SOURCE WATER PROTECTION PROGRAM
BENEFITING THE BOONSBORO-KEEDYSVILLE WATER SYSTEM
(PWSID 021-0002)
WASHINGTON COUNTY, MARYLAND

ALWI Project No. MD7S075

August 19, 2013

PREPARED FOR THE

BOONSBORO-KEEDYSVILLE WATER SYSTEM

IN PARTIAL FULFILLMENT OF MARYLAND DEPARTMENT OF THE ENVIRONMENT IFB SOLICITATION NO. U00R1400308

ADVANCED Land and Water, Inc.
Global Environmental Solutions
7540 Main Street, Suite 7 • Sykesville, MD 21784
PHONE 410-795-4626 • FAX 410-795-4611 • www.alwi.com

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Reviewed and Approved By:

Mark W. Eisner, P.G.
President

Prepared and Submitted By:

David L. Pielmeier
Operations Mgr./Sr. Scientist

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1.0 INTRODUCTION

Advanced Land and Water, Inc. (ALWI) was engaged by the Maryland Department of the Environment (MDE) to assist 12 community groundwater systems, including the Boonsboro-Keedysville Water System (the System), in developing and implementing Source Water Protection Programs (SWPPs). These programs will help protect public health by identifying implementable measures to address existing and potential contaminant threats to groundwater supplies of safe drinking water.

In 2005, MDE developed a Source Water Assessment Program (SWAP) for the System (Appendix A). The System was and remains served by two active wells (Graystone Well 8 and the Shafer Park Well) and two springs (the Warrenfeltz and Keedysville Springs). Three other wells, owned by Boonsboro, are unused. Two of these wells are test wells, which have low blown yields of less than 45 gallons per minute. The third well, Crestview Well 9, is unused due to its susceptibility to surface water contamination, which results in high turbidity levels. Boonsboro has no present plans to use these three wells as municipal supplies, but their presence may aid future hydrogeologic evaluations if and when new groundwater source(s) are developed. The adjacent treatment plant currently lacks a filtration system to address the wells susceptibility to surface water contamination.

We updated this assessment to bring it current, following technical guidance and advice received from the Water Supply Program of MDE. Notwithstanding this, source water assessment is an intrinsically dynamic process. SWAPs continuously are affected by new data, changing regulations and the evolving experience and professional judgment of those involved in developing and implementing source water protection recommendations, such as those offered herein.

1.1 PURPOSE

Maryland's Source Water Assessment Program was approved by the U.S. Environmental Protection Agency (EPA) in November 1999, and the initial Source Water Assessment report for the System was completed in 2005. The 2005 report included recommendations for ongoing management and protection, as well as periodic updates to reflect changes to the water system, appropriation permit and/or land uses within Source Water Protection Areas (SWPAs) as they may periodically occur. Note that in the 2005 report, SWPAs were termed "wellhead protection areas."

While these past efforts recommended certain source protection and management concepts, MDE determined that the System be included in our current work based on a combination of the

size of the population served and the vulnerability of the aquifer to potential groundwater contaminants. Accordingly, the overall purpose of this contract is to assist the System in developing a more refined and ongoing SWPP, which includes specific guidance on implementing feasible source protection measures.

1.2 REGULATORY FRAMEWORK

ALWI followed MDE's source water assessment and wellhead protection guidelines, which stem from the Safe Drinking Water Act (SDWA) of 1974 and its later amendments, which established wellhead protection programs for each state under the oversight of the EPA. The 1996 Amendments to the SDWA mandated the State of Maryland to develop a Source Water Assessment Program. MDE completed a Source Water Assessment in 2005 (Appendix A). In September of 2011, ALWI was awarded the SWPP contract. The System's participation in the SWPP was voluntary and not a regulatory requirement under the SDWA.

1.3 BACKGROUND SYSTEM INFORMATION

The System (PWSID 021-0002) served 3,895 people on 1,541 connections as of 2011. These estimates include the connection of approximately 60 existing residential and commercial properties that were designated groundwater under the influence of surface water (GWUDI) in 2010.

The Towns of Boonsboro and Keedysville came to an agreement where the Town of Keedysville would provide water into the System (from the Keedysville Spring) in exchange for the Town of Boonsboro operating and maintaining the water system. Because the two Towns exist on a shared water system, the responsibility of source water protection also is shared. Accordingly, cooperation in integrating the recommendations provided herein is necessary for the collective safety and well-being of the citizens of both Towns.

The water system is served by the following sources:

- Warrenfeltz Spring - This spring, which MDE has determined is GWUDI, is located in the northern portion of the System, in Boonsboro. The Warrenfeltz Spring has an annualized water appropriation permit for 130,000 gallons per day (gpd).

- Keedysville Spring - This spring, which MDE determined is GWUDI, is located just east of the Town of Keedysville. The Keedysville Spring has an annualized water appropriation permit for 220,000 gpd.

