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Ted Strickland, Governor
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Chris Korleski, Director

Re: Statistical Report of Ground Water Quality
Wapakoneta Landfill, Auglaize County

July 5, 2007

Mr. Rex Katterheinrich
City of Wapakoneta
Safety Service Director
P.O. Box 269
Wapakoneta, Ohio 45895

Dear Mr. Katterheinrich:

The Ohio Environmental Protection Agency (Ohio EPA) completed a review of the submittal titled, "Statistical Report of Ground Water Quality for the Wapakoneta Sanitary Landfill for the November 2006 Sampling Event; Notification of Statistical Significance for monitoring Wells SW-7 and MW-10; and Notification of Constituents Detected in Assessment Monitoring Wells." The submittal was dated January 25, 2007 and received January 26, 2007 for the City of Wapakoneta Landfill (facility).

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, and assessment is incomplete. In addition, the entire uppermost aquifer system in the MW-10 area should be included in the assessment program 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 report includes the results of the November 27 through 29, 2006 sampling event. Following are Ohio EPA comments relating to the review.

COMMENTS

VIOLATIONS

1. Ohio Administrative Code (OAC) Rule 3745-27-10 (C)(3) (Effective March 1, 1990): The owner/operator, Wapakoneta Sanitary Landfill, continues to be in violation of Ohio Administrative Code (OAC) Rule 3745-27-10 (C)(3) by not establishing an appropriate background well for the significant saturated zone wells. This rule requires that, *"The permittee shall 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, state, *"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."*

In the Statistical Procedures and Methodologies section on page 1 and continuing on page 2 of the memorandum discussing "Statistical Analysis of Groundwater Monitoring Data Collected During the November 2006 Detection Sampling Event at the Wapakoneta Sanitary Landfill" dated January 25, 2007 and included in the submittal, the owner/operator states, "Based on the geologic, hydrogeologic, and the 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." Also, in the Introduction on page 1 of the same memorandum the owner/operator states, "Note that, given that two-dimensional horizontal groundwater flow does not exist within the shallow significant saturated zones, the shallow significant saturated zone monitoring wells are not designated with respect to the hydraulic gradient." Similar statements were made in the reports for November 2000, May 2001, November 2001 , May 2002, November 2002, May 2003, November 2003, May 2004, November 2004, May 2005 November 2005 and May 2006 sampling events. At those times Ohio EPA responded in similar fashion to the following:

If the owner/operator indicates that it cannot "determine which wells are upgradient" per OAC Rule 3745-27-10 (C)(4)(a), effective March 1, 1990, it may choose a well that is not upgradient which is "as representative or more representative than that provided by upgradient wells." However, it must first prove that well is not affected by the landfill.

Additional information provided by the owner/operator, including potentiometric surface maps for the areas of SW-2 and SW-3R, and chemical analyses results for the wells in the general areas of SW-2, SW-3R and SW-7, also indicates that horizontal flow exists in the significant zones of saturation; the sands are, at least in part, interconnected; and the upgradient position may be able to be determined.

Correlations of the significant saturated zones can be made. In order to meet the requirements of OAC Rule 3745-27-10 (C)(3) the owner/operator needs to review the data and determine which well or wells is/are upgradient or install background wells for all the zones and collect a sufficient amount of samples to establish background ground water quality.

2. <u>OAC Rule 3745-27-10 (C)(1) (Effective March 1, 1990):</u> 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 shall 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."

On page 3 of the submittal, in the section labeled, "Statistical Evaluation" the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination 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 determination that only specific conductance was determined to be a statistical exceedance in SW-7 is likely a function of the intrawell statistical methods which do not detect the exceedances in wells which are already contaminated. 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 11.9 μg/L in SW-7. Monitoring well SW-1, for example, displays high levels of chloride, sodium, total dissolved solids and specific conductance when compared to some other significant saturated zone wells. Below is a table of analytical results in several wells. The table is based on the November 2006 event data and consists of: affected well SW-7, apparently unaffected well SW-4, possibly affected well SW-1 and possibly affected wells SW-8 and SW-5.

ANALYTE	SW-1	SW-8	SW-7	SW-5	SW-4
pH	7.28	7.03	7.17	6.94	7.31
Specific Conductance mg/L	1280	1430	3730	1830	963
TDS mg/L	876	970	1650	1540	536
TOC	3.2	4.7	4.6	2.6	1.2
Sodium mg/L	79.4	67.3	362	47.5	25.3
Calcium mg/L	118	181	152	261	112
Magnesium mg/L	73.1	77.9	75.5	122	37
Potassium mg/L	3.4	5.6	6.1	4.8	2.4
Chloride mg/L	124	148	594	55	39
Sulfate mg/L	121	124	176	756	58
Alkalinity mg/L	495	550	502	484	397
Arsenic	<0.001	<0.001	0.002	0.0022	0.0078
Iron mg/L	<0.05	5.07	4.04	3.87	<0.05
Manganese mg/L	0.24	0.1	0.07	0.23	0.05
Nickel mg/L	0.02	<0.01	<0.01	<0.01	<0.01
Ammonia mg/L	0.26	<0.1	0.86	0.36	0.23
COD mg/L	<10	<10	13	<10	<10

Significant saturated zone wells SW-1, SW-5, and SW-8 may be affected since concentrations of many analytes in each of these wells are greater than those in SW-4. 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. 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 or utilize some other means to prove that the significant saturated wells are not affected prior to using intrawell methods.

3. OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990): The owner/operator continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990) by not utilizing the required PQL. This rule requires, in part, that, "If the permittee chooses to use practical quantification limits (PQL's) in any of the following statistical procedures in order to comply with paragraph (C)(6) of this rule, the permittee shall use the PQL's as provided for the volatile organic compounds (VOCs) listed in Appendix I of this rule. If the permittee can demonstrate that any alternate PQL is more appropriate for the VOCs listed in Appendix I of this rule, or if the permittee chooses to use PQL's for another constituent not listed in Appendix I of this rule, then the PQL must be proposed by the permittee and approved by the director or his authorized representative before the PQL can be used."

In the case narrative the laboratory states, "The PQL (Limit) of 1 μg/L for 1,2 - Dichloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane and Trichloromethane by EPA Method 8260 are greater than the PQLs listed in the 1990 OAC regulations but are consistent with the draft Ohio EPA Target PQLs. Practical Quantitation Limits (PQLs) utilized in the laboratory results were compared to the PQLs listed in Appendix I of OAC Rule 3745-27-10 (Effective March 1, 1990). Several of the utilized PQLs exceed those in Appendix I. Following is a table which lists the analytes in question, the utilized PQLs and the required PQLs according to Appendix I.

ANALYTE	UTILIZED "LIMIT" (μg/L)	RULE-REQUIRED PQL (μg/L)	STATED PQL (μg/L)
Chloroform (Trichloromethane)	1	0.5	1
1,2-Dichloroethane	1	0.5	1
1,1,2,2-Tetrachloroethane	1	0.5	1
1,1,2-Trichloroethane	1	0.2	1

The owner/operator performed the required statistical analyses for the volatile organic compounds by comparing the analytical results to the PQLs for detection monitoring program wells like SW-4. In these instances, any detection would be considered to be a statistically significant increase since no volatile organic compound is expected to occur naturally in the ground water of this site.

The use of improper PQLs was also reported in the results from the November 2000, May 2001, November 2001, May 2002, November 2002, May 2003, November 2003, May 2004, November 2004, May 2005, November 2005, and May 2006 sampling events. In order to meet the requirements of OAC Rule 3745-27-10 (C)(5) the owner/operator needs to ensure that, at a maximum, the PQLs in Appendix I are utilized in all future analytical reports. Also, the owner/operator is reminded that they have chosen to be regulated by the 1990 regulations and, therefore, are required to operate consistent with those regulations.

4. OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(8): The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(8) by not performing required statistical analyses. 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 shall 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 shall 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.

   In Appendix C of the submittal the owner/operator presents statistical analyses for significant zone of saturation wells SW-1, SW-4, SW-5, SW-6, SW-7, and SW-8. The statistical procedures utilized intrawell methods. Since the exception in paragraph (C)(4) does not apply. 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. This was not done. The owner/operator needs to perform interwell statistical analyses until it can be proven that the downgradient wells are not affected.

5. OAC Rule 3745-27-10 (C)(1): 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.

   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 any 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 had 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 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.

6. OAC Rule 3745-27-10 (C)(1): 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 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

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).

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. 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.

7. OAC Rule 3745-27-10 (C)(8): 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 4 above.

   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 7.9235 (logged value 2.06983). 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. 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.

8. OAC Rule 3745-27-10 (C)(2) and OAC Rule 3745-27-10 (C)(3): The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(2) and OAC Rule 3745-27-10 (C)(3). OAC Rule 3745-27-10 (C)(2) requires that, "Ground-water elevations shall be measured in each well immediately prior to purging and sampling. The permittee shall determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground-water flow each time ground-water elevation measurements are performed." OAC Rule 3745-27-10 (C)(3) requires that, "The permittee shall establish background ground-water quality, unless the exception in paragraph (C)(4) of this rule applies, by analyzing ground-water samples collected from hydraulically upgradient wells 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."

   On page 4 the owner/operator states, "No potentiometric surface map was developed using groundwater elevation data collected from the shallow significant saturated zone monitoring wells due to the discontinuous nature of the granular deposits within the glacial till material." In the second full paragraph on page 4, however, the owner/operator states, "Potentiometric surface maps for assessment areas SW-2, SW-3R, SW-7 and MW-10 (Figures 3-6 respectively), included in Appendix D-2, were constructed using groundwater elevation data collected on November 27, 2006." Wells SW-2, SW-3R, and SW-7 are in the significant zone of saturation.

Also, on page 1 of the statistical memorandum the owner/operator states, "Note that, given that two-dimensional horizontal groundwater flow does not exist within the shallow significant saturated zones, the shallow significant saturated zone monitoring wells are not designated with respect to the hydraulic gradient." On page 3 of the submittal, however, the owner/operator states, "Potentiometric surface maps for assessment areas SW-2, SW-3R, SW-7, and MW-10 (Figures 3-6 respectively), included in Appendix D-2, were constructed using groundwater elevation data collected on November 27, 2006. The general groundwater flow direction in the SW-2 assessment area is toward the Auglaize River with average hydraulic gradients of 0.008 ft/ft for the northwest and 0.005 ft/ft for the southeast riverbanks. The general groundwater flow direction in the SW-3 assessment area is to the east with an average hydraulic gradient of 0.012 ft/ft."

