



Environmental
Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

February 15, 2012

RE: **MILLENNIUM LANDFILL
GROUND WATER MONITORING
NOTICE OF VIOLATION**

CERTIFIED MAIL 7011 0470 0002 3496 1078

Mr. Rick Hughes
Millennium Inorganic Chemicals, Inc.
2426 Middle Road
Ashtabula, Ohio 44004

Dear Mr. Hughes:

The Ohio Environmental Protection Agency (Ohio EPA) has reviewed the following:

- November 2010 Semiannual Statistical Reports of Ground Water Quality for the Millennium Inorganic Chemicals, Inc., A Cristal Global Company, Ashtabula County, dated January 24, 2011 and received by Ohio EPA on January 31, 2011
- May 2011 Semiannual Statistical Reports of Ground Water Quality for the Millennium Inorganic Chemicals, Inc., A Cristal Global Company, Ashtabula County, dated and July 27, 2011 and received by Ohio EPA on August 2, 2011.

The reports were prepared and submitted to the Ohio EPA by TM Engineering, Inc. on behalf of Millennium Chemicals, Inc. (Millennium). Millennium is the owner of the Millennium Ashtabula Landfill. Millennium is conducting ground water detection monitoring in accordance with the Millennium Ashtabula Landfill site specific ground water detection monitoring plan (GWDMP) and Ohio Administrative Code (OAC) 3745-29-10 (A)(1), effective October 30, 2008 and OAC 3745-30-08, effective February 1, 2008.

Upon review of the reports, Ohio EPA identified the following violations:

1. **OAC Rule 3745-30-08(C)(7)** states, in part, that *"[t]he owner or operator shall determine whether or not there is a statistically significant increase (or change in the case of pH) from background values for each parameter or constituent required by paragraph (D), (E), or (F) of this rule, as applicable. The owner or operator shall make this statistical determination semi-annually ... To determine whether a statistically significant increase or decrease has occurred, the owner or operator shall compare the ground water quality of each parameter or constituent at each downgradient ground water monitoring well to the background value of that parameter or constituent according to the statistical procedures specified in paragraphs (C)(5) and (C)(6) of this rule."*

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Millennium is in violation for failure in determining whether or not there are statistically significant differences from background values for each parameter or constituent. Millennium Landfill uses a Shewhart-CUSUM control chart approach that gives control limits for each parameter. Millennium is incorrectly performing the statistical analyses for the alternate parameter list, and it is unclear whether or not there is a statistically significant increase (SSI).

It appears the statistical analyses submitted have not been completed correctly, which should have been done according to the 1997 Hull Associates, Inc. report/plan, and consistent with the methodologies used in the *U.S. EPA Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities Unified Guidance*, March 2009.

Currently, Millennium completes intrawell statistical analysis using the combined Shewhart-CUSUM control chart test. The current Shewhart-CUSUM control charts submitted have been completed with standardized data, and it appears the full methodology has not been applied. Therefore, it is unclear whether Millennium has adequately identified SSIs.

The control charts should be completed and represented with actual parameter concentrations in $\mu\text{g/L}$ or mg/L according to "*Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities Unified Guidance*," March 2009 (EPA 530/R-09-007), Chapter 20.

The Shewhart-CUSUM control charts should not be used on parameters with background trends. Unlike prediction limits, no non-parametric version of the combined Shewhart-CUSUM control chart exists. If the background sample cannot be normalized, perhaps due to a large fraction of non-detects, a non-parametric prediction limit should be considered.

Furthermore, the current data submittal states on Page 3, that statistical evaluation of the background data has been updated and now consists of the first 16 sampling events for the Chagrin Shale monitoring wells, and the first eight sampling events for the shallow lacustrine saturated zones. The actual control charts in Attachment C of this submittal either start in 2004, or at times in 1996. It is troubling and unclear what sampling events have been used for background, when the CUSUM starts, what the rationale was for beginning in 2004, and how many samples were actually used for background.

In order to return to compliance, Millennium will need to reevaluate the last 12 sampling events (first eight sampling events as background, and the last four

sampling events as compliance) and determine if there have been SSIs. Consult the *Unified Guidance* for the complete procedure and methodology to follow for the control charts in order to ascertain current compliance. Millennium must submit the results of the statistical reevaluation to Ohio EPA for review within 45 days.

