WELLHEAD AREA SURVEY
BARTON SCHOOL
ACHD SITE NO. 1
Barton, 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 Barton School, a public facility of the Allegany County Board of Education, located on the south side of Old Miller Road, and east of Georges Creek in southwestern Allegany County, Maryland. This site, designated No. 1 by ACHD, is served by one six-inch steel-cased 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 informal interview with the chief custodian suggested that the number of students (175 annually) combined with the fact that school is in session three-quarters of the year make this 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

Barton School is situated within the Appalachian Plateau physiographic province and is underlain by consolidated sedimentary rocks of Pennsylvanian age. The Conemaugh Formation underlies the site and consists of fine-grained sedimentary rock (Cleaves, 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 Conemaugh Formation are sparse but range from 5 to 170 gpm (Slaughter and Darling, 1962). Conemaugh 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 Conemaugh 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 Conemaugh 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 16, 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.

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 is much 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 December 16, 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 on the accuracy of interviews for this information.

5.1 POTENTIAL HAZARDS AT THE WELLHEAD

Design, construction and present condition are important factors in determining a well's susceptibility to contamination. An existing well completion report for one of the wells (Appendix C) suggests the following:

1. **Casing and Cap** - Steel casing (approximately 6 in. in diameter) was set within a 10-inch diameter hole to approximately 26 feet below ground surface (BGS). ALWI observed that the portion of the casing exposed at ground surface appeared intact for the well. The well 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 the occasional flooding Georges Creek.

2. **Grout** - Neat Portland cement originally sealed the annular space from 26 feet to ground surface. ALWI could not observe the condition of this grout. If the subsurface grout is missing, bridged, or otherwise degraded, surficial contaminants could find a "short-circuit" pathway to groundwater by flowing down the outside of the casing.

3. **Water Bearing Zones** –Water-bearing fractures were encountered at approximately 58 and 110 feet below grade. These depths lessen, but do not eliminate, the possibility of surface water influence. Also, as a general rule natural water quality generally worsens (aesthetically) with well depth in the Georges Creek Basin.

5.2 OTHER LOCAL CONTAMINATION RISKS

ALWI observed several potential contamination sources in the delineated area. ALWI identified the following potential sources of contamination within the surveyed area: a former on-site UST[1], school laboratory wastes, and an on-site AST. ALWI conducted limited personal interviews to identify and describe these potential contaminant hazards.

[1] Any finding of petroleum-contaminated groundwater must be reported to the MDE Oil Control Program. Such a report would open (or reopen) an Oil Control Program case file. MDE Oil Control Program representatives may order additional sampling, UST tightness testing, UST removal(s), monitoring well drilling, and/or other investigative and remedial measures. ALWI suggests that site ownership and ACHD consult legal counsel before taking any action that could have adverse financial or environmental liability consequences.

No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. On-site custodial staff had vague recollection of an MDE required UST leakage investigation. No additional information was available.

The close proximity of the well to Georges Creek 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 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 daily consumption of water).

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. **Underground Storage Tank -** Fuel oil is used as a heating source at this facility. School personnel indicated that the fuel was formerly stored in an on-site 10,000 gallon UST that was of uncertain to doubtful integrity upon removal. Given the proximity of the former UST to the wells and its understood long history of use, one-time analytical testing to confirm the absence of fuel oil constituents (e.g., naphthalene, and total diesel-range petroleum hydrocarbon compounds) in the water seems appropriate. Periodic monitoring and other corrective actions as necessary should then be considered based on the findings.

2. **Above-Ground Fuel Tank** – ALWI observed a 5,000 gallon above-ground fuel storage tank (AST) in a vault. This AST appeared in good condition. 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 overfill.

3. **Surface Water Influence –** Based on the proximity to Georges Creek, 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).

4. **Chemistry Laboratories** – Barton School doubtlessly houses chemistry laboratories. It is unknown where liquid discharges from the laboratory sinks. No

analytical testing data of either the wastewater stream nor the influent water was available relative to the possibly hazardous constituents of this waste system.

