

APPENDIX C

ORIGINAL

FACT SHEET #10



Soil Confirmation Sampling Guidelines Under the Voluntary Remediation Program

In their 2000 session, the Wyoming Legislature created new opportunities, procedures, and standards for voluntary remediation of contaminated sites. These provisions, enacted as Articles 16, 17 and 18 of the Wyoming

Environmental Quality Act and implemented by the Wyoming Department of Environmental Quality (DEQ), will govern future environmental cleanups in Wyoming.

This Fact Sheet provides guidelines for soil confirmation sampling under the Voluntary Remediation Program (VRP).

1. What is soil confirmation sampling and why is it needed?

Soil confirmation samples are samples collected at the completion of excavation beneath or adjacent to areas from which contaminated soil has been removed – that is, at the base and along the side walls of an excavation pit – to determine or verify whether cleanup levels have been achieved. Soil confirmation sampling is necessary for all remedies that involve soil excavation. Soil confirmation sampling is one of the key elements of the VRP, because it gives volunteers and DEQ a way to evaluate the effectiveness of cleanups and make decisions about issuance of certificates of completion and other liability assurances.

2. How are confirmation sampling approaches developed?

DEQ has developed a standard approach to soil confirmation sampling. The standard soil confirmation sampling approach is described, in detail, in the guidelines attached to this Fact Sheet. Volunteers should follow the guidelines carefully to determine important confirmation sampling features such as the number of confirmation samples, sampling locations, and analytical methods. In developing the soil confirmation sampling guidelines, DEQ made a number of key decisions including:

- Sites are classified as small or large based on the excavation area. In general, small sites have excavation areas of 10,000 square feet or less. Large sites have excavation areas of more than 10,000 square feet.
- The number of confirmation samples is specified for small sites and determined on a site-by-site basis for large sites.
- Discrete sampling methods are to be used; compositing samples for confirming completion of soil remediation is not acceptable without prior approval from DEQ.
- Standard U.S. Environmental Protection Agency (USEPA) analytical methods and quality assurance/quality control (QA/QC) procedures are required, with laboratory reporting limits that are appropriate to (i.e., equal to or lower than) cleanup levels.

Because all cleanup sites are different, the standard confirmation sampling approach provides opportunities for volunteers to develop more individual approaches for large sites and under certain other circumstances subject to DEQ approval. While site-specific variations are allowed, DEQ strongly encourages volunteers to follow the standard approach to soil confirmation sampling as much as possible. Using the standard approach will allow DEQ to quickly evaluate your cleanup and make decisions about certificates of completion and other liability assurances.

3. How is soil confirmation sampling documented?

Careful documentation of soil confirmation sampling is very important. At most sites, volunteers will develop a Soil Confirmation Sampling Plan as part of remedy selection. The content of Soil Confirmation Sampling Plan is covered in detail in the attached guidelines. In general, these plans should describe:

- Planned soil excavation area or areas.
- Planned sample locations and rationale.
- Approach to sample analysis and planned analytical parameters and methods.
- Approach to data evaluation.

More information on Soil Confirmation Sampling Plans is included in the attached guidelines.

There are certain situations where soil confirmation is needed but a Soil Confirmation Sampling Plan is not required. The most common example of this is a small site (less than 10,000 square feet) that is accepted into the Independent Cleanup Process (ICP). The ICP is a streamlined administrative process designed for sites where contamination is limited to soil and where the remedy is excavation to cleanup levels appropriate for unrestricted site uses. For more information on the ICP, see the Fact Sheet #6 *Independent Cleanup Under the Voluntary Remediation Program*. Although a Soil Confirmation Sampling Plan generally is not required for ICP sites, DEQ cautions volunteers that without prior DEQ review and approval of soil confirmation sampling activities, the Department may require additional sampling before making a decision about issuance of a certificate of completion or other liability assurance.

