ESTIMATING COSTS FOR THE ECONOMIC BENEFITS OF RCRA NONCOMPLIANCE

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RCRA Enforcement Division
Office of Regulatory Enforcement
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TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION 1-1
1.1 General Methodology for Developing Cost Estimates 1-1
1.2. Assumptions 1-2
1.2.1 Labor Categories and Rates 1-2
1.2.2 Fees for Capital Costs 1-3
1.3. How to Use This Document 1-4
1.4 Organization of Cost Document 1-5

CHAPTER 2. ENVIRONMENTAL COMPLIANCE OVERHEAD COSTS 2-1
2.1 Definitions 2-1
2.2 Assumptions 2-2
2.3 Costs for Conducting Environmental Compliance Audits and Developing RCR A Implementation Plans 2-3
2.3.1 Environmental Compliance Audits 2-3
2.3.2 RCRA Implementation Plans 2-4
2.4 Specific Issues that Could Increase or Decrease Costs 2-4
2.5 References 2-4

CHAPTER 3. MULTIPLE RCRA VIOLATIONS 3-1
3.1 Definitions 3-1
3.2 Assumptions 3-2
3.3 Typical Cost Estimates For Representative Generators and TSD Facilities 3-4
3.4 References 3-4

CHAPTER 4. GROUND-WATER MONITORING PROGRAM 4-1
4.1 Definitions 4-1
4.2 Overview of RCRA Ground-Water Monitoring Requirements 4-2
4.2.1 Ground-Water Monitoring at an Interim Status Facility 4-2
4.2.2 Ground-Water Monitoring at a Permitted Facility 4-3
4.3 Assumptions 4-3
4.3.1 Assumptions for Part 264 Compliance Cost Estimates 4-3
4.3.2 Assumptions for Part 265 Compliance Cost Estimates 4-6
4.4 Costs 4-7
4.4.1 Cost Estimates for Implementing Detection Monitoring Under 40 CFR Parts 264 and 265 4-8
4.4.2 Developing Facility-Specific Cost Estimates 4-8
4.5 References 4-10

CHAPTER 5. OFF-SITE MANAGEMENT OF WASTES 5-1
5.1 Definitions 5-1
5.2 Commercial Transportation 5-2
5.2.1 Assumptions 5-3
5.2.2 Transportation Prices 5-3
5.2.3 References 5-4

5.3 Commercial Hazardous Waste Treatment and Disposal 5-4

5.3.1 Assumptions 5-5
5.3.2 Hazardous Waste Treatment, Recycling, and Disposal Prices 5-5
5.3.3 References 5-6

CHAPTER 6. HAZARDOUS WASTE DETERMINATION 6-1
6.1 Definitions 6-1
6.2 Assumptions 6-2
6.3 Cost Estimates 6-3
6.4 References 6-4

CHAPTER 7. WASTE ANALYSIS 7-1
7.1 Treatment, Storage, and Disposal Facilities 7-1
7.1.1 Definitions 7-1
7.1.2 Assumptions 7-3
7.1.3 Initial (Administrative) Costs 7-5
7.1.4 On-Going Costs 7-7
7.1.5 References 7-8
7.2 Generator Facility 7-8
7.2.1 Definitions 7-9
7.2.2 Assumptions 7-10
7.2.3 Costs 7-11
7.2.4 References 7-13

CHAPTER 8. CONTINGENCY PLAN 8-1
8.1 Definitions 8-1
8.2 Assumptions 8-2
8.3 Cost Estimates 8-3
8.4 References 8-4

CHAPTER 9. PERMITTING 9-1
9.1 Definitions 9-1
9.2 Assumptions 9-2
9.3 Initial (Administrative) Costs 9-7
9.4 Permit Modification Costs 9-8
9.5 Permit Renewal Costs 9-8
9.6 References 9-8

CHAPTER 10. FINANCIAL ASSURANCE FOR CLOSURE AND POST-CLOSURE CARE 10-1
10.1 Definitions 10-1
10.2 Overview of RCRA Closure/Post-Closure Financial Assurance Requirements 10-3
10.2.1 Closure Financial Assurance at a Permitted Facility 10-3
10.2.2 Post-Closure Financial Assurance at a Permitted Facility 10-3
10.2.3 Combining Closure and Post-Closure Financial Assurance 10-4
10.2.4 Closure/Post-Closure Financial Assurance at an Interim Status Facility 10-4
10.3 Assumptions 10-4
10.4 Costs 10-5
10.4.1 Estimating Costs of Financial Assurance 10-5
10.4.2 Estimating Closure/Post-Closure Costs 10-6
10.5 References 10-6

CHAPTER 11. THIRD PARTY LIABILITY COVERAGE 11-1
11.1 Definitions 11-1
11.2 Overview of RCRA Liability Coverage Requirements 11-3
11.2.1 Liability Coverage at a Permitted Facility 11-3
11.2.2 Liability Coverage at an Interim Status Facility 11-4
11.3 Assumptions 11-4
11.4 Estimating Costs of Liability Coverage 11-4
11.5 References 11-5

CHAPTER 12. BOILERS AND INDUSTRIAL FURNACES 12-1
12.1 Definitions 12-1
12.2 Overview of RCRA Regulatory Requirements for Boilers and Industrial Furnaces 12-2
12.2.1 Permitting Procedures 12-2
12.2.2 Controls for Organic Compounds 12-2
12.2.3 Controls for Toxic Substances 12-3
12.2.4 Controls for Emissions for Hydrogen Chloride and Chlorine Gas 12-3
12.2.5 Emission Standards for Particulate Matter 12-4
12.3 Assumptions 12-4
12.4 Cost Estimates 12-4
12.4.1 Waste Characterization and Waste Feed Analysis 12-5
12.4.2 Furnace Modification Costs 12-5
12.4.3 Carbon Monoxide and Oxygen Monitoring 12-6
12.4.4 Waste Feed Metering 12-6
12.4.5 Air Pollution Control Cost 12-6
12.5 References 12-7

CHAPTER 13. PERSONNEL TRAINING PROGRAM 13-1
13.1 Introduction 13-1
13.2 Definitions 13-2
13.3 Overview of Regulatory Training Requirements 13-2
13.3.1 RCRA Training Requirements 13-2
13.3.2 Recordkeeping 13-4
13.3.3 OSHA Required Training for RCRA Facilities 13-4
13.4 Training at Interim Status /Permitted Facilities (40 CFR Parts 264/265) 13-7
13.4.1 Minimum Training 13-7
13.4.2 Training Levels 13-8
13.4.3 Training Records Management 13-8
13.5 Training at Small Quantity Generating Facilities 13-8
13.6 Assumptions 13-9
13.7 Costs 13-9
13.8 References 13-12

APPENDIX A - UPDATING COSTS A-1

APPENDIX B - LABOR COSTS B-1

APPENDIX C - ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS C-1

CHAPTER 1. INTRODUCTION

The purpose of this manual is to provide U.S. Environmental Protection Agency (EPA) Regional offices with consistent cost estimates in order to assist in the calculation of the economic benefit portion of a Resource Conservation and Recovery Act (RCRA) civil penalty. Violators of RCRA derive an economic benefit by either delaying, or avoiding, the costs associated with complying with the regulatory requirements. This document provides estimates of capital costs, initial (administrative) costs, on-going (annual) costs, and unit prices for a number of common RCRA violations. This document also identifies the assumptions made in developing the cost estimates and the methodology used to develop the estimates.

The following sections provide an overview of the methodology used and the general assumptions made in developing the cost estimates. In addition, this chapter includes a section on how-to-use this manual.

1.1 General Methodology for Developing Cost Estimates

The first step in estimating the cost of complying with a specific RCRA provision is to identify the specific activities necessary for a violator to come into compliance with the relevant RCRA regulations. This is accomplished by reviewing and identifying the specific regulatory requirements for a particular RCRA regulation (e.g., 40 CFR Part 264, Subpart F for groundwater monitoring), reviewing EPA technical documents for guidance on specific requirements not specified in the regulations (e.g., the number, or depth, of groundwater monitoring wells required on a site-specific basis for a permitted facility under 40 CFR Part 264 regulations), and using best professional judgement.

Once the specific compliance activities are identified, the second step is to determine whether the activity requires a capital expenditure (e.g., groundwater monitoring wells); an initial/administrative cost (e.g., establishing groundwater background concentrations); or an on-going cost (e.g., groundwater sampling and analysis).

Following the identification of activities and types of expenditures needed, the third step is to determine the amount and type of labor needed (e.g., facility engineer, consultant project engineer, etc.) and the materials and equipment necessary to accomplish the activity.

The fourth step is to develop unit cost estimates for each unit of labor, material, and equipment. The costs, or prices, presented in this document are based on cost information obtained through vendor contacts (e.g., commercial hazardous waste treatment and disposal vendors, well drillers, testing laboratories, monitoring equipment vendors, etc.); a review of background documentation used to support specific RCRA regulatory activities (e.g., information collection requests, regulatory impact analyses); professional journals; technical reports; and best professional engineering judgement.

The final step is to estimate the total cost (capital, initial, and/or on-going) for each activity. This is determined by multiplying the unit cost by the number of units necessary to complete the activity (e.g., hours, feet, etc.). In some cases, indirect fees are applied to the capital costs. Indirect fees account for the design, construction,

testing, and maintenance costs necessary to install and operate a system. Throughout this document all dollar values have been presented in 1996 dollars. The values have been inflated into 1996 dollars by the method described in Appendix A.

Throughout this document a range of hours are presented. The lower and upper bound range estimates are based on professional judgement. The lower bound estimate assumes the minimum number of hours to accomplish the activity or subtask, whereas the upper bound assumes the maximum number of hours. Depending on the circumstances, the "typical" hour range may consist of the median, the mean, or an estimate derived from professional judgement. The "typical" cost estimate is derived from information obtained from professional sources both outside and inside the EPA.

1.2. Assumptions

The following section provides the assumptions used throughout this document to develop the labor categories necessary to complete the activity; the fully burdened wage rates; and the use of indirect fees as it is applied to capital expenditures. Assumptions made for a specific violation are described in the appropriate chapter where the violation is discussed.

1.2.1 Labor Categories and Rates

Labor categories and hourly rates were developed for facility personnel and for an outside consulting firm to perform the necessary activities to bring a facility into compliance with RCRA requirements. The labor rates developed for facility and consultant personnel vary because fringe benefits, labor overhead, and profit ratios are typically different for the two different types of firms.

Hourly labor rates were developed by estimating a typical base salary for each labor category, adding fringe benefits, labor overhead, and profit to the base salaries, and dividing by annual person-hours (2080 hours per year are assumed).

Fringe benefits are usually estimated at 25 to 50 percent of the base salary. They include such items as pensions, holidays and vacations, sick leave, health and life insurance, disability insurance, social security, and unemployment taxes. Labor overhead and profit is usually estimated at 50 to 100 percent of the base salary and fringe. They include such service functions as supervision of personnel, maintenance, security, accounting and purchasing, as well as fixed and variable costs on buildings and property in general use (e.g., offices, cafeterias, roads, parking lots, etc.). The following sections present the fully burdened hourly labor rates used in this document for both facility labor and consultant labor. [1]

[1] The labor categories and rates and the number of labor hours allocated to a particular activity have been developed by best professional judgement of DPRA, Incorporated, an engineering consulting firm. An additional source of unburdened labor rates, which was not used for this document, is the U.S. Department of Commerce, Bureau of Labor Statistics. *Occupational Compensation Survey Part 1: Pay in the U.S. Regions*. Bulletin 2439-1. June 1994. If one chooses to use the Bureau of Labor Statistics document, or any other unburdened source of labor rates, fringe, labor overhead, and profit would need to be added to the base labor rate.

1.2.1.1 Facility Labor

In calculating the facility labor costs used throughout this document fringe benefits were estimated at 50 percent of the base salary. Labor overhead and profit were estimated at 67 percent of the base salary and fringe.[2] The following fully-burdened labor rates are used to determine costs for a RCRA facility:

President	$137/hr
Plant Manager	$116/hr
Facility Engineer	$ 70/hr
Environmental Coordinator	$ 50/hr
Plant Laborer	$ 23/hr
Clerical	$ 21/hr

1.2.1.2 Consultant/Outside Firms Labor

In calculating the labor costs for an outside consulting firm that is retained by the violator, the fringe benefits were estimated at 50 percent of the base salary. Labor overhead and profit were estimated to be 100 percent of the base salary and fringe.[3] The following fully-burdened labor rates are used to determine costs for consultants retained by the RCRA facility:

Attorney	$ 97/hr
Project Manager	$139/hr
Paralegal	$ 37/hr
Project Engineer	$101/hr
Engineering Assistant	$ 52/hr
Drafting $ 48/hr	
Field Technician	$ 39/hr
Clerical	$ 25/hr

1.2.2 Fees for Capital Costs

Fees (also called indirect costs), are related to the design, construction, and testing of a system or facility. Fees are frequently expressed as percentages of the direct capital cost estimate. The type and range of fees vary on the basis of the technology or construction activity undertaken and the project's complexity and scale. The following fees and their percentages were used in developing capital cost estimates used throughout this document:[4]

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[2] DPRA, Incorporated, best professional judgement.

[3] DPRA, Incorporated, best professional judgement.

[4] DPRA, Incorporated, best professional judgement.

1. Engineering and inspection fee at 15 percent.
   - The engineering fee is the cost for design and engineering, architectural drawings, accounting, construction and cost engineering, travel, field expense for construction supervision, and home office expense, including overhead.
   - The inspection fee is the cost for construction inspection and materials or equipment testing to assure the facility meets design specifications.

2. Contractor's overhead and profit at 15 percent.
   - The contractor's overhead and profit fee is the profit the contractor makes on system construction.

3. Contingency at 5 percent.
   - The contingency fee is added to cost estimates to compensate for unpredictable events such as storms, floods, strikes, price changes, small design changes, design errors, and other unforeseen expenses. The contingency fee is a percent of the sum of the direct and indirect (e.g., engineering fee, inspection fee, contractor's overhead and profit) capital costs.

1.3. How to Use This Document

The dollar values obtained from using the methodology in this manual are for the purpose of developing the economic benefit portion of a settlement penalty. The dollar values should be used with extreme discretion. They are not intended for use at civil judicial trials or administrative hearings. If the Agency is going to present testimony at a trial, or in an administrative hearing, on the economic benefit of noncompliance, the Agency should rely on experts to provide site-specific calculations for the economic benefit of noncompliance.

The estimated costs developed in this document may be used by the EPA Regions as input to the BEN computer model, or used with other methods for calculating the monetary benefits gained by a facility for noncompliance with RCRA. If the BEN computer model is used, it can only be used to calculate the economic benefit gained from the delay of expenditures. The BEN computer model is not recommended for use in calculating the economic benefit gained from avoiding expenditures. Avoided expenditures include on-going or annual costs.

In order to determine the economic benefit gained from noncompliance, the Case Development Officer should review and compare the parameters and unit cost estimates used in developing this manual with site specific parameters needed in a specific case. If additional parameters need to be included in the economic benefit calculation because of regional, or state, conditions, the Case Development Officer will need to obtain these values.

The values included in this manual can be used to represent the high and low range of economic benefits gained from noncompliance. Or, the unit cost estimates could be used to validate estimates obtained by the Case Development Officer. Capital expenditures that depend on site specific conditions, such as groundwater monitoring, should be supplemented with additional information. In the case of groundwater monitoring wells,

the total cost in sinking a monitoring well will vary depending on the depth of the groundwater table. The per foot unit costs estimated in this manual can be used, but the total cost will depend on depth of the well, which is site specific.

1.4 Organization of Cost Document

This cost document consists of 13 chapters and three appendices. Chapter 1 is the introduction. Chapters 2 through 13 present the compliance costs for a number of common RCRA violations. Each chapter is devoted to one specific violation. Each chapter includes the assumptions made in developing the costs. Appendix A presents the methodology for updating these costs and prices for use in subsequent years, and Appendix B provides a list of the organic constituents detected by EPA analytical methods.

CHAPTER 2. ENVIRONMENTAL COMPLIANCE OVERHEAD COSTS

This chapter is designed for facilities whose operations are sufficiently complex to require a systematic approach to maintaining environmental compliance (e.g., an environmental compliance audit) and have not done so, as evidenced by the number and extent of violations. In such cases, calculating only the economic benefit of not meeting individual requirements ignores the necessary "overhead" costs that most such complex facilities are incurring to ensure compliance. Though such systems (e.g., audits) are not expressly required by law, to maintain a level playing field, cost estimates are provided that reflect the widespread practices now being implemented by most complex facilities.

Although environmental compliance audits are not the only systematic means of ensuring compliance, the term "audit" is used generically as the most common means of ensuring environmental compliance and in order to include all the components of a complete systematic approach to ensuring compliance.

Under the environmental compliance system in this chapter, an environmental audit/inspection is conducted to determine compliance violations. Following the audit, an implementation plan is developed specifying how the facility would be brought into compliance. A range of costs (i.e., lower bound, upper bound, and typical) are presented for conducting audits and developing RCRA implementation plans. The definitions, documentation of assumptions, and costs are presented in the following sections.

2.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed in this chapter:

Small-Sized[5] Generator	Facilities that generate one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Generator	Facilities that generate four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Small-Sized[6] Treatment, Storage,	Non-commercial or commercial hazardous waste

[5] For the purposes of this manual, "small-sized" refers to the generation of one to three hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

[6] For the purposes of this manual, "small-sized" refers to the generation of one to three hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

and Disposal Facility (TSD)	management facilities which treat, store, or dispose one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Treatment, Storage, and Disposal Facility (TSD)	Non-commercial or commercial hazardous waste management facilities which treat, store, or dispose four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Lower Bound Cost	The lowest cost estimate for conducting an environmental audit or developing a RCRA implementation plan based on waste streams generated, or treated, stored, or disposed by a small-sized generator or a small-sized TSD.
Upper Bound Cost	The highest cost estimate for conducting an environmental audit or developing a RCRA implementation plan based on waste streams generated, or treated, stored, or disposed by a medium-sized generator or a medium-sized TSD.
Typical Cost	The representative cost estimate for conducting an environmental audit or developing a RCRA implementation plan for a facility with three to five hazardous waste streams and limited waste management practices.

2.2 Assumptions

The cost estimates for conducting environmental compliance audits/inspections and developing RCRA implementation plans are based on the following assumptions:

- The cost estimates represent small- to medium-sized facilities since these types of facilities are more likely to be non-notifiers and, as a result, have multiple RCRA violations.

- Table 2-1 provides a description of the various phases of an environmental compliance audit for which initial and on-going costs were estimated. The costs presented in the table are based on the assumption that an industrial facility decides to initiate an audit program and hires an environmental consulting firm to conduct the audit. There is no regulatory agency involvement in this audit.

- The costs associated with the environmental audit discussed in this chapter are only applicable to the hazardous and solid waste regulations. The environmental audit discussed in this chapter is not intended

to be a comprehensive facility audit, which would look at compliance with all environmental regulations, in addition to those for hazardous and solid waste.

- Table 2-2 provides a list of the components of a RCRA implementation plan for both generators and TSDs. Items which are applicable to generators are marked in the second column and items which are applicable to TSDs are marked in third column. The initial costs for each component marked in Table 2-2 are presented in Table 2-7 for generators and Table 2-8 for TSDs.

- Lower bound, upper bound, and typical cost estimates are developed because the time required to conduct an environmental audit and develop a RCRA implementation plan is dependent on the size of the facility, the number of hazardous waste streams, and the waste management technology.

- Hour estimates for conducting audits and developing RCRA implementation plans are based on DPRA's experience in environmental audits, RCRA Facility Assessments, and other similar EPA-related inspections.

- The wage rates and the assumptions used to calculate the wage rates were previously discussed in Section 1.2.1.

- Costs are not included for equipment, travel, per diem, and other direct expenses because of their site- and project-specific nature.

2.3 Costs for Conducting Environmental Compliance Audits and Developing RCRA Implementation Plans

This section presents the detailed cost estimates for conducting environmental audits and developing RCRA implementation plans.

2.3.1 Environmental Compliance Audits

Table 2-3 presents a summary (total cost) of the typical, lower bound, and upper bound cost estimates for initial and on-going environmental audits. Tables 2-4 and 2-5 present detailed cost estimates for each component of the environmental audit for typical, lower bound, and upper bound initial costs and on-going costs, respectively. The costs shown in Tables 2-4 and 2-5 are based on an environmental consulting firm conducting the audit both initially and on an on-going basis with support from the facility's staff.

2.3.2 RCRA Implementation Plans

Table 2-6 presents a summary (total cost) of the typical, lower bound, and upper bound cost estimates for developing a RCRA implementation plan. Tables 2-7 and 2-8 present detailed cost estimates, by compliance component, for developing an implementation plan for a RCRA generator and TSD, respectively. The cost

estimates shown are typical, lower bound, and upper bound estimates. These costs are based on an environmental consulting firm developing the implementation plan. Project management/senior review and clerical time is calculated as a percentage of the project staff's time. Costs are presented by compliance activity to enable the user to construct an implementation plan tailored to specific areas of noncompliance. The costs included in these tables are for developing each component of the implementation plan only. There is no time allotted for meeting with the facility to discuss implementing the plan or to bring the facility into compliance.

2.4 Specific Issues that Could Increase or Decrease Costs

Environmental audits can be conducted with varying degrees of complexity and detail. A partial audit focuses on one specific compliance area, such as solid waste management, whereas, a comprehensive environmental audit assesses all of a facility's operations, processes, and procedures to document compliance with all air, water, hazardous, and solid waste regulations. Similarly, implementation plans can be completed with varying degrees of complexity and detail.

The costs for conducting an environmental audit or developing a RCRA implementation plan is dependent on the size of the facility and the number of hazardous waste streams. As previously stated, the costs presented in this chapter are for a small- to medium-sized facility. The range of hours and costs for medium to large and large to very large facilities would vary substantially compared to the hours and costs presented in this chapter.

Certain costs are not included in the cost estimates because of their facility and project-specific nature. Equipment costs are dependent upon the type of facility and can include personal protective equipment and monitoring equipment. Travel and per diem charges are dependent on the location of the facility in relation to the location of the consultant. Other direct charges such as telephone and photocopies also vary from project to project. Facility-specific conditions, such as location, uncooperative management, and negligent waste handling and management practices, increase the costs associated with conducting an environmental compliance audit and preparing an implementation plan.

2.5 References

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. All dollar values and costs developed by DPRA were originally in 1992 dollars and were inflated to 1996 dollars by the method described in Appendix A.

Table 2-1. Phases of Environmental Compliance Audits

Audit Phase	Activities
Define Scope of the Audit	• Define scope of the audit. • Develop the audit agenda. • Develop the audit strategy. • Set audit date. • Review previous audit reports, if any.
Collect and Review Preliminary Information	• Obtain information from all regulatory sources including permits, manifests, generator notifications, and other pertinent documentation. • Obtain information from the facility including site maps, process flow diagrams, piping and instrumentation diagrams, material safety data sheets, hazardous waste manifests, and other applicable documentation. • Review documentation to develop a thorough understanding of facility operations and identify preliminary areas of concern.
Prepare for Site Inspection	• Contact facility to determine specific personnel protective equipment requirements. • Develop health and safety plan as appropriate. • Obtain necessary personnel protective equipment. • Obtain permission from the facility to take photographs. • Make travel arrangements as necessary.
Conduct Site Inspection	• Conduct opening meeting with owner/operator to state the purpose of the audit and set the proposed agenda. • Review records pertaining to operations and waste handling. • Conduct visual inspection of all processing, waste management, and storage areas. • Interview appropriate site personnel to obtain required information. • Photograph process operations and waste management units as necessary to document compliance areas. • Document findings and develop a list of items for further discussion during the closing meeting. • Conduct closing meeting with owner/operator and request additional information as necessary.
Prepare and Review Audit Report	• Obtain additional information from the facility as necessary to complete the audit report. • Identify areas of noncompliance. • Prepare audit report incorporating information from the preliminary review and site visit.

Table 2-2. Implementation Plan Components

Implementation Plan Component	Generator Facility	TSD Facility
Executive Summary	✓	✓
Objectives of Implementation Plans	✓	✓
Description of Facility and Operations		
• Location, processes, SIC codes, owner	✓	✓
• Waste generation and management	✓	✓
• Scale drawing with waste management areas	✓	✓
Alternatives for Waste Management		
• Ship wastes off site (90 day storage design and compliance requirements)	✓	✓
• Manage wastes on site (meet TSD design and compliance requirements)		✓
Compliance Requirements		
• Introduction	✓	✓
• Notification requirements	✓	✓
• List contents of Part A Permit Application		✓
• List contents of Part B Permit Application (general requirements which include groundwater monitoring and technology specific requirements)		✓
• Exposure information (surface impoundments and landfills only)		✓
• Solid Waste Management Unit Information (includes preliminary review, visual site inspection, and sampling visit)		✓
• Remedial investigation		✓
• Corrective measures		✓
• Hazardous waste determination and characterization	✓	✓
• Written waste analysis plan requirements (includes land disposal restriction component and TSD components)	✓	✓
• Written inspection schedule	✓	✓
• Personnel training	✓	✓
• Requirements for ignitable, reactive, and incompatible wastes	✓	✓
• Preparedness and prevention requirements	✓	✓
• Description of contingency plan contents	✓	✓
• Emergency procedures	✓	✓

Table 2-2. Implementation Plan Components

Implementation Plan Component	Generator Facility	TSD Facility
• Requirements for manifest system	✓	✓
• Packaging, labeling, marking, and placarding requirements	✓	✓
• Description of operating record		✓
• Biennial Report requirements	✓	✓
• Groundwater monitoring program (includes summary of Subpart F requirements; description of well design; description of criteria for number of wells; description of sampling program and generic parameters for analysis; and description of three types (i.e., detection, compliance, and corrective action) of sampling program requirements)		✓
• Closure plan requirements		✓
• Post-closure plan requirements		✓
• Closure cost estimate		✓
• Post-closure cost estimate		✓
• Description of six financial assurance mechanisms for closure		✓
• Description of six financial assurance mechanisms for post-closure care (required only for landfills, land treatment, and disposal surface impoundments)		✓
• Description of six liability coverage mechanisms for sudden and non-sudden occurrences (coverage for non-sudden occurrences required only for landfills, land treatment, and surface impoundments)		✓
• Land Disposal Restrictions Requirements (includes description of possible treatment technologies)	✓	✓
• Description of technical standards for TSD units		✓
Cost Estimate for Implementation Components (includes an estimate of capital and on-going costs for each violation and a comparison of on-site versus off-site costs)	✓	✓
Conclusions and Recommendations	✓	✓

Table 2-3. Summary of Environmental Audit Costs (1996 Dollars)

Audit Type	Lower Bound Cost	Upper Bound Cost	Typical Cost
Initial Audit [1]	$5,639	$16,616	$9,650
On-going Audit [2]	$3,578	$12,018	$6,194

Footnotes:

1. The summary costs for the initial audit are from Table 2-4, page 2-10.
2. The summary costs for the on-going audit are from Table 2-5, page 2-12.

Table 2-4. Cost Estimate for Initial Compliance Audit (1997 dollars)

Audit Phase (a)	Participant	Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Rate $/hr	Lower Bound Cost Estimate*	Upper Bound Cost Estimate*	Typical Cost Estimate*
1. Define Scope of Audit	Facility	Plant Manager	2	6	4	$118	$237	$710	$473
	Facility	Env. Coordinator	12	24	16	$51	$607	$1,215	$810
	Facility	Clerical	1	3	2	$21	$21	$64	$43
	Consultant	Project Manager	2	6	4	$142	$283	$850	$567
	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
	Consultant	Clerical	1	2	2	$26	$26	$51	$51
Subtotal			22	53	36		$1,586	$4,126	$2,767
2. Collect and Review Preliminary Information	Facility	Env. Coordinator	8	16	12	$51	$405	$810	$607
	Facility	Clerical	4	12	8	$21	$86	$257	$172
	Consultant	Project Engineer	8	24	12	$103	$823	$2,469	$1,234
	Consultant	Eng. Assistant	4	12	8	$53	$212	$635	$424
	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Subtotal			25	67	42		$1,551	$4,248	$2,488
3. Prepare for Site Inspection	Facility	Env. Coordinator	1	4	2	$51	$51	$202	$101
	Consultant	Project Engineer	2	8	4	$103	$206	$823	$411
Subtotal			3	12	6		$256	$1,025	$513
4. Conduct Site Inspection	Facility	Plant Manager	0	4	2	$118	$0	$473	$237
	Facility	Env. Coordinator	4	16	8	$51	$202	$810	$405
	Consultant	Project Engineer	4	16	8	$103	$411	$1,646	$823
Subtotal			8	36	18		$614	$2,929	$1,465
5. Prepare and Review Audit Report	Facility	Plant Manager	1	4	2	$118	$118	$473	$237
	Facility	Env. Coordinator	8	16	12	$51	$405	$810	$607
	Facility	Clerical	1	3	2	$21	$21	$64	$43
	Consultant	Project Manager	4	12	8	$142	$567	$1,701	$1,134
	Consultant	Project Engineer	24	80	40	$103	$2,469	$8,229	$4,114
	Consultant	Eng. Assistant	6	12	8	$53	$318	$635	$424
	Consultant	Clerical	4	8	6	$26	$103	$205	$154
Subtotal			48	135	78		$4,001	$12,118	$6,713
Total			130	383	220		$8,008	$24,446	$13,946

Footnotes:

(a) The items in this column correspond to the items in column one of Table 2-2.
(b) DPRA, Incorporated, best professional judgement.
* Totals may not add because of rounding.

Table 2-5. Worksheet to Estimate for On-going Environmental Compliance Audit (1997 dollars)

Audit Phase (a)	Participant	Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Rate $/hr	Lower Bound Cost Estimate*	Upper Bound Cost Estimate*	Typical Cost Estimate*
1. Define Scope of Audit	Facility	Plant Manager	1	2	1	$118	$118	$237	$118
	Facility	Env. Coordinator	6	12	8	$51	$304	$607	$405
	Facility	Clerical	1	3	2	$21	$21	$64	$43
	Consultant	Project Manager	2	4	2	$142	$283	$567	$283
	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Subtotal			13	30	19		$958	$2,170	$1,312
2. Collect and Review Preliminary Information	Facility	Env. Coordinator	2	8	4	$51	$101	$405	$202
	Facility	Clerical	2	6	4	$21	$43	$129	$86
	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
	Consultant	Eng. Assistant	2	6	4	$53	$106	$318	$212
	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Subtotal			11	35	22		$687	$2,163	$1,374
3. Prepare for Site Inspection	Facility	Env. Coordinator	1	4	2	$51	$51	$202	$101
	Consultant	Project Engineer	2	8	4	$103	$206	$823	$411
Subtotal			3	12	6		$256	$1,025	$513
4. Conduct Site Inspection	Facility	Plant Manager	0	4	2	$118	$0	$473	$237
	Facility	Env. Coordinator	4	16	8	$51	$202	$810	$405
	Consultant	Project Engineer	4	16	8	$103	$411	$1,646	$823
Subtotal			8	36	18		$614	$2,929	$1,465
5. Prepare and Review Audit Report	Facility	Plant Manager	1	4	2	$118	$118	$473	$237
	Facility	Env. Coordinator	4	12	8	$51	$202	$607	$405
	Facility	Clerical	1	3	2	$21	$21	$64	$43
	Consultant	Project Manager	2	6	4	$142	$283	$850	$567
	Consultant	Project Engineer	16	64	24	$103	$1,646	$6,583	$2,569
	Consultant	Eng. Assistant	6	12	8	$53	$318	$635	$424
	Consultant	Clerical	2	6	4	$26	$51	$154	$103
Subtotal			32	107	52		$2,641	$9,368	$4,246
Total			83	284	141		$5,156	$17,655	$8,910

Footnotes:

(a) The items in this column correspond to the items in column one of Table 2-2.
(b) DPRA, Incorporated, best professional judgement.
* Totals may not add because of rounding.

Table 2-6. Summary of Implementation Plan Costs (1997 Dollars)

Audit Type	Lower Bound Cost	Upper Bound Cost	Typical Cost
Generator(a)	$5,273	$14,249	$9,111
TSD(b)	$12,381	$35,844	$23,867

Footnotes:

(a) The summary of implementation plan costs for a generating facility is from Table 2-7, page 2-12.
(b) The summary of implementation plan costs for a TSD is from Table 2-8, pages 2-13 and 2-14.

Table 2-7. Cost to Develop an Implementation Plan for a Generator Facility (1997 dollars)

Implementation Plan Component(a)	Participant	Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Rate $/hr	Lower Bound Cost Estimate*	Upper Bound Cost Estimate*	Typical Cost Estimate*
1. Executive Summary	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
2. Objectives of Implementation Plan	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
3. Description of Facility and Operations									
- Location, processes, SIC codes, owner	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Waste generation and management	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Scale drawing with waste management areas	Consultant	Eng. Assistant	1	4	2	$53	$53	$212	$106
4. Alternatives for Waste Management									
- Ship wastes off-site	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
5. Compliance Requirements									
- Introduction focusing on significant violations	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Notification Requirements	Consultant	Eng. Assistant	1	1	1	$53	$53	$53	$53
- Hazardous Waste Determination	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Written waste analysis plan requirements	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Written inspection schedule	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Personnel training	Consultant	Eng. Assistant	2	6	4	$53	$106	$318	$212
- Requirements for ignitable, reactive, and incompatible wastes	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Preparedness and prevention requirements	Consultant	Project Engineer	2	8	4	$103	$206	$823	$411
- Description of contingency plan contents	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Emergency procedures	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Requirements for manifest system	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Packaging, labeling, marking, and placarding requirements	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Biennial Report Requirements	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Land Disposal Restriction Requirements	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
6. Cost estimate for implementation components	Consultant	Project Engineer	4	8	4	$103	$411	$823	$411
7. Conclusions and recommendations	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Subtotal			42	114	73		$3,921	$10,578	$6,760
8. Other Costs	Consultant	Project Manager(d)	8.4	22.8	14.6	$142	$1,191	$3,232	$2,070
Clerical Support	Consultant	Clerical(e)	6.3	17.1	11.0	$26	$162	$439	$281
Total			56.7	153.9	98.6		$5,273	$14,249	$9,111

Footnotes:

(a) The items in this column correspond to the items in column one of Table 2-2.
(b) DPRA, Incorporated, best professional judgement.
* Totals may not add because of rounding.
(d) The number of hours allocated to the Project Manager is assumed to equal 20 percent of the total project staff hours.
(e) The number of hours allocated to the clerical staff is assumed to equal 15 percent of the total project staff hours.

Table 2-8. Cost to Develop an Implementation Plan for a TSD Facility (1997 dollars)

Implementation Plan Component(a)	Participant	Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Rate $/hr	Lower Bound Cost Estimate(c)	Upper Bound Cost Estimate(c)	Typical Cost Estimate(c)
1. Executive Summary	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
2. Objectives of Implementation Plan	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
3. Description of Facility and Operations									
- Location, processes, SIC codes, owner	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Waste generation and management	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Scale drawing with waste management areas	Consultant	Eng. Assistant	1	4	2	$53	$53	$212	$106
4. Alternatives for Waste Management									
- Ship wastes off-site	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Manage wastes on-site	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
5. Compliance Requirements									
- Introduction focusing on significant violations	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Notification requirements	Consultant	Eng. Assistant	1	1	1	$53	$53	$53	$53
- List contents of Part A permit application	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- List contents of Part B permit application	Consultant	Project Engineer	12	24	16	$103	$1,234	$2,469	$1,646
- Exposure information (impoundments and landfills only)	Consultant	Project Engineer	0	4	2	$103	$0	$411	$206
- Solid waste management unit information	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Remedial investigation	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Corrective measures	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Hazardous waste determination and characterization	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Written waste plan requirements	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Written inspection schedule	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Personnel training	Consultant	Eng. Assistant	2	6	4	$53	$106	$318	$212
- Requirements for ignitable, reactive, and incompatible wastes	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Preparedness and prevention requirements	Consultant	Project Engineer	2	10	6	$103	$206	$1,029	$617
- Description of contingency plan contents	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Emergency procedures	Consultant	Project Engineer	1	4	2	$103	$103	$411	$206
- Requirements for manifest system	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Packaging, labeling, marking, and placarding requirements	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106

Table 2-8. Cost to Develop an Implementation Plan for a TSD Facility (1997 dollars) (continued)

Implementation Plan Component(a)	Participant	Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Rate $/hr	Lower Bound Cost Estimate*	Upper Bound Cost Estimate*	Typical Cost Estimate*
- Description of operating record	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Biennial report requirements	Consultant	Eng. Assistant	1	3	2	$53	$53	$159	$106
- Groundwater monitoring program	Consultant	Project Engineer	0	12	8	$103	$0	$1,234	$823
- Closure plan requirements	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
- Post-closure plan requirements	Consultant	Project Engineer	0	8	4	$103	$0	$823	$411
- Closure cost estimate	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Post-closure cost estimate	Consultant	Project Engineer	0	4	2	$103	$0	$411	$206
- Financial assurance for closure	Consultant	Project Engineer	6	10	8	$103	$617	$1,029	$823
- Financial assurance of post-closure	Consultant	Project Engineer	0	4	2	$103	$0	$411	$206
- Liability coverage	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Land disposal restriction requirements	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
- Describe technical standards for TSD units	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
6. Cost estimate for implementation components	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
7. Conclusions and Recommendations	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
Subtotal			95	275	183		$9,322	$26,988	$17,975
8. Other Costs	Consultant	Project Manager(d)	19.0	55.0	36.6	$142	$2,693	$7,796	$5,188
Clerical Support	Consultant	Clerical(e)	14.3	41.3	27.5	$26	$366	$1,059	$705
Total			128.3	371.3	247.1		$12,381	$35,844	$23,867

Footnotes:

(a) The items in this column correspond to the items in column one of Table 2-2.
(b) DPRA, Incorporated, best professional judgement.
* Totals may not add because of rounding.
(d) The number of hours allocated to the Project Manager is assumed to equal 20 percent of the total project staff hours.
(e) The number of hours allocated to the clerical staff is assumed to equal 15 percent of the total project staff hours.

CHAPTER 3. MULTIPLE RCRA VIOLATIONS

This chapter provides typical capital, initial (administrative), and on-going cost information for approximating total costs for RCRA compliance activities at representative generator and treatment, storage, and disposal (TSD) facilities. These facilities tend to be representative of medium-sized facilities. Cost estimates are provided in this chapter for a number of individual RCRA compliance violations. The Assumptions Section of this chapter identifies each of the individual RCRA compliance activities included. The user determines the types of violations for the facility for which the economic benefit is being calculated. Estimates of typical costs for each individual violation are listed in the tables located at the end of this chapter for generators and TSDs. If a more detailed cost estimate is required for any of the individual violations, the user should refer to the other chapters referenced in the tables for specific compliance activities and use those estimates to refine the typical estimates reported here. The cost estimates for those violations with no individual chapter detailing cost estimates will be revised when those chapters are developed.

The definitions, documentation of assumptions, and typical capital, initial, and on-going cost estimates for individual RCRA violations are presented in the following sections.

3.1 Definitions

Definitions are provided for the following terms used in the methodology described in this chapter.

Representative Generator	A facility generating six hazardous waste streams which are all disposed off-site (i.e., at a commercial TSD).
Representative TSD	A facility generating six hazardous waste streams. Three wastes are managed on-site (i.e., non-commercial) in a land based unit (i.e., surface impoundment or landfill), thus making the facility a TSD, and three wastes are disposed off-site (i.e., at a commercial TSD).
Non-Notifier Facility	A facility which has failed to notify State and/or Federal regulators regarding the status of their operations when required by RCRA.
Discovered Facility	A facility whose RCRA status is known either through notification or inspection.
Undiscovered Facility	A facility whose RCRA status is unknown due to lack of notification and inspection.

