



State of Ohio Environmental Protection Agency

STREET ADDRESS:

MAILING ADDRESS:

Lazarus Government Center  
122 S. Front Street  
Columbus, Ohio 43215

TELE: (614) 644-3020 FAX: (614) 644-3184  
www.epa.state.oh.us

P.O. Box 1049  
Columbus, Ohio 43216-1049

December 28, 2004

Dear Consultants:

Some Ohio solid waste landfill facility (SWLF) owners and operators (owners) are using the term "reporting limit" (RL) when reporting ground water monitoring results required by Ohio solid waste landfill rules (solid waste rules). The term "RL" is defined in other rules, but has no meaning in the solid waste rules. As a result, the use of the term "RL," when reporting ground water monitoring data from SWLFs, can cause confusion that may result in violations of the solid waste rules.

This letter provides a summary of the issue, includes technical details, a detailed discussion of solid waste rule requirements that apply, and provides guidance for actions that can be taken by the owners to ensure compliance with the solid waste rules regarding this issue.

If an owner currently uses the term "RL," two changes that can be made by the owner to ensure compliance with the solid waste rules discussed in this letter are:

1. To avoid confusion and possible violations of the solid waste rules, owners of facilities regulated under OAC Rules 3745-27, 29, or 30 should not use the term "RL" when submitting ground water monitoring reports to Ohio EPA, Division of Solid and Infectious Waste Management (DSIWM) because the term has no meaning in the solid waste rules.<sup>1</sup>
2. To meet the solid waste rule requirements<sup>2</sup> for:
  - the accurate representation of ground water quality at a SWLF,
  - the use of valid statistical analysis, and
  - compliance with the ground water monitoring detection plan,

each owner of a SWLF regulated under the solid waste rules mentioned above must report detections below the practical quantitation limits (PQLs) and use them in

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<sup>1</sup> The information in this letter is specific to requirements of Ohio's solid waste landfill rules and does not speak to ground water monitoring activities at facilities regulated by Ohio's hazardous waste management rules, which are different for many requirements.

<sup>2</sup> The solid waste rule citations for the listed requirements are discussed below in the "Requirements" section.

Bob Taft, Governor  
Jennette Bradley, Lieutenant Governor  
Joseph P. Koncelik, Director

accordance with the statistical methodologies included in the SWLF's ground water detection monitoring plan.

The term "RL" often has no understood relationship to PQLs or method detection limits (MDLs). This means some owners that use the term "RL" may have incorrectly reported some analytical results, including reporting some parameters as non-detected (ND) that should have been reported as detections for both ground water background data and monitoring data.

To ensure a clear understanding of the solid waste rule requirements, I am sending out two letters:

- This, the first letter, is being sent to the qualified ground water scientists (QGWS) associated with SWLFs to inform you of the technical details and adjustments that should be made if RLs have been used.
- The second letter is being sent to the owners with the first letter as an attachment, to inform them of the issue, notify them that the QGWS have been given the technical details, and state that all ground water monitoring reports must be compliant with OAC Rule 3745-27-10<sup>3</sup>. Failure to do so will be a violation of the rule.

### **Definitions helpful for understanding this letter**

"Concentration" (#) is the value reported from the lab for a given parameter.

"Maximum Contaminant Level" (MCL) is the maximum permissible level of a contaminant in water delivered to any user of a public water system.

"Method Detection Limit" is a term used to define the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from the analysis of a sample in a given matrix containing the analyte.

"Practical Quantitation Limit" is 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 lab.

"Reporting Limit" is a term used by owners when reporting ground water data. There is no definition of what an RL represents when used with ground water analytical results related to SWLFs regulated by OAC Rule Chapters 3745-27, 29, and 30.

## Requirements

OAC Rule 3745-27-10(A)(1) requires the owner of a SWLF to implement a ground water monitoring program capable of determining the impact of the SWLF on the quality of ground water occurring within the uppermost aquifer system and all significant zones of saturation above the uppermost aquifer system underlying the SWLF.

OAC Rule 3745-27-10(C)(1) requires, in part, that the ground water monitoring program include consistent sampling and analysis procedures and statistical methods that are protective of human health and the environment.

