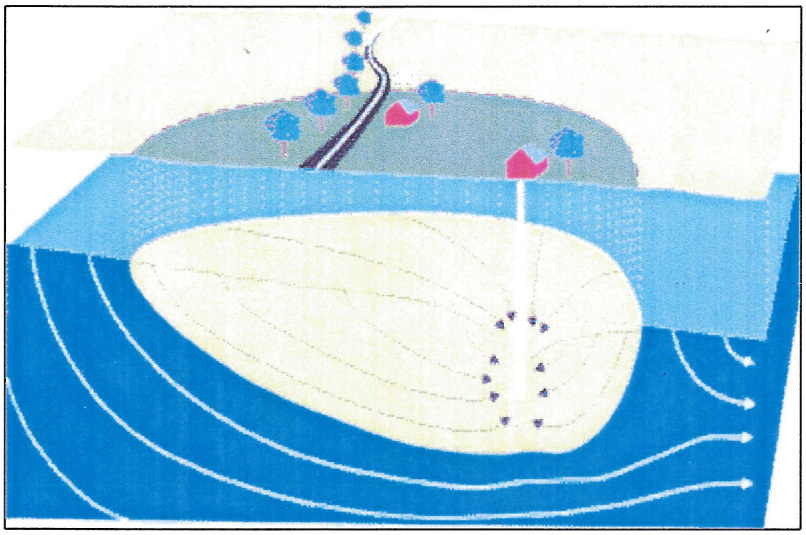
SOURCE WATER ASSESSMENT

FOR GRAYMOUNT APARTMENTS

CECIL COUNTY, MD



Prepared By
Water Management Administration
Water Supply Program
March 2005

MDE

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SUMMARY

The Maryland Department of the Environment's Water Supply Program (WSP) has conducted a Source Water Assessment for Graymount Apartments, a sixteen-unit apartment building located near Elkton in Cecil County, Maryland (Figure1). This report delineates the area that contributes water to the well, identifies potential sources of contamination within the area and determines the susceptibility of the water supply to contamination. Recommendations for protecting the water supply conclude the report.

The source of Graymount Apartment's water supply is one well in the Potomac Group. The aquifer appears to be partially to unconfined at this location. The Wellhead Protection area was delineated using by the WSP using EPA-approved methods.

Point sources of contamination were identified within and near the assessment area from field inspections and inventory databases. The Maryland Office of Planning's 2000 land use map for Cecil County was used to identify non-point sources of contamination. Maps showing location of the well, potential sources of contamination, and land use are included at the end of this report.

The susceptibility analysis is based on a review of existing water quality data for the water system, the presence of potential sources of contamination, in the assessment area, well integrity and the inherent vulnerability of the aquifer. It was determined that the Graymount Apartments water supply is susceptible to contamination by volatile organic compounds and gross alpha. The system is not susceptible to regulated inorganic compounds including nitrates, synthetic organic compounds, radon 222, or microbiological compounds. The wells location on the property and lack of protective structures are of concern.

INTRODUCTION

The Water Supply Program has conducted a Source Water Assessment for Graymount Apartments, an existing apartment building with a new well. The apartment building was previously part of the Fred Smith Apartments, which were served by a common well. In 2001, the apartments were divided into two community systems with separate owners. The original well serves Golden Kay Apartments and a new well was drilled to serve Graymount Apartments. In 2002, when the Source Water Assessment for Small Systems in Cecil County was prepared, the systems were not yet separated and water use at Graymount Apartments was evaluated as part of Golden Kay Apartments' assessment.

As defined as part of Maryland's Source Water Assessment Plan (SWAP), "small systems" are community and noncommunity water systems that have water appropriation and use permits with average annual appropriation permit of less than 10,000 gpd. Graymount Apartments consist of sixteen units and their water appropriation and use permit (CE2001G024(01)) allows for an average annual water use of 3,500 gpd.

HYDROGEOLOGY

Graymount Apartments are located southeast of the Fall Line in the Atlantic Coastal Plain Physiographic Province. In this region, the underlying strata consist of mostly unconsolidated gravel, sand, silt and clay. The coarser materials, such as sand and gravel, if saturated, may be used as aquifers. Finer materials, such as silt and clay, do not yield sufficient water to wells and are considered confining beds.

