Final

Source Water Assessment

for the

Misty Meadows I Mobile Home Park Water System

Cecil 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:

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May 2003

Project No. 61726.01

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LIST OF ACRONYMS AND ABBREVIATIONS

AST	Aboveground Storage Tank
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
mrem	Millirem(s)
OU	Operable Unit
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 Misty Meadows I Mobile Home Park (MHP) water system in Cecil County, Maryland. This water system is identified as Public Water System Identification (PWSID) 0070247 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 Misty Meadows I MHP's water supply is the Port Deposit Gneiss, which is an unconfined crystalline rock aquifer. The Source Water Protection Area (SWPA) for the two ground-water supply wells was delineated using the watershed delineation method for fractured bedrock wells. The area of the SWPA is based on land topography, a nearby stream, and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 121 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. Fuel oil tanks, septic systems, a former Superfund site, and a underground storage tank site were observed within or adjacent to the SWPA. Croplands and residential areas account for a majority of the SWPA and can be considered non-point sources of contamination. Well information and water quality data were also reviewed.

The susceptibility analysis for the Misty Meadows I 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 Misty Meadows I MHP water supply is highly susceptible to radon-222, moderately susceptible to volatile organic compounds and total coliform bacteria, and has a low susceptibility to synthetic organic compounds, other radionuclides, and inorganic compounds.

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 Misty Meadows I Mobile Home Park (MHP) water system in Cecil County, Maryland. EA has performed this study under Purchase Order No. U00P3200205, as authorized by the Maryland Department of the Environment (MDE).

The Misty Meadows I MHP water system serves the community of Misty Meadow I MHP and is interconnected with the water system of Highlands Hill MHP in Cecil County. The water treatment plant and the supply wells for the system are located within the development. The Misty Meadows I MHP water system serves a population of 45 with 40 connections. The water is supplied by two 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 3 and 4 were drilled in 1999, in accordance with the State's current well construction standards, which were implemented in 1973. The wells have a total average yield of 15,900 gallons per day (gpd). An additional well (CE880874) is no longer used because it went dry. This well was known as the Brown Well and/or Well 2. According to the MDE Public Water Supply Inspection Report for the water system dated July 2002, the system has an additional well that is not in use (CE880822). According to site personnel, this well is no longer part of the system, but is only used for vehicle washing due to an existing iron problem. Both of the active supply wells were completed above grade. Each well was observed secure and in good repair. 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
03	Misty Meadows I Well 3 (Well A)	CE943377	400	68	Port Deposit Gneiss
04	Misty Meadows I Well 4 (Well B)	CE943437	400	43	Port Deposit Gneiss

According to the MDE Public Water Supply Inspection Report for the water system dated July 2002, the operator of the water system is David A. Jones. EA personnel discussed water quality issues at the time of the site visit with Mr. Jones.

Currently, the raw ground water is treated with sodium carbonate (soda ash) for corrosion control and sodium hypochlorite (bleach) for disinfection. The raw water is also softened to remove excess iron and manganese. The finished water is stored in eight approximately 100-gal bladder tanks prior to distribution.

1.2 HYDROGEOLOGY

Cecil 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 (Overbeck et al. 1958).

The ground water used by the Misty Meadows I MHP is from production wells drilled into the Port Deposit Gneiss. The Port Deposit Gneiss Formation is described as a "moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite quartz diorite, and biotite granodiorite, with all rocks foliated and some strongly sheared" [Maryland Geological Survey (MGS 1968)].

The source of the ground water in Cecil 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 43 wells in the Port Deposit Gneiss ranges from 2 to 100 gallons per minute (gpm) with 35 percent of the wells having well yields greater than 10 gpm. The range of specific capacity, which relates well yield to drawdown, of 43 wells in the Port Deposit Gneiss range from less than 0.1 to 4.0 gallons per minute per foot of drawdown (Otton et al. 1988).

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 assessment and protection area 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, a drought condition recharge value of 400 gpd per acre (or approximately 5.4 inches per year) was used to estimate the total ground-water contribution area required to supply the wells.