- Graystone Well 8 & Shafer Park Well - These wells are located in the northwestern portion of the System in Boonsboro. The two wells have a combined, annualized water appropriation permit for 332,000 gpd.

- Crestview Well 9 - This well, located in Boonsboro, currently is not in use, as MDE has determined this well to be GWUDI. It has an annualized water appropriation permit for 1,000 gpd.

In the 2005 assessment, MDE reported that all of the wells and springs withdraw water from the Tomstown Formation, which is a carbonate rock aquifer susceptible to surficial contamination due to flow through shallow karst zones (i.e., water-soluble carbonate bedrock typified by sinkholes and other subsurface conduits).

MDE recommended that Boonsboro-Keedysville form a local planning committee to implement a source water protection plan for the two wells, while continuing to monitor contaminants listed in the SDWA. Additionally, MDE recommended that:

- The local planning team should work to develop an Ordinance for Wellhead Protection that encompasses both municipalities and Washington County.

- Boonsboro should properly abandon and seal Crestview Well 9, as no plans had been presented by the Town to construct the necessary treatment to make it a safe source of water. They further recommended that the two test wells be abandoned and sealed.

- The System should begin a groundwater level monitoring program, to help assess whether the permitted amounts for certain sources truly reflect their drought-level capacities. At ALWI's recommendation, the System is considering implementing such a study as part of a broader groundwater availability planning effort.

- Develop a spill response plan in concert with the Fire Department and other emergency response personnel.

One of ALWI's overall SWPP goals is to assist the System in moving forward with many of these and other recommendations.

1.4 TREATMENT METHODS

The system employs a two or three tier treatment process depending on the treatment plant and its associated sources. Treatment Plant 01 draws water from both the Warrenfeltz Spring (which is GWUDI) and the Shafer Park Well. Water is filtered to remove microbes and pathogens, and then disinfected using gaseous chlorination. Finally, the water is fluoridated before entering the distribution system.

Treatment Plant 02 draws water from Graystone Well 8. Water entering this plant is treated with gaseous chlorination and is then fluoridated. Water from Graystone Well 8 does not need to be filtered because the water is not GWUDI and is not known to have colonies of bacteria.

Treatment Plant 03 draws water from Keedysville Spring, another GWUDI source. Water from this spring is filtered to remove microbes and pathogens, and then disinfected using gaseous chlorination. Finally, the water is fluoridated before entering the distribution system.

1.5 DELINEATIONS REMAIN UNCHANGED FROM 2005 SWAP

ALWI reviewed the 2005 SWPA delineations for conformity to present site conditions, operational practices and current MDE guidance. For the two SWPAs, we determined whether or

not delineation updates were necessary. SWPAs are depicted on Figure 1; the 2005 source water assessment (including its narrative support for delineation methods) is provided in Appendix A. Generally, in 2005 MDE delineated two zones, termed the Upper and Lower Wellhead Protection Areas[1], based primarily on geology (carbonate versus fractured rock) and other physical and hydrologic features that might guide groundwater flow.

Updates to each SWPA were not necessary since no new sources were added to the System and there had been no changes to the System's water appropriation permits. However, Boonsboro has accepted an ALWI recommendation to merge the Upper and Lower areas for simplicity and ease of administration. As explained in Section 5.2, we recommend an associated karst-focused ordinance that applies to the entire merged SWPA. While we envision the functional efficacy of the ordinance to apply mainly to areas underlain by karst, inclusion of the full SWPA eliminates ambiguities and disputes over possible inaccuracies of published generalized geologic mapping.

2.0 CONTAMINANT THREATS ASSESSMENT

ALWI performed regulatory database reviews, field reconnaissance and interviews to update the 2005 inventory of potential sources of contamination within the SWPAs delineated by MDE. We considered both point and non-point sources of contamination.

2.1 STATE ENVIRONMENTAL DATABASE REVIEW

MDE provided ALWI the following state-maintained environmental databases to incorporate into point-source hazard inventories, with the date of database publication provided parenthetically as follows:

- Municipal and Industrial Groundwater Discharge Permits (6/14/2012);
- Pesticide Dealers (1/12/2012);
- Land Restoration Program Sites (Voluntary Cleanup Program and Comprehensive Environmental Response, Compensation, and Liability Act) (1/16/2012);
- MDE Oil Control Program databases (10/14/2011);
- Supplemental database listing of solid waste facilities, wood waste disposal sites and other hazardous waste generators. (2/2012); and
- Resource Conservation and Recovery Act sites (6/18/2012).

The databases helped with interpretations of groundwater susceptibility, in that the listed facilities may be generators of hazardous materials, petroleum products and/or other drinking water contaminants. Results of this review are integrated with the susceptibility discussion in

[1] The terms Wellhead Protection Area and Source Water Protection Area often can be used interchangeably. For this SWPP, we collectively refer to the areas delineated for the purpose of source water protection as Source Water Protection Areas (SWPAs).

