



State of Ohio Environmental Protection Agency

Northwest District Office

347 North Dunbridge Road
Bowling Green, OH 43402-9398

TELE: (419) 352-8461 FAX: (419) 352-8468
www.epa.state.oh.us

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

Re: Statistical Report of
Ground Water Quality
St. Marys Landfill, Auglaize County

June 7, 2007

Mr. Thomas Hitchcock
Director of Public Service and Safety
City of St. Marys
101 East Spring Street
St. Marys, Ohio 45885

Dear Mr. Hitchcock:

The Ohio Environmental Protection Agency (Ohio EPA) completed a review of the submittal titled, "Statistical Report of Groundwater Quality for the Detection monitoring Program; Notification of Statistical Significance; and Notification of Constituents Detected in Assessment Monitoring Wells at the St. Marys Landfill." The above referenced submittal was dated April 16, 2007, and received April 18, 2007. Following are Ohio EPA comments relating to the review of this document.

COMMENTS and CONCLUSIONS

VIOLATIONS

1. OAC Rule 3745-27-10 (C)(7)(h): The owner/operator, St Marys Landfill, continues to be in violation of OAC Rule 3745-27-10 (C)(7)(h). This rule requires that, "Prior to using an intra-well statistical method under the ground water detection monitoring program, the owner or operator shall submit to the operating record in accordance with rule 3745-27-09 of the Administrative Code, a demonstration that the ground water has not been affected by the landfill within the relevant well(s). The owner or operator of a facility not subject to rule 3745-27-09 of the Administrative Code shall mail copies of the revisions by certified mail, or any other form of mail accompanied by a receipt, to Ohio EPA and the approved health department."

In the report of the January 2004 sampling event, regarding potassium at well BW-6, the owner/operator indicated, "One data point for potassium in monitoring well BW-6 was calculated to be statistically significant when compared to upgradient monitoring well BW-1, however, it was determined not to be validated."

In the same paragraph they stated, "This one-time higher potassium value, which occurred four years ago, can be considered an isolated occurrence and does not represent the overall potassium levels in monitoring well BW-6."

The owner/operator appears to be indicating that the "one-time higher potassium value", which occurred in June 2000 at well BW-6, is not representative of the ground water. Ohio EPA indicated "With this data point in the background data set, the owner/operator has not shown that this well is not affected by the landfill." This is required by the above-cited rule. Ohio EPA also indicated that in order to meet the requirements of the rule the owner/operator needed to remove that non-representative data point and reassess the data.

A review of the current, February 2, 2007, submittal indicates that this data point is included in the background data set in an intrawell control chart for potassium at well BW-6. The required demonstration had not been made prior to using intrawell methods as required by OAC Rule 3745-27-10 (C)(7)(h) and the owner/operator continues to be in violation of this rule. The owner/operator needs to provide this demonstration and remove the data point.

2. OAC Rule 3745-27-10 (E)(3): The owner/operator continues to be in violation of OAC Rule 3745-27-10 (E)(3). OAC Rule 3745-27-10 (E)(3) requires that, "Within one hundred and thirty-five days of notifying Ohio EPA of a statistically significant increase over background in accordance with paragraph (D)(6)(b) of this rule, the owner or operator shall submit to the Ohio EPA, and to the operating record in accordance with rule 3745-27-09 of the Administrative Code, a ground water quality assessment plan."

Wells BW-5 and BW-6 were sampled on January 13, 2004, and notice of a statistically significant increase over background was provided to the Ohio EPA for this event on March 26, 2004. Two hundred and ten days from January 13, 2004, is August 10, 2004, and one hundred and thirty-five days from March 26, 2004, is August 9, 2004. To date, no ground water quality assessment plan has been received by Ohio EPA relative to wells BW-5 and BW-6. In order to meet the requirements of OAC Rule 3745-27-10(E) the owner/operator should submit the ground water quality assessment plan.

3. OAC Rule 3745-27-10 (C)(1) and (C)(1)(a): The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a). This rule requires, "The owner or operator shall comply with the following requirements regarding ground water sampling, analysis, and statistical methods. (1) General requirements. The ground water monitoring program shall include consistent sampling and analysis procedures and statistical methods 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), (D), (E), or (F) of this rule.

The following shall be included in the ground water detection monitoring plan, ground water quality assessment monitoring plan, compliance monitoring plan, and corrective measures plan: (a) A written sampling and analysis plan, which documents the sampling and analysis procedures that shall be utilized in the ground water monitoring program. The owner or operator is required to use the procedures documented within the sampling and analysis plan."

The sampling and analysis plan, revised June 2003, states on page 22, "If a sample cannot be obtained after the initial purging, multiple trips to the well with less than 24 hours between trips will be made in accordance with the Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (February 1995)." This manual indicates that for wells that purge dry the samples should be collected as soon as sufficient water is available. This is because extended recovery times after purging allow the ground water to equilibrate with atmospheric conditions thereby changing ground water chemistry.

