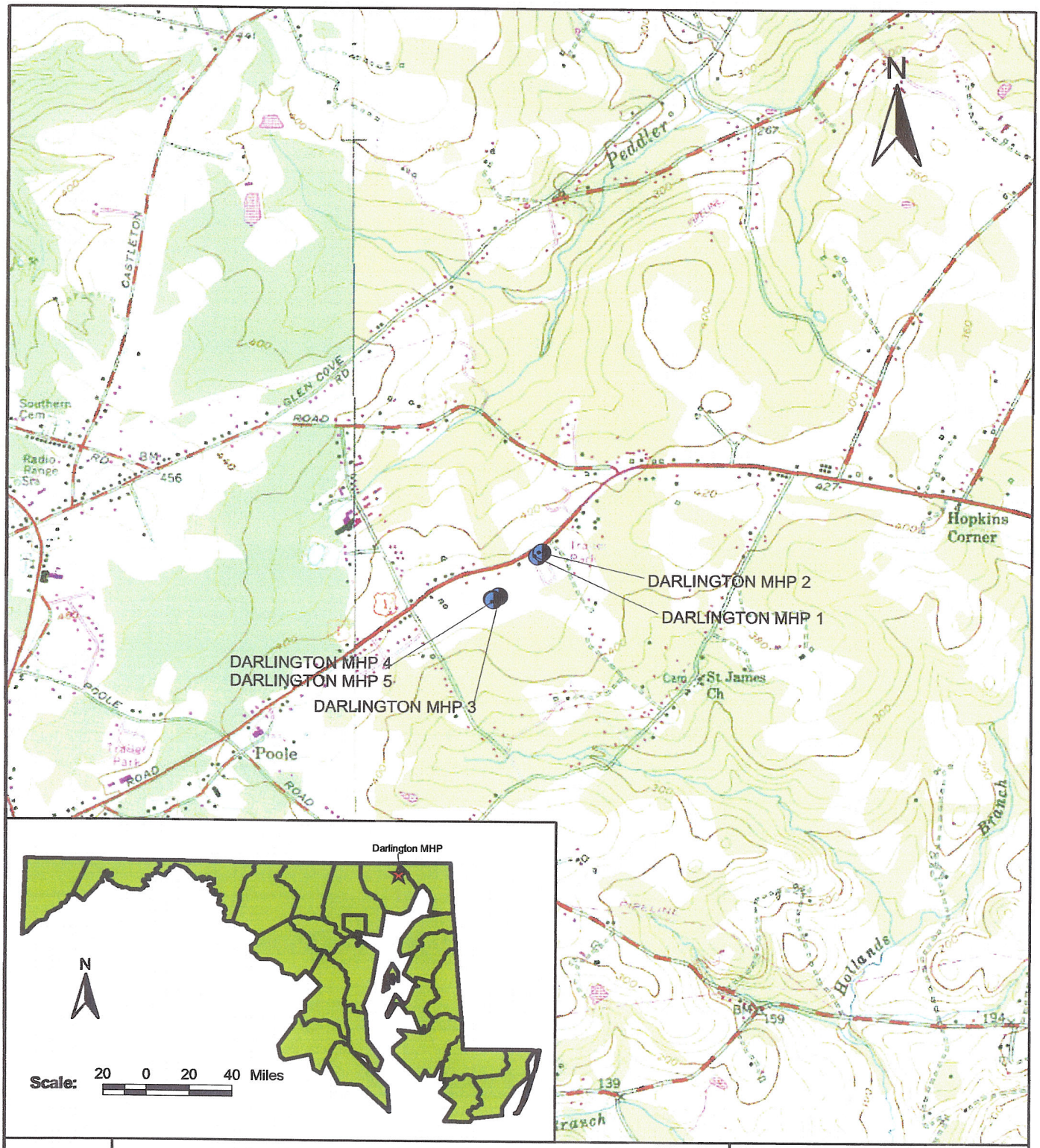


Figure 1. Darlington MHP
Location Map of Supply Wells

Source Water Assessment Program
2003

Legend:

MHP Wells

Source: United States Geologic Survey. 1955 (1990). *7.5-minute Series Map for Delta, Maryland.*

United States Geologic Survey. 1953 (1985). *7.5-minute Series Map for Conowingo Dam, Maryland.*

Scale:

1000 0 1000 2000 Feet

2. DELINEATION OF THE AREA CONTRIBUTING WATER TO SOURCE

For ground-water systems, a Wellhead Protection Area (WHPA) is considered to be the Source Water Protection Area (SWPA) for the system. Consistent with the recommended delineation in the Maryland SWAP (MDE 1999), the watershed drainage area that contributes ground water to the supply wells methodology was used.

This original delineation shape was then modified by accounting for surface water bodies, topography, significant land features, and by using a conservative calculation of total ground-water recharge during a drought. For conservative purposes, drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground-water contribution area required to supply the wells.

For the Darlington MHP, the current Water Appropriation Permit issued by the MDE Water Rights Division are for an average of 14,000 gallons per day (gpd) for the total of the five wells. To determine the total ground-water contribution area during a drought, the following equation was used:

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

From the equation above, the total ground-water contributing area during a drought is approximately 35 acres. The delineated SWPA is approximately 120 acres (Figure 2), and is therefore adequate to meet the average daily ground-water usage during a drought.