It is unclear whether the owner/operator believes potentiometric maps cannot be produced in the shallow zones since they provide localized maps in the submittal. Ohio EPA has provided information indicating the continuity of these zones on the site to the owner/operator. In recent submittals, the owner/operator has provided cross sections indicating the continuity of these units. It appears that the statement about not being able to produce potentiometric surface maps is not valid. A map of the ground water flow in the entire area of the significant zone of saturation should be produced.

Also, the fact that confirmed contamination has spread over a considerable distance including the areas around SW-2, SW-3, SW-7 and MW-10, indicates that the zones are interconnected. This interconnection is present, at least, in the landfill area. A review of previously submitted maps and cross sections indicates that the zones, especially in the southern portion of the site are interconnected. Also, new data indicate that the sands are interconnected and, based on depositional environment, would be expected to be interconnected. Since they are interconnected, an upgradient well can be established.

In order to meet the requirements of OAC Rule 3745-27-10 (C)(2), the owner/operator should provide the agency with a potentiometric surface map of the significant zone of saturation. This zone is shown to be interconnected. In order to meet the requirements of OAC Rule 3745-27-10 (C)(3) the owner/operator should establish background water quality.

9. <u>OAC Rule 3745-27-10 (C)(6)(a):</u> The owner/operator is in violation of OAC Rule 3745-27-10 (C)(6)(a). This rule requires that, "The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or leachate and leachate-derived constituents. If the distribution of the chemical parameters or leachate and leachate-derived constituents is shown by the permittee to be inappropriate for a normal theory test, then the data should be transformed or a distribution free theory test should be used."

A review of the owner/operator-provided Shapiro-Wilks Test of Normality for field conductance at upgradient background well MW-6R indicates that "Evidence of non-normality at 95% level of significance" and that, "Evidence of non-normality at 99% level of significance" exists in the data. The data is, therefore, not normally distributed at both 5% and 1% significance levels with a W statistic of 0.900873.

On the preceding page the owner/operator provided "Parametric Prediction Interval Analysis" for field conductance using interwell methods with the background well being MW-6R. Since the background data is not normally distributed, the use of parametric methods for determination of prediction limits would be inappropriate.

In order to meet the requirements of OAC Rule 3745-27-10 (C)(6)(a), the owner/operator needs to properly utilize non-parametric methods for background data with non-normal distributions. Alternatively, the owner/operator may appropriately transform the data and, if the transformed data area normally distributed, utilize parametric methods. The statistical analyzes must be performed again and provided to Ohio EPA.

MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE

10. OAC Rule 3745-27-10 (C)(1) and (C)(1)(d): 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..."

According to the owner/operator's Revised Groundwater Detection Monitoring Sampling and Analysis Plan (July 2002) page 8, "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. Hull's SOP No. F3008 included in Appendix B-1 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 provided in Appendix B of the plan states in part, "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 ±0.1 S.U. for pH, ±3% for conductivity, ±0.5°C for temperature and ±10% for turbidity (when turbidity is >10 NTU). Also, a parameter can be considered stable when at least three consecutive readings have stabilized.

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:

- revise the Groundwater Detection Monitoring Sampling and Analysis Plan to document the new field parameter stabilization criteria noted above, followed by field implementation;

  OR

- 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).

11. OAC Rule 3745-27-10(C)(1) and (C)(1)(d): Compliance with OAC Rule 3745-27-10(C)(1) and (C)(2)(d) cannot be determined at this time.

For rule citation for OAC Rule 3745-27-10 (C)(1) see comment number 2 above. For rule citation for OAC Rule 3745-27-10 (C)(1)(d) see comment number 10 above.

Based on review of current technical literature, Ohio EPA now considers the criteria for stabilization of these field parameters to be ±0.1 S.U. for pH, ±3% for conductivity, ±0.5°C for temperature and ±10% for turbidity (when turbidity is >10 NTU). Also, 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 27 or November 28, 2006, but were sampled the next day (November 28 or November 29, 2006 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 to 22 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.

WELL	Time from purge to sampling (hrs)	pH at third volume (SU)	Final pH (SU)	Temp. at third volume (°C)	Final Temp (°C)	Conduct. at third volume (μmohs/cm)	Final Conduct. (μmohs/cm)
SW-1	21.4	**7.09**	**7.28**	**12.55**	**11.9**	**1439**	**1280**
SW-2	23.0	**6.91**	**7.05**	**13.70**	**14.21**	**11300**	**11000**
SW-5	21.7	**6.70**	**6.94**	**11.81**	**10.70**	**2030**	**1830**
SW-6	21.6	7.42	7.52	**12.42**	**10.20**	**725**	**773**

SW-7	23.1	**7.00**	**7.17**	**12.08**	**12.67**	3740	3730
SW-8	21.72	**6.81**	**7.03**	**11.93**	**10.30**	**1770**	**1430**
MW-6R	21.45	**7.36**	**7.70**	**12.23**	**11.10**	784	806
MW-8	21.47	**7.20**	**7.49**	**11.90**	**10.10**	812	848
MW-10	22.80	**7.18**	**7.32**	**11.69**	**12.79**	3950	3940
DAW-1	22.75	**6.68**	**6.87**	11.37	12.43	8550	8550
DAW-2	22.72	**6.86**	**7.12**	**11.25**	**12.23**	5480	5490
IAW-1	22.83	**6.99**	**7.20**	12.39	12.78	3140	3130
IAW-3	22.92	**7.03**	**7.27**	12.58	12.92	4860	4860
IAW-4	23.17	7.14	7.24	**11.56**	**13.16**	3070	3030
SAW-4	22.67	**6.95**	**7.16**	11.69	12.18	7580	7550
SAW-5	22.83	**6.90**	**7.03**	**11.45**	**11.85**	**8950**	**8940**
SAW-9	22.50	**6.89**	**7.06**	**11.63**	**12.22**	3650	3700

