

October 23, 2003

Mr. Andrew S. Hartten, Project Director
DuPont Engineering
Barley Mill Plaza - Bldg. 27
Lancaster Pike & Rte. 141
Wilmington, DE 19805

Re: *Sampling Investigation Results, Little Hocking Water Association Well Field (LHWA), Washington County, Ohio April 2003*

Dear Mr. Hartten:

On April 24, 2003, the Ohio Environmental Protection Agency received the document titled "Sampling Investigation Results Little Hocking Water Association (LHWA) Well Field, Washington County, Ohio". The report describes the August 2002 well field investigation conducted by DuPont to delineate ammonium perfluorooctanoate (C-8) concentrations in soil and ground water near monitoring well TW-4. DuPont's report summarizes the work performed, presents results, and provides conclusions and recommendations.

In 2002, ground water sampled from monitoring well TW-4 detected C-8 concentrations ranging from 12.3 ug/l to 37.1 ug/l - significantly higher than concentrations detected in surrounding monitoring wells. Based on the elevated levels, Ohio EPA requested that DuPont conduct a focused field investigation to delineate C-8 concentrations in soil and ground water near TW-4. In August 2002, DuPont sampled soil at two locations and ground water at 10 locations at various depths within the well field. Concurrently, the monitoring wells and production wells at the well field were also sampled for C-8.

As indicated on page 27 of the final Groundwater Investigation Steering Team (GIST) Report dated August 2003, Ohio EPA and DuPont will determine what additional activities are necessary to complete the investigation. Ohio EPA, Division of Drinking and Ground Waters, has completed a review of the DuPont's report and has the following observations, requests for additional investigation, and recommended revisions to the investigation report:

EXP000185

Observations

1. Ohio EPA agrees that the construction of monitoring well TW-4 has likely been compromised due to a failed grout seal or failed well casing. Therefore, the concentrations of C-8 detected in TW-4 may not be representative of C-8 concentrations at the base of the sand and gravel aquifer. This conclusion is supported by ground water samples collected from boring LHWASW-1 located approximately 30 feet from TW-4 which showed low levels of C-8 (0.166 ug/L and 0.254 ug/l) at the base of the aquifer.
2. Based on soil profile sampling at two locations, the highest C-8 concentrations in soil were detected at the ground surface (170 ug/kg and 110 ug/kg). In boring LHWASW-1, the C-8 concentrations in soil generally decreased with depth and most samples below the water table were non-detect. However, in boring LHWANW-1, an increase in concentration was observed at a geologic interface between silty clay and silty sand located near the water table. Samples from this boring collected below the water table, as depicted on cross section A-A', show C-8 concentrations in the saturated zone ranging from 8.4 ug/kg to 18 ug/kg.
3. Based on ground water sampling from 10 temporary borings, the highest concentrations of C-8 in ground water were detected in the most shallow portion of the saturated zone (34.6 ug/l, 50.8 ug/l and 78 ug/l). At borings LHWANE-1 and LHWANW-1, ground water was sampled from at least two elevations within the aquifer. At these two locations, the C-8 concentrations appear to decrease with depth. At a third location (LHWASW-1), C-8 concentrations were consistently less than 1.5 ug/l in samples collected at five foot intervals throughout the saturated zone. Data from this boring indicates no apparent trend in concentrations with depth. Considering all ground water samples from temporary borings, test wells and production wells, the C-8 concentrations appear to vary in the aquifer profile depending on location. However, it can be concluded that the highest concentrations of C-8 were found in the shallow portion of the aquifer.
4. Ohio EPA agrees with DuPont that based on the current data available, the following pathway does exist: C-8 from the DuPont facility is transported via air emissions by wind and is deposited on the Little Hocking well field surface soils. Precipitation then leaches the C-8 downward through the unsaturated zone to the aquifer. Dissolved C-8 then migrates with ground water within the aquifer. Ground water containing C-8 is pumped from the aquifer from production well(s) and enters the Little Hocking Water Association distribution system.

Request for Additional Investigation

EXP000186

The Little Hocking Water Association well field investigation conducted in August 2002 has led to a sufficient understanding of the vertical distribution of C-8 in soil and ground water near TW-4. The surface soil horizon and the shallow saturated portion of the aquifer are likely to contain the highest concentrations of C-8 due to the deposition of C-8 from DuPont's air emissions. While the basic conceptual model is understood, several important pieces of information are missing. These are: (1) an understanding of the range of C-8 concentrations in surface soil and shallow ground water where C-8 concentrations are expected to be the highest, and (2) a determination of how C-8 levels change over time within these zones. Ohio EPA believes this information is necessary as US EPA continues an evaluation of the fate and transport of C-8 and potential levels of human and environmental exposure. Additionally, as DuPont reduces its air emissions, it is important to predict whether levels of C-8 in water supply wells will respond to reductions immediately, or will remain stable or even increase for some period of time. This information will help determine an adequate frequency for future sampling of the LHWA production wells.