The geologic formation underlying Graymount Apartments is the Potomac Group, which is also known as Non-marine Cretaceous Deposits. This strata is composed of non-marine gravel, sand, silt and clay. The clay beds tend to be lens shaped and are not always laterally continuous, so the presence of clay in a well log does not always indicate confined conditions.

WELL INFORMATION

Well information for the system was obtained from the Water Supply Program's data base, site visits well completion reports and sanitary survey inspection reports. Appendix 1 consists of a copy of the application to drill the well and a copy of the well completion report.

The well was drilled in 2002 and was constructed in accordance with the State's current standards. It was drilled 112 feet into the Potomac Group. Ten feet at the bottom of the well were screened in brown sand.

SOURCE WATER ASSESSMENT AREA DELINEATION

For ground water systems, a Wellhead Protection Area (WHPA) is considered to be the source water assessment for the system. As defined by Maryland's SWAP, the wellhead protection area for a small public water system whose wells are completed in an unconfined Coastal Plain aquifer, a simplified variable-shape based on annual recharge was used to delineate the WHPA. This method was used to assess Graymount Apartments' water supply. A major flow direction of 320° from true north was used based on the regional ground water flow. To account for uncertainties in the flow direction, the boundaries were extended 30° to each side of the major flow lines to obtain the maximum outer limits of the WHPA. A 100-foot radius to the southeast of the well was added for additional protection (Figure 2).

POTENTIAL SOURCES OF CONTAMINATION

Potential sources of contamination can be classified as either point or non-point sources. Examples of point sources are leaking underground storage tanks, ground and surface water discharges, landfills, animal feeding operations, and ground water contamination sites. These sites are usually associated with commercial or industrial facilities that use chemicals that may, if handled inappropriately, contaminate ground water via a discrete point location. Non-point sources are associated with land use practices, such as use of pesticides, fertilizer, animal wastes or septic systems, that lead to ground water contamination over a larger area.

Point sources of contamination were identified within and near the assessment area from field inspections and from MDE Water and Waste Management databases. Figure 2 is an aerial photograph showing potential sources of contamination near the WHPA. Two potential point sources of contamination were found in the WHPA. Each of the three apartment buildings at Graymount Apartments are served by their own septic systems. All three systems are believed to be functioning properly at this time.

Cecil Provision Company, located approximately 0.1 mile northwest of Graymount Apartments, was a small slaughterhouse that discharged about 250 gpd of wash water into an infiltration pond. Cecil Provision Company recently went out of business and terminated discharges in January 2005.

The Maryland Office of Planning's 2000 land use map for Cecil County was used to identify non-point sources of contamination (Figure 3). Three land use categories were identified within the delineated WHPA: low density residential, commercial, and forest (Table 1). The predominant land uses are low density residential and commercial.

LAND USE CATEGORIES	TOTAL AREA (acres)	PERCENTAGE OF WHPA
Low Density Residential	7.64	45.4
Commercial	6.07	36.1
Forest	3.12	18.54

Table 1. Land Use Summary for the Wellhead Protection Area

A review of Maryland Office of State Planning's Cecil County Sewer Map shows there is no planned service to Graymount Apartments, to its SWAP or to any of the surrounding area. Graymount Apartments are served by an on-site wastewater disposal system as are the other residential and commercial buildings in the area.

WATER QUALITY DATA

Water quality data from the Water Supply Program's (WSP) database was reviewed for Safe Water Drinking Act (SWDA) contaminants. In accordance with Maryland's SWAP, data submitted by the owner/operator of the system was compared with the Maximum Contaminant Levels (MCLs). If monitoring data is greater than 50% of the MCL, the assessment will describe the typical sources of that contaminant and locate the possible sources of the contaminant for this site. Gray mount apartments has no treatment for its water supply

Since Graymount Apartments is a relatively new system the period of water quality record is short. Synthetic Organic Compounds (SOCs), Inorganic Compounds (IOCs) and Microbiological Contaminants have been tested once. No SOCs, IOCs or VOCs were detected in quantities greater than or equal to 50% of the MCL in the Graymount Apartments water supply.

Water quality reports submitted from 2003 to 2005, have detected both nitrate (1.6 to 1.7 ppm) and nitrite (0.003 ppm). Both detects are well below 50% of the MCL, however their presence may be indicative of the partially confined nature of the aquifer. Since the aquifer appears to be partially confined, it is possible that a small amount of nitrogen products from the septic system or the former Cecil Provision Company discharges may show up in the Graymount well in the future.