A review of the field data sheets in the submittal indicates that wells: MW-2 (not dry), MW-3 (dry), MW-5 (not dry), MW-6 (dry), AW-2 (not dry), AW-3 (dry), AW-4 (dry), BW-2 (not dry), BW-3 (not dry) and BW-5 (dry), whether purged dry or not, were purged on February 1, 2007, but not sampled until February 2, 2007. Some of these wells recharge quickly enough to collect samples immediately after purging. Other wells recharge quickly enough to collect samples in much less than 24 hours. Only 5 of these 10 wells (MW-3, MW-6, BW-5, AW-3, and AW-4) were bailed dry. The ability for some of the wells to be sampled on the same day has been established. During the September 2005 resampling event, three wells were purged on September 21, 2005, and then sampled on the same day. BW-2 was sampled at 13:35; BW-3 was sampled at 13:17; and BW-5 was sampled at 13:55. During the September 2006, resampling event, seven wells were purged on September 19, 2006, and sampled the same day. Some of these wells (MW-3, AW-3, and AW-4) were originally bailed dry, but were sampled within about three hours of purging. The wells, sampled on February 2, 2007, could have been sampled on February 1, 2007.

In addition, some of the wells which should have been sampled shortly after purging display changes in field parameters between the end of purging on February 1, 2007 and sampling on February 2, 2007. Following is a table indicating the change in field parameters from the end of purging on February 1, 2007 the sampling on February 2, 2007.

WELL	2/1/07 pH	2/2/07 pH	2/1/07 Temp.	2/2/07 Temp.	2/1/07 Cond.	2/2/07 Cond
MW-2	6.65	7.08	10.7	8.06	1430	980
MW-5	6.95	7.36	11.9	10.77	1250	1180
AW-2	6.94	7.25	10.3	8.00	1160	1170

WELL	2/1/07 pH	2/2/07 pH	2/1/07 Temp.	2/2/07 Temp.	2/1/07 Cond.	2/2/07 Cond
BW-2	7.09	7.32	10.7	7.96	999	999
BW-3	6.80	7.34	11.7	6.77	980	990

These wells were not bailed dry. The field data indicate a change in chemistry based on changes in the field values from purging on February 1, 2007, to sampling on February 2, 2007.

The owner/operator continues to not meet the requirements of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a) by not following the sampling and analysis plan which requires repeated trips to the well with less than 24 hours between trips, "if a sample cannot be obtained after the initial purging" and by not collecting samples which provide an accurate representation of ground water quality. The owner/operator needs to sample wells that purge dry as soon as enough water is available. Other wells should be sampled immediately after purging to ensure that representative samples are collected. Also, it is recommended that recharge rates of wells that bail dry should be recorded and monitored in order for the field personnel to know when sufficient water is available and when it is appropriate to sample the well. It had been previously observed that enough water is available for sampling within about 3 hours of purging.

4. OAC Rule 3745-27-10 (B)(3)(e): The owner/operator is in violation of OAC Rule 3745-27-10 (B)(3)(e). This rule requires that, "All monitoring wells shall be designed, installed, and developed in a manner that allows the collection of ground water samples that are representative of ground water quality in the geologic unit being monitored, and that are in accordance with the following criteria: (e) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices shall be operated and maintained to perform to design specifications throughout the life of the monitoring program."

In the third paragraph on page 2 of the submittal for the July 2005, sampling event the owner/operator states, "Prior to completing the July 2005, sampling event, the City conducted redevelopment activities for select monitoring wells. Redevelopment activities were completed because some depth discrepancies were noticed between measured and calculated total depth values of wells installed in the significant saturated zone and uppermost aquifer. Most of these discrepancies were negligible and most likely due to build-up of silt in the well column since the last monitoring event. The City will submit documentation of the redevelopment activities under separate cover."

A review of the field data sheets for the current, February 2007, and previous sampling events by Ohio EPA indicates there are still wells with errors in the measured total depth. Since the wells were said to have been redeveloped, the errors in well depth may be due to other factors or other well damage. This potential damage needs to be addressed.

In earlier events the data indicated that the screens were partially or completely covered by fill-up in some wells. Now, data appears to indicate that the total depth of some of the wells is below, and in some cases significantly below the base of the screen. Unless there is a section of riser pipe attached to the bottom of the wells, the total depth of a well is typically at the base of the screen. The boring logs indicate that the bottoms of the wells are at the base of the screen. If the wells are damaged or have been moved, representative data cannot be gathered. From the data provided on the field data sheets it cannot be discerned if the total depth is in error or the top of casing is in error. Following is a table of these errors.