Ohio EPA requests that DuPont establish surface soil and shallow ground water monitoring locations in the vicinity of the Little Hocking Water Association well field. Specifically, the following is recommended:

- Establish at least eight (8) locations to collect surface soil for analysis of C-8. These locations should be selected based on air and ground water modeling and soil and ground water data already collected. Ohio EPA requests that some of the samples be collected in residential areas of Porterfield and/ or Little Hocking, Ohio. Several samples should be collected outside of the alluvial valley (bedrock ridges) where a different soil type is expected.
- Install at least four (4) ground water monitoring wells within the LHWA well field to monitor the shallow portion of the saturated zone. These wells should be installed in the silty sand portion of the aquifer that has detected the highest concentration of C-8. Ohio EPA recommends installing one of these wells north of production well #5, where the DuPont's ground water flow model indicates significantly higher recharge rates to the aquifer. Periodic sampling of the shallow wells is recommended on a frequency to correspond with the production well sampling in the well field as recommended in the final GIST report.

Recommended Revisions to the Investigation Report

1. Section 3.0 - The report states that the Ohio River stage was measured at Kraton, but it does not mention that stage was also measured in a temporary stilling well adjacent to the well field. Please include this data in the report, or explain why the data was not used.
2. Section 4.2 - Ohio EPA requests additional information regarding the relationship of pH and the concentrations of C-8 in ground water and whether or not pH could have an affect on the concentrations of C-8 in TW-4.

EXP000187

3. Section 5.0 - According to Table 4, the C-8 concentrations in soil from boring LHWANW-1 range from 6.1 ug/kg to 110 ug/kg. However, the text in section five reports the range from ND to 110 ug/kg and figure 9 reports the range from 8.4 ug/kg to 110 ug/kg for this same boring. Please revise.
4. Section 6 - Please include the field data sheets in an appendix to the report.
5. Section 6.3 - The report concludes that "no potential ground water migration pathway exists beneath the Ohio River to the Little Hocking well field." This statement should be revised to indicate that if DuPont and GE pumping were to cease, the LHWA well field capture zone would extend beneath the Ohio River to the DuPont facility. This scenario is discussed in DuPont's report on the Revised Groundwater Flow Model dated January 2003.
6. Figure 11, Cross Section A-A' - There is a small discrepancy between Table 1 and Figure 11 where the reported value for LHWASW-1 (45 - 50 feet) is 0.376 ug/L in Table 1 and 0.396 on Figure 11. In addition, soil analytical data is incorrectly recorded on boring LHWAN-1. The data should be recorded on LHWANW-1. Also, the text at the bottom of page 11, section 6.3 should indicate that soil analytical data was collected at LHWANW-1.
7. Figures 11, 12, and 13, Cross Sections - Cross sections A-A', B-B' and C-C' include depictions of the production wells in the Little Hocking well field and Appendix B includes logs of the production wells that were supplied by Little Hocking Water Association. Because the Little Hocking production wells are elevated on mounds of soil, the depiction of the land surface in the cross sections is incorrect. In addition, the total depth of the wells is not accurate due to depicting the well house floor elevation as the original ground surface. The original boring logs for the production wells are attached and the following information is provided by the Little Hocking Water Association in order to correct these cross sections:
 - Well 1 - 59 feet of casing with 9 feet of screen; original grade 592 feet amsl and the bottom of the well at 542.0 feet amsl; 18 feet of fill; current surveyed wellhouse floor elevation 610 feet amsl;
 - Well 2 - 50.3 feet of casing with 20 feet of screen; original grade 599.8 feet amsl and the bottom of the well at 539.8 feet amsl; 10.4 feet of fill; current surveyed wellhouse floor elevation 610.11 feet amsl;
 - Well 3 - 47.3 feet of casing with 20 feet of screen; original grade 600.7 feet amsl and the bottom of the well at 542.7 feet amsl; 9.4 feet of fill; current surveyed wellhouse floor elevation 610.04 feet amsl; and
 - Well 5 - 53.8 feet of casing with 15 feet of screen; original grade 597.11

feet amsl and the bottom of the well at 541.0 feet amsl; 13 feet of fill;
current surveyed wellhouse floor elevation 609.81 feet amsl.

8. Figures 11, 12, and 13, Cross Sections - Please indicate on the cross sections, the source of the ground water elevation. This is important because the water level measured in the temporary borings as indicated on the well logs does not agree with the water table depicted in the cross sections.

CONCLUSION

The Little Hocking Water Association well field investigation conducted in August 2002 has led to a sufficient understanding of the vertical distribution of C-8 in soil and ground water near TW-4. However, Ohio EPA believes that it is important to have a better understanding of the range of C-8 concentrations in surface soil and shallow ground and be able to monitor C-8 concentrations changes in these zones over time. Ohio EPA believes this information is necessary as US EPA continues an evaluation of the fate and transport of C-8 and potential levels of human and environmental exposure. Additionally, as DuPont reduces its air emissions, it is important to predict whether levels of C-8 in water supply wells will respond to reductions immediately, or will remain stable or even increase for some period of time. This information will help determine an adequate frequency for future sampling of the LHWA production wells.

In addition to the work requested in this letter, Ohio EPA and DuPont need to establish the private water supplies that will be periodically sampled as outlined on page 20 of the final Groundwater Investigation Steering Team Report dated August 2003.

Ohio EPA appreciates DuPont's voluntary efforts to investigate the concentrations of C-8 in environmental media in Ohio. We look forward to continuing this work together.

Sincerely,

Steven E. Williams
Hydrogeologist

cc: Mike Baker, Ohio EPA, DDAGW, CO
Mike Preston, Ohio EPA, DDAGW, SEDO
Sarah Wallace, Ohio EPA, DDAGW, SEDO
Mr. Robert Griffin, Little Hocking Water Association
Ms. Linda Aller, Bennett & Williams
file

EXP000189