Chapter 3 of this report.

2.2 FIELD RECONNAISSANCE WITHIN SWPA

ALWI supplemented the database review with a visual reconnaissance within the SWPA on December 15, 2011. Results of this updated inventory are displayed on Figure 1 and summarized in Table 1.

During this reconnaissance, local land use conditions were observed with emphasis on the potential use, storage and disposal practices of hazardous materials and petroleum products in such a location where System wells potentially could entrain related contaminants. Such conditions may have included visual evidence of present or former spills, stained or discolored ground surfaces, stressed vegetation, unusual odors or visible underground storage tank appurtenances. Adjacent and nearby properties were visually scanned to the degree practicable from public rights-of-way[2].

No new point-source hazards or significant changes in either land use or waste disposal practices were noted. ALWI notes that the SWPA is extensively forested, inaccessible by vehicle and not visible without substantial trespassing on private property. The possibility of concealed point-source contamination hazards remains, consequently.

The systems municipal production wells appeared to possess good physical integrity; subsurface or invasive work of a confirmatory nature was not a component of the scope for this contract. We did not observe evidence of direct contamination emanating from areas immediately surrounding the wells or springs. ALWI staff noticed that Graystone Well 8 and the Shafer Park Well are locked behind gates, with well caps that are properly secured and locked. Though Crestview Well 9 and its associated treatment facility are gated, these gates were unlocked at our time of visit.

Also worth noting is that several initiatives to improve source protection and springhouse conditions have been completed, including renovation of the Warrenfeltz springhouse, improvements to the Keedysville springhouse and the purchase of lands adjacent to the springhouse that was believed to have a facility with chemical storage.

2.3 POTENTIAL POINT SOURCE CONTAMINATION HAZARDS

ALWI staff supplemented the December 15, 2011 field reconnaissance with the databases listed in Section 2.1 herein, to identify several potential point sources of contamination within and near the SWPA borders, including controlled hazardous substances, underground storage tanks (USTs) and automotive body shops. They are listed on Table 1 and displayed on Figure 1 and include:

[2] Though ALWI did not observe specific contamination threats warranting further investigation or corrective action, (1) contaminant hazards may exist that remain undetected because of limitations in the methods employed (concealed visual evidence, etc.) and/or (2) new contamination hazards may develop in the future. For these reasons, the measures employed herein for identifying contaminant hazards should be revisited periodically for the Plan to remain current.

- **USTs -** Twelve known USTs were identified within the SWPA, each containing various hydrocarbons such as those used as heating oil. A potential leak from any of these tanks can contaminate the groundwater from which the Boonsboro-Keedysville water system withdraws its drinking water. The location, number of active tanks and owner are listed in Table 1.

- **Boonsboro High School -** Schools typically store controlled hazardous substances, such as cleaning products and chemistry equipment (including lab chemicals), which could enter the groundwater supply if spilled or disposed of improperly.

- **Boonsboro Wastewater Treatment Plant -** This treatment plant makes use of two large sewage lagoons used in the treatment process. In recent years Boonsboro completed substantial wastewater treatment upgrades and an element of the work may have lessened the potential for a release from the treatment plant. Nevertheless, a possible future leak in the lining of the lagoon(s), or potential overflow, could introduce bacteria and/or metabolites of waste biodegradation, (i.e., nitrate) to the groundwater supply.

- **Auto Body/Collision Center Shops -** One such shop was identified within the Boonsboro-Keedysville SWPA. Auto shops often use industrial solvents for degreasing metallic parts. Other volatile organic compounds, including various blends of hydrocarbons, and synthetic organic carbons associated with automobiles may be accidentally discharged from these sites through spills. Such spills could infiltrate the soil surface and percolate into the groundwater supply.

2.4 NON-POINT SOURCE CONTAMINATION HAZARDS AS SUGGESTED BY LAND USE

In order to evaluate the hazard represented by non-point sources of contamination, MDE guidance suggests consideration and mapping of the public sewer service area and land use data within the SWPA. Pertinent land use acreages and percentages are listed in Table 2. Each of these has implications in terms of non-point contaminant sources (e.g., septic systems outside of public sewer areas and the possibility of leaking mains inside said areas).

Potential sources of non-point-source contamination may include but are not restricted to:

- **Septic System Discharges** - These include nitrate and bacteria-laden discharges concordant with the intended design of septic systems. They also can include the inappropriate discharge of hazardous and other regulated liquids through such systems, arising from ignorance or intent. For this reason, MDE guidance suggests consideration and mapping of the public sewer service area(s), with the inference that those areas not sewered are on septic systems. Sewer system maps available from the Maryland Department of Planning (Figure 2) suggest that 82% of the SWPA lies outside of the sewer service area.

