

Major Donald Johnston
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Dear Mr. Johnston:

Thank you for your letter of December 22, 2003, to Acting Administrator Marianne Horinko regarding federal and state waste characterization requirements under the Resource Conservation and Recovery Act (RCRA). In your letter, you asked a series of questions regarding semi-volatile constituent analysis and analytical level of detection limitations under the Toxicity Characteristic Leaching Procedure (TCLP) or one of EPA's Totals Testing procedures. Specifically, you requested guidance on the following topics:

- Whether your approach to analytical characterizations which you described in detail is sound?
- Whether analysis for all TCLP semi-volatile organic constituents is necessary?
- What is the best way to deal with analytical level of detection problems?

I have provided responses to your questions below.

The approach to analytical characterization you described in your letter is reasonable. However, you need to consider several additional points before you can conduct any analyses. Up-front planning is a very important part of waste sampling and characterization. The Agency believes that a Project Team should work together to prepare a sound analytical approach. The team should at least include a project manager and chemist. The team should review the process in which the waste is being generated, and also review the Material Safety Data Sheet (MSDS) to identify constituents that are reasonably believed to be present in the waste. In your letter, you mentioned that many times all the underlying constituents may not be identified. However, you may use process knowledge regarding how the waste is generated, as well as scientific knowledge regarding possible chemical reactions to identify the constituents of concern for which analysis may be required.

We agree with the advice that the Methods Information Communication Exchange (MICE) Service provided to you. In addition, we believe there is a misconception regarding the list of constituents that facilities must test for when performing the TCLP. You do not have to run all or any of the constituents listed in the TCLP test if you believe, and can demonstrate through process knowledge, that your waste is nonhazardous. However, keep in mind, if

enforcement takes a sample and finds that your waste is indeed hazardous, then enforcement actions would take place. Therefore, the TC list is actually a list that under the leaching conditions in Method 1311, these analytes would be detected. The Agency believes that from the use of MSDS and through process knowledge, you should be able to obtain a good list of constituents of concern (COC) for analysis. In many cases, facilities will request as a first option, that a total analysis be conducted, before the TCLP test is performed. The Agency is frequently asked if it is acceptable to perform a total constituent analysis instead of a TCLP analysis, and then divide the total concentration by 20 to determine if a waste is nonhazardous, as is implied in Section 1.2 of Method 1311, TCLP. Section 1.2 of the method, does allow for a total constituent analysis in lieu of the TCLP extraction. If a waste is 100% solid, as defined by the TCLP method, then the results of the total constituent analysis may be divided by twenty to convert the total results into the maximum leachable concentration. This factor is derived from the 20:1 liquid-to-solid ratio employed in the TCLP. If a waste has filterable liquid, then the concentration of the analyte in each phase (liquid and solid) must be determined. The following equation may be used to calculate this value:

$$\frac{[A \times B] + [C \times D]}{B + [20 \text{ (L/kg)} \times D]} = E$$

Where:

A = Concentration of the analyte in liquid portion of the sample (mg/L)

B = Volume of the liquid portion of the sample (L).

C = Concentration of the analyte in solid portion of the sample (mg/kg)

D = Weight of the solid portion of the sample (kg)

E = Maximum theoretical concentration in leachate (mg/L)

The value obtained (E) can be used to show that the maximum theoretical concentration in a leachate from the waste could not exceed the concentration specified in the toxicity characteristic (TC) (40 CFR 261.24). In addition, if the total constituent analysis results themselves are below the TC limits without dividing by 20, then the same argument holds true, i.e., the maximum theoretical concentration in the leachate could not exceed the TC limits. If the calculated maximum theoretical concentrations of volatiles or semivolatiles are lower than their regulatory limits (or calculated thresholds), then a TCLP analysis of those volatiles or semivolatiles will not be necessary.

If you believe that your waste concentration would exceed the regulatory limits, then you would want to perform the TCLP test first. In addition, from the list mentioned in your letter, we recommend that the waste samples be analyzed for total concentrations of carbon disulfide, volatiles, and semivolatiles and TCLP concentrations for TC metals and non-TC metals (including antimony, beryllium, nickel, and thallium). If you do not know the action levels for the constituents of concern you may need to get a risk assessor involved in the planning process. The risk assessor can use models to back calculate the threshold level for each of the constituents of concern. The team should then select the appropriate determinative method (i.e., the reporting

limit of a COC should be well below its calculated threshold level). The TC regulatory limits should be readily achievable using the current commonly employed analytical methodology.

To address your second question regarding semi-volatile organic constituents, the Agency believes that you should carefully review your chemical inventory and the history of the waste generating facilities for potential constituents of concern. The information gathered will provide insight as to how some chemical reactions are formed, which will be useful in determining how to manage the waste. In addition, if the four semi-volatile organic constituents were never used in those facilities, then it would be logical to exclude them from the list of COCs. In addition, we recommend that you consult and obtain approval from the principal regulating authority. We do not have an all inclusive list of constituents or product processes in which the TCLP semi-volatile compounds can be found since the universe of waste is almost infinite. Therefore, we recommend that you search the internet and sources such as the *Merck Index* for information on uses of chemicals.

Regarding your third question on the level of detection limitations, we believe there are appropriate analytical tests available to use on the TCLP leachate to determine the COC. If you have additional specific questions, we will be glad to discuss them with you further. In order to ensure that the data are usable for a decision, you must have a sound analytical strategy to ensure appropriate analytical methods are selected for the constituents of concern. The selected methods should be sensitive enough to detect COCs at levels of concern (i.e., regulatory levels or thresholds derived from risk models). The quantitation limits must be below regulatory or action limits to unequivocally demonstrate that a waste is not hazardous. A good way to evaluate whether you need to perform a TCLP is to conduct the total analysis for the organic constituents of concern and compare their calculated maximum concentrations in a waste leachate to the regulatory levels (or thresholds derived from risk models). For those organic constituents, if their calculated maximum theoretical concentrations are higher than the regulatory limits (or calculated thresholds from models), a TCLP analysis will then be necessary. However, if you encounter matrix effects from the solid matrices of concern, perform the TCLP procedure in Method 1311 and then analyze the leachate for the constituents of concern at the regulatory levels of concern. Matrix effects on the leachate should be minimized.

Through outreach services conducted by the Methods Team during symposia, conference presentations, and workshop sessions, as well as utilizing the MICE call service, the Agency strives to help the public with questions regarding analytical methodologies. If you need more specific information, your staff many contact Kim Kirkland of my staff at 703-308-0490.

Sincerely yours,

Robert Springer, Director
Office of Solid Waste