Final

Source Water Assessment

for the

Bay Country Estates 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:

EA Engineering, Science, Technology, Inc.
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May 2003

Project No. 61726.01

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May 2003

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LIST OF ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
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
GIS	Geographical Information System
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)
ml	Milliliter(s)
MHP	Mobile Home Park
MTBE	methyl-tert-butyl-ether
mrem	Millirem(s)
NaOH	Caustic Soda
Org	Organisms
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

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

SWAP	Source Water Assessment Plan
SWPA	Source Water Protection Area
µg	Microgram(s)
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
USGS	United States Geological Survey
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 Bay Country Estates Mobile Home Park (MHP) water system in Cecil County, Maryland. This water system is identified as Public Water System Identification (PWSID) 0070207 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 Bay Country Estates MHP's water supply is the Wissahickon Formation, which is an unconfined crystalline rock aquifer. The Source Water Protection Area (SWPA) for the four 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 and a calculation of the total ground-water contributing area during a drought. The SWPA is approximately 130 acres and is oval in shape.

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. Septic systems, potential polychlorinated biphenyl (PCB) containing electricity transformers, and a mushroom farm were observed within the SWPA. Croplands account for a majority of the SWPA and can be considered a non-point source of contaminants. Well information and water quality data were also reviewed.

The susceptibility analysis for the Bay Country Estates 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 Bay Country Estates MHP water supply has a moderate susceptibility to volatile organic compounds and a low susceptibility to synthetic organic compounds, inorganic compounds, 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 Bay Country Estates 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 Bay Country Estates MHP water system serves the communities located within the Bay Country Estates MHP in Cecil County. The water treatment plant and the supply wells for the system are located within the development. The Bay Country Estates MHP water system serves a population of 276 with 106 connections. The water is supplied by four wells (Figure 1).

1.1 GROUND-WATER SUPPLY INFORMATION

A review of the well data and sanitary surveys of the system indicates that well numbers 3 and 4 were drilled in 1982, in accordance with the State's current well construction standards, which were implemented in 1973. Each of the four wells was completed outdoors above grade. Each well was observed secure and in good repair. Wells 2, 3 and 4 have pumping rates of 56, 48, and 4, gallons per minute (gpm), respectively. The pumping rate of Well 1 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	Bay Country Estates 1	CE660196	49	40	Wissahickon Formation
02	Bay Country Estates 2	CE690306	61	31	Wissahickon Formation
03	Bay Country Estates 3	CE810212	200	24	Wissahickon Formation
04	Bay Country Estates 4	CE810015	200	30	Wissahickon Formation

According to the MDE Public Water Supply Inspection Report for the water system dated July 2002, the operators of the water system are George Smith and Beth Hamilton of Miller Environmental.

Currently, the raw ground water is treated with caustic soda (NaOH) for corrosion control and sodium hypochlorite (bleach) for disinfection. The finished water is stored in 4,000 or 8,000-gal hydropneumatic tanks within the pump houses adjacent to the wellheads 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 are 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 Bay Country Estates MHP is from production wells drilled into the Wissahickon Formation of the Piedmont province. The Wissachickon Formation is described as an intensely folded and cleaved muscovite-chlorite-albite schist, muscovite-chlorite schist, chloritoid chist, and quartzite (Cleaves et al. 1968). According to Otton et al. [U.S. Geological Survey (USGS) 1988], the Wissahickon Formation consists of the Pelitic facies, the Metagraywacke, and the Gabbro at Appleton.

The source of the ground water in Cecil County is from precipitation in the form of rainfall or snow melt. 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 on the amount of fracture openings penetrated by the well. The well yield range of 560 wells in the Piedmont province range from 0.1 to 200 gallons per minute (gpm) with 30 percent of the wells having well yields greater than 10 gpm (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 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, a drought condition recharge value of 400 gallons per day (gpd) per acre (or approximately 5.4 inches per year) was used to estimate the total ground-water contribution area required to supply the well.

