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August 16, 2001

Mr. David Vossmer
Browning-Ferris Industries of Ohio, Inc.
4005 Tiffin Avenue
Sandusky, Ohio 44870

Re: Ottawa County Landfill
Decline to Grant an OAC Rule 3745-27-10(E)(7)(b) Approval

Dear Mr. Vossmer:

The Ohio Environmental Protection Agency (Ohio EPA) has completed a review of the Ground Water Quality Assessment Demonstration and Potential Source Evaluation Report Addendum for the Ottawa County Landfill dated April 2001. This submittal is an addendum to the original Ground Water Quality Assessment and Potential Source Evaluation Report (Report) dated February 2000. The original Report was submitted to Ohio EPA requesting that the ground water detection monitoring program be reinstated at the facility in accordance with Ohio Administrative Code (OAC) Rule 3745-27-l O(E)(7)(b). However, Ohio EPA declined to grant this request by letter dated May 9, 2000. The April 2001 addendum included additional information and another request to reinstate the ground water detection monitoring program.

The ground water monitoring network at the facility consists of 12 uppermost bedrock aquifer system wells and four wells screened in the significant saturated zone. Currently, seven of the 12 bedrock monitoring wells are in the assessment program and one of the three down-gradient significant saturated zone wells is in the assessment program. Various constituents have triggered the different wells into assessment. But, the collective list of assessment parameters for the wells includes ammonia, chloride, COD, sodium, arsenic, antimony, barium and cobalt.

Ohio EPA has considered the request to reinstate detection monitoring at the Ottawa County Landfill. Based on the information submitted in the report and the reasons outlined in the attached appendix, I cannot determine that a source other than the landfill, or a sampling error, or the natural variation of ground water caused the elevated levels of the above parameters. Therefore, at this time, I decline to grant the request to reinstate ground water detection monitoring in accordance with OAC Rule 3745-27-l O(E)(7)(b).

If you have any questions or concerns in regard to this matter, please contact Ken Brock of Ohio EPA, Northwest District Office at (419) 373-3143.

Sincerely,

Christopher Jones
Director

Attachment

cc: Scott Hester, DSIWM, CO
Beth Brown, DSIWM, NWDO
Ken Brock, DDAGW, NWDO
Pat Nortz BFIO, Lorain County Landfill,
Dave Vossmer, Browning-Ferris Industries of Ohio, Port Clinton

APPENDIX

OAC 3745-27-I O(E)(7)(b) states, "The owner or operator may demonstrate that a source other than the sanitary landfill facility caused the contamination, or that the statistically significant change resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground water quality. A report documenting this demonstration must be submitted to the director and request that the director approve reinstatement of the detection monitoring program described in paragraphs (C) and (D) of this rule."

The Report, dated April 2001, concludes that the statistically significant increases which are being detected in the ground water quality beneath the facility are not attributable to impact from the landfill. Therefore, the Report documents a demonstration in accordance with OAC Rule 3745-27-10(E)(7)(b) that the previous statistically significant increases noted for the ground water at the facility are not attributable to impact from the landfill. The owner/operator's demonstration in accordance with OAC Rule 3745-27-I O(E)(7)(b) is based on the following rationale as detailed (in bold font) in paragraphs A through F below.

A. The GWQAPSER states, **"Substantial thickness of glacial till separate the landfill from the UAS [upper aquifer system] which would make leachate impact to the deeper UAS unlikely."**

The bedrock aquifer system at the facility is covered by approximately 40 to 50 feet of unconsolidated soils. These soils are generally silty clays and silts with some intermittent zones of sand. Ohio EPA agrees that this thickness and composition of soils should generally impede leachate migration more than a thinner and/or coarser-grained soil cover. However, leachate migration through the soil cover at the facility is still possible. Given this, the rationale noted in bold above does not support the owner/operator's demonstration.

B. The submittal states, **"An upward hydraulic gradient exists from the UAS to the landfill while the statistically significant parameters show an increasing vertical concentration gradient from the SZS (shallow) to the UAS (deep), (i.e. assessment parameter concentrations are higher in the deep wells than the shallow wells). This is directly opposite of what would be expected from a leachate release."**

Ohio EPA disagrees. The significant zone of saturation (SZS) is only present in the northwest portion of the facility. Therefore, an evaluation of the hydraulic gradient between the UAS and SZS should only be performed by comparing ground water elevation data from the SZS wells (MW-17, MW-18, MW-19 and MW-23) and the UAS wells in the northwest portion of the facility where the SZS is present (MW-1 and MW-11). Using this comparison, it appears that there is an upward gradient in the western portion of the SZS. However, this is not the case in the eastern portion of the SZS. In the vicinity of monitoring wells MW-1 and MW-23, it appears that the vertical hydraulic gradient is much less significant. In fact, it appears that the

vertical hydraulic gradient in the vicinity of MW-1 and MW-23 may change periodically from being slightly upward to being slightly downward.