For Misty Meadows I MHP, the current Water Appropriation Permit issued by the MDE Water Rights Division is for an average of 15,900 gpd for the total of the two 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 40 acres. The delineated WHPA is approximately 121 acres (Figure 2), and is therefore adequate to meet the average daily ground-water usage during a drought.

3. INVENTORY OF POTENTIAL CONTAMINANTS WITHIN THE DELINEATED AREA

A field survey was performed on 5 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

Two heating oil and one diesel above ground storage oil tanks (ASTs) were observed proximal to the wells. Additionally, several 275-gallon above ground residential heating oil tanks (AST) were observed throughout the development. Failure of an AST could impact the ground water with petroleum hydrocarbons.

Septic system drain fields were observed on-site. 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.

The former Superfund site Bainbridge Naval Training Center is located adjacent to the SWPA to the southwest of the mobile home park. However, the cleanup at the site is complete (USEPA 2003). The majority of the cleanup effort at this site was for asbestos removal. Two Operable Units (OUs) were identified as sources of contaminants to ground water including the Old Base Landfill and the Fire Training Area. A Record of Decision, which details the selected remedial action, for the sites include capping the former landfill to prevent further rain water infiltration and long-term ground-water monitoring for manganese, iron, and chlorobenzene. Neither of the OUs are within the SWPA or within one-half mile of the supply wells.

In addition to the above-stated point sources of contamination within the SWPA, one gasoline station exists along Route 275 that is just outside the SWPA to the east.

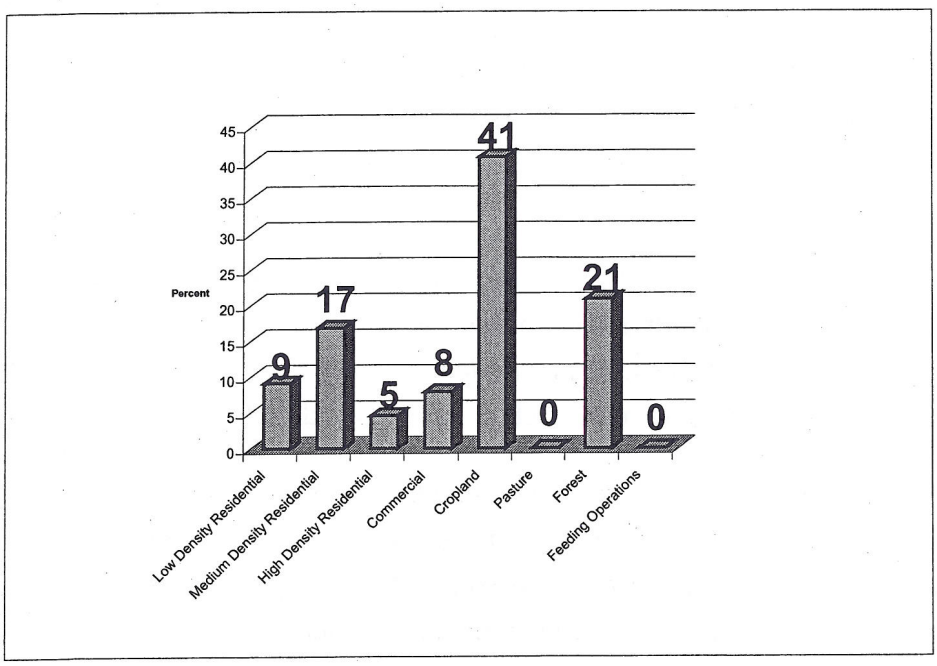
An inactive well (Brown Well CE-88-0874) exists at the property. The well will no longer be used because it went dry; therefore, it should be properly abandoned. Improperly abandoned wells can become pathways for contaminants to enter the ground-water aquifer.

3.2 NON-POINT SOURCES

In addition to the above point-sources, non-point source agricultural lands were observed north of the delineation area.

