WELLHEAD AREA SURVEY
BROADWATER ADDITION WATER SYSTEM
ACHD SITE NO. 46
Cumberland, Allegany County, Maryland

ALWI Project No. AL7N001

1.0 INTRODUCTION

Advanced Land and Water, Inc. (ALWI) was retained by the Allegany County Health Department (ACHD) to prepare a Wellhead Survey Area for the Broadwater Addition Water System located on the northwest side of Michael Road approximately 1 mile north of I-68 and 5 miles east of Cumberland, in central Allegany County, Maryland. This well serves approximately twelve homes in a subdivision. This site, designated No. 46 by ACHD, is served by one production well completed in the local bedrock aquifer.

The draft Maryland Department of the Environment (MDE) "Transient Water Systems Operations Guidance" manual (herein termed the "Guidance Manual") defines a Non-Transient Non-Community (NTNC) Water System as one that "...serves at least 25 regular consumers over 6 months per year." Approximately 12 homes are continuously served (a population served of roughly 35), suggesting that this water system is indeed a non-transient non-community system (NTNC).

1.1 Purpose

The Safe Drinking Water Act (SDWA) of 1974 required the U.S. Environmental Protection Agency (EPA) to develop enforceable drinking water quality standards to protect the public health. In 1986, amendments made to the SDWA strengthened provisions for the protection of underground sources of drinking water. These amendments included provisions for establishing Wellhead Protection Programs by individual states under "umbrella" EPA oversight. The EPA approved a statewide Wellhead Protection Program developed by MDE in June 1991.

The MDE program originally applied to community water supplies, only. A newly proposed broadening of the federal Clean Water Act will have the result of expanding the MDE Wellhead Protection Program to encompass non-community supplies both transient and non-transient in nature. ACHD, in cooperation with MDE, established this program to bring existing non-community supplies into compliance with the coming regulations.

1.2 Scope

ALWI prepared this Wellhead Survey Area following ACHD requirements, which followed MDE guidelines for transient system operation and wellhead protection.

1. **Site Reconnaissance, Photographic Documentation and Interviews** – ALWI observed the on-site wellhead, storage, treatment, and distribution infrastructure to the degree exposed without excavation or exposure to personal hazards. ALWI used an ACHD-owned digital camera to photograph conditions surrounding the wellhead at the time of the field reconnaissance. Said photographs are stored on ACHD's computer system. ALWI interviewed the owner/operator and/or employee(s) to document information on the use patterns, history, and problems associated with the supply.

2. **Baseline Water Quality Assessment** - ALWI purged the water system and collected samples for analysis in the ACHD laboratory that is affiliated with the Maryland Department of Health and Mental Hygiene (DHMH). ALWI performed this fieldwork in accordance with MDE potable water sampling criteria including in-field measurements of turbidity, chlorine, and pH. ACHD selected the analyte list based on countywide experience with potability concerns and the capabilities of the aforementioned laboratory. The analytes included total and fecal coliform bacteria, nitrates, nitrites, iron, sulfur and manganese (Appendix A).

3. **Contamination Hazard Assessment** – ALWI identified existing and potential contaminant hazards within the delineated area based on visual observations and the techniques enumerated above. ALWI ranked these hazards in term of relative risk and provided concrete suggestions for their appropriate address. More generally, herein ALWI provides specific recommendations for source reduction measures, contingency plans, and other methods that may help better protect against occurrences of groundwater contamination.

2.0 HYDROGEOLOGIC FRAMEWORK

ALWI used published information from the United States Geological Survey and the Maryland Geological Survey to identify and describe the characteristics of the local hydrogeologic setting.

2.1 BEDROCK GEOLOGY

The Broadwater System is situated within the Valley and Ridge physiographic province and is underlain by sandstone and shale bedrock of Silurian age, locally mapped as the Clinton Group (Cleaves, 1968). These rocks have been folded and faulted, resulting in synclines (concave-upward folds) and anticlines (convex-upward folds). In three dimensions, the local rock formations dip at right angles to the direction of plunge of the fold system. In general, dip directions may help govern groundwater (and contaminant) movement directions in the bedrock but plunge directions have less relation. At this location, the bedding planes dip to the east, which suggests that deep groundwater flow directions may follow.

