



# MARYLAND DEPARTMENT OF THE ENVIRONMENT

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March 27, 2015

Mr. Kenneth D. Kozel  
President and CEO  
Shore Regional Health  
219 South Washington Street  
Easton MD 21601

**RE: COMMENTS TO PILOT TEST EVALUATION REPORT AND  
PROPOSED 2015 ACTION PLAN**  
**Case No. 1987-2534-KE**  
**Chester River Hospital Center**  
**100 Brown Street, Chestertown**  
**Kent County, Maryland**  
**Facility I.D. No. 3168**

Dear Mr. Kozel:

The Maryland Department of the Environment's Oil Control Program, in conjunction with the Underground Injection Control Program and the Water Supply Program, has completed a review of the *Pilot Test Evaluation Report and Proposed 2015 Action Plan* – January 19, 2015. The report provides results and analysis of the Ivey-sol<sup>®</sup> pilot test and post-test monitoring, and proposes an expanded Action Plan for 2015. To assist with a thorough review of the report, the Department also reviewed the *2014 Fourth Quarter Monitoring* report – January 23, 2015, the *Monthly Monitoring Report for January 2015* – February 16, 2015, the Town of Chestertown's comment letter dated March 4, 2015, and the March 16, 2015 submittal of the 2014 Discharge Monitoring Reports for the onsite pump and treat system.

Generally, the Department believes the pilot test showed that the use of Ivey-sol to assist in accelerated recovery of residual liquid phase hydrocarbons (LPH) was effective. It was also demonstrated that the implementation of the push-pull methodology can be accomplished in a safe manner. The Department agrees that additional events should prove effective at expediting the removal of residual LPH and can be done safely where there is hydraulic control provided by the existing pump and treat system.

The following comments are provided to Shore Regional Health (the Hospital) to address with its consultants. The Department requests that a revised report be submitted that appropriately addresses each comment. The Department offers to meet with the Hospital and representatives from the Town of Chestertown to further discuss the comments prior to the submission of the requested revised report.

## **General Comments**

The Department notes several positive outcomes from the pilot test. One significant outcome was that surfactant was not detected south of Brown Street. This demonstrates that the hydraulic controls (i.e. the pull events and the pump and treat system) and the short life span of the surfactant in the environment do not allow for prolonged persistence in the aquifer. This is a good demonstration that the process was controlled and that it can be implemented in the future without concern for surfactants reaching the Town's active supply wells.

The data also shows there were increases in total petroleum hydrocarbon – diesel range organic (TPH-DRO) concentrations throughout the push-pull events in the target wells, which demonstrates there was residual LPH liberated from the aquifer. Although more discussion of this is requested below, there does seem to be anecdotal evidence that the push-pull process and Ivey-sol increased the liberation of emulsified LPH and/or biosolids as discussed in relation to the treatment system bag filters. This demonstrates that there was an effect on the aquifer that was qualitatively seen in the remediation system, which again demonstrates the effectiveness of the system as a hydraulic control.

Another important observation from the data was there was not a significant increase in contaminant concentrations south of Brown Street. This demonstrates that the hydraulic controls (i.e. the pull events and the pump and treat system) were able to prevent downgradient migration of contaminants.

## **Specific Comments**

### **Pilot Test Evaluation**

#### 1. Section 3.10 – General Observations and Discussion

- a. Generally absent from this section is any discussion of the technical team's field notes and any photos collected during the pilot test. The report should provide more detail on what was observed during the periodic visual inspections and provide photo documentation if collected.
- b. This section provides some general discussion on the presence of biological residue that required the bag filters and Mycelx filters to be replaced periodically during the extraction process. As this is a key observation from the pilot test and the frequent filter changes will be a critical component of the proposed actions for 2015, a more detailed discussion of the biological residue is needed throughout the report.

Provide further discussion of any observations in the pump and treat system during this pilot test that triggered the multiple replacements of the bag filters and the Mycelx filters, and discuss how the frequency of filter changes compared to normal operation and maintenance. The discussions should address the following:

- i. What exactly was observed that was determined to be "biological activity"? Any photos?