OAC Rule 3745-27-10(C)(1) also requires that sampling and analysis procedures and statistical methods are designed to ensure monitoring results that provide an accurate representation of ground water quality at the background and down-gradient wells.

OAC Rule 3745-27-10(C)(1)(a) states in part that [the following shall be included in the ground water detection monitoring plan] 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 is required to use the procedures documented within the sampling and analysis plan.

OAC Rule 3745-27-10(C)(6) states in part that the statistical method specified [in the ground water detection monitoring plan] shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(7) of this rule.

OAC Rule 3745-27-10(C)(7) lists eight performance standards used to demonstrate the statistical methods are valid and accurate.

OAC Rule 3745-27-10(C)(7)(e) requires that any PQL used in the statistical method to 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 SWLF.

OAC Rule 3745-27-10(C)(10)(d) requires that ground water sampling results be placed in data summary table(s) and included in the submission of the results.

OAC Rule 3745-27-10(C)(10)(g) requires that a description of the analysis methods used, including method detection limits and practical quantitation limits for the constituents analyzed, be submitted with ground water monitoring sampling results.

## Interpretation

Ohio EPA interprets the solid waste rules as follows:

MDLs and PQLs must be reported to comply with OAC Rule 3745-27-10(C)(10)(g).<sup>4</sup> No provision for the use of “RLs” is made in the solid waste rules. It is a term defined in other rules that apply to regulating drinking water quality. Therefore, the term should not be used by owners of SWLFs when reporting ground water monitoring data, since its use may lead to confusion and violations of solid waste rules.

To comply with OAC Rules 3745-27-10(A)(1) and (C)(1), which require that:

- ground water sampling analysis results must provide an accurate representation of ground water quality at the SWLF,
- must be protective of human health and the environment, and
- must be able to detect impact on the ground water from the SWLF,

ground water analysis results must be reported down to the MDL. This is because if a constituent is detected above the MDL there is a high probability that it is present in the ground water. To report the constituent as present or detected is a more accurate representation of ground water quality as required by OAC Rule 3745-27-10(C)(1) than it would be to state that it was not detected.

Values greater than the MDL and less than the PQL can be reported either as an estimated concentration with a “J” qualifier or reported without a concentration with a notation that it was present.<sup>5</sup> It is recommended that all owners who use this option use “P” indicating the presence of the constituent was detected. An explanation of the use of this nomenclature should be included in the ground water monitoring report. Reporting detections above the MDL also is compliant with OAC Rule 3745-27-10(A)(1), which requires SWLFs to implement a ground water monitoring program capable of determining the impact of the SWLF on the quality of ground water.<sup>6</sup>

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<sup>4</sup> MDLs and PQLs may vary between samples due to matrix interference. If this occurs, the matrix interference should be reported with the appropriately adjusted MDL and PQL.

<sup>5</sup> If the statistical method chosen by the owner and included in the ground water detection monitoring plan includes procedures for using estimated concentrations reported greater than the MDL and less than the PQL then the estimated concentration must be reported to comply with OAC Rules 3745-27-10(A)(1), (C)(1), and (C)(1)(a).

<sup>6</sup> In accordance with solid waste rules, owners do not need to conduct any additional ground water monitoring activities under OAC Rule 3745-27-10(D) based on the presence or absence of estimated concentrations below a valid PQL, unless the statistical method chosen by the owner for the SWLF and included in the ground water detection monitoring plan has procedures for using those concentrations in statistical analysis and the statistical analysis triggers into the assessment requirements of OAC Rule 3745-27-10(E).

PQLs must be less than associated MCLs or other applicable health-based standards. This is required to fulfill the requirements of OAC Rule 3745-27-10(C)(1), which requires, in part, that the ground water monitoring program include consistent sampling and analysis procedures and statistical methods that are protective of human health and the environment. If PQLs are at or above the MCLs, then the statistical limits that trigger assessment and corrective measures are also at or above the MCLs. The SWLF would have had to be releasing contaminants into the ground water at levels above the health based standards before any assessment or corrective measures activities would start. This would mean that the water would not be safe for human consumption and would not, therefore, be protective of human health and the environment.