Based on stabilization criteria: pH ±0.1 standard units, specific conductance ±3%, temperature ±0.5° Celsius.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) and (C)(1)(d) the owner/operator needs to provide documentation when the wells recharged sufficiently to collect a sample. Wells should be sampled as soon as enough water is available in the well to sample. Also, the owner/operator should explain how not meeting stabilization criteria has produced samples which are representative of the ground water of the site. A similar comment was made regarding the May 2006 sampling event, but no owner/operator response has been received.

12. <u>OAC Rule 3745-27-10 (C)(1):</u> Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

A review of the field data sheets indicates that wells SW-3R, SW-4, MW-5, P-1, and DAW-3 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 2.2 volumes before it went dry and MW-5 was purged of 2.49 volumes before it was purged dry. Well P-1 was purged of 1.55 volumes before it went dry and well SW-3R was purged of 1.27 volumes before it went dry. Even though these wells were recharging rapidly, they were sampled the next day. The samples may have been of stagnant water.

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. Wells should be sampled as soon as enough water is available in the well to sample. A similar comment was made regarding the May 2006 sampling event, but no owner/operator response has been received.

13. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

A review of the field data sheets indicates that wells SW-3R, MW-5, MW-6R, MW-8, P-1, DAW-1, DAW-2, and DAW-3 were purged with a "Keck Pump" at the rate of 1.0 to 1.5 gallons per minute. Some of these wells were purged dry. Sampling on these wells occurred on these wells over 20 hours after purging. The samples recorded from these wells recorded high turbidity readings ranging as high as 201 NTUs (well DAW-2). The other wells were purged using a disposable bailer and were sampled the next day. These wells recorded turbidity readings as high as 1000 NTUs (well SW-5). Even after letting the well set for over 20 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.

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.

14. OAC Rule 3745-27-10 (C)(1) and (C)(5): Compliance with OAC Rule 3745-27-10 (C)(1) and (C)(5) cannot be determined at this time. OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990) requires, in part, that, "The statistical method specified shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(6) of this rule." OAC Rule 3745-27-10 (C)(1) (Effective March 1, 1990); see comment 2 for rule citation.

In Ohio EPA comments to the ground water report for the May 2006 sampling event, the agency stated the following for which no owner/operator response has been received regarding this agency comment:

"On page 2 of the statistical memorandum the owner/operator states, "However, Ohio EPA has requested that prior to updating the background data set, the data be evaluated for small increasing trends that would not be evident when individual data point comparisons are completed"."

In the Ohio EPA comments to the June 2003 sampling event the following comment was made:

"A review of the control charts for several analyte-well combinations was performed by Ohio EPA. The background data bases for these combinations appear to have been updated by the owner/operator. The review indicates that updating of these data bases may be inappropriate. Following is a table indicating some of the well-analyte combinations and reasons for not updating and also associated comments. Decreasing trends are based on Mann-Kendall trend analysis and variation in population is based on rank sum.

Well/Analyte	**Reason for not Updating**	**Comments**
SW-1/Total Organic Carbon (TOC)	Decreasing Trend and Variation in Population	Difference in population between first 8 data points and subsequent data.
SW-4/TOC	Decreasing Trend and Variation in Population	Difference in population between first 16 data points and subsequent data.
SW-6/TOC	Decreasing Trend and Variation in Population	Difference in population between last 4 data points and prior data.
SW-7/TOC	Decreasing Trend and Variation in Population	Difference in population between earlier data and subsequent data.
SW-8/TOC	Decreasing Trend and Variation in Population	Difference in population between first 14 and last 9 data points.
MW-5/TOC	Decreasing Trend	Decreasing trend continues until 9 greatest values removed which are 9 earliest values.
MW-5/pH	Decreasing Trend and Variation in Population	Difference in population between first 12 data points and subsequent data.
MW-6R/TOC	Decreasing Trend and Variation in Population	Difference in population between first 8 data points and subsequent data.

In order to continue to meet the requirements of OAC Rule 3745-27-10 (C)(1) and (C)(5) the owner/operator needs to again determine the presence of trends, including downward trends and variations in population. Any anomalies need to result in the data bases not being updated until there are no significant trends and no population differences. The owner/operator may also show that these data bases had been appropriately updated."

For each sampling event, at least since June 2003, the owner/operator has updated background data sets even though decreasing trends and/or variations in population are indicated. In the case of TOC, these decreasing trends are associated with decreasing turbidity values. The early data no longer appears to be representative of the ground water of the site.

The updating of these data bases with data that no longer appear to be representative of the ground water of the site is not protective of human health and the environment. One way to comply would be for the owner/operator to review the background data bases and incrementally test the data bases for statistical change beginning with the first eight values compared to the next four values. If there is no upward or downward trend, or no significant variation in population the background data may be updated. Where trends or variation in population does occur additional justification would need to be provided before the data could be used.

