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March 4, 2015

Priscilla Carroll, Esquire  
Assistant Attorney General  
Office of the Attorney General  
Maryland Department of the Environment  
1800 Washington Boulevard  
Baltimore, Maryland 21230

RE: Chestertown Concerns About Hospital's Ivey-sol® Implementation Plan  
Chester River Hospital Center; MDE Oil Control Program Case No. 1987-2534-  
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Dear Ms. Carroll:

We appreciate the opportunity to review the Ivey-sol® pilot test as summarized in the January 19, 2015 "Pilot Test Evaluation Report and Proposed 2015 Action Plan" submitted on behalf of the Chester River Hospital Center, by Diversified Building Solutions, LLC ("the Action Plan"). Below are the Town of Chestertown's ("the Town's") concerns and recommendations regarding Diversified Building Solutions, LLC's request for additional implementation of the Ivey-sol® solution. Please keep in mind that the Town agrees with Diversified Building Solutions, LLC's letter that further implementation must maintain controls to ensure public health and safety. This is of the utmost importance given the remedial area's proximity to the Town's water supply.

Although there are some promising pilot test results, the Town is apprehensive with the potential results of Ivey-sol® implementation in moving this project forward. For example, the risk of limited areal effectiveness of Ivey-sol® appears significant; however one of the Town's concerns is that water quality data results from cleansed monitoring wells may come to be used to support case closure in a way that could be misleading. If the areal extent of Ivey-sol® remediation indeed is limited as the Town believes, the Hospital may come to seek case closure based on a set of water quality data from monitoring wells that represented a more cleansed condition than what actually exist in the aquifer as a whole. Copious amounts of petroleum could easily remain in the aquifer, upgradient of the Town production wells but outside of the zones of

influence of Ivey-sol® remediation. Given the proximity of this proposed remedial action to the Town's production wells, the Town would appreciate a copy of the Site Characterization Report and Conceptual Model that was developed for the Chester River Hospital Center remediation site. If they have not been completed at this time, the Town would ask that MDE require and approve the Site Characterization Report and Conceptual Model prior to any further Ivey-sol® remediation activity. The Town values MDE's oversight to ultimately protect the Town's water source; and the sharing of MDE's information regarding this matter is always welcomed.

The Town also appreciates the Hospital's commitment and their consultant's optimism in moving forward. Nonetheless, the Town is somewhat at odds with the speculative and uncertain nature of the supporting data from the pilot study. Some of the technical findings seem unsupported (or possessing debatable support), and the Town would ask that such concerns and recommendations provided by the Town's technical consultant, Advanced Land and Water, Inc. ("ALWI"), listed below be addressed before further implementation of Ivey-sol® is approved by MDE.

- 1. Areal Extent of Ivey-sol® Influence Is Questionable** – Appendices to the Action Plan endeavor to present the technical basis for the 250-to-300-foot radius of Ivey-sol® propagation in the aquifer, and maps illustrating such radii of influence lead the reader to believe that multiple injection points would result in overlapping zones of aquifer cleansing. However, the equation referenced to support these calculations originates from construction dewatering and not propagation and decay of an injection cone. Moreover, the Action Plan is deficient in failing to clearly and unequivocally support its purposed radius of injection influence using clear and unambiguous methods selected and for the purpose. Absent documentation of such necessary methodology, we sought to check the reasonableness of the purported areal extent of Ivey-sol® spread, by using the simple equation for the volume of a cone wherein we solved for its radius. Assuming a 30% porosity and using the degree of drawdown documented in the appendices (as the height of the cone), as well as the rates and volumes of Ivey-sol® injection (280 gallons) as input criteria, we estimated that the probable radius of Ivey-sol® extent was more than one order of magnitude less, or roughly 10 feet, rather than 250 to 300 feet. In order to help prove Ivey-sol® effectiveness over a certain radius of influence beyond an injection well, it would have been necessary to detect Ivey-sol® in one or more non-injection wells. The documents do not present this with clarity, which most certainly calls into question just how far Ivey-sol® actually did spread. The available data suggest that until the supporting mathematics are rigorously reviewed, MDE should not assume an areal extent of Ivey-sol® injection effects more than 10 feet from any injection well.
- 2. Experimental Nature of Push-Pull Technique** – The Town's review of the Ivey-sol® web site found examples of the injection of the solvent in one well and its recollection in another, nearby well. Hydrocarbons were liberated along the Ivey-sol® flow pathway, between the two wells. We did not see clear evidence for its successful deployment in push-pull mode, within the same well, as proposed in Chestertown. One suggestion would be closer



adherence to deployment methods with the greatest, documented track record of successful implementation elsewhere.