3.2 Assumptions

The typical cost estimates developed for each RCRA compliance activity at representative facilities with violations are based on the following assumptions:

- These facilities, whether it be a generator or TSD, tend to be non-notifiers because a facility which has failed to notify EPA of its hazardous waste activities (an initial violation) most likely also has failed to comply with subsequent requirements such as making a hazardous waste determination, conducting a waste analysis and developing a waste analysis plan, developing a contingency plan, and so forth, all of which are RCRA violations. These facilities are typically undiscovered, but in some cases may have been recently discovered through inspection without having complied with notification and subsequent RCRA requirements.

- The size of the facility and specific waste treatment units must be taken into account by the user. The typical cost estimates are based on six waste streams being generated by the facility. For facilities with less than six waste streams or more than six waste streams, the user of this document should refer to the specific chapter for that violation for cost information. If a chapter does not currently exist for the violation, the user may estimate the costs through modification of the total labor costs presented in the assumptions in the tables in this chapter. The user should be cautioned that not all compliance costs are strictly a function of the number of waste streams generated by a facility. For example, the costs for closure/post-closure plans are a function of the number and types of TSD units. The costs for financial assurance are a function of the cost estimated to implement closure/post-closure and a number of facility specific risk factors (e.g., size of facility, relationship with the financial institution, collateral requirements, facility's operating history, and availability of financial instruments such as insurance). Depending on the compliance activity and the significance of the cost (i.e., the dollar amount), the user can make a proportional adjustment to the costs when more or less than six waste streams are present.

- For generators, it is assumed that all six waste streams are stored in <90 day accumulation storage tanks and containers and are disposed off-site (i.e., commercial TSD). For TSD facilities, it is assumed that the TSD units located on-site are noncommercial. Three of the TSD facility wastes are managed on-site in a land based unit (i.e., surface impoundment or landfill) and three of the wastes are sent off-site to a commercial TSD.

- Both generator and TSD facilities will hire an environmental consulting firm to conduct many of the RCRA compliance activities. Time is included for facility personnel (i.e., a facility engineer/environmental coordinator) to provide oversight in development and review of the compliance activities. The hours assumed are either from other chapters or are based on professional judgement and, if available, EPA Information Collection Request (ICR) data.

- The wage rates and the assumptions used to calculate the wage rates were previously discussed in Section 1.2.1.

- Costs are not included for equipment, travel, and per diem because of their site-specific nature.

- The project manager and clerical time are estimated to be 10 percent and 15 percent, respectively, of consultant project staff hours (i.e., project engineer and engineering assistant).

- The facility engineer (i.e., environmental coordinator) time is approximated to be 10 percent of consultant project staff hours (i.e., project engineer and engineering assistant).

- The following RCRA compliance activities are required under 40 CFR Part 262 for generator facilities. However, because of their site-specificity, not all are costed in this manual.
    - Hazardous waste determination and characterization (262.11);
    - Notification requirements (262.12);
    - Land disposal restrictions waste analysis and written land disposal restrictions waste analysis plan, (applicable only for those generators treating restricted waste in a 90-day accumulation tank container, or containment building (262.34(a)(4) and 268.7((a)(4));
    - Inspections according to schedule in regulations;
    - Personnel training (262.34(a)(4) and 265.16);
    - Requirements for ignitable, reactive, and incompatible wastes (262.34(a)(4), 265.176, 265.177, 265.198, and 265.199);
    - Emergency equipment requirements (262.34(a)(4) and 265 Subpart C);
    - Arrangements with local authorities and contingency plan (262.34(a)(4), 265.37, and Subpart D);
    - Requirements for drip pads and containment buildings (262.34(a)(1)(iii) and (iv);
    - Manifest system (262.20-.23);
    - Recordkeeping (262.40);
    - Packaging, labeling, marking, and placarding wastes (262.30-.33);
    - Biennial report preparation (262.41);
    - Import/Export requirements (262.50-.57, and 262.60);
    - Manifest changes (262.54); and
    - Annual reports on exports (262.56).

- The following RCRA compliance activities are required under 40 CFR Parts 264/265 for TSD facilities. However, because of their site-specificity, not all are costed in this manual.
    - Notification requirements (264.11)
    - Hazardous waste determination and characterization;
    - General waste analysis, LDR waste analysis, and written waste analysis plan including land disposal restrictions (264.13 and 268.7);
    - 24 Hour security system (264.14);
    - Written inspection schedule (264.15(b));
    - Personnel training (264.16);
    - Requirements for ignitable, reactive, and incompatible wastes (264.17);
    - Emergency equipment requirements (264.32 and 264.34);

- Arrangements with local authorities (264.37);
- Contingency plans (264.51);
- Emergency Coordinator (264.55);
- Manifest system (264.71);
- Packaging, labeling, marking, and placarding wastes (262.10(f));
- Biennial report preparation (264.75);
- Operating record (264.73);
- Groundwater monitoring program (264 Subpart F);
- Closure and post-closure plans (264 Subpart G);
- Closure and post-closure cost estimates and financial assurance for closure and post-closure care (264 Subpart H);
- Financial assurance for third party liability coverage (264.147);
- Corrective action schedule (264.101); and
- Permitting (270).

- Capital and on-going costs for unit-specific or facility-specific RCRA technical requirements (e.g., construction of liner systems and on-site treatment technologies to meet land disposal restrictions) and initial costs (e.g., off-site disposal of wastes as in Chapter 5) are not included because they cannot be estimated without knowing waste stream and treatment unit details.

3.3 Typical Cost Estimates For Representative Generators and TSD Facilities

Tables 3-1 and 3-2 are worksheets to summarize the total cost estimates for generators and TSDs with violations, respectively. The types of violations for the facility for which EBN is being calculated are facility specific, therefore, the user must specify the violations. Tables 3-3 and 3-4 present typical capital, initial, and on-going cost estimates for individual RCRA compliance activities which are required of a representative generator or TSD facility. The source of the estimate is listed as either EPA Information Collection Request (ICR) data, professional judgement (PJ), or was derived based on information presented in the other chapters within this document. Assumptions also are listed. The user selects the combination of individual violations for the facility for which the EBN is being calculated, enters the costs for each violation on Tables 3-1 or 3-2, and sums the costs.

3.4 References

1. DPRA, an environmental engineering consulting firm with extensive experience in cost engineering, provided cost estimates to assist EPA in determining the economic benefits of noncompliance. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1571, General Hazardous Waste Facility Standards," July 7, 1993.

3. U.S. EPA, "Supporting Statement for Information Collection Request Number 801, Requirements for Generators, Transporters, and Waste Management Facilities Under the RCRA Hazardous Waste Manifest System," June 15, 1992.

Table 3-1. Worksheet to Summarize Cost Estimates for Generators (a)

Component	Capital/Initial Cost Estimate ($)	On-going Cost Estimate ($)
Notification Requirements		
Hazardous Waste Determination and Characterization		
Land Disposal Restrictions Waste Analysis and Written LDR Plan		
Written Inspection Schedule		
Personnel Training		
Requirements for Ignitable, Reactive, and Incompatible Wastes		
Emergency Equipment Requirements		
Arrangements with Local Authorities and Contingency Plan		
Requirements for Drip Pads and Containment Buildings		
Manifest System		
Packaging, Labeling, Marking, and Placarding Wastes		
Recordkeeping		
Notification of Intent to Export		
Manifest Procedures for Exported Wastes		
Annual Report for Exported Wastes		
Biennial Report Preparation		
TOTAL COSTS		

(a) Cost estimates are to be obtained from Table 3-3 and summed for a total capital/initial and on-going cost estimate.

Table 3-2. Worksheet to Summarize Cost Estimates for TSDs (a)

Component	Capital/Initial Cost Estimate ($)	On-going Cost Estimate ($)
Notification Requirements		
Hazardous Waste Determination and Characterization		
General Waste Analysis, LDR Waste Analysis, and Written Waste Analysis		
24-Hour Emergency Security System		
Written Inspection Schedule		
Personnel Training		
Requirements for Ignitable, Reactive, and Incompatible Wastes		
Emergency Equipment Requirements		
Arrangements with Local Authorities		
Contingency Plan		
Emergency Coordinator		
Manifest System		
Packaging, Labeling, Marking, and Placarding Wastes		
Biennial Report Preparation		
Operating Record		
Groundwater Monitoring Program		
Closure and Post-Closure Plans		
Financial Assurance for Closure and Post-Closure		
Financial Assurance for Third Party Liability Coverage		
Corrective Action Schedule		
Permitting		
TOTAL COSTS		

(a) Cost estimates are to be obtained from Table 3-4 and summed for a total capital/initial and on-going cost estimate.

Table 3-3. Typical Cost Estimates for Representative Generators with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Notification Requirements	ICR & PJ	$242	$81/yr	Initial • PE = 3 hrs for OMB form (@ 0.5 hr/waste stream) • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 1 hr/yr for updates • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time
Hazardous Waste Determination and Characterization	Chapter 6	$8,477	0	Initial • 18 analyses (6 wastes @ 3 analyses/waste) @ $264 ea. for TCLP and 8-RCRA metals. All characteristic wastes. Labor costs as in Chapter 6.
Land Disposal Restrictions Waste Analysis and Written LDR Plan	Chapter 7	0	0	Not applicable since all wastes are assumed to be sent off-site to a commercial TSD.
Written Inspection Schedule	ICR & PJ	$966	$1,019/yr	Initial • PE = 12 hrs to develop schedule • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 2 hrs/yr to update schedule • FL = 24 hrs/yr to record problems in inspection log • FE = 10% of PE and FL time

Table 3-3. Typical Cost Estimates for Representative Generators with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Personnel Training	PJ	$1,998	$1,624/yr	Initial • PE = 12 hrs to develop materials for training facility personnel • PE = 8 hr to train facility personnel • FE and FL = 16 hrs initial training (8 hr/person) • PM = 10% of PE time to develop materials • CL = 15% of PE time to develop materials On-Going • PE = 8 hrs/yr to review materials for update • PE = 6 hrs/yr to update facility personnel • FE and FL = 12 hrs/yr update training (6 hr/person) • PM = 10% of PE time to review and update materials • CL = 15% of PE time to review and update materials
Requirements for Ignitable, Reactive, and Incompatible Wastes	PJ	$518	$161/yr	Initial • PE = 8 hrs for procedures • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 2 hrs/yr for updates • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time

Table 3-3. Typical Cost Estimates for Representative Generators with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Emergency Equipment Requirements	PJ	$6,106	$1,792/yr	Initial • PE = 16 hrs to order equipment • PE = 8 hrs to install equipment • FL = 16 hrs to install equipment • Emergency equipment = $3,700 • PM = 10% of PE time • FE = 10% of PE and FL time On-Going • PE = 12 hrs/yr oversight • FL = 24 hrs/yr testing and maintenance • PM = 10% of PE time • FC = 10% of PE and FL time
Arrangements with Local Authorities and Contingency Plan	Chapter 8	$5,306	$523/yr	Initial • Labor costs as in Chapter 8 for a medium generator with 6 waste streams On-Going • Labor costs as in Chapter 8 for a medium generator with 6 waste streams
Manifest System	ICR & PJ	$851	$1,705/yr	Initial • Storage cabinets = $529 • PE = 4 hrs for setup • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • 6 waste streams sent off-site • FE = 6 hrs/yr oversight • FL = 36 hrs/yr for forms • PE = 10% of FE and FL time

Table 3-3. Typical Cost Estimates for Representative Generators with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Packaging, Labeling, Marking, and Placarding Wastes	PJ	$1,288	$3,083/yr	Initial • 6 waste streams sent off-site • PE = 16 hrs to develop procedures • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • 6 waste streams sent off-site • FE = 6 hrs/yr oversight • FL = 72 hrs/yr for implementing procedures • PE = 10% of FE and FL time
Biennial Report Preparation	PJ	0	$644/yr	On-Going • PE = 4 hrs/yr for waste generation report (i.e., 8 hrs every other year) • PE = 4 hrs/yr for waste reduction report (i.e., 8 hrs every other year) • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time
TOTAL COST FOR MULTIPLE VIOLATIONS	NA			Total cost equals the sum of the cost for all the appropriate individual violations for the facility for which EBN is being calculated.

Key: PJ = Professional Judgement (see Reference 1)
ICR = EPA Information Collection Request (see References 2 and 3)
NA = Not Applicable
Consultant Labor:
AT = Attorney @ $98/hr
PL = Paralegal @ $37/hr
PE = Project Engineer @ $101/hr

PM = Project Manager @ $139/hr
CL = Clerical @ $25/hr
Facility Labor:
PR = President @ $137/hr
FE = Engineer @ $70/hr
FL = Laborer @ $23/hr
FC = Clerical @ $21/hr

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Notification Requirements	ICR & PJ	$241	$81/yr	Initial • PE = 3 hrs for OMB form (@ 0.5 hr/waste stream) • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 1 hr/yr for updates • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time
Hazardous Waste Determination and Characterization	Chapter 6	$8,020	0	Initial • 18 analyses (6 wastes @ 3 analyses/waste) @ $250 ea. for TCLP and 8-RCRA metals. All characteristic wastes. Labor costs as in Chapter 6.
General Waste Analysis, LDR Waste Analysis, and Written Waste Analysis Plan Including Land Disposal Restrictions	Chapter 7	$12,430	$6,540/yr	Initial • General waste analysis [18 analyses (6 wastes @ 3 analyses/waste)] @ $150/each for physical and chemical parameters not included in the hazardous waste determination. • Land disposal restrictions (LDR) waste analysis (2 wastes @ 3 analyses/waste) @ $1000/each to verify treated wastes comply with LDR treatment standards • Labor costs for sample collection and waste analysis plan as in Chapter 7 On-Going • Land disposal restrictions (LDR) waste analysis (2 wastes @ 3 analyses/waste) @ $1000/each to verify treated wastes comply with LDR treatment standards • Labor costs for sample collection as in Chapter 7

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Written Inspection Schedule	ICR & PJ	$966	$1,019/yr	Initial • PE = 12 hrs to develop schedule • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 2 hrs/yr to update schedule • FL = 24 hrs/yr to record problems in inspection log • FE = 10% of PE and FL time
Personnel Training	PJ	$2,052	$1,464/yr	Initial • PE = 12 hrs to develop materials for training facility personnel • PE = 8 hr to train facility personnel • FE and FL = 16 hrs initial training (8 hr/person) • PM = 10% of PE time to develop materials • CL = 15% of PE time to develop materials On-Going • PE = 8 hrs/yr to review materials for update • PE = 6 hr to update facility personnel • FE and FL = 12 hrs update training (6 hr/person) • PM = 10% of PE time to review and update materials • CL = 15% of PE time to review and update materials
Requirements for Ignitable, Reactive, and Incompatible Wastes	PJ	$644	$161/yr	Initial • PE = 8 hrs for procedures • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 2 hrs/yr for updates • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Emergency Equipment Requirements	PJ	$5,906	$1,792/yr	Initial • PE = 16 hrs to order equipment • PE = 8 hrs to install equipment • FL = 16 hrs to install equipment • Emergency equipment = $3,500 • PM = 10% of PE time • FE = 10% of PE and FL time On-Going • PE = 12 hrs/yr oversight • FL = 24 hrs/yr testing and maintenance • PM = 10% of PE time • FE = 10% of PE and FL time
Arrangements with Local Authorities And Contingency Plan	Chapter 8	$5,020	$495/yr	Initial • Labor costs as in Chapter 8 for a medium generator with 6 waste streams On-Going • Labor costs as in Chapter 8 for a medium generator with 6 waste streams
Manifest System	ICR & PJ	$411	$852/yr	Initial • Storage cabinet = $250 • PE = 2 hrs for setup • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • 3 waste streams sent off-site • FE = 3 hrs/yr oversight • FL = 18 hrs/yr for forms • PE = 10% of FE and FL time

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Packaging, Labeling, Marking, and Placarding Wastes	PJ	$644	$1,296/yr	Initial • 3 waste streams sent off-site • PE = 8 hrs to develop procedures • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • 3 waste streams sent off-site • FE = 3 hrs/yr oversight • FL = 36 hrs/yr for implementing procedures • PE = 10% of FE and FL time
Biennial Report Preparation	PJ	0	$644/yr	On-Going • PE = 4 hrs/yr for waste generation report (i.e., 8 hrs every other year) • PE = 4 hrs/yr for waste reduction report (i.e., 8 hrs every other year) • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time
Operating Record	ICR & PJ	$1,466	$5,319/yr	Initial • Storage cabinets = $500 • PE = 12 hrs for setup • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • FE = 6 hrs/yr for oversight • FL = 120 hrs/yr to maintain operating record • FC = 15% of FE and FL time • PE = 10% of FE and FL time

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Groundwater Monitoring Program	Chapter 4	$201,835 (Part 264) $71,220 (Part 265)	$60,910/yr (Part 264) $7,290/yr (Part 265)	Capital/Initial • Costs as in Chapter 4 On-Going • Costs as in Chapter 4
Closure and Post-Closure Plans	ICR & PJ	$28,980	$1,288/yr	Initial • PE = 360 hrs to develop plan • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 16 hr/yr for revisions • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Financial Assurance for Closure and Post-Closure	ICR & PJ	$30,000 ($1,000,000 closure/post-closure) $20,000/ additional $1,000,000 closure/post-closure	$21,300/yr ($1,000,000 closure/post-closure) $20,000/yr/ additional $1,000,000 closure/post-closure	Initial • PE = 60 hrs to develop closure/post-closure cost estimates • PM = 12 hrs to review cost estimates • AT = 12 hrs to review financial assurance mechanisms • PL = 8 hrs to review surety bond • PR = 15 hrs to select financial assurance mechanism and negotiate fees • FE = 8 hrs to review cost estimates • CL = 12 hrs administrative support • FC = 8 hrs administrative support • Costs for financial assurance using a surety bond • Costs assume a facility requires financial assurance for $1,000,000. Additional costs per $1,000,000 included. On-Going • PE = 6 hrs to review and update cost estimates • PL = 11 hrs to review surety bond • AT = 3 hrs to review surety bond • Costs for financial assurance using a surety bond • Costs assume a facility requires financial assurance for $1,000,000. Additional costs per $1,000,000 included.
Financial Assurance for Third Party Liability Coverage	ICR & PJ	$80,000	$75,000/yr	Initial • AT = 12 hrs to review financial assurance mechanisms • PL = 4 hrs to review insurance policy • PR = 23 hrs to select financial assurance mechanisms and negotiate fees • FC = 4 hrs administrative support • Insurance premium payment at $75,000 for sudden and nonsudden releases using insurance as in Chapter 10 On-Going • Insurance premium payments at $75,000/year for sudden and nonsudden releases

Table 3-4. Typical Cost Estimates for Representative TSDs with Multiple Violations (1996 Dollars)

Compliance Activity	Source	Typical Capital/Initial and On-Going Costs		Assumptions
		Capital/Initial	On-Going	
Corrective Action Schedule	PJ	$966	$483/yr	Initial • PE = 12 hrs to develop schedule • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time On-Going • PE = 6 hrs/yr for updates • PM = 10% of PE time • CL = 15% of PE time • FE = 10% of PE time
Permitting	Chapter 9	$34,500	$12,000/5 yr	Initial • Labor costs for Part A permit application as in Chapter 9 • Labor costs for Part B permit application as in Chapter 9 - Includes general information requirements, groundwater monitoring requirements, solid waste management units requirements, and a land based unit (i.e., surface impoundment or landfill) requirements On-Going • Permit renewal every 5 years as specified in Chapter 9
TOTAL COST FOR MULTIPLE VIOLATIONS	NA			Total cost equals the sum of the cost for all the appropriate individual violations for the facility for which EBN is being calculated.

Key: PJ = Professional Judgement (see Reference 1)
ICR = EPA Information Collection Request (see References 2 and 3)
Consultant Labor:
AT = Attorney @ $98/hr
PL = Paralegal @ $37/hr
PE = Project Engineer @ $101/hr
PM = Project Manager @ $139/hr
CL = Clerical @ $25/hr
Facility Labor:
PR = President @ $137/hr
FE = Engineer @ $70/hr
FL = Laborer @ $23/hr
FC = Clerical @ $21/hr
NA = Not Applicable

[1] Representative TSD assumed to have 6 waste streams (3 disposed off-site (i.e., commerc ial TSD) and 3 managed in on-site land based non-commercial TSD unit).

CHAPTER 4. GROUND-WATER MONITORING PROGRAM

This chapter presents cost estimates for compliance with both a 40 CFR Part 264 (permitted facility) and Part 265 (interim status facility) ground-water monitoring program. While requirements related to the design and installation of ground-water monitoring systems are similar at permitted and interim status facilities, separate cost functions were developed for both types of ground-water monitoring system to reflect differences in analytical parameters, sampling frequency, typical number of wells, and reporting requirements. For either type of system, costs incurred by a facility will fall into one of two categories: (1) initial (up front) costs for site characterization; design and installation of the system; and sampling and analysis to establish background concentrations, and (2) recurring annual costs for sampling, analysis, and reporting.

Cost estimates presented in this chapter represent initial and on-going compliance costs in 1996 dollars for a "typical" Part 264 ground-water monitoring program and a minimum Part 265 ground-water monitoring program. These costs are provided as guidance. If sufficient information is available, unit quantities in the cost functions can be adjusted up or down to derive facility-specific cost estimates. Costs for compliance monitoring and corrective action procedures under §264 at a permitted facility and assessment monitoring under §265 at an interim status facility are not included in the cost estimates because they are site-specific.

This chapter is organized into five sections. Section 4.1 presents definitions of terms; Section 4.2 presents an overview of RCRA ground-water monitoring requirements; Section 4.3 presents assumptions made to derive the cost estimates; Section 4.4 presents costs; and Section 4.5 provides references.

4.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter:

Ground water	Water below the land surface in a zone of saturation.
Upgradient well	A monitoring well which is installed hydraulically upgradient (i.e., in the direction of increasing static head) from the limit of the waste management area.
Downgradient well	A monitoring well which is installed hydraulically downgradient (i.e., in the direction of decreasing static head) from the limit of the waste management area.
Well cluster	A well cluster consists of three wells at different depths near each other to provide a vertical profile of ground-water composition.

Hollow stem auger drilling — A ground-water monitoring well drilling method which uses a helical auger with a hollow shaft thus allowing soil samples to be collected through the shaft. This drilling method is advanced in five-foot sections.

Split spoon samples — A tube sampler that allows collections of soil samples through pounding into the ground. The tube opens by splitting in half lengthwise for sample collection.

Shelby tube — A thin-walled tubular device pressed into an open borehole to obtain an undisturbed core sample of unconsolidated strata (Nielsen, 1991).

4.2 Overview of RCRA Ground-Water Monitoring Requirements

Ground-water monitoring must be performed at RCRA-regulated hazardous and radioactive mixed waste management units, or facilities, where hazardous waste is stored or disposed of in or on the land. Such units include interim status and permitted surface impoundments, landfills, and land treatment units. The owners, or operators, of permitted waste piles are also required to perform ground-water monitoring. Ground-water monitoring also can be required at miscellaneous units, such as geologic repositories or chemical, physical, or biological treatment units that are not tanks, surface impoundments, and land treatment units.

4.2.1 Ground-Water Monitoring at an Interim Status Facility (40 CFR Part 265)

A monitoring system developed under 40 CFR 265.91 must consist of at least four wells: one upgradient from the unit and three downgradient [40 CFR 265.91(a)]. The upgradient well(s) collect(s) ground-water samples that are representative of background ground-water quality in the uppermost aquifer near the facility and that are not affected by the facility. Samples from downgradient wells are tested for the presence of any statistically significant amounts of hazardous waste or hazardous constituents that migrate from the waste management area to the uppermost aquifer. A determination that the ground water is contaminated is based on a comparison of the data from upgradient and downgradient wells.

Under 40 CFR 265.92, sampling of the upgradient well(s) must take place quarterly for a full year to establish background parameters indicating the suitability of the ground water as a source of drinking water [Appendix III to 40 CFR 265], establish the quality of the ground water [40 CFR 265.92(b)(2)], and establish the extent of ground-water contamination [40 CFR 265.92(b)(3)]. After the first year, all monitoring wells must be sampled at least annually for ground-water quality parameters and sampled at least semi-annually for ground-water contamination indicator parameters. In addition, the elevation of the ground-water surface at each monitoring well must be determined each time a sample is obtained [40 CFR 265.92(e)] to determine if horizontal and vertical flow gradients have changed since the initial site characterization.

If the results of statistical tests show a significant increase (or pH decrease) over initial background, the facility must institute an assessment monitoring program to determine the nature, extent, and rate of the ground-water contamination. 40 CFR Part 265.93(a) requires the owner/operator to develop an assessment program outline to facilitate the timely implementation of an assessment monitoring program.

4.2.2 Ground-Water Monitoring at a Permitted Facility (40 CFR Part 264)

A detection monitoring system developed under 40 CFR Part 264 for a permitted facility is designed to detect a change in ground-water quality in wells surrounding a unit subject to the ground-water monitoring regulations. The ground water at the downgradient edge of the unit must be monitored for indicator parameters or constituents specified in the facility permit [40 CFR 264.98(a)]. These parameters and constituents are established by the permit writer based on information in the facility's waste analysis plan, waste characterization, site hydrogeologic investigation, and proposed plan for ground-water monitoring of waste parameters and constituents.

Background levels must be established for each of the indicator parameters and constituents monitored in the detection program (40 CFR 264.97). The number and kinds of samples collected to establish background levels must be appropriate for the form of statistical tests used to determine if a contaminant release to ground water has occurred. The procedure must involve at least four samples, taken at an interval that assures that an independent sample is obtained each time [40 CFR 264.97(g)]. During detection monitoring, background samples are compared with downgradient samples using one of the statistical methods described in 40 CFR 264.97(h) to determine if there is evidence of ground-water contamination.

Detection monitoring continues during the active life of the unit and during the post-closure care period, unless compliance monitoring is triggered by detection of hazardous constituents in the ground water (40 CFR 264.98).

4.3 Assumptions

This section presents assumptions made to develop cost estimates for compliance with the RCRA ground-water monitoring requirements under 40 CFR Part 264 and Part 265. For the purpose of clarity, assumption relative to §264 monitoring systems and §265 monitoring systems are presented in separate subsections. Differences between the two systems are reflected in analytical parameters required, frequency of sampling, typical depths and number of wells, and reporting requirements.

4.3.1 Assumptions for Part 264 Compliance Cost Estimates

The costs for compliance with a typical 40 CFR Part 264 ground-water monitoring program is based on the following assumptions:

- A hydrogeologic investigation will be conducted to determine the number, location, and depth of ground-water monitoring wells. Information from the investigation also will aid in the selection of type and quantity of well construction materials and screen slot size. For the Part 264 ground-water monitoring

system, a total of 6 soil borings at various depths are assumed.[7] It is recognized that a hydrogeologic investigation can be significantly more complex than the one described for these cost functions. For example, additional costs might be incurred for tasks such as: geotechnical analyses of rock and soils samples, cone penetrometer surveys, geophysical surveys, aerial photo survey, and application of computer-based models.

- Part 264 does not specify the number of wells needed, but says the number of monitoring wells must consist of a sufficient number of wells to provide representative sampling of the upper-most aquifer. The number of wells found at permitted facilities is typically between 10 and 30, however, the number of wells can exceed 100 for very large facilities.[8] For the Part 264 ground-water monitoring system example used in this chapter a total of 15 wells are assumed: six upgradient wells (three shallow wells at the same depth and one cluster of three wells at different depths) and nine downgradient wells consisting of three, three-well clusters with the wells in each cluster at different depths.

- The Part 264 shallow (upgradient) wells are 50 ft. deep and the well clusters consist of three wells which are 45 ft., 90 ft., and 145 ft. deep.

- The capital costs for Part 264 wells assume the following construction and design characteristics:

    - Hollow stem drilling method;
    - Split spoon samples collected every 5 feet per well for visual classification of soil;
    - Two 3-inch thin wall samples collected per well for undisturbed sampling;
    - Two-inch diameter 304 stainless steel casing;
    - Grout with neat cement the length of the casing;
    - Two-inch diameter, 10-foot length stainless steel screen with gravel pack the length of the screen for shallow wells and 2-inch diameter, 5-foot length stainless steel screen with gravel pack the length of the screen for each cluster well;
    - Protective lock cover and three posts for each well;
    - Dedicated sampling system for withdrawing ground-water samples which includes the following items for each well:

        - Stainless steel down-well bladder pump[9],
        - Teflon lined twin connecting tubing,

[7] Note that the hydrogeologic investigation and installation of wells are not necessarily separate events, but they have been broken out as such in this chapter because complex sites usually require multiple phases of field work. On the other hand, if sufficient information already exists about a particular site, a hydrogeologic investigation might not be necessary, and the cost would not be included in the compliance cost estimate.

[8] Personal communication between Jim Brown (USEPA, OSW-PSPD) and Bob Stewart (SAIC). December 6, 1996.

[9] Use of dedicated bladder pumps is not typical industry practice, however, it is consistent with recent EPA guidance and research which discourages the use of bailers and states a preference for the use of pumps (such as bladder pumps) capable of low-flow (e.g., 0.1-0.5 L/min) sampling rates (see USEPA, 1992 and Puls and Barcelona, 1996).

    - Two-inch diameter well cap assembly,
    - Purging pump for reducing purging time and volume,
    - Support cable and inflation tubing for purging pump,
    - Teflon water-level measurement probe, and
    - Probe tubing; and

  - Sampling system network components which are needed to operate a dedicated sampling system and are independent of the number of ground-water monitoring wells at a facility:

    - Controller for purging pump for allowing inflation, adjustment, and verification of purging pump operation,
    - Digital readout indicator for water-level measurement probe, and
    - Portable electronic controller/compressor cart with gasoline engine for operating sampling and purging equipment.

- The facility will hire a local consulting firm to initiate and implement the ground-water monitoring program. The consulting firm will perform activities such as siting monitoring wells, preparing sampling and analysis plans, establishing background concentrations, developing a ground-water monitoring program, performing sampling and analysis, evaluating ground-water elevations, and submitting monitoring results to the Regional Administrator. The cost functions assume the use of a local consulting firm, therefore travel costs (i.e., time, transportation, and per diem) for the consultants have not been included. If a facility can not hire a local firm, travel costs should be estimated based on facility-specific circumstances.

- The facility will provide a facility engineer for oversight during the development and implementation of the monitoring program.

- Sample containers and preservatives will be supplied by the laboratory and the costs are included in the analytical costs.

- Part 264 ground-water monitoring regulations allow for waivers, exceptions, demonstrations, and procedures to be followed for statistically significant increases in constituent concentrations over initial background, etc. A "typical" ground-water monitoring program will not involve these types of exceptions or contingencies and therefore they were not included in the cost estimates as they are very site specific. For a Part 264 ground-water monitoring program, the facility will conduct detection monitoring (40 CFR 264.98) only.

4.3.2 Assumptions for Part 265 Compliance Cost Estimates

The costs for compliance for a minimum Part 265 ground-water monitoring program is based on the following assumptions:

- A hydrogeologic investigation will be conducted to determine the number, location, and depth of ground-water monitoring wells. Information from the investigation also will aid in the selection of type and quantity of well construction materials and screen slot size. For the Part 264 ground-water monitoring system, a total of 6 soil borings to 50 feet are assumed. It is recognized that a hydrogeologic investigations can be significantly more complex than the one described for these cost functions. For example, additional costs might be incurred for tasks such as: geotechnical analyses of rock and soils samples, cone penetrometer surveys, geophysical surveys, aerial photo survey, and application of computer-based models.

- For a Part 265 ground-water monitoring system, a minimum of four wells, one upgradient and three downgradient, as specified in the regulations (40 CFR 265.91(a)) is assumed.

- The Part 265 monitoring wells are 50 ft. deep.

- The capital costs for Part 265 wells assume the following construction and design characteristics:

  - Hollow stem drilling method;
  - Split spoon samples collected every 5 feet per well for visual classification of soil;
  - Two 3-inch thin wall samples collected per well for undisturbed sampling;
  - Two-inch diameter 304 stainless steel casing;
  - Grout with neat cement the length of the casing;
  - Two-inch diameter, 10-foot length stainless steel screen with gravel pack the length of the screen;
  - Protective lock cover and three posts for each well;
  - Dedicated sampling system for withdrawing ground-water samples which includes the following items for each well:
    - Stainless steel down-well bladder pump,
    - Teflon lined twin connecting tubing,
    - Two-inch diameter well cap assembly,
    - Purging pump for reducing purging time and volume,
    - Support cable and inflation tubing for purging pump,
    - Teflon water-level measurement probe, and
    - Probe tubing; and

  - Sampling system network components which are needed to operate a dedicated sampling system and are independent of the number of ground-water monitoring wells at a facility:

    - Controller for purging pump for allowing inflation, adjustment, and verification of purging pump operation,
    - Digital readout indicator for water-level measurement probe, and
    - Portable electronic controller/compressor cart with gasoline engine for operating sampling and purging equipment.

- The facility will hire a consulting firm to initiate and implement the ground-water monitoring program. The consulting firm will perform activities such as siting monitoring wells, preparing sampling and analysis plans, establishing background concentrations, developing a ground-water monitoring program, performing sampling and analysis, evaluating ground-water elevation, and submitting monitoring results to the Regional Administrator. The cost functions assume the use of a local consulting firm, therefore travel costs (i.e., time, transportation, and per diem) for the consultants have not been included. If a facility can not hire a local firm, travel costs should be estimated based on facility-specific circumstances.

- The facility will provide a facility engineer for oversight during the development and implementation of the monitoring program.

- Sample containers and preservatives will be supplied by the laboratory and the costs are included in the analytical costs.

- Parts 265 ground-water monitoring regulations allow for waivers, exceptions, demonstrations, and procedures to be followed for statistically significant increases in constituent concentrations over initial background, etc. A "typical" ground-water monitoring program will not involve these types of exceptions or contingencies and therefore they were not included in the cost estimates as they are very site specific.

4.4 Costs

This section provides detailed cost functions and cost estimates for implementing a detection monitoring program in compliance either 40 CFR Part 264 or Part 265. Section 4.4.1 presents detailed cost functions and cost estimates based on hypothetical scenarios, and Section 4.4.2 provides guidance for developing facility-specific costs estimates.

4.4.1 Cost Estimates for Implementing Detection Monitoring Under 40 CFR Parts 264 and 265

Tables 4-1 through 4-8 present compliance costs in 1996 dollars for a "typical" Part 264 ground-water detection monitoring program. Tables 4-9 through 4-16 present compliance costs in 1996 dollars for a minimum Part 265 ground-water detection monitoring program. For both the 264 and 265 systems, costs are presented in two parts: (1) initial costs incurred "up front" (to conduct the hydrogeologic investigation, install monitoring wells, and establish background concentrations), and (2) subsequent recurring costs for sampling, analysis, and reporting. The following exhibit provides a "road map" to the reader to aid in the use of the tables:

	Task Description	Cost Tables for Part 264 Ground-Water Monitoring System	Cost Tables for Part 265 Ground-Water Monitoring System
Initial "up front" Costs	Hydrogeologic Investigation	Table 4-1	Table 4-9
	Design, Installation, Maintenance of System	Table 4-2	Table 4-10
	Sampling and Analysis	Table 4-3 (Sampling) Table 4-4a (Analytical Costs - Field Samples) Table 4-4b (Analytical Costs - QC Samples)	Table 4-11 (Sampling) Table 4-12a (Analytical Costs - Field Samples) Table 4-12b (Analytical Costs - QC Samples)
	Reporting	Table 4-5	Table 4-13
Recurring/Annual Costs	Sampling and Analysis	Table 4-6 (Sampling) Table 4-7a (Analytical Costs - Field Samples) Table 4-7b (Analytical Costs - QC Samples)	Table 4-14 (Sampling) Table 4-15a (Analytical Costs - Field Samples) Table 4-15b (Analytical Costs - QC Samples)
	Reporting	Table 4-8	Table 4-16

These costs are provided as guidance. If sufficient information is available, unit quantities presented in the detailed cost functions can be adjusted as needed to derive facility-specific cost estimates, as discussed in the following sections.

4.4.2 Developing Facility-Specific Cost Estimates

This section provides guidance for adjusting certain unit quantities and cost presented in Section 4.4.1 to develop facility-specific costs estimates.

Hydrogeologic Investigation

- A hydrogeologic investigation can include a number of additional task not included in the cost estimates. For example, any of the following tasks may required depending on the quantity and quality of existing data and the complexity of subsurface conditions at the facility: geophysical survey, analysis of geotechnical sample (e.g., grain size distribution, Atterberg limits), aerial photography, and application of computer-based models.

Monitoring Well Capital Unit Costs

- **Mobilization/Demobilization**: Costs charged by drillers for mobilization and demobilization ("mob/demob") can vary significantly (from $1,000 to $10,000 or more) depending on the travel distance required by the drillers, the amount of materials and supplies to be transported (which is based on the number and depths of wells and borings), and type and number of rigs and other equipment required. Mob/demob costs for drillers should be adjusted according to facility-specific conditions. For example, if a site requires a small number of shallow wells, and a local driller is available, then a mob/demob cost of $1000 might be appropriate. If a site requires a large number of deep wells, and a local driller is not available, then mob/demob costs could exceed $10,000.

- **Well Casing and Screen Materials**: The cost models assume the use of two-inch stainless steel casing and screen materials. However, installation of 4-inch PVC monitoring wells is more common practice. PVC is resistant to corrosion, lightweight, low maintenances, and low cost. If 4-inch PVC wells are appropriate, typical unit costs are $21.00/ft for casing and $28.00/ft for screen and sand pack (including installation).

- **Drilling Costs**: Rates charged by drillers can differ from those presented in Tables 4-2 and 4-10. Facility-specific cost estimates for a hydrogeologic investigation and ground-water monitoring well installation can be obtained by contacting local well drillers. Site-specific variable that should be considered include:

  - Geologic material (e.g., sandy soil, clay soil, limestone, etc.) to be drilled which determines the drilling method (e.g., rotary, auger, jetting, etc);
  - Number of boreholes, depth, and split-spoon samples required;
  - Well diameter;
  - Well depth and length of screened interval;
  - Casing and screen material (e.g., stainless steel or PVC);
  - Number of wells drilled;
  - Number of rigs used to drill wells;
  - Distance traveled by drilling team to the site (affects mobilization/demobilization costs which can vary significantly); and
  - Level of contamination and personal protection required (e.g., Level B, C, D).

Analytical Methods and Costs

For a **Part 265** monitoring system (interim status facility), the constituents and monitoring frequency are established by the regulation. However, for the **Part 264** monitoring system (at a permitted facility), the indicator parameters and constituents for which monitoring must be performed are specified in the facility's permit by the permit writer and are based on examination of the wastes treated, stored, and disposed at the facility. If facility-specific costs for analysis of ground-water sample are required, parameters should be selected based on information in the facility's waste analysis plan, waste characterization, site hydrogeologic investigation, and any other waste-specific information available.

4.5 References

1. Nielsen, D.M., ed., Practical Handbook of Ground-Water Monitoring. Lewis Publishers, Chelsea, MI.

2. Puls, R.W. and M.J. Barcelona, 1996, EPA Ground Water Issue - Low-flow (Minimal Drawdown) Ground-Water Sampling Procedures (EPA/540/S-95/504). USEPA Office of Research and Development and Office of Solid Waste and Emergency Response, April 1996.

3. USEPA, 1986, Test Methods for Evaluating Solid Waste, SW-846. Office of Solid Waste, Washington, D.C.

4. USEPA, OWPE, "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document," September, 1986.

5. USEPA, Office of Solid Waste, "RCRA Ground-Water Monitoring: Draft Technical Guidance", EPA/530-R-93-001, November 1992.

6. USEPA, 1994, Supporting Statement for EPA Information Collection Request Number 959.09, "Facility Ground-Water Monitoring Requirements" (September 30, 1994).