In addition, the owner/operator's statement as quoted above indicates the background data for several wells may have been updated; however, it is not clear which wells were updated and which data was involved in the updating. For the November 2005 sampling event data, at least for the well/parameter combination for MW-6R (total organic carbon) the data appears to have been updated even though no documentation was presented demonstrating no differences in the population were observed over time. This comment was previously expressed to the owner/operator regarding other updating periods without owner/operator reply. Again, the owner/operator needs to provide information as to which wells were updated, when they were updated, and what data were involved.

15. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

Relative to the ground water report for the May 2006 sampling event Ohio EPA made the following comment following for which no owner/operator response has been received regarding this agency comment:

"The field data sheet indicates a 5 foot screen was installed in well DAW-3. This is consistent with table 1 in the sampling and analysis plans. The boring log, however, indicates that a 10 foot screen was installed. The boring log is considered to be a primary source of information in this instance since the field geologist indicated what size screen was installed at the time of well construction. The owner/operator needs to provide consistent data regarding the wells at the site. If the boring log is in error it needs to be corrected and documentation of why the boring log is in error needs to be provided. This documentation could include copies of original field notes, photos, etc.

Ohio EPA has commented on this error since December 13, 2002. There has been no owner/operator response. Again it is noted that the field data sheets for the May 2006 sampling event show the same discrepancy (5' screen on field data sheet). In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should provide an explanation regarding this discrepancy or make necessary corrections."

16. OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990): Compliance with OAC Rule 3745-27-10 (C)(5) cannot be determined at this time. This rule requires, in part, that, "The statistical method specified shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(6) of this rule."

Relative to the ground water report for the May 2006 sampling event Ohio EPA made the following comment following for which no owner/operator response has been received regarding this agency comment:

"Currently and in the past the owner/operator has supplied some statistical information in the submittals. This is, in part, consistent with OAC Rule 3745-27-10 (D)(7); however, from the data provided, it is difficult to determine the population of the utilized background data base. Compliance with OAC Rule 3745-27-10 (C)(5) cannot be determined since a listing of background was not provided. In accordance with OAC Rule 3745-27-10(D)(7) the owner/operator needs to provide a list of the current background data base for each well/analyte combination in order for Ohio EPA to determine compliance with OAC Rule 3745-27-10 (C)(5)." In order to determine compliance with OAC Rule 3745-27-10 (C)(5) the owner/operator should provide the current background data base and provide the background data bases for previous sampling events where the specific background data sets were not provided.

17. OAC Rule 3745-27-10 (B)(3)(e): Compliance with OAC Rule 3745-27-10 (B)(3)(e) cannot be determined at this time. For rule citation see comment 11 above.

From the current submittal it can be stated that well DAW-3 was purged of only 0.947 volumes before it went dry and well P-1 was purged of 1.55 volumes before it went dry. Relative to the ground water report for the May 2006 sampling event Ohio EPA made the following comment.

"Well DAW-3 is installed with a ten foot screen in a zone containing a total of three feet of sand based on the boring log. When purged by a bailer, the well went dry in 1.4 volumes during the May 2004 sampling event and went dry at less than 1 volume in November 2001. This well went dry at 1.07 volumes in November 2004 using an electric pump and at 1.41 volumes in May 2005, 1.23 volumes in November 2005 and 1.04 volumes in May 2006. With three feet of saturated sand exposed to the screen it would be expected that this well would be more productive.

In addition, in November 2004, well P-1 went dry at 1.3 volumes (4.6 gallons), in May 2005 P-1 went dry at 1.58 volumes (7.5 gallons) using an electric pump, in November 2005 this well went dry at 1.76 volumes (7.5 gallons) and in May 2006 this well went dry at 1.48 volumes (4.81 gallons) using an electric pump. In 2001 this well went dry at 8.5 gallons. Well P-1 is constructed with a 10 foot screen with a 16 foot sand pack across a continuous saturated sand zone. Well P-1 also would be expected to produce more water than this volume before being bailed dry.

These wells might require redevelopment or the wells might need to be replaced. It is also possible a slower pump rate may be required. The stated rate for both wells, 1.0 to 1.5 gallons per minute, may be excessive for these wells. Purging wells dry may result in stripping of volatile organic compounds, increasing turbidity, trapping air resulting in lingering effects on dissolved gas levels and redox states and producing affects on sample chemistry. In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) the owner/operator needs to provide data indicating that these wells are performing to design specifications and that the sampling method is producing representative samples.

Otherwise the wells should be redeveloped or replaced. The owner/operator also needs to provide information demonstrating that the samples were collected as soon as the wells recovered."

The owner/operator has not responded to this comment. In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) the owner/operator should respond to this comment.

18. OAC Rule 3745-27-10 (B)(1)(a) and (b): Compliance with OAC Rule 3745-27-10 (B)(1)(a) and (b) cannot be determined at this time. OAC Rule 3745-27-10 (B)(1)(a) and (b) requires that, "A ground-water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from both the uppermost aquifer system and any significant zones of saturation that exist above the uppermost aquifer system that: (a) represent the quality of the ground water that has not been affected by past or present operations at the sanitary landfill facility; and (b) represent the quality of the ground water passing directly downgradient of the limits of solid waste placement."

