MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Sybil Kolon, Pall Life Science (PLS) Project Manager
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FROM: Jim Coger, Geologist
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DATE: June 23, 2008

SUBJECT: Review of the PLS Evergreen System Dupont Area Investigation Report (Report), Dated April 2008

I have reviewed the subject PLS Report. The Report summarizes recent investigation activities in the Dupont area of the Evergreen Subdivision. My comments address the summaries and conclusions made by PLS in the respective sections of the Report. The comments are listed under the following headings: Introduction, Background, Data Interpretation, Summary of Findings, and Recommendation Sections of the Report.

INTRODUCTION - BACKGROUND

PLS states that the "focus" of the investigation was to determine if 1,4-dioxane contamination, encountered in the Dupont area, is migrating beyond the capture zone of the LB-1, LB-3 and AE-3 extraction wells.

As noted by PLS, 1,4-dioxane concentrations in groundwater began to increase in the residential water supply well, located at 465 Dupont Circle, in the fall of 1998. Contaminant levels exceeded 85 micrograms per liter (ug/l) in April 1999, and are continuing to increase. Current (April 2008) 1,4-dioxane concentrations at 465 Dupont Circle exceed 900 ug/l. Contaminant trends are also increasing in monitor well MW-77, located approximately 300 feet southeast of Dupont Circle.

The vertical and horizontal extent of the 1,4-dioxane plume that is migrating into the western Evergreen Subdivision area has not been defined. There has been no vertical aquifer sampling performed in the western Evergreen area. The vertical and horizontal axis of the contaminant plume "upgradient" from Dupont Circle has not been determined. Until the extent of contamination has been defined, and plume migration flow paths evaluated, it is not possible to determine whether the current monitoring well network, which includes monitoring wells MW-54s, MW-54d, MW-55, MW-77, and various residential water supply wells, is adequate for evaluating the fate and transport of 1,4-dioxane contamination in the western area of the Evergreen Subdivision.

DATA INTERPRETATION

PLS has generated several cross sections, based on data from the recent investigations. The cross sections generally transect the study area on a north – south, and east - west axis.

As depicted in cross section 08-11, a confining unit was not encountered in technical boring GSI-96-01, located at the south end of Rose Drive. Sufficient investigation has not been

conducted in this area to determine the vertical distribution, and/or horizontal extent of 1,4-Dioxane contamination. It is apparent from the increasing contaminant trends in monitor well MW-100, located on the northern prohibition zone boundary, approximately 1,200 feet east of GSI-96-01, that deep (Unit E) contamination extends into the Evergreen Subdivision for an unknown distance north and west of MW-100.

PLS acknowledges in the Data Interpretation – Hydrostratigraphy Section of the Report, that the deep contamination in monitoring well MW-30d, may be hydraulically connected to the screened intervals at 465 Dupont Circle, and MW-77, via a southern route through the confining unit "gap" at GSI-96-01. PLS has not installed any vertically profiled monitor wells between MW-30d and Dupont Circle. Data describing aquifer hydraulic properties and contaminant distribution parameters have not been collected for the area between MW-30d and Dupont Circle. PLS did not propose any additional investigation activities for this area.

PLS's analysis of water level and hydraulic gradient data appears to conflict with the concept of 1,4-dioxane migrating from the south, near MW-30d as referenced above. Figure 7 of the Report, Portions of Units E, D_2, and D_0, Potentiometric Surface Contour Map – February 2008 (Fig. 7) depicts a groundwater flow direction from the northwest to east/southeast, in the Unit D_2/E_1, On the basis of these flow directions, the source of contamination at Dupont Circle would have originated in an area northwest of M-14, and Wagner Road, rather than from the PLS facility located south - southwest of the Evergreen Subdivision.

PLS's analysis of water level data from deeper wells, northwest of Dupont, Figure 8, Unit E_2 and Deeper Dupont Area Wells, Potentiometric Surface Contour Map (Fig.8), indicates that groundwater has "a north/northeast component of flow".

