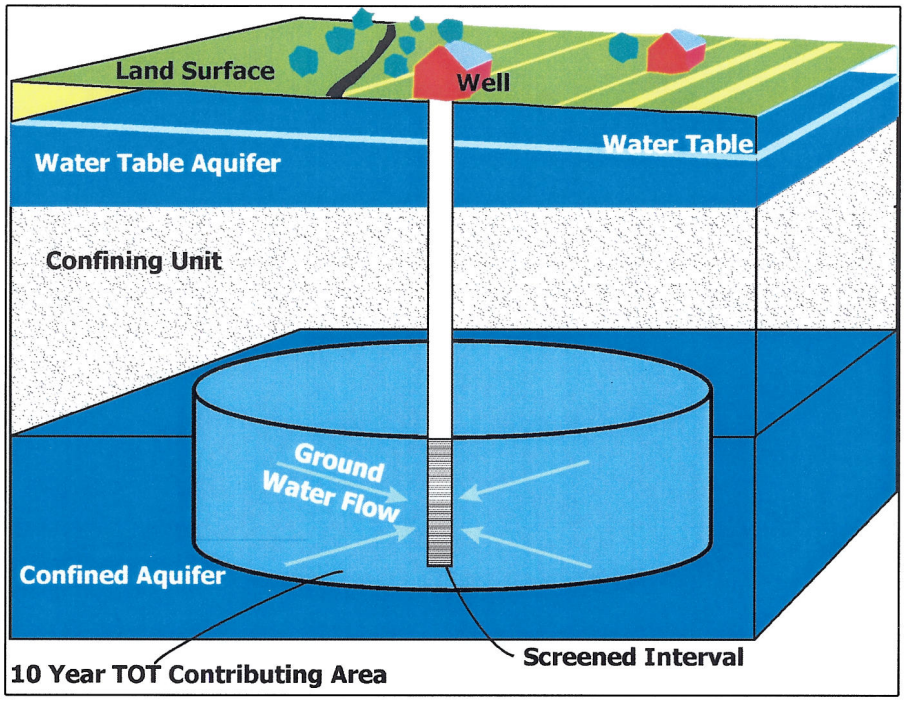
SOURCE WATER ASSESSMENT

FOR SIXTEEN NONTRANSIENT NONCOMMUNITY WATER SYSTEMS IN QUEEN ANNE'S COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
March 2006

MDE

Robert L. Ehrlich, Jr.
Governor

Kendl P. Philbrick
Secretary

Michael S. Steele
Lt. Governor

Jonas A. Jacobson
Deputy Secretary

TABLE OF CONTENTS

List of Figures

List of Tables

SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for sixteen non transient non community water systems in Queen Anne's County, Maryland. These water systems are identified as Public Water Systems with Identification Numbers (PWSID) by the Maryland Department of the Environment (MDE) and are listed in Table 1. 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; and
recommendations for protecting the drinking water supply.

All sixteen systems have wells drilled in confined aquifers. Confining units above the confined aquifers protect water supplies from contaminants originating on the land surface. Three different aquifers are used by the sixteen (16) systems. All but two systems use the Aquia aquifer. Twenty-one wells supply the sixteen systems covered in this report. The Source Water Assessment Areas or Wellhead Protection Areas for the wells were delineated using EPA approved methods.

Potential point sources of contamination within the assessment areas were identified from field inspections and contaminant inventory databases. Figure 1 shows the well locations and assessment areas for the sixteen systems, and maps showing potential point sources of contaminants are attached at the end of this report.

The Water Supply Program reviewed water quality results, the presence of potential sources of contamination within the individual assessment areas, the integrity of the systems' wells and the vulnerability of the aquifers. Eleven of the non transient non community water systems are susceptible to contamination by arsenic but not other inorganic constituents. Arsenic is naturally occurring in the Aquia and Piney Point aquifers. None of the systems are susceptible to synthetic organic compounds, to microbiological contaminants, or volatile organic compounds (VOC). The sanitary integrity of the water supply systems may be maintained by following the protection recommendations at the end of this report. These include disinfection after work is performed on the systems, installing two-piece caps on the wells, caulking the electrical conduits and continuing regular inspections.

INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for sixteen (16) non transient non community water systems in Queen Anne's County. A Source Water Assessment is an analysis of the vulnerability of a water supply source to contaminants and their sources. A non transient non community (NTNC) water system is any non community water system that regularly serves twenty-five or more of the same people for six months of the year. A school that has an on-site well for its source of water is an example of a non transient non community water system.

Queen Anne's County is located in the Eastern Shore portion of the State and is located in the Coastal Plain physiographic province. The Coastal Plain, geologically the youngest province in Maryland, covers nearly half of the State and consists entirely of unconsolidated sediments. All of the water systems in this report obtain their water from wells of various size and depth. All of these wells are completed in confined aquifers. Detailed information about each well is given in Table 1. The location and identification of the sixteen (16) systems are shown in Figure 1.

WELL INFORMATION

Information about the wells supplying each water system was obtained from the Water Supply Program's database, site visits, well completion reports, and sanitary survey inspection reports. A total of twenty-one (21) wells are used by the sixteen (16) systems assessed in this report. From the records it appears that three (3) of the wells were drilled before 1973 and may not be in compliance with Maryland's well construction regulations. Table 1 summarizes construction information about each well.

Delmarva Sash and Door is a manufacturing plant supplied by one well without any treatment. Approximately 130 persons work at the facility. The system uses bottled water for potable supply.

Queen Anne's Recreation & Parks operate two wells at the Route 18 park. One well serves the athletic fields and restroom and the other serves the offices that house the Park administration. The athletic field well casing is less than 1 foot above grade. The athletic field well vent is not screened which can allow insects or other small creatures to enter the well.

Tidewater Publishing Company is a printing company with a population of 75. Potable water for the plant is obtained from one well. Currently bottled water coolers are used for potable supply in the plant. An arsenic removal plan is being drawn up to ensure that water piped into the kitchen is arsenic free.

Church Hill Elementary School is served by one well. There are a total of 280 students and staff at the school. The well was installed in 1998 when the previous well was abandoned.

Kingswood Child Care Center has one well that serves a population of 50 caregivers and children. The well was drilled in 1991.

Clariant Performance Plastic Corp. operates two wells to supply water to the facility. Well #2 is used exclusively for process water in the plant. Well #1 is used as a potable supply for the office staff and workers in the plant. This well serves a population of 45 with one connection.

Kent Town Market is a shopping center supplied by one well. The system expects to connect to public water by March 2006.

Chesapeake College operates two wells serving a population of 1000 with 12 connections. One well is located in the pump house and the other is located outside. Both wells feed into a single plant.

Matapeake Terminal is a DNR/State police facility. Their sanitary and facility water is supplied by one well. Thirty-six people work out of this facility. Bottled water is used for consumption. There is a plan to connect the facility to Stevensville water system.

Grasonville Head Start is a school with a population of 125 served by one well. The well is located in the back of the school building. No treatment is provided to the water before it is placed into the distribution system.

Sudlersville Middle School has a population of 387 served by one well with one connection. An ion exchange unit is used to reduce the hardness.

Sudlersville Elementary School has a population of 400 served by one well with one connection. The well is in good condition and protected.

Gunston Day School has three wells serving the campus. Currently one of he wells has been taken offline. The other two wells serve a population of 150 with one connection.

Eastern Shore Junior Academy has one well that serves the school and a house on the campus. There is no treatment of the water and observation has indicated the presence of iron. The well serves a population of 43 with 2 connections.

Kent Island Shopping Center is a strip mall that is still under construction. Currently the single well in use serves 3 tenants. When the mall is completed, it will serve 11 stores. There is no treatment of the water.

Queen Anne's County Department of Public Works facility is served by one well. Population served is 30 with 1 connection.

HYDROGEOLOGY

An aquifer is any formation that is capable of yielding a significant amount of water. Ground water flows through pores between gravel, sand, and silt grains in unconsolidated sedimentary aquifers such as those used by the non transient non community water systems in Queen Anne's County. A confining unit is a layer generally composed of fine material

such as clay and silt, which transmits relatively very little water. Confined aquifers are those formations that are overlain by a confining unit. Confined aquifers are recharged from the water stored in the confining unit above or below and from precipitation that infiltrates into the formation where it is exposed at the surface. Due to the depth and areal extent of the unconsolidated sediments on the Eastern Shore of Maryland, water stored in these aquifers is very old and the water pumped from wells in these aquifers has generally traveled great distances from its origin at the land surface. (DNR 1987)

Queen Anne's County is located on the unconsolidated sediments of the Coastal Plain Physiographic Province. The sediments were deposited in a southeasterly thickening wedge extending from the Fall Line to the Continental Shelf (Banks, Klohe, & Battigelli, 2001). The Coastal Plain sediments consist of unconsolidated beds of clay, silt, sand, gravel, and shells. The sediments consist of non-marine to marginal-marine deposits of Cretaceous age, overlain by marine, estuarine, and fluvial sediments of Tertiary to Quaternary age (Andreasen & Smith, 1997). Nineteen of the twenty-one wells (90%) in this report are completed in the Aquia Formation. The other two are completed in the Magothy and Piney Point Formations.

Aquia Aquifer

The Aquia aquifer is the most commonly used aquifer by the non transient non community water systems in Queen Anne's County due to its accessibility, its generally high transmissivity, and its relatively good water quality. The Aquia aquifer is a medium to coarse, glauconitic sand, which is interbedded locally with clayey layers and calcite-cemented sandstone. The Aquia aquifer extends from its subcrop area in Kent County southeast to Trappe in Talbot County, where it becomes silty sand and does not produce water. It also extends westward beneath the Chesapeake Bay into Southern Maryland, and eastward into Delaware. Brackish-water intrusion is a potential problem in the Aquia along the Chesapeake Bay shore of Kent Island. There is an occurrence of brackish water within about a quarter mile of the Chesapeake Bay shore from Love Point southward to Kent Point. The top of the Aquia aquifer in Queen Anne's County ranges from 50 feet below sea level near the northern tip of Kent Island to approximately 300 feet below sea level in the southeastern most parts of the County. The Aquia aquifer ranges in thickness from about 100 to greater than 175 feet in Queen Anne's County. The water quality of the aquifer is generally good. Recent study of the occurrence of arsenic in Coastal Plain aquifers, however, has shown that arsenic levels in the Aquia aquifer in Queen Anne's County often exceed the newly established maximum contaminant level of 10 parts per billion (Bolton, 2003). Near the outcrop/subcrop area of the Aquia the water is calcium and magnesium bicarbonate type water with relatively low pH. Downgradient from the outcrop/subcrop area Aquia water changes to a sodium bicarbonate type water with relatively high pH. Iron concentrations tend to be high near the outcrop area, but downgradient they are very low. (DNR, 1983) (Drummond, 1988) (Drummond, 2001)

Magothy Aquifer

The Magothy aquifer, which is present throughout all of Queen Anne's County, consists of light gray to white loose sand and fine gravel containing interbedded lignitic, pyritic and clay layers. The coarser sands and gravels commonly occur near the base of the formation and clays increase towards its top. The top of the Magothy aquifer ranges from about 300 to 900

feet below sea level. The thickness of the aquifer ranges from about 50 to 200 feet. The water in the Magothy aquifer is a sodium bicarbonate and calcium/magnesium sulfate type. The Magothy aquifer in Kent Island has a severe problem with high iron and manganese concentrations. (DNR, 1987)

Piney Point Aquifer

The Piney Point aquifer consists of medium to coarse-grained sands with some layers of shell debris, fine sand and clay. The Piney Point aquifer does not outcrop in Maryland. It is absent in the area northwest of a subsurface truncation line, which runs approximately through Sudlersville, Centerville, and Grasonville. The depth to the top of the aquifer ranges from about 100 to 225 feet in Queen Anne's County. The thickness of the aquifer ranges from less than 25 feet to about 50 feet in the county. The aquifer is overlain by sediments of the Chesapeake Group, and underlain by the Nanjemoy Formation, which acts as a leaky confining unit between the Piney Point and Aquia aquifers. Water quality in the Piney Point aquifer is good throughout Queen Anne's County. Because the Piney Point is confined and does not outcrop, it is not vulnerable to contamination from surface sources. In many respects, ground water produced from the Piney Point aquifer is very similar in chemical quality to water produced from the Aquia aquifer. This is primarily because the lithologies of the Piney Point and the Aquia aquifers are very similar. In upgradient areas, Piney Point water is a calcium magnesium bicarbonate type water with relatively low pH. Downgradient, the water changes to a sodium bicarbonate type water with relatively high pH. Iron concentrations tend to be very similar to Aquia water, which tend to be high at the outcrop area, but down gradient are very low. (Drummond, 1983) (Drummond, 2001) As in the Aquia aquifer, arsenic has also been found to occur in the Piney Point aquifer above maximum contaminant levels (Bolton, 2003).