PQLs must be the lowest reliably obtainable to comply with OAC Rule 3745-27-10(C)(7)(e). It is recommended that a description of how each PQL was defined by the lab be included in the ground water monitoring report to explain why the PQL is the lowest reliably obtainable by the lab under the circumstances. As Ohio EPA reviews ground water monitoring reports, understanding how the PQL was established will aid Ohio EPA in determining if a SWLF owner is in compliance with OAC Rule 3745-27-10(C)(7)(e).

The ground water report may be organized as the owner believes is appropriate for the accurate representation of the data in one or more tables in accordance with OAC Rule 3745-27-10(C)(10)(d).

### **Conducting Statistical Analysis**

When conducting statistical analysis, the owner must perform statistical calculations or use estimated values in accordance with the statistical guidance (e.g., U.S.EPA or ASTM) for the statistical method the owner has included in the ground water monitoring detection plan for the SWLF. If this includes procedures for using estimated concentrations greater than the MDL and less than the PQL then those procedures must be followed.<sup>7</sup> This is necessary to comply with the requirements of OAC Rule 3745-27-10(A)(1) [able to detect release], (C)(1) [protective of human health and the environment; and present an accurate representation of ground water quality], and(C)(1)(a) [comply with procedures in the ground water monitoring detection plan]. If the statistical calculations are not performed in accordance with the statistical guidance for the method, then the results of the analysis will not be valid and will not provide information that can be used to demonstrate that protection of human health and the environment, an accurate representation of ground water quality, and compliance with the ground water

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For example: Non-parametric methods assigning ranks require NDs and estimated concentrations to be assigned different ranks. Some statistical methods, when appropriate, allow substitution of ½ the PQL for NDs and estimated concentrations. Some statistical methods require, when appropriate, that adjustments be made to NDs and estimated concentrations (e.g. Aitchison's Adjustment). Certain methodologies also state that when all concentrations are less than the PQL then the PQL may be used as the statistical limit. Estimated concentrations can also be useful when evaluating data for outliers and there are only one or two concentrations greater than the PQL. When the estimated concentrations are more than five times greater than the MDL, without estimated concentrations to use in the outlier statistical evaluation calculations the concentrations above the PQL may be incorrectly considered outliers.

detection monitoring plan has occurred.

### **Scenarios encountered when RLs were used**

The following six scenarios reflect possible combinations of the concentration (#), MDL, PQL, and RL. Following each scenario is a description of how the use of an RL may have affected the number entered into the background data set.

1. If #<MDL<PQL<RL, then <RL was entered into background data set.
2. If MDL<#<PQL<RL, then <RL was entered into background data set.
3. If MDL<PQL<#<RL, then <RL was entered into background data set.
4. If MDL<RL<#<PQL, then # was entered into the background set.
5. If MDL<#<RL<PQL, then <RL was entered into the background set.
6. If MDL<PQL<RL<#, then # was entered into background data set.

Scenarios 1, 2, 3, 4 and 5 are not in compliance with the statistical requirements of OAC Rule 3745-27-10(C)(6) and the reporting requirements of OAC Rule 3745-27-10(C)(10), because for:

- Scenario 1, ND was required to have been reported and used in accordance with the chosen statistical method,
- Scenarios 2, 4 and 5, the detection was required to have been reported and used in accordance with the chosen statistical method, and
- Scenario 3, the # was required to have been reported and used in accordance with the chosen statistical method.

### **Response from owners and operators**

Ohio EPA recommends that each owner have the use of RLs at each of the owner's facilities evaluated and have the background data set corrected, as needed, to meet the requirements of the solid waste rules. Changes may also be necessary in the ground water monitoring plans. These changes would be self-implementing under the solid waste rules and would need to be submitted to the agency in compliance with the applicable solid waste rules. If the SWLF is regulated in accordance with OAC Rule 3745-27 then the revised plan would also need to be submitted to the operating record in accordance with OAC Rule 3745-27-09.

1. If existing data from wells at the SWLF are available that comply with OAC Rule 3745-27-10(C) then the background data set can be adjusted without any additional sampling.

