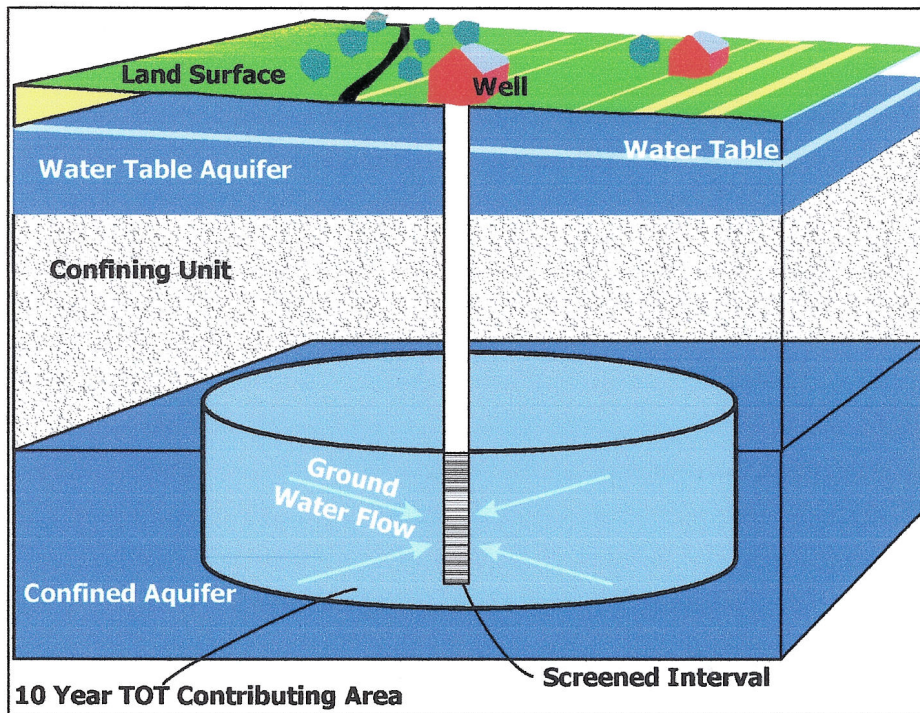


# SOURCE WATER ASSESSMENT

FOR SHORE HOMES

KENT COUNTY, MD



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# TABLE OF CONTENTS

	Page
Summary .....	1
Introduction.....	2
Well Information.....	2
Hydrogeology.....	2
Source Water Assessment Area Delineation .....	2
Potential Sources of Contamination.....	3
Table 1. Land use summary for the Shore Homes WHPA	
Water Quality Data .....	4
Table 2. IOC results for the Shore Homes water supply	
Susceptibility Analysis.....	5
Management of the WHPA.....	6
References.....	8
Other Sources of Data.....	8
Figures .....	9
Figure 1. Location of Small Systems in Kent County	
Figure 2. Shore Homes Wellhead Protection Area with Potential Contaminant Sites	
Figure 3. Land Use Map of the Shore Homes Wellhead Protection Area	

## SUMMARY

The Maryland Department of the Environment's (MDE) Water Supply Program (WSP) has conducted a Source Water Assessment for Shore Homes. The major components of this report as described in Maryland's Source Water Assessment Plan (SWAP) are: (1) delineation of an area that contributes water to the source, (2) an inventory of potential sources of contamination, and (3) determining the susceptibility of the water supply to contamination. Recommendations for management of the assessment area conclude this report.

The source of Shore Homes' water supply is a confined aquifer in the Coastal Plain. One well is currently being used to pump the water out of the aquifer. The Source Water Assessment Area for Shore Homes well was delineated by the WSP using a method approved by the U.S. EPA.

Potential sources of contamination within the assessment area were identified based on MDE site visits, a review of MDE's databases, and land use maps. Well information and water quality data were also reviewed. Figures showing land uses and potential contaminant sources within the Source Water Assessment Area and an aerial photograph of the well location are enclosed at the end of the report.

The susceptibility analysis of Shore Homes 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 Shore Homes water supply is not susceptible to contamination by inorganic compounds, volatile organic compounds, synthetic organic compounds, radionuclides or microbiological contaminants.