Radionuclides

Radionuclides have been measured three times. Gross Alpha, Radium, and Combined Radium have all exceeded the 50% MCL standard as indicated in Table 2. These constituents are naturally occurring in the Potomac Group aquifers due to presence of thorium and uranium in the sediment. A regional study of the occurance of these contaminants indicates that higher values are associated with acidic ph. This is probably the case at Graymount. An acidic pH of 5.0 was recently measured.

CONTAMINANT NAME	MCL(pCi/L)	SAMPLE DATE	RESULT (pCi/L)
GROSS ALPHA	15	11-MAR-03	14
COMBINED RADIUM (226 & 228)	5	11-MAR-03	4.6
RADIUM-228	5	11-MAR-03	3.5
GROSS ALPHA	15	20-MAY-03	14
RADIUM-228	5	20-MAY-03	4.32
COMBINED RADIUM (226 & 228)	5	20-MAY-03	5.62
GROSS ALPHA	15	01-JUL-03	14
COMBINED RADIUM (226 & 228)	5	01-JUL-03	4.01
RADIUM-228	5	01-JUL-03	3.51
GROSS ALPHA	15	07-OCT-03	11
RADIUM-228	5	07-OCT-03	4.23
COMBINED RADIUM (226 & 228)	5	07-OCT-03	5.43

Table 2. Radionuclides at above 50% of the MCL

Volatile Organic Compounds (VOCs)

VOCs were sampled four times. Methyl-tert butyl-ether (MTBE), the only VOC detected, was found to be 0.6 ppb each time.

Microbiological Contaminants

Routine bacteriological monitoring, which measures total coliform bacteria, is conducted in the finished water for each community water system on a monthly basis. Since Graymount Apartments do not use disinfection for treatment of its water supply, the negative bacteriological results are reflective of the quality of raw water from the wells. Total coliform bacteria are not pathogenic but are used as an indicator organism for other disease-causing microorganisms. Since 2003, Graymount Apartments have conducted routine bacteriological sampling 14 times, but no samples have had any detections of total coliform bacteria.

SUSCEPTIBILITY ANALYSIS

Wells completed in unconfined or partially confined aquifers are generally more susceptible to contamination from surficial sources. The susceptibility of source water to contamination is based on the following criteria: 1) the presence of natural and anthropogenic contaminant sources within the WHPA; 2) water quality data; 3) well integrity; and 4) aquifer conditions.

The well serving Graymount Apartments is completed in unconsolidated Coastal Plain sediments. The well completion report indicated red clay between 15 feet and 98 feet below land surface, however, the presence of small level nitrates in water samples indicates that the well is only partially confined. The susceptibility of Greymount Apartments' water supply to various contaminants is shown in Table 3.

CONTAMINANT TYPE	Are Contaminant Sources present in the WHPA?	Are Contaminants detected in WQ samples at 50% of the MCL?	Is Well Integrity a Factor?	Is the Aquifer Vulnerable?	Is the System Susceptible to the Contaminant?
Inorganic Compounds)	YES	NO	NO	YES	NO
Volatile Organic Compounds	YES	NO	NO	YES	YES
Synthetic Organic Compounds	NO	NO	NO	YES	NO
Radionuclides	YES	YES	NO	YES	YES
Microbiological Contaminants	YES	NO	NO	NO	NO

Table 3. Susceptibility Chart for Graymount Apartments' Water Supply

Radionuclides: Gross Alpha, Combined Radium (226 and 228), and Radium 228 were found to be greater the 50% of the MCL, therefore the system is susceptible to these radiological contaminants. Gross Alpha at or near the MCL was also detected in the well serving Golden Kay Apartments. Practices that increase the salinity of ground water are likely to further increase radiological levels in the water system. The use of salt and the discharge of salt from water softeners within the wellhead protection area may contribute to higher radiological levels.

A low level of MTBE was detected in both Graymount Apartment and Golden Kay Apartments. A former leaking underground storage tank (UST) at G & S Contracting, Inc., located about 300 feet northwest, on the north side of U.S.Route 40 is a possible source (Figure 2). However, low levels such as detected in the Graymount water supply can easily be caused by small spills or infiltration of runoff from paved surfaces, such as are present in the wellhead protection area. A leaking tank was removed from this site and the site investigation has been closed.