- ii. How was it determined that this observed activity was a result of the injection process?
  - iii. Was the “biological activity” observed in any of the wells?
  - iv. Other than creating a need for frequent bag filter changes, are there any other implications for the proposed remediation plan (positive or negative)?
- c. Discuss why different pumping rates were used for some of the extraction wells (i.e. MW-22 at 5 gallons per minute [gpm], MW-40 at 5 gpm, MW-41 at 3.5 gpm, and MW-42 at 1 gpm).
- d. In its report of observation included in Appendix C, MDE noted that a reduced surface tension was observed in the pump and treat system recovery wells on several dates, which would indicate the presence of surfactant. However, this observation was not clearly discussed in the report, and must be included in the revised report.
- e. Provide a description of the quality of the extracted water (e.g. were LPH observed? was emulsified oil present? was bio-fouling present?). Present any photos that may have been taken.
- f. Were volumes of liquids extracted from each well determined? If so, please provide details.
- g. Page 12, paragraph 3 – The text states that “it was important to note that there was no free product associated with the liberation of material from the soils...” LPH sheens were noted in several wells on several dates as documented in the MDE report of observations (Appendix C). Additionally, Appendix D, Table 1, denotes detections of sheen in several wells during the pilot. However, the table does not present a “Depth to Product” column, which is common practice within the industry. Note that an LPH sheen is a positive detection of free-phase LPH at a thickness that cannot be discretely measured by an interface probe. Therefore, it is misleading to state that LPH were not observed at any time during the pilot test and that there was no measured depth to product. The text and table must be corrected to acknowledge this.

## 2. Section 4 – Presentation of Results

- a. Table 1 – This paragraph suggests that mounding occurred in the injection wells. Looking at the data presented in Appendix D, Table 1 and the cross sections presented in Appendix G, it appears that at least in the case of MW-42 and MW-22 that the observed mounding appears to be a factor of well construction. The highest measured elevations, taken about 30 minutes after the injection commenced, were about 5.5 feet above the elevation of the well screen and the observed mound appeared to dissipate within approximately one hour after the injections. Further there was approximately 5 feet of screen above the water table in each of these wells prior to the injection commencing. Actual mounding may have been limited to approximately 5 feet and for a limited distance from the well and a limited duration.

Because the 2015 Action Plan places emphasis on mounding as a success factor for delivering the surfactant, provide a more detailed discussion of the observed mounding. The discussion should include, at a minimum, the following:

- i. Duration of the mounding;
- ii. Whether mounding was a factor of well construction (i.e. screen depths); and
- iii. Whether mounding was observed in adjacent wells and at what distances.

Also note that as discussed above, it is misleading to make the statement, "At no time was liquid phase hydrocarbons detected during site activities." LPH sheens were detected on several occasions in several wells and in the bag filters of the pump and treat system. It is more accurate to state that at no time were measurable LPH detected.

- b. Table 3 – There is little discussion on the formula used or the assumptions made to derive the calculated radii of influence for the extraction wells.
  - i. Is the formula meant to be used when a steady state is reached with regard to the pumping rate and the head change, and was this considered to have been achieved?
  - ii. Provide justification for the 20 feet per day value used for the permeability term.
  - iii. How were the pumping rates for each well incorporated into the radius of influence calculations?
  - iv. How did the gauging data from adjacent wells align with the calculated radii of influence?
  - v. A table summarizing each extraction event for each well that includes the following information would be useful in the discussion: duration of the extraction event, the pumping rate, the total gallons pumped, and the total hydraulic head change.
  - vi. Note that the terms Radius of Influence and Capture Zone are not interchangeable terms. Actual capture zone limits are typically less than that of the radius of influence. Figure 3 uses the term capture zone to portray the calculated radii of influences over the extraction wells, which is misleading.

### 3. Section 5 – Discussion of Remedial Effectiveness

- a. Section 5.1.B – The following statement is made, "By achieving a groundwater table mounding on the order of five feet to ten feet in the vicinity of each monitoring well indicated we can target residual TPH-DRO in the unsaturated (vadose) zone onsite if and as required." As commented on previously, the well construction details and gauging data from neighboring wells should be incorporated into this argument. It is not clear that there was anything more than highly localized and short lived "mounding" in the injection well as the slug of surfactant dissipated into the formation. From the data presented, there does not appear to be a way to substantiate just how far into the formation the injected material drained.
- b. Section 5.1.C – These calculations may broadly indicate a percent change in the TPH-DRO concentrations during the push-pull events per well, which is not the same as mass recovery. The term "percent mass recovery" is a misleading term for this calculation as presented in the text. A more accurate term would be percent concentration increase. The discussion is not based on actual mass recovered, which would be measured in units of mass, but is based on

percent differences between contaminant concentrations at various points in time. The discussion is meant to demonstrate that the application of Ivey-sol increased the amount of petroleum hydrocarbons available to be recovered relative to the amount present in the well prior to the pilot test, which is appropriate. It is more accurate to discuss the data in terms of increases in concentration of contaminants, TPH-DRO in this case, than it is to create an unnecessary metric. A more appropriate presentation would be to show the TPH-DRO concentration changes in each well over time and in relation to the push-pull events.

At a minimum, a true discussion of mass recovery would take into account the concentration of TPH-DRO and the volume of liquids pumped to derive a mass recovery. In order to demonstrate that the Ivey-sol had some relative impact over previous mass recovery efforts, one would need to know the mass recovery absent the influence of Ivey-sol. These comments are not presented to suggest that additional work or analysis needs to be conducted by the Hospital, but merely to point out that the "Mass Recovery" discussion is not technically accurate.

