WELLHEAD AREA SURVEY
BELLE GROVE GROCERY
ACHD SITE NO. 61
Belle Grove, 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 Belle Grove Grocery (the Grocery), located on the west side of Orleans Road, 0.2 mile north of its Intersection with the National Freeway (Interstate Route 68) and 0.1 mile south of its intersection with Scenic U.S. Route 40 (Old National Pike) in northeastern Allegany County, Maryland. The Grocery operates a lunch counter and offers coffee for sale. This site, designated No. 61 by ACHD, is served by one 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." On December 14, 1998, the proprietor indicated that an average of 500 customers pass through the store each day. He further assumed that perhaps 200 used the restroom or purchased food or drink prepared on premises. Ten pots of coffee are consumed per day and between two and three employees are present during each shift. In total, approximately 1,000 gallons of water are used per day but over 100 patrons are exposed to the supply. Given the site's highway interchange location, however, ALWI doubts that more than 25 regular patrons are exposed to this supply on a steady basis. Accordingly, this site is appropriately classified as a TNC system.

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.

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 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 site is situated within the Appalachian Valley and Ridge physiographic province and is underlain by sedimentary rocks of late Devonian age. These rocks have been intensely folded and faulted, resulting in alternating synclines (concave-upward folds) and anticlines (convex-upward folds).

In three dimensions, the rock formations of such folds dip at right angles to the direction of plunge of the entire fold system. In general, dip directions may help govern groundwater (and contaminant) movement directions in the bedrock but plunge directions have no relation. At this location, the bedding planes dip gently to the east-southeast. Deep groundwater flow directions likely follow.

Reported local well yields are sparse but range from 5 to 10 gpm. Wells completed within sandstone 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 Hampshire 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 regional water quality as slightly irony (0.01 to as much as .12 micrograms per liter (mg/l), soft (19 to 77 mg/l), and slightly acidic to moderately alkaline (pH range of 6.3 to 8.7). 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 groundwater samples on December 14, 1998, in accordance with the MDE sampling procedures specified in COMAR 26.08.05. ALWI observed that the supply is not disinfected, which allowed ALWI to collect a sample from a port near the pressure tank as provided 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 that the samples collected are potable relative to the analyses performed. The supply appears to be at "moderate risk" for surface water influence as defined in the MDE guidance document. This is based on proximity to two different unnamed tributaries of Sideling Hill Creek. According to the guidance document, two sets of wet weather samples[1] are required to confirm the absence of surface water pathogens.

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 areas across streams and more than 100 feet down-gradient.

The resultant delineation is shown on the "Water Plant Information" survey form (Appendix B) and encompasses approximately 20% of the circle (originally 72 acres in size) or 15 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), over 9,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (approximated by ALWI at 1,000 gpd) is nearly one full order of magnitude smaller than 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.

[1] Analyses should include total and fecal coliform bacteria, temperature and turbidity.

5.0 CONTAMINANT THREATS ASSESSMENT

ALWI performed a site reconnaissance on December 14, 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.

5.1 POTENTIAL HAZARDS AT THE WELLHEAD

The property owner reported that a vehicular accident had damaged the well's casing several years ago. As a corrective measure, new casing was provided and traffic barriers (i.e., large railroad ties) limit the likelihood of a recurrence.

5.2 OTHER LOCAL CONTAMINATION RISKS

Based on observation and interview information, on December 14, 1998, ALWI assessed several potential contamination sources in the delineated area. ALWI identified the following potential sources of contamination within the surveyed area: surficial and subsurface fuel spills from USTs[2], possible stormwater infiltration along the well's casing[3], salt from road deicing, vehicle drippings from both functional and junked vehicles onto the gravel parking lot, and a continuing risk of well casing damage based on its location in the middle of the gravel parking lot.

6.0 CONCLUSION AND RECOMMENDATIONS

ALWI found that the on-site supply is potable relative to the analyses performed. No discharge to groundwater has been confirmed by any of the facilities or practices ALWI observed. Nevertheless, ALWI provides recommendations to assess and mitigate the risk from the following hazards:

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[2] UST facilities have been located on site since it opened in 1984. According to the owner, approximately ten years ago a fiberglass UST failed and was removed along with an unspecified amount of gasoline-contaminated soil. No groundwater assessment was performed at that time. UST compliance upgrades were scheduled for early in 1999.

[3] ALWI observed a PVC casing extension attached to the main steel casing with a rubber Fernco$_{TM}$ compression fitting. COMAR 26.04.04.07D(5)(a-c) suggests that fitting metal to plastic well casing may violate MDE well construction standards and ALWI believes that such an arrangement in inadvisable for a supply at moderate to high risk of surficial contamination. Additionally, the railroad ties employed as traffic barriers likely contain chromium copper arsenate, pentachlorophenol and/or other potentially carcinogenic wood preservative compounds.