Relative to the ground water report for the May 2006 sampling event and continuing in this submittal Ohio EPA made the following comment and no owner/operator response has been received: "A review of Figure 2, Potentiometric Surface Map for the Uppermost Aquifer System (5/08/06) and Figure 6, Potentiometric Surface Map for the MW-10 Area, indicates, for well P-1, "Value not used in the construction of the potentiometric surface map." Data collected needs to be representative. If the data is representative, it should be used in the map. The owner/operator does not indicate why the value was not used.

Since these data were not utilized a complete understanding of the ground water flow regime cannot be determined and; therefore, it cannot be determined if the requirements of OAC Rule 3745-27-10 (B)(1)(a) and (b) are being met. It should be noted that Figure 2, Potentiometric Surface map for the Uppermost Aquifer System (5/08/06), indicates ground water flow to be in a general westerly direction, toward wells P-1, MW-10, DAW-1, DAW-2 and DAW-3. Figure 6, Potentiometric Surface Map for the MW-10 Area (5/8/06), said to be constructed using MW-10, DAW-1, DAW-2 and DAW-3, displays a general south southwest flow direction. If all the data is used from all wells, the flow on the east is generally toward the west impinging on well P-1 and the flow on the west side of the site, in the MW-10 area, is generally toward the southeast, which is generally toward well P-1. Well P-1 displays the lowest ground water elevation of the wells in this zone. A map using all of the data might show a ground water low area under the southwest portion of the facility.

In order to determine compliance with OAC Rule 3745-27-10 (B)(1)(a) and (b) the owner/operator needs to show why the data was not used and show if it is representative. If the data is representative it should be utilized in the maps and new maps should be drawn which include this data point. The new maps should be submitted to Ohio EPA. A similar comment was made by Ohio EPA regarding maps in the May 2004 sampling event submittal, the November 2004 sampling event submittal the May 2005 sampling event submittal, and the November 2005 sampling event submittal.

While not listed on Figure 2, the ground water elevation data for wells DAW-1, DAW-2 and DAW-3, which are located in the MW-10/P-1 area, are not noted as anomalous, but were not utilized in the map on Figure 2. All of the data should be utilized and properly honored. Since all of the data are not being utilized, the maps may provide an erroneous picture of ground water flow." In order to determine compliance with OAC Rule 3745-27-10 (B)(1)(a) and OAC Rule 3745-27-10 (B)(1)(b) the owner/operator should respond to this comment.

19. OAC Rule 3745-27-10 (B)(3)(e): Compliance with OAC Rule 3745-27-10 (B)(3)(e) cannot be determined at this time. For rule citation see comment 14 above.

A review of the field data sheets indicates that the elevation of the total depth measurements for most of the wells is the same as the base of the screen elevations for those wells. Two wells, however, show discrepancies. The field data sheet for well SW-8, for example, indicates that the total depth is 42.33' below the top of the casing. This is an elevation of 873.20' amsl. The field data sheet shows the bottom of the screen to be at 872.50'. Also, the field data sheet for well IAW-4 indicates that the total depth is 59.00 feet below the top of casing. This results in a TD elevation of 831.48' amsl. The field data sheet, however, indicates that the base of the screen is at 857.89' amsl. This is 26.41' higher than the TD elevation. It appears that there is an error in the total depth or the bottom of the screen

In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) the owner/operator should provide documentation why this information and all information stemming from it are accurate (including ground water levels, length of water columns, etc.). If the information is not accurate, the owner/operator needs to make corrections to the erroneous information and all data stemming form it.

20. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

Relative to the ground water report for the May 2006 sampling event and not corrected in this submittal, Ohio EPA made the following comment for which no owner/operator response has been received:

"A review of the historical TDS values for well SW-7 indicates that an outlier is included in this group of values. The value, 115 mg/L appears to have been included. All other values exceed 1124 mg/L and are typically between 1800 mg/L and 3890 mg/L. Outlier analysis of this data set indicates that the value 115 mg/L is an outlier. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to adequately explain how the value in question is not an outlier or remove it and any other outliers from the data set and perform any statistical analyses again." In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this comment.

21. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

Relative to the ground water report for the May 2006 sampling event and not corrected in this submittal, Ohio EPA made the following comment for which no owner/operator response has been received:

"A review of the field data sheet for well SW-5 indicates that the difference between the top of casing elevation and the ground level (a.k.a. stickup) is 2.34 feet. The difference between the total depth measured from the top of casing and the total depth measured from ground level is 1.28 feet. These values should be the same. One or more of the four values involved are in error and need to be corrected.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to review the data, determine the source of the error and make necessary changes. This information should be reported to Ohio EPA." In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this comment.

22. OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation of OAC Rule 3745-27-10 (B)(3)(e) see comment 14 above. For rule citation of OAC Rule 3745-27-10 (C)(1) see comment 2 above.

In comments relating to the May 2006 sampling event Ohio EPA made the following comment. "A review of the field data sheets indicates that the total depths in two wells (SW-3R and MW-6R) were not measured during this sampling event. In light of the errors in total depth values as discussed above, it is possible that the total depths in these wells are not accurate or there is fill-up in the wells." A review of the current submittal indicates that the total depths of these wells were not measured during the latest event.