For Bay Country Estates MHP, the current Water Appropriation Permit issued by the MDE Water Rights Division is for an average total yield of 23,600 gpd for the four 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 59 acres. The delineated SWPA is approximately 130 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 4 November 2002 to confirm potential sources of contamination around the ground-water wells identified in MDE databases. 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 Hazardous 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) for mapping purposes in a Geographical Information System (GIS) software package, ARCVIEW GIS (Figure 2).

3.1 POINT SOURCES

Several pole-mounted electrical transformers were identified at the Bay Country Estates MHP. 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 may eventually leach through the soil overburden into the ground-water aquifer.

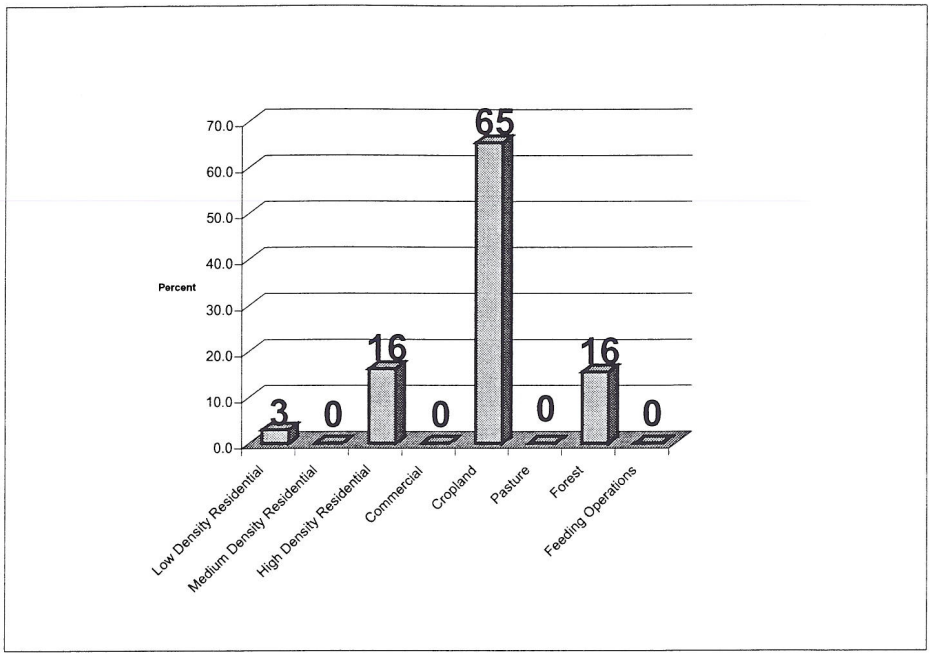
Septic system drain fields were observed onsite. Septic system discharge could contain contaminants if there is insufficient treatment of biological contaminants such as coliforms and inorganic compounds such as nitrogen. Septic system discharge could also contain contaminants that the systems were not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

KNK Farm, a mushroom growing facility, is located across Ebenezer Church Road to the west of Bay Country Estates MHP. Mushroom growing facilities utilize large quantities of mushroom substrate, a mixture of manure, straw, hay, corn cobs, chicken manure, etc. Based on the nature of the substrate material, it may contain microbiological contaminants and nitrogen compounds. This and other organic materials were observed in large open-air piles. Based on the observed storage method, the soluble compounds from this substrate may leach through the soil overburden into the ground-water aquifer.

