

CHAPTER 9

EVALUATION OF COMPLETENESS

ESSENTIAL ELEMENTS OF A SAMPLING PLAN

- ◆ Goals of the Sampling Plan
- ◆ Description of the Facility Generating Sludge
- ◆ Data Quality Objectives
- ◆ Selecting and Describing Sampling Points
- ◆ Sample Collection Procedures
- ◆ Sample Handling Procedures
- ◆ Evaluation of Completeness
- ◆ Record-Keeping and Reporting Procedures

Once a sampling plan has been developed, samples have been collected and transported to a laboratory for analysis, and results from these analyses have been received, a follow-up step must be conducted to verify that nothing unusual or unanticipated has occurred during the process. The procedures used to accomplish this evaluation of completeness should be documented in the sampling plan.

The evaluation of completeness should include a review of the analytical data received from the laboratory and the effectiveness of the procedures used during the sampling event. It should also discuss whether the initial questions driving the need to collect samples have been adequately addressed. It is important to conduct this evaluation because if there are errors or discrepancies from anticipated results, the samples may need to be retested or additional samples may need to be collected and evaluated.

Data Review

A number of specific items should be reviewed once analytical information has been received from the laboratory performing the sample analysis. The terms “data verification” or “data validation” are often used to describe this process of review. The data review is intended to ensure that the data quality objectives described in Chapter 5 have been met. The following important information should be reviewed:

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Analytical Methods – Verify that the laboratory performed the proper analyses, based on the methods specified on the chain-of-custody. If the analytical results are to be used to demonstrate compliance with state or federal land application regulations, then it is critical to also verify that the analytical methods correspond to the appropriate methods specified in the state or federal regulations.

Detection Limits – Verify that the analytical results received were analyzed at the appropriate detection limits. Again, when using the analytical results to demonstrate compliance with state or federal land application regulations, the samples must have been analyzed using detection limits that are lower than the applicable concentration limits specified in the regulations.

QA/QC – Verify that the appropriate field and laboratory QA/QC samples were analyzed (by the appropriate analytical method and at the correct detection limits). Also, review the results of duplicate, replicate, and spiked samples to be sure that the laboratory is demonstrating the requested precision and accuracy.

Sample Size and Frequency – Because the person reviewing the analytical data may not be the person who collected and submitted the samples to the laboratory, the data reviewer may not be aware of potential changes to the sampling plan, based on field conditions. As a result, the data reviewer should verify that all of the samples that were intended to be collected were in fact collected and that all of the samples submitted to the laboratory were in fact analyzed. For instance, if the sampling plan called for seven grab samples to be collected and submitted for total metals analysis; the data reviewer should verify that seven grab samples were in fact collected and that all seven samples received total metals analysis.

Reporting Format – The data reporting format (particularly as it relates to reporting units) can be critical and should be reviewed to ensure that it is acceptable. If samples were collected to demonstrate compliance or for other regulatory or legal purposes, specific reporting formats and units may be required.

Accuracy of Billing – It is always advisable to review the invoices received from a contracted analytical laboratory and reconcile them with the analytical results received to ensure that there are no overcharges or other billing errors.

When using the analytical results to demonstrate compliance with state or federal land application regulations, the samples must have been analyzed using detection limits that are lower than the applicable concentration limits specified in the regulations.

Review of Sampling Procedures

After samples have been collected, it is appropriate to review your experiences with specific collection procedures, collection locations, and sample handling and transportation to evaluate the overall effectiveness of the sampling effort. This evaluation and review is a good way to refine and optimize your overall sampling processes. The following review will help you determine process adequacy and allow you to look for opportunities for improvement:

1. **Sampling Points** – Key questions for review include:

- Were the sampling points accessible?
- Were the samples safely collected from the desired sampling points?
- Did the sampling points provide representative samples?
- Are there other potential sampling points that might be better suited for sample collection?

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2. Sampling Procedures – Key questions to consider include:

- Was the equipment selected for sample collection adequate for the task?
- Were the methods of sample collection effective?
- If a composite sample was collected, was the sludge treatment process amenable to composite sampling?
- Could the sampling procedures be improved?

3. Sample Handling – Key questions to evaluate include:

- Did the samples arrive at the laboratory intact and at the desired preservation temperature?
- Were the samples analyzed within the desired holding times or were they unnecessarily delayed due to transportation issues?
- Were the analyses of the samples unnecessarily delayed at the laboratory?
- Can the sample handling procedures be improved?

4. Record-Keeping – Record-keeping procedures should also be reviewed at this time. Additional information pertaining to record-keeping procedures is presented in Chapter 10.

Overall Review of Your Sampling Program

The period between when your analytical data are received from the laboratory and the analytical results are submitted to a regulatory authority provides you with the opportunity to review the overall effectiveness of your sampling program (as documented in the sampling plan) and of a particular sampling event. Consistent review of the effectiveness of your sampling program ultimately leads to better environmental data.

The following items or issues should be reviewed as you evaluate the effectiveness of your sampling program. (*Note:* These items are biased toward a sampling program designed to demonstrate compliance with state or federal land application regulations.)

- Was the sampling frequency, as defined by regulation, met? For instance, if quarterly sampling is required, were samples collected and analyzed quarterly?
- Were enough samples collected to demonstrate compliance with the appropriate land application regulations?
- Were the samples collected and submitted to the laboratory in sufficient time to allow the analyses to be completed and the results reported before the biosolids sampled were used or disposed?
- Do the analytical data demonstrate compliance with the appropriate land application regulations?
- If sampling was conducted for purposes other than demonstrating environmental compliance, was the initial question or desire for more information sufficiently addressed based on the sample results received?
- Is additional or follow-up sampling necessary or desirable?

CHAPTER 9 REFERENCES

An Addendum to the POTW Sludge Sampling and Analysis Guidance Document. Gaines, Cristina and Safavi, Behzad. US EPA, Office of Wastewater Enforcement and Compliance. May 1992.

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Sampling Manual for Pollutant Limits, Pathogen and Vector Attraction Reductions in Sewage Sludge, 3620-BK-DEP2214, Rev. 12/2000. Pennsylvania Department of Environmental Protection, Bureau of Water Quality Protection, Division of Wastewater Management. December 2000.

Sampling Procedures and Protocols for the National Sewage Sludge Survey. US EPA, Office of Water Regulations and Standards (WH-522), Industrial Technology Division. August 1988.