Reported well yields within the Clinton Group are sparse but range from 2 to 19 gpm (Slaughter and Darling, 1962). Clinton Group wells completed within sandstone beds generally have a higher yield because the greater competence of the rock allows the development of longer and wider fractures both along and across bedding planes.

2.2 Saprolite and Soil Mantle

Natural chemical weathering of the shallow portion of the bedrock, due to percolating water, has chemically altered many of the original rock-forming minerals to clays and other secondary minerals. This has resulted in the development of shallow saprolite (weathered bedrock) and the overlying soil mantle. The thickness of the soil and saprolite is generally 2 to 10 feet, but it varies considerably over short distances. In highly fractured zones, enhanced groundwater storage and movement has accelerated the breakdown of the rock-forming minerals and has caused formation of a thicker saprolitic deposit.

2.3 Aquifer Recharge

Precipitation infiltrating through the soil on site and/or in up-gradient areas is the primary source of aquifer recharge to the on-site supply well. Generally, overlying soil horizons act to absorb and then slowly release infiltrating precipitation. However, in areas where fracture zones have formed, percolating groundwater can reach the water table quickly. A portion of the precipitation percolates downward through the soil mantle and then migrates through narrow, interconnected joints, fractures, faults, and cleavage planes in the bedrock.

2.4 Geology-Controlled Groundwater Flow

Generally, bedding plane partings and cross-bedding fracture zones (where present) function as both downward and lateral water conduits. Consequently, such zones receive and transmit water at a rate higher than would otherwise be achievable and, accordingly, are preferential conduits for groundwater flow and contaminant transport.

Despite the bedrock's overall hardness and resistance to erosion, hydraulic permeabilities in bedding planes and fracture zones within the Clinton Group may be several times greater than in surrounding less-fractured rock. This intrinsic characteristic portends the possibility for the existence of specific zones with higher-than-normal well yields, higher-than-normal groundwater flow velocities and higher-than-normal susceptibility to groundwater contamination.

3.0 WATER QUALITY ASSESSMENT

Slaughter and Darling (1962) reported the groundwater quality from the Clinton Group as locally variable (iron concentrations range from 0.75 to as much as 3.6 micrograms per liter [mg/l]; hardness averages 92 mg/l; and pH ranges from 7.3 to 7.8). ALWI interpreted that the slight reddish colors of the local rock exposures as likely attributable to the trace presence of iron.

At this location, ALWI collected baseline groundwater samples on September 22, 1999, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ALWI was unable to collect raw water samples, as there was no way to access the water supply before it ran through the chlorination disinfection system without risking cross-contamination. ACHD's laboratory analyzed the samples for those constituents of countywide concern. These included total coliform bacteria as specified in COMAR 26.04.01.11A-C, alkalinity, color, conductance, hardness, iron, manganese, nitrate-nitrite nitrogen (COMAR 26.04.01.14(4)(a)), nitrite nitrogen (COMAR 26.04.01.14(4)(b)), pH, and total dissolved solids. The results are included as Appendix A, and suggest potability relative to the samples collected

4.0 DELINEATION

ALWI delineated an area of potential concern surrounding this site's well using generalized criteria developed by MDE for non-community supplies, as modified by ALWI (with ACHD consent) based on the specific topographic setting of the site. ALWI began by using a fixed radius of 1,000 feet around the well. From this radial area, ALWI then excluded downgradient areas more than 100 feet from the wellhead as well as areas unlikely to contribute recharge to the well based on intervening streams and/or drainage divides. ALWI also excluded steeply-sloping cross-gradient areas.

The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B) and encompasses approximately 75% of the circle (originally 72 acres in size) or 54 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), slightly more than 32,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well is much smaller than the total available in the surveyed area, lending a high degree of conservatism to this analysis.

An interview with the owner suggested little if any seasonal peaking in demand, and ALWI used this to interpret little, if any, seasonal fluctuation of the surveyed area boundary. Negligible nitrate-nitrogen concentrations were detected in the sample ALWI collected. This obviated the need for a nitrate balance assessment.

5.0 CONTAMINANT THREATS ASSESSMENT

ALWI performed a site reconnaissance on September 22, 1999. During the reconnaissance, local land use conditions were observed with emphasis on the potential use, storage and disposal practices of hazardous materials and petroleum products. Such conditions may have included visual evidence for present or former spills, stained or discolored ground surfaces, stressed vegetation, unusual odors, or visible underground storage tank (UST) facilities. Adjacent and nearby properties were also visually scanned for such evidence from the property and nearby public right-of-ways. Off-site properties were not entered. ALWI relied on the accuracy of interviews for this information.