7. USDOE, 1993, Ground-Water Monitoring Under RCRA (EH231-039/1193), Office of Environmental Guidance (November 1993).

8. Labor rates and hour estimates are based on DPRA's and SAIC's engineering/field experience. Drilling-related costs are based on sealed bids submitted to SAIC by drilling firms in support of various site investigations conducted by SAIC for government clients.

9. DPRA staff contacted two vendors by telephone in August 1991 and June 1992, to obtain ground-water monitoring well installation and dedicated sampling system components and equipment costs.

10. Labor rates were developed by DPRA in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

Table 4-1. Part 264 Monitoring System Hydrogeologic Investigation (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Develop Work Plan	Facility Engineer	40	hour	$70	2,800
(Define objectives, conduct preliminary	Project Manager	20	hour	$138	2,760
investigation, develop conceptual site	Geologist	20	hour	$50	1,000
model, perform project planning/costing)	Field Technician	20	hour	$38	760
Subtotal					$7,320
Conduct Field Investigation					
Driller Mobilization/Demobilization*	NA	1	lump	$3,000	3,000
Construct decon pad	NA	1	lump	$1,200	1,200
Hollow-stem auger drilling(d)	NA	705	foot	$12	8,460
Split spoon samples	NA	141	each	$26	3,666
Shelby Tube samples (1 per boring)	NA	6	each	$50	300
Grout	NA	1,150	foot	$7	8,050
Decontamination (1.5 hours/well or boring)	NA	9	hour	$125	1,125
Misc. supplies (Tyvek, gloves, etc.)	NA	1	lump	$373	373
Field Oversight/management (4 hours/well)	Geologist	60	hour	$125	7,500
Borehole Logging (4 hours/well)	Geologist	60	hour	$50	3,000
Travel time (consultants) (e)	NA	NA	NA	NA	site specific
Travel costs (consultants) (e)	NA	NA	NA	NA	site specific
Per Diem (consultants) (f)	NA	NA	NA	NA	site specific
Survey by licensed surveyor					
- Mobilization/demobilization	NA	1	lump	$400	400
- Grid points (borings)	NA	6	grid	$60	360
- Surveyor's report	NA	1	lump	$350	350
Subtotal					$37,784
Report Results/Findings (subsurface geology, ground-water flow paths,	Project Engineer	8	hour	$103	824
define uppermost aquifer)	Geologist	30	hour	$142	4,260
	Drafting	20	hour	$50	1,000
	Clerical	20	hour	$26	520
Subtotal					$6,579
Total					$51,683

Footnotes:

(a) SAIC best professional judgement.
(b) DPRA best professional judgement.
(c) Mobilizati*and demobilization costs can range between $1,000 to $10,000. Costs depend upon the number of drilling rigs required, distance traveled, and quantity of materials and supplies.
(d) 6 borings: 3 to 90 feet and 3 to 145 feet.
(e) This component is project specific.
(f) Per diem is based on location.

Table 4-2. Part 264 Monitoring System - Design, Install, and Maintain Ground-water Monitoring System (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Quantity	Unit	Unit Cost	Estimated Total Cost
Design Ground-Water Monitoring System (determine placement, number of wells, depth, screen intervals, and determine drilling method & well materials)	Project Engineer	12	hour	$103	1,236
	Geologist	20	hour	$50	1,000
Subtotal					$2,234
Install Ground-Water Monitoring System *					
Mobilization/Demobilization (d)	NA	1	lump	$3,000	3,000
Construct decon pad	NA	1	lump	$1,200	1,200
Hollow-stem auger drilling *	NA	1,270	foot	$12	15,240
Split spoon samples	NA	254	each	$26	6,604
Well casing (e)	NA	1,180	foot	$16	18,880
Screen (f)	NA	90	foot	$53	4,770
Gravel pack	NA	120	foot	$11	1,320
Grout	NA	1,150	foot	$7	8,050
Surface Completion (g)	NA	15	each	$463	6,945
Decontamination (1.5 hours/boring or well)	NA	23	hour	$125	2,875
Misc. supplies (Tyvek, gloves, etc.)	NA	1	each	$373	373
Travel time (consultants) (h)	NA	NA	NA	NA	site specific
Travel costs (consultants) (h)	NA	NA	NA	NA	site specific
Per Diem (consultants) (i)	NA	NA	IA	NA	site specific
Field oversight/management (4 hours/well)	Project Engineer	60	hour	$103	6,180
Log wells/supervise drillers (4 hours/well)	Geologist	60	hour	$50	3,000
Subtotal					$78,366
Maintain Wells					
Survey by licensed surveyor					
- Mobilization/demobilization	NA	1	lump	$400	400
- Well points	NA	15	each	$100	1,500
- Surveyor's report	NA	1	each	$350	350
Develop monitoring wells (4 hours/well)	Geologist	60	hour	$50	3,000
Develop monitoring wells (4 hours/well)	Field Technician	60	hour	$39	2,340
Development pump & generator					
- Controller for purging pump	NA	1	site	$106	106
- Digital readout indicator for water measurement probe	NA	1	site	$2,109	2,109
- Portable electronic controller	NA	1	site	$3,597	$3,597

Table 4-2. Part 264 Monitoring System - Design, Install, and Maintain Ground-water Monitoring System (1997 Dollars) (continued)

Component or Task	Type of Personnel(a)(b)	Quantity	Unit	Unit Cost	Estimated Total Cost
Install dedicated bladder sampling pump					
- Stainless steel down-well bladder pump	NA	15	each	$680	$10,200
- Teflon lined twin connecting tubing	NA	1,165	foot	$3.35	$3,903
- 2-inch diameter well cap assembly	NA	15	each	$55	$825
- Purging pump	NA	15	each	$475	$7,125
- Support cable and inflation tubing for purging pump	NA	1,165	foot	$2.00	$2,330
- Teflon water-level measurement probe	NA	15	each	$45	$675
- Probe tubing	NA	1,195	foot	$2.80	$3,346
Subtotal					$41,829
Determine Groundwater Flow Rate and Direction					
Preparation time for slug test	Field Technician	2	hour	$39	$79
Conduct Slug Test (2 times per year)	Field Technician	3	hour	$39	$118
Analyze Data for Hydraulic Conductivity	Project Engineer	2	hour	$103	$206
Determine Gradient, Direction, and Flow Rate	Project Engineer	4	hour	$103	$411
Subtotal					$814
Total					$121,009

Footnotes:

(a) SAIC best professional judgment.
(b) DPRA best professional judgment.
(c) The Part 264 system is assumed to consist of six upgradient wells (3 shallow wells at 50 ft depth and one cluster of three wells at 45, 95, and 145 feet) and 9 downgradient wells consisting of three, three-well clusters with each well at different depths 45, 90, and 145 feet.
(d) Mobilization and demobilization costs can range between $1,000 to $10,000. Costs depend upon the number of drilling rigs required, distance traveled, and quantity of materials and supplies.
(e) Well casings are 35 feet for 45 foot wells, 80 feet for 90 foot wells, 135 feet for 145 foot wells, and 40 feet for 50 foot wells.
(f) Screen length equals 10 feet per well for 50 foot shallow wells and 5 feet per well for cluster wells.
(g) Includes cement, gravel, posts, locks, etc., for each well.
(h) This component is project specific.
(I) Per diem is based on location.

Table 4-3. Part 264 Monitoring System - Sampling and Analysis - Initial (First Year) Costs (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit cost	Estimated Total Cost
Presampling Activities					
Develop Sampling & Analysis Plan/QAPjP	Project Engineer	50	hour	$103	$5,143
	Drafting	10	hour	$50	$495
	Clerical	10	hour	$26	$257
	Project Manager	6	hour	$142	$850
Assemble equipment & supplies (8 hours/sampling event)(c)	Field Technician	32	hour	$39	$1,261
Subtotal					$8,006
Field Measurements and Sample Collection(c)					
Travel time (consultants) (d)	NA	NA	NA	NA	site specific
Travel costs (consultants) (d)	NA	NA	NA	NA	site specific
Per Diem (consultants) (e)	NA	NA	NA	NA	site specific
Measure depth, static water level, purge, and sample (2 hours/well)	Geologist	120	hour	$50	$6,000
Prepare samples (filter, preserve, containerize, etc.) (0.5 hours/well)	Field Technician	30	hour	$39	$1,182
Chain of custody/sample packaging/shipping (0.5 hours/well)	Field Technician	30	hour	$39	$1,182
Decontamination/demobilization (0.5 hours/well)	Field Technician	30	hour	$39	$1,182
Subtotal					$9,545
Sample Analysis - Tables 4-4a and 4-4b for costs					$98,021
Total					$115,572

Footnotes:

(a) SAIC best professional judgement.
(b) DPRA best professional judgement.
(c) Assumes 4 sampling events during the first year.
(d) This component is project specific.
(e) Per diem is based on location.

Table 4-4a. Part 264 Monitoring System - Analytical Costs - First Year (1997 Dollars)

Field Samples:	Samples per Well	Unit Cost Per Sample	Min. Number Of Wells	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)					
Facility-specific parameters as required by the permit (a)					
- Metals	1	$203	15	4	$12,165
- Organochlorine pesticides and PCBs	1	$176	15	4	$10,570
- Chlorinated herbicides	1	$154	15	4	$9,230
- Volatile Organics	1	$196	15	4	$11,740
- Semivolatile organics	1	$409	15	4	$24,560
Subtotal					$68,265
Indicator Parameters					
- Specific conductance (b)	1	$10	15	4	$600
- TOC	1	$35	15	4	$2,100
- TOX	1	$75	15	4	$4,500
Subtotal					$7,200
Total					$75,465

Footnotes:

(a) The most common facility-specific parameters are metals and volatiles. Costs for other methods are provided but these are NOT typically required.
(b) Specific conductance should be field determined.

Table 4-4b. Part 264 Monitoring System - First Year QC Samples (1997 Dollars)

QC Samples(a)	Total QC samples/event	Unit Cost (Per Sample)	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)				
Appendix III, 40 CFR Part 265				
- Metals	4	$203	4	$3,244
- Organochlorine pesticides and PCBs	4	$203	4	$3,248
- Chlorinated herbicides	4	$154	4	$2,464
- Volatile Organics	4	$196	4	$3,136
- VOA Trip Blank	5	$196	4	$3,920
- Semivolatile organics	4	$409	4	$6,544
Total				$22,556

Footnote:

(a) QC samples assume 1 field duplicate, 1 field blank, 1 VOA trip blank, and 2 lab QC samples per sampling event.

Table 4-5. Part 264 Monitoring System - Data Evaluation, Statistical Analysis, and Reporting - Initial (First Year) Costs (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity(a)(b)	Unit	Unit Cost	Estimated Total Cost
Evaluate Data Quality (c)					
- Perform data validation and reduction	Chemist	360	hour	$50	$18,000
- Create, edit, correct database					
Determine background and if there is a statistically	Geologist	8	hour	$50	$400
- Significant evidence of contamination (d)					
Prepare and submit report to regulatory authority	Project Manager	5	hour	$142	$709
	Project Engineer	25	hour	$103	$2,571
	Attorney	1	hour	$99	$99
	Clerical	10	hour	$26	$257
Total					$22,036

Footnotes:

(a) SAIC best professional judgement.
(b) U.S. EPA, "Supporting Statement for EPA ICR Number 959.09," September 30, 1994.
(c) Assume 1 hour of QC review per field sample per analyte group. Assume 15 field samples, 6 analyte groups for 4 sampling events.
(d) Report is submitted after at least 4 rounds of sampling.

Table 4-6. Part 264 Monitoring System – Sampling and Analysis Costs – Subsequent Years (1997 Dollars)

Component or Task	Type of Personnel(a)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Presampling Activities					
Assemble equipment & supplies (d)	Field Technician	4	hours	$39	$158
Subtotal					$158
Field Measurements and Sample Collection (e)					
Travel time (consultants) (f)	NA	NA	NA	NA	site-specific
Travel costs (consultants) (f)	NA	NA	NA	NA	site-specific
Per Diem (consultants) (g)	NA	NA	NA	NA	site-specific
Measure depth, static water level, purge, and sample (2 hours/well)	Geologist	60	hours	$50	$3,000
Prepare samples (filter, preserve, containerize, etc.) (0.5 hours/well)	Field Technician	15	hours	$39	$591
Chain of custody/sample packaging/shipping (0.5 hours/well)	Field Technician	15	hours	$39	$591
Decontamination/demobilization (0.5 hours/well)	Field Technician	15	hours	$39	$591
Subtotal					$4,773
Sample Analysis - See Tables 4-7a and 4-7b for costs					$49,011
Total					$53,941

Footnotes:

(a) DPRA best professional judgement.
(b) SAIC best professional judgement.
(c) Assumes the sampling and analysis plan for the first-year of monitoring is adequate for subsequent years.
(d) Assumes 2 sampling events per year.
(e) Assumes 2 ground-water sampling events per year.
(f) This component is project specific.
(g) Per diem is based on location.

Table 4-7a. Part 264 Monitoring System – Analytical Costs – Subsequent Years (1997 Dollars)

Field Samples:	Samples per Well	Unit Cost Per Sample	Min. Number of Wells	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)					
Facility-specific parameters as required by the permit					
- Metals	1	$203	15	2	$6,083
- Organochlorine pesticides and PCBs	1	$176	15	2	$5,285
- Chlorinated herbicides	1	$154	15	2	$4,615
- Volatile Organics	1	$196	15	2	$5,870
- Semivolatile organics	1	$409	15	2	$12,280
Subtotal					$34,133
Indicator Parameters					
- Specific conductance (b)	1	$10	15	2	$300
- TOC	1	$35	15	2	$1,050
- TOX	1	$75	15	2	$2,250
Subtotal					$3,600
Total					$37,733

Footnotes:

(a) The most common parameters for permitted facilities are metals and volatiles. Cost for other methods are provided but these are NOT typically required by the permit.
(b) Specific conductance should be field determined.

Table 4-7b. Part 264 Monitoring System – Subsequent Year QC Samples (1997 Dollars)

QC Samples(c)	Total QC Samples/Event	Unit Cost (Per Sample)	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)				
Appendix III, 40 CFR Part 265				
- Metals	4	$203	2	$1,622
- Organochlorine pesticides and PCBs	4	$203	2	$1,624
- Chlorinated herbicides	4	$154	2	$1,232
- Volatile Organics	4	$196	2	$1,568
- VOA Trip Blank	5	$196	2	$1,960
- Semivolatile organics	4	$409	2	$3,272
Total				$11,278

Footnote:

(a) QC samples assume 1 field duplicate, 1 field blank, 1 VOA trip blank, and 2 lab QC per sampling event.

Table 4-8. Part 264 Monitoring System - Data Evaluation, Statistical Analysis, and Reporting - Subsequent Years (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity(a)(b)	Unit	Unit Cost	Estimated Total Cost
Evaluate Data Quality (c)(d)					
- Perform data validation and reduction	Chemist	180	hour	$50	$9,000
- Create, edit, correct data base					
Determine background and if there is a statistically significant evidence of contamination (d)	Geologist	16	hour	$50	$800
Prepare and submit report to regulatory authority (d)	Project Manager	5	hour	$142	$709
	Project Engineer	25	hour	$103	$2,571
	Attorney	1	hour	$99	$99
	Clerical	10	hour	$26	$257
Total					$13,436

Footnotes:

(a) SAIC best professional judgement.
(b) U.S. EPA, "Supporting Statement for EPA ICR Number 959.09," September 30, 1994.
(c) Assume 1 hour of QC review per field sample per analyte group. Assume 15 field samples, 6 analyte groups for 2 sampling events.
(d) This component occurs every 6 months.

Table 4-9. Part 265 Monitoring System – Hydrogeologic Investigation (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Develop Work Plan	Facility Engineer	40	hour	$70	$2,800
(Define objectives, conduct preliminary	Project Manager	20	hour	$142	$2,835
investigation, develop conceptual site	Geologist	20	hour	$50	$1,000
model, perform project planning/costing)	Field Technician	20	hour	$39	$788
Subtotal					$7,423
Conduct Field Investigation					
Driller Mobilization/Demobilization (c)	NA	1	lump	$3,000	$3,000
Construct decon pad	NA	1	lump	$1,200	$1,200
Hollow-stem auger drilling (d)	NA	300	foot	$12	$3,600
Split spoon samples	NA	60	each	$26	$1,560
Shelby Tube samples (1 per boring)	NA	6	each	$50	$300
Grout	NA	300	foot	$7	$2,100
Decontamination (1.5 hours/well or boring)	NA	9	hour	$125	$1,125
Misc. supplies (Tyvek, gloves, etc.)	NA	1	lump	$373	$373
Field oversight/management (4 hours/well)	Project Engineer	16	hour	$99	$1,590
Log wells/supervise drillers (4 hours/well)	Geologist	16	hour	$50	$800
Travel time (consultants) (e)	NA	NA	NA	NA	site specific
Travel costs (consultants) (e)	NA	NA	NA	NA	site specific
Per Diem (consultants) (f)	NA	NA	NA	NA	site specific
Survey by licensed surveyor					
- Mobilization/demobilization	NA	1	lump	$400	$400
- Grid points (borings)	NA	6	grid	$60	$360
- Surveyor's report	NA	1	lump	$350	$350
Subtotal					$16,758
Report Results/Findings (subsurface geology, ground-water flow paths,	Project Engineer	40	hour	$103	$4,114
define uppermost aquifer)	Project Manager	4	hour	$142	$567
	Drafting	8	hour	$50	$396
	Clerical	8	hour	$39	$315
Subtotal					$5,393
Total					$29,573

Footnotes:

(a) SAIC best professional judgement.
(b) DPRA best professional judgement.
(c) Mobilization and demobilization costs can range between $1,000 to $10,000. Costs depend upon the number of drilling rigs required, distance traveled, and quantity of materials and supplies.
(d) 6 borings each at 50 feet deep.
(e) This component is project specific.
(f) Per diem is based on location.

Table 4-10. Part 265 Monitoring System - Design, Install, and Maintain Ground-water Monitoring System (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Design Ground-Water Monitoring System (determine placement, number of wells, depth, screen intervals, and determine drilling method & well materials)	Project Engineer	12	hour	$103	$1,234
	Geologist	20	hour	$50	$1,000
Subtotal					$2,234
Install Ground-Water Monitoring System (c)					
Mobilization/Demobilization (d)	NA	1	lump	$3,000	$3,000
Construct decon pad	NA	1	lump	$1,200	$1,200
Hollow-stem auger drilling (4 50-foot wells)	NA	200	foot	$12	$2,400
Split spoon samples	NA	40	each	$26	$1,040
Well casing (e)	NA	160	foot	$16	$2,560
Screen (f)	NA	40	foot	$53	$2,120
Gravel pack	NA	48	foot	$11	$528
Grout	NA	152	foot	$7	$1,064
Surface Completion (g)	NA	4	each	$463	$1,852
Decontamination (1.5 hours/boring or well)	NA	6	hour	$125	$750
Misc. supplies (Tyvek, gloves, etc.)	NA	1	each	$373	$373
Travel time (consultants) (h)	NA	NA	NA	NA	site specific
Travel costs (consultants) (h)	NA	NA	NA	NA	site specific
Per Diem (consultants) (i)	NA	NA	NA	NA	site specific
Field oversight/management (4 hours/well)	Project Engineer	16	hour	$103	$1,646
Log wells/supervise drillers (4 hours/well)	Geologist	16	hour	$50	$800
Subtotal					$19,333
Maintain Wells					
Survey by licensed surveyor					
- Mobilization/demobilization	NA	1	lump	$400	$400
- Well points	NA	4	each	$100	$400
- Surveyor's report	NA	1	each	$350	$350
Develop monitoring wells (4 hours/well)	Geologist	16	hour	$50	$800
Develop monitoring wells (4 hours/well)	Field Technician	16	hour	$39	$630
Development pump & generator	NA	1	site	$5,782	$5,782
- Controller for purging pump	NA	1	site	$106	$106
- Digital readout indicator for water measurement probe	NA	1	site	$2,109	$2,109
- Portable electronic controller	NA	1	site	$3,597	$3,597

Table 4-10. Part 265 Monitoring System - Design, Install, and Maintain Ground-water Monitoring System (1997 Dollars) (continued)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Install dedicated sampling pump					
- Stainless steel down-well bladder pump	NA	4	each	$680	$2,720
- Teflon-lined twin connecting tubing	NA	156	foot	$3.35	$523
- 2-inch diameter well cap assembly	NA	4	each	$55	$220
- Purging pump	NA	4	each	$475	$1,900
- Support cable and inflation tubing for purging pump	NA	156	foot	$2.00	$312
- Teflon water-level measurement probe	NA	1	each	$45	$45
- Probe tubing	NA	164	foot	$2.80	$459
Subtotal					$20,353
Ground-water Quality Assessment Outline (40 CFR 265.93(a))					
	Project Engineer	24	hour	$103	$2,469
	Geologist	4	hour	$50	$200
	Clerical	4	hour	$26	$103
Subtotal					$2,771
Determine Groundwater Flow Rate and Direction					
- Preparation time for slug test	Field Technician	2	hour	$39	$79
- Conduct Slug Test (4 times per year)	Field Technician	2	hour	$39	$59
- Analyze Data for Hydraulic Conductivity	Project Engineer	2	hour	$103	$206
- Determine Gradient, Direction, and Flow Rate	Project Engineer	4	hour	$103	$411
Subtotal					$755
Total					$43,212

Footnotes:

(a) SAIC best professional judgement.
(b) DPRA best professional judgement.
(c) The Part 265 System consists of a minimum of 4 wells, 1 upgradient and 3 downgradient. All monitoring wells are 50 feet deep.
(d) Mobilization and demobilization costs can range between $1,000 to $10,000. Costs depend upon the number of drilling rigs required, distance traveled, and quantity of materials and supplies.
(e) Well casings are 40 feet for 50-foot wells.
(f) Screen length equals 10 feet per well for 50-foot shallow wells.
(g) Includes cement, gravel, posts, locks, etc., for each well.
(h) This component is project specific.
(i) Per diem is based on location.

Table 4-11. Part 265 Monitoring System - Sampling and Analysis - Initial (First Year) Costs (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Presampling Activities					
Develop Sampling & Analysis Plan/QAPjP	Project Engineer	40	hour	$101	$4,041
•	Drafting	8	hour	$49	$389
•	Clerical	8	hour	$25	$202
•	Project Manager	4	hour	$139	$557
Assemble equipment & supplies (8 hours/sampling event)(c)	Field Technaician	32	hour	$39	$1,238
Sutototal					$6,426
Field Measurements and Sample Collection (c)					
Travel time (consultant) (d)	NA	NA	NA	NA	site specific
Travel costs (consultant) (d)	NA	NA	NA	NA	site specific
Per Diem (consultant) (e)	NA	NA	NA	NA	site specific
Measure depth, static water level, purge, and sample (2 hours/well)	Geologist	32	hour	$50	$1,600
Prepare samples (filter, preserve, containerize, etc.) (0.5 hours/well)	Field Technaician	8	hour	$39	$309
Chain of custody/sample packaging/shipping (0.5 hours/well)	Field Technician	8	hour	$39	$309
Decontamination/demobilization (0.5 hours/well)	Field Technicial	8	hour	$39	$309
Subtotal					$8,955
Sample Analysis - See Tables 4-12a and 4-12b for costs					$34,648
Total					$50,029

Footnotes:

(a) SAIC best professional judgement.
(b) DPRA best professional judgement.
(c) Assumes 4 sampling events during the first year.
(d) This component is project specific.
(e) Per diem is based on location.

Table 4-12a. Part 265 Monitoring System – Analytical Costs – First Year (1997 Dollars)

Field Samples:	Samples per Well	Unit Cost Per Sample	Min. Number of Wells	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)					
Appendix III, 40 CFR Part 265					
- Metals (As, Ba, Cd, Cr, F2, Pb, Hg, N, Se, Ag)	1	$203	4	4	$3,244
- Pesticides (Endrine, Lindane, Methoxychlor, Toxaphene)	1	$125	4	4	$2,000
- Herbicides (2,4-D, 2,4,5-TP Silvex)	1	$125	4	4	$2,000
- Radium	1	$125	4	4	$2,000
- Gross alpha	1	$50	4	4	$800
- Gross beta	1	$50	4	4	$800
- Coliform Bacteria	1	$50	4	4	$800
Subtotal					$11,644
Ground-water quality parameters (265.92(b)(2))					
- Chloride	1	$15	4	4	$240
- Sulfate	1	$15	4	4	$240
- Metals (Fe, Mg, Na)	1	$40	4	4	$640
- Phenols	1	$50	4	4	$800
Subtotal					$1,920
Indicator parameters (265.92(b)(3))**					
- pH(a)	4	$10	4	4	$640
- Specific conductance(a)	4	$10	4	4	$640
- TOX	4	$75	4	4	$4,800
- TOC	4	$35	4	4	$2,240
Subtotal					$8,320
Total					$21,884

** Part 265.92(c)(2) requires four replicates of the indicator parameters for each sampling event.

Footnote:

(a) pH and specific conductance should be field determined.

Table 4-12b. Part 265 Monitoring System - First Year QC Samples (1997 Dollars)

QC Samples (a)	Total QC samples/event	Unit Cost (Per Sample)	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)				
Appendix III, 40 CFR Part 265				
- Metals (As, Ba, Cd, Cr, F2, Pb, Hg, N, Se, Ag)	4	$203	4	$3,244
- Pesticides (Endrine, Lindane, Methoxychlor, Toxaphene)	4	$125	4	$2,000
- Herbicides (2,4-D, 2,4,5-TP Silvex)	4	$125	4	$2,000
- Radium	4	$125	4	$2,000
- Gross alpha	4	$50	4	$800
- Gross beta	4	$50	4	$800
Subtotal				$10,844
Ground-water quality parameters (265.92(b)(2))				
- Chloride	4	$15	4	$240
- Sulfate	4	$15	4	$240
- Metals (Fe, Mg, Na)	4	$40	4	$640
- Phenols	4	$50	4	$800
Subtotal				$1,920
Total				$12,764

Footnote:

(a) QC samples assume 1 field duplicate, 1 field blank, and 2 lab QC samples per sampling event.

Table 4-13. Part 265 Monitoring - System Data Evaluation, Statistical Analysis, Reporting - Initial (First Year) Costs (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity (a)(b)	Unit	Unit Cost	Estimated Total Cost
Outline of ground-water quality assessment (40 CFR 265.93(a))	Project Engineer	24	hour	$103	$2,469
	Clerical	4	hour	$26	$103
	Project Manager	4	hour	$142	$567
Subtotal					$3,138
Evaluate Data Quality(c)(e)					
- Perform data validation and reduction	Chemist	112	hour	$50	$5,600
- Create, edit, correct data base					
Determine background and determine if there is statistically significant evidence of contamination(d)	Geologist	8	hour	$50	$400
Prepare and submit report to regulatory authority(c)	Project Engineer	5	hour	$103	$514
	Project Manager	25	hour	$142	$3,544
	Attorney	1	hour	$99	$99
	Clerical	10	hour	$26	$257
Subtotal					$10,414
Total					$13,552

Footnotes:

(a) SAIC best professional judgement
(b) U.S. EPA, "Supporting Statement for EPA ICR Number 959.09," September 30, 1994.
(c) The reports from this component is submitted quarterly.
(d) The report from this component is submitted only once at the end of the first year.
(e) Assume 1 hour of QC review per field sample per analyte group. Assume 16 field samples the first year and 7 analyte groups.

Table 4-14. Part 265 Monitoring System - Sampling and Analysis Costs - Subsequent Years (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Presampling Activities (c)					
Assemble equipment & supplies(d)	Field Technician	4	hour	$39	$158
Subtotal					$158
Field Measurements and Sample Collection (e)					
Travel time (consultants) (f)	NA	NA	NA	NA	site specific
Travel costs (consultants) (f)	NA	NA	NA	NA	site specific
Per Diem (consultants) (g)	NA	NA	NA	NA	site specific
Measure depth, static water level, purge, and sample (2 hours/well)	Geologist	32	hour	$50	$1,600
Prepare samples (filter, preserve, containerize, etc.) (0.5 hours/well)	Field Technician	8	hour	$39	$315
Chain of custody/sample packaging/shipping (0.5 hours/well)	Field Technician	8	hour	$39	$315
Decontamination/demobilization (0.5 hours/well)	Field Technician	8	hour	$39	$315
Subtotal					$2,545
Sample Analysis - See Tables 4-15a and 4-15b for costs					$3,440
Total					$6,143

Footnotes:

(a) DPRA best professional judgement.
(b) SAIC best professional judgement.
(c) Assumes the sampling and analysis plan for the first-year of monitoring is adequate for subsequent years.
(d) Assumes 2 sampling events per year.
(e) Assumes 2 ground-water sampling events per year.
(f) This component is project specific.
(g) Per diem is based on location.

Table 4-15a. Part 265 Monitoring System - Analytical Costs - Subsequent Years (1997 Dollars)

Field Samples:	Samples per Well	Unit Cost Per Sample	Min. Number Of Wells	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)					
Ground-water quality parameters (265.92(b)(2)) (sample annually)					
- Chloride	1	$15	4	1	$60
- Sulfate	1	$15	4	1	$60
- Metals (Fe, Mg, Na)	1	$40	4	1	$160
- Phenols	1	$50	4	1	$200
Indicator Parameters (265.92(b)(3)) (sample semi-annually)					
- pH (a)	1	$10	4	2	$80
- Specific Conductance (a)	1	$10	4	2	$80
- TOX	1	$75	4	2	$600
- TOC	1	$35	4	2	$280
Total					$1,520

Footnote:

(a) pH and specific conductance should be field determined.

Table 4-15b. Part 265 Monitoring System - Subsequent Year QC Samples (1997 Dollars)

QC Samples (a)	Total QC samples/event	Unit Cost (Per Sample)	Frequency (events/yr)	Estimated Total Cost
Sample Analysis (prices include reporting)				
Ground-water quality parameters (265.92(b)(2))				
- Chloride	4	$15	4	$240
- Sulfate	4	$15	4	$240
- Metals (Fe, Mg, Na)	4	$40	4	$640
- Phenols	4	$50	4	$800
Total				$1,920

Footnote:

(a) QC samples assume 1 field duplicate, 1 field blank, and 2 lab QC sample per sampling event.

Table 4-16. Part 265 Monitoring System – Data Evaluation, Statistical Analysis, and Reporting – Subsequent Years (1997 Dollars)

Component or Task	Type of Personnel(a)(b)	Estimated Quantity (a)(b)	Unit	Unit Cost	Estimated Total Cost
Evaluate Data Quality (c)					
– Perform data validation and reduction	Chemist	48	hour	$50	$2,400
– Create, edit, correct data base					
Determine background and determine if there is statistically significant evidence of contamination(d)	Geologist	8	hour	$50	$400
Prepare and submit annual report to regulatory authority	Project Engineer	5	hour	$103	$514
	Project Manager	25	hour	$142	$3,544
	Attorney	1	hour	$99	$99
	Clerical	10	hour	$26	$257
Total					$7,214

Footnotes:

(a) DPRA best professional judgment
(b) U.S. EPA, "Supporting Statement for EPA ICR Number 959.09", September 30, 1994.
(c) Assumes 1 hour of QC review per field sample per analyte group. Assumes 8 field samples for subsequent years and 7 analyte groups.
(d) The reports from this component are submitted annually.

CHAPTER 5. OFF-SITE MANAGEMENT OF WASTES

This chapter presents unit prices for transportation, treatment, recycling, and disposal of wastes for use in calculating the economic benefits of noncompliance with RCRA regulations. The number of items identified in this chapter are limited. The case development officer should review appropriate State and local regulations to determine if an additional economic benefit was gained by avoiding the payment of permit fees, etc. This chapter is divided into the following three sections: definitions, commercial transportation, and commercial hazardous waste treatment, recycling, and disposal.

5.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter.

Contaminated Soil — Waste that is primarily soil contaminated with any listed or characteristic waste.

Halogenated Solvents — Any liquid waste that contains an organic constituent listed in the F001-F005 definitions, with greater than 0.1 percent halogen content and greater than 90 percent organic content.

Nonhalogenated Solvent — Any liquid waste that contains an organic constituent listed in the F001-F005 definitions, with less than 0.1 percent halogen content and greater than 90 percent organic content.

Halogenated Organic Liquids — Any liquid waste that does not contain a constituent listed in the F001-F005 definitions, with greater than 0.1 percent halogen content and greater than 90 percent organic content.

Nonhalogenated Organic Liquids — Any liquid waste that does not contain a constituent listed in the F001-F005 definitions, with less than 0.1 percent halogen content and greater than 90 percent organic content.

Mixed Organic/Inorganic Liquids — Any liquid waste with organic content between 1 and 90 percent.

Inorganic Liquids with Organics — Any liquid waste with an organic content less than 1 percent, but no metals exceeding 1 ppm.

Inorganic Liquids with Metals — Any inorganic liquid waste that contains RCRA-regulated metals in excess of 1 ppm and trace amounts (< 1 ppm) of organic content.

Halogenated Organic Sludges/Solids	Any waste that has greater than 5 percent suspended solids, greater than 0.1 percent halogen content, and greater than 90 percent organic content.
Nonhalogenated Organic Sludges/Solids	Any waste that has greater than 5 percent suspended solids, less than 0.1 percent halogen content, and greater than 90 percent organic content.
Mixed Organic/Inorganic Sludges/Solids	Any waste with greater than 5 percent suspended solids and with an organic content between 1 and 90 percent.
Inorganic Sludges/Solids Solids with Metals	Any waste with greater than 5 percent suspended solids and with at least 10 ppm of RCRA-regulated metals, and trace amounts (<1 ppm) of organic content.
Contaminated Debris	Waste consisting of concrete, wood, rags, protective clothing, piping, decommissioned tanks and reactors, etc., contaminated with any listed or characteristic waste.
PCB Solids	Some States have designated PCBs as hazardous under the State's hazardous waste management program. PCB solids are defined as PCB waste with greater than 5 percent suspended solids including drummed wastes, capacitors, transformers, electric motors, pumps, etc.
PCB Liquids	Some States have designated PCBs as hazardous under the State's hazardous waste management program. PCB liquids are defined as PCB waste with less than 5 percent suspended solids.

5.2 Commercial Transportation

Commercial prices for transporting three different waste types--bulk liquids, bulk solids, and drums (55-gallon)--over a range of one-way haul distances are estimated using DPRA's Transportation Cost Model. The assumptions made in using the Transportation Cost Model and in developing the transportation prices are documented in the following section.

5.2.1 Assumptions

DPRA's Transportation Cost Model determines the total price and unit price for commercially transporting a specified amount of waste a designated distance. The model calculates the price based on parameters selected

by the user such as: vehicle capital costs, annual costs (i.e., driver's wage, fuel, oil, tires, maintenance, and repairs), overhead rate, insurance, taxes, general and administrative rate, profit, interest rate, the truck speed and gas mileage, time for loading/unloading the vehicle, and the amortization period. The model's three most critical parameters in determining the transportation price are the driver's wage, the profit rate, and the vehicle load/unload time. The following assumptions are used:

- Full net loads for the trucks range from 20 to 25 tons, resulting in combined weights which do not exceed the legal limit of 80,000 pounds (gross vehicle weight).

- Bulk liquids are transported in a 6,000 gallon tanker with a full net load of 25 tons which is based on a waste density of 8.34 lb/gal. Two hours for loading/unloading the tanker is assumed.

- Bulk solids are transported in a 20 cubic yard roll-off trailer with a full net load of 24 tons which is based on a waste density of 1.2 ton/yd ^{3}. A one-hour time requirement is assumed for loading/unloading the trailer.

- Drummed wastes (55-gallon drums) are transported in an enclosed trailer with a full net load of 20 tons which is based on a waste density of 500 lb/drum and a trailer capacity of 80 drums. A three-hour time requirement is assumed for loading/unloading the trailer.

- A profit rate of 15 percent is assumed for the transporter.

- The unit prices are based on a full truck load of waste from one RCRA violator.

- The one-way distances selected for transportation price development are based on experience in developing costs in regulatory support of EPA's land disposal restriction program.

5.2.2 Transportation Prices

Table 5-1 presents unit prices in 1996 dollars for transporting bulk liquid, bulk solid, and drummed wastes for a range of distances. The distances shown in Table 5-1 have been selected based on cost estimating experience from numerous EPA regulatory support projects. [10] Price estimates are reported in dollars per ton-mile for all three waste types, and in dollars per gallon for bulk liquids, dollars per ton for bulk solids, and dollars per drum for drummed wastes. If site-specific information on the haul distance from the RCRA violator's facility to a commercial treatment or disposal facility is not available, the following one-way distances are recommended:

Commercial treatment or disposal facility	100 - 200 miles one-way
Cement kiln	200 miles one-way
Incinerator	500 miles one-way

[10] The prices charged by commercial transportation companies may vary from region-to-region and state-to-state, therefore, it is recommended that the Case Development Officer contact a nearby hazardous waste transporter to obtain a local price quote.

It should be noted that the transportation unit prices shown in Table 5-1 are based on a full truck load of waste from one RCRA violator. Partial truck loads will result in higher unit prices than those presented in Table 5-1. Unit prices for transporting partial truck loads for the distances and waste types shown in Table 5-1 can be estimated as follows: [($/ton-mile x full net load x one-way distance)/tons to be hauled] or [($/ton x full net load)/ton to be hauled/one- way distance]. For example, the unit price for transporting 20 tons of bulk solids 50 miles one-way is estimated as follows: [($0.20/ton-mile x 24 tons x 50 miles)/20 tons] = $12/ton or [($10.70/ton x 24 tons)/20 tons/50 miles] = $0.25/ton-mile.

5.2.3 References

1. Commercial transportation costs were obtained from the Transportation Cost Model DPRA developed for the U.S. EPA in 1985. The model was intended to assist EPA in cost estimation projects by calculating the transportation cost of various types of solid and hazardous wastes. The model contains both hardwired- and user-specified unit costs. Hardwired costs were updated to 1992 dollars assuming an inflation rate of five percent per year. User-specified unit costs were obtained in 1992 dollars.

2. All dollar values and costs developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

5.3 Commercial Hazardous Waste Treatment and Disposal

Commercial prices are developed for treating and disposing 15 different hazardous waste types based on price quotes obtained from hazardous waste treatment and disposal vendors. The waste types and the management options are based on the Superfund Amendments and Reauthorization Act (SARA) waste types and management categories used by EPA staff in developing capacity assurance plans under RCRA. The SARA waste types and management categories are defined in the "Technical Reference Manual for Reporting the Current Status of Generation, Management Capacity, Imports and Exports," (January 1989). The definitions and assumptions made in developing the hazardous waste treatment and disposal prices are documented in the following sections.

5.3.1 Assumptions

Hazardous waste treatment and disposal prices are based on the following key assumptions:

- Transportation prices are not included in the treatment and disposal prices.

- Unit prices for bulk liquids are reported in both tons and gallons. The following densities are assumed in converting prices to dollars per ton and per gallon:
  - Solvents and organic liquids at 7.8 lb/gal;
  - Mixed organic/inorganic liquids at 8 lb/gal; and
  - PCB liquids and inorganic liquids at 8.34 lb/gal.

- A sludge and solids density of 10 lb/gal is assumed.

- Drummed management prices are not available for many of the waste types. In those cases, drummed prices are derived from bulk prices and are increased to account for the additional burden of handling drums. Based on limited drum pricing information and engineering judgement, derived drummed prices are increased 50 percent for incineration, treatment, deepwell injection, and PCB landfills. Those drummed prices that are derived from bulk prices are noted with an asterisk in the table.

5.3.2 Hazardous Waste Treatment, Recycling, and Disposal Prices

Table 5-2 lists some typical EPA hazardous waste codes for different waste types. The typical waste codes for each waste type listed in Table 5-2 are based on the translation of EPA waste codes to SARA waste types contained in the "Technical Reference Manual for Reporting the Current Status of Generation, Management Capacity, Imports and Exports," (January 1989). It should be noted that certain waste types (i.e., contaminated soil and contaminated debris) can be contaminated with any listed or characteristic waste.

