



State of Ohio Environmental Protection Agency

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

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

June 13, 2008

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 report dated April 7, 2008 and received April 7, 2008. This submittal contains the statistical report of ground water quality for the detection monitoring program for the St. Marys Landfill. Following are Ohio EPA comments relating to the review of this document.

COMMENTS

VIOLATIONS

- 1. The owner/operator continues to be in violation of OAC Rule 3745-27-10 (B)(3)(d) which requires that the design, installation, development, maintenance and abandonment of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices be documented in the operating record. The owner/operator needs to provide the documentation of the redevelopment activities conducted in the summer of 2005.**

In the third paragraph on page 2 of the submittal for the July 2005 sampling event the owner/operator stated, "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." This information has yet to be received.

2. **The City of St. Marys continues to be in violation of OAC Rule 3745-27-10 (D)(7)(c)(ii), which requires that the owner/operator comply with the provisions of paragraph (E) if approval is not granted by the director to return to the detection monitoring program; and OAC Rule 3745-27-10 (E)(1), which requires that unless the director approves a demonstration in accordance with paragraph (D)(7)(c), the owner/operator must implement a ground water assessment plan capable of determining the concentration, rate, and extent of migration of waste-derived constituents in the ground water upon determining a statistically significant increase over background in accordance with paragraph (D)(7). The owner/operator needs to comply with the assessment program requirements as discussed in OAC Rule 3745-27-10 (E) which includes implementation of an adequate assessment program.**

As seen in the statistical analyses for chloride in wells BW-5 and BW-6, the CUSUM values have exceeded the statistical limits for these wells since about 2004. Demonstrations provided by the owner/operator in accordance with OAC Rule 3745-27-10 (D)(7)(c)(ii) have not been approved by the director and the wells are in the assessment program.

3. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (E)(3) which requires that within one hundred and thirty-five days of notifying Ohio EPA of a statistically significant increase over background the owner or operator needs to submit a ground water quality assessment plan. To return to compliance, the owner/operator needs to submit the required ground water quality assessment plan for affected wells BW-5 and BW-6.**

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 was August 10, 2004 and one hundred and thirty-five days from March 26, 2004 was 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.

4. **The City of St. Marys continues to be in violation of OAC Rule 3745-27-10 (E)(5)(a)(i), which requires the sampling of affected wells for appendix II parameters; of OAC Rule 3745-27-10 (E)(5)(a)(ii), which requires the sampling of monitoring wells screened within the same affected zone for waste-derived constituents above background; and of OAC Rule 3745-27-10 (E)(5)(b)(ii), which requires that the all assessment wells be sampled for Appendix II parameters annually. The owner/operator has not performed Appendix II sampling on wells BW-5 and BW-6. To return to compliance the owner/operator needs to sample wells BW-5 and BW-6 and analyze the samples for Appendix II parameters.**

Uppermost aquifer system monitoring wells BW-5 and BW-6 have displayed exceedances of CUSUM values since 2004. Since that time Appendix II parameters have not been analyzed in samples collected from these wells as required by the above stated rules.

5. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a) which require that the ground water monitoring program 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; and that the owner or operator use the procedures documented within the sampling and analysis plan. 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.**

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-1 (not dry), MW-2 (not dry), MW-3 (dry), MW-4 (not dry), MW-5 (not dry), MW-6 (dry), MW-7 (not dry), MW-8 (dry), MW-9 (not dry), AW-1 (not dry), AW-2 (not dry), AW-3 (dry), AW-4 (dry), BW-1 (not dry), BW-2 (not dry), BW-3 (not dry), BW-4 (not dry), BW-5 (dry), and BW-6 (not dry), whether purged dry or not, were purged on January 22, 2008, but not sampled until January 23, 2008. 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 6 of these 19 wells (MW-3, MW-6, MW-8, AW-3, AW-4, and BW-5) 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. During the September 24, 2007 resampling event five wells were purged and sampled on the same day with MW-3, which was bailed dry, being sampled within three hours and eleven minutes of the time of purging. (It is not clear if the time of purging was at the beginning or the end of purging.) Clearly the wells, sampled on July 31, 2007 could have been sampled on July 30, 2007. Also, during the March 13, 2008 resampling event, well MW-6 was bailed dry at 13:15 and sampled at 14:30, which is only one (1) hour and 15 minutes after purging the well dry. Clearly this well can be purged and sampled on the same day and sampling can occur within a few hours of purging.

