



State of Ohio Environmental Protection Agency

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

Re: Statistical Report of Groundwater Quality
Wapakoneta Landfill, Auglaize County
Notice of Violation

April 6, 2009

Mr. Rex A. Katterheinrich, P.E.
Director of Public Service and Safety
City Hall
P.O. Box 269
Wapakoneta, Ohio 45895-0269

Dear Mr. Katterheinrich:

The Ohio Environmental Protection Agency (Ohio EPA) completed a review of the statistical report of ground water quality for the May 2008, sampling event for the Closed Wapakoneta Sanitary Landfill (facility). The submittal was dated January 15, 2009, and received January 16, 2009.

The facility is currently required to operate under the detection and assessment monitoring programs as required by OAC Rule 3745-27-10 (D) and (E) for the uppermost aquifer system, and under the assessment monitoring program as required by OAC Rule 3745-27-10 (E) for the significant zone of saturation. The facility is presently operating under the correct ground water monitoring phases for the significant zone of saturation, but the well system is not adequate, background has not been established, and assessment is incomplete. In addition, the entire uppermost aquifer system in the MW-10 area should be included in the assessment program; but the well system may not be adequate and assessment is incomplete. Also, the owner or operator should move toward implementation of an effective corrective measure. The following are Ohio EPA comments relating to the review.

VIOLATIONS

1. **The owner/operator, Wapakoneta Sanitary Landfill, continues to be in violation of Ohio Administrative Code (OAC) Rule 3745-27-10 (C)(3), effective March 1, 1990, which requires that, the permittee establish background ground-water quality, unless the exception in paragraph (C)(4) of the rule applies, by analyzing ground-water samples collected from hydraulically upgradient well(s) for each of the monitoring parameters or constituents required in the particular ground-water monitoring program that applies to the sanitary landfill facility as determined by paragraphs (D), (E), or (F) of this rule.**

OAC Rule 3745-27-10 (C)(4)(a) and (b), effective March 1, 1990, requires that background ground-water quality at existing sanitary landfill facilities may be based on sampling of wells that are not hydraulically upgradient where: (a) Hydrogeological conditions do not allow the permittee to determine which wells are upgradient; and (b) sampling of other wells will provide an indication of background ground-water quality that is as representative or more representative than that provided by upgradient wells. The permittee needs to establish an appropriate background well(s) and establish background ground water quality for comparison to the downgradient wells in the significant zones of saturation.

While the owner/operator has installed additional wells on the site in the significant zones of saturation no background well has been designated and no interwell analyses have been performed for the significant zones of saturation. The owner/operator is cautioned that background wells must be unaffected by the landfill. The owner/operator is cautioned that while the significant zones of saturation are, at least in part, interconnected, there are several significant zones of saturation at the site and all of these zones must be properly correlated; all of these zones need to be monitored; and any contamination found in them needs to be addressed.

2. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by utilizing inappropriate statistical methods. This rule requires that the ground-water monitoring program include consistent sampling and analysis procedures that are protective of human health and the environment and that are designed to ensure monitoring results that provide an accurate representation of ground-water quality at the background and downgradient wells installed in accordance with paragraph (B) of this rule. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator needs to review the data and perform interwell statistical analyses using a proper background well or utilize some other means to prove that the significant saturated wells are not affected prior to using intrawell methods.**

On page three of the submittal, in the section labeled, "Statistical Evaluation" the owner/operator states, "In general, statistical evaluations of the November 2008, data were completed using "intra-well" procedures." In the same section the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination in the detection monitoring program with the exception of specific conductance in shallow significant saturated zone monitoring well SW-4 and uppermost aquifer upgradient monitoring wells SW-6 and MW-6R and downgradient monitoring wells MW-5 and MW-8.

No statistical significance was identified for any monitoring well/parameter combination in the assessment monitoring program with the exception of specific conductance in monitoring well SW-7 and specific conductance and total dissolved solids (TDS) in monitoring well MW-10."

The observation, that only specific conductance was determined to be a statistical exceedance in one downgradient significant saturated zone detection monitoring well (SW-4), and in two downgradient detection monitoring wells in the uppermost aquifer system (MW-5 and MW-8), is likely a function of the intrawell statistical methods which do not detect the exceedances in wells which are already contaminated unless there are continued statistical increases in concentration. Interwell methods, or some other means, have not been utilized to show that these wells are not affected by leachate-derived constituents. In addition, SW-7 has been known to be affected for at least the past 10 years. The latest analytical results indicate that vinyl chloride was again detected, this time at 16 µg/L in SW-7. Monitoring well SW-1, for example, had previously displayed high levels of chloride and sodium; and currently displays apparent high values of total dissolved solids and specific conductance when compared to some other significant saturated zone wells. (Only pH, temperature, specific conductance, total dissolved solids, and total organic carbon were analyzed during this event.) Below is a table of analytical results in several wells. The table is based on the November 2008, event data and includes: affected well SW-7, apparently unaffected well SW-13, and possibly affected wells SW-1, SW-5 and SW-8.

ANALYTE	SW-1	SW-8	SW-7	SW-5	SW-4	SW-14	SW-13
pH	7.56	7.3	7.73	7.24	6.43	7.05	7.65
Specific Conductance µmohs/cm	1470	1600	3110	2090	1010	2190	999
TDS mg/L	832	964	1720	1560	550	1410	420
TOC	3.3	4.3	4.8	2	1.0	5.3	1.8

Significant saturated zone wells SW-1, SW-5, SW-8, and SW-14 may be affected since concentrations of many analytes in each of these wells are greater than those in SW-13. The use of intrawell statistical techniques without first determining if the well is affected by the landfill would not indicate the presence of contaminants in a contaminated well.