Table 5-3 presents the unit prices for common technologies used to manage each of the 15 waste types (four of the waste types were combined into two waste types because treatment prices are the same). As shown in Table 5-3, for each waste type, both a range of unit prices and a median or midpoint unit price are reported for each management technology. When only two vendor price quotes were obtained for a management technology, a midpoint unit price is calculated. When three or more vendor price quotes were obtained for a management technology, a median unit price is determined. The unit prices reported in Table 5-3 represent pricing in 1996 dollars.[11]

Note that treatment of a waste by stabilization/solidification/fixation will typically increase the quantity (mass) of the waste by 50 percent. Consequently, following stabilization/solidification/fixation the quantity of waste to be further managed (i.e., landfilled) will be 50 percent more than the original quantity.

5.3.3 References

1. DPRA staff contacted commercial hazardous waste treatment/disposal vendors in June 1989 and June 1991 through March 1992 to obtain information on alternative treatment technologies under the Land Disposal Restrictions program. The following types and numbers of commercial hazardous waste treatment/disposal vendors were contacted: 7 landfills; 23 incinerators; 6 stabilization/solidification/fixation facilities; 12 cement kilns; 11 aqueous inorganic treatment facilities (e.g., chemical [chrome] reduction; chemical precipitation, cyanide oxidation, and chemical oxidation); 20 aqueous organic treatment facilities (e.g., biological treatment, carbon adsorption, air stripping, steam stripping, powdered activated carbon, and activated carbon); 3 injection wells; and 4 sludge dewatering facilities (e.g., filter press, centrifuge, lime precipitation and evaporation pond). Prices obtained from 1989 and 1991 were inflated at five percent per year to 1992 dollars. All dollar values and costs developed by

[11] The prices charged by hazardous waste treatment, recycling, and disposal facilities may fluctuate widely from region-to-region and state-to-state partially because of market forces, therefore, it is recommended that the Case Development Officer contact a nearby treatment, recycling, or disposal facility to obtain a local and current price quote.

DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

2. ICF Incorporated, "1990 Survey of Selected Firms in the Hazardous Waste Management Industry," prepared for U.S. EPA, Office of Policy Analysis, July 1992. Prices were inflated at five percent per year to 1992 dollars.

3. ICF Incorporated, "PCB Disposal Price Surveys," Memorandum to David Hannemann, U.S. EPA, Office of Toxic Substances, February 5, 1991. Prices were inflated at five percent per year to 1992 dollars.

4. "Technical Reference Manual for Reporting the Current Status of Generation, Management Capacity, Imports and Exports," prepared for U.S. EPA, Office of Solid Waste, Waste Treatment Branch, January 1989.

TABLE 5-1. COMMERCIAL TRANSPORTATION PRICES (1996 Dollars)

One-Way Mileage	Bulk Liquids(a)(b)	Bulk Solids©	55-Gallon Drums(d)
25	$0.44/ton-mile $0.05/gal	$0.27/ton-mile $7.28/ton	$0.60/ton-mile $3.67/drum
50	$0.27/ton-mile $0.05/gal	$0.22/ton-mile $11.72/ton	$0.38/ton-mile $4.98/drum
100	$0.22/ton-mile $0.11/gal	$0.22/ton-mile $20.75/ton	$0.33/ton-mile $7.61/drum
200	$0.27/ton-mile $0.22/gal	$0.27/ton-mile $50.21/ton	$0.32/ton-mile $16.15/drum
500	$0.22/ton-mile $0.49/gal	$0.22/ton-mile $115.81/ton	$0.27/ton-mile $35.20/drum

(a) Assumes a full net load of 25 tons or 6,000 gallons.

(b) Dollars per gallon estimated as follows: [($X/ton-mile)(25 tons)(X miles)/6,000 gallons]

(c) Assumes a full net load of 24 tons or 20 cubic yards.

(d) Assumes a minimum charge plus an additional per drum charge for each drum over the minimum price. For trips under 100 miles the minimum charge is effective whenever the number of drums transported is less than 15. For trips between 100 and 200 miles the minimum charge is effective whenever the number of drum transported is less than 8. For trips between 200 and 500 miles the minimum charge is effective whenever the number of drums transported is less than 3.

TABLE 5-2. TYPICAL EPA HAZARDOUS WASTE CODES FOR VARIOUS WASTE TYPES (a)

Halogenated Solvents	Halogenated Organic Liquids	Non Halogenated Solvents	Non Halogenated Organic Liquids	Mixed Organic/ Inorganic Liquids	Inorganic Liquids With Organics	Inorganic Liquids With Metals	Halogenated Organic Sludges/ Solids	Non Halogenated Organic Sludges/ Solids	Mixed Organic/ Inorganic Sludges/ Solids	Inorganic Sludges/ Solids With Metals
F001	K029	F003	K023	K009	D012-D017*	D004-D008	F024	K022	K001	D009
F002	K116	F004	K083	K010	K004	D010	K015	K024	K028	F006
		F005	K093	K026	K008	D011	K016	K027	K032	F008
		K086	K113	K033	K011	F007	K017	K037	K034	F011
			K114	K038	K013	F009	K018	K052	K035	F012
			D018	K097	K014	K062	K019	K094	K039	F019
					K021		K020	K115	K040	K002
					K025		K030	K136	K041	K003
					K036		K042	D018	K048	K005
					K038		K043		K049	K006
					K060		K085		K050	K007
					K073		K095		K051	K031
					K098		K096		K087	K046
					K099				K125	K061
					K100				K126	K069
					K103				D018	K071
					K104					K101
					K111					K106
					K112					K118
					K117					
					K123					
					K124					
					D018					

P and U waste codes are generally inorganic liquids with organic unless the metal content is >1 ppm in which case they would be inorganic liquids with metals.

(a) Source: From translation of EPA waste codes to SARA waste types in "Technical Reference Manual for Reporting the Current Status of Generation, Management Capacity, Imports and Exports," prepared for U.S. EPA, Office of Solid Waste, Waste Treatment Branch, January 1989.

* DPRA assumes dilute concentrations of pesticides in wastewater.

TABLE 5-3. COMMERCIAL HAZARDOUS WASTE TREATMENT/RECYCLING/DISPOSAL PRICES (1996 Dollars)

Waste Type	Treatment/Disposal Technology	Bulk	Drummed
Contaminated Soil	Landfill	Range: $131 - 208/ton Median: $186/ton	Range: $66 - 230/drum Median: $110/drum
	Incineration	Range: $580 - 2,880/ton Median: $1,434/ton	Range: $307 - 1,555/drum * Median: $777/drum *
	Stabilization/Solidification/ Fixation (a)	Range: $120 - 230/ton Median: $285/ton	Range: $66 - 1,358/drum * Median: $153/drum
Halogenated Solvents and Organic Liquids	Solvent Recovery	Range: $0 - 2.41/gal $0 - 613/ton Midpoint: $1.20/gal or $307/ton	Range: $0 - 197/drum * Midpoint: $99/drum *
	Incineration High BTU (>8000 BTU/lb), high chlorine (>20%), and low water content (<10%)	Range: $920 - 1,643/ton $3.61 - 6.46/gal Midpoint: $1,281/ton or $5.04/gal	Range: $285 - 515/drum * Midpoint: $405/drum *
	Cement Kiln High BTU (>8000 BTU/lb), high chlorine (>2%), and low water content (<10%)	Range: $164 - 1,544/ton $0.66 - 6.02/gal Midpoint: $361/ton or $1.42/gal	Range: $77 - 383/drum Midpoint: $230/drum
Nonhalogenated Solvents and Organic Liquids	Solvent Recovery	Range: $0 - 2.41/gal $0 - 613/ton Midpoint: $1.20/gal or $307/ton	Range: $0 - 197/drum * Midpoint: $99/drum *
	Incineration High BTU, low chlorine, and low water content (<10%)	Range: $153 - 1,369/ton $0.55 - 5.37/gal Median: $646/ton or $2.52/gal	Range: $175 - 843/drum Median: $405/drum

TABLE 5-3. COMMERCIAL HAZARDOUS WASTE TREATMENT/RECYCLING/DISPOSAL PRICES (1996 Dollars)

Waste Type	Treatment/Disposal Technology	Bulk	Drummed
Nonhalogenated Solvents and Organic Liquids (continued)	Cement Kiln High BTU, low chlorine, and low water content (<10%)	Range: $99 - 942/ton $0.33 - 3.70/gal Median: $186/ton or $0.74/gal	Range: $55 - 230/drum Median: $110/drum
Mixed Organic/ Inorganic Liquids	Solvent Recovery	Range: $0 - 2.41/gal $0 - 602/ton Midpoint: $1.20/gal or $307/ton	Range: $0 - 197/drum * Midpoint: $99/drum *
	Incineration Low BTU and water content >10%	Range: $219 - 1,150/ton $0.88 - 4.60/gal Midpoint: $690/ton or $2.74/gal	Range: $77 - 372/drum* Midpoint: $230/drum
	Cement Kiln Low BTU and water content >10%	Range: $208 - 1,161/ton $0.88 - 4.71/gal Median: $285/ton or $1.10/gal	Range: $164 - 493/drum Median: $350/drum
	Aqueous Organic and Inorganic Treatment Air or steam stripping and chemical precipitation, cyanide oxidation, chemical oxidation, or chemical (chrome) reduction	Range: $120-1,303/ton $0.44 - 5.26/gal Median: $318/ton or $1.20/gal	Range: $44 - 427/drum * Median: $99/drum *
	Deepwell Injection	Range: $77 - 1,434/ton(b) $0.33 - 5.80/gal(b) Median: $175/ton or $0.77/gal	Range: $22 - 471/drum(b) * Median: $55/drum *
Inorganic Liquids with Organics (low metals)	Aqueous Organic Treatment, Biological treatment, or carbon adsorption	Range: $22 - 756/ton $0.11 - 3.18/gal Median: $176/ton or $0.77/gal	Range: $11 - 241/drum * Median: $55/drum

TABLE 5-3. COMMERCIAL HAZARDOUS WASTE TREATMENT/RECYCLING/DISPOSAL PRICES (1996 Dollars)

Waste Type	Treatment/Disposal Technology	Bulk	Drummed
Inorganic Liquids with Organics (low metals) (continued)	Deepwell Injection	Range: $66 - 1,380/ton(b) $0.33 - 5.80/gal(b) Median: $176/ton or $0.77/gal	Range: $22 - 471/drum(b) * Median: $55/drum *
Inorganic Liquids with Metals	Aqueous Inorganic Treatment Chemical precipitation, cyanide oxidation, chemical oxidation, or chemical (chrome) reduction	Range: $55 - 700/ton $0.22 - 2.96/gal Median: $164/ton or $0.66/gal	Range: $22 - 241/drum * Median: $55/drum *
	Deepwell Injection	Range: $66 - 1,380/ton(b) $0.33 - 5.80/gal(b) Median: $175/ton or $0.77/gal	Range: $22 - 471/drum * Median: $55/drum*
Halogenated Organic Sludges and Solids	Landfill	Range: $131 - 208/ton Median: $186/ton	Range: $66 - 230/drum Median: $110/drum
	Incineration High BTU, high chlorine, and low water content	Range: $920 - 2,935/ton Midpoint: $1,927/ton	Range: $383 - 1,205/drum * Midpoint: $799/drum *
Nonhalogenated Organic Sludges and Solids	Landfill	Range: $131 - 208/ton Median: $186/ton	Range: $66 - 230/drum Median: $110/drum
	Incineration	Range: $438 - 2,957/ton Median: $1,478/ton	Range: $493 - 821/drum Median: $799/drum
Mixed Organic/ Inorganic Sludges and Solids	Landfill	Range: $131 - 208/ton Median: $186/ton	Range: $66 - 230/drum Median: $110/drum

TABLE 5-3. COMMERCIAL HAZARDOUS WASTE TREATMENT/RECYCLING/DISPOSAL PRICES (1996 Dollars)

Waste Type	Treatment/Disposal Technology	Bulk	Drummed
Mixed Organic/ Inorganic Sludges and Solids	Incineration	Range: $438 - 2,957/ton Median: $1,478/ton	Range: $493 - 821/drum Median: $799/drum
Inorganic Sludge Solids with Metals	Sludge Dewatering Filter press, centrifuge, lime precipitation, or evaporation pond	Range: $110 - 296/ton $0.55 - 1.53/gal Median: $153/ton or $0.77/gal	Range: $44 - 120/drum * Median: $66/drum *
	Stabilization/Solidification/ Fixation (a)	Range: $120 - 2,300/ton $0.55 - 11.50/gal Median: $285/ton or $1.42/gal	Range: $44 - 953/drum * Median: $120/drum *
	Landfill	Range: $131 - 208/ton Median: $186/ton	Range: $66 - 230/drum Median: $110/drum
Contaminated Debris	Immobilization Stabilization and landfill	Range: $690 - 2,300/ton Median: $876/ton	Range: Not Applicable Median: Not Applicable
	Incineration Low BTU	Range: $1,369 - 3,909/ton Median: $2,529/ton	Range: Not Applicable Median: Not Applicable
PCB Solids	Landfill	Range: $131 - 372/ton Median: $172/ton	Range: $55 - 153/drum * Median: $77/drum
	Incineration	Range: $44 - 4,928/ton Midpoint: $2,486/ton	Range: $11 - 865/drum Midpoint: $438/drum
PCB Liquids	Incineration	Range: $580 - 2,300/ton $2.41 - 9.53/gal Midpoint: $1,445/ton or $6.02/gal	Range: $99 - 405/drum * Midpoint: $252/drum

(a) This treatment technology results in a 50 percent increase in waste quantity.

(b) Some prices include pretreatment (e.g., filtering solids, adjusting pH, destroying sulfides, etc.).

* Derived from bulk prices with a 50 percent price increase to account for drum handling.

CHAPTER 6. HAZARDOUS WASTE DETERMINATION

This chapter presents cost estimates for making a hazardous waste determination in compliance with 40 CFR 262.11. Under 40 CFR 262.11, generators must determine whether their waste is a characteristic hazardous waste (Part 261, Subpart C) or a listed hazardous waste (Part 261, Subpart D). The definitions, documentation of assumptions, and costs are presented in the following sections.

6.1 Definitions

Definitions are provided for the following terms used in the compliance cost estimates developed for this chapter:

Small-Sized[12] Generator	Facilities that generate one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Generator	Facilities that generate four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized[13] Generator	Facilities that generate four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices. Typically, these facilities may have failed to identify one or more waste streams.
Lower Bound Cost	The lowest cost estimate for making a hazardous waste determination.
Upper Bound Cost	The highest cost estimate for making a hazardous waste determination.
Typical Cost	The representative cost estimate for making a hazardous waste determination.

[12] For the purposes of this manual, "small-sized" refers to the generation of one to three hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition of a "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

[13] For the purposes of this chapter, "large-sized" refers to the generation of four to nine hazardous waste streams. The facility is not the same as a large-quantity generator which is defined as large based on the total quantity of hazardous waste generated.

Toxicity Characteristic Leaching Procedure (TCLP) A test method described in 40 CFR Part 261, Appendix II, which is used to obtain a liquid extract from a liquid, solid, or multiphasic waste. The liquid extract may be analyzed to determine if a waste exhibits a characteristic of toxicity as listed in 40 CFR 261.24.

6.2 Assumptions

The compliance cost estimates for making a hazardous waste determination are based on the following assumptions:

- The estimates represent compliance costs for small- to medium-sized facilities which are either non-notifiers or have failed to identify one or more hazardous waste streams, and large facilities which have failed to identify one or more hazardous waste streams.

- The facility will hire an environmental consulting firm to make the hazardous waste determination. Time is included for facility personnel (i.e., environmental coordinator and clerical) to collect and copy background information on materials and processes used, and wastes generated for the consultant to review.

- The cost to determine if the waste is a solid waste, as defined in 40 CFR 261.2, is based solely on a consultant's time to review the regulations and his/her knowledge of the facility's materials, processes, and wastes. It does not include any testing costs.

- The cost to determine if a waste is excluded from the hazardous waste regulations is based on a consultant's time to make a decision using the 40 CFR 261.4 exclusion text and his/her knowledge of the materials, processes and wastes associated with the facility. It is assumed no testing is required to make the exclusion determination.

- The cost to determine if a waste is a listed hazardous waste is based on a consultant's time to review the F, K, P, and U waste lists in 40 CFR 261, Subpart D, for each waste stream. It is assumed no testing is required to make the hazardous waste determination.

- The cost to determine if a waste is a characteristic waste is based on testing a representative sample of the waste. Costs include a consultant's time to determine which specific constituents the waste stream should be tested for based on his/her knowledge of the materials and processes used at the facility. However, instead of testing, a generator may apply it's knowledge of the waste based on a review of the materials or processes used and declare it a characteristic waste. This cost would be less than the cost for testing.

- Small-sized facilities generate one to three waste streams. In developing the cost estimates, a lower bound estimate of one waste stream, an upper bound estimate of three waste streams, and a typical estimate of two waste streams are assumed.

- Medium-sized facilities generate four to nine waste streams. In developing the cost estimates, a lower bound estimate of four waste streams, an upper bound estimate of nine waste streams, and a typical estimate of six waste streams are assumed.

- Medium- and large-sized facilities which have mischaracterized or failed to identify hazardous waste streams have done so for one or more wastes and the cost estimates can be calculated by referring to the cost estimates for the small or medium-sized facilities. For example, the cost estimates for a medium or large-sized facility to make a hazardous waste determination for one or two wastes would approximately be the same as the lower and typical costs for a small-sized facility.

- For sample collection costs, one representative sample per waste stream is assumed. A representative sample consists of three discrete samples taken on different days. Samples are collected by a field technician requiring 0.5 hour per sample for collection, 1 hour drive time to and from the facility for each sampling event, and 2 hour preparation time before each sampling event. [14]

- If off-site disposal is required for the management of hazardous waste, please refer to Chapter 5 - Off-Site Management of Wastes for those EBN calculations.

6.3 Cost Estimates

Tables 6-1 and 6-2 present a range of cost estimates (i.e., lower bound, upper bound, and typical) for making a hazardous waste determination for small and medium-sized generators, respectively. To determine the cost estimates for a medium or large-sized facility which has mischaracterized or failed to identify one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility. Conducting a hazardous waste determination is an initial (one-time) cost. However, there may be subsequent costs due to process changes.

The 40 CFR 262.11 regulations specify that a generator must first determine if the waste is excluded from regulation. If the waste is not excluded from regulation, the generator must determine if the waste is a listed waste. If the waste is not a listed waste, the generator must then determine if it is a characteristic waste. Wastes can be determined as characteristic either based on testing or on the generator's knowledge of the waste. Tables 6-1 and 6-2 present the costs for making a hazardous waste determination for listed wastes and for characteristic wastes based on testing. In some cases a generator may generate listed wastes only. The tables provide a subtotal of costs for making a hazardous waste determination for listed wastes only. For characteristic wastes, the tables present the additional costs for generators to make the characteristic waste determination based on testing. If the

[14] DPRA, Incorporated, best professional judgement.

generator chooses to make the characteristic waste determination based on knowledge of the waste, the costs for the determination would consist only of a review of background information.

The cost estimates presented in Tables 6-1 and 6-2 for a characteristic determination exclude the costs for a chemical waste analysis because the constituents analyzed are waste stream specific. To include the chemical waste analysis costs, the user of this chapter must obtain a unit price per sample from the contract lab prices listed in Table 6-3 based on the specific wastes and waste constituents generated by the facility. For example, a lab analysis for determining if a waste has a toxic characteristic (TC) can include two waste sample extract procedures [i.e., Zero-Headspace Extractor (ZHE) for volatile and bottle extraction for non-volatiles] and five parameter categories (i.e., metals, semi-volatiles, organochlorine pesticides, chlorinated herbicides, and volatile organics). It is not necessary to analyze a waste sample for all TC constituents (i.e., D004 - D043) and characteristics if a facility has not used materials containing those constituents or materials that would produce these characteristics.

In addition, waste streams may need to be tested for ignitability, corrosivity, and reactivity. For example, an electroplating facility would test for metals, corrosivity, and reactivity, but would not need to test for organochlorine pesticides or chlorinated pesticides. A pesticide manufacturer would test for organochlorine pesticides, chlorinated pesticides, and semi-volatiles but would probably not need to test for metals, ignitability, and reactivity. Table 6-3 presents the minimum, maximum, and median unit price per sample for testing each characteristic waste parameter.[15] The table also indicates which EPA hazardous waste numbers (e.g., D001, D002, etc.) are captured by a specific parameter category (e.g., semi-volatiles capture D012, D013, etc.). Table 6-3 should be used in conjunction with Tables 6-1 and 6-2 in estimating the total cost for making a hazardous waste determination for characteristic wastes.

6.4 References

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. DPRA staff contacted three testing laboratories in December 1992 and January 1993 to obtain laboratory analyses costs for various EPA test methods, parameters, and constituents. In addition, SAIC staff obtained analytical costs from two additional testing laboratories in November 1996.

3. U.S. EPA, "Test Methods for Evaluating Solid Waste," Office of Solid Waste, SW-846, November, 1986.

4. All dollar values and costs developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

[15] The prices charged by testing laboratories may vary from region-to-region and state-to-state, therefore, it is recommended that the Case Development Officer contact a nearby laboratory to obtain local price quotes.

Table 6-1. Hazardous Waste Determination – Small Generator Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
1. Background information collection/ review	Facility	Environ. Coord.	2	6	4	$51	$/hr	$101	$304	$202
	Facility	Clerical	1	2	1	$21	$/hr	$21	$43	$21
	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Subtotal			7	16	11			$534	$1,169	$841
2. Waste Determinations										
- Solid waste as defined by 40 CFR 261.2	Consultant	Project Engineer	2	6	4	$103	$/hr	$206	$617	$411
- Waste(s) excluded by 40 CFR 261.4	Consultant	Project Engineer	2	4	3	$103	$/hr	$206	$411	$309
- Waste listed in Part 261, Subpart D	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Subtotal			8	18	13			$823	$1,851	$1,337
3. Characteristic Waste Determination										
- Determine Test Parameters	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
- Waste Sample Collection	Consultant	Field Technician	10.5	13.5	12	$39	$/hr	$414	$532	$473
- Waste Sample Analyses(c)	Consultant	Laboratory	3 samples	9 samples	6 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 6-3.

Table 6-2. Hazardous Waste Determination Initial - Medium Generator Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
1. Background information collection/review	Facility	Environ. Coord.	6	12	8	$51	$/hr	$304	$607	$405
	Facility	Clerical	2	4	2	$21	$/hr	$43	$86	$43
	Consultant	Project Engineer	12	24	16	$103	$/hr	$1,234	$2,469	$1,646
Subtotal			20	40	26			$1,581	$3,162	$2,094
2. Waste Determinations										
- Solid waste as defined by 40 CFR 261.2	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
- Waste(s) excluded by 40 CFR 261.4	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
- Waste listed in Part 261, Subpart D	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Subtotal			12	24	18			$1,234	$2,469	$1,851
3. Characteristic Waste Determination										
- Determine Test Parameters	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
- Waste Sample Collection	Consultant	Field Technician	15	22.5	18	$39	$/hr	$591	$886	$709
- Waste Sample Analyses(c)	Consultant	Laboratory	12 samples	27 samples	18 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 6-3.

Table 6-3. Contract Lab Prices for Characteristic Waste Determination (1996 Dollars)

Parameter	Minimum Price ($/Sample)	Maximum Price ($/Sample)	Median Price ($/Sample)
Flash point - for determining ignitability - D001	25	82	49
pH - for determining corrosivity - D002	5	16	10
Cyanide - for determining reactivity - D003	30	80	41
Sulfides - for determining reactivity - D003	20	70	60
TCLP(a)	110	249	185
Arsenic - D004	11	55	27
Barium - D005	11	33	14
Cadmium - D006	11	27	13
Chromium - D007	11	27	13
Lead - D008	11	27	13
Mercury - D009	11	49	38
Selenium - D010	11	33	27
Silver - D011	11	27	13
Semivolatiles - D012, D013, D014, D015, D020, D023, D024, D025, D026, D027, D030, D031, D032, D033, D034, D036, D037, D041, D042	249	542	350
Organochlorine pesticides - D012, D013, D014, D015	75	219	153
Chlorinated herbicides - D016, D017	140	203	164
ZHE(b)	99	219	164
Volatile organics - D018, D019, D021, D022, D028, D029, D038, D039, D040, D043	99	307	219

(a) Toxicity Characteristic Leaching Procedure (TCLP) used to obtain extract for analyzing metals, semi-volatiles , pesticides, and herbicides.

(b) Zero-Headspace Extractor (ZHE) used to obtain extract for analyzing volatiles.

CHAPTER 7. WASTE ANALYSIS

This chapter presents the cost estimates for compliance with the RCRA waste analysis requirements for both hazardous waste treatment, storage, and disposal facilities (TSD) and generators. A waste analysis determines the physical and chemical constituents of a representative sample of the hazardous waste. A waste analysis plan describes the parameters for which each hazardous waste will be analyzed, the frequency of testing, and the sampling and testing methods which will be used.

This chapter is divided into two sections: TSD and generator facility. The definitions, documentation of assumptions, costs, and references are presented for each section and include references. Table 7-1 presents a summary of the waste analysis components for a TSD and a generator.

7.1 Treatment, Storage, and Disposal Facilities

A TSD must comply with the general waste analysis requirements of 40 CFR 264 (permitted facility), Part 265 (interim status facility), and the land disposal restrictions (LDR) waste analysis requirements of 40 CFR 268. Specifically, under 40 CFR 264.13(a)/265.13(a), a TSD must obtain a detailed chemical and physical analysis of a representative sample of the waste before treatment, storage, or disposal of the waste. In addition, 40 CFR 264.13(b)/265.13(b) requires a TSD to develop and follow a written waste analysis plan which describes the procedures that will be carried out in order to comply with the waste analysis requirements of 40 CFR 264.13(a)/265.13(a).

Under 40 CFR 268.7(b), treatment facilities (except treatment surface impoundments) are required to test the treated waste prior to land disposal to demonstrate that the LDR treatment standards have been met, while 40 CFR 268.7© requires disposal facilities to test their wastes prior to land disposal to assure that the waste constituents do not exceed the LDR treatment standards. For hazardous wastes treated in surface impoundments, 40 CFR 268.4 requires the facility to test both the sludge and supernatant to demonstrate that the LDR treatment standards have been met.

This section presents the initial (administrative) and on-going cost estimates for a TSD to comply with the RCRA waste analysis requirements. This section also defines terms used in this section, documents the assumptions made in developing the cost estimates, and lists the references used.

7.1.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter.

Small-Sized[16] Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility which treats, stores or disposes one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility, which treats, stores or disposes four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility, which treats, stores or disposes of ten or more hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Lower Bound Cost	This is the lowest cost estimate for conducting a waste analysis or developing a waste analysis plan.
Upper Bound Cost	This is the highest cost estimate for conducting a waste analysis or developing a waste analysis plan.
Typical Cost	This is a representative cost estimate for conducting a waste analysis or developing a waste analysis plan.
Extraction Procedure (EP)	A test method described in 40 CFR 268, Appendix IX, which is used to obtain a liquid extract from a waste. The liquid extract may be used to determine if a characteristic waste is exempt from the land disposal restrictions.
Toxicity Characteristic Leaching Procedure (TCLP)	A test method described in 40 CFR 261, Appendix II, which is used to obtain a liquid extract from a liquid, solid, or multiphasic waste. The liquid extract may be analyzed to determine if a waste exhibits a characteristic of toxicity as listed in 40 CFR 261.24. The TCLP is the preferred method as use of the EP method is being eliminated.

[16] For the purposes of this manual "small-sized" refers to the generation of one or two hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

7.1.2 Assumptions

The cost estimates for compliance with the waste analysis requirements (i.e., sample collection, analysis, and waste analysis plan) of 40 CFR 264.13, 40 CFR 265.13, 40 CFR 268.4, and 40 CFR 268.7 are based on the following assumptions:

- The cost estimates represent small, medium, and large-sized on-site, non-commercial, TSDs. The waste streams from these facilities should, therefore, not change dramatically in any given year and would only require one sampling event. These facilities may be non-notifiers, may have failed to test one or more hazardous waste streams, or may have mischaracterized one or more hazardous waste streams.

- The on-site TSD will hire an environmental consulting firm to conduct the waste analysis. Time is included for facility personnel to provide oversight in development and review of the waste analysis plan. Facility personnel time is estimated as a percentage of the total consultant hours.

- The general waste analysis regulations (40 CFR 264.13/265.13) require the hazardous waste to be tested prior to treatment, storage, or disposal, while the LDR waste analysis regulations (40 CFR 268.4 and 40 CFR 268.7) only require the waste to be tested prior to land disposal. It should be noted that some wastes may meet the LDR treatment standards as generated and, therefore, would not require treatment prior to land disposal.

- Small-sized facilities treat, store, or dispose one to three waste streams in on-site management units. The following assumptions were made in developing their cost estimates:

  - General waste analysis and the waste analysis plan estimates assume a lower bound estimate of one waste stream, an upper bound estimate of three waste streams, and a typical estimate of two waste streams.

  - LDR waste analysis estimates, except treatment in surface impoundments, assume a lower bound estimate of one treated waste stream, an upper bound estimate of two treated waste streams, and a typical estimate of one treated waste stream.

  - Treatment in surface impoundments assumes treatment of one to three waste steams in one impoundment.

- Medium-sized facilities treat, store, or dispose four to nine waste streams in on-site waste management units. The following assumptions were made in developing the cost estimates:

  - General waste analysis and the waste analysis plan estimates assume a lower bound estimate of four waste streams, an upper bound estimate of nine waste streams, and a typical estimate of six waste streams.

- LDR waste analysis estimates, except treatment in surface impoundments, assume a lower bound estimate of two treated waste streams, an upper bound estimate of four treated waste streams, and a typical estimate of three treated waste streams.

- Estimates for treatment in surface impoundments assume treatment of four to nine waste streams in two impoundments.

- The cost estimate to conduct waste analyses for one or two waste streams in a large facility would be approximately the same as the lower bound and typical costs for a small-sized facility.

- The components necessary to determine the initial (administrative) cost of compliance with the waste analysis regulations consist of the following:

  - General waste analysis (40 CFR 264.13(a) for permitted facilities and 40 CFR 265.13(a) for interim status facilities).

  - Analysis of waste after treatment or prior to land disposal to demonstrate compliance with the LDR treatment standards (40 CFR 268.4).

  - A waste analysis plan (40 CFR 264.13(b) for permitted facilities and 40 CFR 265.13(b) for interim status facilities).

- For land disposal facilities only, if the LDR waste analysis indicates that the waste exceeds the LDR treatment standards, the waste will need additional treatment prior to disposal. If the facility does not have the ability to treat the waste, it will have to be sent off-site to a commercial treatment/incineration facility (see Chapter 5 for commercial transportation and treatment/incineration prices). The waste analysis cost estimates do not include the cost for additional treatment for wastes that exceed the LDR treatment standards.

- The on-going costs to comply with the waste analysis regulations consist of the following:

  - Review of facility process and operating information to document that a repeat general waste analysis is not necessary.

  - Analysis of treated waste to assure compliance with the LDR treatment standards.

  - Any site specific determinations.

- For sampling costs associated with the general and LDR waste analyses (except treatment in surface impoundments) one representative sample per treated waste stream is assumed, and a representative sample consists of three discrete samples taken on three different days. Samples are collected by a field

technician at 0.5 hour per sample for collection, 1 hour drive time to and from the facility for each sampling event, and 2 hour preparation time before each sampling event. [17]

- For LDR waste analysis treatment in a surface impoundment, two representative samples per impoundment are assumed: one of the sludge and one of the supernatant liquid. Each representative sample consists of three discrete samples taken on three different days. Samples are collected by a field technician at 0.5 hour per sample for supernatant collection and 1 hour per sample for sludge collection, 1 hour drive time to and from the facility for each sampling event, and 2 hour preparation time before each sampling event. [18]

- The general waste analysis regulations (40 CFR 264.13/265.13) specify that the analysis must be repeated as necessary. It is unlikely that the processes or operations will change frequently. The on-going costs, therefore, do not include costs for a repeat general waste analysis. However, the on-going costs do include the cost for a consultant to review facility processes, operations, and raw material information periodically to document that a repeat analysis is not necessary. The on-going costs also include the cost for facility personnel to collect the information and discuss it with the consultant.

- The on-going costs include sample collection and analysis of the treated or untreated waste prior to land disposal as required by the frequency in the waste analysis plan, to assure compliance with the LDR treatment standards. The number of samples collected and the time required for sample collection is assumed to be the same as the initial costs discussed above.

7.1.3 Initial (Administrative) Costs

The initial cost components for complying with the waste analysis regulations consist of a waste analysis and a waste analysis plan. The waste analysis includes both a general waste analysis and an LDR waste analysis for waste streams or residuals that will be land disposed. A TSD must conduct the general waste analysis prior to management of the waste and the LDR waste analysis prior to land disposal of the waste or residuals to assure compliance with the LDR treatment standards. The waste analysis plan includes general and waste management-specific information. For example, waste management-specific information includes considerations relative to ignitable, reactive, and incompatible wastes; bulk and containerized liquid requirements for landfills; waste feed for incineration trial burns; LDR waste analysis plan requirements; and treatment impoundments exempt from LDR.

Tables 7-2 and 7-3 present worksheets to summarize the initial (administrative) cost components for complying with the waste analysis regulations for a small- and medium-sized TSD, respectively. For a medium or large-sized facility which has failed to test or may have mischaracterized one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility. Because the initial costs

[17] DPRA, Incorporated, best professional judgement.

[18] DPRA, Incorporated, best professional judgement.

include both waste management-specific costs and waste stream-specific costs, the user of this document calculates a total cost, for a particular facility, in Table 7-2 or 7-3 based on the applicable cost components from Tables 7-4 through 7-8.

7.1.3.1 Waste Analysis Initial Costs

Table 7-4 and Table 7-5 present a range of cost estimates for conducting a waste analysis for a small- and medium-sized TSD, respectively. To determine the cost estimates for a medium or large-sized facility which has failed to test or may have mischaracterized one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility. The cost estimates presented in Table 7-4 and Table 7-5 include the cost for determining which constituents to analyze and costs for sample collection, but do not include the cost for the physical/chemical analysis because the constituents to be analyzed are waste stream specific. To include the physical/chemical waste analysis costs, the user of this document obtains a unit price per sample from the lab prices listed in Table 7-6 based on the specific wastes generated by the facility. [19] It is also recommended that the Case Development Officer contact nearby testing laboratories because the costs can vary from state-to-state- and region-to-region.

General Waste Analysis. The physical/chemical analysis of the waste may include data developed under the hazardous waste determination (40 CFR 262.11). The hazardous waste determination specifies that if a waste is not a listed waste, it must be tested to determine if it is a characteristic waste. [20] If a generator conducts a hazardous waste characterization for characteristic waste, the physical/chemical analysis would not have to be repeated for compliance with 40 CFR 264.13, or 40 CFR 265.13. The characteristic waste chemical analysis for the hazardous waste determination (40 CFR 262.11) also fulfills the 40 CFR 264.13, or 40 CFR 265.13 general waste analysis requirement.

In calculating the initial cost for the general waste analysis, the user adds the unit price per sample from the lab prices in Table 7-6 for the specific wastes generated by the facility. [21]

LDR Waste Analysis. For both the LDR waste analysis and the analysis conducted as condition of LDR exemption for treatment in surface impoundments, the user should refer to 40 CFR 268.41 and 40 CFR 268.42 for the waste stream-specific constituents for which a waste should be analyzed. In addition, the user should refer to 40 CFR 268.4 for specific information regarding the treatment in surface impoundment exemption.

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[19] For assistance in determining which organic constituents test method(s) are most appropriate, Appendix C - Organic Constituents Detected by EPA Analytical Methods, presents a list of EPA solid waste test methods and the organic constituents included in each method. For further assistance, the user should consult the U.S. EPA "Test Methods for Evaluating Solid Waste (SW-846)," which provides information on the selection of appropriate test methods for compliance with RCRA regulations.

[20] If the waste is a listed waste, 40 CFR §262.11 does not require the waste to be tested. Only non-listed wastes must be tested to determine if they exhibit a characteristic of hazardous waste.

[21] The prices charged by testing laboratories may vary from region-to-region and state-to-state, therefore, it is recommended that the Case Development Officer contact a nearby laboratory to obtain local price quotes.

7.1.3.2 Waste Analysis Plan Initial Costs

Table 7-7 and Table 7-8 present a range of cost estimates for developing a waste analysis plan for small- and medium-sized TSD facilities, respectively. To determine the cost estimates for a medium or large-sized facility which has failed to test or may have mischaracterized one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility. As shown in Table 7-7 and Table 7-8, the waste plan includes costs that are applicable to all TSDs (i.e., general requirements) and those costs that are waste management-specific. For example, waste management-specific information includes considerations for ignitable, reactive, and incompatible wastes; bulk and containerized liquid requirements for landfills; waste feed for incineration trial burns; LDR waste analysis plan requirements; and treatment in surface impoundment exemptions. The total cost of the waste analysis plan is the sum of the applicable waste management-specific requirement costs added to the general requirement costs in Table 7-7 and Table 7-8.

7.1.4 On-Going Costs

The on-going cost components for complying with the waste analysis regulations consist of a repeat waste analysis. Table 7-9 and Table 7-10 present a range of on-going cost estimates for small- and medium-sized TSD facilities. To determine the cost estimates for a medium or large-sized facility which has failed to test or may have mischaracterized one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility. The total on-going cost is the sum of the applicable waste stream-specific costs in Table 7-9 and Table 7-10.

7.1.4.1 General Waste Analysis On-Going Costs

The 40 CFR 264.13(a)(3) and 40 CFR 265.13(a)(3) regulations state that the waste analysis must be repeated as necessary. Since it is assumed that these are on-site non-commercial facilities with uncomplicated processes, it is unlikely that the processes or operations would change frequently. The general waste analysis on-going costs include the cost for reviewing facility processes, operations, and raw material information to document that a repeat analysis is not necessary.

7.1.4.2 LDR Waste Analysis and Treatment In Surface Impoundments

The on-going costs assume a repeat waste analysis is necessary to assure compliance with LDR treatment standards although processes are not assumed to change. LDR analysis is repeated annually to verify treatment system performance or that wastes disposed as generated still comply with LDR treatment standards. The on-going cost estimates presented in Table 7-9 and Table 7-10 include the cost for sample collection, but do not include the cost for the physical/chemical analysis because the constituents to be analyzed are waste stream specific. The specific constituents to be analyzed and the unit price per sample would be the same as the initial cost and is found in Table 7-4 or Table 7-5.

7.1.5 References

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. DPRA contacted three testing laboratories in December 1992 and January 1993 to obtain laboratory analyses costs for various EPA test methods, parameters, and constituents. In addition, SAIC staff obtained analytical costs from two additional testing laboratories in November 1996.

3. U.S. EPA, "Test Methods for Evaluating Solid Wastes," Office of Solid Waste, SW-846, November, 1986.

4. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1571, General Hazardous Waste Facility Standards," July 7, 1993.

5. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1442, Land Disposal Restriction," November 25, 1992.

6. All dollar values developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

7.2 Generator Facility

The 40 CFR 268.7 regulations require generators who are managing their waste by land disposal (i.e., landfill, surface impoundment, land treatment, and waste pile) to test their waste, or use knowledge of the waste, to determine if it is restricted from land disposal. The 40 CFR 268.7 regulations require treatment facilities to test the treated waste prior to disposal to demonstrate that the LDR treatment standards have been met, while disposal facilities must test their wastes prior to disposal to assure that the waste constituents do not exceed the LDR treatment standards. For hazardous wastes treated in surface impoundments, 40 CFR 268.4 requires the facility to test both the sludge and supernatant to demonstrate that the LDR treatment standards have been met. This section presents the initial (administrative) and annual cost estimates for a generator to comply with the 40 CFR 268.7 land disposal restrictions waste analysis requirements.