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 January 22, 2008 and sampling on January 23, 2008. Following is a table indicating the change in field parameter values from the end of purging on January 22, 2008 to the sampling on January 23, 2008 for wells which were not bailed dry and displayed a significant change in ground water chemistry between purging and sampling. (It should be noted that the typical wait time between purging and sampling is about 22 hours.) This change may be due to stagnation of the water in the well between purging and sampling. The values which appear to show a significant change are in **bold**. These differences in values exceed the 10% value specified by the City in SOP No. F3007 included in their sampling and analysis plan.

WELL	01/22/08 pH	01/23/08 pH	01/22/08 Temp.	01/23/08 Temp.	01/22/08 Cond.	01/23/08 Cond.
MW-1	6.60	7.40	11.6	8.21	1850	1830
MW-2	6.42	7.10	11.9	8.6	1660	1288
MW-4	6.38	6.81	12.5	10.18	1730	1750
MW-5	6.78	7.30	12.5	10.35	1348	1349
MW-7	6.98	7.33	11.2	8.32	1415	1449
MW-9	6.89	7.39	10.7	7.50	857	912
AW-1	6.97	7.18	10.6	7.21	1157	1140
AW-2	6.74	7.48	10.8	8.10	1308	1364
BW-1	6.97	7.58	11.4	8.8	1298	1307
BW-2	6.76	7.21	11.2	8.82	1100	962
BW-3	6.70	7.13	11.5	8.60	1116	1079
BW-4	6.94	7.02	11.9	9.52	1436	1436

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, in wells which bailed dry, within about 3 hours of purging.

6. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (B)(3)(e), requiring that all monitoring wells be designed, installed, and developed in a manner that allows the collection of ground water samples that are representative of ground water. 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. There has been no owner/operator response to this comment.**

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."

An Ohio EPA review of the field data sheets for the July 2007, and previous sampling events 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. In the February 2007 event, data appeared to indicate that the total depth of some of the wells is below, and in some cases significantly below the base of the screen. In the July 2007 event's submittal the total depth values suggest that the screens are partially or completely covered. 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 previously cited significant errors based on the July 2007 data.

Well	Measured Total Depth of Well Relative to Bottom of Screen
MW-3	TD 0.74' above bottom.
MW-4	TD 0.77' above bottom.
MW-5	TD 1.66' above bottom.
AW-1	TD 1.53' above bottom.
AW-2	TD 1.25' above bottom.
AW-3	TD 3.15' above bottom. (Well screen is said to be 3 feet long.)
AW-4	TD 2.15' above bottom.
BW-1	TD 1.54' above bottom.
BW-2	TD 3.48' above bottom.
BW-3	TD 0.5' above bottom.
BW-4	TD 1.42' above bottom.
BW-5	TD 1.19' above bottom.
BW-6	TD 0.82' above bottom.

7. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) and (C)(1)(a) which requires that the sampling and analysis plan contain procedures which will provide results which are representative of the ground water of the site and that the procedures in the plan be followed. The owner/operator must ensure that well damage is documented and, as noted in comment 6 above, that the well damage is repaired immediately. There has been no owner/operator response regarding this issue.**

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 6 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 over 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.

8. **The City of St. Marys remains in violation of OAC Rule 3745-27-10(C)(1)(a) which requires that procedures in the plan be utilized. The City needs to respond to the following comment which was sent in response to the owner/operator's submittal of the results for the February and March 2007 events. The owner/operator needs to provide the field data sheets for the March 29, 2007 re-sampling event.**

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.

9. **The City of St. Marys remains in violation of OAC Rule 3745-27-10(C)(1) and OAC Rule 3745-27-10 (C)(7)(e) which require that the plan include procedures which will provide representative results and that if a PQL is used it must be the lowest concentration level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility. The City needs to respond to the following comment which was sent in response to the owner/operator's submittal of the results for the February and March 2007 events.**

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 (R²) 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 R² values when the determination is made for these metals and TSS. For barium R is 0.847 and R² is 0.717. For chromium R is 0.882 and R² 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.

10. **The City of St. Marys remains in violation of OAC Rule 3745-27-10(C)(1) which requires that the plan include procedures which will provide representative results. The City needs to respond to the following comment which was sent in response to the owner/operator's submittal of the results for the February and March 2007 events.**

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.

11. **The City of St. Marys continues to be in violation of OAC Rule 3745-27-10 (C)(3)(b) which requires that the ground water flow direction be determined for all significant zones of saturation monitored. Maps for all significant zones of saturation need to be provided.**

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.