3.2 NON-POINT SOURCES

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). This assessment was performed by overlaying the SWPA shape over the land use coverage layer in ArcView GIS. 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



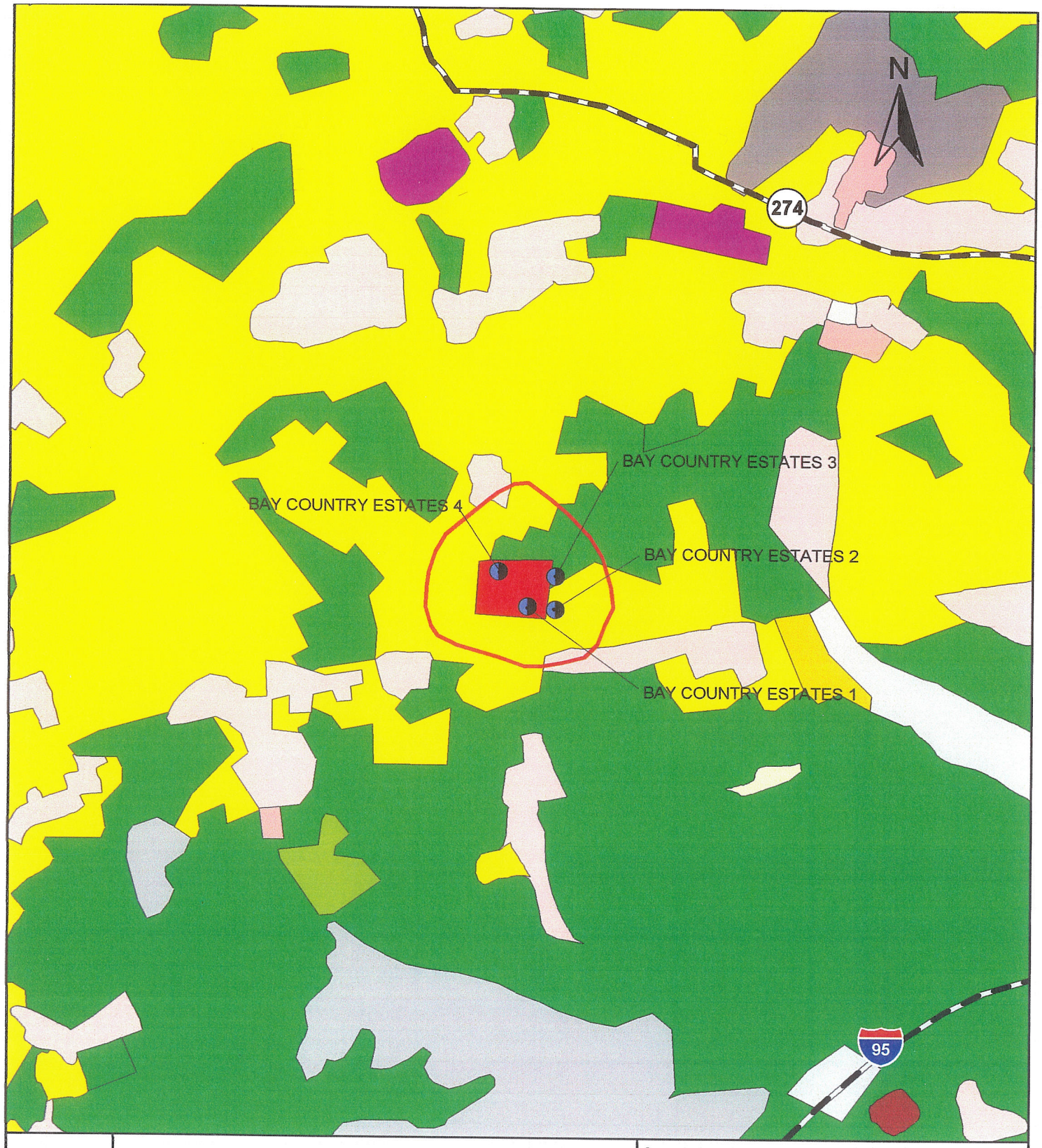


Figure 3. Bay Country Estates MHP Land Use Map of the Source Water Protection Area

Source Water Assessment Program
2003

Scale: 1000 0 1000 2000 Feet

Source: Maryland Office of Planning, 2000.