5. **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: Barton Elementary School

2. WAS: 1

3. System Information:

Address: 19808 New Geo. Creek. Road, SW

Barton, Maryland

Phone No.: (301) 759-2000

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient	___
Regular	175
Total	175 +/-

7. Property Information:

Owner's Name: Allegany Co. Board of Education

Address: 19808 New Georges Creek Road, SW

Barton, Maryland

Phone No. (301) 759-2000

8. No. Service Connections:

9. Type of Facility:

Food Service	___
Church	___
Campground	___
Daycare	___
Other (specify)	School

10. Contact Person:

Name: William Grogg

Phone No. (301) 759-2000

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: 12/16/98

16. System Vulnerability
Protected ___ Vulnerable Yes (see report)

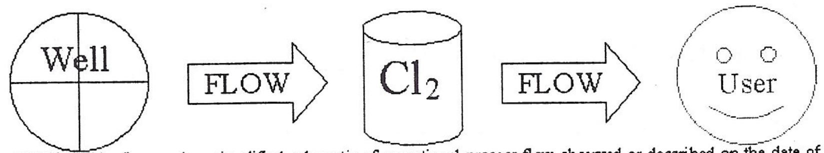
WATER PLANT INFORMATION

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

Disinfection
- Gas Chlorine: ______
- Sodium Hypochlorite _x_____
- Ultraviolet Radiation ______

Iron Removal _x_____
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:

~ 4,000 gpd

21. Untreated water sampling tap?

Yes _x___ No _____

WELL INFORMATION

22. Well Information:

Tag Number: AL-73-0298

Year Drilled: 1975

Casing Depth: 26

Well Depth: 122 feet

Well Yield: 50

Casing Height: 2

Grout Depth: 26

Pitless Adapter? _yes____

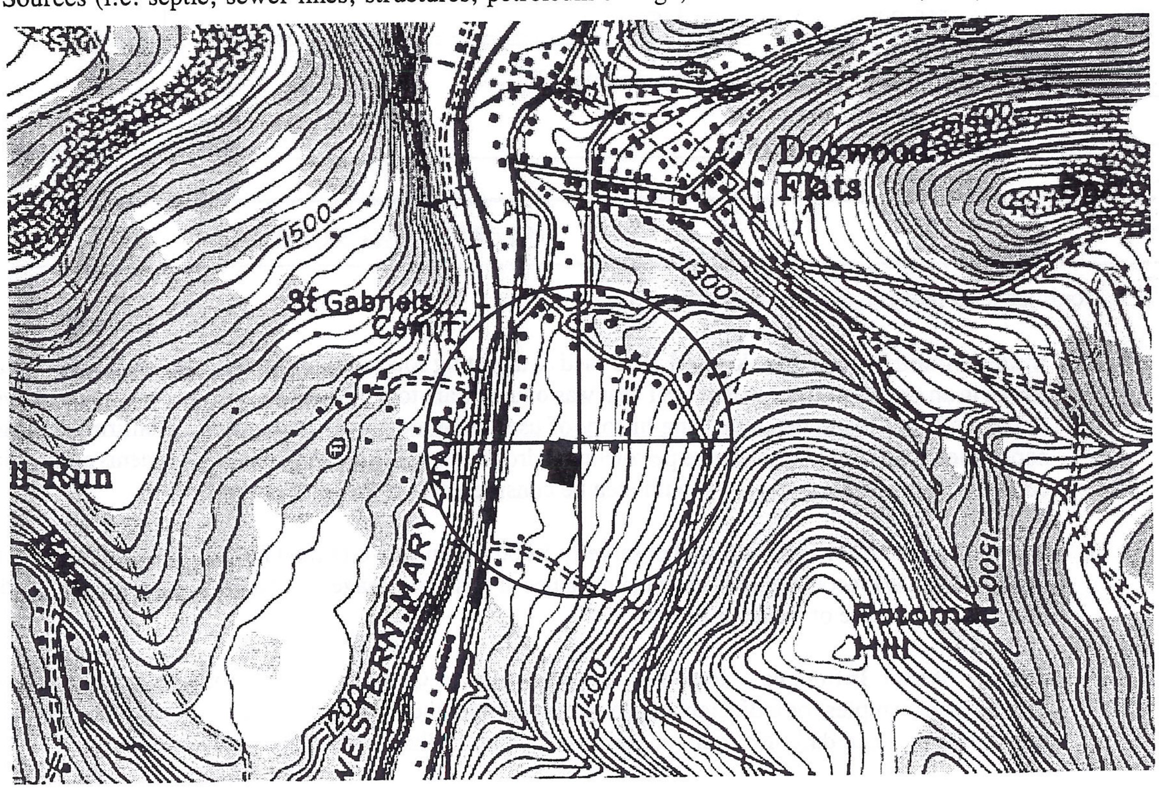
Wiring OK? unknown

Pump OK? unknown

23. Well Type:

Drilled _x___
Driven ______
Dug ______

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.):



25. Aquifer:

Name: Conemaugh___
GAP #: ______________
Confined ______
Unconfined _x___
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 ______