1. **Petroleum from USTs** – Several USTs exist within 200 feet of the well. One former gasoline UST was found to be leaking but a groundwater assessment was never performed. Given the proximity of the UST(s) and their understood long history of use, ALWI recommends semi-annual analytical testing to confirm the absence of gasoline and fuel oil constituents (e.g., benzene, toluene, ethylbenzene, xylenes, methyl-tertiary-butyl-ether, naphthalene, and total gasoline- and diesel-range petroleum hydrocarbon compounds). Consideration should also be given to a solvent scan by EPA Method 524 considering the junked vehicle and parts storage practices on-site whether or not analyses are performed, ALWI recommends that site personnel fully drain and properly dispose of all hazardous materials and petroleum products before storing vehicles and parts on-site. The frequency of repeat sampling may be adjusted depending on the results. Other corrective actions may be necessary based on the findings.

2. **Unpaved Parking Area** – Leaks and spills on the parking lot may infiltrate into the groundwater. Consideration should be given to paving. If cost-prohibitive, no junked vehicles should be parked on site until all residual fluids are drained and the fueling areas should be paved and diked to contain oily runoff and/or spills.

3. **Roadway and Parking Area Deicing** – Highway and parking area deicing practices may increase a seasonal risk of sodium and chloride contamination. The Allegany County Roads Department and the Maryland State Highway Administration are unlikely to curtail or otherwise change deicing practices. 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.

4. **Vehicular Casing Damage** – The railroad ties presently used as traffic barriers may represent contamination sources themselves. ALWI recommends their removal and replacement with taller and brighter barriers of an environmentally inert nature (e.g.; "Jersey-wall" concrete barricades).

5. **Surface Water Influence** - Property owners should collect and analyze groundwater samples for the potential presence 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].

Depending on the results of the analyses indicated above, site ownership interests may find greater cost-effectiveness in converting to bottled sources of potable water. Retrofitting the existing groundwater supply with filtration or other costly treatment measures, if warranted by the supplemental analyses recommended herein, may not be cost-effective considering the nature and quantity of on-site uses. If the site owner concurs, appropriate placarding should be provided so as to warn against use of an untested source for potable purposes.

6.0 SELECTED REFERENCES

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: Belle Grove Grocery

2. WAS: 61

System Information:

Address: Route #1, Box 54

Little Orleans, Maryland 21766

Phone No.: (301) 478-2828

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient	500
Regular	25
Total	525

7. Property Information:

Owner's Name Maxine Jay

Address: Route #1, Box 54

Little Orleans, Maryland

Phone No. (301) 478-2828

8. No. Service Connections:

9. Type of Facility:

Food Service	X
Church	
Campground	
Daycare	
Other (specify)	

10. Contact Person:

Name: Maxine Jay

Phone No. (301) 478-2828

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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2. **Unpaved Parking Area** – Leaks and spills on the parking lot may infiltrate into the groundwater. Consideration should be given to paving. If cost-prohibitive, no junked vehicles should be parked on site until all residual fluids are drained and the fueling areas should be paved and diked to contain oily runoff and/or spills.
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4. **Vehicular Casing Damage** – The railroad ties presently used as traffic barriers may represent contamination sources themselves. ALWI recommends their removal and replacement with taller and brighter barriers of an environmentally inert nature (e.g.; "Jersey-wall" concrete barricades).
5. **Surface Water Influence** - Property owners should collect and analyze groundwater samples for the potential presence 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].

14. Inspected by: Mark W. Eisner

15. Date inspected: 12/14/98

16. System Vulnerability

Protected ______ Vulnerable yes (see report)

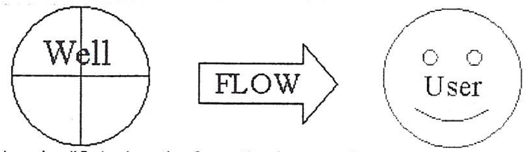
WATER PLANT INFORMATION

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

Disinfection
- Gas Chlorine: ______
- Sodium Hypochlorite ______
- 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 _x____ No _____

WELL INFORMATION

22. Well Information:

Tag Number: not visible

Year Drilled: 1983

Casing Depth: _____

Well Depth: 341 feet

Well Yield: 25

Casing Height: 2

Grout Depth: 27.6 feet

Pitless Adapter? ______

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: Devonian________
GAP #: ________________
Confined ______
Unconfined _x____
Semi-confined ______

26. Quantity Used:

Daily Avg (gpd) 1,000
Pumping Rate (gpm) 5 - 10
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 ______