In addition, at the completion of soil confirmation sampling all volunteers (including volunteers with small sites in the ICP) should prepare a Remedial Action Completion Report to document the results of soil confirmation sampling. The content of Remedial Action Completion Reports is described in the attached guidelines.

4. What if my confirmation sampling reveals that cleanup levels have not been achieved?

DEQ understands that cleanup projects are iterative and that it can sometimes be very difficult – even with proper planning – to determine the exact amount of excavation that will be needed to achieve cleanup levels. If your soil confirmation sampling reveals that cleanup levels are not achieved, DEQ will work with you to identify additional remedial measures, such as additional soil excavation, that are appropriate for your site.

In general, DEQ advises volunteers to wait for DEQ review and approval of soil confirmation sampling results before backfilling excavated areas. This will avoid the need to completely re-excavate if DEQ determines that additional sampling (or additional soil removal) is needed. Of course, you should at all times properly maintain excavated areas so that they do not pose a hazard for workers or the public.

5. How can I get more information about the VRP?

For more information, to learn about VRP sites in your community, to obtain copies of other VRP Fact Sheets and guidance documents, or to volunteer, contact DEQ at (307) 777-7752 or through the VRP web site at <http://deq.state.wy.us/>.

The VRP web site is updated frequently and includes the latest information about DEQ's progress in developing guidance, policy, and other supporting documents for the VRP.

See Attached Guidelines for Soil Confirmation Sampling

Guidelines for Soil Confirmation Sampling

1. *Confirmation Sampling Approaches.* Collection of soil confirmation samples using the following sampling approaches should be done following excavation and removal of contaminated soil:

- a. Small sites: $\leq 10,000$ sq. ft. of excavation floor area (e.g., pit, trench)
 - i. The following tables should be used to determine the minimum number of samples necessary from the excavation floor and sidewalls. A minimum of five total confirmation soil samples should be collected, one from the base and one from each of the sidewalls. For irregularly shaped excavations where four walls are not readily discernible, divide the total wall perimeter into four segments of approximately equal size for collection of excavation sidewall samples. Sidewall samples are not required for excavations less than or equal to 1 ft. in depth.
 - (1) The minimum number of excavation floor samples should be determined from Table 1.

TABLE 1

Excavation Floor Samples

Area of Floor in Sq. Ft.	Minimum Number of Samples
$X < 500$	1
$500 \leq X < 1,000$	2
$1,000 \leq X < 1,500$	3
$1,500 \leq X < 2,500$	4
$2,500 \leq X < 4,000$	5
$4,000 \leq X < 6,000$	6
$6,000 \leq X < 8,500$	7
$8,500 \leq X < 10,000$	8

- (2) The minimum number of excavation sidewall samples should be determined from the table below.

TABLE 2

Excavation Sidewall Samples

Total Linear Ft. of Sidewalls	Minimum Number of Samples
$X < 100$	4
$100 \leq X < 200$	5
$200 \leq X < 300$	6
$300 \leq X < 500$	7
$500 \leq X$	8

- ii. Samples will be biased or collected from areas (or depths for sidewall samples) where the highest concentrations would be expected based on prior investigations, visible contamination, or soil type/characteristics.
- iii. Sample locations including rationale for selection of sample locations should be approved in advance by DEQ.
- iv. To demonstrate compliance with cleanup levels, each sample result is compared directly to the cleanup level for each constituent identified for remediation. If cleanup levels are exceeded at any single location, additional excavation will be required and additional soil confirmation samples should be collected within the areas of additional excavation until compliance with the cleanup levels is attained.

b. Large Sites: >10,000 sq. ft. of excavation floor area.