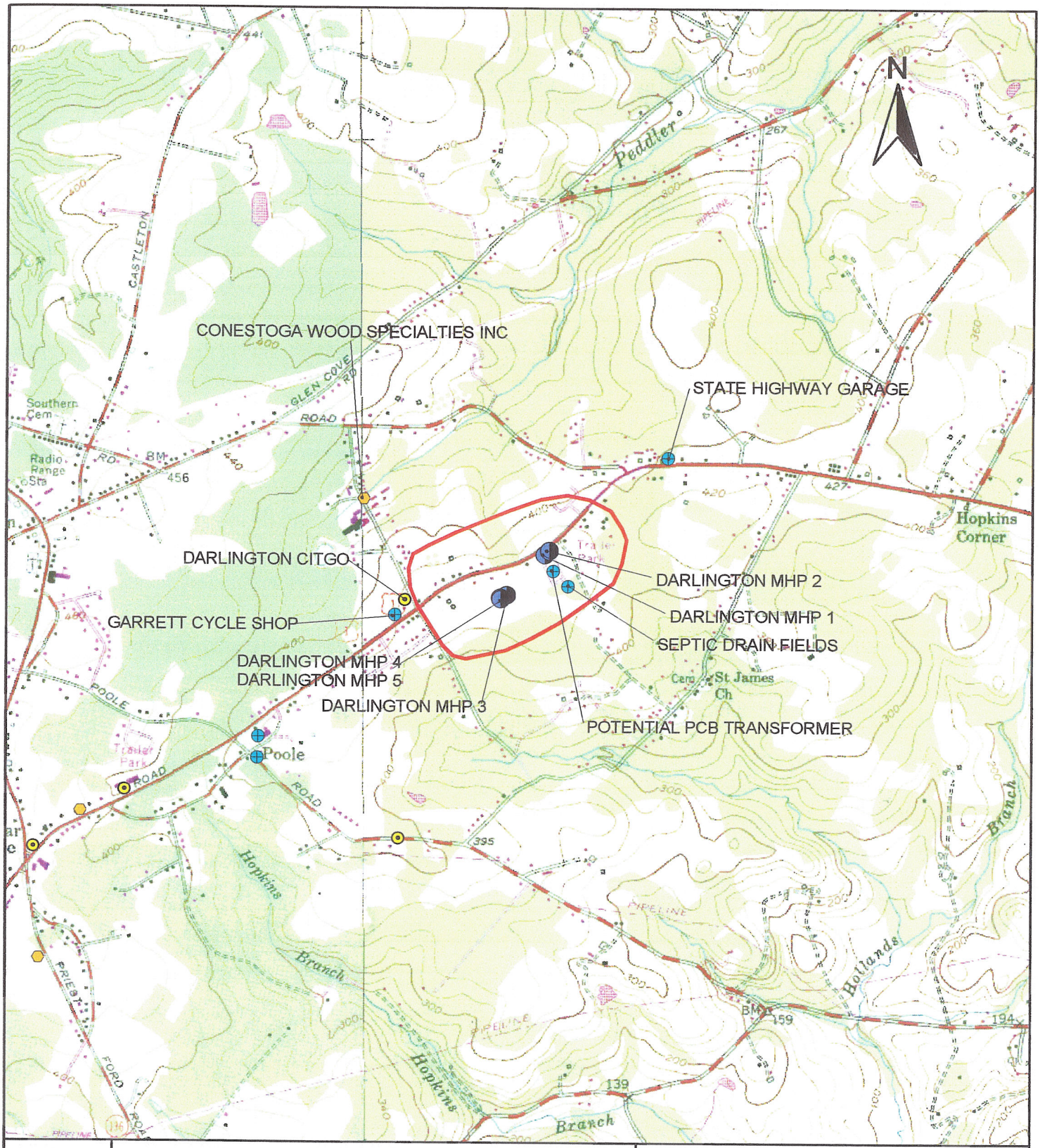


Figure 2. Darlington MHP Source Water Protection Area Map with Potential Sources of Contamination

Source Water Assessment Program
2003

Legend:

- MHP Wells
- SWPA Boundary
- UST
- Miscellaneous
- CHS Generator

Source: United States Geologic Survey. 1955 (1990). *7.5-minute Series Map for Delta, Maryland.*

United States Geologic Survey. 1953 (1985). *7.5-minute Series Map for Conowingo Dam, Maryland.*

Scale:

1000 0 1000 2000 Feet

3. INVENTORY OF POTENTIAL CONTAMINANTS WITHIN THE DELINEATED AREA

A field survey was performed on 4 November 2002 to confirm potential sources of contamination identified in MDE databases around the ground-water wells. These databases include the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which includes National Priority List (Superfund) sites, Maryland Registered Underground Storage Tank (UST) sites, Maryland Leaking Underground Storage Tank (LUST) sites, landfills, pesticide dealers, ground-water discharge permits, Colonial Tanks, and Controlled Hazard Substances (CHS) generator sites.

During the field survey, other sources of potential contamination not in the MDE databases were noted and the location was surveyed using a Global Positioning System (GPS) receiver for mapping purposes (Figure 2).

3.1 POINT SOURCES

Several pole-mounted electrical transformers were identified within the development. Prior to 1977, many transformers contained polychlorinated biphenyls (PCB) fluid as an insulator. It is possible that the transformers onsite contain PCB. If the transformer leaks, the PCB oil could eventually leach through the soil overburden into the ground-water aquifer.