On page 5 of the facility sampling and analysis plan the owner/operator states, "The total depth of each monitoring well will be recorded annually, unless a dedicated pump is installed or if an obstruction in the well casing prohibits the collection of a total depth measurement." There are no dedicated pumps in the wells. It appears that either the owner/operator has failed to perform the plan-required procedures or there is an obstruction in the wells.

In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1), the owner/operator needs to provide accurate total depth measurements for these wells. Explain why the consistent procedure for measuring total depths was not followed. Ensure that total depths are measured as required by the plan.

23. OAC Rule 3745-27-10 (C)(2): Compliance with OAC Rule 3745-27-10 (C)(2) cannot be determined at this time. This rule requires that, "Ground-water elevations shall be measured in each well immediately prior to purging and sampling. The permittee shall determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground-water flow each time ground-water elevation measurements are performed."

Relative to the ground water report for the May 2006 sampling event and not corrected in this submittal, Ohio EPA made the following comment for which no owner/operator response has been received:

"Note 1 in Figure 5, Groundwater Elevation map for the SW-7 Area (11/15/05), states, "Due to the small variation in groundwater elevations no discernable groundwater is apparent." It is not clear what the owner/operator intended to say since elevations determined from the ground water present in the wells are provided in the table on the map. It may be that the word "flow" is missing from the statement, but this is not clear. Based on the data provided, however, there appears to be ground water gradient, and therefore, ground water flow.

In order to determine compliance with OAC Rule 3745-27-10 (C)(2) the owner/operator needs to clarify their statement in Note 1 and provide this clarification to Ohio EPA. If there is ground water present in the wells, per OAC Rule 3745-27-10 (C)(2) the ground water flow direction must be provided." In order to determine compliance with OAC Rule 3745-27-10 (C)(2), the owner/operator should respond to this comment.

24. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

A review of the Analytical QC Summary Report indicates several areas of concern. Following is a table of those areas of concern:

Page	Sample ID	Parameter	Result	Qualifier
10 of 50	G0611635-013AMS	magnesium	% Rec 145	1
11 of 50	G0611635-013AMS	sodium	% Rec 0	1
22 of 50	G0611635-001FLFM	chloride	% Rec -595	1
23 of 50	G0611635-011BLFM	chloride	% Rec -574	1

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to explain how the analytical results provided in the submittal are representative of the ground water of the site in light of the potential errors shown in the QC data. The owner/operator should provide laboratory documentation as to the validity of the data. If the data is not representative of the ground water of the site the owner/operator should make appropriate corrections and/or qualify the data. In addition, the owner/operator should provide documentation regarding the meaning of "Qualifier 1".

25. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

In response to the owner/operator's submittal of the ground water report for the May 2006 sampling event, Ohio EPA made the following comment for which no response has been received by the agency:

"A review of the statistical reports indicates that Mann-Kendall Trend Analyses were performed on several well/analyte combinations. Typically the reports contain a statement ending in the phrase, "...indicating no evidence of an upward trend." These statements are made even for analyses which result in a Z score which is negative. While the statement may be true, the negative Z score is indicative of a downward trend. The analyses presented by the owner/operator do not determine if that downward trend is statistically significant. Following is a table of well/parameter combinations and their negative Z scores:

Well	Parameter	Z Score
SW-1	TDS	-3.8942
SW-4	TOC	-4.69269
SW-5	pH	-2.07877
SW-5	TOC	-2.26184
SW-6	TDS	-2.55853
SW-7	pH	-0.405874
SW-7	TOC	-4.46934
SW-8	TOC	-2.90762
MW-5	pH	-2.55092
MW-5	TDS	-1.91229
MW-5	TOC	-4.18564
MW-6R	TDS	-1.46436
MW-6R	TOC	-4.76174
MW-8	CONDUCTANCE	-0.944215
MW-8	TDS	-2.33233

It is important to determine if a trend, upward or downward is statistically significant. Downward trends in pH are important since the updating of this data may mask a statistically significant change in pH toward low pH. A downward trend for other parameters may be indicative of early data which is no longer representative of ground water in the well. A trend analysis of a few of the parameter/well combinations indicates that pH in well MW-5 displays a statistically significant decreasing trend (Mann-Kendall Statistic -126, Critical Value -106, n = 29 and Mann-Kendal Statistic -128, Critical Value -101, n = 28). Also, total organic carbon in well MW-5 displays a statistical significant decreasing trend (Mann-Kendall Statistic -190, Critical Value -85, n = 25 and Mann-Kendall Statistic -169, Critical Value -81, n = 24).

In order to determine compliance the owner/operator needs to determine if the downward trends are statistically significant. Any statistically significant downward trends, especially for pH, should be reported to Ohio EPA. These downward trends should be taken into account when updating background. If there are/were downward trends for pH, the data should not be updated. If the data was updated, the updated values should be removed from the background data base." In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this comment.

26. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above.

The laboratory analytical reports for the two samples in the duplicate sample set collected from well SW-3R in November 2006 indicated a series of excessive relative percent differences (RPD) for several parameters. Following is a table of these RPD values:

PARAMETER	RELATIVE PERCENT DIFFERENCE
Calcium	36.36
Arsenic	40.00
Chromium	54.50
Iron	50.57
Lead	77.72
Manganese	80.00
Zinc	85.71
Phenols	47.15

Excessive RPD values may be indicative of the use of procedures which will produce results which are not representative of the ground water of the site. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to demonstrate how the use of procedures which produce results with large RPD values meet the requirements of this rule. In addition, the owner/operator needs to ensure that sampling and analytical procedures are used which do not produce large RPD values in field duplicate sample sets.