Well	Total Depth of Well Relative to Bottom of Screen
MW-2	TD 0.5' below base of screen.
MW-3	TD 0.5' below base of screen.
MW-4	TD 1.0' below base of screen.
AW-1	TD 1.0' below base of screen.
AW-2	TD 13.7' below base of screen.
AW-3	TD 3.3' below base of screen.
AW-4	TD 2.0' below base of screen.
BW-1	TD 2.0' below base of screen.
BW-2	TD 1.5' below base of screen.
BW-3	TD 0.5' below base of screen.
BW-4	TD 2.0' below base of screen.
BW-5	TD 5.0' below base of screen.
BW-6	TD 1.5' below base of screen

The owner/operator is in violation of OAC Rule 3745-27-10 (B)(3)(e) by not properly maintaining the site's monitoring wells. The owner/operator needs to make any necessary well repairs immediately. In addition, the owner/operator is requested to provide the report of well redevelopment and any report of well repairs.

- OAC Rule 3745-27-10 (C)(1) and (C)(1)(a): The owner/operator is in violation of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a). For rule citation see comment 3 above.

The owner/operator's sampling and analysis plan states in the section which discusses the Field Data Sheet, "This sheet will include: *Any Evidence of Tampering or Damage to Well or Lock * Field Observation and Notes."

As discussed in comment number 4 above, it is clear that there continues to be apparent damage to the monitoring wells of the site as shown by the errors in total depth or top of casing elevation. This confounds or even may preclude the collection of representative data in these wells. Ohio EPA has commented on this problem in the past several years, yet the owner/operator does not indicate the presence of these well problems on the field data sheets as required by the sampling and analysis plan.

The owner/operator is in violation of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a) by not indicating the presence of the well damage. The owner/operator must ensure that well damage is noted and, as noted in comment #4 above, that the well damage is repaired immediately.

6. OAC Rule 3745-27-10 (C) (1)(a): The owner/operator is in violation of OAC Rule 3745-27-10 (C)(1)(a). For rule citation of OAC Rule 3745-27-10 (C)(1)(a) see comment 3 above.

The owner/operator's sampling and analysis plan states, in the section which discusses the Field Data Sheet, "A field data sheet will be filled out for each monitor well sampled." A review of the submittal indicates that field data sheets were provided for the February 1 and 2, 2007, sampling event; however, no field data sheets were provided for the March 29, 2007, resampling event as required by the owner/operator's sampling and analysis plan.

The owner/operator is in violation of OAC Rule 3745-27-10 (C)(1)(a) for not providing the plan-required field data sheets for the March 29, 2007, resampling event. The owner/operator needs to provide the field data sheets for this re-sampling event.

7. OAC Rule 3745-27-10 (C) (1) and OAC Rule 3745-27-10 (C)(7)(e): The owner/operator is in violation of OAC Rule 3745-27-10(C)(1) and OAC Rule 3745-27-10 (C)(7)(e). For rule citation of OAC Rule 3745-27-10 (C)(1) see comment 3 above. OAC Rule 3745-27-10 (C) (7)(e) requires that, "The statistical method shall account for data below the limit of detection with one or more statistical procedures that ensure protection of human health and the environment. Any practical quantitation limit (PQL) used in the statistical method shall 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."

A review of the "Non-Parametric Prediction Interval Intra-Well Comparison for BW4" for chromium indicates that almost all of the "Baseline Samples" were non-detect with a PQL of <2 µg/L (0.002 mg/L). Included in the baseline samples are a non-detect value utilizing a PQL of <5 µg/L (0.005 mg/L) and two detections recorded at 2.1 µg/L (0.0021 mg/L) and 3.2 µg/L (0.0032 mg/L) observed for the September 15, 1994, and December 6, 1994, sampling events respectively.

OAC Rule 3745-27-10 (C) (1) requires that the owner/operator utilize procedures which produce samples that are representative of the ground water at the site. OAC Rule 3745-27-10 (C) (7)(e) requires that the lowest PQL is used in the background data base. The utilization of a PQL of $<5 \mu\text{g/L}$ (0.005 mg/L) when the lowest PQL has been demonstrated to be $<2 \mu\text{g/L}$ (0.002 mg/L) is not meeting the requirements of OAC Rule 3745-27-10 (C)(1).