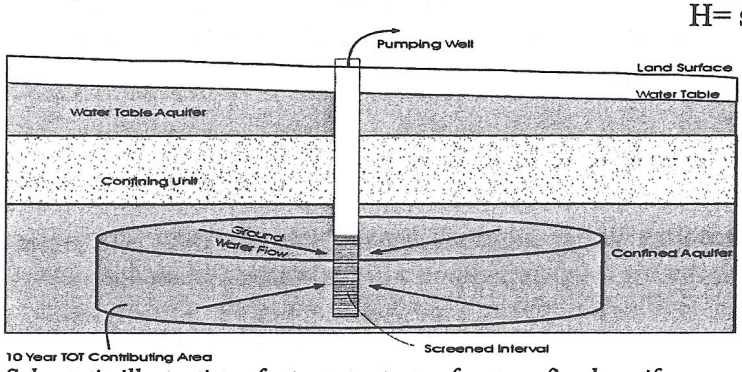
SOURCE WATER ASSESSMENT AREA DELINEATION

The Wellhead Protection Area (WHPA) for non transient non community water systems using more than 10,000 gpd whose wells are completed in confined Coastal Plain aquifers is a circle whose radius is calculated using the Florida method (MDE, 1999). This radius is based on a volumetric equation equating the volume of water pumped over a given time period with the volume of aquifer needed to store an identical quantity of water.

The equation can be written numerically as:

$$r = \sqrt{\frac{Q\,t}{\pi\,n\,H}}$$

Where r = fixed radius(ft)
t = time of travel (yrs)
Q= pumping rate (ft^3/yr)
n= aquifer porosity (dimensionless)
H= screen length (ft)



Schematic illustration of a transport zone for a confined aquifer.

Fourteen of the sixteen systems (19 wells) in this report use less than 10,000 gpd of water to operate. Tidewater Publishing Company and Kent Town Market have wells that use more than 10,000 gpd annual average (MDE, 1999). Table 2 provides a list of the WHPA radius around each supply well. The WHPA for systems using less than an annual average of 10,000 gpd is a circle with a 600 foot radius.

Confined aquifers are naturally protected from land use activities at the ground surface due to confining clay layers that inhibit the infiltration of contaminants from entering the aquifer. Note that the areas to be protected in this geologic setting are below the confining layers at depths below land surface. Figures 2-12 show the WHPAs for the sixteen systems assessed in this report.

POTENTIAL SOURCES OF CONTAMINATION

MDE Water Supply Program staff conducted a field survey on October 19, 2005 to check for potential sources of contamination within and near the area surrounding the wells at the sixteen systems. Potential point sources of contamination were identified and mapped within and near the WHPAs of six of the water systems in this report. The point sources listed are identified from MDE contaminant databases and field inspections conducted by MDE staff. Potential sources of contamination are classified as either point or non-point sources. Examples of point sources of contamination are leaking underground storage tanks, landfills, discharge permits, and known ground water contamination sites. These sites are generally associated with commercial or industrial facilities that use chemical substances that may, if inappropriately handled, contaminate ground water via a discrete point location. Additionally, the MDE database was queried for contaminant sources within and near the sites. The contaminant databases include the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which includes National Priority List (Superfund) sites, Registered Underground Storage Tank (UST) sites, Leaking Underground Storage Tank (LUST) sites, landfills, pesticide dealers, ground water discharge permits, and Controlled Hazard Substances (CHS) generator sites. Table 3 lists the potential contaminant sources within the WHPAs for several systems.

The MDE database of USTs indicates that the Queen Anne's County Department of Public Works and Church Hill Elementary School have USTs (underground storage tanks) located in their WHPAs. Sudlersville Middle School and Kent Town Market have USTs located only about 50 feet outside their WHPA. The MDE databases also indicate industrial ground water discharge at Tidewater Publishing Company. The MDE database indicates that Metapeake Terminal is also a CHS generator..

REVIEW OF WATER QUALITY DATA

Water Quality data was reviewed from the Water Supply Program's database for Safe Drinking Water Act (SDWA) contaminants. All data reported is from the finished (treated) water unless otherwise noted. Some of the systems have no treatment at all. Others treat water from only one of the wells in a multi-well system. Treatment employed by the systems are to provide disinfection, to remove iron and to remove hardness (softening). Table 4 lists the treatment methods for the sixteen systems.

In accordance with Maryland's SWAP, data from the treatment plant was compared with the Maximum Contaminant Levels (MCLs). If the monitoring data is greater than 50% of a MCL, the written assessment will describe the sources of such a contaminant and, if possible, locate the specific sources that are the cause of the elevated contaminant level. Table 5 provides a list of all detections above 50% of the MCL for the various contaminant groups.

Inorganic Compounds (IOCs)

IOC data at or above 50% of the MCL from the sixteen systems are compiled in Table 6. The level of arsenic in the water pumped from the wells at seven water systems is above the new maximum contaminant level. The new MCL for arsenic in public drinking water is 0.010 mg/l and became effective on January 23, 2006. This level is much lower than the previous level of 0.050 mg/L. Because of this change, systems have installed or will install treatment to meet the new standards. Arsenic levels have been measured between 0.005 mg/l and 0.010 mg/l in four other systems.

At **Delmarva Sash and Door** water system, two point of use filters (POU) have been installed below the sink. The filters will remove the arsenic from the water. Bottled water will continue to be provided in both buildings.

Tidewater Publishing Company is another system that has consistently had water sample test results exceed the MCL for arsenic. This system is also planning to install point of use filters (POU) at water faucets in the building where potable water may be obtained. Tidewater will also continue to provide bottled water for its employees. At this time Tidewater does not use the well for potable supply because the water does not meet the new arsenic standard. All drinking water fountains in the plant have been removed and replaced with bottled water coolers. Most of the water is used for printing processes. As of the end of February 2006 the company has not completed installation of filters under the sink to remove any arsenic from the water.

Kent Town Market is another system in Queen Anne's County that has reported high arsenic levels in the water from its well. This system will be connected to the Bridgepointe community water system by March 16, 2006. The Queen Anne's County Sanitary District extended a community water supply pipeline out to the market.

Chesapeake College is another system that has elevated levels of arsenic in the water as reported from several water samples tested from 1998 to present. The levels of arsenic in the water from the wells have exceeded the MCL of 0.010mg/L. This system has obtained an exemption from MDE that will allow them to take additional time to meet the lower MCL. The system has hired an engineering company (McCrone) to design a treatment system for the water.

Water from the wells serving the **Sudlersville Elementary and Middle Schools** are both over the arsenic limit. The schools have hired a consulting engineering firm (McCrone) to design and install a water treatment plant that will remove the arsenic from the well water. This will not be completed before the January 23 deadline. The schools have had to inform all students, the students' families and staff that the water it is providing does not meet the new standard for arsenic level. A Notice of Violation letter has been sent to the schools.

Queen Anne's County Department of Public Works (DPW) has installed a new well in the deeper Magothy aquifer. The water from this well does not have arsenic levels above the MCL.

A sample collected from **Grasonville Head Start** in February 2001 was measured at 0.010 mg/l. Additional samples are recommended for arsenic analysis to determine the average levels for this facility. Table 6 shows that nitrate levels occasionally exceeded maximum contaminant levels in samples from **Delmarva Sash and Door** prior to 1998. After a new well was installed in the Aquia aquifer in 1998, nitrate was no longer detected. Likewise, nitrates have not been detected in the Sudlersville Middle School after installation of a new well in the Aquia aquifer in 1999.

Volatile Organic Compounds (VOCs)
No VOCs have been detected above the 50% MCL threshold for any of the sixteen systems that were tested from this report.

Synthetic Organic Compounds (SOCs)
The only SOC detected above the 50% threshold was Di (2-Ethylhexyl) Phthalate. This contaminant was found in laboratory blank samples accompanying this detection, and therefore is not believed to reflect the actual water quality of the system it was associated with.

PWSID	System Name	Plant ID	Contaminant ID	Contaminant Name	MCL (ppb)	Sample Date	Result (ppb)
0170201	Gunston Day School	2	2039	DI(2-Ethylhexyl) Phthalate	0.6	16-Jan-02	3.1

Microbiological Contaminants

If there are no well construction problems with a well drawing from a confined aquifer the supply should be safe from microbiological contamination. When a system using a confined aquifer tests positive for coliform bacteria, it can be due to a number of reasons, such as insects entering the wellhead, a fouled ion-exchange unit, broken distribution line, broken well casing. Coliform organisms can often grow in the system during periods of disuse at seasonal facilities (such as schools). Storage or a distribution problem or repair can also introduce the coliform into the system. Therefore, correctly disinfecting the water system is very important after pulling a well pump or completing improvements to the distribution system. Wells may also be physically damaged from a vehicle hitting the well. The damage can allow surficial water and microbial contaminants to enter a well.

Four of the systems have more than 10% of their samples positive for total coliform. **Delmarva Sash and Door** had a cracked well cap and poorly fitted electrical conduit. These deficiencies were observed during a system inspection in April 2002. Based on the recommendation of the inspector, the problems were corrected and there has been no further detection of bacteriological contaminants. The old well at **Metapeake Terminal** was abandoned in April 2004. No further detection of bacteriological contaminants have been made since then. The new well at the **Queen Anne's County DPW** facility tested positive for coliform bacteria in 2002. This sample was collected soon after the installation of the well. After the system was chlorinated and flushed, there have been no further detections of coliform bacteria. Well #2 at **Chesapeake College** was buried in a pit until 2001, when the well pipe was extended above ground and a pitless adapter installed. The last positive sample was reported in July 2001 at **Chesapeake College.**

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 WHPA
3. aquifer characteristics
4. well integrity
5. the likelihood of change to the natural conditions

Wells serving the Queen Anne's County non transient non community water systems all draw water from wells in unconsolidated sedimentary aquifers. All of the wells evaluated in this report are in confined aquifers. The wells drawing from confined aquifers are protected if the well is constructed correctly and are not susceptible to contamination from surface activity. Queen Anne's County's unconsolidated sediments and soil provide protection from microbiological contamination as water percolates through the overlying soil and aquifer sediments.

Inorganic Compounds (IOCs)

From the water quality data (Table 6), nitrate was detected at more than 50% of the MCL for two systems (Delmarva Sash and Door and Sudlersville Middle School). These systems have

since replaced the affected shallow wells and their current sources do not have measureable levels of nitrate. No further investigation into the source is necessary for these two systems.

Arsenic was detected in eleven systems at more than 50% of the MCL and at levels that exceeded the MCL in seven systems for this contaminant. These systems have already or are in the process of taking steps to remove arsenic from the water serving these systems. Arsenic is a naturally occurring mineral in the Aquia and Piney Point aquifers (Bolton 2003).

Based on the water quality data reviewed and other well information, none of the sixteen systems listed in this report are susceptible to nitrate contamination and eleven of the systems are susceptible to arsenic but not to any other regulated inorganic compounds (IOCs).

Synthetic Inorganic Compounds (SOCs)
The only detection of a SOC was di (2-Ethylhexyl) phthalate at Gunston Day School. This contaminant was also measured in the laboratory blank run concurrently with the sample and is therefore not an indication of SOC contamination in the water supply.

Based on the water quality data reviewed and the natural protection provided by the confining units, none of the sixteen systems listed in this report are susceptible to synthetic organic compounds (SOCs) in spite of the widescale use of herbicides and pesticides in this region.

Volatile Inorganic Compounds (VOCs)
No VOC was detected in any of the water samples taken at any of the systems over the period of record.

Based on the water quality data reviewed and the natural protection provided by the confining units, none of the sixteen systems listed in this report are susceptible to volatile organic compounds (VOCs) in spite of the presence of underground storage tanks and the common usage of volatile organic compounds.

Microbiological Contaminants
Four of the systems covered in this report had more than 10% of positive total coliform. One of the four systems had a single detect of fecal coliform. However, all of the situations that caused the systems to register contaminant levels above the MCL were eventually corrected and the systems are no longer susceptible to total coliform bacteria. They are: Delmarva Sash and Door, Queen Anne County Department of Public Works, Chesapeake College, and Metapeake Terminal.

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

- The information contained in this report provides a basis for understanding the risks to contamination of the water supplies for the sixteen NTNC water systems in Queen Anne's County. Since all the systems use confined aquifers, maintaining wells and ensuring that they meet current well construction standards is most critical for future water quality protection. Specific management recommendations for consideration are listed below:

Public Awareness and Outreach

- Conduct education outreach to facilities and businesses within the WHPAs focusing on potential contaminant sources. Important topics include: (a) compliance with MDE and federal guidelines for gasoline and heating oil USTs, (b) proper hazardous material disposal and storage, and (c) well abandonment regulations and procedures.