The use of intrawell statistical methods, on analytical results from a well that was contaminated before the statistical methods are applied, is not protective of human health and the environment and is not designed to provide an accurate representation of ground water quality.

3. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(8). For rule citation of OAC Rule 3745-27-10 (C)(3) (effective March 1, 1990) see comment number 1 above. OAC Rule 3745-27-10 (C)(8) (Effective March 1, 1990) requires that the permittee determine whether or not there is a statistically significant increase (or decrease in the case of pH) from background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the sanitary landfill facility, as determined in accordance with paragraph (D), (E), or (F) of this rule. The permittee shall make this determination each time he assesses ground water quality. To determine whether a statistically-significant increase or decrease has occurred the owner or operator needs to compare the ground-water quality of each parameter or constituent at each downgradient ground-water monitoring well to the background value of that parameter or constituent according to the statistical procedures specified in paragraphs (C)(5) and (C)(6) of this rule. The exception in paragraph (C)(4) as expressed in OAC Rule 3745-27-10 (C)(3) has not been shown to apply. The owner/operator needs to perform interwell statistical analyses until it can be proven that the downgradient wells are not affected.**

In Appendix C of the submittal the owner/operator presents statistical analyses for significant zone of saturation wells SW-1, SW-4, SW-7, and SW-8; and uppermost aquifer system wells SW-5, SW-6, MW-5, and MW-8. The statistical procedures for these wells utilized intrawell methods. In order to meet the requirements of OAC Rule 3745-27-10 (C)(8) the owner/operator needs to statistically compare the downgradient well results to the background well results in order to show that these wells are not affected. This was not done.

4. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by updating using inappropriate data. For rule citation see comment 2 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator needs to test for outliers and submit the results and any corrected control charts to Ohio EPA.**

Ohio EPA, in a response to the July 2000, sampling event, indicated that the owner/operator should not update the background data set until appropriate tests for statistical differences and outliers have been performed on the background data set.

Ohio EPA further indicated that the results of these tests needed to be submitted to Ohio EPA along with the corrected control charts resulting from this testing as soon as possible. The owner/operator has not provided information relating to the test for outliers and has indicated that it has updated the background data set. The use of outliers in the background data set is not protective of human health and the environment and is not providing data which is representative of the ground water of the site. In addition, the use of data in the background data set which is no longer representative of the ground water of the site is not protective of human health and the environment. In the current submittal there are no outlier analyses presented for the background for interwell methods. If outlier tests were performed they should be submitted.

- 5. The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by using data in the background data set which is not representative of the ground water of the site. For rule citation see comment 2 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator should remove all TOC data which is not representative of the ground water of the site. This is often the data associated with excessive turbidity values.**

In the Ohio EPA comments regarding the May 29, 2003, sampling event the agency made the following statement: "A review of the historical analytical data indicates downward trends in statistical parameter, total organic carbon (TOC). Ohio EPA calculated correlation coefficient values for several of the wells at the site to determine if changes in TOC concentration are related to changes in turbidity. Following is a list of the analyzed wells where correlation coefficient values were determined for TOC and turbidity. These were performed where values were available and there appeared to be TOC trends.

WELL	TOC/TURBIDITY CORRELATION COEFFICIENT
MW-5	0.994354
SW-6	0.96332
SW-7	0.786882
SW-4	0.609568
SW-1	0.594808
MW-10	0.561779

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These wells display fair to excellent correlation between TOC and turbidity implying that increased TOC is related to increased turbidity. Both the TOC and turbidity values display a downward trend over time suggesting the wells took some time to develop and the early data is no longer representative of the current conditions. Total organic carbon is a statistical parameter for both the uppermost aquifer system and the significant zones of saturation. The data used in the statistical analysis should be representative of the ground water of the site. It should be noted that some high TOC values have been removed from the background data set as outliers, but anomalously high values still appear to be present. Also, wells SW-1, SW-5, SW-7, SW-8, and MW-10 appear to display a significant decrease in TOC values all occurring during the April 1999 sampling event and continuing through the current event." Response to this agency comment has not been provided by the owner/operator. The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1).

Previously, the owner/operator had performed a test for trends on selected well/parameter combinations. Some of these trend test results indicate that there is no upward trend, but the data indicate a downward trend. Downward trends may mean old data is no longer representative of the conditions in the ground water at the site.

6. **The owner/operator continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(8) by not performing the appropriate statistical analysis. For rule citation of OAC Rule 3745-27-10 (C)(8) (effective March 1, 1990) see comment number 3 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(8) the owner/operator needs to utilize a two-tailed test for all statistical analyses for pH.**

In the statistical analysis section of the submittal the owner/operator provides parametric prediction interval analysis using interwell comparisons for pH for well MW-10. The provided information indicates the prediction interval is 0 to 7.846 (logged value 2.06). This is a one-tailed test. OAC Rule 3745-27-10 (C)(8) indicates that the owner/operator shall determine whether or not there is a statistically significant increase (or decrease in the case of pH). This requires a two-tailed test and a lower prediction limit needs to be determined. In addition, the Shewhart-CUSUM Control Chart analysis for pH in wells SW-1, SW-4, SW-5, SW-6, SW-7, SW-8, MW-5, MW-6R, and MW-8 utilize one-tailed procedures. For example, the pH data from January 8, 2008, at wells SW-8 and MW-8 may be displaying an exceedance of a low prediction limit.