If a generator is managing his/her waste by commercial (off-site) treatment or incineration, the generator does not have to test the waste prior to treatment or incineration to determine if it is a restricted waste. The waste is the responsibility of the treatment or incineration facility and it must be tested by that facility prior to land disposal. However, if a generator is managing a restricted waste in 90 day accumulation tanks, containers, containment buildings, or drip pads and is shipping the waste off-site for disposal, the generator would conduct the LDR waste analysis after treatment to demonstrate that the LDR treatment standards are being met and that they also have a waste analysis plan. The waste analysis plan must contain all information necessary to treat the waste(s). Table 7-1 presents a summary of the waste analysis components for a generator.

In addition to the cost estimates, this section also defines terms used in this section, documentation of assumptions made in developing the cost estimates, and lists the references used.

7.2.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter.

Small-Sized[22] Generator	Facilities that generate one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Generator	Facilities that generate four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized[23] Generator	Facilities that generate ten or more hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Lower Bound Cost	The lowest cost estimate for conducting a waste analysis or developing a waste analysis plan.
Upper Bound Cost	The highest cost estimate for conducting a waste analysis or developing a waste analysis plan.
Typical Cost	This is a representative cost estimate for conducting a waste analysis or developing a waste analysis plan.
Extraction Procedure (EP)	A test method described in 40 CFR 268, Appendix IX, which is used to obtain a liquid extract from a waste. The liquid extract may be used to determine if a characteristic waste is exempt from the land disposal restrictions.

[22] For the purposes of this manual "small-sized" refers to the generation of one or two hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition of a "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

[23] For the purposes of this chapter "large-sized" refers to the generation of ten or more hazardous waste streams. The facility is not the same as a large-quantity generator which is defined as large based on the total quantity of hazardous waste generated.

Toxicity Characteristic Leaching Procedure (TCLP) A test method described in 40 CFR 261, Appendix II, which is used to obtain a liquid extract from a liquid, solid, or multiphasic waste. The liquid extract may be analyzed to determine if a waste exhibits a characteristic of toxicity as listed in 40 CFR 261.24.

7.2.2 Assumptions

The cost estimates for compliance with the waste analysis requirements of 40 CFR 268.7 are based on the following assumptions:

- The facility will hire an environmental consulting firm to conduct the waste analysis (i.e., sample collection, analysis, and the waste analysis plan when needed). Time is included for facility personnel to provide oversight in development and review of the waste analysis plan. Facility personnel time is estimated as a percentage of the total consultant hours.

- The cost estimates represent small and medium-sized facilities. These facilities may be non-notifiers, may have failed to test one or more hazardous waste streams, or may have mischaracterized one or more hazardous waste streams.

- Small-sized facilities generate one to three waste streams. The following assumptions were made in developing the cost estimates:

  - A lower bound estimate of one waste stream, an upper bound estimate of three waste streams, and a typical estimate of two waste streams was assumed for testing in determining if the waste was restricted.

  - For those small-sized facilities treating restricted waste in 90 day accumulation tanks, containers, containment buildings, or drip pads before shipping off-site for further treatment or disposal, cost estimates assume a lower bound estimate of one treated waste stream, an upper bound estimate of two treated waste streams, and a typical estimate of one treated waste stream.

- Medium-sized facilities generate four to nine waste streams. The following assumptions were made in developing the cost estimates:

  - A lower bound estimate of four waste streams, an upper bound estimate of nine waste streams, and a typical estimate of six waste streams was assumed for testing in determining if the waste was restricted.

- For those medium-sized facilities treating prohibited waste in 90 day accumulation tanks, containers, containment buildings, or drip pads the cost estimates assume a lower bound estimate of two treated waste streams, an upper bound estimate of four treated waste streams, and a typical estimate of three treated waste streams.

- The cost estimate to conduct waste analyses for one or two waste streams in a large facility would be approximately the same as the lower bound and typical costs for a small-sized facility.

- For sample collection costs, one representative sample per waste stream is assumed, and a representative sample consists of three discrete samples taken on three different days. Samples are collected by a field technician at 0.5 hour per sample for collection, 1 hour drive time to and from the facility for each sampling event, and 2 hour preparation time before each sampling event. [24]

- The on-going costs include either: (1) repeat testing to confirm that wastes comply with LDR treatment standards for generators shipping waste off-site for land disposal; or (2) for those facilities treating restricted wastes in 90 day accumulation tanks, containers, containment buildings, or drip pads, repeat testing to assure that the LDR treatment standards are being met if the residuals are being shipped off-site for land disposal. The number of samples collected and the time required for sample collection is assumed to be the same as the initial costs.

7.2.3 Costs

This section presents the initial (administrative) and on-going cost estimates for a generator to comply with the 40 CFR 268.7 land disposal restrictions waste analysis requirements.

7.2.3.1 Initial Costs

Generators who are not treating their waste prior to land disposal must test, or use knowledge of, their waste to determine if it is prohibited from land disposal. Table 7-11 and Table 7-12 present a range of initial (administrative) costs for testing a waste to determine if it is restricted for small- and medium-sized generators. [25] If a generator is treating a prohibited waste in 90 day accumulation tanks, containers, containment buildings, or drip pads prior to land disposal, the waste would be tested after treatment and the generator would need a waste analysis plan. Table 7-13 and Table 7-14 present a range of initial (administrative) costs for generators treating prohibited wastes in 90 day accumulation tanks, containers, containment buildings, or drip pads. The costs

[24] DPRA, Incorporated, best professional judgement.

[25] To determine the costs for a medium or large-sized facility which has mischaracterized or failed to identify one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility.

include testing a waste to determine if it meets the LDR treatment standards and developing a waste analysis plan for small- and medium-sized generators. [26]

The cost estimates presented in Tables 7-11 through 7-14 include the cost for selection of constituents to analyze and sample collection, but do not include the cost for the physical/chemical analysis because the constituents to be analyzed are waste stream specific. To include the physical/chemical waste analysis costs in the tables, the user should first consult 40 CFR 268.41 and 40 CFR 268.42 to obtain the waste stream-specific constituents for which a waste should be analyzed. The user then obtains a unit price per sample from the lab prices listed in Table 7-6 based on the specific wastes generated by the facility. [27]

7.2.3.2 On-Going Costs

The on-going costs consist of repeat waste analyses, or review of the generating process, either to confirm that the waste complies with the LDR treatment standards, or for those generators both managing and treating a restricted waste in 90 day accumulation tanks, containers, containment buildings, or drip pads to demonstrate that the treatment standards are being met prior to land disposal of the residuals. Table 7-15 and Table 7-16 present a range of on-going cost estimates for small- and medium-sized generators, respectively, to perform repeat analysis to confirm that the waste still complies with the LDR treatment standards. [28] Table 7-17 and Table 7-18 present the on-going costs for generators treating restricted wastes in 90 day accumulation tanks, containers, containment buildings, or drip pads.

Similar to the initial costs, the on-going cost estimates presented in Tables 7-15 through 7-18 include the cost for sample collection, but do not include the cost for the physical/chemical analysis because the constituents to be analyzed are waste stream specific. The specific constituents to be analyzed and the unit price per sample would be the same as for the initial cost. The user should refer to Tables 7-11, 7-12, 7-13, and 7-14 for the analysis costs to be included in Tables 7-15, 7-16, 7-17, and 7-18, respectively.

7.2.4 References

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

[26] To determine the costs for a medium or large-sized facility which has mischaracterized or failed to identify one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility.

[27] For assistance in determining which organic constituents test method(s) are most appropriate, Appendix B - Organic Constituents Detected by EPA Analytical Methods, presents a list of EPA solid waste test methods and the organic constituents included in each method. For further assistance, the user should consult the U.S. EPA "Test Methods for Evaluating Solid Waste (SW-846)," which provides information on the selection of appropriate test methods for compliance with RCRA regulations.

[28] To determine the costs for a medium or large-sized facility which has mischaracterized or failed to identify one or two hazardous waste streams, the user should refer to the lower bound and typical cost estimates for a small-sized facility.

2. DPRA contacted three testing laboratories in December 1992 and January 1993 to obtain laboratory analyses costs for various EPA test methods, parameters, and constituents. In addition, SAIC staff obtained analytical costs from two additional testing laboratories in November 1996.

3. U.S. EPA, "Test Methods for Evaluating Solid Wastes," Office of Solid Waste, SW-846, November, 1986.

4. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1571, General Hazardous Waste Facility Standards," July 7, 1993.

5. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1442, Land Disposal Restriction," November 25, 1992.

6. All dollar values developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

Table 7-1. Summary of Waste Analysis Components

General Waste Analysis (40 CFR 264)		
Component	Generator Facilities	TSD Facilities
• Analysis	Not Applicable	Physical and chemical analysis of waste before management (40 CFR 264.13(a), or 40 CFR 265.13(a)).
• Plan	Not Applicable	Description of parameters to be analyzed, sampling and testing methods, and frequency of repeat analysis (40 CFR 264.13(b), or 40 CFR 265.13(b)).
Land Disposal Restrictions (LDR) Waste Analysis		
Component	Generator Facilities	TSD Facilities
• Analysis	• Generators managing waste by land disposal (40 CFR 264.7(a)). - Listed wastes tested using TCLP to determine if restricted waste. - Characteristic wastes tested using EP to determine if restricted waste. • Generators treating a restricted waste in a 90 day accumulation tanks, containers, containment buildings, or drip pads prior to land disposal(40 CFR 264.7(a)). - Physical and chemical analysis of treated waste to demonstrate treatment standards met.	• Treatment facilities (40 CFR 268.7(b)). - Chemical analysis of treated waste prior to land disposal to demonstrate treatment standards met. • Land disposal facilities (40 CFR 268.7(c)). - Chemical analysis of waste before land disposal to assure compliance with treatment standards.
• Plan	Applicable only for those generators treating a restricted waste in a 90 day accumulation tanks, containers, containment buildings, or drip pads (40 CFR 264.7(a)). - Description of the parameters to be tested to demonstrate compliance with treatment standards, sampling and testing methods, and frequency of repeat analysis.	• Treatment facilities, except treatment impoundments (40 CFR 268.7(b)). - Description of the parameters to be tested to demonstrate compliance with treatment standards, sampling and test methods, and frequency of repeat analysis. • Land disposal facilities (40 CFR 268.7(c)). - Description of the parameters to be tested to assure compliance with treatment standards, sampling and test methods, and frequency of repeat analysis.

Treatment Impoundments Exempt From Land Disposal Restrictions		
Component	Generator Facilities	TSD Facilities
• Analysis	Not Applicable	Chemical analysis of treated sludge and supernatant to demonstrate compliance with treatment standards (40 CFR 268.4(a)).
• Plan	Not Applicable	Description of the procedures and schedules for sampling impoundment contents, for analysis of test data, and for the on-going removal of residues (40 CFR 268.4(a)).

Table 7-2. Worksheet to Summarize Waste Analysis Costs
Small-Size TSDs Initial Administrative Costs

Component	Lower Bound Estimate (1 waste)	Upper Bound Estimate (3 wastes)	Typical Estimate (2 wastes)
Waste Analysis			
• General waste analysis (a)			
• Land disposal restrictions waste analysis (except treatment surface impoundments) (b)			
• Treatment surface impoundment waste analysis (c)			
Waste Analysis Plan			
• General (d)			
• Waste management specific (e)			
TOTAL COST			

(a) Enter General Waste Analysis Subtotals from Table 7-4.
(b) Enter LDR Waste Analysis Subtotals from Table 7-4.
(c) Enter Treatment Impoundment Waste Analysis Subtotals from Table 7-4.
(d) General Waste Analysis Plan Subtotals from Table 7-7.
(e) Enter Waste Management-Specific Waste Analysis Plan Subtotals from Table 7-7.

Table 7-3. Worksheet to Summarize Waste Analysis Costs
Medium-Sized TSD Initial (Administrative) Costs

Component	Lower Bound Estimate (4 wastes)	Upper Bound Estimate (9 wastes)	Typical Estimate (6 wastes)
Waste Analysis			
• General waste analysis (a)			
• Land disposal restrictions waste analysis (except treatment surface impoundments) (b)			
• Treatment surface impoundment waste analysis (c)			
Waste Analysis Plan			
• General (d)			
• Waste management specific (e)			
TOTAL COST			

(a) Enter General Waste Analysis Subtotals from Table 7-5.
(b) Enter LDR Waste Analysis Subtotals from Table 7-5.
(c) Enter Treatment Impoundment Waste Analysis Subtotals from Table 7-5.
(d) General Waste Analysis Plan Subtotals from Table 7-8.
(e) Enter Waste Management-Specific Waste Analysis Plan Subtotals from Table 7-8.

Table 7-4. Worksheet to Estimate Waste Analysis – Small TSD Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
1. General Waste Analysis										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
Waste Sample Collection	Consultant	Field Technician	10.5	13.5	12	$39	$/hr	$414	$532	$473
Waste Sample Analysis (# of samples) (c)	Consultant	Laboratory	3 samples	9 samples	6 samples		$/sample			
Subtotal										
2. Land Disposal Restriction Waste Analysis										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	1	1	1	$103	$/hr	$103	$103	$103
Waste Sample Collection	Consultant	Field Technician	10.5	12	10.5	$39	$/hr	$414	$473	$414
Waste Sample Analysis (# of samples) (c)	Consultant	Laboratory	3 samples	6 samples	3 samples		$/sample			
Subtotal										
3. Land Disposal Restriction Surface Impoundments										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	1	1	1	$103	$/hr	$103	$103	$103
Waste Sample Collection	Consultant	Field Technician	13.5	13.5	13.5	$39	$/hr	$532	$532	$532
Waste Sample Analysis (# of samples) (c)	Consultant	Laboratory	6 samples	6 samples	6 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.
* 40 CFR 268 Subpart D

Table 7-5. Worksheet to Estimate Waste Analysis – Medium TSD Initial (Administrative) Costs (1997 Dollars)

Component	* Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
1. General Waste Analysis										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Waste Sample Collection	Consultant	Field Technician	15	22.5	18	$39	$/hr	$591	$886	$709
Waste Sample Analysis (# of samples)(3)	Consultant	Laboratory	12 samples	27 samples	18 samples		$/sample			
Subtotal										
2. Land Disposal Restriction Waste Analysis										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	2	2	2	$103	$/hr	$206	$206	$206
Waste Sample Collection	Consultant	Field Technician	12	15	13.5	$39	$/hr	$473	$591	$532
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	6 samples	12 samples	9 samples		$/sample			
Subtotal										
3. Land Disposal Restriction Surface Impoundments										
Select Waste Specific Constituents to Test*	Consultant	Project Engineer	2	2	2	$103	$/hr	$206	$206	$206
Waste Sample Collection	Consultant	Field Technician	18	18	18	$39	$/hr	$709	$709	$709
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	12 samples	12 samples	12 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.
* 40 CFR Part 268 Subpart D

Table 7-6. Contract Lab Prices for Waste Analysis (1997 Dollars)

Type of Analysis	SW-846 Method(a)	Parameter	Minimum Price ($/Sample)	Maximum Price ($/Sample)	Median Price ($/Sample)
Physical		Solids content	12	38	17
		Oil & grease	30	82	63
		Suspended solids	16	38	16
		Dissolved solids	19	38	20
		Specific gravity	20	22	22
		BTUs	32	82	55
Chemical		pH	5	16	10
		Cyanides, total and amenable	30	80	41
		Sulfides, total	20	70	60
		TCLP with bottle extractor(b)	110	249	185
		TCLP with ZHE(c)	99	219	164
		EP(d)	100	126	110
		Metals			
		Arsenic	11	55	27
		Barium	11	33	14
		Cadmium	11	27	13
		Chromium	11	27	13
		Lead	11	27	13
		Mercury	11	49	38
		Selenium	11	33	27
		Silver	11	27	13
	8010	Purgeable Halogenated Volatile Organics	100	219	167
	8015	Purgeable Non-Halogenated Volatile Organics	55	219	107
	8020	Aromatic Volatile Organics	55	192	126
	8030	Acrolein, Acrylonitrile, Acetonitrile	130	153	142
	8040	Phenols	95	252	131
	8060	Phthalate Esters	95	175	131
	8080	Organochlorine, Pesticides and PCBs	75	219	153
	8090	Nitroaromatics and Cyclic Ketones	130	131	131
	8100/8310	Polynuclear Aromatic Hydrocarbons	100	246	197
	8120	Chlorinated Hydrocarbons	137	150	143
	8140	Organophosphorus Pesticides	130	301	175
	8150	Chlorinated Herbicides	140	203	164
	8240	Volatile Organics	99	307	219
	8270	Semi-Volatile Organics	249	542	361

Footnotes:

(a) SW-846 Methods are provided for organic constituents to assist the user in determining which methods are most appropriate for analyzing a specific hazardous waste stream. Appendix A to this document presents a listing of each organic constituent detected for each 8XXX Method.

(b) Toxicity Characteristic Leaching Procedure (TCLP), with bottle extractor, used to obtain extract for analyzing metals, semi-volatiles, pesticides, and herbicides.

(c) TCLP with Zero-Headspace Extractor (ZHE) used to obtain extract for analyzing volatiles.

(d) Extraction procedure (EP) used to obtain extract for generators to determine if their characteristic wastes are restricted from land disposal.

Table 7-7. Worksheet to Estimate Hazardous Waste Analysis Plan(a) - Small TSD Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Cost(b)	Unit	Lower Bound Estimate 1 wastes(c)	Upper Bound Estimate 3 wastes(c)	Typical Estimate 2 wastes(c)
1. General Requirements (all facilities)										
Listing of Parameters	Consultant	Project Engineer	2	6	4	$103	$/hr	$206	$617	$411
Description of Test Methods	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
Description of Sampling Methods	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
Description of Analysis Frequency	Consultant	Project Engineer	2	6	4	$103	$/hr	$206	$617	$411
Subtotal Project Staff			6	18	12			$617	$1,851	$1,234
Review Plan and Technical Support	Consultant	Project Manager(d)	0.6	1.8	1.2	$142	$/hr	$85	$255	$170
Clerical Support	Consultant	Clerical(e)	0.9	2.7	1.8	$26	$/hr	$23	$69	$46
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	0.8	2.3	1.5	$51	$/hr	$38	$114	$76
Subtotal			14.3	42.8	28.5			$1,380	$4,141	$2,761
2. Description of Methods										
Ignitable, reactive, or incompatible wastes										
- Presentation of Results (Landfills)	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
- Description of Test Method (Incinerators)	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
- Description of parameters to be tested	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Restricted Wastes Treated/Disposed										
- Description of parameters to be tested	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823

Table 7-7. Worksheet to Estimate Hazardous Waste Analysis Plan(a) - Small TSD Initial (Administrative) Costs (1997 Dollars) (continued)

Component	Participant	Type of Personnel(b)	Lower Bound Estimate Hours(b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Cost(b)	Unit	Lower Bound Estimate 1 waste(c)	Upper Bound Estimate 3 wastes(c)	Typical Estimate 2 wastes(c)
Surface Impoundments (exempt from LDR)										
- Description of Procedures and Schedules	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Subtotal Project Staff			20	42	28			$1,440	$3,086	$2,057
Review Plan and Technical Support	Consultant	Project Manager(d)	2	4.2	2.8	$142	$/hr	$283	$595	$397
Clerical Support	Consultant	Clerical(e)	3	6.3	4.2	$26	$/hr	$77	$162	$108
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	2	4.2	2.8	$51	$/hr	$101	$213	$142
Subtotal			47.0	98.7	65.8			$3,959	$8,376	$5,584
Total			61.3	141.5	94.3			$7,397	$12,517	$8,345

Footnotes:

(a) The user should select only those specific requirements applicable to the facility for which EBN is being calculated.
(b) DPRA, Incorporated, best professional judgement.
(c) Totals may not add because of rounding.
(d) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(e) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.
(f) The number of hours allocated to facility's Environmental Coordinator is assumed to equal to 10 % of the total consultant hours.

Table 7-8. Worksheet to Estimate Hazardous Waste Analysis Plan(a) - Medium TSD Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(b)	Lower Bound Estimate Hours (b)	Upper Bound Estimate Hours(b)	Typical Estimate Hours(b)	Cost(b)	Unit	Lower Bound Estimate 4 wastes(c)	Upper Bound Estimate 9 waste(c)	Typical Estimate 6 wastes(c)
1. General Requirements (all facilities)										
Listing of Parameters	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Description of Test Methods	Consultant	Project Engineer	3	5	4	$103	$/hr	$309	$514	$411
Description of Sampling Methods	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Description of Analysis Frequency	Consultant	Project Engineer	6	10	8	$103	$/hr	$617	$1,029	$823
Subtotal Project Staff			19	35	26			$1,954	$3,600	$2,674
Review Plan and Technical Support	Consultant	Project Manager(d)	1.9	3.5	2.6	$142	$/hr	$269	$496	$369
Clerical Support	Consultant	Clerical(e)	2.9	5.3	3.9	$26	$/hr	$73	$135	$100
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	2.4	4.4	3.3	$51	$/hr	$120	$221	$165
Subtotal			26.1	48.1	35.8			$2,417	$4,452	$3,308
2. Description of Methods										
Ignitable, reactive or incompatible wastes										
- Presentation of Results (Landfills)	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$823
- Description of Test Method (Incinerators)	Consultant	Project Engineer	1	3	2	$103	$/hr	$103	$309	$206
- Description of parameters to be tested	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Restricted Wastes Treated/Disposed										
- Description of parameters to be tested	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Surface Impoundments (exempt from LDR)										
- Description of Procedures and Schedule	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Subtotal Project Staff			20	42	28			$2,057	$4,320	$2,880
Review Plan and Technical Support	Consultant	Project Manager(d)	2	4.2	2.8	$142	$/hr	$283	$595	$397
Clerical Support	Consultant	Clerical(e)	3	6.3	4.2	$26	$/hr	$77	$162	$108
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	2.5	5.3	3.5	$51	$/hr	$127	$266	$177
Subtotal			27.5	57.8	38.5			$2,544	$5,343	$3,562
Total			53.6	105.9	74.3			$4961	$9,795	$6,870

Footnotes:

(a) The user should select only those specific requirements applicable to the facility for which EBN is being calculated.
(b) DPRA, Incorporated, best professional judgement.
(c) Totals may not add because of rounding.
(d) The number of hours allocated to the Project Manager is assumed to equal to 10% of the total project staff hours.
(e) The number of hours allocated to Clerical support is assumed to equal to 15% of the total project staff hours.
(f) The number of hours allocated to facility's Environmental Coordinator is assumed to equal to 10% of the total consultant hours.

Table 7-9. Worksheet to Estimate Waste Analysis - Small TSD On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
1. General Waste Analysis										
Data and Information Collection	Facility	Env. Coordinator	1	3	2	$51	$/hr	$51	$152	$101
Data and Information Review(c)	Consultant	Project Engineer	2	4	3	$103	$/hr	$206	$411	$309
Subtotal			3	7	5			$256	$563	$410
2. Land Disposal Restriction Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	10.5	12	10.5	$39	$/hr	$414	$473	$414
Waste Sample Analysis (# of samples)(d)	Consultant	Laboratory	3 samples	6 samples	3 samples		$/sample			
Subtotal										
3. Land Disposal Restriction Surface Impoundments										
Waste Sample Collection	Consultant	Field Technician	13.5	13.5	13.5	$39	$/hr	$532	$532	$532
Waste Sample Analysis (# of samples)(d)	Consultant	Laboratory	6 samples	6 samples	6 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The on-going cost of re-analysis is not presented in this table. If re-analysis is required, it would be the same as the cost for the initial analysis evaluated in Table 7-4.
(d) Obtain price per sample from Table 7-6.

Table 7-10. Worksheet to Estimate Waste Analysis - Medium TSD On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
1. General Waste Analysis										
Data and Information Collection	Facility	Env. Coordinator	4	8	6	$51	$/hr	$202	$405	$304
Data and Information Review(c)	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Subtotal			8	16	12			$614	$1,228	$921
2. Land Disposal Restriction Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	12	15	13.5	$39	$/hr	$473	$591	$532
Waste Sample Analysis (# of samples)(d)	Consultant	Laboratory	6 samples	12 samples	9 samples		$/sample			
Subtotal										
3. Land Disposal Restriction Surface Impoundments										
Waste Sample Collection	Consultant	Field Technician	18	18	18	$39	$/hr	$709	$709	$709
Waste Sample Analysis (# of samples)(d)	Consultant	Laboratory	12 samples	12 samples	12 samples		$/sample			
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The on-going cost of re-analysis is not presented in this table. If re-analysis is required, it would be the same as the cost for the initial analysis evaluated in Table 7-4.
(d) Obtain price per sample from Table 7-6.

Table 7-11. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Small Generator Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
Waste Tested to Determine if Restricted Waste										
Select Waste Specific Constituents to Test	Consultant	Project Engineer	1	1	1	$103	$/hr	$103	$103	$103
Waste Sample Collection	Consultant	Field Technician	10.5	13.5	12	$39	$/hr	$414	$532	$473
Waste Sample Analysis (# of samples) (c)	Consultant	Laboratory	3 samples	9 samples	6 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Total may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

Table 7-12. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Medium Generator Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
Waste Tested to Determine if Restricted Waste										
Select Waste Specific Constituents to Test	Consultant	Project Engineer	2	2	2	$103	$/hr	$206	$206	$206
Waste Sample Collection	Consultant	Field Technician	15	22.5	18	$39	$/hr	$591	$886	$709
Waste Sample Analysis (# of samples) (c)	Consultant	Laboratory	12 samples	27 samples	18 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Total may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

Table 7-13. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Small Generator Treating Restricted Wastes in 90-Day Accumulation Tanks, Containers, Containment Buildings, or Drip Pads Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
1. Physical and Chemical Analysis										
Select Waste Specific Constituents to Test	Consultant	Project Engineer	1	1	1	$103	$/hr	$103	$103	$103
Waste Sample Collection	Consultant	Field Technician	10.5	12	10.5	$39	$/hr	$414	$473	$414
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	3 samples	6 samples	3 samples		$/sample			
Waste Analysis Plan	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Subtotal										
Review Plan and Technical Support	Consultant	Project Manager(d)	1.8	2.5	2.0	$142	$/hr	$248	$354	$276
Clerical Support	Consultant	Clerical(e)	2.6	3.8	2.9	$26	$/hr	$67	$96	$75
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	2.2	3.1	2.4	$71	$/hr	$156	$223	$174
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.
(d) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(e) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.
(f) The number of hours allocated to facility's Environmental Coordinator is assumed to equal to 10 % of the total consultant hours.

Table 7-14. Worksheet to Estimate Land Disposal Restrictions Waste Analysis – Medium Generator Treating Restricted Wastes in 90 Day Accumulation Tanks, Containers, Container Buildings, or Drip Pads Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
1. Physical and Chemical Analysis										
Select Waste Specific Constituents to Test	Consultant	Project Engineer	2	2	2	$103	$/hr	$206	$206	$206
Waste Sample Collection	Consultant	Field Technician	12	15	13.5	$39	$/hr	$473	$591	$532
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	6 samples	12 samples	9 samples		$/sample			
Waste Analysis Plan	Consultant	Project Engineer	6	12	8	$103	$/hr	$617	$1,234	$823
Subtotal										
Review Plan and Technical Support	Consultant	Project Manager(d)	2.0	2.9	2.4	$142	$/hr	$283	$411	$333
Clerical Support	Consultant	Clerical(e)	3.0	4.4	3.5	$26	$/hr	$77	$112	$91
Assist Consultant and Review Plan	Facility	Env. Coordinator(f)	2.8	4.1	3.3	$51	$/hr	$142	$206	$167
Subtotal										
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.
(d) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(e) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.
(f) The number of hours allocated to facility's Environmental Coordinator is assumed to equal to 10 % of the total consultant hours.

Table 7-15. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Small Generator On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Repeat Physical and Chemical Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	10.5	13.5	12	$39	$/hr	$414	$532	$473
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	3 samples	9 samples	6 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

Table 7-17. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Small Generator Treating Restricted Wastes in 90-Day Accumulation Tanks Containers, Containment Buildings, or Drip Pads On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Repeat Physical and Chemical Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	10.5	12	10.5	$39	$/hr	$414	$473	$414
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	3 samples	6 samples	3 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

Table 7-16. Worksheet to Estimate Land Disposal Restrictions Waste Analysis - Medium Generator On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
Repeat Physical and Chemical Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	15	22.5	18	$39	$/hr	$591	$886	$709
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	12 samples	27 samples	18 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

Table 7-18. Worksheet to Estimate Land Disposal Restrictions Waste Analysis – Medium Generator Treating Restricted Wastes in 90-Day Accumulation Tanks Containers, Container Buildings, or Drip Pads On-going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost(a)	Unit	Lower Bound Estimate 4 wastes(b)	Upper Bound Estimate 9 wastes(b)	Typical Estimate 6 wastes(b)
Repeat Physical and Chemical Waste Analysis										
Waste Sample Collection	Consultant	Field Technician	12	15	13.5	$39	$/hr	$473	$591	$532
Waste Sample Analysis (# of samples)(c)	Consultant	Laboratory	6 samples	12 samples	9 samples		$/sample			
Total										

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Obtain price per sample from Table 7-6.

CHAPTER 8. CONTINGENCY PLAN

This chapter presents the cost estimates for developing a contingency plan. The RCRA regulations require both generators and treatment, storage, and disposal facilities (TSD) to have a written contingency plan. The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water. Definitions, documentation of assumptions, and costs for developing and maintaining a contingency plan are presented in the following sections.

8.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter.

Small-Sized[29] Generator	Facilities that generate one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Generator	Facilities that generate four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized Generator	Facilities that generate ten or more hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Small-Sized[30] Treatment, Storage, and Disposal Facility (TSD)	Non-commercial or commercial hazardous waste management facilities which treat, store, or dispose one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.

[29] For the purposes of this manual, "small-sized" refers to the generation of one to three hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition of a "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

[30] For the purposes of this manual, "small-sized" refers to the generation of one to three hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

Medium-Sized Treatment, Storage, and Disposal Facility (TSD)	Non-commercial or commercial hazardous waste management facilities which treat, store, or dispose four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized Treatment, Storage, and Disposal Facility (TSD)	Non-commercial or commercial hazardous waste management facilities which treat, store, or dispose of ten or more hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Lower Bound Cost	The lowest cost estimate for developing a contingency plan for a small-sized generator, or TSD, based on the generation, treatment, storage, or disposal of one or two hazardous waste streams.
Upper Bound Cost	The highest cost estimate for developing a contingency plan for a medium-sized generator, or TSD, based on the generation, treatment, storage, or disposal of six or more hazardous waste streams.
Typical Cost	The representative cost estimate for developing a contingency plan for a typically-sized generator, or TSD, based on the generation, treatment, storage, or disposal of three to five hazardous waste streams.

8.2 Assumptions

The cost estimates for compliance with the contingency plan requirements are based on the following assumptions:

- The cost estimates represent small, medium, or large-sized generators or TSDs.

- The facility, especially if a non-notifier, will hire an environmental consulting firm to develop the contingency plan. (For further information on a non-notifier, the user should refer to Chapter 3 - Multiple RCRA Violations.) Time is included for facility personnel (i.e., an environmental coordinator) to meet with local authorities to make emergency service arrangements and to provide oversight in the plan development.

- The facility does not have an existing Spill Prevention, Control, and Countermeasures (SPCC) Plan in compliance with the oil pollution prevention requirements of 40 CFR Part 112 or any other emergency or contingency plan. The 40 CFR 264.52 and 40 CFR 265.52 regulations state that if the facility already has an SPCC Plan, that plan only needs to be amended to incorporate the hazardous waste management provisions. The cost to amend an existing SPCC plan to include hazardous waste management provisions would be less than the costs reported in Tables 8-1 through 8-3.

- In the case where a generator or TSD has developed a contingency plan, but the plan is deficient, costs to correct the deficiency may be interpolated from the costs reported in Tables 8-1 through 8-6.

- The contingency plan regulations (40 CFR 264/265, Subpart D) require that the emergency service arrangements made with local authorities (i.e., police, fire department, emergency response teams, and hospitals) under 40 CFR 264/265, Subpart C (Preparedness and Prevention) must be described in the contingency plan. If a facility has not prepared a contingency plan, it is unlikely that they have made emergency service arrangements with local authorities as specified in 40 CFR 264.37 and 40 CFR 265.37. Costs, therefore, are included to develop written documentation to familiarize local authorities with the facility (i.e., facility layout, chemical/physical properties of hazardous waste at the facility and associated hazards, areas where facility personnel work, entrances to and roads inside the facility, and possible evacuation routes) and to meet with local authorities to make emergency service arrangements. The cost for meeting with local authorities is estimated assuming one meeting with all authorities attending, rather than separate meetings with each authority. The costs include both consultant and facility personnel to meet with local authorities.

- The contingency plan regulations (40 CFR 264.54 and 40 CFR 265.54) specify that the contingency plan must be amended as necessary (i.e., facility changes in design, construction, operation, or maintenance; changes in emergency coordinator or equipment; etc.). The on-going costs include the cost for a consultant and the facility environmental coordinator to review the plan for necessary changes.

8.3 Cost Estimates

Tables 8-1 through 8-3 present the initial (administrative) cost estimates for developing a contingency plan for a small, medium, and large-sized generator or TSD, respectively. The tables present detailed cost estimates for each component of a contingency plan. The cost estimates include lower bound, upper bound, and typical estimates.

Tables 8-4 through 8-6 present the on-going costs for a contingency plan for a small, medium, and large-sized generator or TSD, respectively. The on-going costs consist of a consultant (i.e., project engineer) and facility staff (i.e., an environmental coordinator) reviewing the plan for changes. Costs are not included for revisions because they may not occur annually and will vary depending on the extent of the change. The cost estimates shown provide lower bound, upper bound, and typical estimates.

8.4 References

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. U.S. EPA, "Supporting Statement for EPA Information Collection Request #1571, General Hazardous Waste Facility Standards," July 7, 1993.

3. All dollar values and costs developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

Table 8-1. Contingency Plan - Small Generator or TSD Facility Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Oversight of plan development	Facility	Env. Coordinator	2	4	3	$51	$/hr	$101	$202	$152
Actions of facility's emergency coordinator (EC)	Consultant	Project Engineer	8	16	12	$103	$/hr	$823	$1,646	$1,234
Local authorities arrangements										
- Prepare facility familiarization fact sheet	Consultant	Project Engineer	2	6	4	$103	$/hr	$206	$617	$411
- Assist project engineer	Consultant	Drafting	2	4	3	$50	$/hr	$99	$198	$149
- Assist project engineer	Consultant	Eng. Assistant	4	8	6	$53	$/hr	$212	$424	$318
- Meet with local authorities and facility staff	Consultant	Project Engineer	2	2	2	$103	$/hr	$206	$206	$206
- Assist project engineer	Facility	Env. Coordinator	2	2	2	$51	$/hr	$101	$101	$101
- Describe arrangements in contingency plan	Consultant	Project Engineer	2	4	3	$103	$/hr	$206	$411	$309
Lists										
- Names and addresses of qualified ECs	Consultant	Eng. Assistant	1	1	1	$53	$/hr	$53	$53	$53
- Emergency equipment at the facility	Consultant	Eng. Assistant	2	4	3	$53	$/hr	$106	$212	$159
- Assist engineering assistant	Consultant	Drafting	1	2	1	$50	$/hr	$50	$99	$50
Describe evacuation plan	Consultant	Project Engineer	2	4	3	$103	$/hr	$206	$411	$309
Subtotal			30	57	43			$2,367	$4,580	$3,449
Review plan and technical support	Consultant	Project Manager(c)	3.0	5.7	4.3	$142	$/hr	$425	$808	$610
Assist Project Manager	Consultant	Clerical(d)	4.5	8.6	6.5	$26	$/hr	$116	$220	$166
Submit copies of plan to local authorities	Facility	Eng. Assistant	2.0	2.0	2.0	$53	$/hr	$106	$106	$106
Total			39.5	73.3	55.8			$3,014	$5,714	$4,330

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.

Table 8-2. Contingency Plan - Medium Generator or TSD Facility Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Oversight of plan development	Facility	Env. Coordinator	4	8	6	$51	$/hr	$192	$405	$304
Actions of facility's emergency coordinator (EC)	Consultant	Project Engineer	16	24	20	$103	$/hr	$1,646	$2,469	$2,057
Local authorities arrangements										
- Prepare facility familiarization fact sheet	Consultant	Project Engineer	8	16	12	$103	$/hr	$823	$1,646	$1,234
- Assist project engineer	Consultant	Drafting	4	6	5	$50	$/hr	$198	$297	$248
- Assist project engineer	Consultant	Eng. Assistant	8	12	10	$53	$/hr	$424	$635	$529
- Meet with local authorities and facility staff	Consultant	Project Engineer	2	4	3	$103	$/hr	$206	$411	$309
- Assist project engineer	Facility	Env. Coordinator	2	4	3	$51	$/hr	$96	$96	$96
- Describe arrangements in contingency plan	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
Lists										
- Names and addresses of qualified ECs	Consultant	Eng. Assistant	1	1	1	$53	$/hr	$53	$53	$53
- Emergency equipment at the facility	Consultant	Eng. Assistant	4	6	5	$53	$/hr	$212	$318	$265
- Assist engineering assistant	Consultant	Drafting	2	3	2	$50	$/hr	$99	$149	$99
Describe evacuation plan	Consultant	Project Engineer	4	6	5	$103	$/hr	$411	$617	$514
Subtotal			59	98	78			$4,578	$7,918	$6,325
Review plan and technical support	Consultant	Project Manager(c)	5.9	9.8	7.8	$142	$/hr	$836	$1,389	$1,106
Assist Project Manager	Consultant	Clerical(d)	8.9	14.7	11.7	$26	$/hr	$227	$377	$300
Submit copies of plan to local authorities	Facility	Eng. Assistant	2.0	2.0	2.0	$53	$/hr	$106	$106	$106
Total			75.8	124.5	99.5			$5,748	$9,791	$7,837

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.

Table 8-3. Contingency Plan – Large Generator or TSD Facility Initial (Administrative) Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Oversight of plan development	Facility	Env. Coordinator	8	10	9	$51	$/hr	$192	$506	$456
Actions of facility's emergency coordinator (EC)	Consultant	Project Engineer	24	32	28	$103	$/hr	$2,469	$3,291	$2,880
Local authorities arrangements										
- Prepare facility familiarization fact sheet	Consultant	Project Engineer	20	30	24	$103	$/hr	$2,057	$3,086	$2,469
- Assist project engineer	Consultant	Drafting	6	8	7	$50	$/hr	$297	$396	$347
- Assist project engineer	Consultant	Eng. Assistant	12	14	13	$53	$/hr	$635	$741	$688
- Meet with local authorities and facility staff	Consultant	Project Engineer	4	4	4	$103	$/hr	$411	$411	$411
- Assist project engineer	Facility	Env. Coordinator	4	4	4	$51	$/hr	$204	$204	$204
- Describe arrangements in contingency plan	Consultant	Project Engineer	8	10	9	$103	$/hr	$823	$1,029	$926
Lists										
- Names and addresses of qualified ECs	Consultant	Eng. Assistant	1	1	1	$53	$/hr	$53	$53	$53
- Emergency equipment at the facility	Consultant	Eng. Assistant	6	8	7	$53	$/hr	$318	$424	$371
- Assist engineering assistant	Consultant	Drafting	3	3	3	$50	$/hr	$149	$149	$149
Describe evacuation plan	Consultant	Project Engineer	6	8	7	$103	$/hr	$617	$823	$720
Subtotal			102	132	116			$8,033	$11,113	$9,672
Review plan and technical support	Consultant	Project Manager(c)	10	13	12	$142	$/hr	$1,446	$1,871	$1,644
Assist Project Manager	Consultant	Clerical(d)	15	20	17	$26	$/hr	$393	$508	$447
Submit copies of plan to local authorities	Facility	Eng. Assistant	2	2	2	$53	$/hr	$106	$106	$106
Total			129.5	167	147			$9,978	$13,598	$11,869

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal to 10 % of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal to 15 % of the total project staff hours.