Monitoring

- Continue to monitor for all required Safe Drinking Water Act contaminants as required by MDE.
- Annual raw water bacteriological testing is a good check on well integrity.
- Sample individual wells for systems that have arsenic at >50% of the MCL.

Contaminant Source Inventory Updates/Inspections/Maintenance

- Conduct a survey of the WHPA and inventory any potential sources of contamination, including unused wells that may not have been included in this report. Keep records of new development within the WHPA and new potential sources of contamination that may be associated with the new use.
- Work with the County Health Department to ensure that there are no unused wells within the WHPA. An improperly abandoned well can be a potential source of contamination to the aquifer.
- Water operation personnel should have a program for periodic inspections and maintenance of the supply wells and backup wells to ensure their integrity and protect the aquifer from contamination.
- Wells drilled prior to 1973 that do not meet current construction standards should be upgraded to protect them from contamination associated with poor or outdated construction.
- Two-piece insect-proof well caps should be installed on wells that have one-piece caps.

Changes in Use

Water system owners are required to notify the MDE Water Supply Program if new wells are to be added or if they wish to increase their water usage. An increase in use or the addition of new wells may require revisions to the WHPA.

REFERENCES

Maryland Department of the Environment. Water Supply Program, 1999, Maryland Source Water Assessment Plan

Maryland Department of Natural Resources (DNR), 1987, The Quantity and Natural Quality of Ground Water in Maryland: DNR Water Resources Administration.

Drummond David, 2001, Hydrogeology of the Coastal Plain Aquifer System in Queen Anne's and Talbot Counties, Maryland, with Emphasis in Water-Supply Potential and Brackish-Water Intrusion in the Aquia Aquifer: (MGS) Report of Investigations No. 72

Drummond David, 1988, Hydrogeology, Brackish-Water Occurrence, and Simulation of Flow and Brackish-Water Movement in the Aquia Aquifer in the Kent Island Area, Maryland: (MGS) Report of Investigations No. 51

Drummond David, 1983, Hydrogeology, Digital Simulation, and Geochemistry of the Aquia and Piney Point-Nanjemoy Aquifer System in Southern Maryland: (MGS) Report of Investigations No. 38

Nickerson John, 1995, Queen Anne's County Groundwater Protection Report: Queen Anne's County Health Department

Bolton, 2003, Maryland Geological Survey Interim Report: Sum of Ground Water Arsenic Concentration in The Major Aquifers of The Maryland Coastal Plain:

Andreasen, David C., and Smith, Barry S., 1997, Hydrogeology and Simulation of Ground-Water Flow in the Upper Wicomico River Basin and Estimation of Contributing Areas of the City of Salisbury Well Fields, Wicomico County, Maryland: Maryland Geological Survey Report of Investigations No. 65, 87 p.

Banks, William S.L., Klohe, Cheryl A., and Battigelli, David A., Occurrence and Distribution of Enteric Viruses in Shallow Ground Water and Factors Affecting Well Vulnerability to Microbiological Contamination in Worcester and Wicomico Counties, Maryland: U.S. Geological Survey Water-Resources Investigations Report 01-4147, 23 p.

Other Sources of Data

Water Appropriation and Use Permits
Queen Anne's County Sanitary Survey Inspection Reports
MDE Water Supply Program (PDWIS) Database
MDE Waste Management Sites Database
Department of Natural Resources Digital Orthophoto Quarter Quadrangles
USGS Topographic 7.5 Minute Quadrangles

FIGURES

N

QUEEN ANNE'S COUNTY, MARYLAND

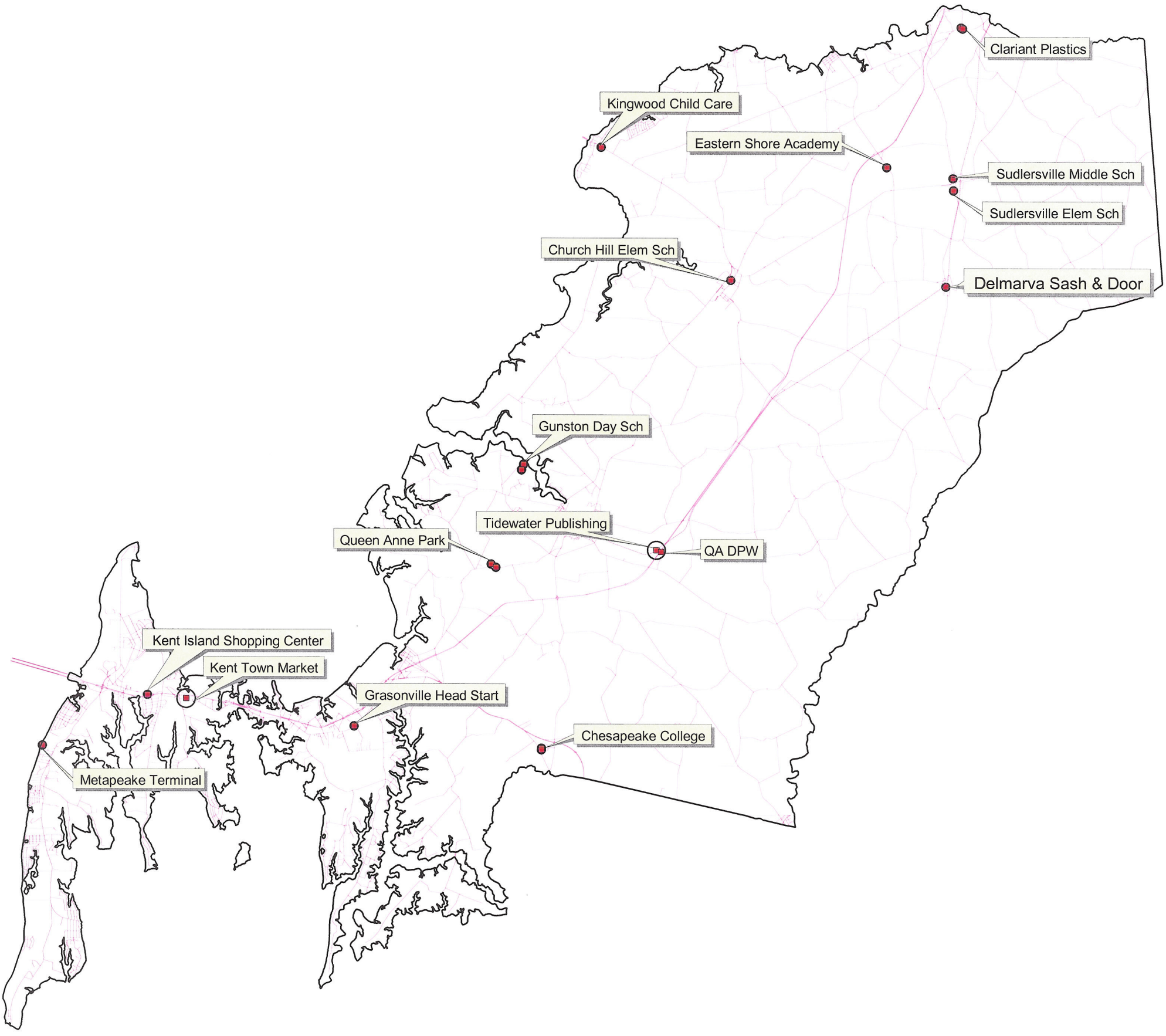


Figure 1. Map of Queen Anne's County with Locations of Sixteen Systems and Wellhead Protection Areas