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

PERCENTAGE OF EACH LAND USE TYPE



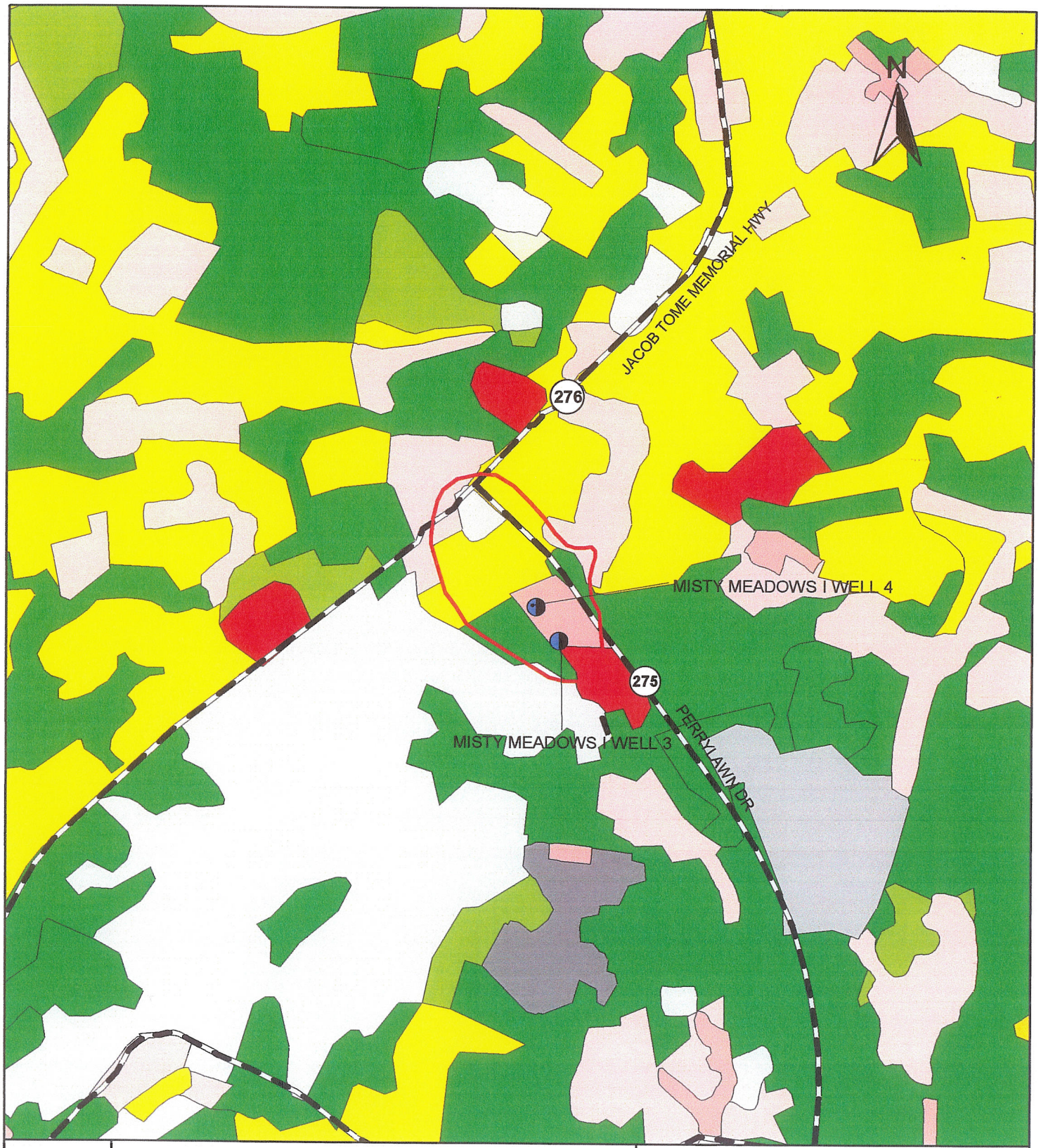


Figure 3. Misty Meadows I MHP
Land Use Map of the
Source Water Protection Area

Source Water Assessment Program
2003

Scale: 1000 0 1000 2000 Feet

Source: Maryland Office of Planning, 2000.