Design, construction and present condition are important factors in determining a well's susceptibility to contamination. However, no well tag was visible. Accordingly, ALWI could not assess the initial design nor present condition of the casing or grout seal. ALWI observed that the portion of the casing exposed at ground surface appeared intact and was equipped with a conventional pitless-style cap of the type that can sometimes allow insects to enter the well. An upgrade to a more modern cap would provide greater protection against microbial contamination.

ALWI performed a reconnaissance in an attempt to identify potential contamination sources in the delineated surveyed area. ALWI identified no obvious sources of contamination other than the on-site risks listed above.

6.0 CONCLUSION AND RECOMMENDATIONS

ALWI found that the supply is potable relative to the analyses performed. No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. ALWI has ranked its observation in decreasing order of overall relative risk. ALWI provides specific recommendations at the conclusion of each respective observation or interpretation.

1. **Subsurface Disposal Facilities** – Various homes and businesses in the area doubtlessly have septic systems varying in age and condition. Though the low nitrate concentrations detected in the groundwater sample collected indicate no present release, property ownership interests should embark on a regularly scheduled program of pump-outs. When the septic system needs replacement, the tank should be replaced with a seamless model and no facilities should be relocated uphill or within 100 feet of the well.

2. **Roadway and Parking Area Deicing** – Roadway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. Consideration should be given to using non-chemical abrasives on private driveways for deicing to the degree possible. Baseline and bi-annual sampling for sodium and chlorides should be considered.

7.0 SELECTED REFERENCES

Cleaves, Emery T., Jonathan Edwards Jr. and John D. Glaser, 1968. Geologic Map of Maryland: Maryland Geologic Survey, 1:250,000.

MDE Public Drinking Water Program, 1998, Transient Water System Operations Guidance; Guidance For Counties With Delegated Responsibilities (Draft), 45p.

Slaughter, Turbit H. and John M. Darling, 1963, The Water Resources of Allegany and Washington Counties: Maryland Department of Geology, Mines, and Water Resources, Bulletin 24, p. 408.

NONCOMMUNITY WATER SUPPLY SANITARY SURVEY

1. System Name: Broadwater Addition Water Supply

2. WAS: 46

3. System Information:

Address: Route 2, Baltimore Pike

Cumberland, Maryland

Phone No.: (301) 722-6456

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient	>25
Regular	
Total	>25

7. Property Information:

Owner's Name Barb Smith

Address: Route 2, Baltimore Pike

Cumberland, Maryland

Phone No.: (301) 722-6456

8. No. Service Connections:

9. Type of Facility:

Food Service	
Church	
Campground	
Daycare	
Other (specify)	Water Supply

10. Contact Person:

Name: Barb Smith

Phone No. (301) 722-6456

11. Operator:

Name:

Cert. No.

12. Sample History (Has the system had any violations?):

Bacteria: None apparent or reported

Nitrate: None apparent or reported

SURVEY RESULTS

13. Comments on System, Recommendations:

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14. Inspected by:

Mark W. Eisner

15. Date inspected:

9/22/99

16. System Vulnerability

Protected ________ Vulnerable Yes (see report)

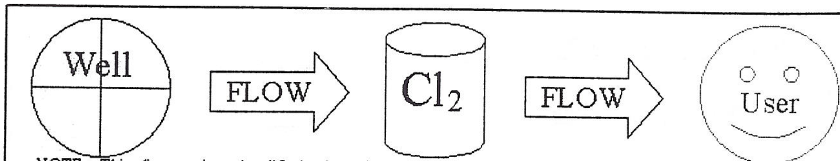
WATER PLANT INFORMATION

17. Type of Treatment:
(Check all that apply)

Disinfection

Gas Chlorine:	____
Sodium Hypochlorite	_x_
Ultraviolet Radiation	____
Iron Removal	____
Nitrate Removal	____
PH Neutralizer	____
Other	____
Unknown	____

18. System Schematic (Process Flow):



NOTE: This diagram is a simplified schematic of operational process flow observed or described on the date of the reconnaissance. Many water systems possess malfunctioning, disconnected and/or occasionally/regularly-bypassed equipment. Actual treatment processes may differ, therefore, from those shown herein.