Also, the owner/operator included the detections for chromium from well BW-4, being $2.1 \mu\text{g/L}$ (0.0021 mg/L) and $3.2 \mu\text{g/L}$ (0.0032 mg/L) observed for the September 15, 1994, and December 6, 1994 sampling events, in the background data set. These detections are associated with excessive total suspended solids (TSS). The typical BW-4 total suspended solids readings between December 1998, and July 2006, range from a high value of 21 mg/L to a low of $<3 \text{ mg/L}$ (mean of 11.4 mg/L) based on data provided by the owner/operator. The TSS reading recorded on September 15, 1994, was 125 mg/L and the TSS reading recorded on December 6, 1994, was 173 mg/L . These are the highest readings for TSS reported on Table B-14 by the owner/operator with the exception of 645 mg/L recorded for the February 2007 event. Interestingly, in February 2007, the chromium was reported to be $8.35 \mu\text{g/L}$. Where TSS values are reported, only three chromium detections are recorded on Table B-14 for well BW-4; and all three of these detections are associated with excessive TSS readings. A determination of the correlation coefficient (R) at 0.977 and the coefficient of regression (R^2) at 0.933 indicates an excellent correlation between excessive TSS and the concentration of chromium. These chromium data associated with excessive TSS are not representative of the ground water of the site and do not meet the requirements of OAC Rule 3745-27-10 (C)(1).

In addition, barium and arsenic in BW-4 display high R and R^2 values when the determination is made for these metals and TSS. For barium R is 0.989 and R^2 is 0.96. For arsenic R is 0.878 and R^2 is 0.771. These metals also display a relationship between high concentrations and excessive TSS. The use of metals concentrations in background which are the result of excessive TSS is inconsistent with the requirements of OAC Rule 3745-27-10 (C) (1). The use of metals concentrations derived prior to the time when TSS values stabilized (about December 1998) does not provide values which are representative of the ground water of the site.

A review of the "Non-Parametric Prediction Interval Intra-Well Comparison for BW6" for lead indicates that almost all of the "Baseline Samples" were non-detect with the lower utilized PQL of $<1 \mu\text{g/L}$ (0.001 mg/L). Included in the baseline samples are two detections recorded at $6.75 \mu\text{g/L}$ (0.00675 mg/L) and $5.27 \mu\text{g/L}$ (0.00527 mg/L) observed for the March 10, 1997, and June 14, 2000, sampling events respectively.

These detections are associated with excessive TSS. The typical BW-6 TSS readings between December 2000, and July 2006, range from a high value of 82 mg/L to a low of 14 mg/L (mean of 35.4 mg/L) based on data provided by the owner/operator. The TSS readings recorded for the duplicate sample set on March 10, 1997, were 455 mg/L and 457 mg/L and the TSS reading recorded on June 14, 2000, was 265 mg/L. With the exception of that recorded on December 22, 1997, these are the highest readings for TSS reported on Table B-16 by the owner/operator. Interestingly, in February 2007, the lead was reported to be 2.64 µg/L with a TSS of 147 mg/L. Where TSS values are reported, only five lead detections are recorded on Table B-16 for well BW-6; and four of the five of these detections are associated with excessive TSS readings. A determination of the correlation coefficient (R) at 0.963 and the coefficient of regression (R^2) at 0.928 indicates an excellent correlation between excessive TSS and the concentration of lead in BW-6. These lead data associated with excessive TSS are not representative of the ground water of the site and do not meet the requirements of OAC Rule 3745-27-10 (C)(1).

In addition, barium and chromium in BW-6 display high R and R^2 values when the determination is made for these metals and TSS. For barium R is 0.847 and R^2 is 0.717. For chromium R is 0.882 and R^2 is 0.778. These metals also display a relationship between high concentrations and excessive TSS. The use of metals concentrations in background which are the result of excessive TSS is inconsistent with the requirements of OAC Rule 3745-27-10 (C)(1). The use of metals concentrations derived prior to the time when TSS values stabilized (about December 2000) does not provide values which are representative of the ground water of the site.

The owner/operator is in violation of OAC Rule 3745-27-10 (C) (1) by utilizing metals values in the background which are the result of high TSS. The owner/operator is also in violation of OAC Rule 3745-27-10 (C)(7)(e) by not utilizing the lowest PQL in the statistical analyses.

The owner/operator needs to review all metals data for all wells and ensure that metals concentration values, which are associated with excessive TSS values, are not utilized in the background data set. The use of the metals concentrations in the background must be justified. Subsequently, the owner/operator needs to perform the plan-required statistical analyses as required by OAC Rule 3745-27-10 (C) and resubmit the results of the analyses. It is clear that some of the results for the samples collected in February 2007, especially those collected with high TSS readings, will result in statistically significant increases after the excessive TSS background data is removed.

8. OAC Rule 3745-27-10 (C)(1): The owner/operator is in violation of OAC Rule 3745-27-10(C)(1). For rule citation of OAC Rule 3745-27-10 (C)(1) see comment 3 above.

