OhioEPA

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Ted Strickland, Governor
Lee Fisher, Lieutenant Governor
Chris Korleski, Director

Re: GMPT Landfill, Defiance County
Ground Water

May 6, 2008

Mr. Chuck Renn
Environmental Engineering
General Motors Powertrain
P. O. Box 70
Defiance, Ohio 43512-0070

Dear Mr. Renn:

On March 20, 2008, the Ohio Environmental Protection Agency (Ohio EPA), Division of Solid and Infectious Waste Management (DSIWM), Northwest District Office (NWDO) received a response (dated March 19, 2008) to an Ohio EPA comment letter dated February 14, 2008, regarding the Ground Water Monitoring Program at the General Motors Powertrain Landfill (facility) in Defiance County.

A response letter from Ohio EPA, dated April 15, 2008, stated that Comments No. 3, 4, and 7 of Ohio EPA's February 14, 2008, letter had been adequately addressed by the owner/operator's (GMPT-Defiance) response and that Comments 5 and 6 of the letter did not require a response. Ohio EPA deferred comments on GMPT-Defiance's responses to Comments No. 1 and 2 of the February 14, 2008, letter pending further evaluation by Ohio EPA's Division of Drinking and Ground Water's (DDAGW) Statistical Workgroup (Statistics Workgroup). This letter is intended to provide Ohio EPA's response to these remaining comments.

In evaluating GMPT-Defiance's responses to Comments No. 1 and 2 of the February 14, 2008, letter, the Statistics Workgroup also referenced GMPT-Defiance's report, *October 2007 Semiannual Statistical Evaluation of Groundwater Monitoring Data for the Residual Waste landfill*, dated January 2008, a spreadsheet of analysis results for iron, and historical correspondence (Ohio EPA letters dated July 24, 2007, and November 30, 2007 and GMPT-Defiance letter dated August 22, 2007). The Statistics Workgroup reviewed the information for compliance with the ground water monitoring requirements of Ohio Administrative Code (OAC) 3745-30-08(C)(6), statistical method performance standards. Below are the Statistics Workgroup's findings from the review.

COMMENTS

Violations

1. **The facility owner/operator, GMPT-Defiance, is in violation of OAC Rules 3745-30-08(C)(6)(f) and 3745-30-08(C)(5). OAC Rule 3745-30-08(C)(6)(f) requires the statistical method, if necessary, to include procedures to control or correct for spatial variability in the data. OAC Rule 3745-30-08(C)(5) requires that the statistical method ensure protection of human health and safety and the environment and comply with the performance standards outlined in OAC Rule 3745-30-08(C)(6). Therefore, to return to compliance, GMPT-Defiance must revise their statistical analysis procedures to include procedures to control or correct for spatial variability in the background data.**

   GMPT-Defiance chose the inter-well tolerance limit method to evaluate data for iron, sulfate, and total dissolved solids (TDS). However, GMPT-Defiance has also identified the presence of spatial variability in upgradient data for each of these constituents. GMPT-Defiance's March 19, 2008, response to comment 2 states: "Similar to iron, the upgradient wells have also exhibited a high degree of spatial variability with respect to sulfate and TDS concentrations." US EPA Guidance *Statistical Analysis of GW Monitoring Data at RCRA Facilities - Interim Final Guidance*, April 1989, page 5-21, states, "Tolerance intervals are most appropriate for use at facilities that do not exhibit high degrees of spatial variation between background wells and compliance wells."

   More recent US EPA guidance, Draft *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (Unified Guidance), September 2004, discusses in more detail problems encountered with spatial variability. The guidance repeatedly cautions against inter-well statistical methods when spatial variability is identified. The following are examples:

   - Section 3.6 Establishing Background, page 3-22 -- "Finally, the statistical characteristics of the separate background wells should be similar. This last condition cannot be tested until a few rounds of initial sampling data have been collected, but then it is recommended that a one-way analysis of variance [ANOVA] (Section 9.3) be conducted to test for significant differences in the mean levels at the different wells (in the context of groundwater, this is termed *spatial variability*). If the ANOVA identifies significant spatial variation, the user should investigate *intrawell* comparisons at each downgradient well as a possible solution (see Section 3.7)."

- Section 3.7.1 Assumptions in Background-To-Downgradient Comparisons, page 3-24 -- "A closely related assumption is that upgradient and downgradient measurements should be completely comparable and equal on average unless some site- or waste-related change occurs which causes downgradient measurements to increase above the background values. That is, the upgradient and downgradient populations should exhibit statistically significant differences only if such a change has occurred."