- **Agriculture** - Fertilization of cultivated fields, livestock wastes, and agri-chemical releases constitute the primary sources of groundwater contamination from agricultural sources. Agricultural lands within the SWPA may be sources of nutrients (including nitrates), herbicides, insecticides and/or animal wastes. Land use coverage maps (Figure 2) indicate that approximately 38% of the total SWPA is agricultural and that farming land uses exist

closer than 100 feet from Graystone Well 8, and 400 feet from the Keedysville Spring.

- **Sediment and Stormwater** - Commercial and industrial land uses, particularly those with substantial impervious areas, may contribute to contaminant and sediment-laden stormwater within the SWPA. Available mapping data suggests that 1.4% of the SWPA is in such land uses, though some measure of future development remains possible.

Sources of the information summarized above included 2010 land use and recent public sewer service areas Geographic Information System data obtained from the Maryland Department of Planning (Figure 2). Table 2 reflects dominant land uses by type, within the combined SWPA. Figure 3 reflects this information in pie chart form.

3.0 CONTAMINANT SUSCEPTIBILITY

ALWI completed a review of available groundwater quality records, integrated with other findings herein, to support an assessment of groundwater susceptibility. MDE guidance defines a statistical threshold for regarding a water source being "susceptible" to a given contaminant as being either:

- When the concentrations equal or exceed 50% of the Maximum Contaminant Level (MCL) for 10% or more of the documented samples for a regulated contaminant and/or

- When a persistent but lower concentration is either increasing or chemically appears associated with an unknown or unexpected source.

In addition to these water quality data considerations, ALWI also considered the following factors in evaluating overall susceptibility:

1. The spatial position of potential contamination hazards relative to System water sources and SWPAs;

2. Observed conditions of wellhead integrity and treatment supplies management; and

3. The natural chemical properties of the source water within contributing aquifers.

3.1 PROCEDURES

ALWI completed the susceptibility assessment in the following step-wise procedure:

1. **Obtain and Filter Water Quality Databases -** ALWI reviewed available electronic databases of water quality analyses provided by MDE for the period post-dating the 2005 SWAP (i.e., 2005 to 2011). These databases were filtered to isolate contaminants affecting System supplies. Additionally, the system provided raw water quality samples for microbes or microbial pathogens from January 2008 to December 2008.

2. **Consider Chemical Classes and Sampling Conditions** - The furnished databases were developed by MDE as an incidence of operational compliance record-keeping. They

contained analytical records for inorganic compounds including radiological species, volatile and synthetic organic compounds. The available water quality records only reflect post-treatment, composite water samples and not raw groundwater sources, unless otherwise noted. As such, mixing, blending and treatment efficacy is reflected in the water quality results as furnished to us. Generally the absence of comprehensive analytical results of raw groundwater samples hampered correlating specific water quality findings to specific sources.

3. **Review of MDE Paper Files** - To gain a more thorough understanding of raw water quality by source, ALWI supplemented the MDE databases with raw groundwater quality laboratory results available in MDE paper files.

4. **Identify "Exceedance" Instances** - To identify water quality sample exceedances, we compared each specific analytical result to published MCLs (in COMAR 26.04.01 as of September 2011). Based on guidance from MDE, we determined a concentration of greater than or equal to 50% of a given MCL to be an "exceedance." Procedurally, this was accomplished by sorting the data by analyte, concentration and by well (to the degree possible).

5. **Assess Frequency and Relative Percentage of Exceedance Instances** - The number of times that a given analyte was detected in a concentration greater than 50% of its respective MCL was discerned in terms of overall frequency, percentage of total number of samples and date range of exceedance. Contaminants with results equaling or exceeding 50% of the MCL more than 10% of the time were considered *prima facie* susceptible. ALWI also identified changes in contaminant trends over time, even for those that did not equal or exceed 50% of the MCL more than 10% of the time.

6. **Integrate Information** - ALWI then considered these identified exceedances in the context of the results of the contamination hazard reconnaissance to correlate water quality results to specific field observations suggestive of a condition of susceptibility.

ALWI noted that the 2005 MDE-prepared SWAP reports detections to certain water quality parameters and chemical classes, such as low-level, sporadic VOC concentrations. We also observed that hydrogeological conditions (karst geology) and land uses (generally anthropogenic development and agricultural) suggest a level of future risk of contaminant entrainment (including but not restricted to VOCs and nitrates) irrespective of the content of the water quality records reviewed for this SWPP and discussed herein.

For conservatism and appropriate source water protection, provisions of ALWI-recommended ordinance (see Section 5.2 and Table 3) have been developed to help limit the likelihood of future contamination from point and non-point sources, whether or not presently contributing to conditions of quantitative susceptibility.