The Graymount Apartment's water supply well is most suceptible to physical damage location on the property. The well has no protective structures around it and is located in lawn, about 10 feet from the driveway. There is no curb or elevation change between driveway and lawn. In snow, lawn and driveway appear the same. The driveway is used by 16 apartment units, so the well is very vulnerable to being hit by a car or truck. If the well is hit, but not destroyed, the impact could disturb the grout or crack the casing, thus allowing surface contamination to enter the well.

MANAGEMENT OF THE SOURCE WATER ASSESSMENT AREA

The well serving Graymount Apartments is relatively new and in good condition. Water quality testing indicated the presence of naturally occuring radionuclides close to the maximum contaminant level and small amounts of MTBE, whose source is unknown. Recommendations for maintaining the integrity of this system are listed below.

The well needs protection from traffic on the common drive. A well house, concrete ring or concrete posts are recommended.

Review area for potential sources of sodium chloride to the ground water. Minimize use of salt for de-icing.

Continue monitoring for VOCs, IOCs, SOCs and radionuclides.

Annual sampling for microbiological contaminants is reccommended. It is a good indicator of the integrity of the wellhead.

REFERENCES

Higgins, M.W. and Conant, L.B., 1990, The Geology of Cecil County, Maryland, Maryland Geological Survey Bulletin 37, 183p.

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

Maryland Department of the Environment, Water Supply Program, 2002, Source Water Assessment for Small Systems in Cecil County, 17p.

Otton, E.G.,Willey, R.E., McGregor, R.A., Achmad, G., Hiortdahl, S.N. and Gerhart, J.M., 1988, Maryland Geological Survey Bulletin 34, 133p.