- Section 3.7.2.2 Choosing Interwell Tests, page 3-30 -- "In fact, given the host of assumptions attendant to traditional interwell tests, background levels should be established using hydraulically upgradient wells *only when* a clear and consistent groundwater gradient exists *and* there is no evidence of significant spatial variability; i.e., only when the traditional RCRA groundwater framework is tenable. That is, interwell testing is generally only valid when – apart from site-related waste management activity – there is no discernible statistical difference between upgradient and downgradient concentration levels. Furthermore, when spills or leaks of contaminated substances occur, they should only impact concentration levels at downgradient locations."

- Section 9.3.2 One-way Analysis of Variance for Spatial Variability, Section 9.3.2.1 Purpose and Background, page 9-15 -- "One recommended use of one-way ANOVA in the Unified Guidance is to test for the presence of significant spatial variability. Substantial, natural differences in concentration levels between different wells can invalidate upgradient-to-downgradient, interwell comparisons and point the way toward use of intrawell prediction limits (see Chapter 13)."

The American Society for Testing and Materials (ASTM) also cautions against using inter-well statistical methods when there is spatial variability. ASTM Designation: D 6312-98, Standard Guide for Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Programs, paragraph 6.2.1.3,"...Where significant spatial variability exists, it may not be possible to obtain a representative upgradient background, and intra-well comparisons may be required. A one-way analysis of variance (ANOVA) applied to the upgradient well data provides a good way of testing for significant spatial variability."

The Statistics Workgroup concurs with GMPT-Defiance that there is significant spatial variability in upgradient data for iron, sulfate, and TDS. GMPT-Defiance must revise their procedures to control or correct for the presence of spatial variability in the data. Use of intra-well statistical procedures negates the necessity to correct for spatial variability.

In accordance with OAC Rule 3745-30-08(C)(6)(h), prior to initially using an intra-well statistical method for the detection monitoring program, the owner or operator must demonstrate the ground water is not impacted by a release from the landfill facility within the relevant wells.

Statement

2. In GMPT-Defiance's August 22, 2007, correspondence, response number 1, GMPT-Defiance indicates that if statistical limits of detection monitoring indicator parameters are below drinking water standards then the limits are protective of human health and the environment. However, detection monitoring is based on monitoring of indicator parameters chosen by the constituent's ability to provide early detection of a release that might include other, hazardous constituents. Identification of a statistical increase in concentration of an indicator parameter triggers additional assessment sampling and evaluation of an expanded parameter list. Assessment monitoring may identify more hazardous constituent concentrations. If the statistical test conducted on indicator parameter data in detection monitoring does not have sufficient power to detect a release the detection of more hazardous constituents may be delayed or go undetected. Thus, the protectiveness of a statistical test in detection monitoring is judged by its ability to identify a change in concentration. This led to the US EPA developing the standard power curve for evaluating whether a statistical test has acceptable power to detect a release. Standard power curves were added to US EPA's statistical guidance in an Addendum dated April 1992 and expanded upon in the September 2004 Unified Guidance.

   It should also be noted that although the levels of confidence, percentage of population contained in the interval, and the number of background samples used in the tolerance interval provide sufficient power, the limit is not protective due to the unrepresentativeness of the background data as discussed in comment 1 above.

Recommendation

3. GMPT-Defiance is automatically updating background using a moving window of 32 background samples. First, it is not recommended to use a moving window for background unless there has been an increasing trend identified in the upgradient that has been demonstrated not to be due to a release from the landfill. New background data should be added to old background data to increase the background size and statistical power. Second, frequent automatically updating of background can cause a slow increasing trend to go undetected.

While these concerns are especially relevant for intra-well background data they can also be relevant to upgradient background data if the upgradient well is actually downgradient of a mounding under the waste unit or there is contaminant migration upgradient through landfill gas migration.

To address these concerns the following procedures are recommended.

- Do not update background more frequently then once a year.
- Do not update background with less than 4 data points from each well contributing data to the background data group.
- Run an outlier test on the proposed new background (old background plus new background data). Do not include outliers in the background unless they are demonstrated to be representative of background ground water quality.
- Run a trend analysis on each well contributing data to background. If a trend is identified do not update background unless it is demonstrated not to be due to operations of the facility.

If GMPT-Defiance has additional questions about how to return to compliance, a member of the Statistics Workgroup can attend the meeting requested in GMPT-Defiance's March 19, 2008, correspondence.

If you have any questions, please feel free to contact Ken Brock at the Ohio EPA Northwest District Office at 419-373-3143. Any written correspondence should be sent to the attention of Kimberly Burnham, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 N. Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,

Kimberly Burnham, R.S.
Environmental Specialist
Division of Solid and Infectious Waste Management

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