

**WELLHEAD AREA SURVEY
WILLOWBROOK SEVENTH DAY ADVENTIST SCHOOL
ACHD SITE NO. 60
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 Area Survey for Willowbrook Seventh Day Adventist School (the School), located on the northeast side of Williams Road in central Allegany County, Maryland. This site, designated No. 60 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." An interview with an administrator suggested that the small number of students (8 in 1999) and faculty support its classification as 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 attempted to interview the owner/operator and/or employee(s) to document information on the use patterns, history, and problems associated with the supply. However, no one was present at the time of a site visit and several attempts at correspondence with the site owner were unsuccessful.
2. **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.

2.1.1 BEDROCK GEOLOGY

The School is situated within the Valley and Ridge physiographic province and is underlain by fine-grained sedimentary rock of Devonian age. The Hamilton Group, which mainly consists of the Marcellus and Needmore shales (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 west, and the groundwater flow direction likely follows. Reported well yields within the Hamilton Group are sparse but average six gpm (Slaughter and Darling, 1962).

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 Hamilton 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 water quality from the Hamilton Group as locally variable (iron concentrations range from 0.79 to as much as 8.2 micrograms per liter (mg/l); hardness ranges from 213 to 227 mg/l; and pH ranges from 7.1 to 7.7). 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 water samples on September 22, 1999, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. 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. 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 (doubtlessly less than 100 gpd) is more than two orders of magnitude smaller than the total available in the surveyed area, lending a high degree of conservatism to this analysis.

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 observed two potential contamination sources in the delineated area: an on-site AST and a suspect wastewater cistern. No discharge to groundwater has been confirmed by either of the facilities.

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. **Above-Ground Storage Tank** – School personnel indicated that heating oil was stored in an AST located in a second building in the northeast corner of the property. ALWI could not enter the building and therefore could not assess the condition of the tank. ALWI recommends regular maintenance of this fuel storage and delivery system, including development of specific protocols to be employed in case of a leak or overflow.
2. **Wastewater Disposal Facilities** – ALWI observed a wastewater cistern directly east of the main school building. 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 and/or a plan to replace the cistern with a more modern disposal system.
3. **Parking Area Deicing** – Parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. 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.

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>Seventh Day Adventist School</u>		2. WAS: <u>60</u>	
System Information: Address: <u>12235 Williams Road, SE</u> <u>Cumberland, Maryland</u> Phone No.: <u>(301) 722-2721</u>		4. ADC Map/Grid: <u>N/A</u>	5. Tax Map/Plat: <u>N/A</u>
		6. Population: Transient <u><25</u> Regular _____ Total <u><25</u>	
7. Property Information: Owner's Name <u>Seventh Day Adventist School</u> Address: <u>12235 Williams Road, SE</u> <u>Cumberland, Maryland</u> Phone No.: <u>(301) 722-2721</u>		8. No. Service Connections: _____	
		9. Type of Facility: Food Service _____ Church _____ Campground _____ Daycare _____ Other (specify) <u>School</u>	
10. Contact Person: Name: _____ Phone No. _____	11. Operator: Name: _____ 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 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.

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14. Inspected by: <u>Mark W. Eisner</u>	15. Date inspected: <u>9/22/99</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: _____

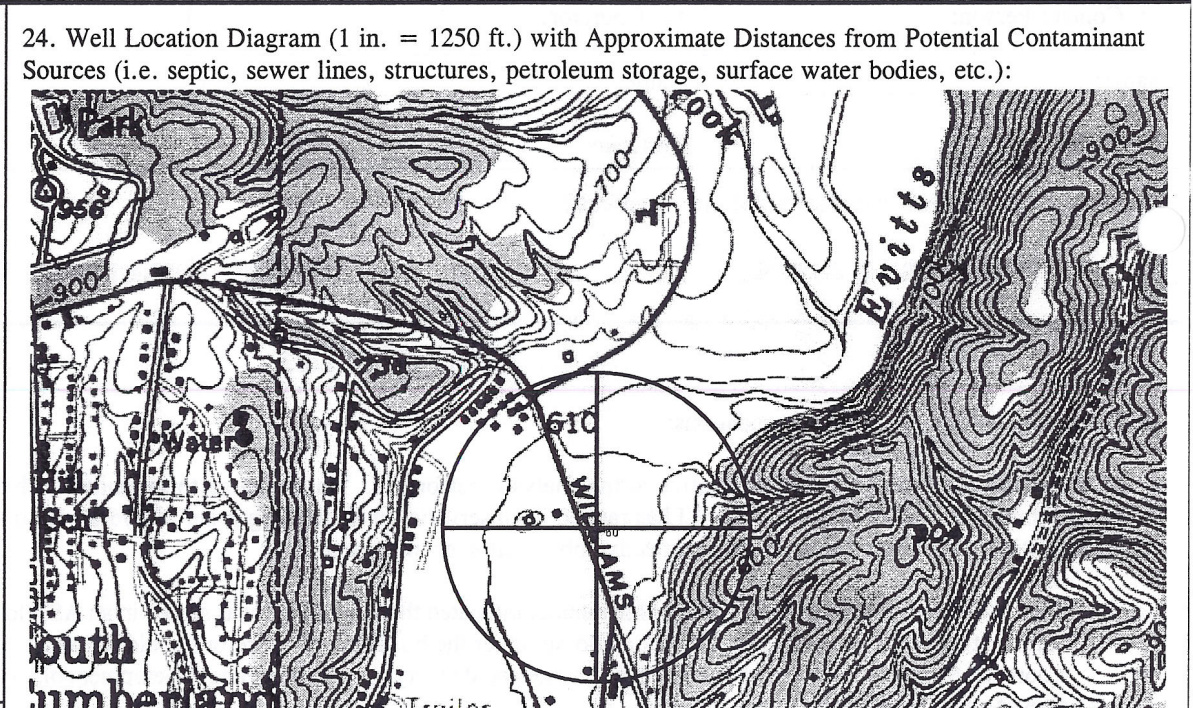
Casing Height: _____

Grout Depth: _____

Pitless Adapter? _____

Wiring OK? unknown

Pump OK? unknown



23. Well Type:

Drilled

Driven _____

Dug _____

25. Aquifer:

Name: Hamilton Group

GAP #: _____

Confined _____

Unconfined

Semi-confined _____

26. Quantity Used:

Daily Avg (gpd) < 100

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"

Other _____

29. Casing Type:

PVC _____

Metal

Concrete _____