Table 8.4. Contingency Plan - Small Generator or TSD Facility On-Going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Review plan for necessary amendments	Consultant	Project Engineer	2	4	3	$206	$/hr	$206	$411	$309
	Facility	Env. Coordinator	1	2	1	$51	$/hr	$51	$101	$51
Total			3	6	4			$256	$513	$359

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.

Table 8.5. Contingency Plan – Medium Generator or TSD Facility On-Going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Review plan for necessary amendments	Consultant	Project Engineer	4	8	6	$103	$/hr	$411	$823	$617
	Facility	Env. Coordinator	2	4	3	$51	$/hr	$101	$202	$152
Total			6	12	9			$513	$1,025	$769

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.

Table 8-6. Contingency Plan - Large Generator or TSD Facility On-Going Costs (1997 Dollars)

Component	Participant	Type of Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Cost	Unit	Lower Bound Estimate 1 wastes(b)	Upper Bound Estimate 3 wastes(b)	Typical Estimate 2 wastes(b)
Review plan for necessary amendments	Consultant	Project Engineer	8	10	9	$103	$/hr	$823	$1,029	$926
	Facility	Env. Coordinator	6	8	7	$51	$/hr	$304	$405	$354
Total			14	18	16			$1,127	$1,434	$1,280

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.

CHAPTER 9. PERMITTING

This chapter presents the cost estimates for obtaining a permit to operate a treatment, storage, and disposal facility (TSD). The RCRA regulations require facilities that are treating, storing, or disposing hazardous wastes on site for more than 90 days to obtain a permit, except for small quantity generators (100 to 1000 kg/mo) who accumulate wastes on-site for less than 180 days. The permit application consists of two parts, the Part A requirements (40 CFR 270.13) and the Part B requirements (40 CFR 270.14 to 40 CFR 270.26).
If a facility is in violation of permitting requirements, they may also be in violation of other RCRA regulations (e.g., multiple RCRA violations, see Chapter 3 and waste analysis, see Chapter 7). The user of this chapter should refer to the other chapters in this manual for cost estimates for other RCRA violations.

The definitions, documentation of assumptions, and costs for obtaining a permit are presented in the following sections.

9.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter.

Small-Sized[31] Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility which treats, stores or disposes one to three hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Medium-Sized Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility, which treats, stores or disposes four to nine hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Large-Sized Treatment, Storage, and Disposal Facility (TSD)	An on-site, non-commercial facility, which treats, stores or disposes ten or more hazardous waste streams, which may include one or any number of waste codes defined in 40 CFR 261, and have a limited number of waste management practices.
Lower Bound Cost	This is the lowest cost estimate for completing a permit application.

31 For the purposes of this manual "small-sized" refers to the generation of one or two hazardous waste streams. "Small-sized", as used in this manual, should not be equated with the definition "small business" as defined in EPA's *Final Policy on Compliance Incentives for Small Businesses* published on June 3, 1996.

Upper Bound Cost	This is the highest cost estimate for completing a permit application.
Typical Cost	This is a representative cost estimate for completing a permit application.
Land Disposal Facilities	A surface impoundment, waste pile, land treatment unit, or landfill.
Solid Waste Management Unit (SWMU)	Any hazardous or nonhazardous solid waste management unit at a facility including inactive units. A SWMU may include any of the following: landfill, surface impoundment, waste pile, land treatment unit, tank (including 90-day accumulation tank), injection well, incinerator, boiler or industrial furnace (BIF) burning hazardous waste, a RCRA Subpart X unit, wastewater treatment tank, container storage area, waste handling area, transfer station, and waste recycling operations.
New TSD Facility	A TSD facility which began operation or for which construction commenced after November 19, 1980, or after the effective date of regulatory or statutory changes subjecting them to RCRA permit requirements.

9.2 Assumptions

The cost estimates for obtaining a permit are based on the following general assumptions:

- The cost estimates represent small, medium, and large-sized on-site, non-commercial TSDs. The waste streams from these facilities should, therefore, not change dramatically in any given year and would only require one sampling event. These facilities may be non-notifiers, may have failed to test one or more hazardous waste streams, or may have mischaracterized one or more hazardous waste streams.

- The cost estimates are for a commercial or noncommercial TSD to obtain a permit.

- The TSD will hire an environmental consulting firm to prepare both the Part A and Part B permit applications. Time is included for facility personnel (i.e., an environmental coordinator) to provide oversight in the development and review of the Part A and Part B permit applications. For the Part B permit application cost estimate, facility personnel time is estimated as a percentage of the total consultant hours.

The cost estimates for developing the Part B permit application are based on the following assumptions:

- Cost estimates are developed for the following technologies: containers, tanks, surface impoundments, waste piles, land treatment units, landfills, and incinerators. Cost estimates are not included for the following technologies: boilers or industrial furnaces (40 CFR 270.22), miscellaneous units (40 CFR 270.23), process vents (40 CFR 270.24), equipment (40 CFR 270.25), or drip pads (40 CFR 270.26) because the costs are site specific in nature.

- Cost estimates are not included for Class I injection wells since they are covered by RCRA permit by rule.

- Cost estimates are not included for obtaining a post-closure permit.

- Cost estimates are not included for public hearings or legal review of the permit application, or corrective action measures, as these costs are site specific in nature.

- The cost estimates include a contingency fee of 15 percent for responding to the Part B application notice of deficiencies (NODs). TSDs must submit their Part B application to State or EPA regional staff for review and approval. The State or EPA regional staff review the application for completeness and technical adequacy. Typically, the authority reviewing the application will identify deficiencies in the application, which are prepared in notice form, and will ask the applicant to respond to the NODs.

- Cost estimates are not included for developing engineering and profile drawings (i.e., containment system, run-on/run-off control structures, etc.) of the TSD unit; calculations demonstrating that the containment system has sufficient capacity; engineering analyses of foundation or containment system materials; etc., since costs for these items are part of the design and construction capital costs inherent to the TSD unit. Copies of these items would be included as part of the Part B application. Cost estimates are included for clerical time to make copies of the items for inclusion in the permit application.

- Where the Part B general requirements specify a copy of an item (e.g., waste analysis plan, general inspection schedule, contingency plan, closure/post-closure plans, closure/post-closure cost estimates, and financial assurance mechanisms), the Part B cost estimate includes only the cost (i.e., clerical time) for making copies. The user should refer to the other chapters in this manual for cost estimates for the activities, if the cost is accounted for elsewhere.

- The Part B general and TSD specific requirements allow for waivers, variances, and exemptions. Costs estimates have not been developed for site-specific items, however, the case development officer should not overlook the economic benefit gained from site-specific costs that are not costed in this manual. Costs are not included for the following exceptions because they are site specific in nature:

  - Waivers for the 40 CFR 264 preparedness and prevention requirements;

- Tank systems with variances from the secondary containment requirements;

- Surface impoundments with exemptions from the liner requirements or alternate liner design;

- Unenclosed waste piles with exemptions from the liner requirements, alternate liner design, or exemptions from a groundwater monitoring program; and

- Landfills with exemptions from the liner system and leachate collection and removal system, alternate design, or exemptions from a groundwater monitoring program.

- The Part B general requirements specify seismic standards for new TSD facilities. The TSD must identify if it is located in an area listed in Appendix VI of 40 CFR 264. (These areas are political jurisdictions in which compliance with the seismic location standards must be demonstrated.) If the TSD is located in a listed area, it must be determined whether any faults are present within 3,000 feet of the unit that have had displacement in Holocene time. If there are faults within 3,000 feet of the TSD that have had displacement since Holocene time, it must be determined whether any faults pass within 200 feet of the active TSD area (i.e., where treatment, storage, or disposal of hazardous waste is conducted). Cost estimates are included for determining whether the TSD is located in a listed area and for demonstrating that there are no faults that have had displacement in Holocene time. Cost estimates are not included for demonstrating that no faults pass within 200 feet of the TSD active area because the costs are site specific in nature.

- The Part B general requirements specify floodplain standards for all TSDs. First, the TSD must identify whether it is located in a 100-year floodplain. The cost estimate assumes a Federal Insurance Administration (FIA) map is available for the TSD location. Costs are not included for equivalent mapping techniques where FIA maps are not available, because they are site specific in nature. If a TSD is located in a 100-year floodplain, the regulations specify two options for compliance demonstration. Costs are included for both options. For those TSDs located in a 100-year floodplain but not in compliance, costs are included for developing a compliance plan and schedule.

- The Part B general requirements specify that an outline of training programs be included with the permit application. The cost estimate assumes preparation of an outline based on a training program that has already been developed. Costs are not included for developing a training program in this chapter.

- The Part B general requirements specify that additional information required by other laws (e.g., Wild & Scenic Rivers, Endangered Species Act, etc.) may be required. Costs were not included for this information because it is site specific in nature.

- The cost estimates for the Part B groundwater monitoring requirements assume the TSD is conducting detection monitoring only. The Part B groundwater monitoring requirements specify requirements for TSDs that have detected the presence of hazardous constituents in the groundwater (i.e., compliance monitoring) and for those TSDs that have hazardous constituents exceeding established concentrations

in the groundwater (i.e., corrective action procedures). Cost estimates are not included for these requirements because they are both site specific and enforcement related in nature.

- Cost estimates for the Part B groundwater monitoring requirements do not include the cost for a hydrogeologic investigation or developing a groundwater sampling and analysis plan or statistical procedures because these are 40 CFR Part 264, Subpart F costs. Cost estimates are included for clerical time to make copies of the items for inclusion as part of the Part B permit application. The user should refer to Chapter 4 on cost estimates for developing a groundwater monitoring program.

- The Part B general requirements specify that TSDs must submit information pertaining to any release of hazardous wastes or hazardous constituents from all SWMUs. The Part B general requirements also specify that the owner/operator of the TSD may have to conduct and provide the results of sampling and analysis of groundwater, land surface, and subsurface strata, surface water, or air. The cost estimate includes the costs for identifying SWMUs and characterizing releases using existing data and demonstrating no releases. The cost estimate does not include sampling and analysis because it is site specific in nature.

- Tank Part B permit application costs are estimated for the following three types of secondary containment systems: external liner, vault, and double-walled tank. The user should select the secondary containment systems applicable to the facility for which EBN is being calculated.

- The surface impoundment Part B requirements specify that a description of inspection procedures, removal from service procedures, and closure procedures be included in the application. This information is included in the inspection plan, contingency plan, and closure plan which is required under the Part B general requirements. Therefore, no additional costs are incurred for these requirements.

- Waste pile Part B permit application costs are estimated for both enclosed dry piles and unenclosed piles. The user should select the type of waste piles applicable to the facility for which EBN is being calculated.

- The waste pile Part B requirements specify that a description of inspection procedures and closure procedures be included in the application. This information is included in the inspection plan and closure plan which is required under the Part B general requirements. Therefore, no additional costs are incurred for these requirements.

- The land treatment Part B requirements specify that a description of the treatment demonstration be included as part of the application. Costs for conducting a treatment demonstration are a 40 CFR Part 264, Subpart M (40 CFR 264.272) cost which is included as part of the initial costs for the facility. As a part of the Part B application, a copy of this demonstration would be included. Cost estimates are included for clerical time to make a copy of the demonstration for inclusion in the permit application.

- The land treatment Part B requirements specify that a description of the food-chain crop demonstration be included as part of the application if food-chain crops are grown in the treatment zone. Costs for conducting a food-chain crop demonstration are a 40 CFR Part 264, Subpart M (40 CFR 264.276) cost which is included as part of the initial costs for the facility. As a part of the Part B application, a copy of this demonstration would be included. Cost estimates are included for clerical time to make a copy of the demonstration for inclusion in the permit application.

- The Part B requirements for land treatment and landfills specify that a description of inspection procedures and closure procedures be included in the application. This information is included in the inspection plan and closure plan which is required under the Part B general requirements. Therefore, no additional costs are incurred for these requirements.

- Incinerator Part B application costs are estimated for three options: Option 1 - exemption for ignitable, corrosive, or reactive wastes; Option 2 - trial burn; and Option 3 - data submitted in lieu of a trial burn. Option 1 is applicable for facilities that incinerate only ignitable (D001), corrosive (D002), or reactive (D003) wastes. The user should select the option which is most appropriate to the facility for which EBN is being calculated.

- The incinerator Part B application costs for a trial burn (Option 2), include developing a trial burn plan and conducting trial burns. The trial burn cost estimates assume an environmental consulting firm will develop the plan and conduct the trial burns for the facility. The trial burn costs include all analytical work, interaction with facility personnel and the permitting agency, and preparation of a draft and final report. The lower bound cost estimate is based on conducting three separate trial burns on different days and includes sampling for volatiles, particulates, and hydrochloric acid, and continuous emission monitoring. The typical cost estimate is based on conducting three separate trial burns on different days, and includes sampling for volatiles, particulates, hydrochloric acid, metals, and dioxins, and continuous emission monitoring. The upper bound cost estimate is based on conducting four separate trial burns on different days, and includes sampling for volatiles, particulates, hydrochloric acid, metals, and dioxins, and continuous emission monitoring.

9.3 Initial (Administrative) Costs

The initial cost components for obtaining a RCRA permit to operate a TSD consist of the Part A application and the Part B application. The Part B application consists of general facility requirements and technology specific requirements (i.e., specific requirements for containers, tanks, surface impoundments, waste piles, land treatment units, landfills, and incinerators).

Table 9-1 presents a worksheet to summarize the initial (administrative) cost components for obtaining a permit. Table 9-1 allows the user of this document to calculate the total initial (administrative) costs for the particular facility for which EBN is being calculated. The costs entered on Table 9-1 are derived from the applicable cost components from Tables 9-2 through 9-10.

Tables 9-2 through 9-10 present worksheets for determining the cost for specific components of a permit application. The tables and the cost estimates included on each table are as follows:

- Table 9-2 - Part A permit application cost;
- Table 9-3 - Part B general facility requirements cost;
- Table 9-4 - Part B container requirements cost;
- Table 9-5 - Part B tank system requirements cost;
- Table 9-6 - Part B surface impoundment requirements cost;
- Table 9-7 - Part B waste pile requirements cost;
- Table 9-8 - Part B land treatment requirements cost;
- Table 9-9 - Part B landfill requirements cost; and
- Table 9-10 - Part B incinerator requirements cost.

Tables 9-2 through 9-10 present detailed cost estimates for each component of a permit application and provide lower bound, upper bound, and typical estimates. The tables do not report a total cost because the tables include costs for many components that are not applicable to all facilities. For example, demonstration costs are included for facilities located in a seismic area and a 100-year floodplain. These costs are not applicable for all facilities. Tables 9-2 through 9-10 note those components that are not applicable to all facilities. The total cost for each applicable table is calculated by adding the costs for those components that are applicable to the facility for which EBN is being calculated.

9.4 Permit Modification Costs

Changes may occur at a TSD during its operating life that would require a modification to the permit. Permit modifications are classified as either Class 1, Class 2, or Class 3. Under RCRA, 40 CFR 270.42, Appendix I lists several types of modifications and their class. Cost estimates were not developed for permit modifications because they are site specific in nature. However, permit modifications for adding a new unit, a Class 3 modification, can be obtained from Tables 9-4 through 9-10 for the specific technology (i.e., container, tank, etc.) being added. The Part B general facility requirements for adding a new unit are estimated as 25 percent of the general facility requirements initial cost.

9.5 Permit Renewal Costs

The Part B permit application must be renewed periodically (40 CFR 270.50). The regulations specify a maximum duration of 10 years for a RCRA permit. The regulations further state that a RCRA permit for a land disposal facility will be reviewed by the Director every five years. The costs for permit renewal are estimated as 25 to 50 percent of the initial cost for obtaining the permit. [32]

9.6 References

[32] DPRA, Incorporated, best professional judgement.

1. Labor rates and hour estimates are based on DPRA's engineering/field experience. DPRA is an environmental engineering consulting firm with extensive experience in cost engineering. DPRA has provided EPA with substantial cost engineering support for several proposed and final RCRA rules.

2. Midwest Research Institute phone conversation regarding information on the cost to obtain a Part B permit application for an incinerator conducting a trial burn, Kansas City, Missouri, June 22, 1993.

3. Permit renewal and modification cost information was obtained from DPRA and ICF's working notes used to develop class permit costs for the U.S. EPA in support of RCRA Reauthorization in April 1990.

4. DPRA (formerly Pope-Reid Associates), "Surface Impoundment and Landfill Time Requirements for Part B Permit Application and Facility Construction," prepared for U.S. EPA, OSW, September 8, 1983.

5. U.S. EPA, "Supporting Statement for EPA Information Collection Request Number 262, RCRA Hazardous Waste Permit Application and Modification, Part A," July 1, 1993.

6. U.S. EPA, "Supporting Statement for EPA Information Collection Request Number 1573, Part B Permit Application, Permit Modifications, and Special Permits," July 7, 1993.

7. All dollar values and costs developed by DPRA were originally in 1992 dollars and inflated to 1996 dollars by the method described in Appendix A.

Table 9-1. Worksheet to Summarize RCRA Permit Costs Initial (Administrative) Costs (1996 dollars)

Component	Lower Bound Cost Estimate ($)	Upper Bound Cost Estimate ($)	Typical Cost Estimate ($)
Part A Permit Application (a)			
Part B Permit Application			
• General facility requirements (b)			
• Container requirements (c)			
• Tank system requirements (d)			
• Surface impoundment requirements (e)			
• Waste pile requirements (f)			
• Land treatment requirements (g)			
• Landfill requirements (h)			
• Incinerator requirements (I)			
TOTAL COST			

(a) Enter Part A permit application total cost from Table 9-2.
(b) Enter Part B permit application general facility requirements total cost from Table 9-3.
(c) Enter Part B permit application container requirements total cost from Table 9-4.
(d) Enter Part B permit application tank system requirements total cost from Table 9-5.
(e) Enter Part B permit application surface impoundment requirements total cost from Table 9-6.
(f) Enter Part B permit application waste pile requirements total cost from Table 9-7.
(g) Enter Part B permit application land treatment requirements total cost from Table 9-8.
(h) Enter Part B permit application landfill requirements total cost from Table 9-9.
(I) Enter Part B permit application incinerator requirements total cost from Table 9-10.

Table 9-2. Part A Permit Application Initial (Administrative) Costs (1997 Dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
1. Provide information to consultant to complete part A application and review completed application	Facility	Env. Coordinator	8	16	12	$51	$405	$810	$607
2. Part A application									
Complete part A form	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
Prepare scale drawing	Consultant	Drafting	2	6	4	$50	$99	$297	$198
Photos of facility	Consultant	Eng. Assistant	2	4	2	$53	$106	$212	$106
Topographical map	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Topographical map (assistance)	Consultant	Eng. Assistant	4	12	8	$53	$212	$635	$424
Subtotal			26	60	42		$1,850	$4,217	$2,981
3. Review information and provide support	Consultant(c)	Project Manager	2.6	6	4.2	$142	$369	$850	$595
Clerical support	Consultant(d)	Clerical	3.9	9	6.3	$26	$100	$231	$162
Total			32.5	75	52.5		$2,319	$5,299	$3,738

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Total may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated for clerical support is assumed to equal 15 percent of the total project staff hours.

Table 9-3. Worksheet to Estimate Part B Permit Application – General Facility Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
1. General information requirements									
Brief description of facility	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Description of hazardous waste managed	Consultant	Project Engineer	2	8	6	$103	$206	$823	$617
Copy laboratory report	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy waste analysis report	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Description of security procedures	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Copy general inspection schedule	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of contingency plan	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Description of procedures, structure, or equipment used at facility	Consultant	Project Engineer	6	16	12	$103	$617	$1,646	$1,234
Description of precautions to prevent ignition or reaction of wastes	Consultant	Project Engineer	1	6	4	$103	$103	$617	$411
Traffic information									
- Description of traffic patterns, volume	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Traffic pattern drawings	Consultant	Drafting	1	4	2	$50	$50	$198	$99
Seismic standard									
- Identify political jurisdiction	Consultant	Project Engineer	1	1	1	$103	$103	$103	$103
- Demonstrate facility is 3000 feet from fault									
-- Review published reports	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Review published reports (assistance)	Consultant	Eng. Assistant	12	18	16	$53	$635	$953	$847
-- Obtain aerial published photographs	Consultant	Eng. Assistant	4	8	6	$53	$212	$424	$318
-- Analyze aerial photographs	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
-- Analyze aerial photographs (assistance)	Consultant	Eng. Assistant	8	16	12	$53	$424	$847	$635
-- Walking reconnaissance	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Report preparation	Consultant	Project Engineer	12	24	18	$103	$1,234	$2,469	$1,851
-- Report preparation (assistance)	Consultant	Eng. Assistant	4	8	6	$53	$212	$424	$318
100-year floodplain standard									
- Identify if the facility in 100-yr floodplain									
-- Obtain and review FIA maps	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Obtain and review FIA maps (assistance)	Consultant	Eng. Assistant	2	4	3	$53	$106	$212	$159

Table 9-3. Worksheet to Estimate Part B Permit Application – General Facility Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
- Demonstrate compliance (2 Options)(c)									
-- Option one: engineering study of hydrodynamic and hydrostatic forces expected in 100-year flood.	Consultant	Project Engineer	16	32	24	$103	$1,648	$3,296	$2,472
	Consultant	Eng. Assistant	4	6	5	$53	$212	$318	$265
	Consultant	Drafting	4	8	6	$50	$200	$400	$300
-- Option two: detailed plan describing procedures to remove hazardous waste before facility is flooded.	Consultant	Project Engineer	12	40	24	$103	$1,236	$4,120	$2,472
	Consultant	Drafting	4	8	6	$50	$200	$400	$300
- Plan and schedule to bring facility in compliance with floodplain standard.	Consultant	Project Engineer	8	16	12	$103	$824	$1,648	$1,236
	Consultant	Drafting	4	8	6	$50	$200	$400	$300
Outline of intro and continuing training plan	Consultant	Project Engineer	6	12	8	$103	$618	$1,236	$824
Copy of closure plan and cost estimate	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of post-closure plan and cost estimate	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of closure financial assurance mechanism	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of third-party liability financial mechanism	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Prepare topographical maps									
- Provide oversight	Consultant	Project Engineer	4	8	6	$103	412	$824	$618
- Obtain map and assist with research	Consultant	Eng. Assistant	16	32	24	$53	$848	$1,696	$1,272
- Prepare map with information	Consultant	Drafting	8	16	12	$50	$400	$800	$600
Copy of notice of approval for land disposal restrictions extension or petition	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Project Staff Subtotal(d)			152	306	231		$12,969	$28,777	$20,850
Review information and provide support	Consultant	Project Manager(e)	15	31	23	$142	$2,130	$4,402	$3,266
Clerical support	Consultant	Clerical(f)	23	46	35	$26	$598	$1,196	$910
Assist consultant	Facility	Env. Coordinator(g)	15	31	23	$51	$765	$1,581	$1,173
Subtotal - General Information Requirements			205.2	413.1	311.9		$16,479	$35,843	$26,184

Table 9-3. Worksheet to Estimate Part B Permit Application – General Facility Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
2. Groundwater monitoring requirements									
Summary of groundwater monitoring data	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Identification of uppermost aquifer and aquifers	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
hydraulically connected	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Prepare topographical map for 270.14(b)									
- Provide oversight	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Prepare map with information	Consultant	Drafting	8	8	6	$50	$396	$396	$297
Prepare detailed plans and engineering report									
- List of Indicator Parameters	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Description of Monitoring Wells	Consultant	Project Engineer	4	6		$103	$411	$823	$617
- Prepare map with monitoring well locations	Consultant	Drafting	2	6	4	$50	$99	$297	$198
- Description of background procedures	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
- Copy of sampling and analysis plan	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Copy of statistical procedures	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Project staff subtotal			38	72	53		$3,144	$6,427	$4,686
Review information and provide support	Consultant	Project Manager(e)	3.8	7.2	5.3	$142	$539	$1,021	$751
Clerical support	Consultant	Clerical(f)	5.7	10.8	8.0	$26	$146	$277	$204
Assist consultant	Facility	Env. Coordinator(g)	3.8	7.2	5.3	$51	$192	$364	$268
Subtotal - General Information Requirements			51.3	97.2	71.6		$4,021	$8,090	$5,910
3. Solid waste management units (2 Options)(c)									
Option One - SWMUs at facility									
- Identify all SWMUs at facility	Consultant	Project Engineer	2	16	8	$103	$206	$1,646	$823
- Prepare topographical map of SWMUs	Consultant	Drafting	2	8	6	$50	$99	$396	$297
- Copy of engineering plans for each unit	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Description of each SWMU	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
- Hazardous waste release, or hazardous waste constituents at each unit (2 Options)									
-- Option one: characterization of release	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
-- Option two: if no release then describe method used to determine no release	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Option two - if no SWMUs at facility									
-- Describe methodology used to determine that there are no existing or former SWMUs	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Project staff subtotal(d)			23	77	50		$2,182	$7,416	$4,746

Table 9-3. Worksheet to Estimate Part B Permit Application – General Facility Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Review information and provide support	Consultant	Project Manager(e)	2.3	7.7	5.0	$142	$326	$1,091	$709
Clerical support	Consultant	Clerical(f)	3.5	11.6	7.5	$26	$89	$297	$193
Assist consultant	Facility	Env. Coordinator(g)	2.3	7.7	5.0	$51	$116	$390	$253
Subtotal - Solid Waste Management Unit Requirements			31.1	104.0	67.5		$2,713	$9,194	$5,900
4. Summary									
Subtotal - General Information Requirements			205.2	413.1	311.9		$16,479	$35,843	$26,184
Subtotal - Groundwater Monitoring Requirements			51.3	97.2	71.6		$4,021	$8,090	$5,910
Subtotal - Solid Waste Management Unit Requirements			31.1	104.0	67.5		$2,713	$9,194	$5,900
Subtotal - Summary			287.6	614.3	450.9		$23,213	$53,126	$37,994
Contingency Fee (h)							$3,482	$7,969	$5,699
Total			287.6	614.3	450.9		$26,695	$61,095	$43,693

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) Two options are available to the facility, but for display purposes only, the table assumes option one was chosen.
(d) For the purposes of this example, the Project Staff Subtotal assumes Option One was chosen.
(e) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(f) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(g) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(h) A contingency fee of 15 percent is applied to the Subtotal - Summary value.

Table 9-4. Worksheet to Estimate Part B Permit Application – Container Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
1. Containers with free liquids									
List of hazardous wastes	Consultant	Project Engineer	1	2	1	$103	$103	$206	$103
Describe containers used	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Describe container management practices	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Describe containment system									
- Copy of engineering and profile drawings	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Visual inspection of structural integrity	Consultant	Project Engineer	2	3	2	$103	$206	$309	$206
- Description of containment system	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Description of capacity	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of volume calculations	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Description of run-on controls	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
- Liquid management procedures	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Document compliance with requirements for ignitable, reactive, or incompatible wastes									
- Prepare drawings	Consultant	Drafting	2	4	3	$50	$99	$198	$149
- Description of designs for wastes	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Copy of procedures to ensure compliance with 40 CFR 264.17	Consultant	Clerical	1	2	1	$26	$26	$51	$26
Project staff subtotal			32	63	45		$2,953	$5,804	$4,237
Review information and provide support	Consultant	Project Manager(c)	2.3	7.7	5.0	$142	$326	$1,091	$709
Clerical support	Consultant	Clerical(d)	3.5	11.6	7.5	$26	$89	$297	$193
Assist consultant	Facility	Env. Coordinator(e)	2.3	7.7	5.0	$51	$116	$390	$253
Subtotal - Containers with Free Liquids			40.1	90.0	62.5		$3,484	$7,581	$5,391
2. Containers without free liquids									
List of hazardous wastes	Consultant	Project Engineer	1	2	1	$103	$103	$206	$103
Describe containers used	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Describe container management practices	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Copy of test procedures and results	Consultant	Clerical	1	2	1	$26	$26	$51	$26
Describe how storage area is designed									
- Copy of engineering and profile drawings	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Description of design and/or operation	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Document compliance with requirements for ignitable, reactive, or incompatible wastes									
- Prepare drawings	Consultant	Drafting	2	4	3	$50	$99	$198	$149

Table 9-4. Worksheet to Estimate Part B Permit Application – Container Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate (b)
- Description of designs for wastes	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Copy of procedures to ensure compliance with 40 CFR 264.17	Consultant	Clerical	1	2	1	$26	$26	$51	$26
Project staff subtotal			18	36	25		$1,513	$3,026	$2,180
Review information and provide support	Consultant	Project Manager(c)	1.8	3.6	2.5	$142	$255	$510	$354
Clerical support	Consultant	Clerical(d)	2.7	5.4	3.8	$26	$69	$139	$96
Assist consultant	Facility	Env. Coordinator(e)	1.8	3.6	2.5	$51	$91	$182	$127
Subtotal - Containers without Free Liquids			24.3	48.6	33.8		$1,929	$3,858	$2,757
3. Summary									
Subtotal - Containers with Free Liquids			40.1	90.0	62.5		$3,484	$7,581	$5,391
Subtotal - Liquids without Free Liquids			18.0	36.0	25.0		$1,929	$3,858	$2,757
Subtotal - Summary			58.1	126.0	87.5		$5,413	$11,439	$8,149
Contingency Fee(f)							$812	$1,716	$1,222
Total			58.1	126.0	87.5		$6,225	$13,155	$9,371

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal - Summary value.

Table 9-5. Worksheet to Estimate Part B Permit Application – Tank System Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
List or all hazardous waste placed in each tank	Consultant	Project Engineer	1	2	1	$103	$103	$206	$103
Description of tanks	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Copy of written assessment for each tank	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of tank piping & instrumentation diagrams and process flows	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Detailed description of tank system installation and testing plans, and inspections	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Detailed description of secondary containment									
- Identification of tank age	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Copy of engineering and profile drawings	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Description of construction materials	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Documentation showing strength of system	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Description of system placement	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of placement calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Description of leak detection system	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Description of design and operation	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Procedures to remove wastes from system	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Documentation of ancillary equipment									
- Secondary containment - external liner									
-- Document external liner capacity	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
-- Copy of calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Document run-on controls	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
-- Document external liner surrounds tank	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Secondary containment - vault system									
-- Document vault system capacity	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
-- Copy of calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Document run-on controls	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
-- Document vault system water stops	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Document interior has impemerable barrier	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Describe process to protect against vapors	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Describe exterior moisture barrier	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309

Table 9-5. Worksheet to Estimate Part B Permit Application – Tank System Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
- Secondary containment - double walled tank									
-- Document unit is an integral structure	Consultant	Project Engineer	2	6	4	$103	206	618	412
-- Identify corrions protection used	Consultant	Project Engineer	2	4	3	$103	206	412	309
Description of spill/overflow prevention practices									
- Document tank wastes will not cause failure	Consultant	Project Engineer	2	4	3	$103	206	412	309
- Describe spill prevention controls	Consultant	Project Engineer	4	8	6	$103	412	824	618
- Copy of inspection schedule and procedures	Consultant	Clerical	1	1	1	$26	26	26	26
Document compliance with ignitable, reactive, or incompatible waste requirements									
- Copy of drawings indicating tanks/roadways	Consultant	Clerical	1	1	1	$26	26	26	26
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	206	618	412
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	26	26	26
Project Staff Subtotal - Secondary Containment (Liners)(c)			52	110	80		$4,731	$10,620	$7,611
Review Information and provide support	Consultant	Project Manager(d)	5.2	11.0	8.0	$142	738	1,562	1,136
Clerical Support	Consultant	Clerical(e)	7.8	16.5	12.0	$26	203	429	312
Assist Consultant	Facility	Env. Coordinator(f)	5.2	11.0	8.0	$51	265	561	408
Subtotal - Secondary Containment (Liners)			70.2	148.5	108.0		$5,932	$13,160	$9,458
Contingency Fee(g)							0	0	0
Total - Secondary Containment (Liners)			70	149	108		5,932	13,160	9,458
Project Staff Subtotal - Secondary Containment (Vaults)(h)			58	120	88		$5,348	$11,648	$8,434
Review Information and provide support	Consultant	Project Manager(d)	5.8	12.0	8.8	$142	824	1,704	1,250
Clerical Support	Consultant	Clerical(e)	8.7	18.0	13.2	$26	226	468	343
Assist Consultant	Facility	Env. Coordinator(f)	5.8	12.0	8.8	$51	296	612	449
Subtotal - Secondary Containment (Vaults)			78.3	162.0	118.8		$6,688	$14,419	$10,466
Contingency Fee(g)							$1,003	$2,163	$1,570
Total -Secondary Containment (Vaults)			78	162	119		$7,691	$16,582	$12,036

Table 9-5. Worksheet to Estimate Part B Permit Application – Tank System Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Project Staff Subtotal - Secondary Containment (Double-Walls)(i)			49	101	74		$4,500	$9,771	$7,071
Review Information and provide support	Consultant	Project Manager(d)	4.9	10.1	7.4	$142	696	1,434	1,051
Clerical Support	Consultant	Clerical(e)	7.4	15.2	11.1	$26	192	395	289
Assist Consultant	Facility	Env. Coordinator(f)	4.9	10.1	7.4	$51	250	515	377
Subtotal - Secondary Containment (Double-Walls)			66.2	136.4	99.9		$5,631	$12,103	$8,780
Contingency Fee(g)							0	0	0
Total - Secondary Containment (Double-Walls)			66	136	100		5,631	12,103	8,780

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The subtotal and total for Secondary Containment (Liner) only includes the hours and costs for secondary containment with external lines.
(d) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(e) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(f) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(g) A contingency fee of 15 percent is applied to the Subtotal.
(h) The subtotal and total for Secondary Containment (Vault) only includes the hours and costs for secondary containment with vault systems.
(i) The subtotal and total for Secondary Containment (Double-Walls) only includes the hours and costs for secondary containment with vault systems.

Table 9-6. Worksheet to Estimate Part B Permit Application – Surface Impoundment Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
List of all hazardous wastes in impoundment	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Detailed impoundment engineering report									
- Copy of engineering drawings for liner system and geologic drawings of subsoils	Consultant	Clerical	2	4	3	$26	$51	$103	$77
- Liner system foundation									
– Description of foundation materials	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
– Copy of subsurface data and subsoil tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
– Copy of foundation engineering analysis	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Liner system									
– Description of liner system	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
– Description of system relative to water table	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
– Copy of data showing seasonal water table	Consultant	Clerical	1	1	1	$26	$26	$26	$26
– Copy of load & stress calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
– Document system covers all earthen areas likely to be contacted by waste/leachate	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
– Document system wind/sunlight exposure	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
– Document system bedding sufficiency	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
– Copy of synthetic liner specifications	Consultant	Clerical	1	3	2	$26	$26	$77	$51
– Copy of soil liner material specifications	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Liner systems leachate detection system									
– Description of leachate detection system	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
– Copy of engineering and contour drawings of the layout and spacing of piping	Consultant	Clerical	1	3	2	$26	$26	$77	$51
– Copy of piping test data and calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Construction quality assurance/quality control									
– Description of QA/QC program	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
– Copy of QA/QC construction tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Overtopping and overflowing protection									
- Design and operating procedures	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of calculations showing freeboard	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Documentation of dike structural integrity									
- Copy of engineering drawings	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Description of dike	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
- Copy of engineer's certification of the dike	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Copy of dike foundation testing results	Consultant	Clerical	1	1	1	$26	$26	$26	$26

Table 9-6. Worksheet to Estimate Part B Permit Application - Surface Impoundment Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Document compliance with ignitable, reactive, or incompatible waste requirements									
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of waste management plan for F020, F021, F022, F023, F024, F026 & F027 impoundments	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Exposure information									
- Describe potential releases	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Identify potential pathways to humans	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Identify nature and magnitude of exposure to humans resulting from potential releases	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
Project staff subtotal			93	202	145		$8,254	$18,308	$13,062
Review information and provide support	Consultant	Project Manager(c)	9.3	20.2	14.5	$142	$1,318	$2,863	$2,055
Clerical support	Consultant	Clerical(d)	14.0	30.3	21.8	$26	$358	$778	$559
Assist consultant	Facility	Env. Coordinator(e)	9.3	20.2	14.5	$51	$471	$1,023	$734
Subtotal			125.6	272.7	195.8		$10,401	$22,972	$16,410
Contingency Fee (f)							$1,560	$3,446	$2,462
Total			125.6	272.7	195.8		$11,961	$26,417	$18,872

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal.

Table 9-7. Worksheet to Estimate Part B Permit Application – Waste Pile Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
1. Enclosed dry piles									
List of hazardous wastes in, or to be in piles	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Copy of engineering profile drawings	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Document structure has water/wind controls	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
Identification that free liquids are not in piles	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
Copy of waste physical analysis	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Description of waste treatment within pile	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
Document compliance with ignitable, reactive, or incompatible waste requirements									
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Project staff subtotal			23	47	33		$2,134	$4,448	$3,086
Review information and provide support	Consultant	Project Manager(c)	2.3	4.7	3.3	$142	$326	$666	$468
Clerical support	Consultant	Clerical(d)	3.5	7.1	5.0	$26	$89	$181	$127
Assist consultant	Facility	Env. Coordinator(e)	2.3	4.7	3.3	$51	$116	$238	$167
Subtotal - Enclosed Dry Piles			31.1	63.5	44.6		$2,665	$5,534	$3,848
Contingency Fee (f)							$400	$830	$577
Total - Enclosed Dry Piles			31.1	63.5	44.6		$3,065	$6,364	$4,425
2. Unenclosed piles									
List of all hazardous wastes in impoundment	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Detailed impoundment engineering report									
- Copy of engineering drawings for liner system and geologic drawings of subsoils	Consultant	Clerical	2	4	3	$26	$51	$103	$77
- Liner foundation									

Table 9-7. Worksheet to Estimate Part B Permit Application - Waste Pile Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(s)	Personnel(s)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
- Description of foundation materials	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of subsurface data and lab tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Copy of foundation engineering analysis	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Liner system									
- Describe liner system	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
- Describe system relative to water table	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of seasonal water table data	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Copy of load & stress calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Copy of liner/waste compatibility tests	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Document system covers all areas likely to be contacted by waste/leachate	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Document no wind/sunlight exposure	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
- Document system bedding sufficiency	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
- Leachate detection system									
- Description of leachate detection system	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
- Copy of engineering and contour of pipe layout and spacing	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Copy of piping test data and calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Runon/runoff control system									
- Copy of engineering and profile drawings	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Description of runon/runoff controls	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Copy of peak surface water flow calculations during 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Copy of total runoff calculations for a 24-hour, 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Construction QA/QC plan									
- Description of QA/QC program	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Copy of QA/QC construction tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Description of whether pile contains particulate matter subject to entrainment	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
- Detailed description of pile treatmentand processes used, and impact on wastes	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
- Document compliance with ignitable, reactive, or incompatible wastes									
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	$26	$26	$26

Table 9-7. Worksheet to Estimate Part B Permit Application – Waste Pile Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
Copy of management plan for F020, F021, F022, F023, F024, F026 & F027 materials	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Project staff subtotal - Unenclosed Piles			75	162	117		$6,557	$14,811	$10,568
Review information and provide support	Consultant	Project Manager(c)	7.5	16.2	11.7	$142	$1,063	$2,296	$1,658
Clerical support	Consultant	Clerical(d)	11.3	24.3	17.6	$26	$289	$624	$451
Assist consultant	Facility	Env. Coordinator(e)	7.5	16.2	11.7	$51	$380	$820	$592
Subtotal - Unenclosed Piles			101.3	218.7	158.0		$8,288	$18,551	$13,269
Contingency Fee (f)							$1,243	$2,783	$1,990
Total			101.3	218.7	158.0		$9,532	$21,334	$15,260

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal.