- i. The number and location of confirmation soil samples for large sites should be determined by site-specific characteristics, such as expected locations of highest contaminant concentrations, variability of soil contamination, visible contamination, or soil type/characteristics.
- ii. Use of a sampling grid is recommended to determine soil sample locations. A scaled square grid is superimposed onto a map of the remediated area (including both sidewalls and base). Some specified point (usually the southwest corner) is designated as the 0,0 coordinate. The grid is then adjusted, as necessary, to maximize sampling coverage and to accommodate a minimum of at least one sample per sidewall.
- iii. A grid cell size of 400 to 1000 sq. ft. will be appropriate for most large sites. The number of samples depends on grid dimensions and area of excavation floor.
- iv. If sampling grids are used for collection of soil confirmation samples, the samples will be collected within each grid using systematic sampling techniques (sample collected at the center of each grid) or a random sampling approach (randomly-generated coordinates are determined using a random number generator). Procedures for conducting sampling within grids are provided in *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Soils and Solid Media* (EPA 1989).
- v. To demonstrate compliance with site cleanup levels, each sample result is directly compared to the cleanup levels. Alternatively, a statistical approach can be used that allows one or more samples to exceed the cleanup level. The recommended statistical approach uses the 95 percent upper confidence level (UCL) on the true population mean to demonstrate compliance for a single, contiguous remedial area. Methodology for this statistical approach is provided in supplemental guidance to *RAGS: Calculating the Concentration Term, Publication 9285.7-081* (EPA 1992).
- vi. If cleanup levels are exceeded, additional excavation may be required until criteria are attained. The radius of excavation around the sample exceeding the cleanup level is equal to the grid interval. If additional excavation is required, additional soil confirmation

samples should be collected within the areas of additional excavation until the cleanup levels are attained.

- vii. Alternatively, additional soil samples may be collected to define the extent of contamination where soil concentrations exceed the cleanup levels. If the boundaries of contamination are defined with additional sampling, DEQ will consider use of these additional soil samples as confirmation samples, as long as the sample results demonstrate compliance with cleanup levels.

2. *Sample Analysis.* Analytical methods used for soil confirmation samples should be appropriate for the contaminants identified for cleanup at the site. The laboratory reporting limits should be set at levels equal to or less than the cleanup levels, unless other reporting limits are approved by DEQ. Laboratory methods and analyses should be performed in accordance with EPA or other standard methods [such as *Test Methods for Evaluating Solid Waste, SW-846* (EPA 1986)] and using appropriate QA/QC procedures. Generally, constituents in soil will be measured on a total, dry-weight basis.
3. *Quality Assurance/Quality Control.* QA/QC procedures in the field and laboratory should be followed. General QA/QC procedures for field activities and laboratory analyses should be provided in the Soil Confirmation Sampling Plan (see 4a below). At a minimum, the procedures will include the following:
 - a. Data quality objectives will be identified so that the types and quantity of data are obtained in a manner such that the data are of known, appropriate, and sufficient quality to support their intended use.
 - b. Project data should be technically sound, statistically valid, and properly documented, having been evaluated against EPA-established criteria for precision, accuracy, representativeness, completeness, and comparability.
 - c. Laboratory reporting limits for sample data should be set at levels less than or equal to the cleanup levels, unless other reporting limits are approved by DEQ. Laboratory reporting limits may need to be lowered to meet cleanup levels.
 - d. Field QA/QC procedures:
 - i. Confirmation soil sample collection activities and other relevant field information will be documented in the field on appropriate forms and/or in field notebooks at the time of sampling.
 - ii. Sampling equipment will be properly decontaminated before collection of each sample to avoid cross-contamination between samples or disposable implements will be used.
 - iii. Field QC samples will be collected to identify potential problems resulting from sample collection and/or sample processing and to evaluate data precision. Samples are generally collected at a frequency of one in 20 samples, not including QC samples. The soil confirmation sampling plan should include specifics on sample collection techniques for these samples. Field QC samples will include, at a minimum:
 - (1) Blind field duplicate.
 - (2) Field equipment rinsate blanks, as necessary.