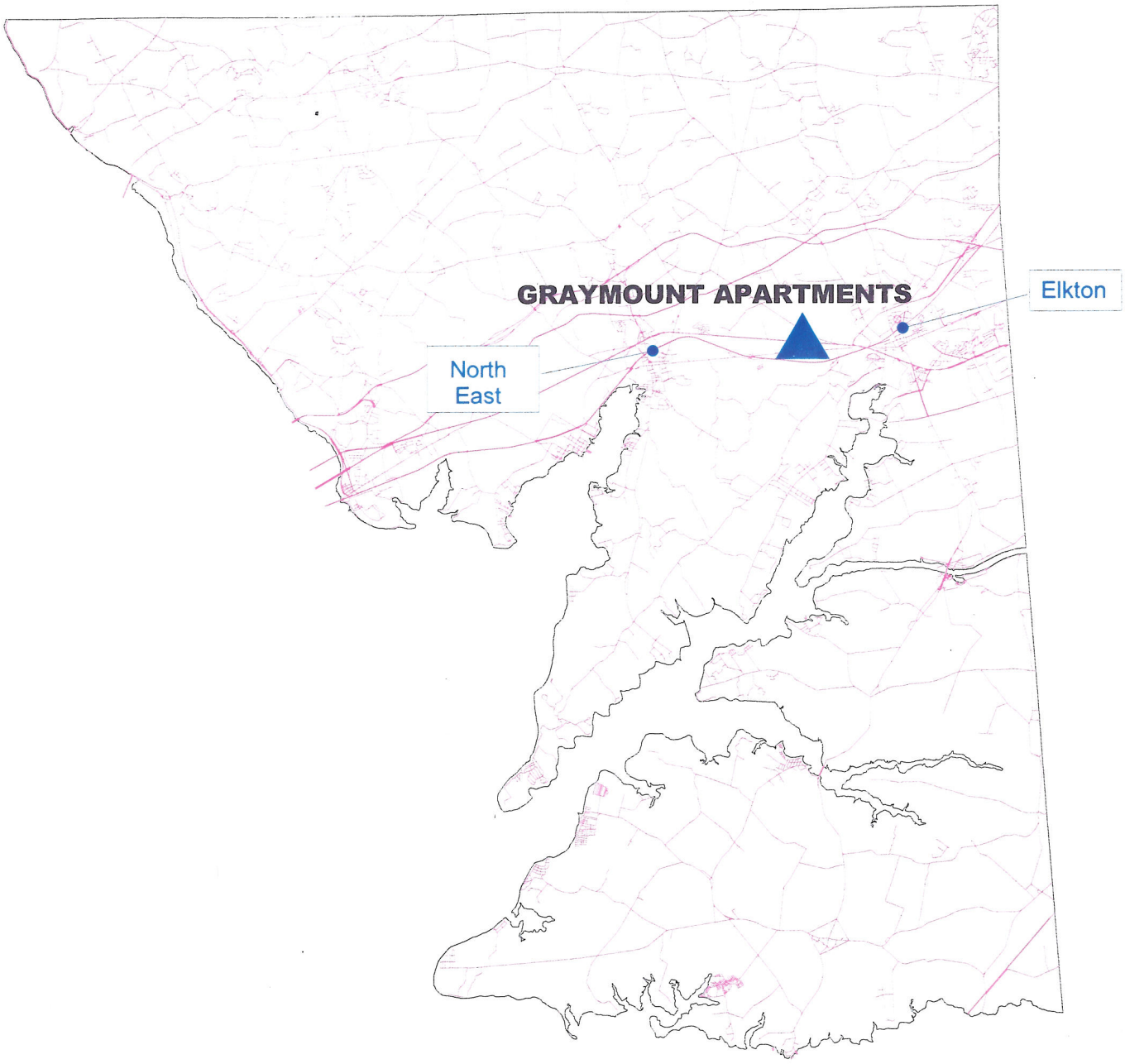


Figure 1. Location Map

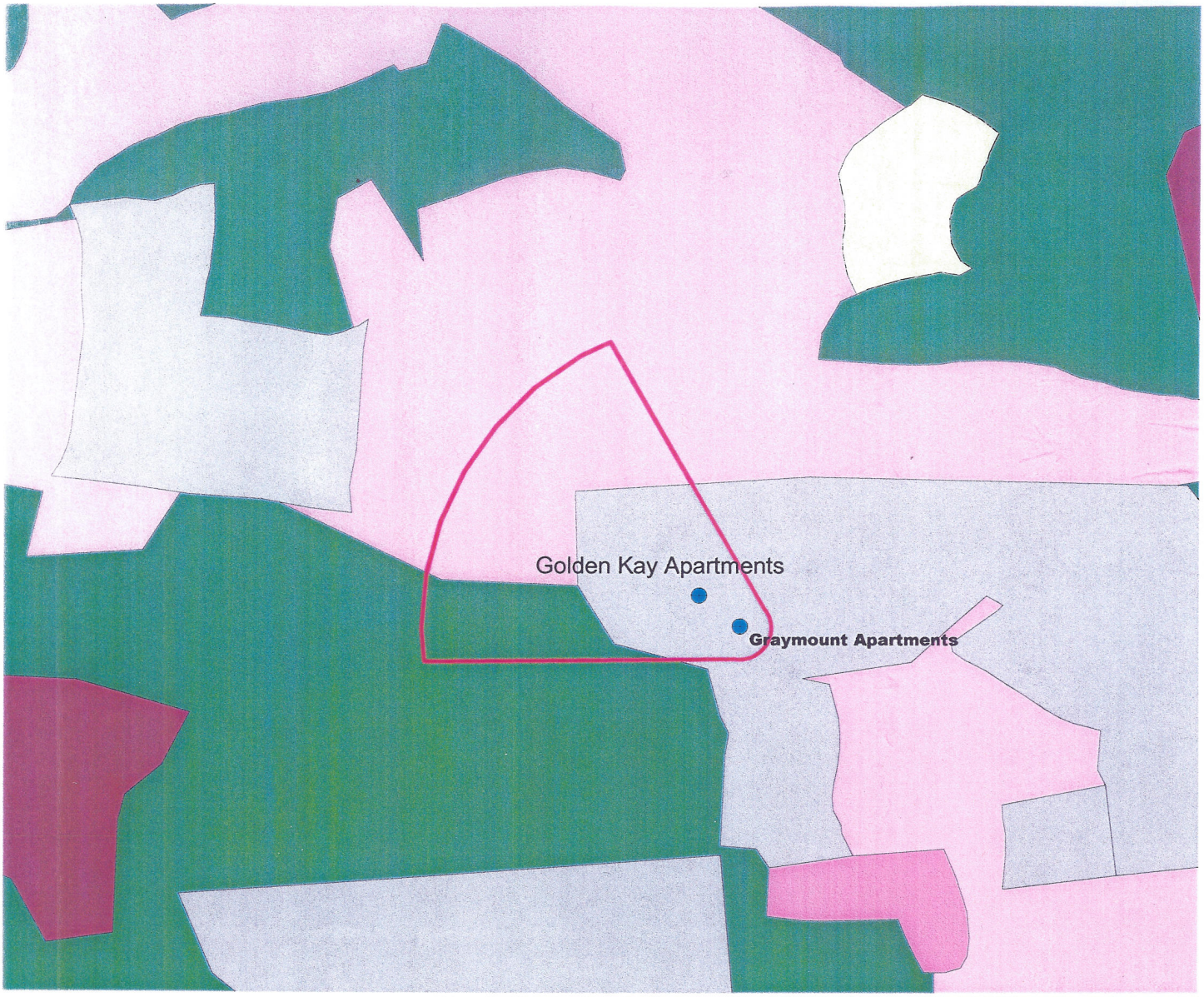


Figure 3: Land Use Map of Graymount Aparment's Wellhead Protection Area

Legend

- Supply Well
- Welllhead Protection Area

Cecil Co Land Use Map

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

N

200 0 200 400 Feet

Base Map: Cecil County Land Use Map (2000)

APPENDIX

B	1	0535	SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please type

STATE PERMIT NUMBER: CE – 94 – 5022 (70–79)
fill in this form completely

Date Received (APA): 11-16-01 (8 MM DD YY 13)

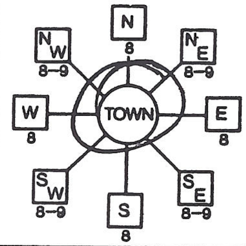
OWNER INFORMATION
410-642-0109
Last Name: Smith — Owner — First Name: Ron (15–34)
Street or RFD: 718 W Pulaski HWY (36–55)
Town: ELKton — State: Md — Zip: 21921 (57, 70, 72, 76)

DRILLER INFORMATION
Driller's Name: Robert DiFilippo — License No.: M S D 079 (76–81)
Firm Name: Cecil County Well Drilling
Address: 236 Johnstown Rd Elkton Md
Signature: Robert DiFilippo — Date: 11-16-01

B 3 LOCATION OF WELL
PCO
Fred Smith Apt
COUNTY: Cecil (8–21)
SUBDIVISION: Graymount Apts. (23–42)
SECTION ___ (44–46) LOT ___ (48–50)
NEAREST TOWN: ELKton (52–71)
MILES FROM TOWN (enter 0 if in town): 1 (73, 76 77 78 M I)