3.2 LIMITATIONS OF SUSCEPTIBILITY ASSESSMENT

This susceptibility assessment was comprehensive insofar that all available chemical data were evaluated in comparison to 50% of the respective MCL, for each of the subject sources for which

data were furnished.

The databases contain information specific to treatment plants, not necessarily to individual wells. Each chemical class was considered separately for each treatment plant, since composite groundwater samples could not be separated. Where more than one source shares a treatment plant (e.g., Warrenfeltz Spring and Shafer Park Well), source-specific information generally was not available on which to base an evaluation of susceptibility for individual sources. Blending and other operational protocols may affect source-specific susceptibilities in a manner not discernible from the available data.

3.3 SUSCEPTIBILITY TO SURFICIAL CONTAMINATION

Carbon dioxide that exists naturally in the atmosphere and soil reacts with water, forming a weak acid, known as carbonic acid. Carbonic acid infiltrates the soil surface and percolates into the underlying groundwater, where it can dissolve bedrock along fractures and joints, forming interconnected channels.

The bedrock on the western side of the Boonsboro-Keedysville system, from which each System source receives water, is composed of carbonate dolomites, and is therefore, soluble. When exposed to carbonic acid, these carbonate dolomites undergo dissolution forming bicarbonate and other ions (such as calcium) that are dissolved in groundwater, while creating voids and interconnected channels. Surface water can then become directly connected to groundwater supplies through these voids and interconnected channels.

Natural filtration of chemicals and bacteria may not occur in karst aquifers, as opposed to other subsurface environments, such as sandstone, as sinkholes in karst topography act as a conduit for direct contamination. As a result, the groundwater supply becomes directly linked to surface runoff, making it more susceptible to surficial contamination, including turbidity and bacterial contamination.

In 1993, MDE conducted a study to determine the influence of surface water on the Warrenfeltz and Keedysville Springs (Appendix A). This study included the execution of dye tracing studies, collection of streamflow measurements and monitoring for bacteria. The study concluded that streamflow data indicated a strong hydraulic connection between Boonsboro Branch and Keedysville Spring, while the results of the dye tracing studies and bacteria data indicated a poor hydraulic connection. MDE explained that the data for the dye tracing studies and bacterial monitoring may have been influenced by streambed sediments.

Community outreach efforts are one way to approach this issue. Educating the residents within the SWPA about the issues surrounding karst hazards possibly would lessen the likelihood of groundwater contamination.

3.4 SUSCEPTIBILITY TO COLIFORM BACTERIA

Town officials provided ALWI Total Coliform and Escherichia (E. Coli) results from raw water samples that were taken bi-weekly from Shafer Park Well, Warrenfeltz Spring, and Keedysville Spring between January 4, 2008 and December 19, 2008. In the 2005 SWAP, MDE determined

that Warrenfeltz Spring and Keedysville Spring were both GWUDI based on the results of bacteriological sampling and the presence of surface water indicators. Comparatively, MDE determined that the Shafer Park Well was not a GWUDI source.

Bi-weekly samples from the Shafer Park Well indicated that Total Coliform and E. Coli generally were below one colony, indicating that the well is not susceptible to surficial contamination. We found that Warrenfeltz Spring and Keedysville Spring both had frequent detections of total coliform colonies with occasional E. Coli colony detections. The number of colonies detected in the Warrenfeltz Spring was significantly higher than in the Keedysville Spring. Both the Warrenfeltz Spring and Keedysville Spring are susceptible to surface water contamination.

Whether or not sources are susceptible to surface water contamination, the Warrenfeltz Spring, Shafer Park Well, and Keedysville Spring make use of a filtration system to remove bacteria and pathogens, as well as gas chlorination for disinfecting water, which kills bacteria and pathogens. Water supplied to residents is both clean and safe because of this rigorous filtration and disinfection process.

3.5 NITRATE SUSCEPTIBILITY

While the water quality data indicate that the System is not susceptible to nitrates, ALWI believes that nitrates could become a problem for the System. Karst geology, low-level detections between 2005 and 2011, and widespread agricultural land uses within the SWPA are enough to conclude qualitatively that the System is susceptible to nitrate contamination. We note that MDE reported in the 2005 SWAP that an analysis of water quality data supported a finding of susceptibility to nitrate contamination (Appendix A).

The low but consistent nitrate concentrations observed in the water quality data may forebode a future condition of statistical nitrate susceptibility as well. ALWI cautions that the System should continue to closely monitor nitrate concentrations, as a large proportion of lands within the SWPA are (1) in agricultural use and/or (2) outside of System sewer service. Given those conditions, a future finding of susceptibility is of heightened possibility.