Septic system drain fields were observed onsite. Septic system discharge could contain contaminants if there is insufficient treatment of biological contaminants such as coliforms and inorganic compounds such as nitrogen. Septic system discharge could also contain contaminants that the systems were not designed to treat, such as solvents and fuels.

Several 275-gallon above ground residential heating oil tanks (ASTs) were observed throughout the development as well as an AST in the basement of the permanent residence at the corner of Center and First Streets. Failure of an AST could impact the ground water with petroleum hydrocarbons.

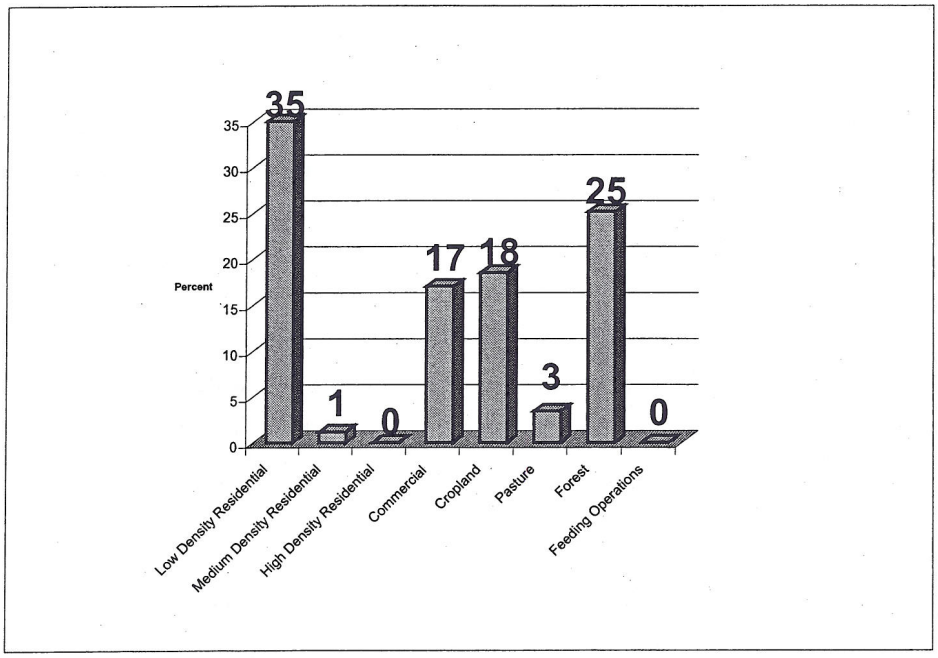
In addition to the above-stated point sources of contamination within the SWPA, a State Highway facility (used for servicing vehicles) exists along Route 1 that is just outside the SWPA to the east. A lumber company exists northwest of the SPWA that could be a potential source of metals and other wood treatment chemicals, however the nature of operations conducted at this facility is unknown.

An Underground Storage Tank (UST) site (Darlington Citgo) was observed adjacent to the SWPA to the west. A release of gasoline from the USTs could impact the ground-water with petroleum hydrocarbons. In addition, a motorcycle repair shop was observed adjacent to Darlington Citgo where use of fuels and solvents are prevalent.

3.2 NON-POINT SOURCES

Using the Maryland Office of Planning's 2000 Land Use/Land Cover map for Harford County, potential non-point sources within the SWPA were also evaluated by land use designation (Figure 3). A summary of the percent and acreage of each type of land use is presented in the graphs below:

PERCENTAGE OF EACH LAND USE TYPE



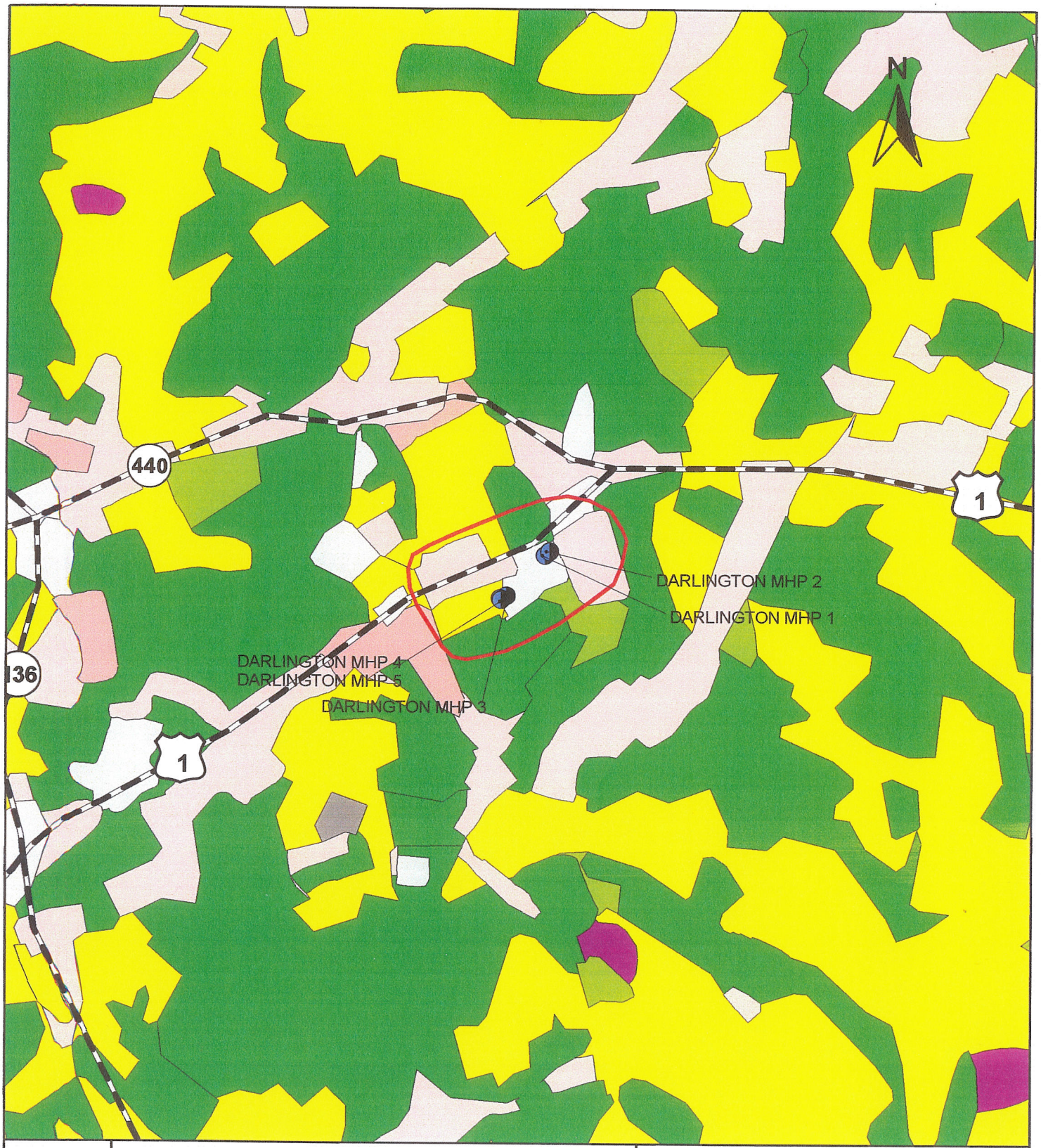


Figure 3. Darlington MHP
Land Use Map of the
Source Water Protection Area

Source Water Assessment Program
2003

Scale: 1000 0 1000 2000 Feet

Source: Maryland Office of Planning, 2000.

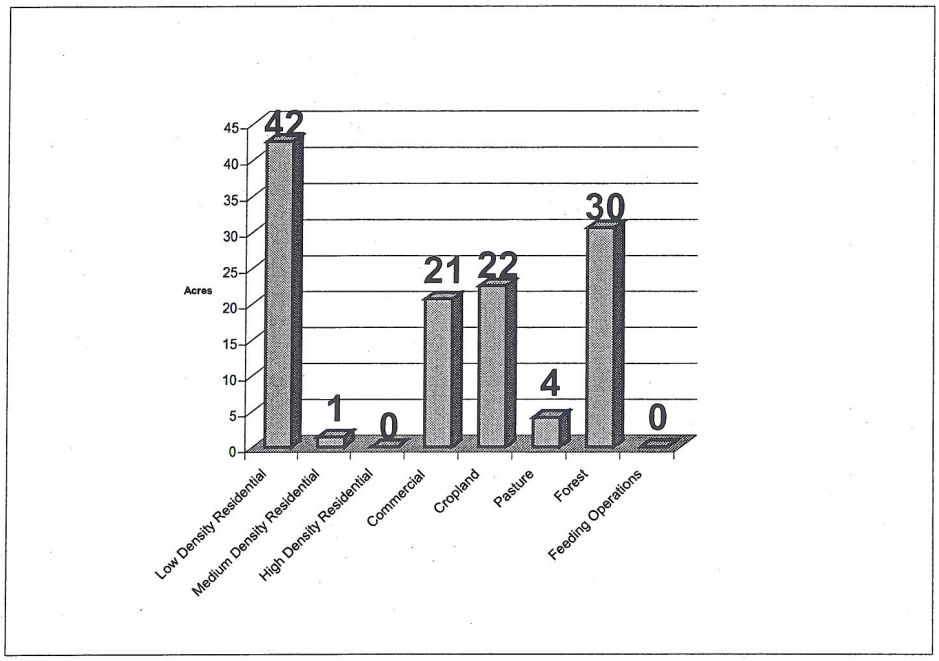
Legend:

- MHP Wells
- SWPA Boundary
- Major Roads

Land Use

- Low Density Residential
- Medium Density Residential
- Commercial
- Cropland
- Pasture
- Forest
- Feeding Operations

ACREAGE OF EACH LAND USE TYPE



From an interpretation of the graphs above, residential areas (43 acres), cropland (22 acres) and pastures (4 acres) account for over one half of the SWPA (120 acres). The use of fertilizers and pesticides in croplands and residential areas is common. Excessive animal waste in pasture areas can be a source of nitrate pollution in ground water. Therefore, there could be potential for the migration of potential contaminants from these non-point sources into the ground water.

Using the 1993 Maryland Office of Planning's Harford County sewerage coverage, potential non-point sources from other septic system users in the SWPA were assessed (Figure 4). By overlaying the SWPA on the sewerage coverage layer in ArcView GIS, it was determined that 100 percent of the SWPA does not have public sewer service nor is planned for service for at least 10 years.