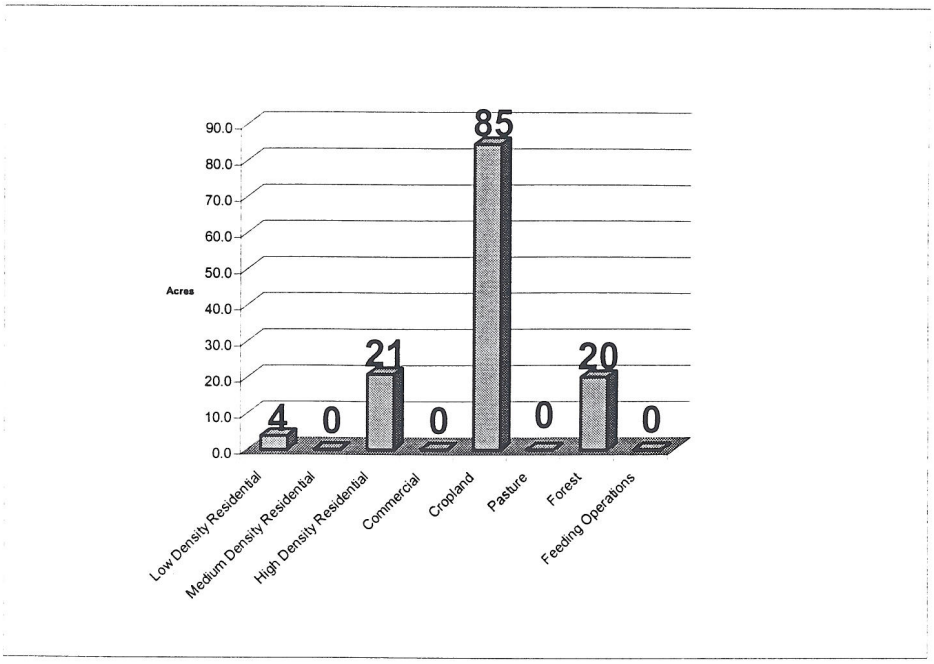
Legend:

- MHP Wells
- SWPA Boundary
- Major Roads

Land Use

- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Extractive
- Open Urban Land
- Cropland
- Pasture
- Orchards
- Forest
- Feeding Operations
- Barren Land

ACREAGE OF EACH LAND USE TYPE



From an interpretation of the graphs above, cropland (85 acres) and residential areas (25 acres) accounts for a majority of the SWPA (130 acres). The use of fertilizers and pesticides in croplands and on residential area lawns is common. Therefore, there may be potential for the migration of potential contaminants from this non-point source 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 over the sewerage coverage layer in ArcView GIS, it was determined that approximately 76 percent of the SWPA is not on sewer service while 24 percent is either on public sewer service or is under construction.

