WELLHEAD AREA SURVEY
HOUSE OF ICE
ACHD SITE NO. 24
Dawson, 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 House of Ice, located at the west end of Silver Ridge Road, and immediately south of an unnamed tributary of the Potomac River in southern Allegany County, Maryland. The House of Ice is a privately owned commercial ice operation. This site, designated No. 24 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." An informal interview with the owner suggested the ice is sold to various people, so there is typically no constant exposure. Therefore, this is 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 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

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 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 House of Ice 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 varies considerably over short distances depending on the thickness of Quaternary alluvial deposits and other factors. In highly overlying soil mantle. The thickness of the soil and saprolite varies considerably over short distances depending on the thickness of Quaternary alluvial deposits and other factors. 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 and Quaternary alluvium 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.

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 December 15, 1998, 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 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. 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 80% of the circle (originally 72 acres in size) or 58 acres. Within an assumed 600 gallons per day per acre (gpd/ac) of annualized groundwater recharge (Slaughter and Darling, 1962, Table 37), slightly less than 35,000 gallons per day exists within the aquifer beneath this surveyed area. In actuality, the modest demand of this well (500 – 600 gpd on average) 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 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 upon the accuracy of historical interview information provided by the owner to provide context for some of its observations.

5.1 POTENTIAL HAZARDS AT THE WELLHEAD

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 top of the casing terminates below grade, in apparent violation of several provisions[1] within COMAR 26.04.04.07F. Stormwater may enter the vault and may accumulate in this vault and enter the well, entraining microbial contaminants from the dark recesses of the pit as well as various other potential contaminants. Extension of the casing to above natural grade and the addition of a pitless adapter and conduit well cap would provide greater protection against possible contamination.

[1] This regulation prohibits frost pits, requires pitless adapters, and specifies that the finished height of well casings extend at least 8 inches above natural grade.

5.2 Other Local Contamination Risks

ALWI observed little other for potential contamination in the delineated area including equipment storage near the wellhead. ALWI performed a site reconnaissance and conducted limited personal interviews to identify and describe these potential contaminant hazards.

The proximity of the well to a nearby stream places it at "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 are appropriately driven by economic considerations (the capital and operational costs of domestic-scale filtration vs. the daily manufacture of ice).

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 has ranked its observations in decreasing order of overall relative risk. ALWI provides specific recommendations at the conclusion of each respective observation or interpretation.

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

1. **Subsurface Well Completion –** The well should be retrofitted with a pitless adapter and casing extended to above-grade. The frost pit should be backfilled with inert material taking care to adhere to casing grouting requirements in so doing. The addition of a modern conduit well cap will help prevent the entrance of bacteria into the well. Access for pump repairs and replacements should be maintained as well.

2. **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).

3. **Storage Practices** – ALWI observed equipment storage (snow plow blade, back hoe components, etc.) near the wellhead. These represent a risk of contamination during rainstorms, when residue can be mobilized. This risk is heightened by the existence of the well vault, where these contaminants may collect and infiltrate along the well casing.

4. **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.

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: House of Ice

2. WAS: 24

3. System Information:

Address: 19807 Cemetery Road, SW

Rawlings, Maryland

Phone No.: (301) 777-3585

4. ADC Map/Grid: N/A

5. Tax Map/Plat: N/A

6. Population:

Transient ____
Regular 1
Total 1 +/-

7. Property Information:

Owner's Name House of Ice

Address: 19807 Cemetery Road, SW

Rawlings, Maryland

Phone No. (301) 777-3585

8. No. Service Connections:

9. Type of Facility:

Food Service ____
Church ____
Campground ____
Daycare ____
Other (specify) Commercial Ice Production

10. Contact Person:

Name: House of Ice

Phone No. (301) 777-3585

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 ______
- Ultraviolet Radiation _x____

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 __x__ No _____

WELL INFORMATION

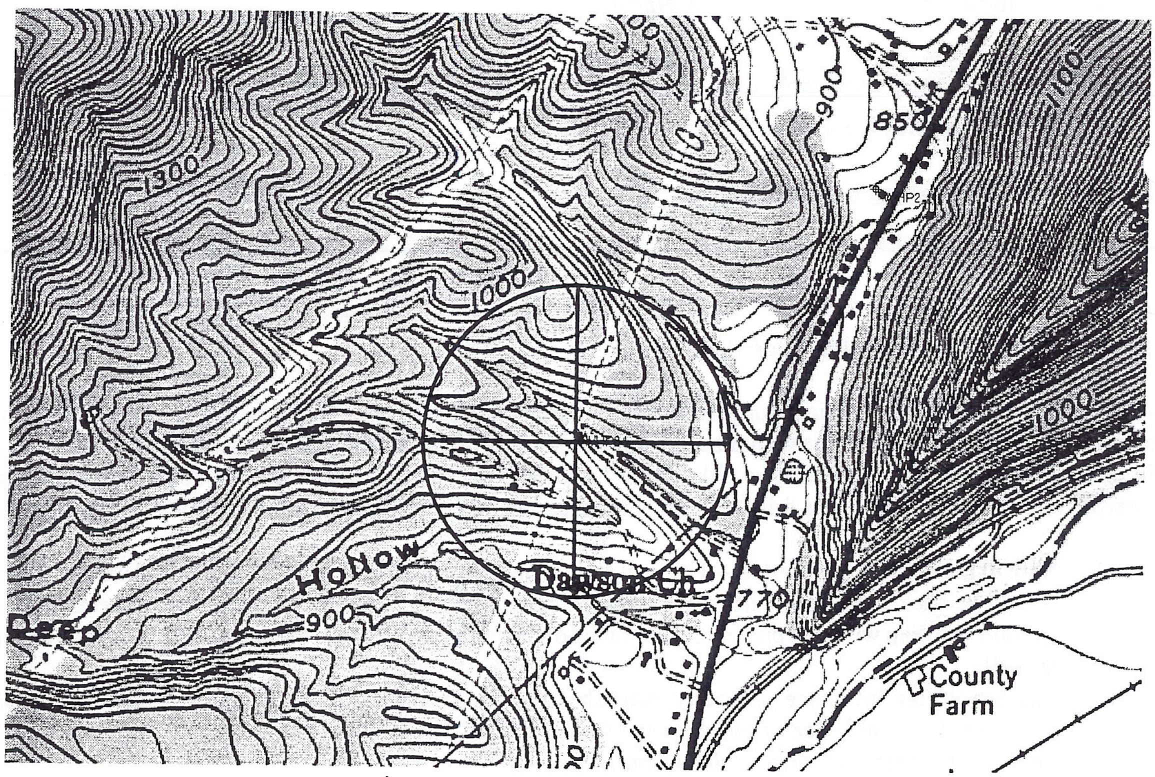
22. Well Information:

Tag Number: not visible
Year Drilled: ______
Casing Depth: ______
Well Depth: ______
Well Yield: ______
Casing Height: in pit
Grout Depth: ______
Pitless Adapter? no___
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: Hamilton________
GAP #: ______________
Confined ______
Unconfined _x___
Semi-confined ______

26. Quantity Used:

Daily Avg (gpd) 550___
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" __x___
Other ______

29. Casing Type:

PVC ______
Metal __x___
Concrete______