A review of Figure 1, Potentiometric Surface Map for the Significant Saturated Units indicates that the data at wells AW-1 and MW-4 were not honored. Based on the map, well AW-1, which has a ground water elevation of 836.50' amsl, is located at an elevation of about 836.90' amsl. Well MW-4, which has a ground water elevation of 838.41' amsl, is located at an elevation of about 837.20' amsl. Also, wells MW-6, AW-3 and MW-2 are not adequately honored. If wells AW-1 and MW-4 are honored, the ground water flow direction will change significantly in the area of these wells. OAC Rule 3745-27-10 (C)(1) requires that the method produce results that are representative of the ground water of the site.

The owner/operator is in violation of OAC Rule 3745-27-10(C)(1) by not providing a potentiometric surface map which accurately represents the groundwater flow under the site. The owner/operator needs to provide an accurate map.

9. OAC Rule 3745-27-10 (C)(3)(b): The owner/operator is in violation of OAC Rule 3745-27-10 (C)(3)(b). For rule citation of OAC Rule 3745-27-10 (C)(3)(b) see comment 8 above.

This rule requires that the ground water flow direction be determined for "all significant zones of saturation monitored". Based on cross sections provided by the owner/operator in 2004, there are three separate significant zones of saturation. It is unreasonable to assume that all of these three significant zones of saturation display exactly the same ground water flow direction. The owner/operator submitted one map indicating flow direction; however, since there are three (3) significant zones of saturation, there should be a map for each of these zones.

The owner/operator is in violation of OAC Rule 3745-27-10 (C)(3)(b) by not determining ground water flow direction for all the significant zones of saturation on the site. Maps for each zone must be provided.

10. OAC Rule 3745-27-10 (B)(1)(b): The owner/operator is in violation of OAC Rule 3745-27-10 (B)(1)(b). OAC Rule 3745-27-10 (B)(1)(b) require that, "The ground water monitoring system, for detection monitoring, assessment monitoring, or corrective measures, 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 do the following: (b) Represent the quality of the ground water passing directly downgradient of the limits of solid waste placement."

This rule requires that the monitoring system have sufficient number of downgradient wells in, "any significant zones of saturation that exist above the uppermost aquifer system". Based on cross sections provided by the owner/operator in 2004, there are three separate significant zones of saturation. As yet, each of these three zones is not properly monitored and additional wells are needed in each of these three zones.

A violation of OAC Rule 3745-27-10 (B)(1)(b) was cited by Ohio EPA in a letter to the owner/operator dated September 27, 2004. In addition, the need for additional wells and the potential locations of these wells was discussed with the owner/operator in a meeting held in the City of St. Marys on September 16, 2004.

The owner/operator continues to be in violation of OAC Rule 3745-27-10 (B) (1)(b) by not installing a sufficient number of wells. Additional wells need to be added to the monitoring system for each of the three significant zones of saturation.

MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE

11. OAC Rule 3745-27-10(C) (6)&(7): Compliance with OAC Rule 3745-27-10(C)(6) and (C)(7) cannot be determined at this time.

OAC rule 3745-27-10(C) (6) requires that the specified method "...shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(7) of this rule." Therefore, as part of specifying in the ground water monitoring detection plan the statistical method to be used, there also needs to be a demonstration that given the site specific ground water chemistry, the statistical method specified is protective of human health safety and the environment in that it will detect a release from the facility as required by OAC rule 3745-27-10(A) and that the specified method complies with the performance standards of OAC rule 3745-27-10(C)(7).

The performance standard listed in OAC Rule 3745-27-10(C)(7)(a) states, in part, that "The statistical method used to evaluate ground water monitoring data shall be appropriate for the distribution of chemical parameters or waste-derived constituents." This rule requires that the demonstration submitted with the ground water detection monitoring plan along with the specified statistical method include a section showing that the results of a normality test supports the type (parametric or non-parametric) of the statistical method specified. This will require including in the demonstration the following information for each constituent required to be statistically analyzed:

1. A listing of the current background data to be used with the specified method; and
2. A description of the normality test used in making the demonstration including the formula for the test; and
3. The results of the normality test.

A review of the submittal continues to indicate that it is unclear what background values are being utilized in the statistical analyses for the various well/parameter combinations at the site. This appears to be typical of Poisson Prediction Limits and Shewhart-CUSUM Control Chart analyses. The sampling and analysis plan does not appear to specifically list the current background values.

In order to determine compliance with OAC Rule 3745-27-10 (C) (6) and (C)(7), the owner/operator must submit the above information (items 1, 2 and 3 above) to the operating record and the Ohio EPA. This needs to be in the form of a revision/addendum to the plan. If these values and the formulas for normality have been provided for the current analyses the agency requests that the owner/operator provide the location of the specified background values. If this information is not provided the owner/operator may be found in violation of OAC Rule 3745-27-10(C) (6) and (C)(7).