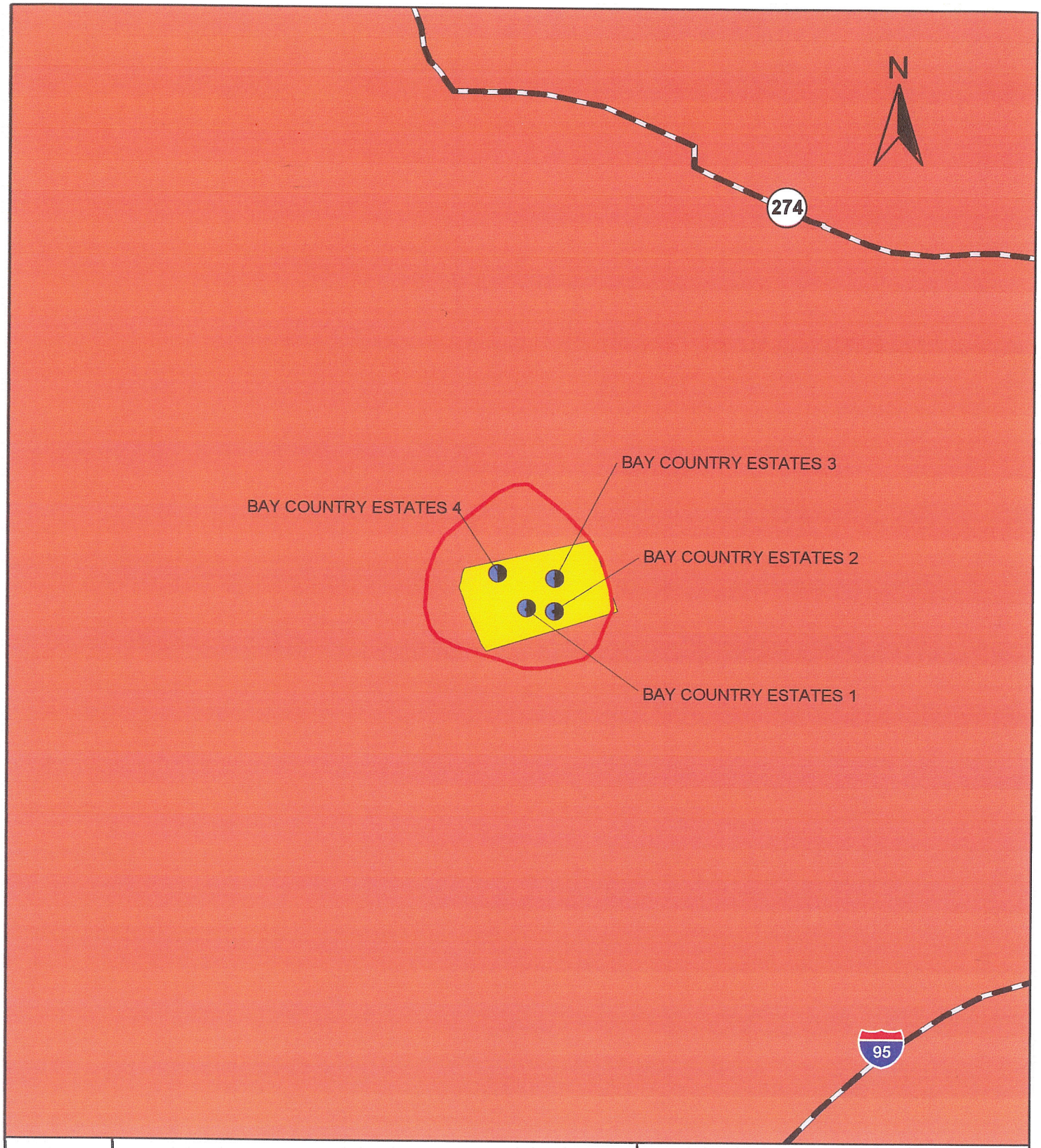


Figure 4. Bay Country Estates MHP Sewer Service Map of the Source Water Protection Area

Source Water Assessment Program
2003

Legend:

- MHP Wells
- SWPA Boundary
- Major Roads

Sewer

- No planned service area
- Existing service area

Scale: 1000 0 1000 2000 Feet

Source: Maryland Office of Planning, 1993.

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 Bay Country Estates 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 DWSR 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 12 November 1996 was reported with a pH of 6.2. This is below the SDWR range of 6.5 to 8.5. SDWR parameters are non-enforceable federal guidelines regarding cosmetic effects, such as tooth or skin discoloration, or aesthetic effects, such as taste, odors or color.

However, two other water samples were reported with a pH of 6.7 and 7.2; both are within the SDWR range.

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 June 2001 and in June 2002 and ranged from 0.7 to 1.2 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.

The concentrations reported in the June 2001 water samples are comparable to the concentrations reported in the June 2002 samples and are below half the USEPA advisory level (20 to 40 µg/L). MTBE is commonly found in gasoline as a oxygenate additive.

The disinfection by-products bromodichloromethane, bromoform, chloroform, and dibromochloromethane (commonly known as trihalomethanes) were also reported in the water samples and ranged in concentration from 0.5 to 0.9 µg/L. Effective 1 January 2004, the MCL for total trihalomethanes will be 80 µg/L.

4.3 SYNTHETIC ORGANIC COMPOUNDS

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

Chlordane, a pesticide, was reported in only the 14 February 2001 water sample (1 µg/L). The MCL for chlordane is 2 µg/L.