My review of static water levels from 776 and 788 Rose Drive, 465 Dupont Circle, and MW-54d, indicates that groundwater elevations were lower in the Rose Drive wells. The data from the static water level investigation indicates that depth to groundwater in the Rose Drive residential wells were taken on February 25, 2008 between 8:35 and 8:45 am. Contingent on the amount of groundwater withdrawn from the aquifer during morning household activities, and well efficiencies, sufficient time may not have elapsed for groundwater elevations to have equilibrated. PLS did not provide information addressing when the wells were last used. The groundwater elevations collected from these residential wells may or may not represent regional potentiometric elevations.

SUMMARY OF FINDINGS

Historical data from purge well TW-11, located south of Nancy Drive, documents that significant concentrations of 1,4-dioxane (3,100 ug/l @ 149 – 150.5 feet below grade (fbg), 2,200 ug/l @ 169 – 170.5 fbg, and 1,800 ug/l @ 189 -190.5 fbg) were detected at depth when this boring was installed in December 2001. Fig. 8 of the PLS Report depicts a groundwater flow direction from the southwest to northeast for the deeper saturated intervals of the western Evergreen Subdivision. Review of historical and current data sets from TW-11, Dupont Circle, and the MW-30d area indicates that 1,4-dioxane exceeding 85 ug/l was detected at 465 Dupont Circle in April 1999. The 1,4-dioxane concentrations did not exceed 85 ug/l at monitoring well MW-30d until April 2002. As noted above, the groundwater flow direction depicted in Fig. 8 of the PLS Report, suggests that the source of contamination in the western Evergreen Subdivision area is from an area west of Wagner Road, proximal to Nancy Drive and TW-11.

The vertical profiling data from newly installed monitoring well MW-118 (Ferry Street and Wagner Road), may not be representative of 1,4-dioxane concentrations west of Wagner Road. Additional investigation, north of TW-11, is needed to define the extent of contamination to 85 ug/l, and determine if there is hydraulic communication between the deep or shallow intervals proximal to TW-11, and the western area of the Evergreen Subdivision.

PLS concludes that monitoring wells MW-54d and MW-55 are properly located to monitor expansion of the 1,4-dioxane plume to the north. These wells were not vertically profiled to bedrock to determine whether they are screened at the correct depth. Also, the distance between MW-55 and the nearest vertically profiled monitoring well to the east, MW-113, is approximately 1,250 feet. Additional investigation may be needed north of MW-55 and west of MW-113 to verify that no 1,4-dioxane is migrating to the north in this area. The need for additional monitoring wells north and east of MW-55 will be contingent on the results from the investigation west of Dupont Circle.

The vertical and horizontal extent of 1,4-dioxane contamination has not been defined in the western portion of the Evergreen Subdivision. Assumptions regarding the effectiveness of the purge system capture can not be verified until the full vertical and horizontal extent of 1,4-dioxane contamination has been determined, and groundwater flow paths evaluated.

RECOMMENDATIONS

PLS did not propose additional investigation in the Dupont/Evergreen area.

My recommendations include the installation of at least three additional nested monitor wells:

- A nested monitoring well is needed immediately west of Dupont Circle, proximal to Rose Drive. Additional wells may be needed west, north and northeast of this location to define the vertical and horizontal extent of 1,4-dioxane contamination to 85 ug/l.

- A nested monitoring well is needed at the south end of Rose Drive, proximal to PLS technical boring GSI-96-01. Additional wells may be needed northwest, west, and southwest of this location to define the extent of contamination.

- A nested monitoring well is needed for the area proximal to the south end of Nancy Drive. Additional wells may be needed west, northwest, and north of this location to define the extent of contamination.

All wells should be vertically profiled to bedrock. Screened intervals should be set in the zone of highest contamination as determined by the vertical profiling activities.

If you have any questions or comments, please let me know.

JC/KJ

cc: Mitch Adelman, RRD