3.6 OTHER GROUNDWATER CONSTITUENTS

ALWI did not otherwise find the System susceptible to other groundwater contaminants of natural or anthropogenic origin (including inorganic, synthetic/volatile organic, disinfection byproduct and/or radiological contaminants). This finding is supported as follows:

- **Other Inorganic Compounds** - Fluoride was detected at low concentrations at each treatment plant. Concentrations of this inorganic compound did not exceed the 50% MCL threshold in the subject sources in the data collected since MDEs 2005 SWAP. Fluoride is likely a result of its use in water fluoridation.

- **Synthetic Organic Compounds -** Di(2-ethylhexyl) phthalate exceeded the 50% MCL threshold in one of three samples (33%) at the Boonsboro filtration plant. This synthetic organic compound also exceeded the MCL in one of four samples (25%) at both Graystone

Well 8 and the Keedysville filtration plant. However, this contaminant is often found in laboratory blank samples. Its method of testing has produced many false positive results, and likely does not accurately represent the actual water quality of a system. Based on the foregoing, we determined that the system not to be susceptible to Di(2-ethylhexyl) phthalate contamination.

4.0 STEERING COMMITTEE INTERACTIONS

The System convened a Source Water Protection Steering Committee comprised of the following individuals:

- Debra Smith, Boonsboro Town Manager
- Megan Clark, Boonsboro Town Planner
- Barry Levey, Keedysville Town Council Representative
- Stephen Goodrich, Washington County Director of Planning and Zoning
- Julie Pippel, Washington County Director of Environmental Management

ALWI met with the Committee on two occasions; May 30, 2012 and September 24, 2012. The September meeting (summarized below) included most of the discussion regarding our SWPP ideas and recommendations.

ALWI opened the meeting with a PowerPoint presentation summarizing activities on the MDE-funded contract as of that date. A roundtable discussion then followed, which focused on the following issues:

1. **The Need for Protective Ordinances** - The risks of land development on karst were discussed in detail, aided by the graphical illustration within the PowerPoint presentation. All in attendance agreed in the conceptual benefit of an ordinance to help protect water sources from karst-borne contaminants. We envisioned three ordinances, ideally identical in technical detail: Boonsboro, Keedysville and the portion of Washington County within the SWPA. Note that later in the meeting there was some discussion of whether any Washington County SWPP ordinance possibly would need to be county-wide, or might need to cover all SWPAs in the County and not merely the recommended one for Boonsboro and Keedysville.

2. **The Pros and Cons of Making the Ordinance SWPA-Wide** - We discussed the MDE SWPA delineation, its upper and lower zones, the ALWI recommendation that the ordinance need not honor this zonal distinction, the benefits of adopting the combined MDE SWPA delineation, the ALWI recommendation that the ordinance not be truncated along a mapped geologic boundary other than as delineated by MDE, and the possibility of a future change in delineation at such time that the System brings a new source(s) into service. Attendees agreed that a SWPA-wide ordinance would be best and most appropriate, rather than some subset of the delineated area.

3. **The Septic Provision of the Recommended Ordinance** - At some length, we discussed the septic provision of the recommended ordinance (Section 5.2 and Table 3). County representatives were apprehensive about the potential cost to an individual homeowner or the farmer/developer of a small-scale subdivision. We explored if this provision would still be effective, if it were made only applicable to developers of major subdivisions (greater than seven lots). Depending on the final designation of tiers in Washington County (driven by SB 236) there may be no Tier III areas (and thus no major subdivision potential) in the SWPA. According to newspaper and internet sources as of June 2013, Washington County and state agencies had not reached consensus on a final map of growth tiers. While the Towns easily can and should prohibit septic within their boundaries, the question of whether Washington County could and should prohibit them elsewhere was left unresolved. Based on a general distaste for SB 236 and its growth restrictions as probably felt by the Washington County Commissioners, a further growth control measure for SWPP purposes may not be supported or embraced. In this vein, different levels of septic system prohibition (or land use restriction in general) may come to be how the three ordinances would differ. ALWI continues to recommend new septic system prohibitions throughout the SWPA.

4. **Whether a County Ordinance Would Have to Be Countywide, (all) SWPA-wide, or Just Local to the Boonsboro/Keedysville SWPA** - For legal or precedential reasons, the County may be unable to geographically restrict the jurisdictional area of an ordinance only to cover the SWPA. If the County cannot exercise this restriction, there may be implications for other jurisdictions and property owners. This issue could result in no county ordinance, or in one of diminished source protection effectiveness. The County Commissioners also may feel philosophically opposed to passing any ordinance that result in (further) land use restrictions beyond those arising from SB 236 of the 2012 legislative session. Some debate ensued on whether a County ordinance would have value if it did not somehow limit land use, inasmuch as one that would limit land use may be unfavorably received by the Commissioners on ideological grounds. ALWI continues to recommend land use restrictions as central elements of any ordinance(s) related to the Boonsboro/Keedysville SWPP. The County agreed to review the ALWI-recommended restrictions (Table 3) in greater detail.