Di(2-ethylhexyl)phthlate, generally associated with laboratory cross contamination and with plasticizers, was also reported in the 14 February 2001 water sample (1.5 µg/L). The MCL for di(2-ethylhexyl)phthlate is 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.

The IOC reported the greatest number of times in the ground-water samples was nitrate with concentrations that ranged from 0.4 to 2.7 mg/L. The MCL for nitrate is 10 mg/L.

Reported nitrite concentrations ranged from 0.002 to 0.004 mg/L. The MCL for nitrite is 1 mg/L.

Reported sulfate concentrations ranged from 3.1 to 5.6 mg/L. This is within the range of sulfate concentrations in the ground water from crystalline rock aquifers (0.1 to 67 mg/L) in Cecil County (Otton et al. 1988). The concentrations were also well below the SDWR of 250 mg/L.

Reported barium concentrations ranged from 0.037 to 0.051 mg/L. The MCL for barium is 2.0 mg/L.

Sodium concentrations ranged from 7.3 to 10.9 mg/L. These concentrations are comparable to the median sodium concentration in the ground water from crystalline rock aquifers (6.7 mg/L) in Cecil County (Otton et al. 1988).

4.5 MICROBIOLOGICAL CONTAMINANTS

No total or fecal coliform has 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 Public Water Supply Inspection Reports were reviewed.

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. Surface water that directly recharges the aquifer through major fractures in rock does not pass through by the soil overburden that both filters and contains beneficial microorganisms that break down potential contaminants. Four GWUDI samples were collected in March of 2000. One GWUDI sample was collected from each of the four supply wells. Only Well 1 was reported to contain total coliform (20 org/100 ml).

From an assessment of the GWUDI ground-water results, the ground-water supply for Bay Country Estates MHP is not under the direct influence of surface water.

4.6 RADIONUCLIDES

No radionuclides were reported above 50 percent of the MCL.

Gross beta was reported in only one water sample collected in June 2001 at a concentration [3 picocuries per liter (pCi/L)] below the MCL (50 pCi/L).

Gross alpha and radon-222, two other radionuclides, were also reported in water samples. The reported gross alpha concentration (1 pCi/L) is below the MCL of 15. Radon-222 was also reported in the February 2000 water sample at a concentration of 145 pCi/L, which is below the more conservative proposed MCL of 300 pCi/L.

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 Bay Country Estates 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

MTBE and trihalomethanes were the only VOCs reported in the water samples collected. Both were reported below 50 percent of the MCL or the USEPA advisory level.

The reported trihalomethanes could be the result of the disinfection process using sodium hypochlorite (bleach).

No commercial or industrial facilities were observed or reported within the SWPA that would impact the ground water with VOCs, specifically the gasoline additive MTBE. However, MTBE has little affinity to attach to soil particles and is highly soluble in ground water. Therefore, it is possible that small spills of gasoline in or near the SWPA could cause the low-level detections (less than 1.5 mg/L) of MTBE in the ground water. MTBE can also be a leading edge of a plume of gasoline constituents in ground water from a distant source.

Based on the water quality data reviewed and the reported MTBE, the water supply at Bay Country Estates MHP is moderately susceptible to VOCs.

5.2 SYNTHETIC ORGANIC COMPOUNDS

The only SOC reported in the water samples collected included chlordane (a pesticide) and di(2-etrhylhexyl)phthalate. Di(2-ethylhexyl)phthalate is a common laboratory contaminant. Both were reported only one time in the February 2001 water sample well below 50 percent of the MCL. Most SOCs have an affinity to sorb to soil particles. Based on the well information, there appears to be between 20 to 40 ft of soil overburden above the bedrock aquifer.

No commercial or industrial facilities were observed or reported within the SWPA that would impact the ground water with SOCs.