## **INTRODUCTION**

A review of the Water Supply Program's (WSP) database indicated that there are three active small systems in Kent County. Maryland's Source Water Assessment Plan (MDE, 1999), defines a "small system" as a community or a nontransient noncommunity system that has a water appropriation permit of less than 10,000 gallons per day (gpd). Since the three systems are located in different areas of the county (figure 1) individual source water assessments were conducted rather than a regional one as specified in the Source Water Assessment Plan (SWAP). This source water assessment deals with Shore Homes (formerly Delta Heights) which is classified as a community system.

Shore Homes is an apartment complex located in the Tolechester Beach area approximately 4 miles north of Rock Hall. The apartment complex was originally built to house military personnel working at the Tolchester Beach Nike Missile Site. The apartment complex has its own water supply and is owned and operated by Shore Homes LLC. Shore Homes currently has 24 units with a population of 210. The water is supplied by one well.

## **WELL INFORMATION**

A review of the well data and sanitary surveys, indicates that the supply well (Permit No. KE-81-0016) was drilled in July 1982 in accordance with Maryland's well construction regulations which were implemented in 1973. The well has a total depth of 185 feet, casing depth of 175 feet, and has been grouted to 50 feet with cement. The well has a pumping rate of 7 gallons per minute (gpm). An onsite inspection indicated that the well seal was broken and needed to be replaced.

## **HYDROGEOLOGY**

The Shore Homes well draws water from a Coastal Plain aquifer known as the Magothy aquifer. In the Shore Homes area the top and the bottom of the Magothy aquifer are about 150 feet and 200 feet below sea level, respectively (Drummond 1998). The regional ground water flow in the area is towards the southeast. The Magothy Formation comprises two lithofacies in Kent County, a light-colored lignitic sand and a light to dark-gray carboniferous silt-clay. The sand is white to yellowish brown, fine to coarse-grained quartz. In the Shore Homes area, the Magothy aquifer is overlain by the Matawan confining unit which is a dark to olive gray silty clay (Drummond, 1998).

## **SOURCE WATER ASSESSMENT AREA DELINEATION**

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment area for the system. According to Maryland's SWAP, the delineated area for a system in a confined aquifer in the Coastal Plain using less than 10,000 gpd is a circle with a radius of 600 feet. A volumetric equation was used to

calculate a fixed radius representing a 10-year zone of transport, assuming a minimum aquifer thickness of 20 feet and a porosity of 0.25.

## POTENTIAL SOURCES OF CONTAMINATION

For this assessment, MDE Waste and Water Management databases were reviewed and a field inspection conducted to identify potential for any direct injection of contaminants into the aquifer in and around the Shores Home WHPA.

A site investigation and database review indicated no potential sources for direct injection of contaminants into the aquifer in the Shore Homes WHPA. A portion of the WHPA passes through the former Tolchester Nike Missile Site (figure 2), which is a Superfund Site. The site had ground water contamination from trichloroethylene (TCE) and total petroleum hydrocarbons (TPH). Investigation by MDE Waste Management Administration (WAS) of this site indicated that the contamination was restricted to the soils and the shallow unconfined Columbia aquifer. A feasibility study (U.S Army Corp. 1999) requested by WAS indicated no TPH detects and that a TCE plume was moving towards the SW towards an unnamed stream at the south edge of the property. No remedial action was recommended since the TCE is naturally attenuating and will pose no public health risks.

The former missile site is now owned by Kent County and the site is used by Kent County Roads Department for storing and stockpiling road construction equipment and maintenance materials. According to Mr. George Kendall the operator for Shores Homes Water Treatment Plant, the county removed leaking underground storage tanks and contaminated soil about a year ago.

Based on the Maryland Office of Planning 1997 Land Use Map, four land use categories were identified in the WHPA (table 1). Figure 3 shows the land use in and around Shore Homes. It must be noted that the land use designated commercial is the former missile site.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
High Density Residential	6.37	24.5
Commercial	5.21	20.0
Cropland	1.02	3.9
Forest	13.43	51.6

**Table 1. Land Use Summary for the Shore Homes WHPA.**

A review of the 1995 Kent County Sewer Map shows that only the residential area has sewer service. There is no planned sewer service for the rest of the WHPA.

Non-point sources of contamination are usually associated with land use activities in the area. Since the Shore Homes source of water supply is a confined aquifer, current land use activities should not have an impact on its water quality.

## WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database and system files for Safe Drinking Water Act contaminants. The data described is from finished water unless indicated otherwise. The treatment currently in use at Shore Homes is disinfection, pH adjustment for corrosion control, and coagulation, flocculation, sedimentation and filtration for iron removal.

In accordance with Maryland's SWAP, data from the water supply was compared with the Maximum Contaminant Levels (MCLs). If the monitoring data is greater than 50% of the MCL, the written assessment will describe the source of such a contaminant, and, if possible, locate the specific sources, which are the cause of the elevated contaminant level. A review of the monitoring data since 1991 for Shore Homes indicates that the school's water supply meets the drinking water standards.

### *Inorganic Compounds (IOCs)*

No IOCs above 50% of the MCL have been detected in the Shore Homes water supply since 1993. Table 2 lists the IOCs that have been detected in the water supply since 1993. MCLs have not been established for iron, sodium and sulfate. The secondary standard for sulfate is 250 ppm. Secondary standards are levels established to indicate when taste, odor and color of the water may be offensive. As can be noted from table 3 the detected levels of the regulated IOCs are well below 50% of the MCL.

CONTAMINANT ID	CONTAMINANT NAME	MCL (ppm)	SAMPLE DATE	RESULT (ppm)
1010	BARIUM	2	18-Sep-93	0.02
1040	NITRATE	10	2-Oct-96	0.81
1055	SULFATE	none	1-Apr-97	7.9
1052	SODIUM	none	1-Apr-97	7.2
1025	FLUORIDE	4	1-Apr-97	0.13
1040	NITRATE	10	1-Oct-98	0.278
1025	FLUORIDE	4	22-Feb-00	0.11
1028	IRON	none	22-Feb-00	0.18
1052	SODIUM	none	22-Feb-00	7.29

Table 2. IOC results for the Shore Homes water supply.

### *Volatile Organic Compounds (VOCs)*

No VOCs above 50% of the MCL have been detected in Shore Homes water supply since 1991. 1,1,1-Trichloroethane was detected in 1991 and 1993 at 0.7 ppb and 1.1 ppb. These concentrations are well below 50% of the MCL for 1,1,1-trichloroethane which is 200 ppb. Methylene chloride was also detected in 1991 at 1 ppb. The MCL for methylene chloride is 5 ppb. Unregulated VOCs known as trihalomethanes (THMs) have also been detected in samples taken in 1991, 1993 and 1998. THMs – bromodichloromethane, bromoform, chloroform, and dibromochloromethane, are disinfection by-products which are the result of a reaction between chlorine use for disinfection and organic material in the water supply. THMs are currently regulated

only for systems serving a population of over 10,000. The current MCL for regulated systems in 100 ppb. For the total of the four above mentioned VOCs. The total concentrations of the THMs in the Shore Homes water supply were 32 ppb, 46.3 ppb and 24.7 ppb.

#### ***Synthetic Organic Compounds (SOCs)***

No SOC's have been detected in the Shore Home water supply since since 1993.

#### ***Radionuclides***

No radionuclides above 50% of the MCL have been detected in Shore Homes water supply since 1993. Gross beta was detected in 1997 and 2001 at 2 picoCuries per liter (pCi/L) and 5 pCi/L. These concentrations are well below 50% of the MCL for gross beta which is 50 pCi/L. Gross alpha was detected at 2 pCi/L in a sample collected in 2001. The MCL for gross alpha is 15 pCi/L. Radon-222 was detected at 30pCi/L in a sample collected in 2000. Currently, there is no MCL for radomn-222. EPA has proposed an MCL of 300 pCi/L and an alternate MCL of 4000 pCi/L for States that have an indoor air abatement program.

#### ***Microbiological Contaminants***

No total or fecal coliform has been detected in the Shore Homes water supply since 1993.

## **SUSCEPTIBILITY ANALYSIS**

The aquifer that supplies Shore Home's drinking water is confined and based on the well completion reports has a confining bed approximately 80 feet thick. This confining layer would retard the flow of any surface contamination into the aquifer supplying Shore Homes. Only direct injection into the aquifer from point sources within the WHPA like underground injection wells or improperly abandoned wells could cause a potential contamination threat to the supply. The information that was used to conduct the susceptibility analysis is as follows: (1) available water quality data, (2) presence of potential contaminant sources in the WHPA, (3) aquifer characteristics, (4) well integrity and (5) the likelihood of change to the natural conditions.