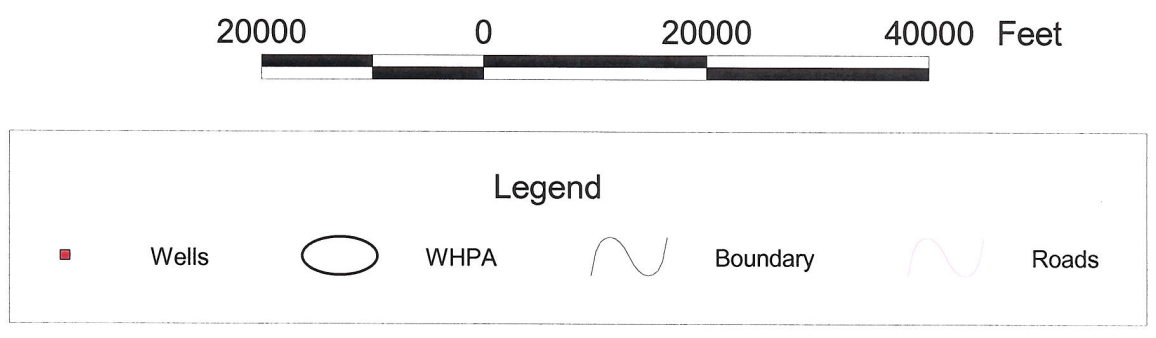


Figure 2. Location Map of Clariant Performance Plastics With WHPA

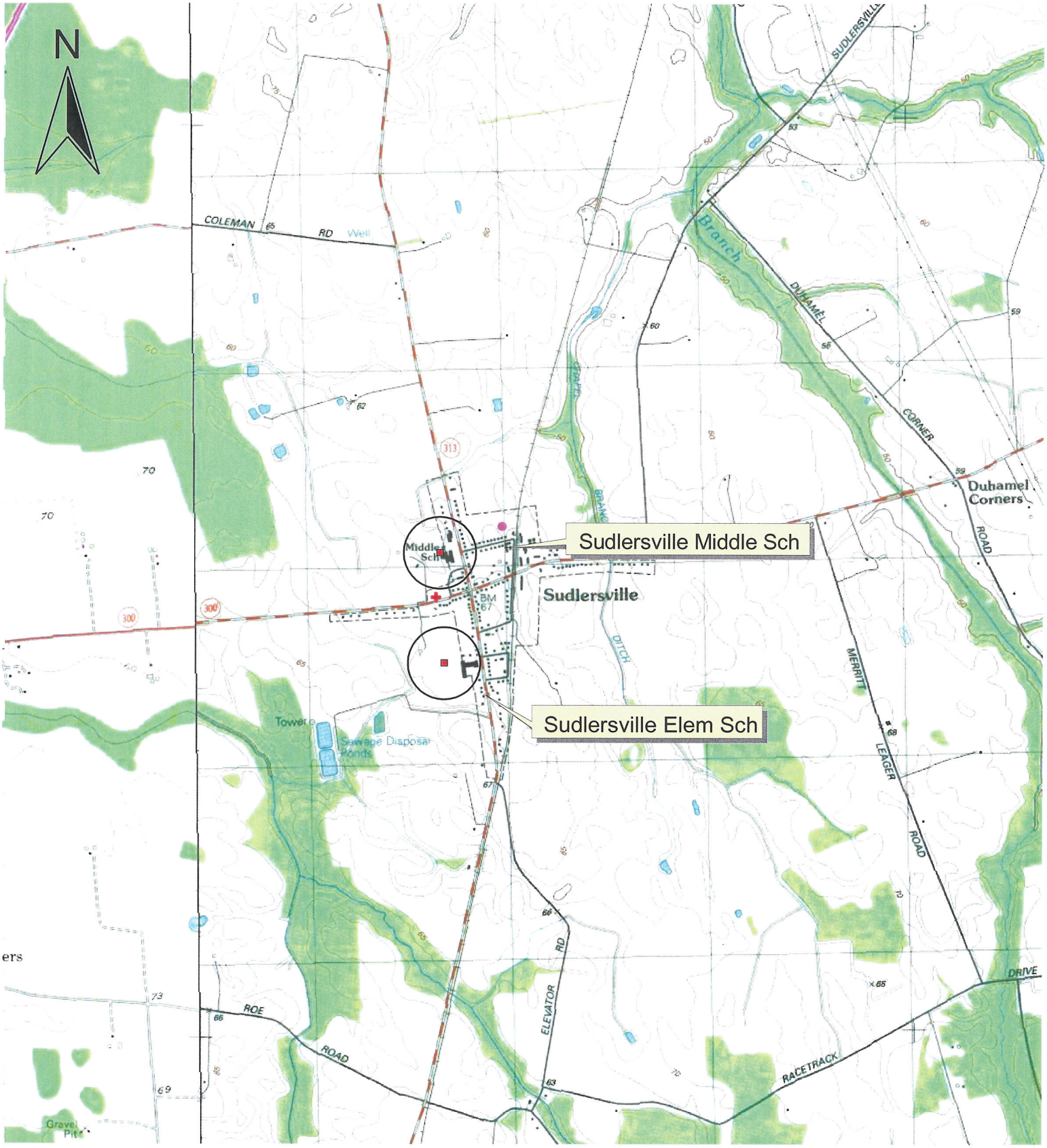


Figure 3. Location Map of Sudlersville Elementary & Middle Schools With WHPA

2000 0 2000 4000 Feet

Legend

Wells WHPA UST

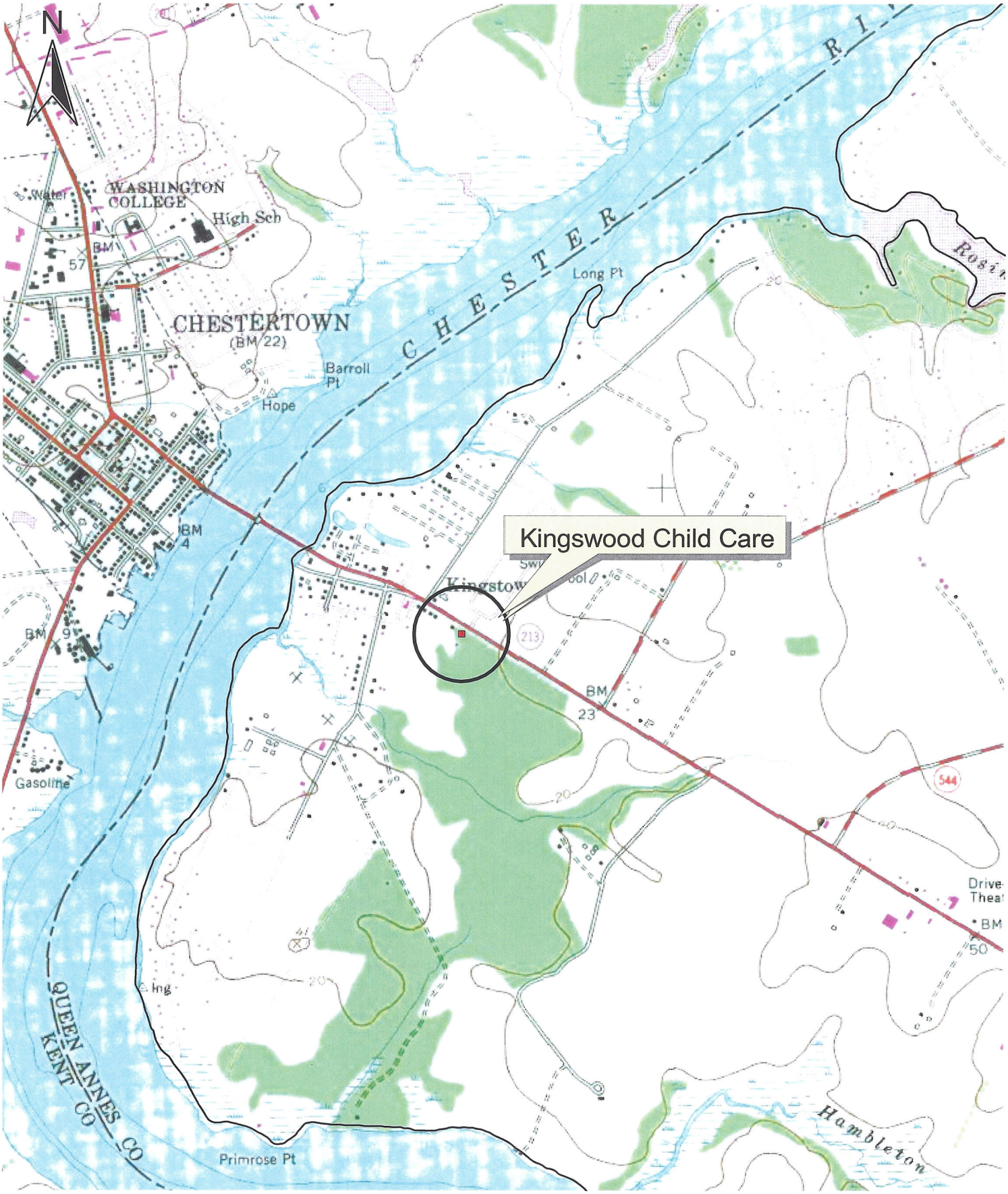


Figure 4: Location Map of Kingswood Child Care Center With WHPA.