B 2 WELL INFORMATION
APPROX. PUMPING RATE (GAL. PER MIN.): 15 (8–12)
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 1500 (14–20)

B 4
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



NEAR WHAT ROAD: Pulaski HWY (11–30)
ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, E EAST, S SOUTH (circled: S)
DISTANCE FROM ROAD: 200 (34–37)
ENTER FT OR MI: FT (38 39)
TAX MAP 26 BLK: 22 PARCEL 63

USE FOR WATER (CIRCLE APPROPRIATE BOX)
- D DOMESTIC POTABLE SUPPLY & RESIDENTIAL IRRIGATION
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 N INDUSTRIAL, COMMERICIAL, DEWATERING (circled)
- P PUBLIC WATER SUPPLY WELL (marked X) 07 0202
- T TEST, OBSERVATION, MONITORING
- G GEO-THERMAL

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL
COUNTY NAME: Cecil — COUNTY NO.
STATE SIGNATURE: Mark A. Hajas — INSERT S → ___ 41
DATE ISSUED: 11/26/01 (43 MM DD YY 48) — CO SIGNATURE: June Hill — EXP. DATE: 11/25/02
NORTH GRID: 648 000 (50–55) — EAST GRID: 1117 000 (57–63)

APPROXIMATE DEPTH OF WELL: 100 FEET (24–28)
APPROXIMATE DIAMETER OF WELL: 6 NEAREST INCH

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →

SOURCES OF DRILLING WATER
1. Well Water
2.
3.