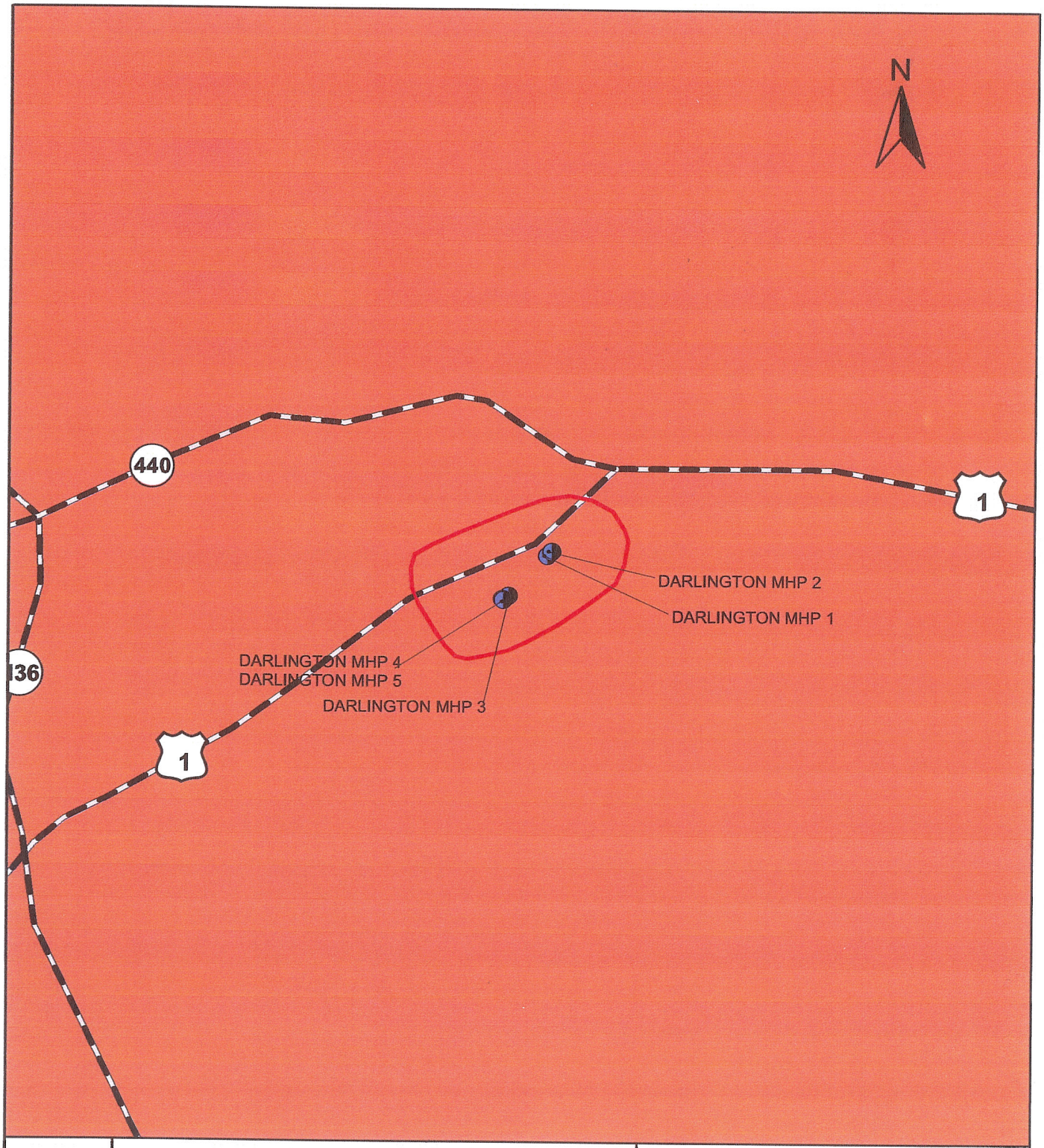


Figure 4. Darlington MHP Sewer Service Map of the Source Water Protection Area

Source Water Assessment Program
2003

Legend:

- MHP Wells
- SWPA Boundary
- Major Roads
- Sewer
- No planned service area

Source: Maryland Office of Planning, 1993.

Scale: 1000 0 1000 2000 Feet

4. REVIEW OF WATER QUALITY DATA

Water quality data was obtained from the MDE Water Supply Program database of Safe Drinking Water Act (SDWA) contaminants. The results reported are for finished (treated) ground water (unless noted).

A review of the water quality data from 1991 to 2002 has been performed for Darlington MHP's finished water samples. All detected compounds from ground-water samples collected are shown in Appendix A.

Ground-water analytical results were compared to 50 percent of the United States Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs) or the USEPA Secondary Drinking Water Regulations (SDWR). If no MCL or SDWR is available, the Drinking Water Equivalent Level (DWEL) was substituted as recommended by the USEPA Office of Water.

4.1 GENERAL WATER QUALITY PARAMETERS

No general water quality parameters were reported in the ground-water samples above 50 percent of the comparison criteria. The ground-water pH ranged from 6.7 to 7.3 standard units.

4.2 VOLATILE ORGANIC COMPOUNDS

No volatile organic compounds (VOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL.

Low levels of methyl-tert-butyl-ether (MTBE) were reported in ground-water samples collected in March 1998 and in April 1999 and ranged from 0.7 to 3.5 µg/L. MTBE is presently on the USEPA Contaminant Candidate List (CCL) for evaluation of whether placement on the Primary Drinking Water Standards list is warranted. Due to its presence on the CCL, MTBE currently has no MCL; however, the USEPA has an advisory level of 20 to 40 µg/L for the compound. MTBE is commonly found in gasoline as an oxygenate.