2. **OAC Rule 3745-30-08(C)(2)** states *“Ground water elevations shall be measured within a single twenty-four-hour period in all monitoring wells at least semi-annually and in each well prior to purging and sampling. The owner or operator shall determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground-water flow at least semi-annually. The ground water elevations and direction(s) of flow shall be shown on a potentiometric map(s) submitted with the sampling data.”*

Millennium failed to measure ground water elevations within a single 24-hour period in all monitoring wells at least semiannually, and in each well prior to purging and sampling. Millennium failed to determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground water flow at least semiannually. The ground water elevations and direction(s) of flow must be shown on a potentiometric map(s) submitted with the sampling data.

The potentiometric surface map submitted with the November 2010 report is from the May 2010 data, and not the current round of sampling. In addition, contours are inaccurate and need revision. To return to compliance with this violation, Millennium must submit both accurate and current potentiometric surface maps with each data submittal.

Ohio EPA identified the following potential violation, but more information is needed:

3. **OAC Rule 3745-30-08(D)(8)** states *“[i]f at any monitoring well, the owner or operator determines, for two consecutive semi-annual statistical determination periods, that there has been a statistically significant increase (or change in the case of pH) from background values for one or more of the applicable indicator parameters specified in appendix III of this rule according to the statistical method specified by the owner or operator pursuant to paragraphs (C)(5), (C)(6), and (D)(9) of this rule, the owner or operator shall notify Ohio environmental protection agency not later than fifteen days after receiving the second period's statistical or analytical results which indicate a statistically significant change. The notification must indicate which parameters have shown a statistically significant change from background levels.”*

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Ohio EPA needs further information to determine whether a violation exists, however, it appears that unverified SSIs exist at the site. Therefore, Millennium must determine if there has been a SSI from background values for one or more of the applicable indicator parameters specified in Appendix III of this rule. If a confirmed SSI exists, Millennium must notify Ohio EPA not later than 15 days after receiving the second period's statistical or analytical results which indicate a statistically significant change. The notification must indicate which parameters have shown a statistically significant change from background.

Furthermore, if SSIs are reported, Millennium must, within 180 days of conducting the sampling analysis required under paragraph (D)(12) of this rule, submit to Ohio EPA and implement a specific plan for a ground water quality assessment program to determine the concentration and the rate and extent of migration of waste-derived constituents in the ground water at the landfill facility.

Note that for control charts, an SSI occurs whenever either the CUSUM or Shewhart portions of the chart exceed their respective control limits (U.S. EPA Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities Unified Guidance, March 2009, Chapter 20).

In addition, Ohio EPA also noted the following:

1. According to OAC Rule 3745-30-08 (D)(9)(b), when the owner or operator demonstrates that the SSI to be an error in statistical procedure or from natural variation in ground water quality, a report documenting this demonstration shall be submitted as an addendum to the results and data required in paragraph (C)(8) of this rule for approval by the director or his authorized representative. The owner or operator shall comply with paragraphs (D)(8) to (D)(12) of this rule until the demonstration report is approved.

If an SSI is confirmed, Millennium could demonstrate that a source other than the landfill facility is the cause of the contamination or that the statistically significant increase (SSI) results from error in the sampling, analysis, or statistical evaluation, or from natural variation in ground water quality. Millennium may need to demonstrate that the following SSIs resulted from errors in sampling, analysis, or statistical evaluation, or from natural variation in ground water quality:

- Monitoring well MW2-1 is currently triggering for alkalinity and chloride-CUSUM, in 2009 for chloride, twice for iron 2000 and 2003-2004 (non-parametric test), the past for sodium-CUSUM.

- Monitoring well MW2-2 is currently triggering for alkalinity and potassium-CUSUM, in the past for calcium and chloride-CUSUM.
- Monitoring well MW2-3 is currently triggering for calcium and sodium (requires a non-parametric test), also currently for alkalinity, calcium, chloride and potassium-CUSUM, in the past for calcium (2007-2008) chloride (2008-2009) ammonia (2001) and sodium (2006-2009).
- Monitoring well MW2-4 is currently triggering for sodium (requires a non-parametric test), also currently for calcium, chloride and potassium-CUSUM.

If Millennium does not make a demonstration according to OAC Rule 3745-30-08(D)(9), Millennium must comply with paragraphs (D)(10) to (D)(12) of this rule.

2. Ohio EPA recommends that Millennium identify the source of the low levels of VOCs that were detected in November 2010 at monitoring well MW2-1: Benzene at 1.35 µg/L, and 1, 2-dichloroethane at 1.29 µg/L, and benzene in MW2-3 at 1.19 µg/L, and for May 2011, benzene was detected in monitoring well MW2-1 at a concentration of 5.47 µg/L, and in monitoring well MW2-3 at 1.03 µg/L, and determine the rate, extent, and concentration.
3. Ohio EPA recommends that Millennium evaluate potential background data prior to establishing or updating background. However, the background update should be in accordance with Solid Waste Rules 3745-30-08(C)(1), (C)(5) & (C)(6). After performing outlier tests, statistical trend analyses should be performed on background data, and background completed according to 3745-30-08 (C)(6)(g): Background data can be added only in blocks of data resulting from the analysis of four or more statistically independent samples after the data have been statistically compared to the current background data, and no statistical differences are detected, unless another method is deemed acceptable to the director.