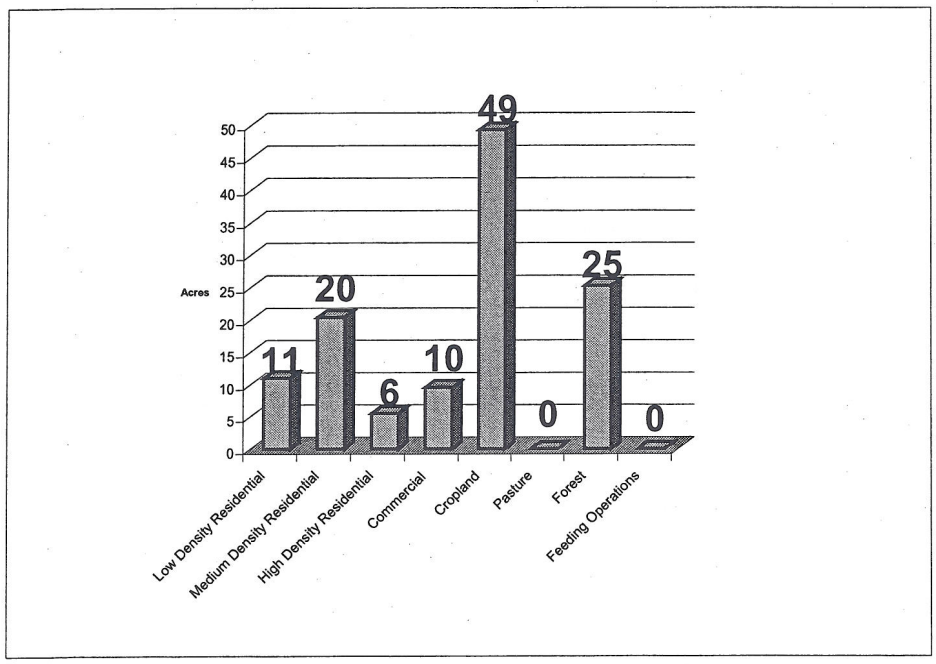
Legend:

- MHP Wells
- SWPA Boundary
- Major Roads

Land Use

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Open Urban Land
- Cropland
- Pasture
- Forest
- Barren Land

ACREAGE OF EACH LAND USE TYPE



From an interpretation of the graphs above, cropland (49 acres) and residential areas (37 acres) accounts for over one-half of the SWPA (121 acres). The use of fertilizers and pesticides in croplands and residential areas are common. Therefore, there is potential for the migration of potential contaminants into the ground water.

Using the 1993 Maryland Office of Planning's Cecil 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 approximately 68 percent of the SWPA does not have public sewer service and 32 percent is either on public sewer service or is under construction.