Every time background data is updated with new analysis results per OAC Rule 3745-27-10(C)(7)(g), an updated demonstration of compliance with OAC Rule 3745-27-10(C)(6) and (C)(7)(a) must be made. The statistical method section of the GWMP will have to be revised each time the background data is updated. This comment or a similar comment was also made relative to the owner/operator's report for the July 2004, January 2005, July 2005, January 2006, and July 2006 sampling events.

12. 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 3 above.

A review of the laboratory turbidity, field turbidity, total suspended solids (TSS) data for the well samples included in the submittal indicates that several wells continue to demonstrate excessive turbidity/TSS values. Excessive turbidity/TSS values can adversely impact parameter concentrations producing results which are not representative of the ground water of the site. Following is a list of the turbidity/TSS results available from the field forms, bottle order forms and laboratory reports. Some of the wells display significantly excessive values (bold) as observed from the results for the February/March 2007 sampling event/resampling event.

WELL	FIELD TURBIDITY	LAB TURBIDITY	TSS
MW-1	112	140	120
MW-2	44.6	44.6	23.6
MW-3	284	262	238
MW-4	1000	810	859
MW-5	112/112	52.2/47	27/28.2
MW-6	29.5	-	19.2
AW-1	13.9/16	29.4	13.2
AW-2	113	40.2	35
AW-3	93	44.6	57.2

WELL	FIELD TURBIDITY	LAB TURBIDITY	TSS
AW-4	-	18.1	25.3
BW-1	54	-	30.4
BW-2	36.7	-	14
BW-3	57	-	9.41
BW-4	439/11	-	645
BW-5	24.1	-	9.76
BW-6	127	-	147

In the third paragraph on page 2 of the submittal for the July 2005, sampling event the owner/operator states, "Prior to completing the July 2005, sampling event, the City conducted redevelopment activities for select monitoring wells. Redevelopment activities were completed because some depth discrepancies were noticed between measured and calculated total depth values of wells installed in the significant saturated zone and uppermost aquifer. Most of these discrepancies were negligible and most likely due to build-up of silt in the well column since the last monitoring event. The City will submit documentation of the redevelopment activities under separate cover." It appears the owner/operator has attempted to service the wells; however, some of them are still producing excessively turbid samples. In addition, as shown between the February sampling event and the March resampling event, there was a change in well BW-4 resulting in a significant decrease in field turbidity from 435 NTU to 11 NTU based on data gleaned from the bottle order forms. Unfortunately, the owner/operator has not provided field data forms which could be used to help determine what procedures were different in March which might have positively impacted the results.

In order to determine compliance with OAC Rule 3745-27-10(C)(1) the owner/operator needs to indicate how the collection of excessively turbid samples provides results which are representative of the ground water of the site. Alternatively, the owner/operator may repair or replace the wells as needed. The owner/operator needs to ensure that low turbidity samples are collected from the site's wells. In addition, Ohio EPA requests the documentation of the redevelopment activities which the owner/operator indicated they would provide. A similar comment was made in Ohio EPA comments to the July 2006 event.

13. OAC Rule 3745-27-10 (C)(7)(e): Compliance with OAC Rule 3745-27-10 (C)(7)(e) cannot be determined at this time. For rule citation see comment 7 above.

A review of the analytical results indicates that some of the practical quantitation limits (PQLs) utilized were greater than those utilized by other laboratories in Ohio.

These lower values utilized by other laboratories have been achieved during routine laboratory operating conditions and have been determined to be reliably achievable. Following is a table of the parameters and PQL values utilized by the owner/operator's laboratory for which there are lower reliably achievable PQLs. These increased PQLs do not contain a qualifier indicating that the PQLs were increased due to matrix interference. In addition, where increased PQLs are utilized, there does not appear to be a dilution factor other than one.

PARAMETER	TEST AMERICA PQL ($\mu\text{g/L}$)	TYPICAL PQL ($\mu\text{g/L}$)
Ammonia Nitrogen	50	20
Total Dissolved Solids	50,000	20,000
Sulfate	10,000	50,000
Alkalinity	50,000	10,000
Arsenic	5	3
Barium	20	10
Copper	20	10
Iron	100	50
Silver	40	10
Vanadium	50	20
Zinc	50	20
Acrylonitrile	50	20
Methyl bromide	5	1
2 Butanone	12.5	10
Chloromethane	5	1
Methylene chloride	5	2
4-Methyl-2-pentanone	12.5	10
1,2,3-Trichloropropane	5	1

In order to determine compliance with OAC Rule 3745-27-10 (C)(7)(e) the owner/operator needs to utilize the lower PQLs noted in the table above or demonstrate how the use of their original PQLs are protective of human health and the environment, are the lowest reliably achievable and will provide an accurate representation of the ground water of the site.