- 7. The owner/operator continues to be in violation of OAC Rule 3745-27-10(C)(1). For rule citation for OAC Rule 3745-27-10 (C)(1) see comment number 2 above. In order to return to compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation when the wells recharged sufficiently to collect a sample. Also, the owner/operator needs to ensure that representative samples are collected, and that the procedures used for collecting samples are documented in the plan.**

A review of the field data sheets for the wells sampled at the site indicates that ground water field parameter values did not display stable conditions or displayed conditions which were not consistent with purge data. In wells which were not purged dry, there are typically seven (7) readings for field parameters: pH, temperature and conductance. These represent readings labeled: initial, 1, 1.5, 2, 2.5, 3, and Sampling Data. When properly purged, field data from the wells should display consistent results for the last three readings. When compared to each other the last three readings ideally should be within 0.2 S.U. for pH, within 3% for conductance, and within 0.5°C for temperature.

Based on review of ASTM and U.S. EPA guidance, Ohio EPA considers the criteria for stabilization of these field parameters to be ± 0.2 S.U. for pH, $\pm 3\%$ for conductivity, $\pm 0.5^\circ\text{C}$ for temperature and $\pm 10\%$ for turbidity (when turbidity is > 10 NTU). A parameter can be considered stable when at least three consecutive readings have stabilized.

A review of the field data sheets indicates that all wells were purged on either November 18, or November 19, 2008, but were sampled the next day (November 19, or November 20, 2008, respectively), whether they could produce enough water immediately following purging or not. It is understood that several wells recharge slowly and it might take several hours before enough water is available for sampling. However, many of the wells cannot be purged dry and enough water is available for sampling immediately following purging. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. This usually means that samples are collected as soon as enough water is available for sampling. Waiting 18 or more hours to sample a well which had recharged immediately following purging, could result in samples of "stagnant" water and would not result in representative samples. A review of the stabilization data recorded as field parameters for wells that were not bailed dry indicates the chemistry of the water in several of the wells changed significantly between the end of purging and the time of sampling. The chemistry of the sampled water is significantly different from that removed from the well at the end of purging and is not representative of the ground water of the site. The sampled water appears to be stagnant. Following is a table comparing the field parameters of some of the wells which were not bailed dry.

Bold values exceed new stabilization criteria. Values with an asterisk indicate values equal or exceed a 10% difference.

WELL	Time from purge to sampling (hrs)	pH at third volume (SU)	Sample pH (SU)	Temp. at third volume (°C)	Sample Temp (°C)	Conduct. at third volume (µmohs/cm)	Sample Conduct. (µmohs/cm)
SW-1*	18:55	6.8	7.56*	11.2	10.4	1470	1470
SW-2*	19:40	6.65	7.19	13.9	12.5*	8690	7650*
SW-6*	20:05	7.21	7.74	11.6	11.0	778	920*
SW-7	20:00	6.72	7.73*	12.1	10.8*	4370	3110*
SW-8*	21:15	6.60	7.30	9.9	9.8	1850	1600*
SW-12*	18:05	6.94	7.60	11.8	11.4	1550	1710*
MW-5*	19:20	7.1	7.89*	10.6	8.5*	999	999
MW-6R	20:00	7.2	7.49	11.2	11.3	844	900
MW-8*	21:05	6.95	7.55	11.3	9.1*	999	999
MW-10*	19:25	6.39	7.58*	11.0	10.0	3830	2270*
IAW-1*	19:24	7.31	7.22	12.5	11.3*	9580	8210*
IAW-3*	19:40	7.45	7.47	12.6	11.5	4970	4480*
IAW-4	19:35	7.61	7.42	11.2	10.7	3210	3020
SAW-4*	19:40	6.78	7.08	12.3	11.0*	8520	8550
SAW-5*	19:40	7.23	7.07	12.4	10.7*	9230	11300*
SAW-9	19:35	7.21	7.03	12.4	10.7*	4460	5540*
DAW-2	21:25	7.3	6.15*	11.2	10.5	5200	3330*
AW-1*	20:25	7.37	7.51	11.8	11.3	757	990*
AW-7	20:05	7.1	7.34	12.3	11.9	1176	1240
AW-9*	20:15	7.76	7.46	12.3	11.4	791	900*

Based on stabilization criteria: pH ± 0.2 standard units, specific conductance $\pm 3\%$, and temperature $\pm 0.5^\circ$ Celsius.

* Exceeds 10% criteria set by owner/operator.

Wells should be sampled as soon as enough water is available in the well to sample. A similar comment was made regarding several previous sampling events, but no owner/operator response has been received.

8. **The City of Wapakoneta continues to be in violation of OAC Rule 3745-27-10 (B)(3)(e) which requires that the monitoring wells, piezometers, and other measurement, sampling, and analytical devices be operated and maintained to perform to design specifications. Wells which display siltation and fill-up need to be cleaned, redeveloped or replaced in order to provide representative samples.**

The owner/operator had previously indicated that the wells had been surveyed for location and elevation and that the well total depths were measured. The measured total depths were recorded on the field data sheets as "Measured Total Depth (Referenced from Top of Casing)". There is also a total depth recorded as "As-Constructed Well Depth (Referenced from Top of Casing)". A review of the field data sheets for the May 2008, event indicated that several wells display a significant change in total depth. In some cases the measured well TDs were shallower than the as-constructed value and in other cases the measured TDs were deeper than the as-constructed value. These changes could be due to fill-up of the well by silt or other damage. Following is a table indicating significant changes in TD values at some of the wells during the May 2008, event:

WELL	Measured TD	As-constructed TD	Difference in TD (minus is shallower)
SW-6	79.28'	79.92'	-0.64'
DAW-2	44.37'	40.40'	+3.97'
MW-6R	109.97'	111.48'	-1.51'

9. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(3), OAC Rule 3745-27-10 (C)(4), and OAC Rule 3745-27-10 (C)(7) which requires that the owner/operator determine the presence of statistically significant change from background values. For rule citation of OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(4) see comment number 1 above. The owner/operator must perform interwell statistical analyses on the uppermost aquifer system well data, including data from the new uppermost aquifer system wells. In addition, the owner/operator must perform interwell statistical analyses on the significant zone of saturation well data to determine the presence of statistically significant change.**

In the last paragraph on page one of the statistical analysis memorandum the owner/operator states, "Based on the geologic, hydrogeologic, and geochemical conditions at the facility, statistical evaluations completed for shallow significant saturated zone and uppermost aquifer monitoring wells were generally completed using "intra-well" procedures. However, monitoring well MW-10 was evaluated using "inter-well" procedures upon the request of Ohio EPA." It has not been shown that uppermost aquifer system monitoring wells, other than the upgradient well MW-6R, will provide data which are as representative or more representative. Downgradient well MW-10 has been shown to be affected and requires interwell procedures. The exception in OAC Rule 3745-27-10 (C)(4), therefore, does not apply to the other uppermost aquifer system monitoring wells. The owner/operator must determine the presence of statistically significant change utilizing interwell methods using upgradient well MW-6R for all uppermost aquifer system monitoring wells until it can be adequately shown that the exceptions in OAC Rule 3745-27-10 (C)(4) are applicable or that the downgradient wells are not affected by the landfill. In addition, the owner/operator must utilize an appropriate and unaffected upgradient background well to determine the presence of statistically significant change at the significant zone of saturation wells.

10. **The City of Wapakoneta continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(7), which requires that the permittee determine if there is a statistically significant increase (or decrease in the case of pH) by comparing the downgradient well data to the background data. The City is in violation of this rule by not determining the presence of a statistically significant change. The permittee must properly determine the presence of a statistically significant change for all appropriate wells.**

Regarding Ohio EPA comments relating to the January 2008, sampling event the agency made the following comment. The owner/operator has not responded. In the last paragraph on page 3 of the statistical memorandum the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination evaluated for the January 2008, sampling event with the exception of specific conductance in monitoring well SW-7 and specific conductance and TDS in monitoring well MW-10." Tables C-1 and C-2 provide a summary of statistical evaluations of monitoring wells screened in the significant saturated units and uppermost aquifer system. The tables only note statistical significance and, what the owner/operator calls "validation", for specific conductance in well SW-7 and specific conductance and total dissolved solids in well MW-10. Statistical analyses were performed for pH in other wells, but none were noted as being an exceedance.

A review of the statistical analyses results was performed by Ohio EPA. Wells SW-4, SW-8 and MW-8 all show an apparent significant change exceeding standardized units for pH on Shewhart-CUSUM control charts. The statistical limits on control charts are set at 4.5 and 5.0 units. Additional review and statistical analyses by Ohio EPA indicates that the low pH readings in wells SW-4, SW-8, and MW-8 are, indeed, statistically significant changes. These changes were not determined by the City of Wapakoneta as required by OAC Rule 3745-27-10 (C)(7).

11. **The City of Wapakoneta continues to be in violation of OAC Rule 3745-27-10 (C)(6)(e), which requires that any practical quantitation limit (PQL) utilized in the statistical analyses be the lowest concentration level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility. The owner/operator should not utilize the total organic carbon non-parametric prediction limit which is based on a PQL that is greater than the current PQL. The owner/operator should appropriately recalculate the statistical limit after removing outliers and not including PQL values which are not the lowest.**

A review of the determination of the non-parametric limit for TOC, as calculated from well MW-6/MW-6R data, indicates that the statistical limit is one half of a former PQL value of <25 mg/L. The lowest PQL for background is now 0.5 mg/L. Based on OAC Rule 3745-27-10 (C)(6)(e) it is inappropriate to utilize the PQL of 25 mg/L or even one half of 25 mg/L.

12. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (D)(8)(b), which requires that the permittee resample a well that displayed a statistically significant increase and of which the permittee notified Ohio EPA as displaying the increase within fifteen days of that notification; also the permittee is required to notify Ohio EPA when the resampling will be performed. The City of Wapakoneta needs to resample well SW-16 for benzene, and notify Ohio EPA of the sampling event. Subsequent to the resampling notification needs to be made to the director regarding the results of the resampling per OAC Rule 3745-27-10 (D)(8)(c).**

In the second paragraph on page 3 of the submittal for the May 2008, event, the owner/operator states, "Two VOCs were reported in both the sample and the duplicate sample collected from monitoring well SW-3R including benzene (1.9 and 2.1) and acetone (12 µg/L). Benzene was also reported at a concentration of 1.1 µg/L in the sample collected from investigative well SW-16.

During future sampling events, these wells will be closely monitored to determine if the reporting of benzene and acetone resulted from the landfill or were the result of field/laboratory conditions at the time of sample collection/analysis." Well SW-3R has, for some time, been considered an assessment well, however, well SW-16 has now been sampled and a statistically significant increase has been observed (benzene 1.1 µg/L). The well is a detection well which must be resampled per OAC Rule 3745-27-10 (D)(8)(b).