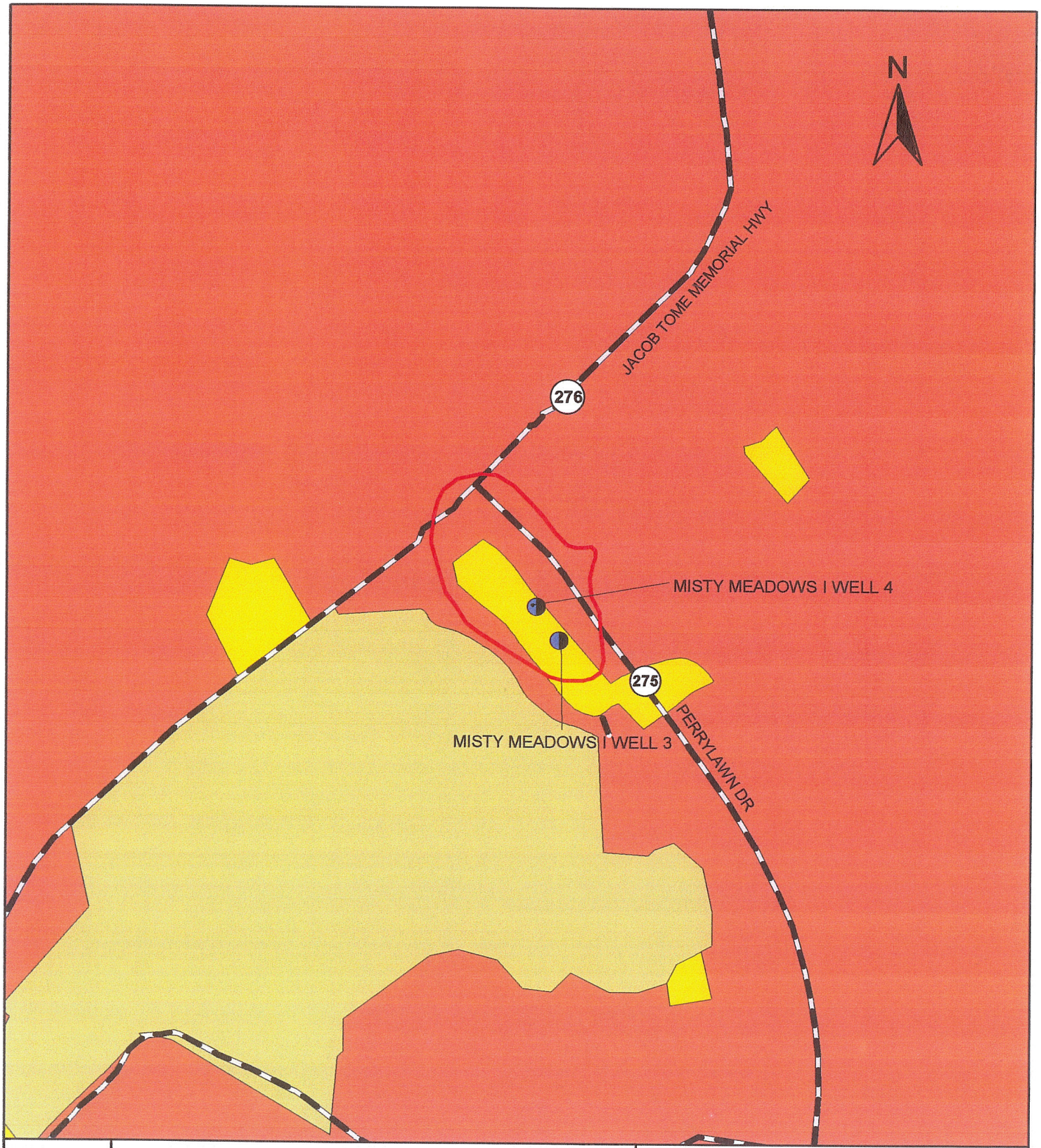


Figure 4. Misty Meadows I MHP Sewer Service Map of the Source Water Protection Area

Source Water Assessment Program
2003

Legend:

- MHP Wells
- SWPA Boundary
- Major Roads

Sewer

- No planned service area
- Existing service area
- Area programmed for service within 5 years

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 1992 to 2002 has been performed for Misty Meadows I 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

One ground-water sample collected on 15 October 1996 was reported with a pH of 6.4 units. This is below the SDWR range of 6.5 to 8.5 units. SDWR parameters are non-enforceable federal guidelines regarding cosmetic effects, such as tooth or skin discoloration, or aesthetic effects, such as taste, odor, or color.

4.2 VOLATILE ORGANIC COMPOUNDS

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

However, low levels of 1,1,1-trichloroethane were reported in ground-water samples collected in April 1996, April 1997, July 1997 and November 1997, which ranged from 2 to 7 µg/L. 1,1,1-trichloroethane is commonly used as a dry cleaner, parts cleaner, and industrial solvent and has a USEPA MCL of 200 µg/L.