5. **Whether the Towns Should Adopt an Ordinance Even if the County Does Not** - Limited discussion focused on whether adopting SWPP ordinances would remain beneficial for the Towns even if the County does not adopt a SWPP ordinance, or does not in a way that is meaningfully restrictive. It seemed possible that a County ordinance might restrict major point sources of contamination such as landfills and hazardous waste sites. Meaningful restrictions on stormwater generation, USTs and septic systems may find greater resistance. The value of a County ordinance focused only on major point-source hazards would be less than one that includes land septic restrictions, but probably would be more beneficial than no County ordinance at all.

6. **Public Involvement Considerations** - All in attendance felt that public involvement and a sense of "buy-in" by the regulated community would be beneficial. At the time of this meeting it was premature to hold a workshop, because the Steering Committee had yet to form a recommendation for elected officials to consider, and had not gotten an initial sense of the officials' response. We discussed the scope and timeframe of the ALWI MDE contract and the possibility that the time required to fully vet this process may be longer than the

sunset date of the contract. Attendees understood the limitations of ALWI's MDE SWPP contract (in terms of timeframe, budget, etc.).

ALWI later met with Ms. Smith (Boonsboro Town Manager) on June 10, 2013, to discuss the timeframe and content of a prospective public workshop. It was at this time that we learned of the Town's disinclination to adopt an ordinance without a parallel County ordinance protecting those areas within the SWPA but within County jurisdiction.

At the time of this meeting and during the preparation of this report, the County had yet to provide feedback on our ordinance recommendations or commit to adopting an ordinance. Ms. Smith decided that a workshop would be conducted on July 11, 2013, at a Boonsboro Municipal Utilities Commission (BMUC) meeting.

Ms. Smith advised us on June 26 that the BMUC and Environmental Commission decided that another meeting was not desired and would not be scheduled after all. Such a meeting, with its public workshop element, was determined by these bodies not to be necessary to close out the SWPP. The System did agree to place an informational flyer on the Town website. The presentation that was developed for the cancelled meeting and workshop is provided as Appendix B.

5.0 RECOMMENDATIONS

ALWI has developed preliminary recommendations to improve overall source protection in light of the observations, analyses and interpretations presented herein.

5.1 RESPONSE PLAN FOR SINKHOLE OCCURRENCE AND REPAIR IN SWPA

MDE has recommended that the System design a monitoring and response plan for the possible occurrence of sinkholes in the SWPA. Sinkholes can present point-source contamination hazards by allowing rapid infiltration of surface water into the water supply aquifer. This reduces retention time and lessens the potential for natural treatment of contaminants. Point-source recharge features and wide flow paths may limit natural filtration processes.

Elements of such a response plan would be similar to the plan for a new anthropogenic contamination hazard. As a proactive approach, we recommend that such a plan map sinkhole frequency and designate areas for inspection, describe methods for repair, and assignment of responsibilities for remediation. Sinkholes may allow utility infrastructures such as sewer or stormwater lines to collapse thereby increasing the risk to the water supply. Therefore as a component of inspections, rapid changes in water quality indicators (i.e., turbidity levels higher than usual) should be used to target investigation of possible new sinkholes.

5.2 ALWI RECOMMENDS KARST FOCUSED ORDINANCE

ALWI recommends adopting a karst-focused ordinance that applies to the entire SWPA. While we envision the functional efficacy of the ordinance to apply only to areas underlain by karst, inclusion of the full SWPA eliminates ambiguities and disputes over possible inaccuracies of published generalized geologic mapping. Ideally, such an ordinance would offer the following

restrictions and protection strategies:

- Existing (and new) petroleum product hazards should be mitigated by using the most protective technology possible. Grandfathering can apply to unchanging systems, but existing USTs should be replaced with vaulted above ground storage tanks when upgrading or replacing systems (i.e., when the facility owner seeks a municipal or County permit or approval for any change).

- No new septic systems should be permitted within the SWPA unless supported by in-depth hydrogeologic impact evaluation reviewed and approved by the System/County (as appropriate) and MDE. The System would be best served if the sewer service area were extended throughout the SWPA, obviating the need for septic systems.

- No non-domestic privately-owned wells should be permitted within SWPA unless installed under order from Washington County Health Department or MDE.

- No commercial fertilization should be permitted without MDE approvable Nutrient Management Plan. There should be coordination with County and agricultural extension liaison agencies to help manage fertilizer application on agricultural lands within SWPA but outside of System owned/controlled lands.