12. **The City of St. Marys continues to be in violation of OAC Rule 3745-27-10 (B)(1)(b) which requires that the ground water monitoring system 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 represent the quality of the ground water passing directly downgradient of the limits of solid waste placement. Additional wells need to be added to the monitoring system for each of the three significant zones of saturation.**

OAC Rule 3745-27-10 (B)(1)(b) requires that the monitoring system have sufficient number of downgradient wells in the significant zones of saturation. 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.

MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE

13. **Compliance with OAC Rule 3745-27-10(C)(6), which requires that the specified method ensure protection of human health and the environment and comply with the performance standards outlined in paragraph (C)(7) and OAC Rule 3745-27-10(C)(7), which requires that the statistical method used to evaluate ground water monitoring data be appropriate for the distribution of chemical parameters or waste-derived constituents, cannot be determined at this time. The owner/operator needs to submit specific information regarding background and normality testing.**

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.

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, July 2006, February 2007, and July 2007 sampling events.

14. **Compliance with OAC Rule 3745-27-10(C)(1), which requires the plan to contain procedures which produce results which are representative of the ground water of the site, cannot be determined at this time. The City of Saint Marys 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. Documentation of design, installation, development, maintenance, and abandonment of monitoring wells, piezometers, and other measurement, sampling, and analytical devices is required by OAC Rule 3745-27-10 (B)(3)(d).**

A review of the laboratory turbidity, field turbidity, and 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. Ideally, turbidity should be less than 10 NTU. Following is a list of the turbidity/TSS results available from the field forms and laboratory reports. Some of the wells display significantly excessive values (**bold**) as observed from the results for the July/September 2007 sampling event/resampling event.

WELL	FIELD TURBIDITY (NTU)	LAB TURBIDITY (NTU)	LOWEST HISTORICAL REPORTED TURBIDITY (DATE) (NTU)	TSS (MG/L)
MW-1	44	45.8	25 (4/96)	52
MW-2	61	39.4	31.8 (6/01)	14
MW-3	216	312	50 (6/97)	101
MW-4	87	191	120 (7/96)	121
MW-5	104	42.6	23 (6/97)	31.5
MW-6	53	--	9.38 (7/04)	34.5
MW-7	27	--	--	27
MW-8	39	--	--	33.5
MW-9	70	--	--	25
AW-1	45	30.6	10.2 (1/06)	10.0
AW-2	38	35.6	7.4 (9/96)	21.5
AW-3	52	40.4	27.5 (7/96)	54.5
AW-4	37	73.0	13.4 (6/02)	478
BW-1	22	--	10.7 (6/01)	11

BW-2	80	--	15.1 (6/00)	27.5
BW-3	51	--	4 (7/98)	16.5
BW-4	17	--	8 (7/98)	15
BW-5	43	--	6.88 (6/00)	17.5
BW-6	48	--	14 (7/98)	27.5

In the third paragraph on page 2 of the submittal for the July 2005 sampling event the owner/operator stated, "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 had previously attempted to service the wells; however, some of them are still producing excessively turbid samples. In addition, as shown between the July 2007 sampling event and the September 2007 resampling event, there was a change in well BW-6 resulting in a significant decrease in field turbidity from 168 NTU to 12 NTU. Also, a review of the historical turbidity readings provided by the owner/operator indicates that some of the wells have recorded significantly lower turbidity readings in the past.

A similar comment was made in Ohio EPA comments to the July 2006 event, the February 2007 event, and the July 2007 event.

- 15. Compliance with OAC Rule 3745-27-10(C)(1), which requires the ground water monitoring program include consistent sampling and analysis procedures which produce results which are representative of the ground water of the site, cannot be determined at this time. The City of Saint Marys needs to indicate why field and laboratory turbidity results, which display great discrepancy, meet the requirement for consistent procedures. (See comment 14 above.)**

As shown in the table in comment 14 above, some of the turbidity results, especially those from MW-2, MW-4, and MW-5, display significant differences in value between the field turbidity result and the laboratory turbidity result. These results may be displaying inconsistency in procedures, which is in opposition to the requirements of OAC Rule 3745-27-10 (C)(1).

- 16. Compliance with OAC Rule 3745-27-10 (C)(7)(e), which requires that if a PQL is used it must 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, cannot be determined at this time.**

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 below 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.