#### ***Inorganic Compounds (IOCs)***

No IOCs above 50% of the MCL have been detected in Shore Homes water supply. Nitrate levels detected are probably background levels found in the aquifer. Barium, sulfate and iron are naturally occurring minerals in the aquifer material. The sodium may be the result of the treatment process.

Based on the above analysis, Shore Homes water supply is **not** susceptible to IOC contamination.

#### ***Volatile Organic Compounds (VOCs)***

1,1,1-trichloroethane was detected at very low levels in 1991 and 1993.

Trichloroethane is an organic solvent and is also a VOC that is denser than water and

tends to sink to the bottom of the aquifer. It is possible that the detects may have been due to an unknown badly constructed well in the WHPA. There have been no subsequent detections and the only identified VOC contaminant, the TCE plume on the missile site is know to be flowing southwest away from the supply well. Methylene chloride detected in 1991 is known to be a laboratory contaminant in most of the samples collected for analysi.

Based on the above analysis, the Shore Homes water supply is **not** susceptible to VOC contamination.

#### ***Synthetic Organic Compounds (SOCs)***

No SOC's have been detected in Shore Homes water supply since 1993. There ar no sources of SOC contamination in the WHPA that could impact the confined aquifer. Hence the Shore Homes water supply is **not** susceptible to SOC contamination.

#### ***Radionuclides***

Gross alpha, and gross beta radiation have been detected in Shore Homes water supply at levels well below 50% of the MCL. Radon-222 was detected at levels well below both the proposed MCLs. The presence of these contaminants may be attributed to decay of naturally occurring minerals like uranium in the aquifer sediments. The Shore Homes water supply is **not** susceptible to radionuclides.

#### ***Microbiological Contaminants***

Based on the coliform sampling data and the aquifer characteristics, the Shore Homes water supply is **not** microbiological contaminants.

## **MANAGEMENT OF THE WHPA**

#### ***Form a Local Planning Team***

- Shore Homes should work closely with Kent County Road, Planning and Health Departments to look at ways to protect the water supply.

#### ***Public Awareness and Outreach***

- Information from this report or pamphlets and flyers to local residents, property owners and farmers will help educate them about Wellhead Protection.
- Placing road signs at WHPA boundaries are an effective way making the public aware of protecting their source of water supply.

#### ***Monitoring***

- Continue to monitor for all Safe Drinking Water Act contaminants are required by MDE.
- Annual sampling for microbiological contaminants is a good check for well integrity

#### ***Contaminant Source Inventory/Well Inspections***

- Replace the well seal to ensure that no surface contamination gets into the aquifer.



- Work with the County Health Department to ensure that there are no unused wells within the WHPA. Improperly abandoned wells can be potential sources of contamination to the aquifer.
- Periodic inspections and a regular maintenance program for the well will ensure its integrity and protect the aquifer from contamination.

*Changes in Use*

- Any increase in pumpage or addition of a new well to the system may require revision of the WHPA. The system is required to contact the Water Supply Program when an increase in pumpage is applied for or when new wells are being considered.

## REFERENCES

- Drummond, D. D., 1998, Hydrogeology, Simulation of Ground-Water Flow, and Ground-Water Quality of the Upper Coastal Plain Aquifers in Kent County, Maryland: Maryland Geological Survey Report of Investigations No. 68, 76 p.
- Maryland Department of the Environment, Water Supply Program, 1999, Maryland's Source Water Assessment Plan, 36 p.
- Tompkins, M. D., Cooper, B. F., and Drummond, D. D., 1994, Ground-Water and Surface-Water Data for Kent County, Maryland: Maryland Geological Survey Basic Data Report No. 20, 155 p.
- United States Environmental Protection Agency, Office of Ground-Water Protection, 1987, Guidelines for Delineation of Wellhead Protection Areas.