Table 9-8. Worksheet to Estimate Part B Permit Application – Land Treatment Requirements Initial (Administrative) Costs (1997 Dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Copy of treatment demonstration plan	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Characteristics and operating conditions									
- List of all hazardous wastes to be land treated	Consultant	Project Engineer	1	3	2	$103	$103	$309	$206
- Description of operating procedures	Consultant	Project Engineer	8	16	12	$103	$823	$1 646	$1,234
- Rate and frequency of waste application	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
- Description of methods used to apply wastes	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Description of measures to control soil pH	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Description of measures to enhance reactions	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Identification of limits on soil moisture content	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
- Copy of unsaturated zone monitoring plan	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- List of all hazardous constituents expected to be in or derived from wastes land treated	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Description of design, construction, O&M									
- Detailed description of treatment zone									
-- Horizontal and vertical dimensions	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823
-- Map delineating horizontal boundaries	Consultant	Drafting	4	8	6	$50	$198	$396	$297
-- Copy of soil analyses of each soil in zone	Consultant	Clerical	1	2	1	$26	$26	$51	$26
-- Description of depth of high water table	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Copy of water table data sources	Consultant	Clerical	1	1	1	$26	$26	$26	$26
- Runon/runoff control system									
-- View of control system components	Consultant	Drafting	4	8	6	$50	$198	$396	$297
-- Copy of engineering drawings & profiles	Consultant	Clerical	1	3	2	$26	$26	$77	$51
-- Description of runon/runoff controls	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
-- Copy of peak surface water flow calculations during 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Copy of total runoff calculations for a 24-hour, 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Description of wind controls	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Copy of food-chain demonstration	Consultant	Clerical	1	1	1	$26	$26	$26	$26

Table 9-8. Worksheet to Estimate Part B Permit Application – Land Treatment Requirements Initial (Administrative) Costs (1997 Dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Document compliance with ignitable, reactive, or incompatible wastes									
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Copy of management plan for F020, F021, F022, F023, F024, F026 & F027 material	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Project staff subtotal			75	150	110		$6,516	$13,572	$9,825
Review information and provide support	Consultant	Project Manager(c)	7.5	15.0	11.0	$142	$1,063	$2,126	$1,559
Clerical support	Consultant	Clerical(d)	11.3	22.5	16.5	$26	$289	$578	$424
Assist consultant	Facility	Env. Cordinator(e)	7.5	15.0	11.0	$51	$380	$759	$557
Subtotal			101.3	202.5	148.5		$8,247	$17,035	$12,365
Contingency Fee(f)							$1,237	$2,555	$1,855
Total			101.3	202.5	148.5		$9,485	$19,590	$14,220

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal.

Table 9-9. Worksheet to Estimate Part B Permit Application – Landfill Requirements Initial (Administrative) Costs (1997 dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
List of all hazardous waste placed in each landfill	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Detailed plans and engineering report describing landfill design, construction, O&M									
- Copy of engineering drawings of liner system	Consultant	Clerical	2	4	3	$26	$51	$103	$77
- Liner system foundation									
-- Description of foundation materials	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Copy of subsurface data and subsoil tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
-- Copy of foundation engineering analysis	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Liner system									
-- Description of liner system	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
-- Description of system relative to water table	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Copy of data showing seasonal water table	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Copy of load & stress calculations	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Document system covers all earthen areas likely to be contacted by waste/leachate	Consultant	Project Engineer	4	8	6	$103	$411	$823	$617
-- Document system wind/sunlight exposure	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Document system bedding sufficiency	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
-- Copy of synthetic liner specifications	Consultant	Clerical	1	3	2	$26	$26	$77	$51
-- Copy of soil liner material specifications	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Liner system leachate collection system (LCS) and leach detection system (LDS)									
-- Description of LCS and LDS systems	Consultant	Project Engineer	12	40	32	$103	$1,234	$4,114	$3,291
-- Copy of engineering and contour drawings of the layout and spacing of piping	Consultant	Clerical	2	6	4	$26	$51	$154	$103
-- Copy of piping test data and calculations	Consultant	Clerical	1	3	2	$26	$26	$77	$51
- Runon/runoff control system									
-- View of control system components	Consultant	Drafting	4	8	6	$50	$198	$396	$297
-- Copy of engineering drawings & profiles	Consultant	Clerical	1	3	2	$26	$26	$77	$51
-- Description of runon/runoff controls	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
-- Copy of peak surface water flow calculations during 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26
-- Copy of total runoff calculations for a 24-hour, 25-year storm	Consultant	Clerical	1	1	1	$26	$26	$26	$26

Table 9-9. Worksheet to Estimate Part B Permit Application – Landfill Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
- Construction QA/QC plan									
-- Description of QA/QC program	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
-- Copy of QA/QC construction tests	Consultant	Clerical	1	3	2	$26	$26	$77	$51
Description of whether pile contains particulate matter subject to entrainment	Consultant	Project Engineer	2	4	3	$103	$206	$411	$309
Document compliance with ignitable, reactive, or incompatible wastes									
- Describe procedures on how facility can accommodate wastes	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Describe procedures to ensure overpacked drums are compatible and how reactive wastes will be rendered nonreactive	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
- Copy of procedures to ensure regulatory compliance with 40 CFR 264.17	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Describe procedures to ensure no hazardous waste with free liquid is placed in landfill									
- Description of stabilization techniques	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
- Copy of testing methods	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Describe procedures to assure all containers are at least 90% full and containers will be crushed or reduced in size	Consultant	Project Engineer	2	6	4	$103	$206	$617	$411
Copy of management plan for F020, F021, F022, F023, F024, F026 & F027 material	Consultant	Clerical	1	1	1	$26	$26	$26	$26
Exposure Information									
- Describe potential releases	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Identify potential pathways to humans	Consultant	Project Engineer	8	16	12	$103	$823	$1,646	$1,234
- Identify nature and magnitude of exposure to humans resulting from potential releases	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823

Table 9-9. Worksheet to Estimate Part B Permit Application – Landfill Requirements Initial (Administrative) Costs (1997 dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate (b)	Upper Bound Cost Estimate (b)	Typical Cost Estimate (b)
Project Staff Subtotal			110	257	188		$9,712	$23,152	$16,933
Review Information and provide support	Consultant	Project Manager(c)	11.0	25.7	18.8	$142	$1,559	$3,643	$2,665
Clerical Support	Consultant	Clerical(d)	16.5	38.6	28.2	$26	$424	$990	$724
Assist Consultant	Facility	Env. Coordinator(e)	11.0	25.7	18.8	$51	$557	$1,301	$952
Subtotal			148.5	347.0	253.8		$12,252	$29,086	$21,274
Contingency Fee(f)							$1,838	$4,363	$3,191
Total			148.5	347.0	253.8		$14,089	$33,449	$24,465

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal.

Table 9-10. Worksheet to Estimate Part B Permit Application – Incinerator Requirements Initial (Administrative) Costs (1997 Dollars)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
Option 1 - Exemption									
- Description of hazardous wastes to be burned	Consultant	Project Engineer	8	24	16	$103	$823	$2,469	$1,646
- Document that reactive wastes do not generate toxic gases, vapors, or fumes	Consultant	Project Engineer	4	12	8	$103	$411	$1,234	$823
- Copy of waste analysis for each waste	Consultant	Clerical	1	2	1	$26	$26	$51	$26
Project Staff Subtotal - Exemption			13	38	25		$1,260	$3,754	$2,494
Review Information and provide support	Consultant	Project Manager(c)	1.3	3.8	2.5	$142	$184	$539	$354
Clerical Support	Consultant	Clerical(d)	2.0	5.7	3.8	$26	$50	$146	$96
Assist Consultant	Facility	Env. Coordinator(e)	1.3	3.8	2.5	$51	$66	$192	$127
Subtotal			17.6	51.3	33.8		$1,560	$4,632	$3,072
Contingency Fee(f)							$234	$695	$461
Total - Exemption			17.6	51.3	33.8		$1,794	$5,326	$3,532
Option 2 - Trial Burn									
- Trial Burn Plan	Consultant		NA	NA	NA	NA	$11,150	$22,300	$16,725
- Trial Burn	Consultant		NA	NA	NA	NA	$122,650	$367,950	$306,625
Assist Consultant	Facility	Env. Coordinator(e)	NA	NA	NA	$51	$1,338	$3,903	$3,234
Total - Trial Burn							$135,138	$394,153	$326,584
Option 3 - Data submitted in lieu of trial burn									
- Description of hazardous wastes to be burned	Consultant	Project Engineer	16	32	24	$103	$1,646	$3,291	$2,469
- Copy of waste analysis data	Consultant	Clerical	1	2	1	$26	$26	$51	$26
- Detailed engineering description of incinerator	Consultant	Project Engineer	12	24	16	$103	$1,234	$2,469	$1,646
- Copy of specification and engineering drawings of the system	Consultant	Clerical	2	4	3	$26	$51	$103	$77
- Identification of POHCs based on operating data or other trial burns	Consultant	Project Engineer	6	12	8	$103	$617	$1,234	$823

Table 9-10. Worksheet to Estimate Part B Permit Application - Incinerator Requirements Initial (Administrative) Costs (1997 Dollars) (continued)

Component	Participant(a)	Personnel(a)	Lower Bound Estimate Hours(a)	Upper Bound Estimate Hours(a)	Typical Estimate Hours(a)	Rate $/hr	Lower Bound Cost Estimate(b)	Upper Bound Cost Estimate(b)	Typical Cost Estimate(b)
- Description of the design and operating conditions of the incinerator compared with similar information from the unit	Consultant	Project Engineer	6	12	8	$103	618	1,236	824
- Description of results from previously conducted trial burns	Consultant	Project Engineer	12	24	16	$103	1,236	2,472	1,648
- Copy of the results	Consultant	Clerical	1	1	1	$26	26	26	26
- Description of expected incinerator operation to demonstrate compliance with CFR 264.343 and CFR 264.345	Consultant	Project Engineer	40	120	80	$103	4,120	12,360	8,240
Project Staff Subtotal - In lieu of trial burn			96	231	157		$9,566	$23,220	$15,763
Review Information and provide support	Consultant	Project Manager(c)	9.6	23.1	15.7	$142	1,363	3,280	2,229
Clerical Support	Consultant	Clerical(d)	14.4	34.7	23.6	$26	374	902	614
Assist Consultant	Facility	Env. Coordinator(e)	9.6	23.1	15.7	$51	490	1,178	801
Subtotal			129.6	311.9	212.0		$11,782	$28,554	$19,388
Contingency Fee(f)							$1,767	$4,283	$2,908
Total - Data submitted in lieu of trial burn			130	312	212		$13,549	$32,837	$22,296

Footnotes:

(a) DPRA, Incorporated, best professional judgement.
(b) Totals may not add because of rounding.
(c) The number of hours allocated to the Project Manager is assumed to equal 10 percent of the total project staff hours.
(d) The number of hours allocated to Clerical support is assumed to equal 15 percent of the total project staff hours.
(e) The number of hours allocated to the facility's Environmental Coordinator is assumed to equal 10 percent of the total consultant hours.
(f) A contingency fee of 15 percent is applied to the Subtotal.

CHAPTER 10. FINANCIAL ASSURANCE FOR CLOSURE AND POST-CLOSURE CARE

This chapter presents cost estimates for compliance with the Resource Conservation and Recovery Act (RCRA) financial assurance requirements under 40 CFR Part 264 (permitted facilities) and Part 265 (interim status facilities). The requirements for permitted and interim status facilities are virtually identical, so their cost estimates are presented using the same tables. Costs incurred by a facility will fall into one of two categories: (1) initial (up front) costs and (2) annual costs. Initial financial assurance costs include estimating closure and post-closure costs, selecting and establishing the financial assurance mechanism(s), and maintaining (funding) the chosen financial assurance mechanism for the first year. Annual financial assurance costs include updating cost estimates and maintaining (funding) the financial assurance mechanism(s) for each of the following years until financial assurance is no longer required.

Cost estimates in this chapter are also grouped into general and site-specific costs. General costs reflect those that a "typical" facility would incur, regardless of its site characteristics. Site-specific costs are those that depend on the characteristics of the site or facility in question. The general costs have been estimated and are presented in the cost tables. The site-specific costs must be derived by the case development officer. The methodology for deriving site-specific costs is also presented in the cost tables. All costs presented in this chapter are in 1997 dollars.

This chapter is organized into five sections. Section 10.1 presents definitions of terms; Section 10.2 presents an overview of RCRA financial assurance requirements; Section 10.3 presents assumptions made to derive the cost estimates; Section 10.4 presents the cost estimates; and Section 10.5 provides references.

10.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter:

Financial Assurance	Measures taken on the part of a firm to ensure that adequate funds will be available for closure or post-closure care.
Owner/Operator	The owner or operator of a hazardous waste management facility or, in general, the person responsible for a facility and any violations associated with it. The owner/operator may be an individual or a firm.
Firm	A business, sole proprietorship, partnership, or corporation.
Closure/Post-Closure Care	Procedures performed to close an active hazardous waste management facility and manage it in a manner that minimizes any negative environmental or health impacts after closure.
Trust Fund	A financial instrument by which the owner/operator transfers legal title of closure/post-closure funds to a bank or financial institution. The beneficiary of this agreement (recipient of the funds) is EPA.
Surety Bond	A financial instrument by which a surety company (surety) assumes the liability of the owner/operator of payment into a trust fund or performance of adequate closure/post-closure

care (permitted facilities only). The penal sum (face value) of the bond represents the extent of the surety's liability in monetary terms.

Letter of Credit — A financial instrument by which a bank or financial institution (issuer) guarantees the payment of adequate funds into a standby trust fund. If the owner/operator fails to make sufficient payment, the issuer allows EPA to draw sufficient funds to fulfill the owner/operator's obligations.

Financial Test — A financial instrument by which a firm demonstrates its ability to meet the financial requirements for closure/post-closure care by showing it meets certain financial criteria.

Corporate Guarantee — A financial instrument by which a firm's parent/sibling corporation or substantial business partner guarantees the firm will fulfill its closure/post-closure financial requirements. The firm providing the guarantee must pass the financial test.

Substantial Business Relationship — The extent of a business relationship necessary under applicable State law to make a guarantee contract issued incident to that relationship valid and enforceable. The relationship must arise from a pattern of recent or ongoing business transactions, in addition to the guarantee itself.

Guarantor — The business entity that guarantees a facility will fulfill its closure/post-closure obligations. A guarantor must be a parent/sibling corporation or substantial business partner and must pass the financial test.

Pay-In Period — The period of time in which a firm must build a trust fund to its full amount. For permitted facilities, this is the term of the initial RCRA permit or the remaining operating life of the facility, whichever is shorter [§264.143(a)(3)]. For interim status facilities, this is 20 years or the remaining life of the facility as estimated in the closure plan, whichever is shorter [§264.145(a)(5)].

Assured Costs — The portion of costs that are assured by a particular financial mechanism. For a firm using a single financial mechanism, the assured costs are equal to the closure/post-closure costs.

Accidental Occurrence — An accident, including continuous or related exposure to conditions, which results in bodily injury or property damage neither expected not intended from the standpoint of the insured.

Nonsudden Accidental Occurrence — An occurrence which takes places over time and involves continuous or repeated exposure.

Sudden Accidental Occurrence An occurrence which is not continuous or repeated in nature.

10.2 Overview of RCRA Closure/Post-Closure Financial Assurance Requirements

Owners/operators of hazardous waste management facilities must provide assurance that they will have the financial means to perform adequate closure and post-closure care at the end of the facility's life. This assurance can be provided by a number of different mechanisms. These mechanism include: a trust fund; surety bond guaranteeing payment into a trust fund; surety bond guaranteeing performance of closure; letter of credit; insurance; financial test; or corporate guarantee.

10.2.1 Closure Financial Assurance at a Permitted Facility (40 CFR Part 264)

The financial assurance requirements for closure care apply to all hazardous waste management facilities [§264.140(a)]. The owner/operator must have a detailed written estimate, in current dollars, of the cost of closing the facility in accordance with RCRA requirements [§264.142]. One of six financial mechanisms must be used to guarantee the necessary funds will be available at the time of closure: a trust fund [§264.143(a)], surety bond guaranteeing payment into a trust fund [§264.143(b)], surety bond guaranteeing performance of closure [§264.143(c)], letter of credit [§264.143(d)], insurance [§264.143(e)], financial test [§264.143(f)], or corporate guarantee [§264.143(f)]. A combination of mechanisms may be used, provided the total amount of assured costs is at least equal to the current closure cost estimate [§264.143(g)]. Also, the same financial assurance mechanism(s) may be used to assure the costs of closure for more than one facility, provided the total amount of assured costs is at least equal to the sum of the estimated closure costs of all facilities involved [§264.143(h)]. Proof of assurance, which varies with the mechanism(s) used, must be submitted to the Regional Administrator. The owner/operator of a facility is subject to these requirements until closure has been satisfactorily completed [§264.143(I)].

10.2.2 Post-Closure Financial Assurance at a Permitted Facility (40 CFR Part 264)

The financial assurance requirements for post-closure care apply to hazardous waste disposal facilities, surface impoundments, and any facilities required to meet the requirements of landfills [§ 264.140(b)]. The owner/operator must have a detailed written estimate, in current dollars, of the annual cost of performing post-closure care in accordance with RCRA requirements [§264.144]. One of six financial mechanisms must be used to guarantee the necessary funds will be available at the time of closure: a trust fund [§264.145(a)], surety bond guaranteeing payment into a trust fund [§264.145(b)], surety bond guaranteeing performance of post-closure care [§264.145(c)], letter of credit [§264.145(d)], insurance [§264.145(e)], financial test [§264.145(f)], or corporate guarantee [§264.145(f)]. A combination of mechanisms may be used, provided the total amount of assured costs is at least equal to the current post-closure cost estimate [§264.145(g)]. Also, the same financial assurance mechanism(s) may be used to assure the post-closure costs of more than one facility, provided the total amount of assured costs is at least equal to the sum of the estimated post-closure costs of all facilities involved [§264.145(h)]. Proof of assurance, which varies with the mechanism(s) used, must be submitted to the Regional Administrator. The owner/operator of a facility is subject to these requirements until the post-closure care period has been satisfactorily completed [§264.145(I)].

10.2.3 Combining Closure and Post-Closure Financial Assurance (40 CFR Part 264)

The same financial mechanism(s) may be used to provide assurance for both closure and post-closure costs, provided the amount of assured costs is at least equal to that which would be assured under separate mechanisms [§264.146].

10.2.4 Closure/Post-Closure Financial Assurance at an Interim Status Facility (40 CFR Part 265)

The closure and post-closure financial assurance requirements for an interim status facility are identical to those of a permitted facility, with two exceptions: (1) an interim status facility may not satisfy its financial assurance obligations by obtaining a surety bond guaranteeing performance of closure or post-closure care [§265.143, 145]; (2) the trust fund pay-in period is different for an interim status facility than for a permitted facility. The pay-in period for Interim status facilities is 20 years or the remaining operating life of the facility as indicated by the closure plan, whichever period is shorter, whereas the pay-in period for permitted facilities is the term of the initial RCRA permit or the remaining operating life of the facility as indicated by the closure plan, whichever period is shorter.

10.3 Assumptions

The costs for compliance with the RCRA financial assurance requirements under 40 CFR Parts 264 and 265 are based on the following assumptions:

- A firm will use the same financial assurance mechanism(s) to assure its closure and post-closure costs. This will enable the firm to avoid the costs of establishing additional mechanisms.

- A firm's closure and post-closure cost estimates will not change.

- A firm will not switch between financial assurance mechanisms.

- A firm will rely on a consulting firm to estimate its closure/post-closure costs.

- A professional accountant will perform the "technical" portions of tasks outlined in the financial assurance portions of the Supporting Statements for EPA ICR Numbers 1571 and 1573.

- The trustee fees calculated in Table 10-10 represent the average trustee fee a firm will pay over the pay-in period. During that time, the trust fund will increase steadily from zero to the full value of the assured costs. Its average size will be 50% of the assured costs, and the annual trustee fees are 1% of the value of the trust fund. Therefore, over the pay-in period the average annual trustee fee will equal 0.5% of assured costs (50% x 1% x assured costs). If the facility has been noncompliant for a period of time greater than the pay-in period, this estimate will tend to underestimate the value of the annual trustee fees. If the period of noncompliance is less than the pay-in period, this estimate will tend to overestimate the value of the annual trustee fees. In such instances, more detailed estimates of the annual trustee fees may be beneficial.

- The annual taxes on interest earned on the trust fund (as estimated in Table 10-10) represent the average amount a firm will pay in taxes over the pay-in period. During that time, the trust fund will increase steadily from zero to the full value of the assured costs. Its average size will be 50% of the assured costs. Therefore, over the pay-in period the average tax payment made on trust fund interest will equal the marginal tax rate (state and federal) multiplied by 50% of the assured costs. If the facility has been noncompliant for a period of time greater than the pay-in period, this estimate will tend to underestimate the value of the tax payments. If the period of noncompliance is less than the pay-in period, this estimate will tend to overestimate the value of the tax payments. In such instances, more detailed estimates of the tax payments may be beneficial.

- All noncompliant facilities are still active (i.e., have not yet undergone closure). The diminishing value of trust funds, surety bonds, etc. that may occur after closure have not been accounted for in the cost tables.

- Although many financial institutions will impose a minimum trustee fee, these vary greatly in value and have been ignored to simplify the cost model.

- The standby trust fund required by a surety bond and letter of credit will not be subject to trustee fees until it is at least partially funded.

- Firms large enough to pass the financial test (at least $10 million in tangible net worth) are already audited each year for tax purposes. The cost of an accountant's audit is therefore not included as a cost of the financial test.

10.4 Costs

10.4.1 Estimating Costs of Financial Assurance

Tables 10-1a and 10-1b provide an overview of the costs involved with financial assurance. Not all of the costs listed will apply in every case. The applicable costs will depend on the nature of the violation and the characteristics of the facility. For instance, an owner/operator who has not met any of the financial assurance requirements would be subject to nearly all of the costs in Tables 10-1a and 10-1b, while an owner/operator who has made insufficient payments into a trust fund would be subject only to the costs of maintaining the financial assurance mechanism(s).

Once the applicable costs are identified, they may be estimated using their respective source tables, which are referenced in Tables 10-1a and 10-1b. The source tables, Tables 10-2 through 10-9, break the major costs down into their component costs. In some tables, these cost components have been grouped into general and site-specific costs. The general costs have already been estimated and are provided, but the site-specific cost estimates must be developed by the Case Development Officer and take into consideration the unique characteristics of each site. Table 10-10 provides methodology for deriving these estimates.

Once all of the cost components in the relevant source tables have been filled in, they may then be subtotaled and totaled. The total from each source table may then be put back into Table 10-1a or 10-1b (in the "Amount" column). Summing the cost amounts in Table 10-1a will yield the estimated total initial cost of financial assurance. Summing the cost amounts in Table 10-1b will yield the estimated total annual cost of financial assurance.

10.4.2 Estimating Closure/Post-Closure Costs

Tables 10-1 through 10-10 assume the assured costs for a facility are known. If the closure or post-closure costs have not yet been estimated, Table 10-11 may be used as a guide. The figures presented in this table do not reflect site-specific information and should not be used if other estimates are available.

10.5 References

1. U.S. Environmental Protection Agency, Office of Solid Waste. November 30, 1981. *Background Document for the Financial Test & Municipal Revenue Test Financial Assurance for Closure and Post-Closure Care: Appendix B, Cost Analysis for a Financial Test.*

2. U.S. Environmental Protection Agency. Office of Solid Waste. September 11, 1981. *Preliminary Regulatory Impact Analysis of the Financial Assurance and Liability Insurance Regulations.*

3. US Department of Commerce, Bureau of Labor Statistics. November 1994. *Occupational Compensation Survey: National Summary, 1994; Part 1: Pay in the United States and Regions*

4. Labor rates were developed by DPRA in 1992 dollars and inflated to 1997 dollars by the method described in Appendix A

5. U.S. Environmental Protection Agency. October 14, 1993. *Supporting Statement for EPA Information Collection Request Number 1573: Part B Permit Application, Permit Modifications, and Special Permits*

6. U.S. Environmental Protection Agency. October 14, 1993. *Supporting Statement for EPA Information Collection Request Number 1571: General Hazardous Waste Facility Standards.*

7. Sedgwick of North America web site, http://www.sedgwickna.com/, May 1997

8. SAIC staff contacted selected financial institutions by telephone and e-mail in May 1997 to obtain estimates of surety fees, credit fees, and trustee fees.

Table 10-1a. Total Costs of Closure/Post-Closure Financial Assurance - First Year

Component	Source Table	Amount[1]
Estimate Closure/Post-Closure Costs	Table 10-2a	
Select Financial Assurance Mechanism(s)	Table 10-3	
Establish Financial Assurance Mechanism(s)		
- Financial Test	Table 10-4a	
- Corporate Guarantee	Table 10-5a	
- Letter of Credit	Table 10-6a	
- Surety Bond (Payment or Performance)	Table 10-7a	
- Trust Fund	Table 10-8a	
- Insurance	Table 10-9a	
Total		

Footnote:
1. These numbers must be retrieved from the source tables listed. Only the applicable costs should be listed here and totaled.

Table 10-1b. Total Costs of Closure/Post Closure Financial Assurance - Subsequent Years

Component	Source Table	Amount[1]
Estimate Closure/Post-Closure Costs	Table 10-2b	
Maintain Financial Assurance Mechanism(s)		
- Financial Test	Table 10-4b	
- Corporate Guarantee	Table 10-5b	
- Letter of Credit	Table 10-6b	
- Surety Bond (Payment or Performance)	Table 10-7b	
- Trust Fund	Table 10-8b	
- Insurance	Table 10-9b	
Total		

Footnote:
1. These numbers must be retrieved from the source tables listed. Only the applicable costs should be listed here and totaled.

Table 10-2a. Estimate Closure/Post-Closure Costs - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Estimate Costs for Closure/Post-Closure Care[1] (Read Regulations, Collect Data, Prepare and Submit Written Cost Estimates)	Plant Manager	1	hour	$118	$118
	Project Engineer	14	hour	$103	$1,442
	Clerical (Consultant)	2	hour	$26	$52
	Clerical (Facility)	1	hour	$21	$21
Total					$1,633

Footnote:
1. U.S.EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1573: Part B Permit Application, Permit Modifications, and Special Permits*

Table 10-2b. Estimate Closure/Post-Close Costs - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Adjust Estimates to Reflect Inflation[1]	Accountant	0.5	hour	$81	$41
Total					$41

Footnote:
1. U.S.EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Standards*

Table 10-3. Select Financial Assurance Mechanism (First Year Only) (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Select Financial Assurance Mechanism[1] (Read Regulations, Collect Data, and Evaluate Options)	Plant Manager	1	hour	$118	$118
	Accountant	2	hour	$81	$162
	Attorney	2	hour	$99	$198
	Clerical (Facility)	1	hour	$21	$21
Total					$499

Footnote:
1. SAIC best professional judgement.

Table 10-4a. Establish Financial Test - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Write and Submit Letter Signed by Chief Financial Officer[1]	Attorney	1	hour	$99	$99
	Plant Manager	0.25	hour	$118	$30
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.75	hour	$21	$16
Accountant's Special Report[2]	Accountant	8	hour	$81	$648
Submit Accountant's Report and Special Report[2]	Clerical (Facility)	1	hour	$21	$21
Total[3]					$975

Footnote:
1. U.S.EPA. October 14, 1993.*Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. SAIC best professional judgement.
3. The total costs for establishing and maintaining the financial test may be lower than Tables 10-4a and 10-4b combined because EPA regulations allow a single letter from the Chief Financial Officer to service both purposes.

Table 10-4b. Maintain Financial Test - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Accountant's Special Report[1]	Accountant	8	hour	$81	$648
Submit Updated Information[2]	Clerical (Facility)	4	hour	$21	$84
Total[2]					$732

Footnote:
1. U.S.EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1573: Part B Permit Application, Permit Modifications, and Special Permits*
2. The total costs for establishing and maintaining the financial test may be lower than Tables 10-4a and 10-4b combined because EPA regulations allow a single letter from the Chief Financial Officer to service both purposes.

Table 10-5a. Establish Corporate Guarantee - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Obtain and Submit Corporate Guarantee from Parent Corporation[1]	Attorney	0.5	hour	$99	$50
	Plant Manager	0.5	hour	$118	$59
	Accountant	0.5	hour	$81	$41
	Clerical (Facility)	0.5	hour	$21	$11
Submit Letter from Guarantor's Chief Financial Officer[1]	Clerical (Facility)	1	hour	$21	$21
Total					$181

Footnote:
1. U.S.EPA. October 14, 1993.*Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Standards*

Table 10-5b. Maintain Corporate Guarante - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Submit Annual Updated Information[1]	Clerical (Facility)	4	hour	$21	$84
Total					$84

Footnote:
1. U.S.EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: Generall Hazardous Waste Facility Standards*

Table 10-6a. Establish Letter of Credit - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Obtain/submit Letter of Credit and Establish Trust Fund[1]	Attorney	4	hour	$99	$396
	Plant Manager	1.5	hour	$118	$177
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.5	hour	$21	$11
- Write/submit Letter to Accompany Letter of Credit[1]	Attorney	1.25	hour	$99	$124
	Plant Manager	0.25	hour	$118	$30
	Clerical (Facility)	0.5	hour	$21	$11
- Submit Original Trust Agreement[1]	Clerical (Facility)	0.5	hour	$21	$11
Subtotal					$920
Site-Specific:					
- Credit Fee[2]	NA[3]	1	each		See Table 10-10
- Collateral[2]	NA[3]	1	each		See Table 10-10
Subtotal					
Total					

Footnotes:
1. U.S. EPA. October 14, 1993. "Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards."
2. Table 10-10 provides the methodology for estimating these costs.
3. NA = Not Applicable.

Table 10-6b. Maintain Letter of Credit - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Credit Fee[1]	NA[2]	1	each		See Table 10-10
Total					

Footnote:
1. Table 10-10 provides the methodology for estimating this cost.
2. NA = Not Applicable.

Table 10-7a. Establish Surety Bond - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Surety Bond and Trust Agreement [1]	Attorney	4	hour	$99	$396
	Plant Manager	1.5	hour	$118	$177
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.5	hour	$21	$11
- Submit Original Trust Agreement [1]	Clerical (Facility)	0.5	hour	$21	$11
Subtotal					$756
Site-Specific:					
- Surety fee[2]	NA[3]	1	each		See Table 10-10
- Collateral[2]	NA[3]	1	each		See Table 10-10
Subtotal					
Total					

Footnotes:
1. U.S. EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. Table 10-10 provides the methodology for estimating these costs.
3. NA = Not Applicable

Table 10-7b. Maintain Surety Bond - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Surety Fee[1]	NA[2]	1	each		See Table 10-10
Total					

Footnotes:
1. Table 10-10 provides the methodology for estimating this cost.
2. NA = Not Applicable.

Table 10-8a. Establish Trust Fund - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Closure/Post-Closure Trust Fund [1]	Attorney	4	hour	$99	$396
	Plant Manager	1.5	hour	$118	$177
	Accountant	2	hour	$81	$162
	Clerical (Facility)	3	hour	$21	$63
- Submit Original Trust Agreement [1]	Clerical (Facility)	0.5	hour	$21	$11
- Submit Formal Certification of Acknowledgment (Post-Closure Only)[1]	Clerical (Facility)	1	hour	$21	$21
- Submit Receipt for First Payment Under Trust Agreement (New Facilities)[1]	Clerical (Facility)	1	hour	$21	$21
Subtotal					$851
Site-Specific:					
- Trustee Fee [2]	NA[3]	1	each		See Table 10-10
- Payment into Trust Fund [2]	NA[3]	1	each		See Table 10-10
- Taxes on Interest Earned on Trust Fund [2]	NA[3]	1	each		See Table 10-10
Subtotal					
Total					

Footnotes:
1. U.S. EPA. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. Table 10-10 provides the methodology for estimating these costs.
3. NA = Not Applicable.

Table 10-8b. Maintain Trust Fund - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Trustee Fee[1]	NA[2]	1	each		See Table 10-10
Payment Into Trust Fund[1]	NA[2]	1	each		See Table 10-10
Taxes on Interest Earned on Trust Fund[1]	NA[2]	1	each		See Table 10-10
Total					

Footnote:

1. Table 10-10 provides the methodology for estimating these costs.
2. NA = Not Applicable.

Table 10-9a. Establish Insurance - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Insurance Policy [1]	Attorney	4	hour	$99	$396
	Plant Manager	1.5	hour	$118	$177
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.5	hour	$21	$11
- Submit Insurance Policy Certificate to EPA [1]	Clerical (Facility)	0.5	hour	$21	$11
- Administrative Fee for Insurance [2]	NA[4]	1	each	$1,846	$1,846
Subtotal					$2,602
Site-Specific:					
- Insurance Premium [3]	NA[4]	1	each		See Table 10-10
- Collateral [3]	NA[4]	1	each		See Table 10-10
Subtotal					
Total					

Footnotes:
1. U.S. EPA. ctober 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. U.S. EPA. September 11, 1981.*Preliminary RIA of the Financial Assurance and Liability Insurance Regulations*
3. Table 10-10 provides the methodology for estimating these costs.
4. NA = Not Applicable.

Table 10-9b. Maintain Insurance - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Administrative Fee for Insurance [1]	NA[3]	1	each	$1,846	$1,846
Subtotal					$1,846
Site-Specific:					
- Insurance Premium [2]	NA[3]	1	each		
Subtotal					
Total					

Footnotes:
1. U.S. EPA.Office of Solid Waste. September 11, 1981*Preliminary RIA of the Financial Assurance and Liability Insurance Regulations*
2. Table 10-10 provides the methodology for estimating these costs.
3. NA = Not Applicable.

Table 10-10. Financial Assurance Site-Specific Cost Calculations

Cost Type	Method of Calculation	Cost Estimate
Credit Fee	Approximately 1.5% of Assured Costs (0.5 to 2%, Depending on Firm's Credit).	
Surety Fee	Approximately 1.5% of Assured Costs (0.5 to 3%, Depending on Firm's Credit).	
Collateral	Obtain Site-Specific Estimate from Appropriate Financial Institution.	
Insurance Premium	Total Assured Costs Divided by Estimated Facility Life.	
Payment Into Trust Fund	Total Assured Costs Divided by Number of Years in Pay-in Period.	
Trustee Fee	Approximately 0.5% of Assured Costs. [1]	
Taxes on Interest Earned on Trust Fund	50% of Assured Costs Multiplied by Trust Fund Rate of Return and Marginal Tax Rate (State and Federal). [1]	

Footnote:
1. See Section 10.3 for underlying assumptions.

Table 10-11. Estimates of Closure/Post-Closure Costs (Thousands of 1997 Dollars)

Facility Type	Activity	Low Estimate	Typical Estimate	High Estimate
Storage[1]	Closure	$13	$28	$41
	Post-Closure	$0	$0	$0
	Both	$13	$28	$41
Surface Impoundment[1]	Closure	$55	$111	$222
	Post-Closure	$277	$554	$1,108
	Both	$332	$665	$1,330
Land Disposal[1]	Closure	$92	$185	$277
	Post-Closure	$462	$923	$2,769
	Both	$554	$1,108	$3,046
Land Treatment[2]	Closure	NA	$306	NA
	Post-Closure	NA	$0	NA
	Both	NA	$306	NA
Incinerator[2]	Closure	$46	$92	$138
	Post-Closure	$0	$0	$0
	Both	$46	$92	$138

Footnotes:

1. U.S. EPA. Office of Solid Waste. November 30, 1981. *Background Document for the Financial Test & Municipal Revenue Test Financial Assurance for Closure and Post-Closure Care: Appendix B, Cost Analysis for a Financial Test*
2. U.S. EPA.. Office of Solid Waste. September 11, 1981. *Preliminary RIA of the Financial Assurance and Liability Insurance Regulations*

CHAPTER 11. THIRD PARTY LIABILITY COVERAGE

This chapter presents cost estimates for compliance with the RCRA liability requirements under 40 CFR Part 264 (permitted facilities) and Part 265 (interim status facilities). The requirements for permitted and interim status facilities are identical, so their cost estimates are presented using the same tables. Costs incurred by a facility will fall into one of two categories: (1) initial (up front) costs and (2) annual costs. Initial coverage costs include selecting and establishing the liability coverage mechanism(s) and maintaining (funding) the chosen mechanism for the first year. Annual liability coverage costs involve maintaining (funding) the liability coverage mechanism(s) for each of the following years until liability coverage is no longer required.

Cost estimates in this chapter are also grouped into general and site-specific costs. General costs reflect those that a "typical" facility would incur, regardless of its site characteristics. Site-specific costs are those that depend on the characteristics of the site or facility in question. The general costs have been estimated and are presented in the cost tables. The site-specific costs must be derived by the case development officer. The methodology for deriving site-specific costs is also presented in the cost tables. All costs presented in this chapter are in 1997 dollars.

This chapter is organized into five sections. Section 11.1 presents definitions of terms; Section 11.2 presents an overview of RCRA liability coverage requirements; Section 11.3 presents assumptions made to derive the cost estimates; Section 11.4 presents the cost estimates; and Section 11.5 provides references.

11.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter:

Liability Coverage — Measures taken on the part of a firm to ensure that adequate funds will be available to cover any third party liability claims of bodily injury or property damage. Such claims may arise as a result of sudden or nonsudden accidental occurrences.

Owner/Operator — The owner or operator of a hazardous waste management facility or, in general, the person responsible for a facility and any violations associated with it. The owner/operator may be an individual or a firm.

Firm — A business, sole proprietorship, partnership, or corporation.

Trust Fund — A financial instrument by which the owner/operator transfers legal title of funds for liability coverage to a bank or financial

institution. The beneficiary of this agreement (recipient of the funds) is EPA.

Surety Bond — A financial instrument by which a surety company (surety) guarantees the owner/operator of a facility will pay any liability claims that may arise from operating that facility. The penal sum of the bond equals the amount of liability coverage to be assured by the bond.

Letter of Credit — A financial instrument by which a bank or financial institution (issuer)guarantees the payment of any liability claims that may arise. If the owner/operator fails to pay any claims, the issuer allows EPA to draw sufficient funds to fulfill the owner/operator's obligations (up to the face value of the letter of credit).

Financial Test — A financial instrument by which a firm demonstrates its ability to meet the financial requirements for liability coverage by showing it meets certain financial criteria.

Corporate Guarantee — A financial instrument by which a firm's parent/sibling corporation or substantial business partner guarantees the firm will fulfill its liability coverage requirements. The firm providing the guarantee must pass the financial test.

Substantial Business Relationship — The extent of a business relationship necessary under applicable State law to make a guarantee contract issued incident to that relationship valid and enforceable. The relationship must arise from a pattern of recent or ongoing business transactions, in addition to the guarantee itself.

Guarantor — The business entity that guarantees a facility will fulfill its liability coverage obligations. A guarantor must be a parent/sibling corporation or substantial business partner and must pass the financial test.

Pay-In Period — The period of time in which a firm must build a trust fund to its full amount. For permitted facilities, this is the term of the initial RCRA permit or the remaining operating life of the facility, whichever is shorter [§264.143(a)(3)]. For interim

status facilities, this is 20 years or the remaining life of the facility as estimated in the closure plan, whichever is shorter [§264.145(a)(5)].