13. **The owner/operator, Wapakoneta Sanitary Landfill, is in violation of OAC Rule 3745-27-10 (C)(1). For rule citation see comment 2 above. The owner/operator continues to utilize potentially compromised data in the background data set. The data from well MW-6 should be purged from the MW-6/MW-6R data set until such time that it can be shown to be representative of the ground water of the site.**

Interwell prediction limits were calculated by the owner/operator for the uppermost aquifer system (UAS) wells using data purportedly from well MW-6R dating back to October 1993. Well MW-6R, installed in July 2000, is a replacement well for well MW-6 which observed the presence of methane in the well. In addition, well MW-6 displayed damage to the surface casing. Well MW-6 was not considered to be operating to design specifications. Based on the entrance of the methane, damage to the surface casing, and the well not operating to design specifications, the data from well MW-6 is in question. In particular, the total organic carbon (TOC) data from 1993 through 1999 appears to be anomalous compared to the data collected from 2000 to the present (after well MW-6R was installed). In addition, a Sen's Slope analysis indicates a statistically significant decreasing trend for all TOC data resulting from the addition of the MW-6 data. When the MW-6 data is removed from the data set, the trend is no longer significant. The data from well MW-6 is not representative of current background conditions.

MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE

14. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. It appears that the owner/operator is utilizing inappropriate data in the background data base. The owner/operator needs to clearly and completely explain how they have removed all outliers from the background database and are not using inappropriate data for background. Alternatively, the owner/operator may test the background data for outliers, remove all outliers from the background database, reanalyze the data and submit the results and any corrected control charts to Ohio EPA.**

A review of interwell parametric prediction interval analysis for TDS in well MW-10 indicates that the owner/operator utilized 32 values in the background database. The background well is said to be MW-6/MW-6R and, based on the historical data contains 33 TDS values. This would indicate that one value was removed from the background data base prior to performing prediction interval analysis.

Ohio EPA reviewed the data and performed outlier analyses using Rosner's outlier test and the 1989 U.S. EPA method. Both methods indicated the presence of two (2) outliers. If the owner/operator removed one value, there is still one outlier in the background database.

15. **Compliance with OAC Rule 3745-27-10 (C)(1) and (C)(1)(d) cannot be determined at this time. For rule citation for OAC Rule 3745-27-10 (C)(1) see comment number 2 above. OAC Rule 3745-27-10 (C)(1)(d) requires that the sampling and analysis plan include, "a detailed description of the equipment, procedures, and techniques to be used for (d) performance of field analysis..." To assure compliance with OAC Rules 3745-27-10(C)(1) and (C)(1)(d) in the future, the owner/operator needs to do one of the following: a) revise the Groundwater Detection Monitoring Sampling and Analysis Plan to document the new field parameter stabilization criteria noted above, followed by field implementation; or 2) demonstrate to Ohio EPA how the current field parameter stabilization criteria in the Groundwater Detection Monitoring Sampling and Analysis Plan meet the requirements of OAC Rule 3745-27-10(C)(1).**

According to Section 5.7 on page 14 of the owner/operator's Revised Groundwater Detection Monitoring Sampling and Analysis Plan (revised July 2002, and January 2008), "After groundwater elevations are measured in all monitoring wells and prior to sample collection, all monitoring wells will be purged to remove any stagnant water in the casing and to ensure that a representative groundwater sample is being collected. Purging will be performed using a Teflon bailer or Keck pump. Purge water will be disposed of away from the well head. Hull's SOP No. F3007 included in Appendix C outlines the proper purging procedures and documentation utilized. Note that in all cases, the monitoring well will be purged until the temperature, conductivity and pH values of the purge water have stabilized." Hull's SOP 3008 (not 3007) provided in Appendix C of the plan states in part in the second paragraph of section G on page 4 of 7, "The temperature, pH, and conductivity will be measured initially, as well as after each well volume is purged. The last two values obtained must be within 10 percent of one another."

Based on review of current technical literature, Ohio EPA now considers the criteria for stabilization of these field parameters to be ± 0.2 S.U. for pH, $\pm 3\%$ for conductivity, $\pm 0.5^\circ\text{C}$ for temperature and $\pm 10\%$ for turbidity (when turbidity is >10 NTU). A parameter can be considered stable when at least three consecutive readings have stabilized.

16. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation relating to when the wells recharged sufficiently to collect a sample.**

A review of the field data sheets indicates that wells SW-4, SW-3R, SW-5, P-1, SW-11, SW-13, SW-14, SW-15, and SW-16 were purged dry. The wells were then sampled the next day. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. This usually means that samples are collected as soon as enough water is available for sampling. Waiting 18 to 22 hours to sample a well which had recharged shortly after going dry could result in samples of "stagnant" water and would not result in representative samples. There is no information provided by the owner/operator which clearly indicates when these wells recharged with enough water to sample. It can be determined from the data provided that several of the wells which were purged dry were recharging at a rapid rate. Well SW-4, for example, was purged of 1.34 volumes before it went dry, SW-3R was purged of 2.03 volumes before it went dry, SW-14 was purged of 1.5 volumes before it went dry, and SW-15 was purged of 1.98 volumes before it went dry. Even though these wells were recharging, they were sampled the next day. The samples may have been of stagnant water.

Wells should be sampled as soon as enough water is available in the well to sample. Similar comments were made since the report of the May 2006, sampling event, but no owner/operator response has been received.

17. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation that the procedure utilized for purging and sampling is providing representative samples with low turbidity. Alternatively, the owner/operator may modify their procedure in such a manner as to produce representative samples. This may include purging at a slower rate.**

A review of the laboratory reports indicates that several wells produced samples with excessive total suspended solids (TSS). These wells, DAW 2 (215 mg/L), SW-3R (307 mg/L), and SW-13 (492 mg/L), were purged using bailers.