Based on the water quality data reviewed, the soil thickness above the aquifer, and the absence of any known facilities that may cause SOC contamination in the SWPA, the water supply at Bay Country Estates MHP has a low susceptibly to SOCs.

5.3 INORGANIC COMPOUNDS

No IOC concentrations were reported above 50 percent of the MCL.

Non-point sources of nitrate could include agricultural land such as croplands, which often utilize manure and other nitrogen-containing fertilizers. Approximately 65 percent of the SWPA is cropland. Other sources of nitrate could include the discharge from septic systems. Approximately 76 percent of the SWPA is not using public sewer service and is likely to rely on septic system use.

Nitrate has been detected at a mean concentration of 1.64 mg/L. The MCL for nitrate is 10 mg/L. No increases or decreases in concentration were observed over time. Therefore, it does not appear that the septic systems and/or the croplands are a source of nitrate contamination to the water source at this time.

Based on the water quality review and the absence of known facilities or areas that may cause IOC contamination, the water supply at Bay Country Estates has a low susceptibility to IOCs.

5.4 MICROBIOLOGICAL CONTAMINANTS

No coliform bacterium has been detected in the water samples that were collected since 1997. From an assessment of GWUDI ground-water results by MDE, only a raw water sample from Well Number 1 was reported to contain total coliforms.

Two of the wells have been constructed after 1973, the year that current well construction standards were required. All of the wells were secure and appeared to be in good repair.

Based on the water quality review and the condition, and construction of the wells, and the proper chlorination of the raw water, the water supply at Bay Country Estates MHP has a low susceptibility to microbiological contaminants.

5.5 RADIONUCLIDES

Low levels of gross alpha particles, gross beta particles, and radon-222 were reported in the water samples collected. No radionuclide concentrations were reported greater than 50 percent of the MCL. This is most likely due to presence of uranium-bearing minerals in the bedrock in the Piedmont region of Maryland (Bolton 1996).

Based on the natural occurrence of radionuclides in the ground water in the Piedmont region of Maryland, the water supply at Bay Country Estates MHP has a low susceptibility to radionuclides.

6. RECOMMENDATIONS FOR PROTECTING THE WATER SUPPLY

With the information contained in this report, Bay Country Estates 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 boundary 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 transformer observed onsite 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 the activities that may 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 an example that is available from MDE. The residents should also be encouraged to notify the mobile home park management 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 of 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.

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 may provide a pathway for contaminants to the aquifer.

Depressions around the wellheads should be filled and graded to prevent surface water ponding that may 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:

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

3. Cleaves, E. T., Edward, Jonathan, Jr., and Glaser, J. D. 1968. Geologic map of Maryland: Maryland Geological Survey, scale 1:250,000.

4. 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.

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

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.