To comply with OAC Rule 3745-27-10(C) for the purposes of adjusting background data, the existing data must, among other things:

- have a minimum of eight valid data points in accordance with OAC Rules 3745-27-10(D)(5)(a)(ii)(a) and (D)(5)(b)(ii)(a),
  - be derived from independent samples in accordance with OAC Rule 3745-27-10(C)(1),
  - be derived from representative samples in accordance with OAC Rule 3745-27-10(C)(1),
  - have MDLs and PQLs that were recorded in accordance with OAC Rule 3745-27-10(C)(10)(g), and
  - have had trend analysis of the data set for each parameter that shows no increasing or decreasing trend over the period of time the background samples were collected in accordance with OAC Rule 3745-27-10(C)(6).<sup>8</sup>
2. If there are insufficient existing data available that comply with OAC Rule 3745-27-10(C) for one or more parameters then the background data set will need to be reestablished for those parameters by following the rule requirements specific to establishing background in OAC Rule 3745-27-10(C)(5) and (C)(6).<sup>9</sup>

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If evaluation of a trend analysis of the data set for each parameter shows any decreasing trend over the period of time background samples were collected, then the evaluation should explain the reason for the decreasing trend, including any indication that earlier data may not be representative. OAC 3745-27-10(B)(3) requires that all wells be designed, installed and maintained to produce samples representative of ground water quality. OAC 3745-27-10(C)(1) requires the use of sampling and analysis methods that will produce an accurate representation of ground water quality. If the analytical data values from samples from a well are decreasing significantly over time, it could indicate that the well was poorly developed initially and that the samples from the well were not representative of background ground water quality. This could, in turn, lead to an inappropriately elevated statistical limit, thereby preventing a release from the SWLF triggering into assessment as is needed to be protective of human health and the environment, and to determine impact caused by the SWLF as required by OAC Rule 3745-27-10(A)(1).

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If an owner has been regularly updating the background data set, it must be demonstrated that the existing background data set meets the solid waste rule requirements as described above before continuing with the routine adjustment of the background data set. This is because, any well being used for producing the background data set must be located in a manner to yield ground water samples indicative of background conditions at the SWLF [OAC 3745-27-10(B)(1)(I), (C)(4) and C(5)]. OAC 3745-27-10(C)(6) states the statistical method used must be protective of human health and the environment and meet all the provisions of C(7). OAC 3745-27-10(A)(1) says the ground water monitoring program must be able to determine the impact of the SWLF on ground water quality. To do all of the above, the background data used cannot be impacted by a release from the SWLF.

3. There are numerous different options for adjusting ground water sampling data sets and statistical analyses so they are based on MDLs and PQLs rather than RLs. The following seven options have been evaluated by Ohio EPA. Scenarios 3.1 through 3.4 apply for intra-well comparisons for naturally-occurring parameters.

3.1 If the new PQL is lower than the RL and

- historical data are 100% non-detect based on the RL, or
- background data are a combination of detections and non-detect data based on the RL,

then background can be re-established at the new lower PQL and the PQL can be immediately used as a non-parametric prediction limit.

Alternatively, background can be re-established based on the new lower PQL by either:

- collecting new background samples based on the new PQL so at least the minimum of eight required background samples are provided<sup>10</sup>, or
- having the laboratory report the PQL and the concentrations from at least eight historical results that were previously reported based on an RL.<sup>11</sup>

If apparent seasonal variation is indicated by past data or if the collection of the needed samples cannot be completed by the time the next semi-annual ground water monitoring event is reported, the owner should report as much information as has been collected by that time rather than fail to submit any report at all.

If the owner does not submit a ground water monitoring report or submits a report that does not comply with all of the requirements of OAC Rule 3745-27-10 for

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<sup>10</sup> If the background data based on the RL are a combination of detections and non-detect data and the existing statistical limit is above the new PQL, it is appropriate statistically to have the statistical limit remain the same until the background is updated. However, doing so will result in a violation of the solid waste rules if the statistical limit that is being used until background is reestablished was created based on an RL that is not the same as the PQL for the parameter.