19. System Storage:

Ground Storage	____
Elevated Storage	____
Hydropneumatic Tank	_x_
Other	____

20. Storage Capacity:

Typical Domestic

21. Untreated water sampling tap?

Yes ____ No _x_

WELL INFORMATION

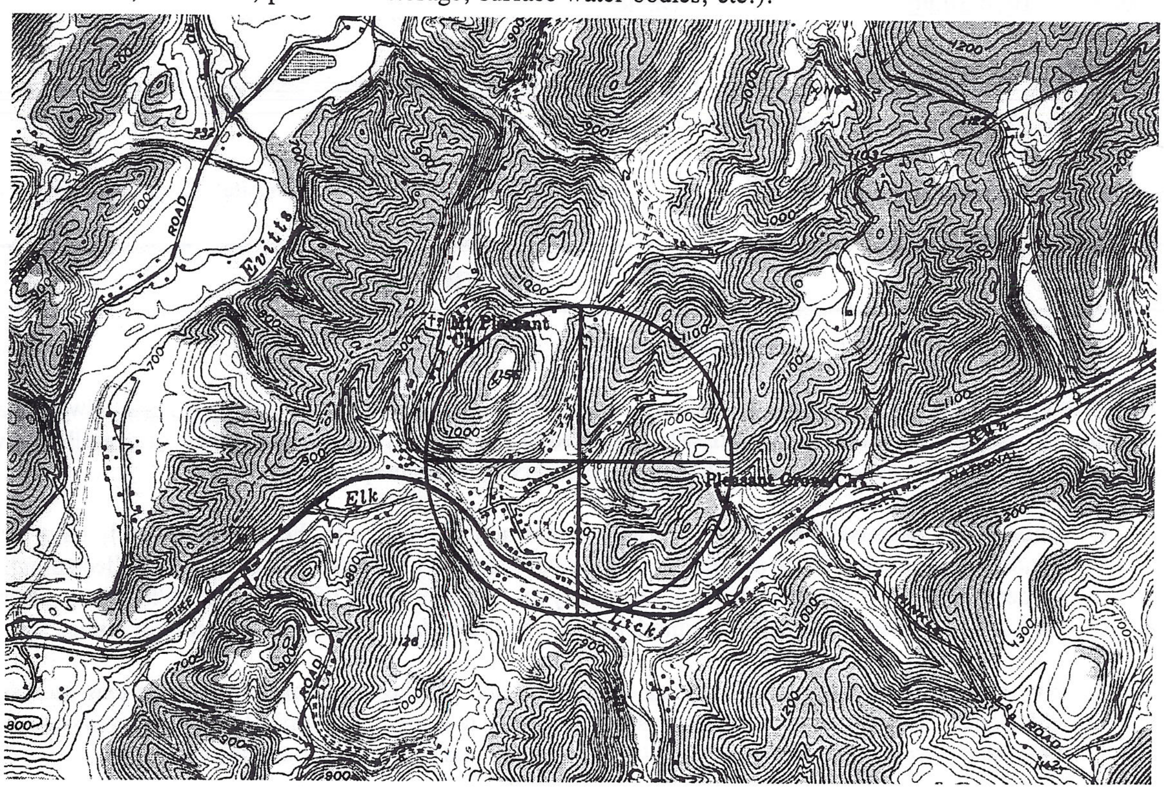
22. Well Information:

Tag Number:	Not visible
Year Drilled:	____
Casing Depth:	____
Well Depth:	____
Well Yield:	____
Casing Height:	____
Grout Depth:	____
Pitless Adapter?	____
Wiring OK?	unknown
Pump OK?	unknown

23. Well Type:

Drilled	_x_
Driven	____
Dug	____

24. Well Location Diagram with Approximate Distances from Potential Contaminant Sources (i.e. septic, sewer lines, structures, petroleum storage, surface water bodies, etc.):



25. Aquifer:

Name:	Clinton Group
GAP #:	____
Confined	____
Unconfined	____
Semi-confined	____

26. Quantity Used:

Daily Avg (gpd)	<600
Pumping Rate (gpm)	____
Hours run per day	____

27. Well Cap:

Type?	____
Seal Tight?	O.K.
Vented?	O.K.
Screened?	No
Conduit OK?	O.K.

28. Casing Diameter:

2"	____
4"	____
6"	_x_
Other	____

29. Casing Type:

PVC	____
Metal	_x_
Concrete	____