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 Cecil County Land Use Map
Maryland Office of Planning 1993 Cecil County Land Use Map
USGS Topographic 7.5 minute Quadrangle Map – 1992 Rising Sun, Maryland Quad
USGS Topographic 7.5 minute Quadrangle Map – 1992 Bay View, Maryland Quad
USGS Topographic 7.5 minute Quadrangle Map – 1992 North East, 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 BAY COUNTRY ESTATES MHP WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Volatile Organic Compounds				
03	19-Mar-98	BROMOCHLOROMETHANE	0.6	ug/L
03	21-Jun-01	BROMOFORM	0.9	ug/L
01	04-Jun-02	CHLOROFORM	0.5	ug/L
03	21-Jun-01	DIBROMOCHLOROMETHANE	0.8	ug/L
03	04-Jun-02	DIBROMOCHLOROMETHANE	0.6	ug/L
01	21-Jun-01	METHYL-TERT-BUTYL-ETHER	0.8	ug/L
02	21-Jun-01	METHYL-TERT-BUTYL-ETHER	0.7	ug/L
03	21-Jun-01	METHYL-TERT-BUTYL-ETHER	0.7	ug/L
03	21-Jun-01	METHYL-TERT-BUTYL-ETHER	0.7	ug/L
01	04-Jun-02	METHYL-TERT-BUTYL-ETHER	1.1	ug/L
02	04-Jun-02	METHYL-TERT-BUTYL-ETHER	1.2	ug/L
03	04-Jun-02	METHYL-TERT-BUTYL-ETHER	1.1	ug/L
Synethetic Organic Compounds				
01	14-Feb-00	CHLORDANE	1	ug/L
01	14-Feb-00	DI(2-ETHYLHEXYL) PHTHALATE	1.5	ug/L
Inorganic Compounds				
01	18-Dec-95	BARIUM	0.039	mg/L
02	18-Dec-95	BARIUM	0.051	mg/L
03	18-Dec-95	BARIUM	0.037	mg/L
01	16-Feb-93	NITRATE	1.2	mg/L
01	25-Jan-94	NITRATE	1.56	mg/L
01	11-Jan-95	NITRATE	2.04	mg/L
01	23-Jan-96	NITRATE	1.64	mg/L
02	23-Jan-96	NITRATE	2.33	mg/L
03	23-Jan-96	NITRATE	1.41	mg/L
02	12-Nov-96	NITRATE	1.9	mg/L
03	12-Nov-96	NITRATE	0.7	mg/L
01	25-Nov-96	NITRATE	0.7	mg/L
01	13-Jan-97	NITRATE	2.19	mg/L
01	14-Jan-98	NITRATE	2.34	mg/L
01	13-Jan-99	NITRATE	2.1	mg/L
01	22-Feb-99	NITRATE	2.4	mg/L
02	22-Feb-99	NITRATE	2	mg/L
01	10-Jan-00	NITRATE	1.6	mg/L
02	07-Feb-00	NITRATE	1.8	mg/L
01	14-Feb-00	NITRATE	2.7	mg/L
03	14-Feb-00	NITRATE	1.2	mg/L
01	22-Mar-01	NITRATE	1.9	mg/L
02	22-Mar-01	NITRATE	1.37	mg/L
03	22-Mar-01	NITRATE	0.8	mg/L
01	26-Mar-02	NITRATE	1.68	mg/L
01	26-Mar-02	NITRATE	1.92	mg/L
02	26-Mar-02	NITRATE	1.68	mg/L
03	26-Mar-02	NITRATE	0.386	mg/L

SUMMARY OF DETECTED COMPOUNDS IN BAY COUNTRY ESTATES MHP WATER SAMPLES				
Plant ID	**Sample Date**	**Contaminant Name**	**Result**	**Unit**
Inorganic Compounds				
02	12-Nov-96	NITRITE	0.003	mg/L
03	12-Nov-96	NITRITE	0.004	mg/L
01	25-Nov-96	NITRITE	0.004	mg/L
03	14-Feb-00	NITRITE	0.002	mg/L
02	12-Nov-96	SODIUM	7.3	mg/L
03	12-Nov-96	SODIUM	10.9	mg/L
01	25-Nov-96	SODIUM	9.7	mg/L
01	14-Feb-00	SODIUM	4.67	mg/L
02	14-Feb-00	SODIUM	6.66	mg/L
03	14-Feb-00	SODIUM	8.97	mg/L
02	12-Nov-96	SULFATE	3.1	mg/L
03	12-Nov-96	SULFATE	4.1	mg/L
01	25-Nov-96	SULFATE	5.6	mg/L
General Water Quality Parameters				
02	12-Nov-96	pH	6.2	s.u.
03	12-Nov-96	pH	6.7	s.u.
01	25-Nov-96	pH	7.2	s.u.
Radionuclides				
01	21-Jun-01	GROSS ALPHA	1	pCi/L
02	21-Jun-01	GROSS ALPHA	1	pCi/L
03	21-Jun-01	GROSS ALPHA	1	pCi/L
03	21-Jun-01	GROSS BETA	3	pCi/L
03	14-Feb-00	RADON-222	145	pCi/L
GWUDI Sampling				
01	14-Mar-00	TOTAL COLIFORM	20	org/100ml

s.u. – standard units.