Of these wells SW-3R and SW-13 were purged dry. Sampling on these high TSS wells typically occurred over 19 hours after purging. Even after letting the wells set for over 19 hours, these wells still produced turbid water. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. With these high turbidity readings, it is clear that the procedures utilized may not be producing representative samples. It appears that purging and/or sampling methods are causing an increase in intergranular velocities resulting in the movement of clay and fine silt size fraction materials.

18. **Compliance with OAC Rule 3745-27-10 (C)(6)(a), which requires that the statistical method be appropriate for the distribution of the parameters, cannot be determined at this time. The owner/operator may be inappropriately transforming the data. The City of Wapakoneta should provide details relating to how the W statistic was determined. The owner/operator should show how the use of natural log transformation is more appropriate than raw data when performing Shewhart-CUSUM Control Charts. Typically the need for transformation should be based on the best "W". The default method should be the use of untransformed data.**

A review of the control chart for specific conductance at well MW-5 indicates that the data was transformed using a natural logarithm transformation. Ohio EPA determined the "W" coefficient for both the normality of the raw data and the log transformed data. The best "W" was for the raw data (0.9380) rather than the log transformed data (0.9341). The owner/operator should use the raw data. This comment was also made regarding the January and May 2008, events.

19. **Compliance with OAC Rule 3745-27-10 (C)(1), which requires the use of procedures which will result in the collection of representative samples, cannot be determined at this time. The owner/operator did not use the ground water elevation determined for well SW-16 because of "gas pressure", but the data suggest gas pressure did not impact the ground water elevation. The City of Wapakoneta needs to explain how much pressure was in the well and explain how this pressure affected the ground water elevation. Otherwise, the city should use this data in a properly constructed potentiometric surface map.**

The field data sheet for well SW-16 indicates the well was bailed dry, and that prior to purging the well contained 0.49 feet of water which covered part of its 5 foot screen. On Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (11/18/08), well SW-16 contains a note which states, "Piezometer not used to develop potentiometric surface map due to impacts from gas pressure." Actual gas pressure was not provided by the City. It is unclear what "impacts" the gas pressure had on the ground water level in the well since the gas was open to the well in the 4.5 feet of open screen above water level. It is also unclear how those impacts were caused.

A review of the cross sections provided in the sampling and analysis plan and a review of the ground water elevations in this area of the facility indicates that the ground water elevation in well SW-16 is more similar to the levels in the uppermost aquifer system wells than the several significant zones of saturation. This sand unit may be in communication with the uppermost aquifer system.

20. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator should clearly indicate how the potentiometric surface map in Figure 1 meets the requirements of this rule. Alternatively, the owner/operator may produce one potentiometric surface map for each of the significant zones of saturation.**

On page 4 of the submittal the owner/operator states, "Figure 1, included in Appendix D-2, provides a potentiometric surface map constructed for the significant saturated zone using groundwater elevation data collected on November 18, 2008." A review of Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (11/18/08), indicates that the map incorporates data from all wells considered by the owner/operator to be screened in the significant zone of saturation. A review of the cross sections provided by the owner/operator in March of 2008, indicates that there are likely three significant zones of saturation under the site. While these zones are, to some extent, interconnected, locally they tend to display different ground water elevations. In addition, locally the chemistry of these zones tends to vary. For example, well SW-2, located near the Auglaize River and screened at about 870' amsl, shows the presence of volatile organic compounds (VOC) benzene and chloroethane. However, well SW-7, located in the same area, but screened about 10 feet deeper at about 860' amsl, has only reported VOC vinyl chloride. Yet another zone is screened about 890' amsl in SW-11. This "890' zone" appears to be approximately equivalent to that screened at about 885' in well SW-14. Since there are multiple significant zones of saturation there should likely be several potentiometric surface maps.

21. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clarify their statement.**

On page 4 of the submittal the owner/operator discusses the significant zone of saturation potentiometric surface map (Figure 1) and states, "Groundwater flow within the significant saturated zone is to the northeast in the northern portion of the facility and to the southwest in the southern portion of the facility." A review of Figure 1, as presented by the owner/operator, indicates that the map does not support this statement. It appears that the statement may be indicating the presence of radial flow, but the map is not drawn to show radial flow.

22. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to provide the time of purging for well AW-7 for the May 2008, sampling event.**

The field data sheet for well AW-7 indicates that the well was purged on May 28, 2008, and sampled at 10:12 on May 29, 2008. There is no notation as to the time the well was purged. In order to determine if representative samples are collected Ohio EPA needs to know if there was an excessive amount of time between purging and sampling. In order to know this the time of purging is necessary.

23. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clearly and in detail explain why well MW-6R is not being affected by conductivity contamination from damaged well MW-6.**

A review of the conductance data for well combination MW-6/MW-6R indicates a statistically significant increasing trend over time beginning after about the year 2000. Well MW-6R was installed in July 2000, and is a replacement well for well MW-6. Well MW-6 was shown to be producing methane, was damaged and was not operating to design specifications. The increasing trend may be the result of contaminants flowing down damaged well MW-6 to the uppermost aquifer system and then to new well MW-6R.

24. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to explain how the ground water level in well DAW-1 is anomalous.**

On Figure 2 Potentiometric Surface Map for the Uppermost Aquifer (11/18/08) the owner/operator provides two note references next to well DAW-1. Reference "2" refers to the note which states, "Piezometer not used to develop potentiometric surface map due to anomolous [sic] measurement." There is no discussion why the owner/operator considers this measurement to be anomalous. All representative data should be used. If the data is not representative it should be explained.

25. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clearly and in detail explain why wells DAW-1 and DAW-3 need to be decommissioned.**

In item 4 on page 2 of the submittal the owner/operator states, "As documented in the AMSAP, uppermost aquifer assessment monitoring wells DAW-1 and DAW-3 will no longer be monitored as part of the assessment monitoring program as they are not performing to design specifications." The AMSAP only indicates, "A review of data suggests assessment wells DAW-1 and DAW-3 are not performing according to design specifications and will be decommissioned in the near future." On Figure 2 Potentiometric Surface Map for the Uppermost Aquifer (11/18/08) the owner/operator provides two note references next to wells DAW-1 and DAW-3. Reference "1" refers to the note which states, "To be decommissioned." These wells have been shown to be affected by the landfill and should not be removed unless they are properly replaced in the same immediate area in the exact same zone. No clear, detailed reasons have been presented by the owner/operator for their removal.

26. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clarify if the fourth temperature reading recorded for well SW-7 during purging is accurate or is an error. If the value is an error the correct value should be provided.**

In the field data sheet for well SW-7 temperature was recorded during purging six times. The readings range from an initial reading of 11.9°C to 12.1°C. The third and the last two readings are consistently 12.1°C, but the fourth reading is 21.1°C. It appears that the fourth reading may be a typographical error.

27. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to provide detailed explanation to clarify if the conductivity reading recorded consistently for several wells is correct. If it is not correct, the correct data should be provided.**

In the field data sheets for several wells the conductivity reading of 999 $\mu\text{mohs/cm}$ is presented. For well MW-5 the conductivity value 999 $\mu\text{mohs/cm}$ is recorded for readings numbered 1, 1.5, 2, 2.5, 3, and the sample reading. For well MW-8 this value is presented for readings numbered 1.5, 2, 2.5, 3, and the sample reading. For well SW-13 the sample reading was 999 $\mu\text{mohs/cm}$. A review of the historical data for well MW-8 indicates a conductivity value of exactly 999 $\mu\text{mohs/cm}$ in January 2008, and November 2008. This value is unusual since exactly 999 $\mu\text{mohs/cm}$ occurs consistently in these wells. It appears that the instrument's scale was incorrectly set.

STATEMENTS

28. **Wells MW-10, P-1, DAW-1, DAW-2 and DAW-3 are affected by operations at the landfill.** On page 3 of the memorandum on the statistical analysis located in Appendix C it is stated, "Therefore, the calculated statistical significances identified in monitoring well MW-10 are considered to be the result of the statistical method used in the evaluation of the data (inter-well procedure). None-the-less, these statistical significances are currently under investigation as outlined in the facility's AMSAP."

Although errors in the statistical method may sometimes result in the calculation of statistical significances that do not exist, the inappropriate use of a statistical method may show no statistical significance where one exists. A review of the conductivity and TDS results for the uppermost aquifer system wells indicates that the results from MW-10 are significantly greater than those for the upgradient well, MW-6R, and even other downgradient wells. The use of interwell statistical analysis was appropriate and correctly determined that well MW-10 is an affected well. Since this well is affected, the use of intrawell methods would be inappropriate. In addition, interwell statistical procedures indicate that MW-10 area wells: P-1, DAW-1, DAW-2, DAW-3 and SW-16 are affected by operations at the landfill. In addition, well SW-5, which was formerly in the significant zone of saturation and was recently added to the uppermost aquifer system, and well MW-8 also appear to be affected using interwell methods.

29. **Phenolics, benzene, and acetone have been observed in the ground water and are considered to be present in the ground water of well SW-3R.** A review of the analytical results for the samples collected from well SW-3R indicates that benzene (2.7 $\mu\text{g/L}$) was reported. Based on the presence of benzene reported since May 25, 2005, this volatile organic compound must be considered to be present in this well. In addition, acetone has been detected five times since May 25, 2005. Phenolics, while not analyzed in the current event, have been sporadically observed since March 2003.

These organic compounds are considered to be present in the samples and, therefore, in the ground water of the well.

30. **In addition to well MW-10, wells P-1, DAW-1, DAW-2, and DAW-3 had displayed exceedances for field conductance and total dissolved solids when comparing the data to the non-parametric prediction limit for these parameters.** Similar comparisons also indicate that well DAW-1 also had displayed exceedances for pH and total organic carbon (TOC) and DAW-2 displayed an exceedance for pH. Wells DAW-1 and DAW-3 are no longer sampled.
31. **Well SW-16 is currently declared to be an "investigative" well however, since benzene has been observed, this detection will be treated as a statistically significant increase since benzene is not naturally present in the ground water.** The owner/operator is reminded that OAC Rule 3745-27-10 (D)(8)(b) requires that for any monitoring well that is determined to display a statistically significant increase the permittee needs to resample the well not later than fifteen days after notification of the director. In addition OAC Rule 3745-27-10 (D)(8)(c) requires that not later than sixty days after the resampling the permittee should confirm or reject the original notification in a written notification. Failure to do so may result in a violation of these rules.
32. **There may be complete radial flow from SW-14 in all directions around this well resulting in the presence of leachate or leachate-derived constituents in the significant zones of saturation west of the landfill as well as in other directions.** Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (5/14/07), showed that ground water flows from well SW-14 in a partial radial manner in generally northerly, easterly and southerly directions. The latest data and map from the November 2008, sampling event has been interpreted in a similar fashion. There are no wells, interpreted by the owner/operator to be in the significant zones of saturation, within at least 500 feet in any direction of well SW-14.