Further, an adequate comparison of assessment parameter concentrations in the shallow wells to that of the deep wells at the facility is difficult to produce. As stated above, the SZS is only located in the northwest portion of the facility and there are no nested pairs of wells (set of two adjacent wells screened in the UAS and the SZS). The two closest wells screened in both zones are MW-11 (UAS) and MW-18 (SZS), which are located approximately 175 feet apart. Unfortunately, these wells do not provide a good basis for comparison because neither of these wells is in assessment. In fact, all of the UAS wells that are in assessment are outside the area of the SZS. Therefore, a valid vertical concentration gradient from the SZS to the UAS for the assessment parameters cannot be determined. Given this, the rationale noted in bold above does not support the owner/operator's demonstration.

C. The submittal states, **"Geochemical comparisons of the leachate, UAS, SZS and regional bedrock groundwater show no mixing of the fluids. In addition, tritium level comparisons between landfill leachate and the UAS groundwater samples do not indicate any mixing of the two fluids. Tritium level comparisons between leachate and groundwater provide a valuable tool for evaluating whether any mixing of the two fluids is occurring. For example, the Ohio EPA considers tritium analyses to be an acceptable method of calculating .groundwater time-of-travel scenarios as part of the solid waste siting criteria (Ohio EPA Guidance Document GD0202.102)."**

Ohio EPA disagrees. The geochemical comparisons of the leachate, UAS, SZS and regional bedrock groundwater were done using Stiff, Schoeller and Piper diagrams. As stated previously in the May 9,2000 letter from Ohio EPA, "The Stiff, Schoeller and Piper diagrams are not considered to be good tools for evaluating the potential for leachate releases at municipal solid waste facilities for two reasons. First, these diagrams only evaluate relative concentrations of six major ions (Na, Ca, Mg, Cl, HC03 and SO_4), and do not include other constituents of concern. Secondly, these diagrams indicate that the quality (for the six major ions only) of the ground water at the assessment wells is generally different than that of leachate. However, this would be expected at any facility regardless of whether or not the landfill was impacting the ground water. For example, if a sample collected from an impacted ground water monitoring well contained 70% ground water and 30% leachate (which is an extremely high percentage of leachate), the Stiff, Schoeller and Piper diagrams would probably indicate that the impacted sample was more similar to clean ground water than to leachate. The conclusion from this evaluation

would probably be that the diagrams indicate that leachate mixing was not occurring, even though significant leachate mixing was actually occurring.".

Further, as stated previously in the May9, 2000 letter from Ohio EPA, '... regardless of "typical" leachate tritium levels, the leachate from the facility has not been analyzed for tritium. Therefore, a comparison of the tritium levels in the leachate at the facility versus that of the ground water at the facility cannot be made. Secondly, the ground water quality from impacted wells which monitor a leaking landfill are not typically impacted for all constituents that are higher in leachate than in ground water. For example, if a given landfill is leaking and the leachate is higher in concentration than in the ground water for ten constituents, it is unlikely that all wells which are impacted by the leaking landfill will be impacted for all ten elevated constituents. Similarly, a relatively low tritium concentration in the ground water alone would not be proof that the landfill is not impacting the ground water for other constituents.". Given this, the rationale noted in bold above does not support the owner/operator's demonstration.

D. The submittal states, **"An evaluation of the historical water levels and potentiometric surface maps shows a consistent groundwater flow direction to the south-southwest across the site. Based on the established flow direction, trial inter-well statistics were performed and show the only statistical exceedences occur at well MW-32 for arsenic and COD."**

Prior to this submittal, the ground water flow directions in the uppermost bedrock aquifer system beneath the facility were believed to be temporally variable, with no consistent up-gradient or down-gradient locations. Therefore, statistical evaluations of the ground water quality data have always been done using intra-well analysis because up-gradient wells could not be designated for inter-well analysis.

However, after reviewing the past practices for preparing potentiometric surface maps, the owner/operator has determined that two different sets of top-of-casing elevation data were used for determining the potentiometric surfaces at the facility. The most recent elevation survey was performed in 1998. The potentiometric data from 1998 to the present for the facility were re-calculated using the more recent survey data and new potentiometric surface maps were prepared using this data. These new potentiometric surface maps consist of six new maps from June and December 1998, June and December 1999, and June and December 2000. All of these new potentiometric surface maps indicate a fairly consistent pattern with a flow direction in the uppermost bedrock aquifer system towards the south-southwest.

With this south-southwest flow direction, the owner/operator designated MW-1, MW-4, MW-24 and MW-25 as up-gradient wells and performed an inter-well statistical evaluation of the ground water quality data from the December 2000 sampling event. Using this analysis, statistical exceedences were only noted at MW-32 (for arsenic and COD). This number of statistical exceedences is much less than is typically seen at the landfill during a ground water monitoring event. Multiple constituents statistically trigger at multiple wells during a typical ground water monitoring event.