27. OAC Rule 3745-27-10 (C)(6)(a): Compliance with OAC Rule 3745-27-10 (C)(6)(a) cannot be determined at this time. This rule requires that, "The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or leachate and leachate-derived constituents. If the distribution of the chemical parameters or leachate and leachate-derived constituents is shown by the permittee to be inappropriate for a normal theory test, then the data should be transformed or a distribution free theory test should be used."

A review of the owner/operator-provided Shapiro-Wilks Test of Normality for field conductance at upgradient background well MW-6R indicates that the data is normally distributed at both 5% and 1% with a W statistic of 1.00077. Few details relative to how the W statistic was calculated were provided by the owner/operator.

Ohio EPA using the same apparent 28 background values with the same sample standard deviation of 78.12 and same mean of 719.6 arrived at a lower W statistic (0.9151) for non-transformed data using both Sanitas® statistical software and hand calculation using the 1992 U.S. EPA guidance assuming a 95% level of significance. The Ohio EPA calculations indicate that the non-transformed data is not normally distributed. It is unclear if the method used by the owner/operator is properly determining the normality of the data.

In addition, the statistical software package used by Ohio EPA indicated that there were outliers in the background. After removing the outliers, the non-transformed data was normally distributed.

In order to determine compliance with OAC Rule 3745-27-10 (C)(6)(a) the owner/operator needs to provide details relating to how the W statistic was determined. This information should include the list of coefficients a_{n-i+1} which were utilized in the Shapiro-Wilks Normality calculation. A similar comment was made by Ohio EPA regarding the owner/operator's submittal regarding the May 2006 sampling event.

STATEMENTS

28. 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 wells P-1, DAW-1, DAW-2, and DAW-3 are affected by operations at the landfill.

29. A review of the analytical results for the samples (duplicate sample set) collected from well SW-3R indicates that benzene (3.1 and 1.9 μg/L) was reported from both samples in the duplicate set. 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 now been detected three times since May 10, 2006 and four times since May 25, 2005. Phenolics have been observed since May 2006. 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 display exceedances for field conductance when comparing the data to the non-parametric prediction limit for field conductance. Similar comparisons also indicate that in addition to MW-10, wells P-1, (conductivity and total dissolved solids [TDS]), DAW-1 (conductivity, TDS and total organic carbon), DAW-2 (conductivity and TDS) and DAW-3 (conductivity and TDS) display exceedances to the parametric prediction limit. Also, based on the use of a two-tailed test for pH, rather than the one tailed test utilized by the owner/operator, well DAW-1 displays an exceedance of the parametric prediction limit.

31. A review of the ground water elevation data provided in the table on Figure 5, Groundwater Elevation map for the SW-7 Area (11/27/06), indicates an apparent ground water mound in the area of the west ditch. This ground water mound may be indicative of recharge to that zone in that area. Also, while this map contains the statement, "Due to the small variation in groundwater elevations no discernable groundwater (sic) is apparent.", contour lines can be drawn. These lines are important to show localized changes in ground water flow direction, the location of potential recharge areas and the general direction of ground water flow. On this map, at a minimum, the "874.00' contour should be drawn if the owner/operator does not feel comfortable in adding more contours.

32. On page 2 of the submittal the owner/operator states, "In addition, acetone, a common laboratory contaminant, was also reported in both the sample and the duplicate sample collected from monitoring well SW-3R at 11.9 µg/L and 1.3 µg/L. As such, the reporting of acetone is most likely the result of laboratory conditions at the time of analysis and not the result of the landfill." It should be noted that the laboratory analytical results for the duplicate sample set collected from SW-3R were 11.9 µg/L for the sample labeled "sample" and 13.0 µg/L for the sample labeled "duplicate". Acetone was not observed in any other samples. Acetone was also not observed in any of the two trip blanks or any of the two field blanks collected during this sampling event. In addition, acetone has been observed in samples collected from well SW-3R in May 2005, May 2006, August 2006 and November 2006. Acetone has clearly been shown to be present in well SW-3B along with other organic compounds benzene, and phenols. It should be noted that this well also displays anomalously high concentrations of other parameters including: ammonia, sodium, potassium, chloride, lead, manganese and iron.

33. A comparison of the field turbidity values provided by the owner/operator on the field data sheets and the turbidity values provided on the laboratory report indicates, in some instances, a significant discrepancy. For example, the field turbidity for well SW-5 is noted as 1000 on the field form. The laboratory value is 1770 NTU. The field value for well SW-1 is 136 while the laboratory value is 17 NTU. The field value for well MW-6R is 110 while the laboratory value is 13.9 NTU. Other wells, where turbidity was analyzed in both the field and in the laboratory display similar discrepancies. While OAC Rule 3745-27-10 (D)(5) requires that turbidity be analyzed annually, field analysis of turbidity is not required. The discrepancies noted, however, may indicate a potential error in procedure relating to either the field or laboratory determination of turbidity.

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 should be sent to the attention of Mike Reiser, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 North Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,

Michael A. Reiser

Michael A. Reiser, R. S.
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/csl

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«File: Auglaize County, Wapakoneta Landfill, Ground Water

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