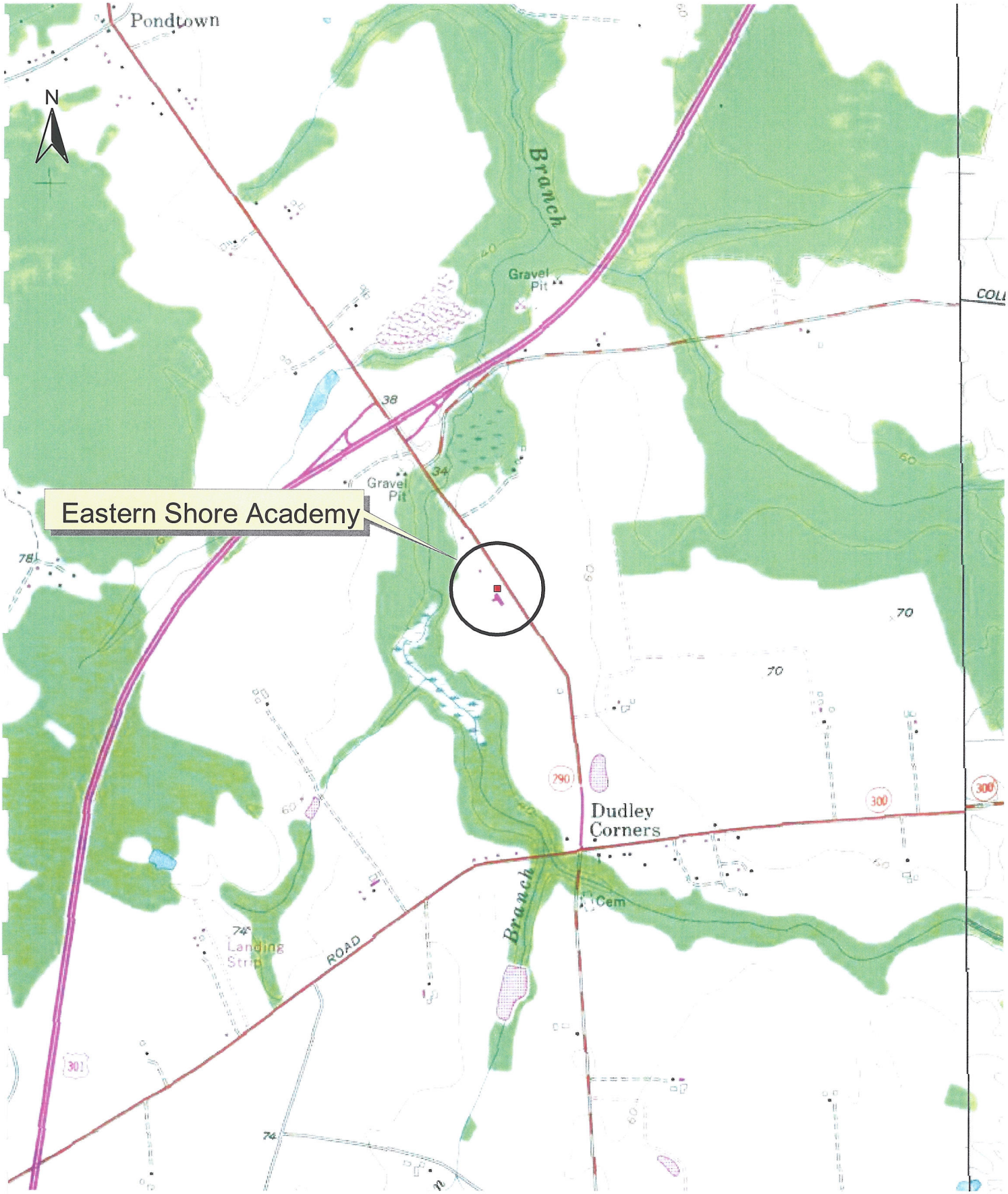


Figure 5: Location Map of Eastern Shore Academy with WHPA

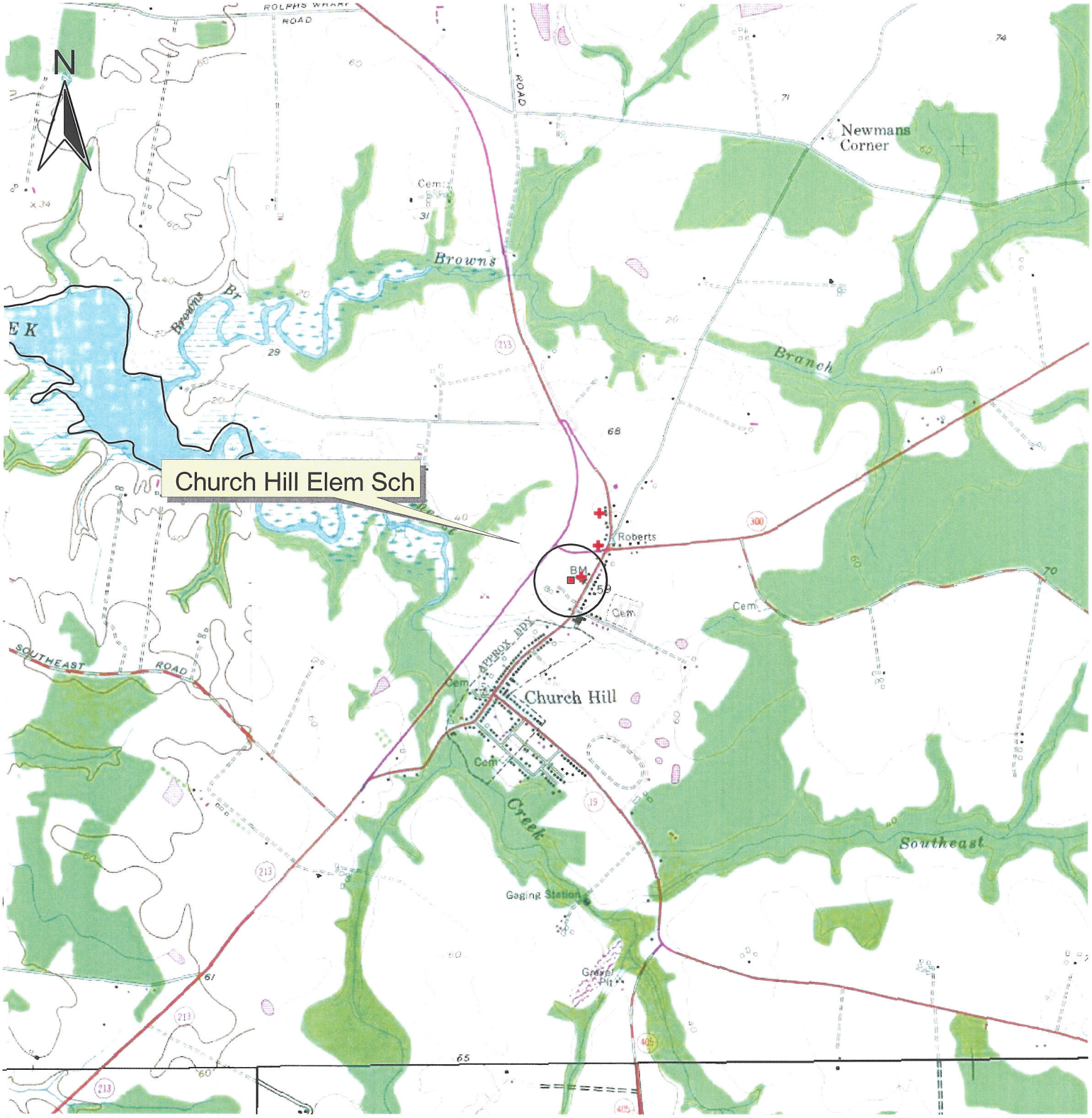


Figure 6. Location Map of Church Hill Elementary School With WHPA

2000 0 2000 4000 Feet

Legend

Wells WHPA UST

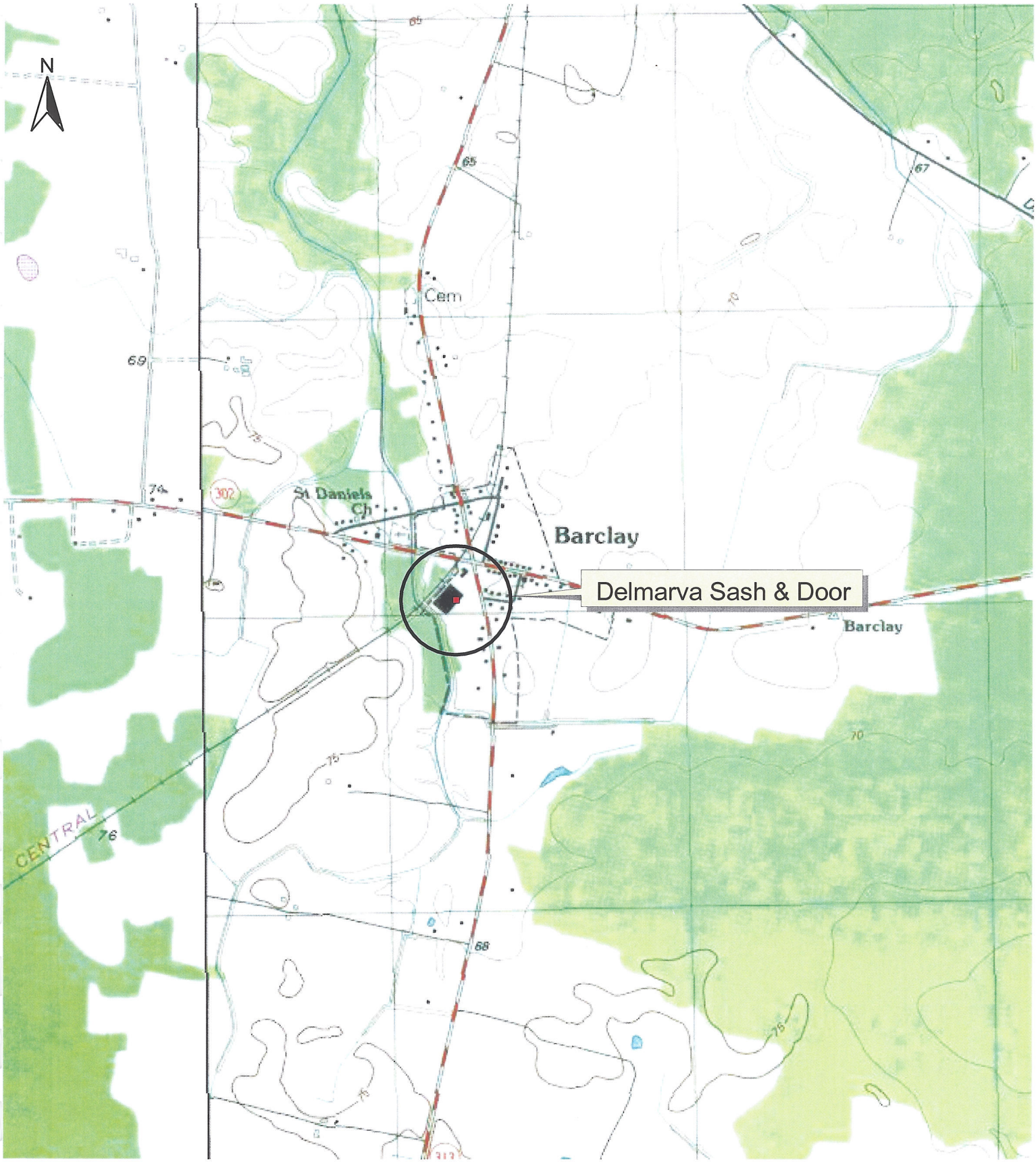


Figure 7: Location Map of Delmarva Sash & Door with WHPA

Legend

Wells

WHPA

1000 0 1000 2000 Feet

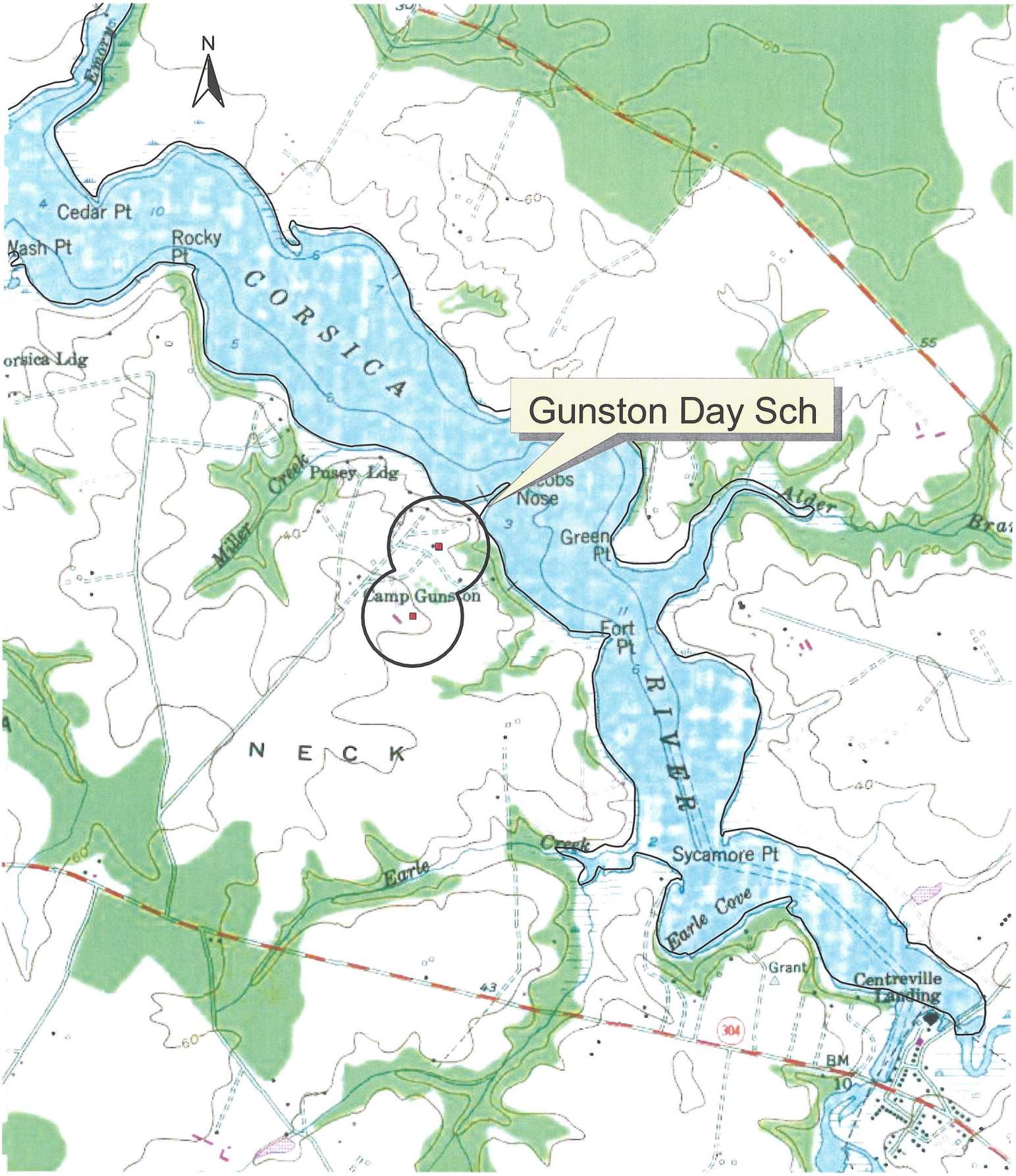


Figure 8: Location Map of Gunston Day School with WHPA

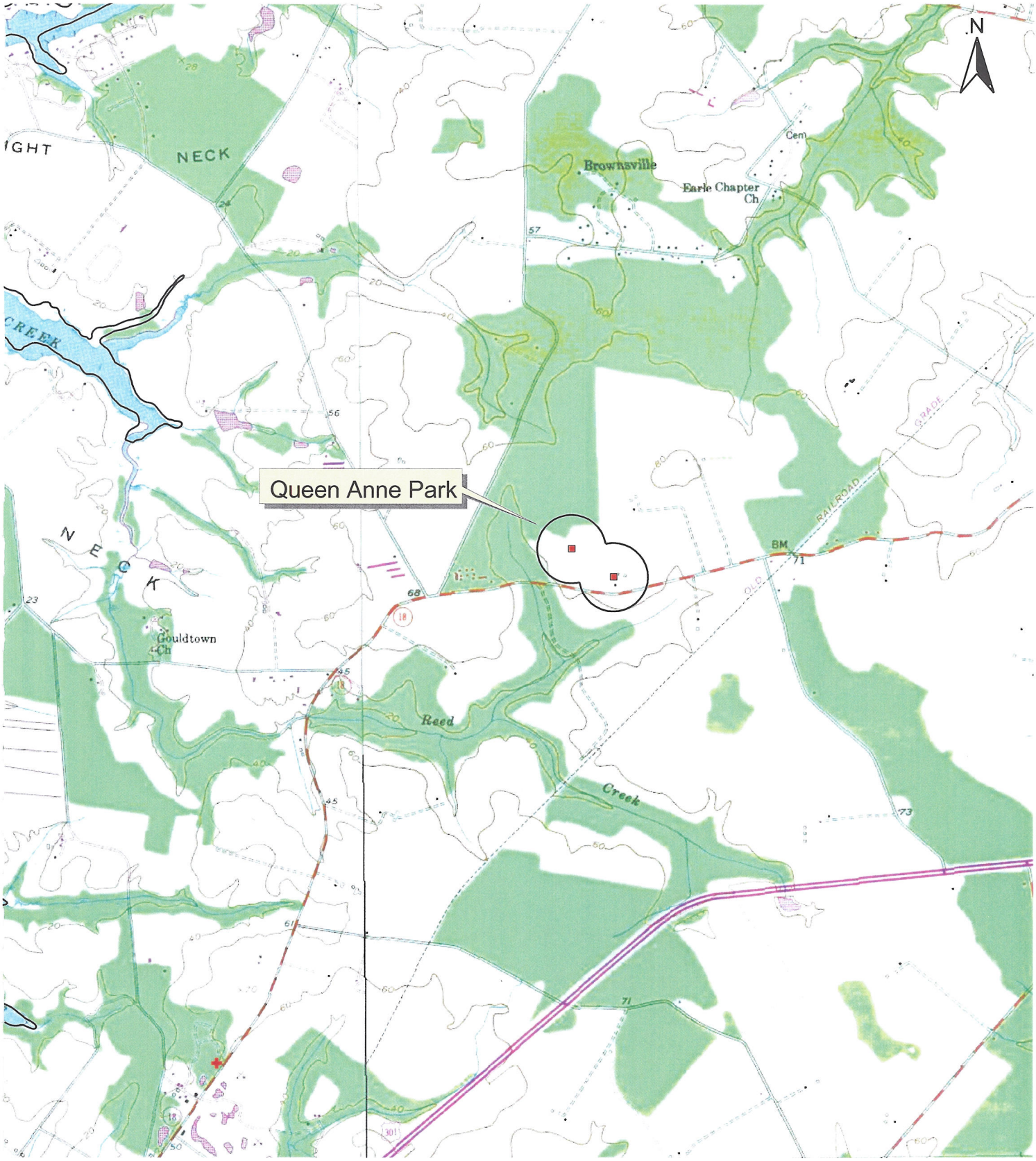


Figure 9. Location Map of Queen Anne's Park With WHPA