## SOURCES OF DATA

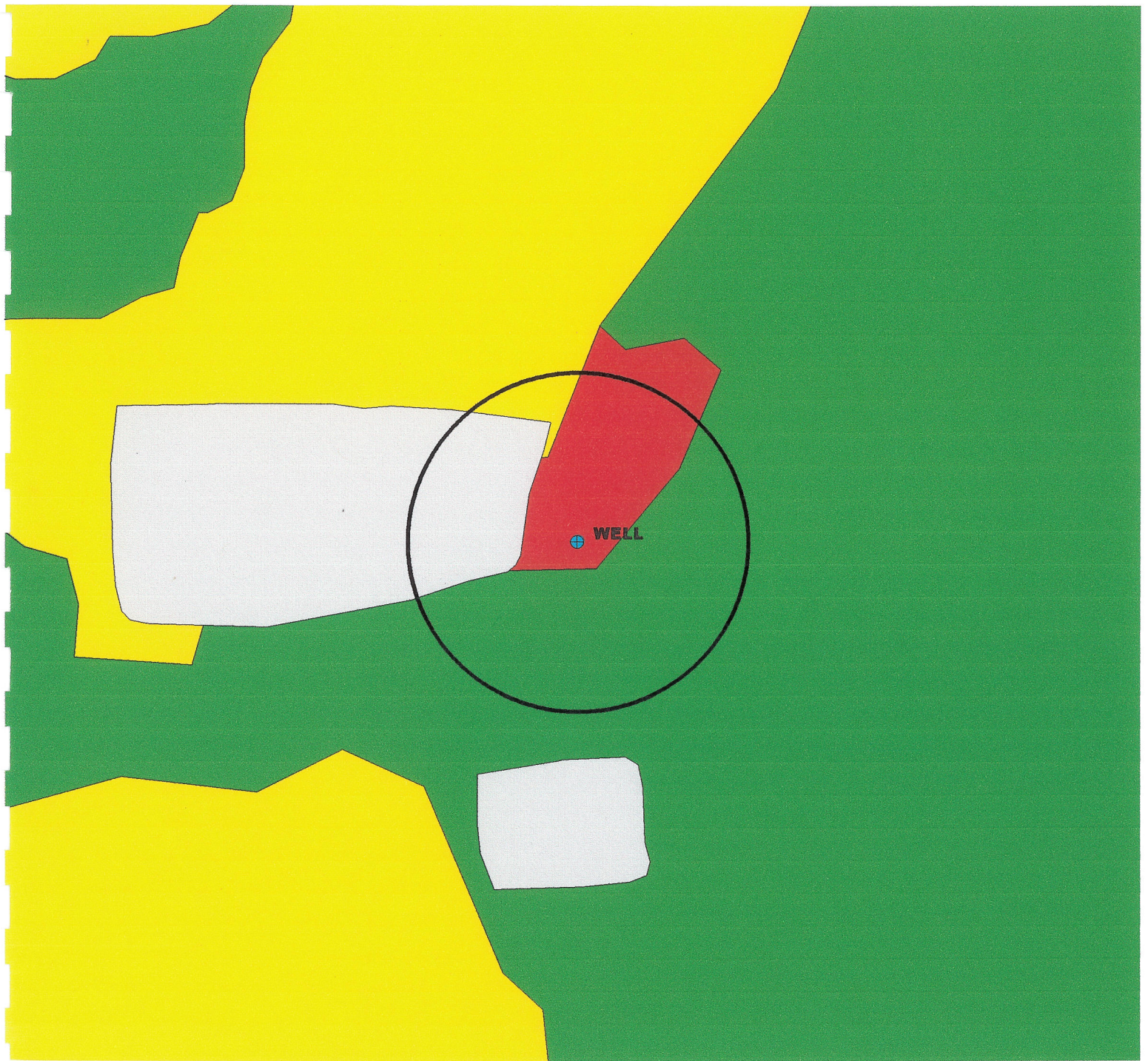
Water Appropriation and Use Permit No. KE1982G004  
Public Water Supply Inspection Reports  
Monthly Operating Reports  
Monitoring Reports  
MDE Water Supply Program Oracle Database  
MDE Waste Management Sites Database  
Department of Natural Resources Digital Orthophoto Quarter Quadrangle: Rock Hall  
NW 4-8-94  
Maryland Office of Planning 1997 Land Use Map  
Maryland Office of Planning 1995 Kent County Sewerage Coverage

**FIGURES**



**Figure 1. Location of Small Systems in Kent County.**





**Figure 3. Land Use Map of Shore Homes Wellhead Protection Area**

**LEGEND**

**Land Use**

-  High Density Residential
-  Commercial
-  Cropland

-  Forest
-  Wellhead Protection Area
-  Supply Well



Source: Maryland Office of Planning 1997 Kent County Land Use Map