3. **Active Hydrologic Control Requested and Recommended** – A key element of safety associated with the pilot test was the continuous operation of the pump-and-treat system throughout the process. The hydrologic control represented by the cones-of-depression of the operable remediation system provided an important safeguard from the potentially unconstrained down-gradient migration and propagation of both Ivey-sol® and liberated petroleum products. The Action Plan suggests that as an element of implementation, the pump-and-treat would not be in operation. The Town believes that this plan represents unconstrained risk of product migration and further aquifer (and potential supply well) contamination. Moreover, elements of the Action Plan speak to benefits of a “hydrologic curtain” which most logically interpreted as an area of null groundwater flow down-gradient of the extent of the cone-of-depression associated with the pump and treat system. There seems little if any basis to theorize on the formation of a hydrologic curtain (absent pump-and-treat continuing) or the protection that such a natural curtain may afford.
4. **Hydrogeological Implication of Filter Biofouling** – The Action Plan speaks to an increased, anticipated frequency of 10- to 30-micron bag filter change-outs. Much is known and has been written about the propensity of diesel-range petroleum products to breakdown and reform into larger molecules, some of which may not pass through such filters. Polymerization, agglomeration and solids formation are natural processes associated with the aging and stagnation of diesel fuel, possibly compounded by Ivey-sol® introduction. Unexplained in the Action Plan is the implication and remedy for the potential formation of clogging agents in the aquifer, and the clogging of groundwater pathways by such larger and heavier hydrocarbon molecules. An unaddressed possibility is a potential cordon of such clogging material at or near the outward extent of Ivey-sol® application that could lessen the degree to which water quality tests inside the clogging cordon (i.e., at a given well) are representative of the aquifer as a whole. Because of the uncertain reliability of any given set of water quality data being representative of the aquifer as a whole, a conservative approach seems mandated.

**Unsupported Request for Lessened Monitoring of Down-Gradient Wells** – The Action Plan seeks a considerable lessening of background and compliance water quality sampling in location (fewer wells), specific analyses (elimination of gasoline-range constituent analysis) and frequency, all with an eye toward cost control. Gasoline constituents include regulated drinking water contaminants. The likely limited areal extent of Ivey-sol® effectiveness and the fluvial and dendritic nature of the original sedimentary depositional environment of the aquifer materials combine to highlight a real risk of missed, down-gradient migration of regulated contaminants if the sampling and monitoring protocols are reduced as the Action Plan requests (with speculative support). If Ivey-sol® is as effective in liberating petroleum contaminants as the Action Plan purports, the period of full-scale Ivey-sol® application should be when sampling and monitoring efforts are maximized rather than minimized. Best would be no lessening of robustness of the sampling, monitoring and reporting requirements.



Priscilla Carroll, Esquire  
Assistant Attorney General  
March 4, 2015  
Chestertown Concerns

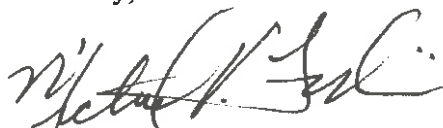
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At minimum we request and recommend great care be exercised in any such lessening with risks to Town wells held in considerably higher regard than Hospital cost control.

The Town hopes and trusts that both MDE and the Hospital share recognition of the need for caution as this remedial activity moves forward since the Town's source water protection area is potentially at risk. The Town seeks to remain an active participant in all further discussions and negotiations, specifically regarding Ivey-sol® and the remedial effort in general. The Town does not seek to unreasonably delay or restrict the Hospital in remediating the spill, but instead looks forward to a successful remedy that will ensure public health and safety.

The Town requests that the MDE's Oil Control Program and the Hospital address the Town's concerns and recommendations in the approved Action Plan. It is important that all parties concur with the Action Plan prior to a public rollout. For this reason, the Town suggests a meeting with MDE, the Hospital and their consultants to further discuss these concerns and recommendations. Thank you for your time and consideration. We look forward to hearing from you soon.

Sincerely,



Michael V. Forlini

Cc: Mayor Christopher Cerino  
William S. Ingersoll, Town Manager  
Bob Sipes, Utilities Department Manager  
Bud Ivey, Ivey International Inc.  
Mr. Dane Bauer, Diversified Building Solutions, LLC  
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