2000 0 2000 4000 Feet

Legend

Wells WHPA

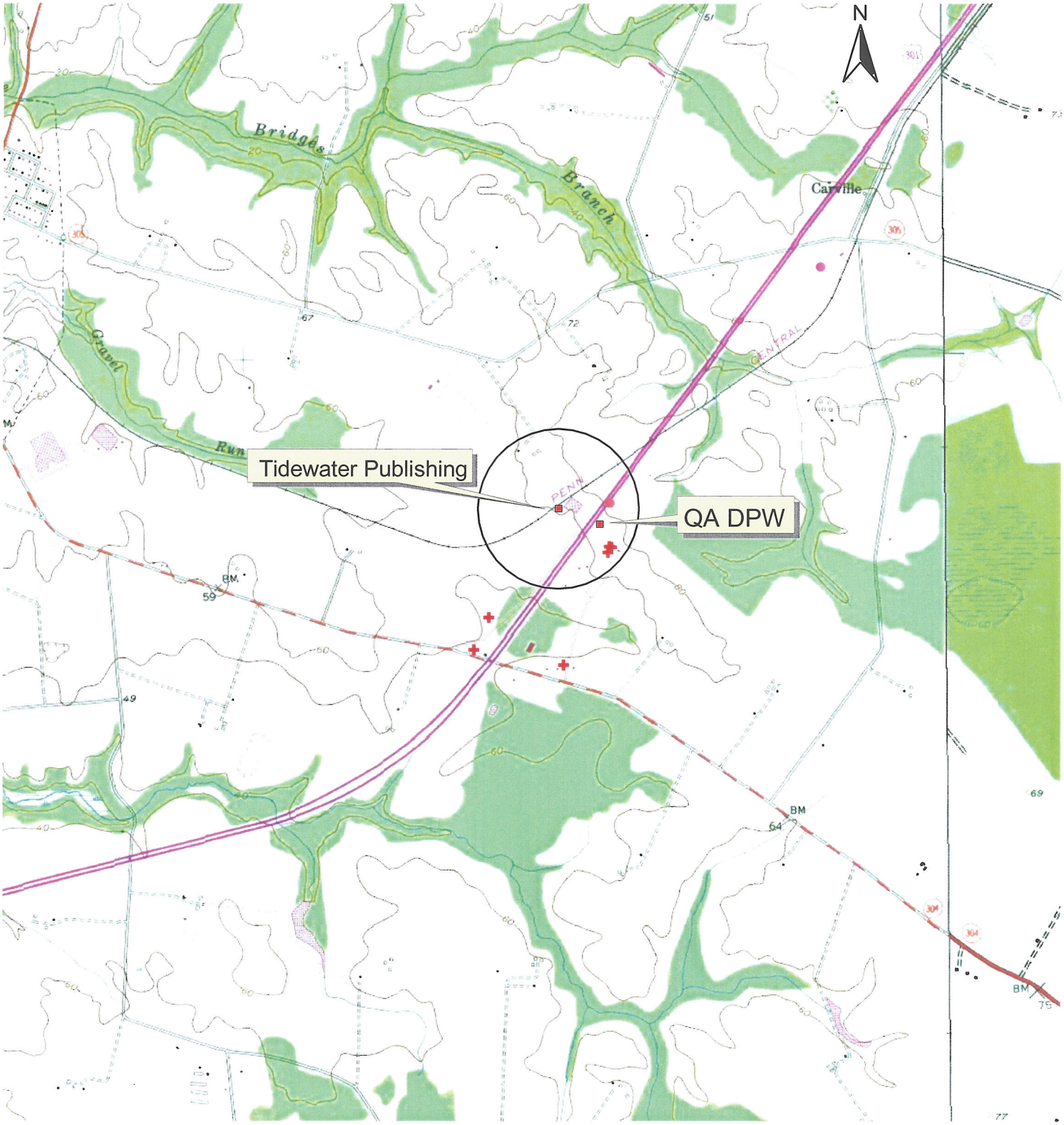


Figure 10. Location Map of Tidewater Publishing Co. and Queen Anne's Dept. of Public Works With WHPA

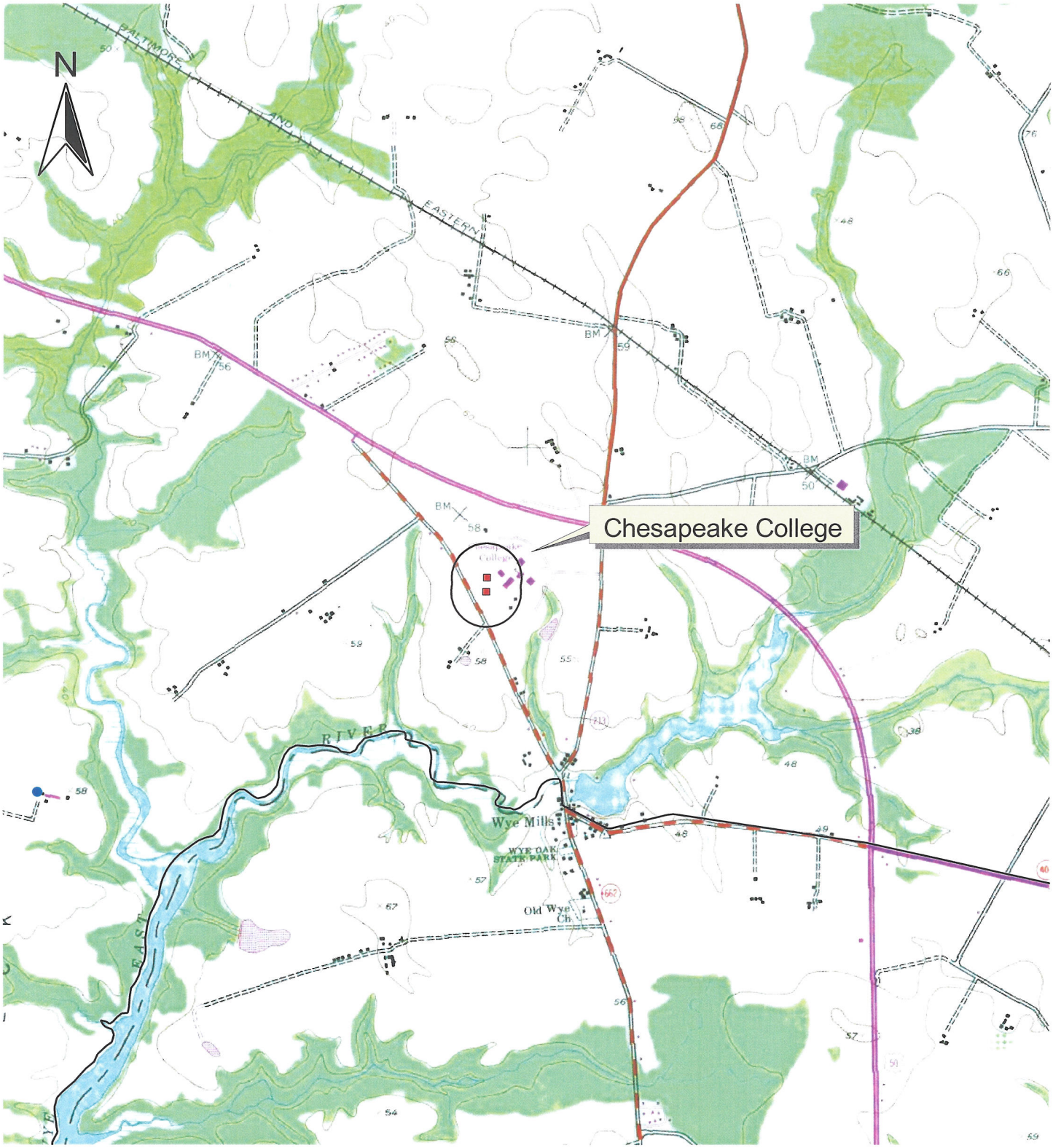


Figure 11. Location Map of Chesapeake College With WHPA

3000 0 3000 6000 Feet

Legend

Wells WHPA

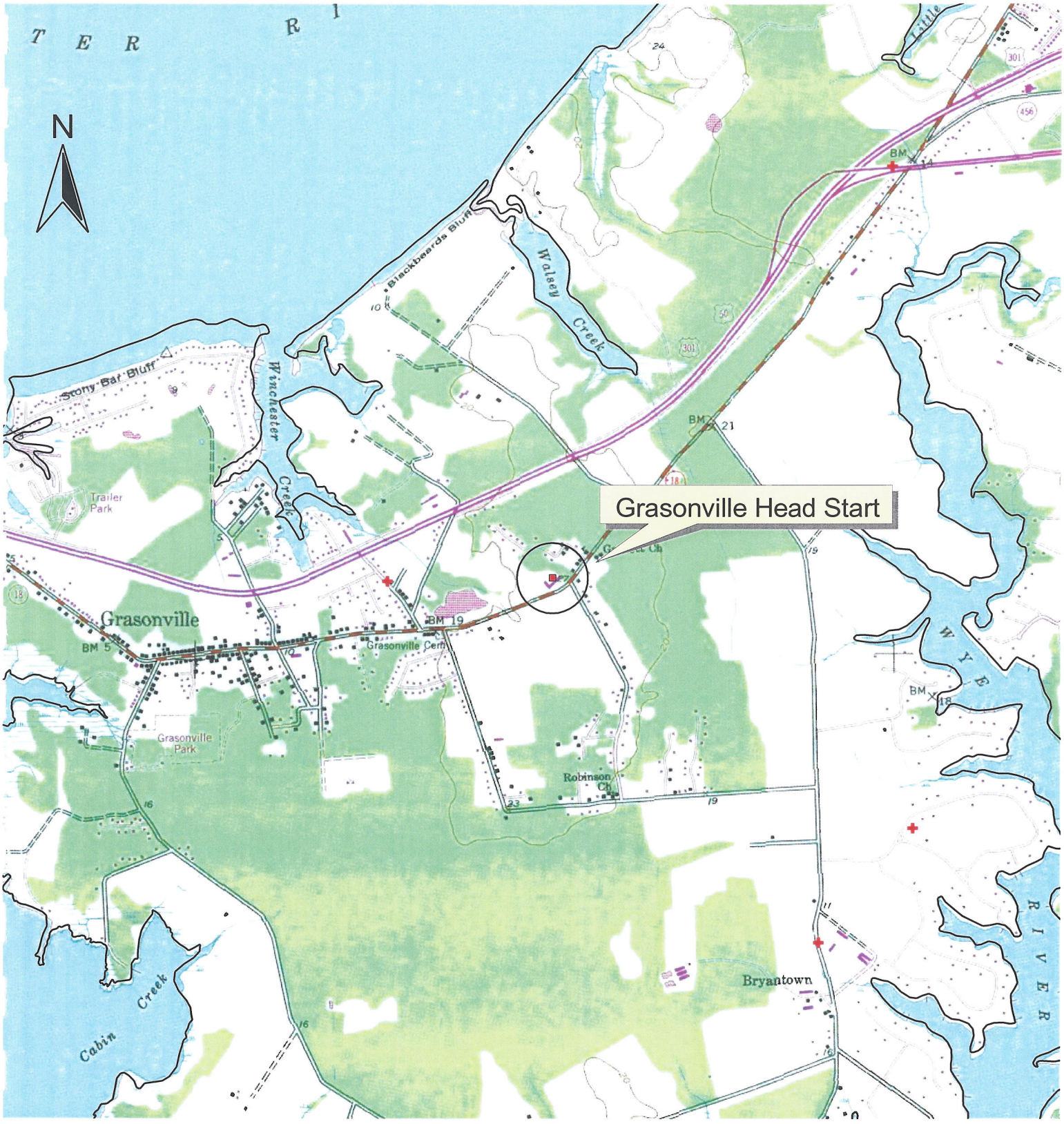


Figure 12. Location Map of Grasonville Head Start with WHPA

2000 0 2000 4000 Feet

Legend

Wells WHPA

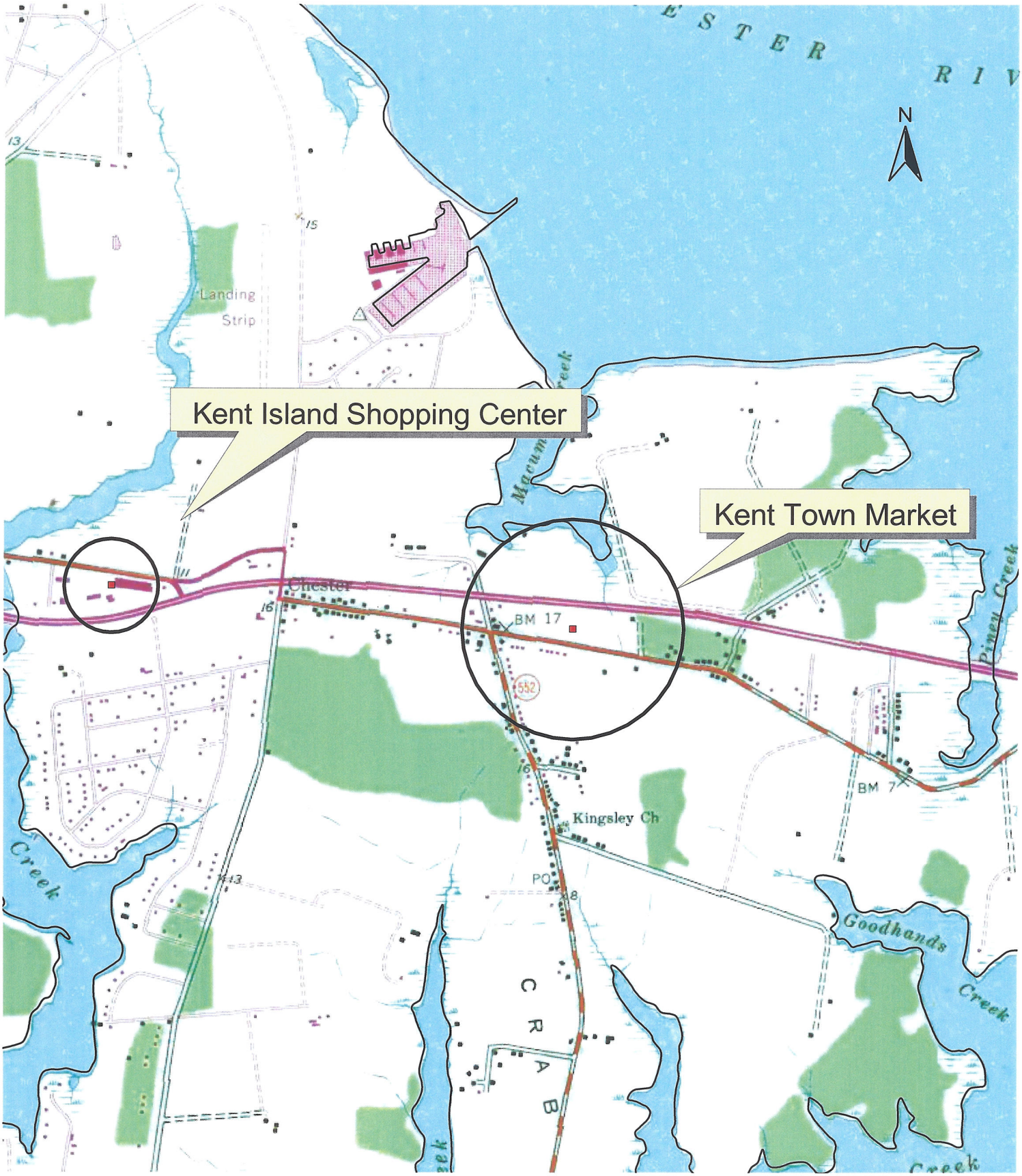


Figure 13: Location Map of Kent Island Shopping Center & Kent Town Market With WHPA