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 (µg/L)	TYPICAL PQL (µg/L)
Arsenic	5	3
Barium	20	10
Copper	20	10
Iron	100	50
Silver	40	10
Vanadium	50	20
Zinc	50	20

17. **Compliance with OAC Rule 3745-27-10(B)(3)(e), which requires that monitoring wells be operated and maintained to perform to design specifications, and OAC Rule 3745-27-10 (C)(1), which requires that representative samples be collected, cannot be determined at this time. The City of St. Marys 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 purging, sampling or analytical procedures which might affect the turbidity of these samples.**

During the July, 2007 sampling event, wells MW-3 and MW-4 have displayed increases in turbidity values compared to previous years. In general, the MW-3 turbidity values from June 2002 to the present are significantly greater than those prior to June 2002. In addition, the MW-4 turbidity values from February and July 2007, and January 2008 are greater than turbidity values back to June 1996 and December 2001. 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 turbidity 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 lower turbidity values, it would not be expected that turbidity values would rise due to natural conditions. Ground water velocities would typically not be sufficient to mobilize additional fine material to cause increased turbidity unless some outside stress was applied. These wells were purged and sampled with a bailer. Care must be taken to purge and sample with a bailer in order to not produce increased turbidity. It might be helpful to use a constant flow pump at a very slow rate to obtain low turbidity samples. The use of slow rate constant flow pumps has been successful in reducing turbidity at other sites.

18. **Compliance with OAC Rule 3745-27-10(C)(1), which requires procedures which will result in representative data, cannot be determined at this time. In order to determine compliance with this rule the City of St. Marys 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. While the blanks now appear to be normal, this comment was made regarding former submittals and was not responded to by the owner/operator. The owner/operator needs to respond.**

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 or sampling procedure. The report indicates the presence of sulfate, barium, cadmium, iron, manganese, nickel, potassium, sodium, and thallium in the blank. In addition, the results indicate the presence of 45 mg/L total dissolved solids (TDS). Also, and more troubling, the results indicate the presence of 61 mg/L total suspended solids (TSS). It is unclear how that much TSS entered the blank. That TSS value 61 mg/L is greater than 12 of the 19 TSS results recorded during this event from monitoring wells. 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.

19. **Compliance with OAC Rule 3745-27-10(C)(1)(a), which requires that procedures in the plan be utilized, cannot be determined at this time. The City needs to explain how field parameters were analyzed 16 days after collection. While holding times in the current event appear to be appropriate, this comment was made regarding previous submittals and has not been responded to by the owner/operator. An owner/operator response regarding this issue should be made.**

A review of the TestAmerica laboratory reports indicates for pH, Specific Conductance, Temperature, and Turbidity, "Client Supplied Field Data", "Sampled 07/31/07..." The report lists the results, but also states, "Date Analyzed 08/15/07..." By these statements it appears that the field samples were collected on July 31, 2007, but were not analyzed until August 15, 2007 at the laboratory. The field sheets suggest that the parameters were determined in the field. The owner/operator's sampling and analysis plan indicates in Table 3 that temperature, pH, and conductivity will be "Field Determined". Based on conflicting data it cannot be determined when the parameters were determined.

20. **Compliance with OAC Rule 3745-27-10(C)(6), which requires that the specified method ensure protection of human health and the environment and comply with the performance standards outlined in OAC Rule 3745-27-10(C)(7), cannot be determined at this time. OAC Rule 3745-27-10 (C)(7) requires that the statistical method used to evaluate ground water monitoring data be appropriate for the distribution of chemical parameters or waste-derived constituents. OAC Rule 3745-27-10 (C)(7)(c) requires that if a control chart approach is used to evaluate ground water monitoring data, the specific type of control chart and its associated parameter values be protective of human health and safety and the environment and the parameters be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent. The owner/operator needs to clarify why the mean values are greater than even the greatest values shown on some of the control charts and clarify how the means and the limits were calculated and show that they were calculated correctly.**

A review of the statistical analyses indicates that some of the control charts display a horizontal line labeled "baseline mean" which is greater than all of the values on the chart. If a mean is displayed on the chart, by definition it should be near the middle of the group of data points. In addition, the vertical scale on these control charts is labeled "Conc (Standardized Units)". If this is the case, it appears that the mean should be at "0" in standardized units. It also appears that the mean values on the charts are in concentration units and not in standardized units. It is possible that the control charts and/or the mean values are not properly determined. It cannot be determined if the control charts were properly applied.