If monitoring wells MW-1, MW-4, MW-24 and MW-25 are truly consistent up-gradient wells and the only inter-well statistical exceedences are those observed at MW-32, this would strongly suggest that the statistical exceedences noted previously in various other ground water monitoring wells were the result of natural variation, rather than from impact from the landfill. However, Ohio EPA believes that it is premature to base a demonstration to return to detection monitoring on this inter-well statistical analysis scenario because this statistical scenario has only been performed for one sampling event (December 2000 event). Given this, the rationale noted in bold above provides some support to the owner/operator's demonstration. However, additional inter-well statistical analyses are necessary to further evaluate the demonstration.

Ohio EPA recommends that the owner/operator continue to seek approval for a demonstration in accordance with OAC Rule 3745-27-10(E)(7)(b). If the owner/operator wishes to continue to seek approval for a demonstration in accordance with OAC Rule 3745-27-l O(E)(7)(b), additional inter-well statistical analysis scenarios should be performed for the ground water quality data collected from the five previous sampling events; June and December 1998, June and December 1999 and June 2000. After evaluating the results of inter-well statistical analysis of these previous sampling events, Ohio EPA will be able to further evaluate a demonstration in accordance with OAC Rule 3745-27-l O(E)(7)(b).

E. The submittal states, **"The potentiometric surface of the bedrock aquifer is closely related to the surface of Lake Erie. Even though the elevation of Lake Erie and the bedrock aquifer have fluctuated significantly over the last three years, the groundwaterflow direction beneath the Ottawa County Landfill has remained consistent. In addition, an overall lowering of the elevations of Lake Erie and the bedrock aquifer beneath the site since 1998 may have the effect of enriching the groundwater in those inorganics for which statistically significant detections are occurring."**

It is true that the potentiometric surface elevation of the bedrock aquifer system is similar to the elevational surface of Lake Erie. Further, even though the potentiometric elevation of the bedrock aquifer system has fluctuated significantly over the last three years, the ground water flow direction in the bedrock has remained relatively consistent. However, it is not clear how a lowering of the water elevation in the aquifer would increase the constituent concentrations in the ground water wells unless the residence time of the ground water in the bedrock was lengthened. The residence time of the ground water in the bedrock at the facility would become longer if the potentiometric gradient became less steep and the ground water flow rate was slowed. However, the potentiometric maps indicate that this is not the case because the potentiometric gradient from event to event is fairly consistent. Given this, the rationale noted in bold above does not support the owner/operator's demonstration.

F. The submittal states, **"It is likely that statistical exceedences for inorganics in the groundwater at the landfill are caused by natural variations in the geochemistry of the groundwater system. Based on a review of groundwater studies completed for Ottawa County and the region, it is apparent the water quality of the Salina Dolomite is highly mineralized. This is due to the occurrence of evaporites within the dolomite. These studies have demonstrated that the elevated concentrations of alkalinity, calcium, chloride, sodium, sulfate and TDS in groundwater are attributable to the dissolution of evaporites. In addition, the biochemical reduction of sulfate creates significant amounts of sulfide gas."**

Ohio EPA agrees that the Salina Dolomite is highly mineralized and that the elevated concentrations of alkalinity, calcium, chloride, sodium, sulfate and total dissolved solids (TDS) in the ground water may be at least partially attributable to the dissolution of evaporites. However, the regional studies of ground water that were referenced in the submittal mostly regard the regional ground water quality in a region several miles south and east of the facility and lack detailed information regarding the ground water quality in the immediate vicinity of the landfill. Therefore, it is difficult to determine whether the elevated constituents in the ground water at the facility could be naturally occurring or the result of impact from the landfill. Given this, the rationale noted in bold above does not support the owner/operator's demonstration.

In conclusion the submittal states, **"Since the results of this assessment program provide a demonstration that the observed changes in groundwater chemistry were not caused by a release of leachate or leachate (derived constituents from the landfill, it is recommended that the facility be returned to detection monitoring."**

This recommendation is based on the rationale detailed in paragraphs A through F, above.

As detailed above, Ohio EPA does not believe that the rationale noted in paragraphs A, B, C, E, and F support a demonstration in accordance with OAC Rule 3745-27-l O(E)(7)(b) that the statistically significant increases in the ground water are not the result of impact from the landfill. However, Ohio EPA believes that the rationale noted in paragraph D above provides some support to a demonstration in accordance with OAC Rule 3745-27-10(E)(7)(b). Further, as stated in paragraph D above, Ohio EPA will be able to further evaluate a demonstration in accordance with OAC Rule 3745-27-l O(E)(7)(b) once evaluations are made of the results of inter-well statistical analysis of previous sampling events.