Low-level concentrations of 1,1,1-trichloroethane (0.7, 0.6, and 0.5 µg/L) were reported in ground-water samples collected in April 1997, October 1998, and July 2002. The compound 1,1,1-trichloroethane is commonly used as a dry cleaner, parts cleaner, and industrial solvent. The current MCL is 200 µg/L.

4.3 SYNTHETIC ORGANIC COMPOUNDS

No synthetic organic compounds (SOCs) were reported in the ground-water samples.

4.4 INORGANIC COMPOUNDS

No inorganic compounds (IOCs) were reported in the ground-water samples above 50 percent of the USEPA MCL.

Nitrate was reported in a number of water samples and ranged in concentration for 1.9 to 4.35 mg/L. The MCL for nitrate is 10 mg/L.

Sodium, nitrite, and sulfate were also reported in the ground-water samples. All reported concentrations were within normal ranges (Nutter, 1977).

4.5 MICROBIOLOGICAL CONTAMINANTS

No total or fecal coliforms have been detected in ground-water samples of the water system's finished water from January 1997 to August 2002.

To assess the potential of Ground Water Under the Direct Influence (GWUDI) of surface water, ground-water sampling records (during dry and storm conditions) in MDE databases were assessed and information from Water Supply Inspection Reports were reviewed.

Surface water that directly recharges the aquifer through major fractures in rock does not pass through the soil overburden that both filters and contains beneficial microorganisms that break down potential contaminants. If significant variances in the ground-water results from dry and storm conditions are observed, it is possible that the ground water is under the direct influence of surface water.

Based on a review of available sampling data, Wells 1, 2, 3, and 5 are not under the direct influence of surface water. No determination could be made for Well 4 due to the absence of GWUDI sampling data to date.

4.6 RADIONUCLIDES

One radionuclide, radon-222, was reported above 50 percent of the more conservative proposed MCL of 300 picocuries per liter (pCi/L) in one of the water samples collected. A summary of all radon-222 concentrations in the ground-water samples collected is shown in Table 2 below:

TABLE 2. SUMMARY OF RADON-222 ANALYSIS

Plant ID	Sample Date	Contaminant Name	Result	Unit
02	03-Apr-97	Radon-222	265	pCi/L
01	03-Apr-97	Radon-222	45	pCi/L

Shaded values are greater than 50 percent of the more conservative proposed MCL.

The MCL used for comparing detections of radon-222 was 300 pCi/L. This MCL is a proposed MCL established by USEPA since there is no current MCL for this contaminant (USEPA 1999). However, if a state has a program to address the more significant risk from radon in indoor air, then 4,000 pCi/L can be used as an alternate MCL. For the purpose of this investigation, the more conservative number was utilized.

5. SUSCEPTIBILITY ANALYSIS

To evaluate the susceptibility of the ground-water source to contamination, the following criteria were used:

1. available water quality data
2. presence of potential contaminant sources in the SWPA
3. aquifer characteristics
4. well integrity
5. the likelihood of change to the natural conditions

The aquifer that supplies Darlington MHP's drinking water is an unconfined aquifer.

For the Susceptibility Analysis in this report, rankings of "high," "moderate," and "low" susceptibility to contamination were utilized after a review of current information. However, other SWAP reports for the State of Maryland also utilized rankings of "is," "may be," and "is not" susceptible to contamination. For consistency between the ranking systems, the following details their equivalence. The ranking of "highly susceptible" is equivalent to "is susceptible," "moderately susceptible" is equivalent to "may be susceptible," and "low susceptibility" is equivalent to "is not susceptible."

5.1 VOLATILE COMPOUNDS

No VOCs were reported above 50 percent of the MCL.

MTBE was reported in eight water samples since 1996. MTBE is a gasoline additive used for cleaner air emissions. Each reported concentration was reported below 50 percent of the USEPA advisory level of 20 to 40 µg/L and were generally less than 2 µg/L. However, MTBE is more soluble in ground water than other petroleum hydrocarbons such as benzene and could be the leading edge of a contaminants plume. Two point sources of VOC were identified adjacent to the SWPA including a gas station and a motorcycle repair shop.

The VOC 1,1,1-trichloroethane is a common degreaser and solvent. The low-level detections may be the result of a spill at one of the identified point sources such as a repair shop or from the improper disposal of a solvent into a septic system that was not designed to treat and degrade this compound.

Based on the water quality data reviewed, the chemical characteristics of VOCs, and the observed facilities that could cause VOC contamination in the SWPA, the water supply at Darlington MHP is moderately susceptible to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

The only point sources that could impact the ground water with SOCs within the SWPA are from heating oil tanks and a potential PCB-oil-containing transformers observed onsite. The possible use of herbicides and pesticides on croplands and residential lawns, which accounts for 54 percent of the SWPA, can be considered a potential non-point sources for SOCs. However, no SOCs have been reported in any of the water samples submitted for analysis. Most SOCs have a high affinity to sorb to soil particles and are not likely to infiltrate into the ground-water aquifer. From an assessment of the well construction information, there is 30 to 50 ft of soil overburden between the surface and the rock aquifer.

Based on the water quality data reviewed, the nature of SOCs, and the relatively thick soil overburden, the water supply at Darlington MHP has a low susceptibility to SOCs.

5.3 INORGANIC COMPOUNDS

No IOCs were reported in the water samples analyzed with concentrations greater than 50 percent of the MCL.