14. 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. OAC Rule 3745-27-10 (B)(3)(e) requires that, "The monitoring wells, piezometers, and other measurement, sampling and analytical devices shall be operated and maintained to perform to design specifications throughout the life of the monitoring program." For citation of OAC Rule 3745-27-10 (C)(1) see comment number 3 above.

During the February 2, 2007, sampling event, wells MW-1, MW-4, AW-3, BW-1, BW-4, and BW-6 have displayed slight to significant increases in TSS values compared to the past several years. OAC Rule 3745-27-10 (B) (3)(e) requires that the wells be maintained to perform to design specifications and OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will result in data which is representative of the ground water of the site. These increases in TSS may be the result of changes in sampling procedure or may be due to damage to the wells. Since these wells have been installed and sampled for some time and the conditions in most of the wells have stabilized at low TSS values, it would not be expected that TSS values would rise due to natural conditions. Ground water velocities would typically not be sufficient to mobilize additional fine material to cause increased TSS unless some outside stress was applied. A review of the field data sheet for MW-1, for example indicates that a Keck Pump was used for purging and the purging rate was 1.0 gallons per minute. Previously, bailers were used for purging. While pumps often can produce excellent results with low turbidity, they should be operated consistently and at a moderate rate. It appears that 1.0 gallons per minute may be too great a rate for this well resulting in higher turbidity.

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 describe any changes in well conditions which occurred at the site and if any of the wells were damaged. In addition, the owner/operator needs to describe any changes in procedures. The owner/operator is reminded that representative samples must be collected.

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 3 above. A review of the analytical results indicates that the chloride concentration for affected well MW-2 is 8.00 mg/L. A review of the historical data for this well indicates that the previous 26 sampling events reported chloride concentrations equal to or in excess of 185 mg/L. The previous historical low value of 142 mg/L occurred on July 2, 1996. The current value of 8.00 mg/L is historically anomalous and may be the result of laboratory or sampling error.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to explain this anomalously low result.

16. 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 3 above.

A review of the Test America Laboratory Blank QC Data indicates that there are a number of detections in the laboratory blanks. While some detections are understandable, others are not easily explained and suggest potential errors in laboratory procedure. The report indicates the presence of sulfate, barium, iron, magnesium, manganese, potassium, sodium, and zinc in the blank. OAC Rule 3745-27-10 (C) (1) requires the use of procedures which will result in the reporting of data which is 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 adequately explain how a procedure which results in a significant number of inorganic parameters in the blank meets the requirements of this rule.

17. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For citation of OAC Rule 3745-27-10 (C)(1) see comment 3 above.

A review of the field data sheet for well AW-1 indicates that the well was purged on February 1, 2007 at 14:10. Although there are some initialed strike outs the form indicates that AW-1 was sampled on February 1, 2007 at 10:10. Since, based on the field data sheet, it appears that the well was sampled before it was purged, it cannot be accurately determined when AW-1 was purged and sampled. The chain of custody form, however, indicates that the well was sampled at 10:10 on February 2, 2007. It is unclear when the well was actually purged and sampled.

In addition, well AW-4 was purged dry February 1, 2007 at 09:05 and sampled on February 1, 2007, at 13:20 and on February 2, 2007, at 08:05. The final pH, temperature and conductivity are exactly the same as the last readings before the well was purged dry. Also, there is no indication what the field readings were for the time of sampling.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide accurate and representative data relative to the purging and sampling dates and times for well AW-1 and for the field parameters for well AW-4 at the time of sampling. Based on the form, it is assumed that the well was sampled twice; however, clarification is also requested.

18. OAC Rule 3745-27-10 (C)(1): Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For citation of OAC Rule 3745-27-10 (C)(1) see comment 3 above.

A review of the field data sheet for well BW-1 indicates that the final pH is significantly different than the pH at the fifth volume. The determination of stability for field pH is based on a change of no more than 0.1 S.U. over the last 3 readings. The field data sheet indicates that the last four readings, including the final, are 7.43, 7.39, 7.38 and 7.60.

While readings number 3, 4, and 5 indicate stability in the pH readings, the last reading indicates that the water in the well was not stable.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) and OAC Rule 3745-27-10 (C)(10) the owner/operator needs explain how the last pH reading (7.60 S.U.) indicates that the ground water measurements were stable in well BW-1 and how this procedure is protective of human health and the environment. Also the owner/operator needs to provide accurate and representative data which indicates that the well was stable.