In addition, a review of the cross sections provided by the owner/operator in March 2008, indicates that well SW-14 is in a significant zone of saturation which is stratigraphically higher than other significant zones of saturation. The zone screened in SW-14 is located at about 885' amsl. The prominent zone screened in well SW-2, by contrast, is observed across the southern half of the site at about 870' to 875' amsl.

Also, cross sections provided by the owner/operator in September 2002 indicate the "Approximate Minimum Elevation of Landfill" is at 883' amsl. Since well SW-14 is located within about 5' to 10' of the limit of solid waste, based on the maps provided by the owner/operator in the current submittal, the zone screened in SW-14 can reasonably be interpreted to be in connection with waste in the landfill since they are both about the same elevation and located near each other. It may be erroneous to include ground water elevations from this well in the potentiometric surface map which includes ground water elevations from other significant zones of saturation. The inclusion of this zone in these maps will result in a flow direction and gradient that is not representative of the ground water of the site.

33. **All of the zones in the area of the plume(s) near wells MW-10, P-1, SW-16, DAW-1, DAW-2, and DAW-3 are not completely defined as required by OAC Rule 3745-27-10 (E)(6).** In item 4 on page 2 of the submittal the owner/operator states, "As documented in the AMSAP, uppermost aquifer assessment monitoring wells DAW-1 and DAW-3 will no longer be monitored as part of the assessment monitoring program as they are not performing to design specifications." The owner/operator also states that these wells will be decommissioned and they are, "...evaluating locations for potential replacement wells..." The owner/operator is reminded that the ground water in several of the zones in this area has displayed significant impact from leachate or leachate-derived constituents.
34. **The field data sheet for well SW-16, located in the general P-1, MW-10, DAW-1, DAW-2, DAW-3 affected area, indicates an explosive gas reading of 70% methane and 100% LEL from this well.** Ground water samples from this well, collected in May 2008, have also indicated the presence of 1.1 µg/L benzene. Also, well SW-11, located on the east side of the site displayed an explosive gas reading of 20% methane and 100% LEL.
35. **There are six wells in the uppermost aquifer system which display statistically significant increases above background.** In Appendix C the owner/operator has provided prediction limits for conductivity, total dissolved solids (TDS), total organic carbon (TOC) and pH. As indicated the pH prediction limit is in error since it was determined using a one-tailed test. For this reason Ohio EPA determined the two-tailed prediction limits for pH. In addition, the owner/operator utilized inappropriate data in the background for TOC. Ohio EPA determined an appropriate limit for TOC. The Ohio EPA pH and TOC limits and the owner/operator's conductivity and TDS limits were used to compare to the recent results of the wells that the owner/operator considers uppermost aquifer system (UAS) wells.

Based on these prediction limits several wells were found to display statistically significant increases above background. The table below lists these exceedances.

WELL	CONDUCTIVITY EXCEEDED?	TDS EXCEEDED?	TOC EXCEEDED?	pH EXCEEDED?
SW-5	Yes	Yes	No	No
MW-5	Yes	No	No	No
MW-8	Yes	No	No	No
MW-10	Yes	Yes	Yes	No
P-1	Yes	Yes	Yes	No
DAW-2	Yes	Yes	Yes	Yes (low)

In the report the owner/operator only determined interwell statistically significant increases for well MW-10. The other wells were not analyzed. The owner/operator is reminded that these other wells display statistically significant increases.

36. **The facility is generally in the shape of a triangle and contamination has been determined to exist on all three sides of the triangle.** Data from all of the wells around the site indicate significant contamination around and on all three sides of the facility.
37. **The statistically significant increase over background noted for conductivity in well SW-4 is considered by Ohio EPA to be an exceedance per OAC Rule 3745-27-10 (C)(7).** The owner/operator is reminded that OAC Rule 3745-27-10 (D)(8)(b) requires the owner/operator to resample the well for that parameter even though the owner/operator has stated that the result was not verified by the means presented in Table C-1.
38. **Relative to the owner/operator's report for the May 2006 sampling event, dated and received July 7, 2006, Ohio EPA provided a series of comments dated September 13, 2006. No response was received for comments 12, 14, 15, 16, 17, 19, 20, 21, 24, and 32, which were requests for information. Response to these comments is requested as soon as possible.**
39. **Relative to the owner/operator's report for the January 2008, sampling event, dated and received March 7, 2008, Ohio EPA provided a series of comments dated June 14, 2008. No response was received for comment number 24, a request for information. Response to this comment is requested as soon as possible.**

Mr. Rex A. Katterheinrich, P.E.

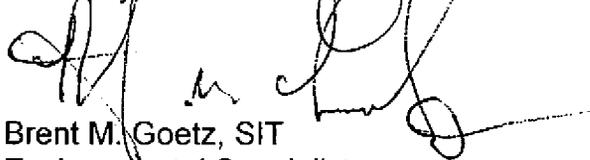
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40. **Relative to the owner/operator's report for the May 2008, sampling event, dated July 24, 2008, and received July 25, 2008, Ohio EPA provided a series of comments dated September 13, 2008. No response was received for comments 17, 26, 31, and 32, which were requests for information. Response to these comments is requested as soon as possible.**

If you have any questions, please feel free to contact Randy Skrzyniecki at the Ohio EPA Northwest District Office (419) 373-3149. Any written correspondence needs to be sent to the attention of Brent Goetz, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 North Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,



Brent M. Goetz, SIT
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/csl

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