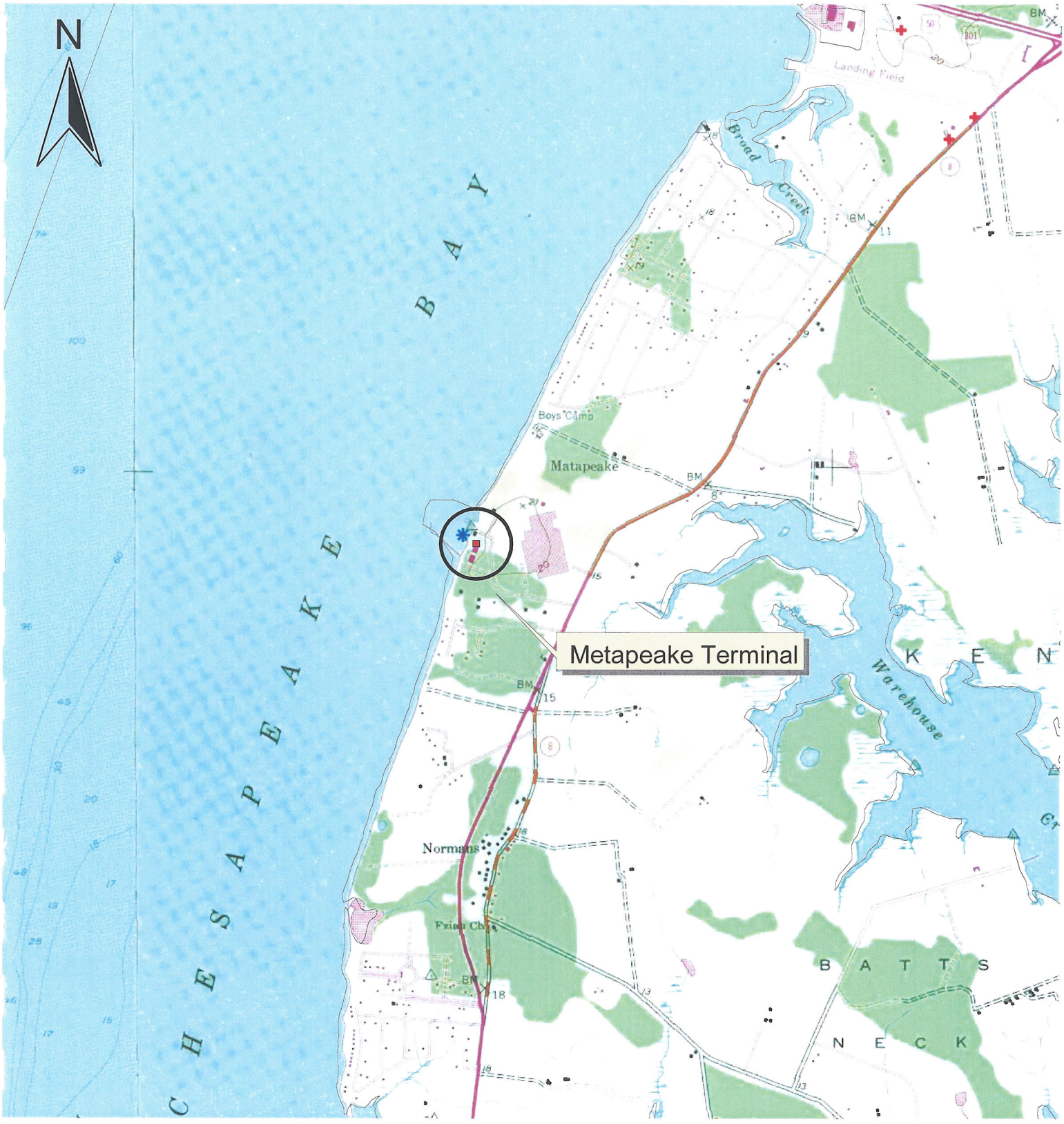


Figure 14. Location Map of Metapeake Terminal With WHPA

2000 0 2000 4000 Feet

Legend

Wells WHPA CHS-Generators

TABLES

PWSID	System Name	Plant ID	Source ID	Source Name	WAPID	Ave gpd	Well Permit	Total Depth	Completion Date	AQUIFER
0170201	GUNSTON DAY SCHOOL	02	02	SECONDARY PRODUCTION WELL	QA1981G005	2200	QA733541	350	5/26/1981	AQUIA FORMATION
0170201	GUNSTON DAY SCHOOL	01	03	WELL BY STABLE	QA1981G005	2200	QA810283	380	9/6/1983	AQUIA FORMATION
0170201	GUNSTON DAY SCHOOL	02	01	MAIN PROD WELL (OUTSIDE PIT)	QA1981G005	2200	No Tag			AQUIA FORMATION
1170002	CHURCH HILL ELEMENTARY SCHOOL	02	02	CHURCH HILL ELEM WELL 2	QA1994G001	1300	QA940808	280	8/8/1997	AQUIA FORMATION
1170005	DELMARVA SASH & DOOR	01	02	NEW WELL	QA1979G004	1500	QA941322	290	9/9/1998	PINEY POINT FORMATION
1170007	EASTERN SHORE JR. ACADEMY	01	01	EASTERN SHORE ACADEMY WELL 1	QA1973G001	500	QA730057	160	9/11/1972	AQUIA FORMATION
1170012	KINGSWOOD CHILD CARE CENTER	01	01	KINGSWOOD CHILD CARE CTR.	QA1989G009	6700	QA881137	160	8/15/1991	AQUIA FORMATION
1170014	QUEEN ANNES COUNTY DPW	01	02	QUEEN ANNE'S CO. DPW WELL 2	QA1973G002	1000	QA942824	610	2/18/2002	MAGOTHY FORMATION
1170016	QUEEN ANNES REC. & PARKS	02	02	ATHLETIC FIELD/RESTROOMS	QA1977G023	2800	QA810497	250	3/21/1984	AQUIA FORMATION
1170016	QUEEN ANNES REC. & PARKS	01	01	QAC REC. & PARKS OFFICE AREA	QA1977G023	2800	QA731996	250	9/9/1977	AQUIA FORMATION
1170020	SUDLERSVILLE ELEMENTARY SCHOOL	01	01	SUDLERSVILLE ELEM. SCHOOL	QA1998G045	2600	QA941420	310	1/4/1999	AQUIA FORMATION
1170021	SUDLERSVILLE MIDDLE SCHOOL	01	01	SUDLERSVILLE MIDDLE SCHOOL	QA1999G083	2100	QA941996	225	10/19/1999	AQUIA FORMATION
1170022	TIDEWATER PUBLISHING CORP.	01	02	TIDEWATER PUBLISHING (NEW WELL	QA1961G005	90000	QA940130	390	10/3/1995	AQUIA FORMATION
1170025	KENT ISLAND SHOPPING CENTER	01	02	KENT ISLAND SHOPPING CENTER	QA1965G006	600	QA881825	240	4/15/1993	AQUIA FORMATION
1170027	CLARIANT PERFORMANCE PLASTICS	02	02	BAY RESIN NEW WELL.	QA1986G023	700	QA880390	158	6/13/1989	AQUIA FORMATION
1170027	CLARIANT PERFORMANCE PLASTICS	01	01	BAY RESIN OLD WELL	QA1986G023	700	No Tag			AQUIA FORMATION
1170030	CHESAPEAKE COLLEGE	01	01	CHESAPEAKE COLLEGE 1	QA2000G031	7000	QA680054	426	11/19/1967	AQUIA FORMATION
1170030	CHESAPEAKE COLLEGE	01	02	CHESAPEAKE COLLEGE 2	QA2000G031	7000	QA680055	431	12/6/1967	AQUIA FORMATION
1170031	MATAPEAKE TERMINAL	01	02	NEW WELL	QA2003G031	1000	QA950144	145	12/18/2003	AQUIA FORMATION
1171123	KENT TOWN MARKET	01	01	WELL	QA1984G004	23000	QA811227	300	8/23/1985	AQUIA FORMATION
1171203	GRASONVILLE HEAD START	01	01	WELL	QA1985G023	700	QA811289	280	10/19/1985	AQUIA FORMATION

Table 1: System and Well Information

PWSID	System Name	Plant ID	Source ID	Source Name	WAPID	Ave gpd	Well Permit	Total Depth	AQUIFER	Buffer Distance (WHPA)
0170201	GUNSTON DAY SCHOOL	02	02	SECONDARY PRODUCTION WELL	QA1981G005	2200	QA733541	350	AQUIA	600
0170201	GUNSTON DAY SCHOOL	01	03	WELL BY STABLE	QA1981G005	2200	QA810283	380	AQUIA	600
0170201	GUNSTON DAY SCHOOL	02	01	MAIN PROD WELL (OUTSIDE PIT)	QA1981G005	2200	No Tag	0	AQUIA	600
1170002	CHURCH HILL ELEMENTARY SCHOOL	02	02	CHURCH HILL ELEM WELL 2	QA1994G001	1300	QA940808	280	AQUIA	600
1170005	DELMARVA SASH & DOOR	01	02	NEW WELL	QA1979G004	1500	QA941322	290	PINEY POINT	600
1170007	EASTERN SHORE JR. ACADEMY	01	01	EASTERN SHORE ACADEMY WELL	QA1973G001	500	QA730057	160	AQUIA	600
1170012	KINGSWOOD CHILD CARE CENTER	01	01	KINGSWOOD CHILD CARE CTR.	QA1989G009	6700	QA881137	160	AQUIA	600
1170014	QUEEN ANNES COUNTY DPW	01	02	QUEEN ANNE'S CO. DPW WELL 2	QA1973G002	1000	QA942824	610	MAGOTHY	600
1170016	QUEEN ANNES REC. & PARKS	02	02	ATHLETIC FIELD/RESTROOMS	QA1977G023	2800	QA810497	250	AQUIA	600
1170016	QUEEN ANNES REC. & PARKS	01	01	QAC REC. & PARKS OFFICE AREA	QA1977G023	2800	QA731996	250	AQUIA	600
1170020	SUDLERSVILLE ELEMENTARY SCHOOL	01	01	SUDLERSVILLE ELEM. SCHOOL	QA1998G045	2600	QA941420	310	AQUIA	600
1170021	SUDLERSVILLE MIDDLE SCHOOL	01	01	SUDLERSVILLE MIDDLE SCHOOL	QA1999G083	2100	QA941996	225	AQUIA	600
1170022	TIDEWATER PUBLISHING CORP.	01	02	DEWATER PUBLISHING (NEW WEI	QA1961G005	90000	QA940130	390	AQUIA	1365
1170025	KENT ISLAND SHOPPING CENTER	01	02	KENT ISLAND SHOPPING CENTER	QA1965G006	600	QA881825	240	AQUIA	600
1170027	CLARIANT PERFORMANCE PLASTICS	02	02	BAY RESIN NEW WELL.	QA1986G023	700	QA880390	158	AQUIA	600
1170027	CLARIANT PERFORMANCE PLASTICS	01	01	BAY RESIN OLD WELL	QA1986G023	700	No Tag	0	AQUIA	600
1170030	CHESAPEAKE COLLEGE	01	01	CHESAPEAKE COLLEGE 1	QA2000G031	7000	QA680054	426	AQUIA	600
1170030	CHESAPEAKE COLLEGE	01	02	CHESAPEAKE COLLEGE 2	QA2000G031	7000	QA680055	431	AQUIA	600
1170031	MATAPEAKE TERMINAL	01	02	NEW WELL	QA2003G031	1000	QA950144	145	AQUIA	600
1171123	KENT TOWN MARKET	01	01	WELL	QA1984G004	23000	QA811227	300	AQUIA	1410
1171203	GRASONVILLE HEAD START	01	01	WELL	QA1985G023	700	QA811289	280	AQUIA	600

