

**WELLHEAD SURVEY AREA
BARRELVILLE OUTDOOR CLUB, INC.
ACHD SITE NO. 28
Mount Savage, 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 Area Survey for Barrelville Outdoor Club, Inc. (The Club), located on the east side of Barrelville Road (MD Route 47), immediately west of North Branch in Barrelville, in northwestern Allegany County, Maryland. This site, designated No. 28 by ACHD, is served by one 6-inch diameter, steel-cased production well completed in the local bedrock aquifer.

The draft 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." Although no confirming interview information was available, ALWI observed the facility to be vacant and closed on each of several occasions suggest that this water system is indeed a transient non-community system (TNC).

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 Area Survey 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 B).
3. **Contamination Hazard Assessment** – ALWI identified existing and potential contaminant hazards within the delineated surveyed 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 Club is situated within the Appalachian Plateau physiographic province and is underlain by consolidated sedimentary rocks of Pennsylvanian age. The Casselman Formation underlies the site and consists of fine-grained sedimentary rock (Cleaves and others, 1968). These rocks have been gently folded, resulting in broad 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. However, at this location, the bedding planes are nearly horizontal, which suggests that the gentle southwesterly structural plunge may exert greater-than-usual control on deep groundwater flow directions.

Reported well yields within the Casselman Formation are sparse but range from 1 to 170 gpm (Slaughter and Darling, 1962). Casselman Formation 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 Casselman Formation 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 Casselman Formation as locally variable (iron concentrations range from 0.02 to as much as 6.0 micrograms per liter (mg/l); hardness ranges from 17 to 303 mg/l; and pH ranges from 6.5 to 8.3). 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 December 28, 1998, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ALWI collected raw water samples as specified in COMAR 26.04.01.14. 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. However, the close proximity of the well to North Branch places it at moderate to high risk for surface water influence as defined in the MDE guidance document. This risk would be better quantified with better information on subsurface borehole conditions (e.g., depth of casing) and the potential for variance in surface water indicator parameters (raw water bacteria; temperature and turbidity) with differing precipitation regimes. Ultimate decisions regarding possible filtration retrofits or bottled water conversion are appropriately driven by economic considerations (the capital and operational costs of domestic-scale filtration vs. the nightly consumption).

4.0 DELINEATION

ALWI delineated a surveyed area 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. The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B). ALWI used a fixed radius of 1,000 feet around the well, which creates an area of approximately 72 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 43,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (approximately 500 gpd) is more than one full order of magnitude 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 December 28, 1998. 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 upon the accuracy of historical interview information provided by the owner and his employees to provide context for some of its observations.

No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. 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. The well is located at the rear of the building and is surrounded both by chain link fence and (on three sides) masonry walls. The owner reported that these measures were taken to avoid a repeat of casing damage that occurred in the past. On one such occasion, an intoxicated patron collided with the casing while exiting the parking lot.

ALWI observed that the portion of the casing exposed at ground surface appeared restored 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. A watertight cap would also provide greater protection from occasional flooding of North Branch.

On December 28, 1998, 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.

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

6.0 CONCLUSION AND RECOMMENDATIONS

ALWI did not find acute conditions suggesting non-potability of a type warranting immediate reporting, resampling, or other emergency corrective action. No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. ALWI developed the recommendations within this section following MDE guidelines but also in light of site-specific practicalities. For example, ALWI acknowledges that the on-site well cannot be relocated so far from North Branch so as to eliminate all risk of contamination of the groundwater supply from surface water. ALWI also acknowledges that the use of water is intrinsic to the Club's functions.

6.1 SUPPLEMENTAL INVESTIGATIVE MEASURES

ALWI developed the following recommendations to better assess the vulnerability of this water supply.

1. **Surface Water Influence** - Property ownership interests should collect and analyze groundwater samples for indicators of groundwater under the direct influence of surface water (e.g., turbidity, temperature, and bacteria analyses performed daily for four consecutive days immediately after a 0.5-inch rainfall event).
2. **Subsurface Disposal Facilities** – 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.
3. **Highway and Parking Area Deicing** – Highway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. The State Highway Administration (SHA) is unlikely to curtail or otherwise change deicing practices on Barrelville Road. However, consideration should be given to using non-chemical abrasives on the parking lot for deicing to the degree possible. Baseline and bi-annual sampling for sodium and chlorides should be considered.

6.2 SOURCE REDUCTION MEASURES

Depending on the results of the analyses indicated above, business ownership interests should evaluate the comparative cost and feasibility of converting to bottled sources of potable water vs. retrofitting the existing groundwater supply system with appropriate filtration measures to better protect from human health pathogens typically found in surface water (e.g., *Giardia* and *Cryptosporidium*). If bottled water is the preferred option or if no action is taken to investigate and mitigate this risk, appropriate placarding should be provided so as to warn against use of an untested source for potable purposes.

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: <u>Barrelville Outdoor Club, Inc.</u>		2. WAS: <u>28</u>	
3. System Information:		4. ADC Map/Grid: <u>N/A</u>	5. Tax Map/Plat: <u>N/A</u>
Address: <u>13916 Barrelville Road, NW</u>		6. Population:	
<u>Mt. Savage, Maryland</u>			
Phone No.: <u>(301) 264-3239</u>			
7. Property Information:		8. No. Service Connections:	
Owner's Name <u>Barrelville Outdoor Club</u>		9. Type of Facility:	
Address: <u>13916 Barrelville Road, NW</u>			
<u>Mt. Savage, Maryland</u>			
Phone No. <u>(301) 264-3239</u>			
10. Contact Person:	11. Operator:		
Name: <u>Barrelville Outdoor Club</u>	Name: _____		
Phone No. <u>(301) 264-3239</u>	Cert. No. _____		
12. Sample History (Has the system had any violations?):			
Bacteria: <u>None apparent or reported</u>		Nitrate: <u>None apparent or reported</u>	

SURVEY RESULTS

13. Comments on System, Recommendations:

ALWI developed the following recommendations to better assess the vulnerability of this water supply.