- (3) Samples sufficient to run matrix spike/ matrix spike, as appropriate.
 - iv. Field instruments will be properly operated, calibrated, and maintained by qualified personnel according to the manufacturer's guidelines and recommendations.
 - v. Sample handling during packaging and shipment should not result in cross-contamination or loss of contaminants (e.g., VOCs).
 - vi. Possession or custody of samples should be traceable from the time of collection until the time the sample is submitted to the laboratory for analysis. Custody means sample is secured to prevent tampering, is placed in a designated, secured area, or the sample is in actual physical possession of the sampler. Chain-of-custody records are used to document the custody of the sample from collection until submitted to the laboratory.
 - vii. Sample labels are used to accurately document the sample location, date/time of collection, and sample analyses requested.
 - e. Laboratory QA/QC procedures:
 - i. The laboratory will maintain sample integrity, security, and custody.
 - ii. Laboratory quality control samples should include, at a minimum:
 - (1) Laboratory method blanks.
 - (2) Surrogate spikes, as appropriate.
 - (3) Laboratory matrix spike/matrix spike duplicates, as appropriate.
 - (4) Laboratory duplicates, as appropriate.
 - (5) Laboratory control samples, as appropriate.
 - ii. Laboratory QC samples are generally analyzed at a frequency of one in 20 samples, not including QC samples.
4. *Documentation.* Soil confirmation sampling activities should be documented and documentation should be submitted to DEQ for review and approval. The documents include a Soil Confirmation Sampling Plan and Remedial Action Completion Report.
 - a. Soil Confirmation Sampling Plan
 - i. The Soil Confirmation Sampling Plan may either be provided to DEQ as part of the remedy agreement or, for independent cleanup sites, as part of a proposal for site investigation and cleanup. DEQ encourages property owners to enter the Voluntary Remediation Program and obtain DEQ approval prior to soil cleanup and confirmation sampling. If soil cleanup and confirmation sampling activities are completed prior to DEQ approval, DEQ may require additional work. The soil confirmation sampling plan should include the following, as appropriate:
 - (1) Planned soil removal area(s). A scaled map of the planned soil removal area(s) with intended locations for soil confirmation samples identified.
 - (2) Sample location rationale. Detailed information should be provided to explain the rationale used to define the following:
 - (a) Confirmation sample locations (with sample grid, as appropriate).
 - (b) Sample depths.

- (c) Sample collection procedures.
- (d) Any biases that will or may be used for sample location selection (e.g., discolored soil, source area, etc.).
- (e) Description of how sample number and locations will be modified, if excavation area is smaller or larger than expected.
- (f) Field QA/QC.
- (3) Sample analysis. The following information should be provided on the type of sample analysis to be used for the soil confirmation samples:
 - (a) Analytical parameters.
 - (b) Analytical methods.
 - (c) Method reporting limit goals.
 - (d) Laboratory QA/QC.
- (4) Data evaluation. The description of data evaluation methods should include information on the following:
 - (a) Cleanup levels.
 - (b) Evaluation methods (e.g., direct comparison to cleanup levels, statistical evaluations).
 - (c) Strategy for determining if further action is necessary based on data results.

b. Remedial Action Completion Report

- i. Following completion of a remedial action involving excavation and removal of contaminated soil, documentation of the soil confirmation sampling results is required. The results should be provided with the documentation for completion of the remedial action. The documentation should include the following, as appropriate:
 - (1) Scaled map of remediation area(s), showing sample grid (if used) and soil confirmation sample locations.
 - (2) Description of confirmation sampling, including:
 - (a) Confirmation sample locations (with sample grid, as appropriate).
 - (b) Sample depths.
 - (c) Sample collection procedures.
 - (d) Rationale for any modifications to confirmation sample locations from those specified in the Soil Confirmation Sampling Plan.
 - (3) Confirmation sample results, including:
 - (a) Tables providing analytical parameters, methods, and analytical results for each parameter.
 - (b) Cleanup levels.
 - (c) Description of data evaluation technique (direct comparison to cleanup levels or statistical analysis).
 - (d) Results of data evaluation, including any additional remediation that was necessary because of exceeding cleanup levels.
 - (e) Laboratory data sheets and data validation results.
 - (4) Additional information needed to support completion of remedy agreement requirements.