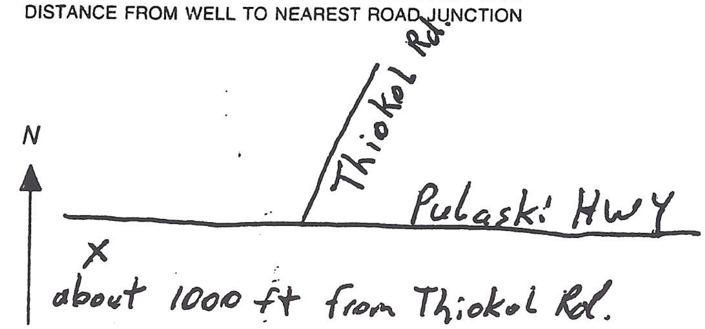
METHOD OF DRILLING (circle one)
30 / 37
BORED (or Augered) — JETTED — Jetted & DRIVEN
AIR-ROTary — AIR-PERcussion (circled) — ROTARY (Hydraulic Rotary)
CABLE — REVerse-ROTary — DRive-POINT
other ______

WRITE THE BOX NUMBER FROM THE MAP HERE
E 1120
N 648
000
000 X

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)
- N THIS WELL WILL NOT REPLACE AN EXISTING WELL (circled)
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 __ __ - __ __ - __ __ __ __ 52

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)
APPROP. PERMIT NUMBER: CE 2001 G024
PERMIT No.: CE – 94 – 5022 (70 71 72 73 74 75 76 77 78 79)

SPECIAL CONDITIONS: SEE ATTACHMENT
NOTE – APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

DENV-Permit 97 — ① ORIGINAL

ST 11143 (MDE USE ONLY)

1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER PCO - Fred Smith Ap

ST/CO USE ONLY
DATE Received MAR 18 2002

DATE WELL COMPLETED MM 11 DD 23 YY 02

Depth of Well 112' (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" CE - 94 - 5022

OWNER SMITH (last name) RON (first name)
STREET OR RFD 118 W PULASKI HIWY TOWN ELKTON
SUBDIVISION GRAYMONT APTS SECTION ______ LOT ______

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brn silty sand	0	15	
Red silty clay	15	98	
Brn F-Sand	98	112	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes Y no **N** (circled)

CIRCLE APPROPRIATE LETTER
- **A** A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- **E** ELECTRIC LOG OBTAINED
- **P** TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M WD 547
[signature]
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. __ D ____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes **Y** (circled) no N

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT CM BENTONITE CLAY **BC** (circled)

NO. OF BAGS 9 NO. OF POUNDS 450
GALLONS OF WATER 225
DEPTH OF GROUT SEAL (to nearest foot)
from 3 ft. (TOP) to 90 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	4"	102

OTHER CASING (if used)
EACH CASING — diameter inch ______ depth (feet) from ______ to ______

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2
DEPTH (nearest ft.)
EACH SCREEN
1. PL 102' to 112'
2. ______
3. ______

SLOT SIZE 1 30 2 ____ 3 ____
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 90' to 112'
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING / LOG INDICATOR / OTHER DATA

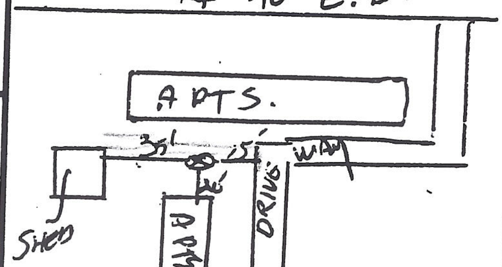
C 3
PUMPING TEST
HOURS PUMPED (nearest hour) 2
PUMPING RATE (gal. per min.) 50.
METHOD USED TO MEASURE PUMPING RATE Watch & Pail
WATER LEVEL (distance from land surface)
BEFORE PUMPING 62 ft.
WHEN PUMPING 100 ft.

TYPE OF PUMP USED (for test)
A air (circled), P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES **NO** (circled)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ______
PUMP HORSE POWER ______
PUMP COLUMN LENGTH (nearest ft.) ______
CASING HEIGHT (circle appropriate box and enter casing height)
+ above (circled) / − below LAND SURFACE 1 (nearest) foot

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)
Rt 40 E.B.



DENV-CR00 STATE