Non-point sources for IOCs, specifically nitrate, are usually associated with the land use categories. Approximately 21 percent of the SWPA is agricultural (cropland and pastures) and another 36 percent is residential, which is not serviced by public sanitary sewers.

From an assessment of land use maps and observations of septic systems on site, domestic wastewater within the SWPA is treated by septic systems, which can cause nitrate pollution in ground water. However, concentrations of nitrate have been generally reported between 2 and 4 mg/L, which is less than 50 percent of the MCL (5 mg/L). No trends in the reported nitrate concentrations in the water samples have been observed over time.

Based on the water quality data reviewed, the water supply at Darlington MHP has a low susceptibility to IOCs.

5.4 RADIONUCLIDES

Radon-222 was reported above 50 percent of the more conservative proposed MCL of 300 pCi/L in one of two water samples collected in April 1997.

Based on the natural occurrence of radionuclides in the ground water in the Piedmont region of Maryland (Bolton 1996) and the water quality data, the water supply at Darlington Home Park is moderately susceptible to radon-222, but has a low susceptibility to other radionuclides.

5.5 MICROBIOLOGICAL CONTAMINANTS

No coliform bacteria have been detected in the water samples since sampling began in 1997.

From an assessment of GWUDI ground-water results by MDE, ground-water Wells 1, 2, 3, and 5 are not under the direct influence of surface water. The ground water from Well 4 has not been sampled to date and, therefore, the susceptibility to surface water could not be determined.

Three of the five supply wells are known to have been constructed after 1973, the year that current well construction standards were required. All the wellheads were observed to be in good repair.

Based on the water quality review and the condition and construction of the wells, the water supply has a low susceptibility to microbiological contaminants.

6. RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, Darlington MHP has a basis for better understanding of the risks to its drinking water supply. Being aware of the SWPA, knowing potential contaminant sources, evaluating current and future development, working with agricultural producers and soil conservation agencies, and effective outreach and education are examples of management practices that will help protect the water supply.

Recommendations for the protection of the ground-water supply are intended for the mobile home park owner and its residents. Specific management recommendations for consideration are listed below.

6.1 PROTECTION TEAM

The management of the mobile home park should be aware of the SWPA limits and evaluate the possible effects to the quality of the ground water prior to building or making any changes.

The management of the mobile home park should also contact the owner of the electricity transformers observed on-site to assess whether they contain PCB oil.

6.2 PUBLIC AWARENESS AND OUTREACH

The management of the mobile home park should consider discussing with property owners and businesses located within the SWPA of the activities that could have impacts to the ground water and its quality.

The management of the mobile home park should also consider sending pamphlets, flyers, or bill stuffers to its residents to educate them about the SWPA. An example pamphlet, "Gardening in a Wellhead Protection Area", is available from MDE. The residents should also be encouraged to notify the mobile home park management of any significant spills from gasoline or any other potentially hazardous substances.

Placing signs at the SWPA boundaries is an effective way to make the public aware of protecting their source of water supply, and to help in the event of spill notification and response.

The Executive Summary of this report should also be listed in the Consumer Confidence Report for the water system, and should also indicate that the report is available to the general public by contacting the MHP owner, the local library, or the MDE.

6.3 PLANNING/NEW DEVELOPMENT

The management of the mobile home park should also inform the Harford County Health and Planning Departments about any concerns to future development or zoning changes for properties that are within the SWPA.

6.4 MONITORING

The management of the mobile home park should continue to monitor the ground water for all SWDA contaminants as required by MDE.

Annual raw water sampling for microbiological contaminants is a good way to check the integrity of the well.

The management of the mobile home park should also contact the MDE Oil Control Program for the status of LUST sites within or adjacent to the SWPA.

The management of the mobile home park is required to conduct GWUDI sampling for Well 4 to determine its susceptibility to surface water infiltration.

6.5 CONTINGENCY PLAN

As required by the Code of Maryland Regulations (COMAR) 26.04.01.22, all water system owners are required to prepare and submit for approval a plan to provide safe drinking water under emergency conditions.

6.6 CHANGES IN USES

The management of the mobile home park should inform the Water Supply Program at MDE of any changes to pumping rates and when a change in the number of wells used is anticipated. Any changes to the pumping rate and/or the number of supply wells will affect the size and shape of the SWPA.

6.7 CONTAMINANT SOURCE INVENTORY UPDATES/INSPECTIONS

The management of the mobile home park should conduct its own survey of the SWPA to ensure that there are no additional potential sources of contamination.

A regular inspection and maintenance program of the supply wells should be considered to prevent a failure in the well's integrity, which could provide a pathway for contaminants to the aquifer.

Unused wells that are no longer connected to the distribution system should be abandoned and sealed as per COMAR 26.04.04.11. Unused wells can provide a pathway for contaminants to the aquifer. Two unused wells were reported from a review of a MDE database. The status of these wells is unknown.

The management of the mobile home park should inspect and maintain the well pit for Well 1 to ensure that surface water infiltration does not occur. No surface water accumulation in the pit was observed during the site visit.

Depressions around the wellheads should be filled and graded to prevent surface water ponding that could occur during rain events. This will help to prevent surface water infiltration into the well.

6.8 COOPERATIVE EFFORTS WITH OTHER AGENCIES

The management of the mobile home park may request the assistance of the University of Maryland Agricultural Extension Service, Soil Conservation Service to work with the nearby farmers to adopt Best Management Practices (BMPs) for cropland located within the SWPA.