Low levels of 1,1-dichloroethylene were reported in ground-water samples collected in April 1996, April 1997 and July 1997, which ranged from 0.7 to 1.1 µg/L. 1,1-dichloroethylene has a USEPA MCL of 7 µg/L.

A low level concentration (0.7 µg/L) of 1,2,4-trimethylbenzene was reported in ground-water sample collected in August 2001. This compound is presently on the Contaminant Candidate List (CCL), created by the USEPA to identify compounds that do not currently have an MCL, but are targeted for future research for the purpose of establishing an MCL.

4.3 SYNTHETIC ORGANIC COMPOUNDS

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

Low levels of di(2-ethylhexyl) phthalate were reported in ground-water samples collected in October 2000 at 1.1 µg/L. Di(2-ethylhexyl) phthalate is a common laboratory cross-contaminant and has a USEPA MCL of 6 µg/L.

4.4 INORGANIC COMPOUNDS

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

However, low levels of nitrate were reported in ground-water samples collected in January 1995, October 1996, January 1997, December 1998, March 1999, April 1999, June 2000, and June 2001, which ranged from 0.85 to 2.8 mg/L. Low levels of nitrite were reported in ground-water samples collected in October 1996 at 0.006 mg/L. Nitrate and nitrite are USEPA primary drinking water standard parameters with a USEPA MCL of 10 and 1 mg/L, respectively. Elevated levels could occur due to the influx of agricultural animal waste, agricultural chemicals or fertilizers, and/or septic system effluent into the drinking water.

A low level of sulfate was reported in a ground-water sample collected in October 1996 at 5.9 mg/L but below the SDWR standard of 250 mg/L. SDWR parameters are non-enforceable federal guidelines regarding cosmetic effects, such as tooth or skin discoloration, or aesthetic effects, such as taste, odor, or color.

4.5 MICROBIOLOGICAL CONTAMINANTS

Monthly ground-water sampling and analysis is performed for total and fecal coliform bacteria per the Total Coliform Rule.

A routine water sample submitted for analysis in October 1998 was reported to contain total coliform bacteria. The sample was not reported to contain fecal coliform bacteria. However, none of the five repeat water samples were reported to contain total coliform bacteria.

Routine water samples submitted for analysis in December 1998 and December 1999 were reported to contain total coliform bacteria. The samples were not reported to contain fecal coliform bacteria. However, no repeat water samples were analyzed to confirm or deny the presence of total or fecal coliform bacteria.

Another routine water sample submitted for analysis in August 2001 was also reported to contain total coliform bacteria. No fecal coliform was reported in this sample. However, none of the four repeat samples collected and submitted for analysis were reported to contain total coliform bacteria.

No other samples collected monthly since January 1997 through August 2002 were reported to contain coliform bacteria.

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 Public Water Supply Reports were reviewed.

Surface water that directly recharges the aquifer through major fractures in rock does not pass through on 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.

According to the Public Water Supply Inspection Report, the ground-water supply for Misty Meadows I MHP is not under the direct influence of surface water.

4.6 RADIONUCLIDES

Radionuclides are primary drinking water standard parameters. The MCL used for comparing detections of Radon-222 was 300 picocuries per liter (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. Radon-222 results are summarized in Table 2 below:

TABLE 2. SUMMARY OF RADON-222 ANALYSIS

Plant ID	Sample Date	Contaminant Name	Result	Unit
01	13-Aug-01	Radon-222	2,615	pCi/L

ND = Not Detected.
Shaded values are greater than the more conservative proposed MCL.

Radon-222 was detected above the more conservative proposed MCL at 2,615 pCi/L in the only sample analyzed for this parameter. Additionally, gross alpha was detected below the MCL (15 pCi/L) in two sampling events in August 2001 and December 1992 at 2 and 1.1 pCi/L, respectively.

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 Misty Meadows I 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 ORGANIC COMPOUNDS

No VOC concentrations were reported above 50 percent of the MCL in any of the water samples analyzed.

Low-level concentrations of the chlorinated organic compounds 1,1,1-trichloroethane and 1,1-dichloroethane were reported below 50 percent of the MCL. No point sources for the chlorinated compounds were observed or reported within or adjacent to the SWPA. However, neither of these compounds have been reported in water samples since 1997.