STATEMENTS

21. **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.**
22. **On the site are several wells which have displayed and continue to display exceedances. During this sampling event, wells BW-5 and BW-6 continue to display exceedances for chloride.**
23. **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). 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."**

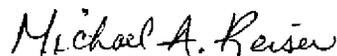
24. **Wells BW-5 and BW-6 are in the assessment program and should be treated as such.** Appendix C-2 is labeled, "Statistical Evaluations, Basic Statistics, Normality Tests, and Trend Tests for Wells Screened in the Significant Saturated Unit and Monitored as part of the Detection Program". Included in Appendix C-2 are statistical analyses for chloride in wells BW-5 and BW-6. These analyses indicate that the CUSUM values for wells BW-5 and BW-6 have displayed exceedances of their statistical limits since about 2004 for some time and continue to do so. Based on OAC Rule 3745-27-10 (D)(7)(c)(ii) these wells have been in the assessment program and the wells should be treated as assessment wells.
25. **The City was found in violation of OAC Rule 3745-27-10 (C)(1) because the data provided was not representative due to improper purging and sampling procedures.** On page 2 of the submittal the City states, "In a letter dated March 18, 2004 from Ben Smith of Ohio EPA to Mike Mackenzie of the City, Ohio EPA states that the low flow data does not appear to be an accurate representation of groundwater quality and requested it be removed from the dataset." It should be noted that in comment 2 of that March 18, 2004 letter, Ohio EPA provided details on proper procedures relative to low flow purging and sampling.
26. **Wells AW-4 and MW-7 might be completed in two hydraulically different zones.** A review of Figure 1 Potentiometric Surface Map for the Significant Saturated Units indicates a ground water elevation difference between well AW-4 and MW-7 of 1.17' even though they are located within about 25' of each other based on the map. For this map this is a significant difference and may be indicating that the two wells are completed in two separate zones.
27. **Ground water elevations in the area of wells MW-4 and BW-4 are higher than the elevations in the area of wells MW-2 and BW-2.** The elevation of the ground water at well MW-4 is 839.45' while at MW-2 the ground water elevation is 835.76'. In the bedrock, the ground water elevation at BW-4 is 836.76' while the ground water elevation at well BW-2 is 835.80'. Both sets of wells are about the same distance from the St. Marys River which flows, in general, from the MW-2/BW-2 area toward the MW-4/BW-4 area. This difference suggests a component of ground water flow which is counter to the flow direction of the river.
28. **Ground water gradient as stated on Figure 1 may be in error.** A review of Figure 1 Potentiometric Surface Map for the Significant Saturated Units indicates the statement "Average Hydraulic Gradient = 0.004 FT/FT". Ohio EPA calculated the gradient in several areas of the map using the ground water elevation data and the contours. The average hydraulic gradient was about 0.006 ft/ft rather than 0.004 ft/ft.
29. **The owner/operator is reminded that OAC Rule 3745-27-10 (E)(5)(b)(ii) requires assessment wells to be sampled annually for Appendix II parameters.** In the third paragraph of page 3 of the submittal the owner/operator states, "Tin was reported above the PQL in the upgradient well (0.0716 mg/l) and in every assessment well (0.0563 to 0.0695 mg/l) during the July 2007 sampling event. Tin was not detected in groundwater samples during previous sampling events. Therefore during the January 2008 sampling event, conformation [sic] resampling was completed for tin in the assessment monitoring wells.

Tin was not detected above the PQL in any of the assessment wells during the January 2008 conformation [sic] sampling event. Therefore the July 2007 tin values are attributed to unfavorable conditions at the time of sampling and/or analysis. If tin is not detected during the next sampling event, the tin values may be removed from the dataset."

30. **The owner/operator is reminded that storing samples at temperatures below freezing may cause the bottles to break resulting in the loss of the sample requiring resampling of the wells with the lost samples.** A review of the chain of custody forms for the January 2008 sampling event indicates that the samples were at a temperature of -1.4°C upon arrival at the laboratory.
31. **Chloride data at upgradient well BW-1 may contain outliers.** A review of the Shewhart-CUSUM Control Chart for chloride at well BW-1 indicates potential outliers in the data set. Depending on the method used, the size of the population and the level of significance, as many as four (4) outliers appear to be present. Inclusion of these outliers in the background during statistical analyses may be inappropriate and may not meet the requirements of OAC Rule 3745-27-10 (C)(6) which requires that the statistical method be protective of human health and the environment and comply with the performance standards listed in OAC Rule 3745-27-10 (C)(7).

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

/csi

pc: James Lavrich, Hull & Associates, Inc.
Todd Flagle, City of St. Marys
'File: Auglaize County, St. Marys Landfill, Ground Water'

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