5.3 ADDITIONAL RECOMMENDATIONS

ALWI has developed additional recommendations to improve overall source protection in light of the observations, analyses and interpretations presented herein:

1. **Limit Incompatible, Upgradient Land Uses** - ALWI judges that the greatest measure of source water protection would arise from the protection of karst-underlain and upgradient watershed areas from incompatible land uses. Based on the setting of the System, we further believe that the most likely form of potentially incompatible land use would be in the form of septic discharges into solution conduits potentially recharging System sources. It would be best if such land uses were prohibited in the delineated SWPA, both within and outside of the jurisdictions of Boonsboro and Keedysville. We recommend that the Steering Committee reach a final consensus and recommendation (to the Commissioners) on this issue. Prohibitions requiring the application and uses of the best available protective techniques and technologies should be considered as well.

2. **Encourage Compliance With Applicable Nutrient Management Standards** - Though the System sources are not susceptible to nitrate contamination, there are agricultural properties close to System sources. The possibility of direct surface to groundwater conduits in karst topography further pose a potential threat to the Systems source water, particularly for agricultural related nutrients and pathogens. The System should consider requesting that the MDE and Maryland Department of Agriculture carefully review environmental compliance matters at the agricultural facilities within the SWPA. To the degree voluntary or enforced nutrient management compliance is not readily achievable; the System also should consider asking State officials to require strict nutrient management compliance practices at potential nutrient source properties within the SWPA.

3. **Agricultural Outreach** - ALWI sees potential benefit in financial incentives (including but not necessarily restricted to property tax reductions) offered to property owners of agricultural lands, for their proactive and voluntary cooperation in planting trees, rotating crops, and otherwise changing land management practices in a way that results in improved System water quality. This would help prevent nitrate concentrations from rising to a level resulting in a finding of susceptibility. The implementation of such a program would require careful planning and ongoing public relations to be successful in the long-term. Also, the concurrence and active assistance of the County would be needed for effective implementation because some of the Systems source water originates in County jurisdiction.

4. **Consider Land Acquisition** - Based on Maryland Department of Planning property ownership information 76% of the forested lands (1,461.6 acres) within the SWPA are privately owned. The remaining 24% (470 acres) is within the Greenbrier, South Mountain and Washington Monument State Parks. As economically feasible the System should consider purchasing or easing available forested lands to better protect their sources from alternative and incompatible land uses such as agriculture or pervious surface creation.

5. **Promote Participation in Forest Conservation and Management Program** - The System also should consider encouraging private landowners within the SWPA to manage their forested lands by way of the Maryland Department of Natural Resources (DNR) Forest Conservation and Management Program. The program allows for a legal agreement between the landowner and the DNR to be recorded in the land records of the County in which the property is located. The landowner agrees to manage their forest land according to a plan that is prepared for the property in return for a reduced and/or frozen property tax assessment (generally reduced and frozen at a low agricultural rate). The minimum acreage to participate in the program is five acres and the minimum term of the agreement is fifteen years. If the agreement is breached through failure to comply with the plan, sale of the property to someone unwilling to assume the responsibility or a landowner who simply wants to be out of the program, back taxes will be levied and will be computed back to the beginning of the agreement. The agreement can be amended to increase or decrease acreage and it can be transferred to a buyer if the buyer is willing to assume the responsibilities of the agreement.

6. **Contingency Planning; Spill Response Planning** - Assuming that one does not already exist, we recommend that the System develop protocols for contingency responses to a possible contamination release. One key element of such protocols is the frequent communication and close cooperation between water system personnel, the Washington County Health Department and MDE. Also, to the degree perhaps not already in existence, the System may wish to consider establishing an additional financial reserve to fund contingencies of a possibly costly nature, and should remain abreast of MDE grant programs regarding the same.

7. **Unneeded Wells** - We discussed failed test wells and other wells in or near the SWPA that no longer are needed (Figure 1). We recommended that unneeded wells be abandoned and sealed, as a method to further protect System sources. Should the System conclude that no present or future plans exist for the treatment and use of the Crestview well, ALWI recommends that it too should be properly abandoned. Please also be advised that it is

MDE's formal position that the Crestview well be abandoned without delay. For those wells not already planned for abandonment by the System, the County health department should be contacted regarding their (or MDE's) capability to order the proper abandonment and sealing of other wells owned or controlled by third parties, as appropriate.

8. **Community Outreach and Public Education** - Educating the residents within the SWPA about the issues surrounding karst hazards would lessen the likelihood of groundwater contamination. The System may consider a SWPA-wide community outreach and awareness program, focusing on residential and commercial landowners. One focus of such a program should be to educate homeowners on well and septic systems about proper septic system use and maintenance. The County should consider a mass mailing with pertinent information on best management practices for landscaping and handling of household chemicals as a measure to educate landowners on contamination issues.

9. **Post "No Dumping" Signs Within SWPA** - Consideration should be given to posting "No Dumping" signs at various locations within the SWPA to discourage the informal disposal of hazardous wastes and petroleum products. The System should contact the Maryland Rural Water Association, as they may be able to assist the System by providing such signs. Similarly, the System occasionally should inspect the SWPA for evidence of dumping, while removing unwanted debris and waste items.