

Interim
Final



Technical Guidance Manual for the Implementation of the Hawai`i State Contingency Plan

SECTION 4

SOIL SAMPLE COLLECTION APPROACHES



CONTENTS

Acronyms and Abbreviations.....	4-4
4.0 Soil Sample Collection Approaches.....	4-5
4.1 Soil Sample Collection and Statistical Inference of Average Contaminant Concentrations in Decision units	4-6
4.2 <i>Multi-Increment</i> Sample Collection	4-9
4.2.1 Field Collection of <i>Multi-increment</i> Samples	4-9
4.2.2 Laboratory Preparation of <i>Multi-increment</i> Samples	4-12
4.2.3 Collection of Field Replicate <i>Multi-increment</i> Samples	4-14
4.2.4 Field Tools for the Collection of <i>Multi-increment</i> Samples	4-15
4.2.5 Statistical Evaluation of Replicate <i>Multi-increment</i> Samples	4-16
4.2.5.1 Standard Deviation.....	4-16
4.2.5.2 95% Upper Confidence Limit.....	4-17
4.2.5.3 Evaluation of Replicates and Data Representativeness.....	4-18
4.2.6 Collection of Subsurface <i>Multi-increment</i> Samples	4-19
4.2.7 <i>Multi-Increment</i> Soil Sample Collection for Volatile Analyses.....	4-21
4.2.8 Collection of <i>Multi-increment</i> Samples for Stockpiles.....	4-23
4.2.9 <i>Multi-increment</i> Sampling for Site Characterization Versus Site Remediation.....	4-25
4.3 Discrete Sample Collection.....	4-26
4.3.1 Discrete Samples	4-26
4.3.2 Discrete Sample Data and Representative Contaminant Concentrations.....	4-27
4.3.3 Use of Discrete Samples to Identify Large Spill Areas.....	4-29
4.3.4 Use of Discrete Sample Data to Establish DUs	4-30



4.3.5 Use and Misuse of Individual, Discrete Sample Points4-32

4.3.6 Use of Field Screening Tools to Identify Large Spill Areas4-33

4.4 Judgemental Sample Collection.....4-36

References4-37

Figures

Figure 4-1. Example Decision Units4-10

Figure 4-2. Sample Increment Collection4-11

Figure 4-3. Sample Processing in Field.....4-11

Figure 4-4. Obtaining Subsamples in the Field.....4-12

Figure 4-5. Obtaining Subsamples in the Laboratory4-13

Figure 4-6. Use of a Sectorial Splitter to Collect Subsamples ...4-13

Figure 4-7. Collecting Subsurface *Multi-increment* Samples4-20

Figure 4-8. Coring Device for Soil Increment Collection4-21

Figure 4-9. Collecting Soil Increments from a Split Spoon Sampler4-23

Figure 4-10. Methanol Containers for Volatile Samples4-23

Figure 4-11. Soil Cores *Multi-increment*-Sampled.....4-24

Figure 4-12. Grid of Discrete Sample Points4-28

Figure 4-13. Identification of Large Spill Areas from Discrete Samples.....4-30

Figure 4-14. *Multi-increment* Decision Units Chosen with Use of Initial Discrete Sampling Data.....4-31

Figure 4-15. Limitations of Discrete Samples to Identify “Hot Spots”4-33

Figure 4-16. Use of Field XRF Data to Screen a Site for Large Spill Areas4-34



ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
COPC	Chemicals (or Contaminants) of Potential Concern
DQO	Data Quality Objectives
DU	Decision Unit
HDOH	Hawai'i Department of Health
HEER Office	Hazard Evaluation and Emergency Response Office
µm	Micrometers
mg/kg	Milligrams per kilogram
mm	Millimeter
MIS	<i>Multi-increment</i> Sample(s)
MDL	Method Detection Limit
%	Percent
RSD	Relative standard deviation
SAP	Sampling and Analysis Plan
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VRP	HEER Office Voluntary Response Program
XRF	X-Ray Fluorescence



4.0 SOIL SAMPLE COLLECTION APPROACHES

This section provides an overview of *Multi-increment*¹, discrete, and judgmental soil sampling approaches and an introduction to the statistical evaluation of sample data. When designing a Sampling and Analysis Plan (SAP), it is important that the selected sampling approach will generate accurate (precise and unbiased) data that meets the objectives of the site investigation.

More than one sampling approach may be applicable at a given site. For example, *Multi-increment* samples may be collected to evaluate surface soils, excavation floors and walls, or stockpiles that may be contaminated. A grid of discrete samples could be used to help identify large spill areas and/or provide information to help select decision units (DUs) for *Multi-increment* sampling. A description of different sampling approaches and the advantages and disadvantages of each is provided in this Section. Section 5 presents additional guidance on sampling methods for soil and sediment, Section 6 presents guidance for sampling groundwater and surface water, and Section 7 presents guidance for soil vapor and indoor air sampling methods.

¹ *Multi-increment*[®] is a registered trademark of EnviroStat, Inc