If the background data exhibits a clear seasonal cyclical pattern, the values should be de-seasonalized before computing the control chart baseline parameters. Control charts also assume that the background mean is stationary over time. This means there should be no apparent upward or downward trend in the background measurements. Should an upward or downward trend be verified, the background data should not be de-trended. While it is possible to construct and use a control chart with de-trended background and future data, the assumption that the trend will continue indefinitely is very problematic. The

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trend should first be investigated to ensure that background has been properly designated. Other monitoring wells should be checked to see if the same trend is occurring, indicating either evidence of an earlier release or possibly a sitewide change in the aquifer. In any case, a switch should be made to a trend test rather than a control chart.

Updating background for intrawell control charts depends on the control chart remaining 'in control' for several consecutive sampling events. As long as a confirmed exceedance does not occur, the in-control compliance measurements collected since the last background update can be tested against the existing background for statistical similarity using a Student's t- or Wilcoxon rank-sum test (*U.S. EPA Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities Unified Guidance*, March 2009, Section 5.3). ASTM Standard D6312-98 (1999) recommends testing the newly revised background set for trends, using trend tests including those in Chapter 17. The ASTM methodology is intended to avoid incorporating a subtle trend into the control chart background, which influences the re-computed baseline parameters and weakens the statistical power of the control chart to identify contaminant releases. The overriding goal is to ensure that background reflects the most current and representative ground water conditions (Chapter 3).

4. Ohio EPA noted that page 2 of 3 in the "*Summary of Statistical Analysis*" for the November 2010 report, Well MW2-5 is stated as being downgradient. In addition, statistical analysis is performed on the data from this well. On the potentiometric surface map, it appears this well is upgradient of the limits of waste. It is recommended that if well MW2-5 is consistently upgradient of the limits of waste at all times, then statistical analysis of data from this well is not necessary or required by the rules, and Millennium may cease statistical analysis of well MW2-5. If flow in well MW2-5 is up and downgradient from time to time, then it would be appropriate to continue to statistically analyze the data from this well.

Millennium needs to immediately take the necessary measures to return to compliance with Ohio's environmental laws. Within 14 days of receipt of this letter, Millennium is requested to provide documentation to this office including the steps taken to abate the violations cited above. Documentation of steps taken to return to compliance includes written correspondence, updated policies, and photographs, as appropriate, and may be submitted via the postal service, or electronically to colum.mckenna@epa.ohio.gov.

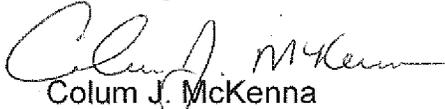
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Please be advised that violations cited above will continue until the violations have been properly abated. Failure to comply with Chapter 3734. of the Ohio Revised Code and rules promulgated thereunder may result in a civil penalty of up to \$10,000 per day for each violation. It is imperative that you return to compliance. If circumstances delay the abatement of violations, Millennium is requested to submit written correspondence of the steps that will be taken by date certain to attain compliance.

Nothing in this letter shall be construed to authorize any waiver from the requirements of any applicable state or federal laws or regulations. This letter shall not be interpreted to release the owner or operator, or others, from responsibility under Chapters 3704, 3714, 3734, or 6111 of the Ohio Revised Code or under the Federal Clean Water Act, Resource Conservation and Recovery Act, or Comprehensive Environmental Response, Compensation, and Liability Act for remedying conditions resulting from any release of contaminants to the environment.

Please contact Kay Springer Amey, Division of Drinking and Ground Waters, at (330) 963-1289 if you have any technical questions regarding this review. Otherwise, please submit all correspondence to Colum McKenna, Ohio EPA, Division of Materials and Waste Management, Northeast District Office, 2110 East Aurora Road, Twinsburg, Ohio 44087.

Sincerely,



Colum J. McKenna
Environmental Specialist
Division of Materials and Waste Management

CJM/cl

cc: Kay Springer Amey, NEDO-DDAGW
Ray Saporito, Ashtabula County Board of Health
Steve Kilper, ALMI
File: [Sowers/LAND/Millennium Landfill/GRO/04]
DMWM #s 3723, 4050