Based on the water quality data reviewed and the observed or reported facilities that could cause VOC contamination within or near the SWPA, the water supply at Misty Meadows I MHP is moderately susceptible to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

No SOC concentrations were reported above the 50 percent of the MCL in any of the water samples analyzed.

Only the SOC, di(2-ethylhexyl)phthalate was reported in one water sample at a level well below the MCL and is most likely the result of laboratory cross-contamination.

The only point sources that could impact the ground water with SOCs within the SWPA are from heating oil tanks observed onsite. The possible use of herbicides and pesticides on croplands and residential areas, which accounts for approximately 72 percent of the SWPA can be considered potential non-point sources of SOCs. However, no SOCs common to pesticides and herbicides have been reported in any of the water samples submitted for analysis. Most SOCs also have a high affinity to sorb to soil particles and are not likely to infiltrate into the ground-water aquifer.

From a review of well construction information, there is approximately 40 to 60 ft of soil overburden between the surface and the top of the bedrock aquifer.

Based on the water quality data reviewed, the relatively thick soil overburden, and the absence of significant point sources of SOCs, the water supply at Misty Meadows I MHP has a low susceptibility to SOCs.

5.3 INORGANIC COMPOUNDS

No IOC concentrations were reported above 50 percent of the MCL in any of the water samples analyzed.

Approximately 68 percent of the SWPA is not served by public sanitary sewer systems and most likely use septic systems, which can cause nitrate pollution in ground water. However, no concentrations of nitrate have been reported above 3 mg/L, which is less than 50 percent of the MCL of 10 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 and the lack of point sources of IOC, the water supply at Misty Meadows I MHP has a low susceptibility to IOC.

5.4 RADIONUCLIDES

Radon-222 was reported above the more conservative proposed MCL of 300 piC/L and above 50 percent of the less conservative proposed MCL of 4,000 pCi/L in the water sample collected in August 2001. Gross alpha was also detected in two samples at concentrations below the 50 percent MCL threshold.

Based on the natural occurrence of radionuclides in the ground water in the Piedmont region of Maryland and the water quality data (Bolton 1996), the water supply at Misty Meadows I MHP is highly susceptible to radon-222 and has a low susceptibility to other radionuclides.

5.5 MICROBIOLOGICAL CONTAMINANTS

Total coliform bacteria have been reported in the water samples occasionally during routine sampling events. No total coliform bacteria were reported in the subsequent repeat water samples.

Total coliforms are a group of closely related bacteria that are generally harmless. They are natural and common inhabitants of soil and surface water bodies. However, they are not generally found in ground water that is free of surface water or fecal contaminants (USEPA 2001). Therefore, if total coliforms are reported in water samples, there may be a direct pathway between surface water and the ground water.

Fecal coliforms are a subset of total coliforms and are a good indicator of surface water contamination, and of the potential presence of waterborne pathogens associated with fecal contamination (USEPA 2001). No fecal coliform bacteria were reported in any of the water samples.

From an assessment of GWUDI ground-water results by MDE, the ground-water supply for Misty Meadows I MHP is not under the direct influence of surface water. Mill Creek is within 1,000 ft of the supply wells and is a boundary of the SWPA. An inactive well also exists at the property and, if it falls into disrepair, it could be a pathway for surface water containing naturally occurring total coliforms to enter the ground-water aquifer.

From documentation reviewed, both of the supply wells were constructed after 1973, the year that proper well construction standards were required. All of the wellheads were observed to be in good repair.

Based on the water quality review, the presence of an inactive well on-site, and the nearby stream, the water supply at Misty Meadows I MHP is moderately susceptible to total coliform bacteria.

6. RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, Misty Meadows I 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.

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 MDE.

6.3 PLANNING/NEW DEVELOPMENT

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

Due to the reported total coliforms in the finished water samples, proper chlorination of the water is essential and should be closely monitored.