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

7. REFERENCES

The following sources of information were consulted as a part of this investigation:

1. Bolton, David W., 1996. *Network Description and Initial Water-Quality Data from a Statewide Ground-Water Quality Network in Maryland*, Maryland Geological Survey Report of Investigations No. 60.

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

3. Maryland Geologic Survey 1968. *Harford County Geologic Map adapted from Maryland Geological Survey's Geologic Map of Maryland.*

4. Nutter, Larry J. 1977. *Ground-Water Resources of Harford County, Maryland.* Maryland Department of Natural Resources, Maryland Geologic Survey, Geologic Survey of the United States Department of the Interior and Harford County Department of Planning and Zoning. Bulletin No. 32.

1. United States Environmental Protection Agency (USEPA). 2001. *A Small Systems Guide to the Total Coliform Rule.* Office of Water. EPA 816-R-01-017A. June.

2. United States Environmental Protection Agency (USEPA). 1999. *Proposed Radon in Drinking Water Rule.* Office of Water. EPA 815-F-99-006. October.

SOURCES OF DATA

Water Appropriation and Use Database.
Public Water Supply Inspection Reports
Monitoring Reports
MDE Water Supply Program Oracle Database
MDE Waste Management Sites Database
Maryland Office of Planning 2000 Harford County Land Use Map
Maryland Office of Planning 1993 Harford County Land Use Map
USGS Topographic 7.5 minute Quadrangle Map – 1955 (1990) Delta, Maryland Quad
USGS Topographic 7.5 minute Quadrangle Map – 1953 (1985) Conowingo Dam, Maryland Quad

Appendix A

Detected Compounds in Ground-Water Samples

SUMMARY OF DETECTED COMPOUNDS IN DARLINGTON MOBILE HOME PARK WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Volatile Organic Compounds				
02	03-Apr-97	1,1,1-TRICHLOROETHANE	0.7	ug/L
02	20-Oct-98	1,1,1-TRICHLOROETHANE	0.6	ug/L
02	02-Jul-02	1,1,1-TRICHLOROETHANE	0.5	ug/L
01	01-May-96	CHLOROFORM	2	ug/L
02	01-May-96	METHYL-TERT-BUTYL-ETHER	2	ug/L
02	03-Apr-97	METHYL-TERT-BUTYL-ETHER	3.5	ug/L
02	20-Oct-98	METHYL-TERT-BUTYL-ETHER	1.3	ug/L
02	27-Sep-99	METHYL-TERT-BUTYL-ETHER	1.5	ug/L
01	27-Sep-99	METHYL-TERT-BUTYL-ETHER	1.9	ug/L
01	03-Jan-01	METHYL-TERT-BUTYL-ETHER	0.7	ug/L
02	10-Sep-01	METHYL-TERT-BUTYL-ETHER	0.8	ug/L
02	02-Jul-02	METHYL-TERT-BUTYL-ETHER	0.6	ug/L
Inorganic Compounds				
01	18-Apr-94	NITRATE	3.36	mg/L
02	18-Apr-94	NITRATE	2.31	mg/L
01	25-Apr-94	NITRATE	3.22	mg/L
02	25-Apr-94	NITRATE	2.25	mg/L
01	17-Jan-95	NITRATE	4.35	mg/L
02	17-Jan-95	NITRATE	2.98	mg/L
01	12-Dec-95	NITRATE	2.3	mg/L
02	12-Dec-95	NITRATE	2.3	mg/L
01	18-Jan-96	NITRATE	4.07	mg/L
02	18-Jan-96	NITRATE	2.93	mg/L
01	07-Jan-97	NITRATE	2.77	mg/L
02	07-Jan-97	NITRATE	2.44	mg/L
01	20-Oct-98	NITRATE	3.5	mg/L
02	20-Oct-98	NITRATE	2	mg/L
01	06-Jan-99	NITRATE	4.09	mg/L
01	06-Jan-99	NITRATE	2.05	mg/L
02	06-Jan-99	NITRATE	2.05	mg/L
01	05-Jan-00	NITRATE	2.9	mg/L
02	05-Jan-00	NITRATE	1.9	mg/L
01	03-Jan-01	NITRATE	3.8	mg/L
02	03-Jan-01	NITRATE	2.6	mg/L
01	10-Jan-01	NITRATE	3.2	mg/L
02	10-Jan-01	NITRATE	2.1	mg/L
01	10-Jan-02	NITRATE	4.2	mg/L
02	10-Jan-02	NITRATE	2.6	mg/L
02	12-Dec-95	NITRITE	0.003	mg/L
01	20-Oct-98	SODIUM	5	mg/L
02	20-Oct-98	SODIUM	3	mg/L
01	03-Jan-01	SODIUM	3.81	mg/L
02	03-Jan-01	SODIUM	2.8	mg/L

SUMMARY OF DETECTED COMPOUNDS IN DARLINGTON MOBILE HOME PARK WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Inorganic Compounds				
02	12-Dec-95	SULFATE	3.5	mg/L
01	20-Oct-98	SULFATE	6.6	mg/L
02	20-Oct-98	SULFATE	2.8	mg/L
General Water Quality Parameters				
02	12-Dec-95	pH	6.7	s.u.
01	12-Dec-95	pH	6.9	s.u.
01	03-Jan-01	pH	7.3	s.u.
Radionuclides				
02	03-Apr-97	RADON-222	265	pCi/L
01	03-Apr-97	RADON-222	45	pCi/L

s.u. – standard units.