- c. Section 5.1.D – Further explanation is needed for this section. The objective of these comments or observations is not clear.

#### 4. Section 6 – Recommendations for Additional Implementation

- a. Bullet 2 – Recall that the purpose of the pilot test was more a demonstration than a true remedial scale implementation, which is what was proposed in the plan for 2015. There is still residual LPH in and around the treated area because the wells are located within the footprint of the former LPH plume. A more robust implementation, as proposed for 2015, would be necessary for sustained improvement.

### **Proposed 2015 Action Plan**

- 1. Section 7.3 Protocol 2 – Hydraulic Controls to Remain in Place. The Department agrees that the pump and treat treatment system should remain in operation to provide hydraulic control during the proposed work. However, there appears to be a conflict between this protocol and the second bullet under Section 7.7A. The Department needs confirmation that the pump and treat remediation system will remain on during the proposed push-pull events.

It is not clear from the various discussions in the report which wells will be running during the proposed activities. Through verbal communications with your consultant, it was suggested that the pump and treat system recovery wells used may vary depending on the treatment zone that is being addressed. Provide appropriate clarification on how the pump and treat system will be operating during the proposed push-pull activities. If needed, also provide revised or additional figures.

- 2. Section 7.4 Protocol 3 – Extractions to be Removed Through Pump and Treat. Although the Department may agree that the pump and treat system is a good means to process the extracted material, additional information is needed in order to approve the use of the system to handle the

additional proposed waste water. The following information will be needed before the plan can be approved:

- a. In reading the manufacturer's information on their website and the Brightfields, Inc. discussion of the system (Appendix E), it seems as though the filters work on both a molecular size mechanism and a surface attraction mechanism. The Hospital must provide manufacturer's documentation that the Mycelx filters will operate adequately to filter the recovered groundwater, oil, and surfactant mixture that is proposed. Alternatively, a controlled treatment demonstration may be required.
- b. Provide a piping and instrumentation diagram for the treatment system including which wells are attached to it. The diagram should indicate all components of the system, various ratings, etc. so that the Department can evaluate the system capabilities more thoroughly.
- c. Provide a summary table showing the system influent and effluent concentration data, total gallons of water pumped, flow rates, and system runtimes over the last two years. If this data is not available, that will need to be noted.
- d. If approved, what is the anticipated additional monthly discharge during the time that the pump and treat system will be used to filter water from the proposed push-pull events?

### 3. Section 7.7 Priority Zone Implementation Plan

- a. Section 7.7.A – The text proposes several modifications to the pilot study procedures. The following comments are made in response to the modifications:
  - i. Number 1 – The only concern with the residence time increase would be for MW-20, which is discussed further below.
  - ii. Number 2 – This modification seems to contradict other statements made throughout this report. The Department does not approve turning off the system and relying on only the push-pull process for hydraulic control.
  - iii. Number 3 – Because the Mycelx filters did not filter the additional material extracted during the pilot test as this text alludes, the Department has concerns about whether the filters will provide adequate treatment to achieve effluent with part per billion (ppb) range petroleum hydrocarbons when exposed to the surfactants. This concern was discussed above.
- b. Section 7.7.B – At this time, the Department will not permit treatment of any of the wells in Priority Zone #4 with the following exceptions: MW-20 may be utilized but only with a 24-hour residence time and with the pump and treat system fully operational.

4. Section 7.8 Post Injection Extraction Monitoring and Sampling – The two bullets appear to state the same requirements for monthly and quarterly sampling. However, the proposed analyses do not include TPH-GRO, which was included in Section 6.3. Please clearly propose which analyses will be included and at what frequency.

The Department appreciates your patience while it conducted its review of this document. We look forward to responses to these comments and again offer to meet with your team and representatives from the Town of Chestertown to discuss the proposal. If you have any questions or would like to schedule a meeting, please contact me at 410-537-3470 (email: [chris.ralston@maryland.gov](mailto:chris.ralston@maryland.gov)) or the case manager, Ms. Susan Bull, at 410-537-3499 (email: [susan.bull@maryland.gov](mailto:susan.bull@maryland.gov)).

Sincerely,



Christopher H. Ralston, Administrator  
Oil Control Program

cc: Mayor Chris Cerino (Town of Chestertown)  
Mr. Bill Ingersoll (Town of Chestertown)  
Mr. Bob Sipes (Town of Chestertown)  
Mr. Michael Forlini, Esquire (Funk & Bolton, PA)  
Mr. John Beskid (Kent County Health Dept.)  
Mr. Dane Bauer (H&B Solutions, LLC)  
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CHR/srb