1. **Surface Water Influence** - Property ownership interests should collect and analyze groundwater samples for indicators of groundwater under the direct influence of surface water (e.g., turbidity, temperature, and bacteria analyses performed daily for four consecutive days immediately after a 0.5-inch rainfall event).
2. **Subsurface Disposal Facilities** – 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.
3. **Highway and Parking Area Deicing** – Highway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. The State Highway Administration (SHA) is unlikely to curtail or otherwise change deicing practices on Barrelville Road. However, consideration should be given to using non-chemical abrasives on the parking lot for deicing to the degree possible. Baseline and bi-annual sampling for sodium and chlorides should be considered.

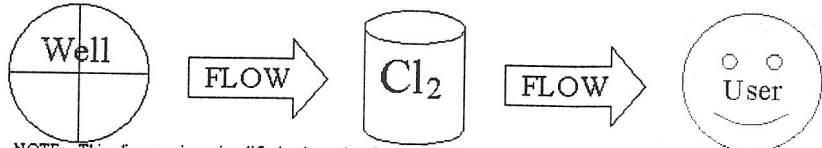
14. Inspected by: <u>Mark W. Eisner</u>	15. Date inspected: <u>12/28/98</u>	16. System Vulnerability Protected _____ Vulnerable <u>yes (see report)</u>
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WATER PLANT INFORMATION

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

- Disinfection
 Gas Chlorine: _____
 Sodium Hypochlorite _____
 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 _____
 Other _____

20. Storage Capacity:

Typical Domestic

21. Untreated water sampling tap?

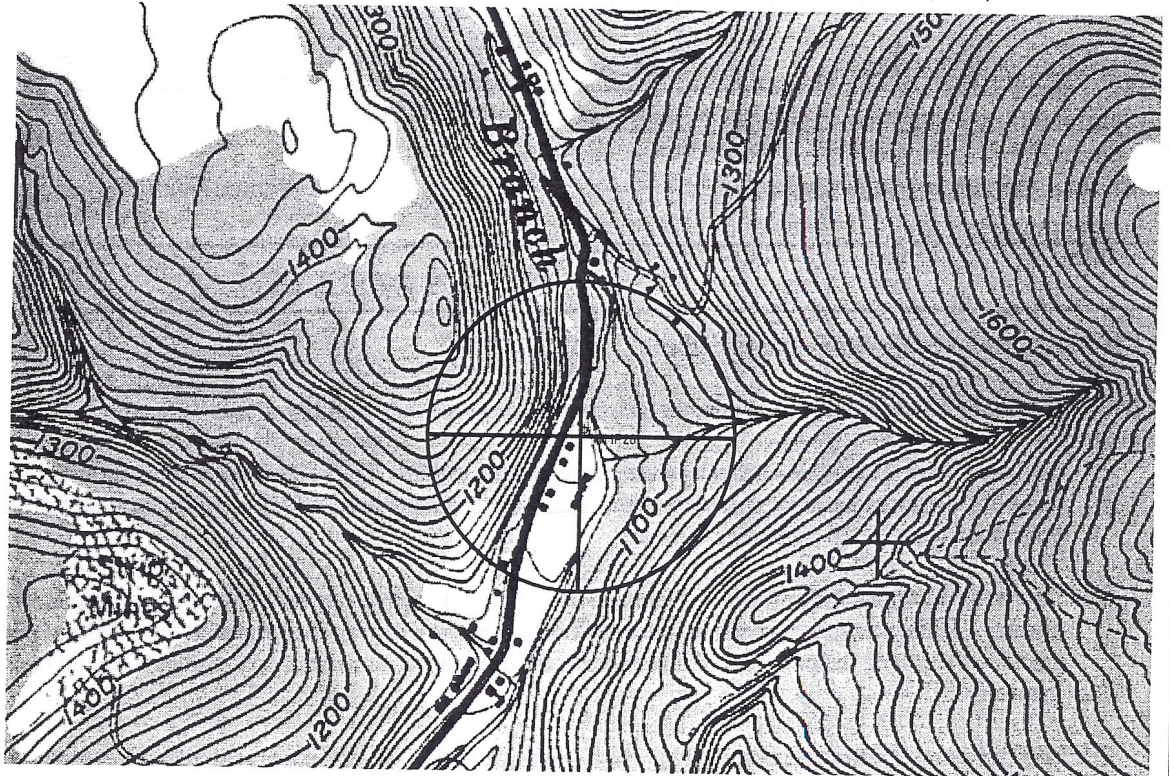
Yes _____ No _____

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

24. Well Location Diagram (1 in. = 1250 ft.) with Approximate Distances from Potential Contaminant Sources (i.e. septic, sewer lines, structures, petroleum storage, surface water bodies, etc.):



23. Well Type:

- Drilled _____
 Driven _____
 Dug _____

25. Aquifer:

- Name: Casselman
 GAP #: _____
 Confined _____
 Unconfined _____
 Semi-confined _____

26. Quantity Used:

- Daily Avg (gpd) 500 +/-
 Pumping Rate (gpm) unknown
 Hours run per day unknown

27. Well Cap:

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

28. Casing Diameter:

- 2" _____
 4" _____
 6" _____
 Other _____

29. Casing Type:

- PVC _____
 Metal _____
 Concrete _____