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.

Additional sampling for radiological contaminants (specifically radon-222) should be performed to monitor and document levels until the USEPA determined how to regulate the radionuclides in public water supplies.

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.

The unused well (Brown well) should be abandoned and sealed as per COMAR 26.04.04.11. Unused wells can provide a pathway for contaminants to the aquifer.

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 (MGS). 1968. *Cecil County Geologic Map adapted from Maryland Geological Survey's Geologic Map of Maryland.*

4. Otton, E. G, R. E Willey, R. A McGregor, G. Achmad, S. N. Hiortdahl, J.M. Gerhart. 1988. *Water Resources and Estimated Effects of Ground-Water Development, Cecil County, Maryland.* United States Department of the Interior, Geologic Survey. Bulletin 34.

5. Overbeck, R.M., T.H. Slaughter, and A.E Hulme, 1958. *Water Resources of Cecil, Kent, and Queen Annes Counties.* Maryland Department of Geology, Mines and Water Resources Bulletin No. 21.

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

7. 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.

8. United States Environmental Protection Agency (USEPA). 2003. Hazardous Site Cleanup Division Website. Accessed 14 March 2003. http://www.epa.gov/reg3hwmd/super/MD/naval-bainbridge/pad.htm.

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 – 1992 Rising Sun, Maryland Quad
USGS Topographic 7.5 minute Quadrangle Map – 1992 Havre de Grace, Maryland Quad

Appendix A

Detected Compounds in Ground-Water Samples

SUMMARY OF DETECTED COMPOUNDS IN MISTY MEADOWS I WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Volatile Organic Compounds				
01	16-Apr-96	1,1,1-TRICHLOROETHANE	5	ug/L
01	09-Apr-97	1,1,1-TRICHLOROETHANE	3.6	ug/L
01	17-Jul-97	1,1,1-TRICHLOROETHANE	7	ug/L
01	03-Nov-97	1,1,1-TRICHLOROETHANE	2	ug/L
01	16-Apr-96	1,1-DICHLOROETHYLENE	1	ug/L
01	09-Apr-97	1,1-DICHLOROETHYLENE	1.1	ug/L
01	17-Jul-97	1,1-DICHLOROETHYLENE	0.7	ug/L
01	13-Aug-01	1,2,4-TRIMETHYLBENZENE	0.7	ug/L
Synethic Organic Compounds				
01	16-Oct-00	DI(2-ETHYLHEXYL) PHTHALATE	1.1	ug/L
Inorganic Compounds				
01	11-Jan-95	NITRATE	1.04	mg/L
01	15-Oct-96	NITRATE	1.1	mg/L
01	13-Jan-97	NITRATE	1.67	mg/L
01	15-Dec-98	NITRATE	2.8	mg/L
01	17-Mar-99	NITRATE	1.5	mg/L
01	12-Apr-99	NITRATE	1.6	mg/L
01	30-Jun-00	NITRATE	0.85	mg/L
01	05-Jun-01	NITRATE	1.72	mg/L
01	15-Oct-96	NITRITE	0.006	mg/L
01	15-Oct-96	SODIUM	11.2	mg/L
01	12-Apr-99	SODIUM	13.04	mg/L
01	15-Oct-96	SULFATE	5.9	mg/L
General Water Quality Parameters				
01	15-Oct-96	pH	6.4	s.u.
Radionuclides				
00	08-Dec-92	GROSS ALPHA	1.1	pCi/L
01	13-Aug-01	GROSS ALPHA	2	pCi/L
01	13-Aug-01	RADON-222	2615	pCi/L
Microbiological Contaminants				
NA	1-Oct-98	TOTAL COLIFORM (ROUTINE)	Positive	
NA	1-Dec-98	TOTAL COLIFORM (ROUTINE)	Positive	
NA	1-Dec-99	TOTAL COLIFORM (ROUTINE)	Positive	
NA	1-Aug-01	TOTAL COLIFORM (ROUTINE)	Positive	

s.u. – standard units.
NA – not applicable.