<sup>11</sup> If the reporting of historical data, as described, results in having less than the requisite eight samples, the owner will need to collect enough new samples based on the new PQL to have a minimum of eight background samples. If the additional sample results cannot be included in the report for the next semi-annual monitoring event, it will be a violation of OAC Rule 3745-27-10(C)(10). OAC Rule 3745-27-10(D)(5)(a)(ii)(a) and (D)(5)(b)(ii)(a) require that eight independent background samples be collected during the initial year of monitoring. If the SWLF does not have eight independent background samples from its initial year, then it is in violation of these rules. Since eight initial background samples (i.e., a complete initial background data set) have not been collected, then 10(C)(7)(g) would not be triggered and the owner could collect more background samples and add the results to background. This means the owner could, during the current semi-annual monitoring period collect additional independent samples, enough to complete the initial background data set, and come into compliance with D(5) and one additional sample to perform a statistical analysis in compliance with C(6). All future updates of the background would then have to comply with C(7)(g).

ground water monitoring reports, then a violation of the solid waste rules will have occurred. If an incomplete report will be submitted, Ohio EPA recommends that the ground water monitoring report include information that describes the reason the report is incomplete, activities that will be undertaken to provide the missing information, and a schedule for when it will be completed.<sup>12</sup>

- 3.2 If a new PQL is higher than the RL and background data are 100% non-detect based on the RL, the new PQL can immediately be used as a non-parametric prediction limit. However, the new PQL must be evaluated to ensure it meets the requirements of OAC Rule 3745-27-10(C)(7)(e) to 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.”
- 3.3 If a new PQL is higher than the RL, the background data based on the RL are a combination of detections and non-detections, and the existing statistical limit is above the new PQL, all historical non-detects may be set at the new higher PQL and the statistical limit may be calculated based on the distribution of the background data after replacing non-detects in background with the new PQL.
- 3.4 If a new PQL is higher than the RL, the background data based on the RL are a combination of detections and non-detections, and the existing statistical limit is below the new PQL, the statistical limit can be immediately changed to the new higher PQL.
- 3.5 The above approaches (3.1 through 3.4) are also applicable to inter-well programs. When one of the above approaches will be used for inter-well programs, the up-gradient well data must be evaluated to determine which approach is appropriate in order to comply with OAC 3745-27-10(C)(6) [statistical method used must be protective of human health and the environment and meet all the provisions of C(7)] and OAC 3745-27-10(A)(1) [able to determine the impact of the SWLF on ground water quality].
- 3.6 For non-naturally occurring constituents, the new PQL can become the new non-parametric prediction limit.
- 3.7 If the owner submits and receives approval of an OAC Rule 3745-27-10(D)(3) request for an alternate inorganic parameter list to substitute inorganic

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Ohio EPA expects that, except in the case of very unusual circumstances, the re-establishment of background data can be completed in time to include complete background data and statistical analysis in the submission of results from the upcoming semi-annual ground water sampling event, and will not take any longer than to the time of the following semi-annual ground water sampling event. In any case, submission of no report, an incomplete report, or an incorrect report will be a violation of OAC Rule 3745-27-10(C)(10).

parameters that have sufficient background data for those that do not have sufficient background data, background for the parameters that were replaced will not be needed. However, violations of OAC Rule 3745-27-10 will continue for any ground water monitoring report submitted without the proper background data until and unless the OAC Rule 3745-27-10(D)(3) approval is issued by Ohio EPA or valid background data are established for all parameters.

Ongoing or unresolved violations of Ohio's regulations or laws may result in a recommendation to the director of Ohio EPA to escalate enforcement action to seek resolution to the violations and obtain compliance from the owner of a landfill facility.

If you have any questions about this letter or how to comply with the requirements of OAC Rule 3745-27-10, OAC Rule 3745-29-10, or OAC Rule 3745-30-08 described in this letter, please contact the Ohio EPA district office DSIWM inspector for the SWLF to coordinate with the appropriate Ohio EPA personnel.

Central District Office	614-728-3778
Northeast District Office	330-963-1200
Northwest District Office	419-352-8461
Southeast District Office	740-385-8501
Southwest District Office	937-285-6357

Sincerely,

Dan Harris, Chief  
Division of Solid and Infectious Waste Management

DH/SH/kd