STATEMENTS

19. A comparison of the parametric and non-parametric prediction limits for ammonia nitrogen, chloride, sodium and potassium using well MW-1 as the background well to wells AW-1, AW-2, AW-3 and AW-4 indicates that wells AW-1, AW-2, AW-3, and AW-4 continue to exceed the prediction limit for chloride, well AW-4 continues to exceed the prediction limit for sodium and AW-4 continues to exceed the prediction limit for potassium. These wells are considered to be assessment wells. In addition, it should be noted that well AW-1 noted the presence of benzene (between the MDL and PQL) and a concentration of chloroethane at 7.54 µg/L during the February sampling event and the presence of chloroethane during the March resampling event. This is the second semiannual event where chloroethane has been observed. It should be noted that the presence of this parameter is not considered a quantifiable detection.
20. On the site are several wells which have displayed and continue to display exceedances. During this sampling event, well BW-4 has displayed an exceedance for cadmium and nickel.
21. On page 4 of the submittal the owner/operator states, "Prior to updating a background, a Mann-Kendall trend test or Student t-test was performed to comply with Ohio EPA's request to evaluate background data sets for small increasing trends that may not be evident when individual data point comparisons are completed." It should be noted that Ohio EPA has always indicated that both upward and downward trends should be evaluated. Upward trends may indicate the presence of contamination which is now affecting the well. Downward trends may indicate changes have occurred which indicate that previous data are no longer representative of current conditions. This may be due to the well developing over time.
22. On page 1 of the submittal the owner/operator states, "Note that significant saturated unit monitoring wells MW-1 through MW-5 are included in both the detection and assessment monitoring programs at the facility." It should be noted that based on the requirements of OAC Rule 3745-27-10 wells MW-1 through MW-5 are in the assessment program and must comply with the requirements of OAC Rule 3745-27-10 (E).

23. The owner/operator has performed intrawell statistical methods on upgradient wells. In addition, the owner/operator has updated the background data sets for these wells. Some of the updates included outlier tests and trend tests. A review of some of the BW-1 background data indicates that some of the metals data in the background is correlative with high turbidity/TSS readings. For example the correlation coefficient (R) for chromium in well BW-1 is 0.789 and for barium it is 0.89. The use of these high turbidity/TSS data might be inappropriate since they would not be representative of the ground water of the site. In addition some of the background values included PQL values which were not the lowest as required by OAC Rule 3745-27-10 (C)(7)(e).

While it is not required that upgradient wells be statistically analyzed, the owner/operator should be aware that if these background values from the upgradient wells are utilized to determine the presence of a statistically significant increase over background in downgradient wells as required by OAC Rule 3745-27-10 (C)(8), the owner/operator may be required to justify the use of high turbidity/TSS data or data consisting of PQLs which are not the lowest. The owner/operator may elect not to include those data in the background.

24. On page 5 of the submittal the owner/operator states, "No calculated statistical significance was identified for any parameter in any downgradient monitoring well monitored as part of the detection program, with the exception of arsenic, cadmium, chromium, nickel, and potassium in monitoring well BW-4 and chloride in monitoring wells BW-5 and BW-6." The owner/operator is cautioned that removal of results in several of the wells which are the result of excessive TSS will likely result in additional statistically significant increases.
25. On page 5 of the submittal the owner/operator states, "Note that OAC 3745-27-10 does not require the completion of statistical evaluations for upgradient or assessment monitoring wells. However, to assist in the evaluation of the groundwater data, intra-well statistical evaluations were completed for upgradient monitoring wells MW-1 and BW-1, and interwell statistical evaluations were completed for assessment monitoring wells MW-2, MW-3, MW-4, and MW-5." The owner/operator is cautioned that the most recent results observed for MW-1 and BW-3 are associated with sharp increases in TSS and/or Turbidity. In fact, the Turbidity for well MW-1, 140 NTU, has never been reported at a greater value than the February 2, 2007, event. The TSS value, 120 mg/L, is the highest value since May 23, 1996. The incorporation of data into the background dataset must be justified. Increased concentrations of metals in these wells have been shown to display excellent correlations with increased concentrations in TSS/Turbidity. The use of data resulting from TSS is not representative of the ground water of the site and the use of such data in background might result in a violation of OAC Rule 3745-27-10.
26. The Test America laboratory report for MW-2 provides a page which includes the statement, "Client Supplied Field Data".

Mr. Thomas Hitchcock
June 6, 2007
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On this page it also indicates that the well was sampled at 09:35 on 02/02/07 and the sample was received at 10:00 on 02/03/07. However, it states that pH, Specific Conductance, Temperature, and Turbidity were analyzed on 02/13/07. This appears to be a typographical error.

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 Mike Reiser, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,

Michael A. Reiser

Michael A. Reiser, R.S.
Environmental Supervisor
Division of Solid and Infectious Waste Management

/llr

pc: Kelly Bensman, Hull & Associates, Inc.
Todd Flagle, City of St. Marys
Randy Skrzyniecki, DDAGW, NWDO
Jack Leow, DDAGW, NWDO
File: Auglaize County, St. Marys Landfill, Ground Water
id: 5-6887