Table 2:Buffer Distances for Wells

System	Name of Contaminant	Figure
	USTs in WHPA	
QA Dept. of Public Works	Heating Oil, Gasoline & Diesel tanks	Fig 10
*Sudlersville Middle Sch	Gasoline& Diesel Tanks- Phillips Garage	Fig 3
Church Hill Elem Sch	C.L. Bennett Auto Repair-Heating oil tank	Fig 6
	Dischargers in WHPA	
Tidewater Publishing Company	Industrial groundwater discharge	Fig 10
	CERCLA Sites in WHPA	
None		
	CHS-Generators	
Matapeake Terminal		Fig 14
	Pesticide Dealers	
None		

* Contaminant Source is only 50 ft Outside WHPA

Table 3: QA County Systems-Point Sources of Contamination in WHPA

PWSID	Plant	System Name	Type of Treatment	Reason for Treatment
1170002	1	CHURCH HILL ELEMENTARY SCHOOL	HYPOCHLORINATION, POST	Disinfection
1170020	1	SUDLERSVILLE ELEMENTARY SCHOOL	HYPOCHLORINATION, POST	Disinfection
1171123	1	KENT TOWN MARKET	HYPOCHLORINATION, POST	Disinfection
1170030	1	CHESAPEAKE COLLEGE	HYPOCHLORINATION, PRE	Disinfection
1170012	1	KINGSWOOD CHILD CARE CENTER	ION EXCHANGE -IRON (NON-SDWIS CODE)	Iron Removal
1170016	1	QUEEN ANNES REC. & PARKS	ION EXCHANGE -IRON (NON-SDWIS CODE)	Iron Removal
1170012	1	KINGSWOOD CHILD CARE CENTER	ION EXCHANGE	Softening
170201	2	GUNSTON DAY SCHOOL	NO TREATMENT	None
1170005	1	DELMARVA SASH & DOOR	NO TREATMENT	None
1170007	1	EASTERN SHORE JR. ACADEMY	NO TREATMENT	None
1170014	1	QUEEN ANNES COUNTY DPW	NO TREATMENT	None
1170022	1	TIDEWATER PUBLISHING CORP.	NO TREATMENT	None
1170025	1	KENT ISLAND SHOPPING CENTER	NO TREATMENT	None
1170027	1	CLARIANT PERFORMANCE PLASTICS	NO TREATMENT	None
1170027	2	CLARIANT PERFORMANCE PLASTICS	NO TREATMENT	None
1170031	1	MATAPEAKE TERMINAL	NO TREATMENT	None
1171203	1	GRASONVILLE HEAD START	NO TREATMENT	None
170201	1	GUNSTON DAY SCHOOL	FILTRATION, CARTRIDGE	Sediment Removal
1170002	1	CHURCH HILL ELEMENTARY SCHOOL	ION EXCHANGE	Softening
1170016	1	QUEEN ANNES REC. & PARKS	ION EXCHANGE	Softening
1170020	1	SUDLERSVILLE ELEMENTARY SCHOOL	ION EXCHANGE	Softening
1170021	1	SUDLERSVILLE MIDDLE SCHOOL	ION EXCHANGE	Softening
1171123	1	KENT TOWN MARKET	ION EXCHANGE	Softening

Table 4: Treatment Methods for Wells Supplying the 16 Systems.

PWSID	System Name	Plant #	SOCs		VOCs		IOCs	
			No. of samples	No. of samples > 50% MCL	No. of samples	No. of samples > 50% MCL	No. of samples	No. of samples > 50% MCL
170201	GUNSTON DAY SCHOOL	01	1	0	4	0	63	1
170201	GUNSTON DAY SCHOOL	2	1	1	6	0	17	0
1170002	CHURCH HILL ELEMENTARY SCHOOL	2	2	0	3	0	64	0
1170005	DELMARVA SASH & DOOR	1	2	0	14	0	110	30
1170007	EASTERN SHORE JR. ACADEMY	01	1	0	7	0	54	1
1170012	KINGSWOOD CHILD CARE CENTER	01	0	0	7	0	70	0
1170014	QUEEN ANNES COUNTY DPW	01	1	0	6	0	33	3
1170016	QUEEN ANNES REC. & PARKS	01	0	0	9	0	47	0
1170020	SUDLERSVILLE ELEMENTARY SCHOOL	0 2	3	0	8	0	69	5
1170021	SUDLERSVILLE MIDDLE SCHOOL	01	3	0	11	0	78	13
1170022	TIDEWATER PUBLISHING CORP.	01	0	0	7	0	77	7
1170025	KENT ISLAND SHOPPING CENTER	01	2	0	8	0	70	0
1170027	CLARIANT PERFORMANCE PLASTICS	1	0	0	8	0	49	0
1170027	CLARIANT PERFORMANCE PLASTICS	2	1	0	7	0	57	0
1170030	CHESAPEAKE COLLEGE	0 3	0	0	6	0	106	12
1170031	MATAPEAKE TERMINAL	01	3	0	6	0	35	1
1171123	KENT TOWN MARKET	01	4	0	8	0	61	5
1171203	GRASONVILLE HEAD START	01	1	0	6	0	36	1
Totals			25	1	131	0	1096	79

Table 5: Contaminant Detects greater than 50% of MCL for IOC, SOC & VOC

	PWSID	System Name	Plant	Contaminant Code	Contaminant Name	MCL mg/L)	Sample Date	Result (mg/L)
1	170201	GUNSTON DAY SCHOOL	1	1005	ARSENIC	0.01	11-Mar-04	0.005
2	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	8-Feb-99	0.03
3	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	27-Nov-01	0.03
4	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	7-Dec-04	0.021
5	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	7-Dec-04	0.025
6	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	13-Apr-05	0.025
7	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	13-Apr-05	0.025
8	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	13-Apr-05	0.026
9	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	13-Apr-05	0.026
10	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	18-Oct-05	0.026
11	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	18-Oct-05	0.026
12	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	18-Oct-05	0.026
13	1170005	DELMARVA SASH & DOOR	1	1005	ARSENIC	0.01	18-Oct-05	0.026
14	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	29-Mar-93	7.3
15	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	29-Jul-93	10
16	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	26-Oct-93	9.1
17	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	11-Jan-94	12
18	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	29-Apr-94	12
19	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	22-Jul-94	9.5
20	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	7-Oct-94	12
21	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	16-Jan-95	11
22	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	23-May-95	11
23	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	29-Dec-95	8.95
24	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	24-Jan-96	7.8
25	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	26-Jan-96	10.3
26	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	26-Jan-96	10.3
27	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	24-Jun-96	8.4
28	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	26-Nov-96	7.21
29	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	9-Jan-98	8.48
30	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	17-Apr-98	6.6
31	1170005	DELMARVA SASH & DOOR	1	1040	NITRATE	10	25-Aug-98	7.21
32	1170007	EASTERN SHORE JR. ACADEMY	1	1005	ARSENIC	0.01	11-Feb-03	0.005

Table 6. IOC Data for Systems with Results greater Than 50% of MCL.

	PWSID	System Name	Plant	Contaminant Code	Contaminant Name	MCL mg/L)	Sample Date	Result (mg/L)
33	1170014	QUEEN ANNES COUNTY DPW	1	1005	ARSENIC	0.01	6-Feb-02	0.066
34	1170014	QUEEN ANNES COUNTY DPW	1	1005	ARSENIC	0.01	20-Feb-02	0.013
35	1170014	QUEEN ANNES COUNTY DPW	1	1005	ARSENIC	0.01	20-Feb-02	0.013
36	1170020	SUDLERSVILLE ELEMENTARY SCHOOL	1	1005	ARSENIC	0.01	9-Jan-03	0.018
37	1170020	SUDLERSVILLE ELEMENTARY SCHOOL	1	1005	ARSENIC	0.01	28-Jan-03	0.02
38	1170020	SUDLERSVILLE ELEMENTARY SCHOOL	1	1005	ARSENIC	0.01	10-Mar-05	0.02
39	1170020	SUDLERSVILLE ELEMENTARY SCHOOL	1	1005	ARSENIC	0.01	27-Jun-05	0.025
40	1170020	SUDLERSVILLE ELEMENTARY SCHOOL	1	1005	ARSENIC	0.01	28-Sep-05	0.019
41	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1005	ARSENIC	0.01	28-Jan-03	0.018
42	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1005	ARSENIC	0.01	10-Mar-05	0.018
43	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1005	ARSENIC	0.01	27-Jun-05	0.02
44	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1005	ARSENIC	0.01	28-Sep-05	0.017
45	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	12-Jan-93	6.5
46	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	7-Jan-94	5.93
47	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	8-Feb-95	6.32
48	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	15-Mar-96	5.9
49	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	22-May-96	5.86
50	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	10-Sep-96	5.2
51	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	10-Sep-96	5.2
52	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	16-Oct-96	5.76
53	1170021	SUDLERSVILLE MIDDLE SCHOOL	1	1040	NITRATE	10	3-Feb-97	5.54
54	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	20-Feb-98	0.047
55	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	27-Feb-01	0.051
56	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	11-Jun-02	0.0502
57	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	24-Jun-02	0.0537
58	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	9-Feb-04	0.049
59	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	7-Apr-05	0.032
60	1170022	TIDEWATER PUBLISHING CORP.	1	1005	ARSENIC	0.01	28-Jul-05	0.03
61	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	19-Aug-98	0.027
62	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	14-Dec-98	0.03
63	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	19-Mar-01	0.029
64	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	24-Feb-04	0.029
65	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	10-Aug-04	0.022
66	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	10-Aug-04	0.025
67	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	27-Jun-05	0.026

Table 6. IOC Data for Systems with Results greater Than 50% of MCL.

	PWSID	System Name	Plant	Contaminant Code	Contaminant Name	MCL mg/L)	Sample Date	Result (mg/L)
68	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	27-Jun-05	0.025
69	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	30-Aug-05	0.022
70	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	30-Aug-05	0.029
71	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	13-Oct-05	0.022
72	1170030	CHESAPEAKE COLLEGE	1	1005	ARSENIC	0.01	13-Oct-05	0.024
73	1170031	MATAPEAKE TERMINAL	1	1005	ARSENIC	0.01	19-Mar-04	0.007
74	1171123	KENT TOWN MARKET	1	1005	ARSENIC	0.01	21-Mar-00	0.04
75	1171123	KENT TOWN MARKET	1	1005	ARSENIC	0.01	28-Apr-05	0.038
76	1171123	KENT TOWN MARKET	1	1005	ARSENIC	0.01	26-Jul-05	0.029
77	1171123	KENT TOWN MARKET	1	1005	ARSENIC	0.01	29-Sep-05	0.043
78	1171123	KENT TOWN MARKET	1	1005	ARSENIC	0.01	15-Nov-05	0.046
79	1171203	GRASONVILLE HEAD START	1	1005	ARSENIC	0.01	21-Feb-01	0.01

Table 6. IOC Data for Systems with Results greater Than 50% of MCL.

PWSID	System Name	No. of Samples	Number Tested Positive	Percent Positive	Fecal Positive
170201	GUNSTON DAY SCHOOL	104	2	2	0
1170002	CHURCH HILL ELEMENTARY SCHOOL	39	1	3	0
1170005	DELMARVA SASH & DOOR	41	5	12	0
1170007	EASTERN SHORE JR. ACADEMY	37	2	5	0
1170012	KINGSWOOD CHILD CARE CENTER	38	0	0	0
1170014	QUEEN ANNES COUNTY DPW	19	3	16	0
1170016	QUEEN ANNES REC. & PARKS	36	1	3	0
1170020	SUDLERSVILLE ELEMENTARY SCHOOL	40	0	0	0
1170021	SUDLERSVILLE MIDDLE SCHOOL	40	0	0	0
1170022	TIDEWATER PUBLISHING CORP.	38	0	0	0
1170025	KENT ISLAND SHOPPING CENTER	38	0	0	0
1170027	CLARIANT PERFORMANCE PLASTICS	38	0	0	0
1170030	CHESAPEAKE COLLEGE	40	9	23	1
1170031	MATAPEAKE TERMINAL	30	5	17	0
1171123	KENT TOWN MARKET	29	0	0	0
1171203	GRASONVILLE HEAD START	20	0	0	0

Table 7: Routine Bacteriological Samples for each System since 1993