Assured Costs The portion of costs that are assured by a particular financial mechanism. For a firm using a single financial mechanism, the assured costs are equal to the closure/post-closure costs.

Accidental Occurrence An accident, including continuous or related exposure to conditions, which results in bodily injury or property damage neither expected not intended from the standpoint of the insured.

Nonsudden Accidental Occurrence An occurrence which takes places over time and involves continuous or repeated exposure.

Sudden Accidental Occurrence An occurrence which is not continuous or repeated in nature.

11.2 Overview of RCRA Liability Coverage Requirements

Owners/operators of hazardous waste management facilities must provide assurance that they will have the financial means to pay out any claims that might arise during the operating life of the facility. This assurance can be provided by a number of different mechanisms. These mechanisms include: a financial test; corporate guarantees; letters of credit; surety bonds; establishment and maintenance of trust funds; and insurance.

11.2.1 Liability Coverage at a Permitted Facility (40 CFR Part 264)

All hazardous waste treatment, storage, and disposal facilities are required to provide liability coverage for third party liability claims that may result from sudden accidental occurrences during the operating life of the facility [§264.147(a)]. This coverage must be in the amount of at least $1 million per occurrence, with an annual aggregate of at least $2 million [§264.147(a)]. A firm may provide this coverage by passing a financial test; obtaining a corporate guarantee, 31surety bond, letter of credit, or insurance policy; or establishing a trust fund [§264.147(a)]. A combination of mechanisms may be used, provided the total amount of liability coverage is at least equal to the amount(s) required by RCRA [§264.147(a)(6)]. Liability coverage of sudden accidental occurrences must be provided for a facility until it has been properly closed [§264.147(e)].

Owners/operators of surface impoundments, landfills, land treatment facilities, or disposal miscellaneous units are also required to provide liability coverage for third party liability claims that may result from nonsudden accidental occurrences during the operating life of the facility [§264.147(b)]. This coverage must be in the amount of at least $3 million per occurrence, with an annual aggregate of at least $6 million [§264.147(b)]. A firm may provide this coverage by passing a financial test; obtaining a corporate guarantee, surety bond, letter of credit, or insurance policy; or establishing a trust fund [§264.147(b)]. A combination of mechanisms may be

used, provided the total amount of liability coverage is at least equal to the amount(s) required by RCRA [§264.147(b)(6)]. Liability coverage of sudden accidental occurrences must be provided for a facility until it has been properly closed [§264.147(e)].

11.2.2 Liability Coverage at an Interim Status Facility (40 CFR Part 265)

The liability coverage requirements for an interim status facility are identical to those of a permitted facility.

11.3 Assumptions

The costs for compliance with the RCRA liability coverage requirements under § 264 and §265 are based on the following assumptions:

- A firm will not switch between liability coverage mechanisms.
- A professional accountant will perform the "technical" portions of tasks outlined in the liability coverage portions of the Supporting Statements for EPA ICR Numbers 1571 and 1573.
- All noncompliant facilities are still active (i.e., have not yet undergone closure) and have hazardous waste on-site.
- The standby trust fund which may be used with a surety bond and letter of credit will not be subject to trustee fees until it is at least partially funded.
- Firms large enough to pass the financial test (at least $10 million in tangible net worth) are already audited each year for tax purposes. The cost of an accountant's audit is therefore not included as a cost of the financial test.

11.4 Estimating Costs of Liability Coverage

Tables 11-1a and 11-1b provide an overview of the costs involved with liability coverage. Not all of the costs listed will apply in every case. The applicable costs will depend on the nature of the violation and the characteristics of the facility. For instance, an owner/operator who has not provided any liability coverage would be subject to nearly all of the costs in Tables 11-1a and 11-1b, while an owner/operator who has provided insufficient coverage would be subject only to the incremental costs of maintaining the financial assurance mechanism(s) for the increased liability coverage.

Once the applicable costs are identified, they may be estimated using their respective source tables, which are referenced in Tables 11-1a and 11-1b. The source tables, Tables 11-2 through 11-8, break the major costs down into their component costs. In some tables, these cost components have been grouped into general and site-specific costs. The general costs have already been estimated, but the site-specific cost estimates must be derived.

Table 11-9 provides methodology for deriving these estimates, which are based on the levels of liability coverage required by RCRA. Table 11-10 may be used as a reference for determining the coverage levels required for different types of facilities.

Once all of the cost components in the relevant source tables have been filled in, they may then be subtotaled and totaled. The total from each source table may then be put back into Table 11-1a or 11-1b (in the "Amount" column). Summing the cost amounts in Table 11-1a will yield the estimated total initial cost of liability coverage. Summing the cost amounts in Table 11-1b will yield the estimated total annual cost of liability coverage.

11.5 References

1. U.S. Environmental Protection Agency, Office of Solid Waste, 1981, Background Document for the Financial Test & Municipal Revenue Test Financial Assurance for Closure and Post-Closure Care: Appendix B, Cost Analysis for a Financial Test (November 30, 1981)

2. U.S. Environmental Protection Agency, Office of Solid Waste, 1981, Preliminary Regulatory Impact Analysis of the Financial Assurance and Liability Insurance Regulations (September 11, 1981)

3. US Department of Commerce, Bureau of Labor Statistics, "Occupational Compensation Survey: National Summary, 1994; Part 1: Pay in the United States and Regions, November 1994

4. Labor rates were developed by DPRA in 1992 dollars and inflated to 1997 dollars by the method described in Appendix A.

5. U.S. Environmental Protection Agency, 1993, Supporting Statement for EPA Information Collection Request Number 1573, "Part B Permit Application, Permit Modifications, and Special Permits" (October 14, 1993)

6. U.S. Environmental Protection Agency, 1993, Supporting Statement for EPA Information Collection Request Number 1571, "General Hazardous Waste Facility Standards" (October 14, 1993)

7. Sedgwick of North America web site, http://www.sedgwickna.com/, May 1997

8. SAIC staff contacted selected financial institutions by telephone and e-mail in May 1997 to obtain estimates of surety fees, credit fees, and trustee fees.

Table 11-1a. Total Costs for Third Party Liability Coverage - First Year

Component	Source Table	Amount[1]
Select Liability Coverage Mechanism(s)	Table 11-2	
Establish/maintain Liability Coverage Mechanism(s)		
- Financial Test	Table 11-3a	
- Corporate Guarantee	Table 11-4a	
- Letter of Credit	Table 11-5a	
- Surety Bond	Table 11-6a	
- Trust Fund	Table 11-7a	
- Insurance	Table 11-8a	
Total		

Footnote:
1. These numbers must be retrieved from the source tables listed. Only the applicable costs should be listed here and totaled.

Table 11-1b. Total Costs of Third Party Liability Coverage - Subsequent Years

Component	Source Table	Amount[1]
Maintain Liability Coverage Mechanism(s)		
- Financial Test	Table 11-4b	
- Corporate Guarantee	Table 11-5b	
- Letter of Credit	Table 11-6b	
- Surety Bond	Table 11-7b	
- Trust Fund	Table 11-8b	
- Insurance	Table 11-9b	
Total		

Footnote:
1. These numbers must be retrieved from the source tables listed. Only the applicable costs should be listed here and totaled.

Table 11-2. Select Liability Coverage Mechanism (First Year Only) (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Select Liability Coverage Mechanism (Read regulations, collect data, evaluate options)	Plant Manager	1	hour	$118	$118
	Accountant	2	hour	$81	$162
	Attorney	2	hour	$99	$198
	Clerical (Facility)	1	hour	$21	$21
Total					$499

Table 11-3a. Establish/Maintain Financial Test - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Write and Submit Letter Signed by Chief Financial Officer[1]	Attorney	1	hour	$99	$99
	Plant Manager	0.25	hour	$118	$30
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.75	hour	$21	$16
Accountant's Special Report[2]	Accountant	8	hour	$81	$648
Submit Copy of Public Accountant's Report and Special Report[1]	Clerical (Facility)	1	hour	$21	$21
Total[3]					$975

Footnotes
1. U.S. Environmental Protection Agency. October 14, 1993 *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. SAIC Best Professional Judgement.
3. The total costs for establishing and maintaining the financial test may be lower than Tables 10-3a and 10-3b combined because EPA regulations allow a single letter from the Chief Financial Officer to service both purposes.

Table 11-3b. Establish/Maintain Financial Test- Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Accountant's Special Report[1]	Accountant	8	hour	$81	$648
Submit Copy of Public Accountant's Report and Special Report[2]	Clerical (Facility)	1	hour	$21	$21
Total[3]					$669

Footnotes:
1. U.S. Environmental Protection Agency. October 14, 1993 *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*
2. SAIC Best Professional Judgement.
3. The total costs for establishing and maintaining the financial test may be lower than Tables 10-3a and 10-3b combined because EPA regulations allow a single letter from the Chief Financial Officer to service both purposes.

Table 11-4a. Establish/Maintain Corporate Guarantee - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Submit Letter from Guarantor's Chief Financial Officer[1]	Clerical (Facility)	1	hour	$21	$21
Obtain and Submit Corporate Guarantee from Parent Corporation[1]	Attorney	0.5	hour	$99	$50
	Plant Manager	0.5	hour	$118	$59
	Accountant	0.5	hour	$81	$41
	Clerical (Facility)	0.5	hour	$21	$11
Total					$181

Footnote:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.

Table 11-4b. Maintain Corporate Guarantee - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Submit Updated Information[1]	Clerical (Facility)	1	hour	$21	$21
Total					$21

Footnote:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.

Table 11-5a. Establish/Maintain Letter of Credit - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Obtain/submit Letter of Credit and Establish Trust Fund[1]	Attorney	4	hour	$99	$396
	Plant Manager	1	hour	$118	$118
	Accountant	2	hour	$81	$162
	Clerical (Facility)	1	hour	$21	$21
Subtotal					$697
Site-Specific:					
- Credit Fee [2]	NA	1	each		
- Collateral [2]	NA	1	each		
Subtotal					
Total					

Footnotes:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.
2. Table 11-9 provides the methodology for estimating these costs.

Table 11-5b. Maintain Letter of Credit - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Credit Fee[1]	NA	1	each		
Total					

Footnote:
1. Table 11-9 provides the methodology for estimating this cost.

Table 11-6a. Establish/Maintain Surety Bond - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Surety Bond and Trust Agreement [1]	Attorney	4	hour	$99	$396
	Plant Manager	1	hour	$118	$118
	Accountant	2	hour	$81	$162
	Clerical (Facility)	1	hour	$21	$21
- Submit Original of Bond/Trust Agreement [1]	Clerical (Facility)	1	hour	$21	$21
Subtotal					$718
Site-Specific:					
- Surety Fee [2]	NA	1	each		
- Collateral [2]	NA	1	each		
Subtotal					
Total					

Footnotes:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.
2. Table 11-9 provides the methodology for estimating these costs.

Table 11-6b. Maintain Surety Bond - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Surety Fee[1]	NA	1	each		
Total					

Footnote:
1. Table 11-9 provides the methodology for estimating this cost.

Table 11-7a. Establish/Maintain Trust Fund - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Closure/Post-Closure Trust Fund [1]	Attorney	4.5	hour	$99	$446
	Plant Manager	1.5	hour	$118	$177
	Accountant	1	hour	$81	$81
	Clerical (Facility)	1	hour	$21	$21
- Submit Original of Trust Agreement [1]	Clerical (Facility)	1	hour	$21	$21
Subtotal					$746
Site-Specific:					
- Trustee Fee [2]	NA	1	each		
- Initial Payment into Trust Fund [2]	NA	1	each		
- Taxes on Interest Earned on Trust Fund [2]	NA	1	each		
Subtotal					
Total					

Footnotes:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.
2. Table 11-9 provides the methodology for estimating these costs.

Table 11-7b. Maintain Trust Fund - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
- Trustee Fee [2]	NA	1	each		
- Taxes on Interest Earned on Trust Fund [2]	NA	1	each		
Total					

Footnote:
1. Table 11-9 provides the methodology for estimating these costs.

Table 11-8a. Establish/Maintain Insurance - First Year (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
General:					
- Establish Insurance Policy [1]	Attorney	4	hour	$99	$396
	Plant Manager	1	hour	$118	$118
	Accountant	2	hour	$81	$162
	Clerical (Facility)	0.5	hour	$21	$11
- Submit Insurance Policy Certificate to EPA [1]	Clerical (Facility)	0.5	hour	$21	$11
Subtotal					$697
Site-Specific:					
- Insurance Premium [2]	NA	1	each		
- Collateral [2]	NA	1	each		
Subtotal					
Total					

Footnotes:
1. U.S. Environmental Protection Agency, Office of Solid Waste. October 14, 1993. *Supporting Statement for EPA ICR Number 1571: General Hazardous Waste Facility Standards*.
2. Table 11-9 provides the methodology for estimating these costs.

Table 11-8b. Maintain Insurance - Subsequent Years (1997 Dollars)

Component	Type of Personnel	Estimated Quantity	Unit	Unit Cost	Estimated Total Cost
Insurance Premium[1]	NA	1	each		
Total					

Footnote:
1. Table 11-9 provides the methodology for estimating this cost.

Table 11-9. Liability Coverage Site-Specific Cost Calculations

Cost Type	Method of Calculation	Cost Estimate
Credit Fee	Approximately 1.5% of Liability Coverage (0.5 to 2% Depending on Firm's Credit).	
Surety Fee	Approximately 1.5% of Liability Coverage (0.5 to 3%, Depending on Firm's Credit).	
Collateral	Obtain Site-Specific Estimate from Appropriate Financial Institution.	
Insurance Premium	Obtain Site-Specific Estimated from Appropriate Financial Institution.	
Payment Into Trust Fund	Liability Coverage.	
Trustee Fee	Approximately 1.0% of Liability Coverage	
Taxes on Interest Earned on Trust Fund	Liability Coverage Multiplied by Trust Fund Rate of Return and Marginal Tax Rate (State and Federal).	

Table 11-10. Liability Coverage Requirements (Thousands of 1997 Dollars)

Facility Type	Coverage Type	Per Event [1]	Annual	Total Liability Coverage
Storage	Sudden	1	2	$2,000
	Nonsudden	0	0	$0
	Combined	1	2	$2,000
Surface Impoundment	Sudden	1	2	$2,000
	Nonsudden	3	6	$6,000
	Combined	4	8	$8,000
Land Disposal	Sudden	1	2	$2,000
	Nonsudden	3	6	$6,000
	Combined	4	8	$8,000
Land Treatment	Sudden	1	2	$2,000
	Nonsudden	3	6	$6,000
	Combined	4	8	$8,000
Incinerator	Sudden	1	2	$2,000
	Nonsudden	0	0	$0
	Combined	1	2	$2,000

Footnotes:

1. The liability requirements for sudden and nonsudden accidental occurrences are listed separately and then combined to show the total amount of coverage for each type of facility.

CHAPTER 12. BOILERS AND INDUSTRIAL FURNACES

This chapter presents cost estimates for compliance with the RCRA requirements for boilers and industrial furnaces under Subpart H (Hazardous Waste Burned in Boilers and Industrial Furnaces) of 40 CFR Part 266 (Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities). The BIF rule controls emissions of toxic organic compounds, particulate matter, hydrogen chloride and chlorine gas, and toxic metals.

Cost estimates in this chapter represent the minimum and maximum initial and ongoing compliance costs in 1997 dollars for "typical" boiler and industrial furnaces (BIFs). These costs are provided as guidance. Typical costs are those a facility would incur regardless of site-specific conditions. If sufficient information is available, unit quantities in the cost functions can be adjusted up or down to derive facility-specific cost estimates. Site-specific costs are those that depend on the characteristics of the site or facility in question. The general costs have been estimated and are presented in the cost tables. The site-specific costs must be derived by the case development officer. The methodology for deriving site-specific costs is also presented in the cost tables. All costs presented in this chapter are in 1997 dollars.

This chapter is organized into five sections. Section 12.1 presents definitions of terms; Section 12.2 presents an overview of regulatory requirements for boilers and industrial furnaces; Section 12.3 presents assumptions made to derive the cost estimates; Section 12.4 presents the cost estimates; and Section 12.5 provides references.

12.1 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter:

Boilers An enclosed device using controlled flame combustion and having the following characteristics: (1) the combustion chamber and primary energy recovery section must be of integral design; (2) thermal recovery efficiency must be at least 60 percent; and (3) at least 75 percent of the recovered energy must be "exported" (i.e., not used for internal uses such as preheating of combustion air or fuel, or driving combustion air fans or feed water pumps).

Incinerator Any enclosed device that uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer, or carbon regeneration unit, nor is listed as industrial furnace; or meets the definition of infrared incinerator or plasma arc incinerator.

Industrial Furnaces Those designated devices that are an integral component of a manufacturing process and that use thermal treatment to recover materials or energy. The following 12 devices are classified as

industrial furnaces: (1) cement kilns; (2) lime kilns; (3) aggregate kilns; (4) phosphate kilns; (5) coke ovens; (6) blast furnaces; (7) smelting, melting and refining furnaces; (8) titanium dioxide chloride process oxidation reactors; (9) methane reforming furnaces; (10) pulping liquor recovery furnaces; (11) combustion devices used in the recovery of sulfur values from spent sulphuric acid; and (12) halogen acid furnaces.

Operator Means the person responsible for the overall operation of the facility.

Owner Means the person who owns a facility or part of a facility.

12.2 Overview of RCRA Regulatory Requirements for Boilers and Industrial Furnaces

12.2.1 Permitting Procedures

The permitting procedures for BIFs are similar to those that apply to hazardous waste incinerators. For example, owners/operators are required to submit a Part B permit application for evaluation in order to be eligible for an operating permit. BIFs that have interim status must comply with substantive emission controls for metals, hydrogen chloride, free chlorine, particulates, and carbon monoxide. Owners/operators must certify compliance with the emissions controls under a prescribed schedule, establish limits on prescribed operating parameters, and operate within those limits throughout interim status.

12.2.2 Controls for Organic Compounds

Boilers and industrial furnaces are required to comply with the same destruction and removal efficiency (DRE) standard currently applicable to hazardous waste incinerators: 99.9999 percent DRE of dioxin listed wastes, and 99.99 percent DRE for all other hazardous wastes. In addition BIFs are required to control their emissions for products of incomplete combustion (PICs) by limiting flue gas concentrations of carbon monoxide, and where applicable, hydrocarbons to ensure that the device is operated under good combustion conditions. Finally emissions testing and health-risk assessment is required for chlorinated dioxins and furans for facilities meeting specified criteria where the potential for significant concentrations may exist.

12.2.3 Controls for Toxic Substances

Boilers and industrial furnaces are required to meet emission limits for 10 toxic metals listed in Appendix VIII of 40 CFR Part 261. The standards for carcinogenic metals (arsenic, beryllium, cadmium, and chromium) limit the increased lifetime cancer risk to a maximum exposed individual (MEI) to 1 in 100,000. The standards for

the noncarcinogenic metals (antimony, barium, lead, mercury, silver, and thallium) are based on Reference Doses (RfDs) below which adverse health effects have not been observed.

The standards for noncarcinogenic metals are implemented through a three-tiered approach. The tiers are structured to allow higher emission rates as the owner/operator elects to conduct more site-specific testing and analysis. Thus, the feed rate limits under each of the tiers are based on different levels of site-specific information related to facility design and surrounding terrain. Tier I have feed rate screening limits. Tier II establishes conservative emission rate screening limits. Tier III allows for the use of site-specific analysis based on detailed facility information and air dispersion modeling. Adjusted Tier I, a hybrid of Tiers I and III, allow feed rate limits to be adjusted to reflect site-specific dispersion modeling.

Compliance with any tier is acceptable. It is also acceptable to use different tiers to comply with the standards for different metals.

12.2.4 Controls for Emissions for Hydrogen Chloride and Chlorine Gas

Both hydrogen chloride and chlorine gas are controlled by the BIF rule. The BIF rule controls emissions of hydrogen chloride and free chlorine under the same general approach used for noncarcinogenic metals.

Tier I, the simplest and most conservative approach, limits the feed rates of metals and total chlorine to combustion devices. The conservative waste feed rate screening limits are provided in reference tables given in Appendix I (metals) and Appendix II (total chlorine) of 40 CFR Part 266. The BIF rule incorporates these screening limits as a function of terrain-adjusted effective stack height, noncomplex versus complex terrain, and urban versus rural land use in the vicinity of the stack. Neither emissions modeling nor dispersion modeling is conducted under Tier I. Compliance is demonstrated through sampling and analysis of all feedstreams (hazardous waste, other fuels, and raw materials). If the feed rates under Tier I are too restrictive the owner/operator may determine site-specific limits under Tier III of Adjusted Tier I.

Tier II limits the emission rates of metals, hydrogen chloride and chlorine gas released from BIFs. The conservative emission rate screening limits to be used with this approach were derived the same way as, and are identical to, the feed rate screening limits used for Tier I. Facility owners/operators conduct emissions testing (but not dispersion modeling) to demonstrate compliance with the Tier II standards. The emission rates for hydrogen chloride and chlorine gas may not exceed the screening limits given in Appendix III of 40 CFR Part 266.

Tier III limits provide more flexibility than Tier I and II approaches. Tier III standards require emissions testing and site-specific dispersion modeling. Appendices IV and V of Part 266 contain the reference values needed by owners and operators complying with the Tier III standards.

12.2.5 Emission Standards for Particulate Matter

Boilers and industrial furnaces burning hazardous waste may not emit particulate matter in excess of 0.08 grams per dry standard cubic foot (0.08 gr/dscf) after correction to a stack gas concentration of 7 percent oxygen. However, boilers and industrial furnaces already subject to new source performance standards, or other particulate matter limit under the Clean Air Act, are required to meet the more stringent standard. Compliance with the standard is demonstrated by emissions testing, and the standard is implemented by operating limits in the permit on parameters including: ash content of feed streams, feedrate of specific feed streams, and air pollution control system operating procedures.

Facilities must demonstrate compliance with the particulate matter standard using Methods 1-5 of 40 CFR Part 60, Appendix A. Compliance with the emission limit must be demonstrated during both a facility's interim status compliance test, and the trial burn for the Part B RCRA permit. The compliance test and the trial burn must represent worst-case operating conditions with respect to particulate emissions. Limits on operating conditions applicable for the remainder of interim status are based on operating conditions during the compliance test. Limits in the operating permit are based on the trial burn.

12.3 Assumptions

The compliance cost estimates for boilers and industrial furnaces are based on the following assumptions:

- Facilities will do some analytical work in their onsite laboratory and will contract with commercial laboratories for more complex analyses.

- Wastes are pumped to the burner and therefore the costs do not include a fuel handling train.

12.4 Cost Estimates

There are five major cost categories associated with the standards for BIFs. These include:

- Preliminary Waste Characterization - As part of the permit application, the owner/operator would need to conduct a waste stream analysis for metals.

- Waste Feed Analysis - To complete the Feed Rate Screen, the owner/operator would need to characterize the wastes combusted.

- Emissions Sampling and Analysis - For the emission screen the owner/operator would need to collect monitoring data on specific metals.

- Site-specific Risk Assessment - As part of the permit application process, some facilities would need to incur costs for site-specific risk assessments. In addition, some facilities would need to collect site-specific meteorological data.

- Air Pollution Control Devices - If unable to demonstrate compliance with risk-based standards, the owner/operator would need to reduce emissions from its current levels.

- The cost of CO and oxygen continuous emission monitoring systems for a "clean" environment are considerably less than that for a "dirty" application. There is not a clear distinction between "clean" and "dirty" emissions. For the purposes of this manual a "dirty" exhaust gas application is defined as one that requires an extractive monitoring system in which the extracted sample must be treated to reduce the gas temperature, particulate loading, and moisture content.

- Only costs for venturi scrubbers and a packed bed absorber are provided for air pollution control equipment.

12.4.1 Waste Characterization and Waste Feed Analysis

A waste characterization requires characterization of the physical and chemical properties of the waste stream. There are three approaches for obtaining the characterizing the wastes. One approach would be to perform all onsite analyses, which would require the acquisition of analytical equipment. Laboratory space for the needed equipment could be made available in an existing laboratory or by converting office space. Another option would entail using a commercial laboratory for the required analyses. A third approach is to perform some of the simple analyses in the facility's laboratory while contracting with a commercial laboratory for the more sophisticate analyses. The costs for the waste determination and characterization were previously indicated in Chapters 6 and 7 of this manual.

12.4.2 Furnace Modification Costs

The cost for modifying an existing burner system to fire hazardous waste is site-specific. It depends on the existing burner type and capacity, type of conventional fuel fired, properties of the waste, and quantity of waste to be fired. The least expensive approach is likely to be taken. Some BIFs require only that a burner gun be replumbed to fire the waste. This would not require a significant capital expenditure. In other instances, the hazardous waste could be blended with conventional fuel and fired with little or no modifications to the burner. This approach could be used when the waste and conventional fuel are compatible or when burning liquid waste in oil-fired burners.

The costs for providing the necessary burner components to fire a liquid hazardous waste in natural gas, oil and combination fossil fuel-fired furnaces were obtained from burner vendors and, therefore, may be different from actual costs because some furnace operators may fabricate their own waste burners. The costs for installing an atomizing burner gun vary from $30,000 to $42,000 (1997 dollars)

12.4.3 Carbon Monoxide and Oxygen Monitoring

Continuous monitoring of carbon monoxide levels in the exhaust gases is necessary to ensure that good combustion conditions are maintained to provide adequate destruction of POHCs and PICs. Oxygen monitoring is required in conjunction with carbon monoxide monitoring to adjust CO levels. The cost of CO and oxygen continuous emission monitoring systems for a "clean" environment are considerably less than that for a "dirty" application. There is not a clear distinction between "clean" and "dirty" emissions. For this purposes of this manual a "dirty" exhaust gas application is defined as one that requires an extractive monitoring system in which the extracted sample must be treated to reduce the gas temperature, particulate loading, and moisture content.

12.4.4 Waste Feed Metering

If limitations on the hazardous waste feedrate are established based on the trial burn results, capital outlays for flow metering will be necessary. Table 12- indicates the estimated cost for waste feed metering.

12.4.5 Air Pollution Control Cost

The issue of metals, organic compounds, particulate matter, hydrogen chloride and chlorine gas from BIFs needs to be considered on a source specific basis. Most BIFs are already equipped with air pollution control systems for removing particulate matter from the exhaust gases. It is possible that metals could be controlled by particulate matter controls or by waste fuel specifications. Furthermore, hydrogen chloride and chorine gas emissions may not be a problem if operators do not burn chlorinated wastes at chloride levels that could cause an emission level to be exceeded.

The type of control system that would be installed will vary depending on the emission limitations and the exhaust parameters. For the purposes of this manual, costs are presented for a combination venturi scrubber for particulate matter removal followed by a packed bed absorber for HCL removal. The venturi scrubber will remove metals that are contained in the exhaust gases as particulate matter while those in the vapor state will be removed by the packed tower. Costs are presented as a function of furnace exhaust gas flow. Factors are also given to estimate costs if only metals as particulate matter or HCL removal are required. Other combinations of toxic metals and HCL removal are available, but the venturi/absorber is a practical technique that adequately represents the cost element needed to estimate the expenditures for air pollution control equipment.

Installed costs for a combination venturi/absorber system may be estimated from the following equation:

$$\text{Cost} = 96 \text{ X } Q^{0.8164}$$

where: Q= the exhaust gas flow in acfm.

This system includes a quench tower to lower the exhaust temperature from 550 ^{0}F to saturation, a venturi scrubber for particulate collection, acid gas absorber, caustic recycle system for neutralizing the scrubber water, ID fan, stack, and auxiliaries. The assumed materials for construction are: high-nickel-alloy quencher and venturi

throat; high-grade, chemically resistant, high-temperature fiberglass shell for cyclonic separator and packed tower; polypropylene tower packing; and inconel or hastelloy fan wheel with rubber-lined steel housing.

12.5 References

Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volumes I, II, and III.* Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987

Industrial Economics, Incorporated. *Regulatory Analysis for Waste-as-Fuel Technical Standards Proposed Rule: Draft Report*, Report prepared for U.S. Environmental Protection Agency, Office of Solid Waste. October 1986.

Industrial Economics, Incorporated. *Effects of Recent Changes on the Estimated Costs and Benefits of the Proposed Waste as Fuel Technical Standards: Draft*, Report prepared for U.S. Environmental Protection Agency, Office of Solid Waste. January 1987.

Temple, Barker & Sloane, Incorporated. *The Regulatory Impacts of Proposed Hazardous Waste Incineration Regulations: Draft.* Report prepared for U.S. Environmental Protection Agency, Office of Solid Waste. April 1988.

U.S. Environmental Protection Agency, Office of Solid Waste. *Environmental Fact Sheet: Hazardous Waste Boilers and Industrial Furnaces Now Under Strict RCRA Regulations.* December 1990.

Table 12-1. Burner Modifications - Initial and Ongoing Estimated Costs (1997 $)

Component	Percentage Multiplier	Lower Bound Estimate	Upper Bound Estimate
Initial (Capital) Expenditures			
Atomizing Burner Gun		$15,035	$21,216
Installation Costs		$15,000	$21,000
Subtotal		$30,035	$42,216
Ongoing Costs			
Maintenance	5% of capital costs	$1,502	$2,111
Capital Recovery	13.2% of capital costs	$3,965	$5,573
Taxes, Insurance and Administration	4% of capital costs	$1,201	$1,689
Subtotal		$6,668	$9,372

Source: Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volumes I and II*, Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987.

Table 12-2. Oxygen and Carbon Monoxide Monitoring System - Initial Costs (1997 $)

Component	Lower Bound Estimate	Upper Bound Estimate
Initial (Capital) Expenditures		
Continuous Oxygen Monitoring System	$21,216	$30,070
Automatic Data Reduction System	$30,070	$30,070
Total	$51,286	$60,140

Source: Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volumes I and II*, Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987.

Table 12-3 Oxygen and Carbon Monoxide Monitoring System - Ongoing Costs (1997 $)

Component or Task	Type of Personnel [1]	Quantity [2]	Unit	Unit Cost	Estimated Total Cost
"Clean" Systems					
Maintenance	Plant Laborer	546	hours	$24	$13,104
Performance Certificiaton [3]	NA	1	year	$16,832	$16,832
Total					$29,936
"Dirty" Systems					
Maintenance	Plant Laborer	819	hours	$24	$19,656
Performance Certificiaton [3]	NA	1	year	$16,832	$16,832
Total					$36,488

Footnotes:
1. SAIC best professional judgement.
2. The system is assumed to operate 8,700 hours/year. One-half man-hour per 8-hour shift was assumed to be required for maintenance for the "clean" system and three-quarters man-hours per 8-hour shift for the "dirty" system.
3. It was assumed that one certification test per year would be required. The cost is assumed to be a flat fee.

Source: Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volume I: Industrial Boilers*, Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987, page 6-40.

Table 12-4. Waste Feed Metering - Initial Costs (1997 $)

Component	Lower Bound Estimate	Upper Bound Estimate
Initial (Capital) Expenditures		
Flow Meter	$3,000	$3,000
Chart Recorder	$1,255	$1,255
Float Pulley	$85	$210
Float Line	$45	$45
Floats	$75	$250
Total	$4,460	$4,760

Sources: Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volumes I and II*, Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987.
Ben Meadows Company. *1997 Catalogue.*

Table 12-5. Air Pollution Control - Initial and Ongoing Estimated Costs (1997 $)

Component	Percentage Multiplier	Estimated Cost
Initial (Capital) Expenditures		
Venturi/absorber system [1]		$176,958
No Venturi Scrubber Needed	Minus 15% of capital costs	($26,544)
Subtotal		$150,414
No Absorption System Needed	Minus 40% of capital costs	($70,783)
Subtotal		$106,175
Ongoing Costs		
Maintenance	5% of capital costs	$8,848
Labor (Plant Laborer) [2]		$104,832
Subtotal		$113,680

Notes:
1. The cost for the venturi scrubber is based on the formula: Installed Cost = 96 X $Q^{0.8164}$ where Q = the exhaust gas flow rate in acfm. In this example 10,000 acfm is used.
2. It is assumed that a plant laborer making $24 per hour will operate the pollution control system. The system will operate 8,700 hours/year operating time and will require 4 man-hours per 8-hour shift.

Source: Engineering-Science, Incorporated. *Background Information Document for the Development of Regulations to Control the Burning of Hazardous Wastes in Boilers and Industrial Furnaces Volumes I and II*, Report submitted to U.S. Environmental Protection Agency, Office of Solid Waste. January 1987.

CHAPTER 13. PERSONNEL TRAINING PROGRAM

This chapter presents information that can be used by a Case Development Officer to estimate costs associated with the personnel training regulatory requirements necessary at hazardous waste generator facilities and hazardous waste treatment, storage, and disposal facilities. Although training requirements are similar for both types of facilities, separate costs functions were developed to reflect the amount of training and retraining requirements.

This chapter is organized into seven sections. Section 13.1 is the introduction; Section 13.2 presents definitions of terms; Section 13.3 presents a review of RCRA training requirements; Section 13.4 presents assumptions made to derive the cost estimates; Section 13.5 presents costs; and Section 13.6 presents references. Section 13.7 provides tables indicating the estimated compliance costs for personnel training

13.1 Introduction

The level of training and subsequent training costs for both types of facilities are affected by two major factors. The first is that training is often done in-house by facility staff and can consist of classroom or on the job training. Secondly, according to Resource Conservation and Recovery Act (RCRA) regulations, the amount of training should be commensurate with the degree of operator skills required. For example, a hazardous waste incinerator operator may require considerably more training hours than a hazardous waste technician who is responsible for labeling and recordkeeping.

In addition, other regulatory agencies have regulatory training program requirements that overlap RCRA requirements. For example, the Occupational Safety and Health Administration's (OSHA) hazardous waste operations regulations have specific training requirements for RCRA sites that cover the same training areas as those required by RCRA. Consequently, there is considerable disagreement on training levels, appropriate, training time, and training recordkeeping across the industry.

In order to make it easier for an enforcement Inspector to better judge the type and level of training that is appropriate for a given situation the cost estimates include training requirements for several "typical" employees each having different job duties and training requirements.

13.2 Definitions

Definitions are provided for the following terms used in the cost estimates developed for this chapter:

Facility Personnel All persons who work at, or oversee the operations of a hazardous waste facility, and who's actions or failure to act may result in noncompliance with the requirements of 40 CFR Parts 264 or 265.

HAZWOPER Hazardous Waste Operations and Emergency Response (29 CFR 1910.120).

Training Hours The number of hours devoted to lecture, learning activities, small group work sessions, demonstration, evaluations, or hands-on experience.

13.3 Overview of Regulatory Training Requirements

This section presents a review of regulatory training requirements including RCRA-required training, OSHA-required training for RCRA treatment, storage, and disposal (TSD) facilities, and other training which, depending on the facility, may be part of a facility training program.

13.3.1 RCRA Training Requirements

In general, training must be given to all employees that work with or near hazardous waste, be relevant to the employees' positions, and be completed within six months of the employees' date of employment.

The regulations do not specify the exact course content, rather, the appropriate amount, level, and frequency of training for individuals will depend upon their duties. Generally, RCRA training requirements for Part 264 or 265 facility personnel include:

- Elements of the RCRA Contingency Plan.
- Communications or alarm systems.
- Standard operating procedures for using, inspecting, repairing and replacing facility emergency and monitoring equipment.
- Use and limitations of personal protective equipment.
- Response to fires, explosions, groundwater contamination incidents and shutdown of operations

The U.S. Environmental Protection Agency (EPA) small quantity generator (SQG) regulations do not specify or give additional guidance on training requirements. Training for SQG facilities is generally less detailed than for Part 264/265 facilities.

Specific regulatory requirements for personnel training under RCRA Subtitle C include:

- **40 CFR 262.34(d)(5)**: Small quantity generator waste management personnel must be trained in accordance with the requirements of 40 CFR 262.34(d)(5). Under this provision, generators must ensure that all employees are thoroughly familiar with the proper waste handling and emergency procedures. In addition, an emergency coordinator must be designated and respond to fire, explosion, or releases from the facility.

- **40 CFR 262.34(a)(4):** Large quantity generator (LQG) waste management personnel must be trained in accordance with the requirements of 40 CFR 265.16, (interim status facilities).

- **40 CFR 264.16**: Permitted facility personnel must complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirement of § 264. The program must teach facility personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed. At a minimum, the program must ensure that employees are able to respond to emergencies and must include training on emergency procedures, equipment, and systems. Personnel must complete the training within six months of employment and take part in annual refresher training. For each employee, the owner or operator must maintain documentation of the job titles, employee names, job description, and the type and amount of training provided. Note: A generator of more than 1000 kg/month of hazardous waste that is a permitted TSD facility must train waste management personnel in accordance with the requirements of 40 CFR 264.16.

- **40 CFR 265.16**: Interim status facilities are required to train waste management personnel. The provisions of 40 CFR 265.16 are essentially the same as those under Part 264.

13.3.2 Recordkeeping

Interim status facilities and SQG facilities are required to maintain training records for three years. For permitted facilities, information on employee training must be submitted with Part B of the permit application. A training outline and a statement of how the training will meet job tasks are required as part of the permit application.

13.3.3 OSHA Required Training for RCRA Facilities

It is important to note that certain workers also are required to receive the Occupational Safety and Health Administration (OSHA) training under 29 CFR Part 1910.120(p). This training can be combined with the RCRA personnel training, as long as the provisions of both programs are met. In fact, it is common practice to structure training courses to meet the requirements of both 29 CFR 1910.120 and 40 CFR 264.16 (or 40 CFR 265.16 or 40 CFR 262.34(a)(4), as appropriate). Because of the overlap of training requirements, RCRA enforcement personnel should consider a review of the OSHA personnel training requirements to determine whether the RCRA personnel training requirements have also been met. The OSHA requirements are discussed in the following section.

13.3.3.1 OSHA Training Under 29 CFR Part 1910.120

The Hazardous Waste Operations and Emergency Response (HAZWOPER) standard found at 29 CFR 1910.120 applies to five distinct groups of workers listed below. Any employees who are exposed or potentially exposed to hazardous substances including hazardous waste and who are engaged in one of the following operations are covered by these regulations.

- Clean-up operations required by a governmental body, whether federal, state, local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (e.g., National Priorities List sites).

- Corrective actions involving clean-up operations at sites covered by RCRA as amended (42 U.S.C. 6901 et seq.).

- Voluntary clean-up operations at sites recognized by federal, state, local or other governmental bodies as uncontrolled hazardous waste sites.

- Operations involving hazardous wastes that are conducted at TSD facilities regulated by 40 CFR 264 and 265 pursuant to RCRA, or by agencies under agreement with U.S. EPA to implement RCRA regulations.

- Emergency response operations for releases of, or substantial threats of release of, hazardous substances without regard to the location of the hazard.

All provisions of paragraph (p) of 29 CFR 1910.120 cover any treatment, storage or disposal (TSD) operation regulated by 40 CFR parts 264 and 265 or by state law authorized under RCRA, and required to have a permit or interim status from EPA pursuant to 40 CFR 270.1 or from a state agency pursuant to RCRA. In general, the provisions of paragraph (p) of 29 CFR 1910.120 cover certain operations conducted under the RCRA at TSD facilities and require the following:

- written safety and health program;
- hazard communication program;
- medical surveillance program;
- decontamination program;
- new technology program;
- material handling program;
- training program to include initial for 24 hours (or demonstrated equivalent for current employees) and refresher training for eight hours annually by qualified trainers; and
- emergency response program.

There are some exceptions to these requirements. For example, employers who are not required to have a permit or interim status because they are conditionally exempt small quantity generators under 40 CFR 261.5 or are generators who qualify under 40 CFR 262.34 for exemptions from regulation under 40 CFR parts 264, 265, and 270 ("excepted employers") are not covered by paragraphs (p)(1) through (p)(7) of this section. However, excepted employers who are required by the EPA or state agency to have their employees engage in emergency response or who direct their employees to engage in emergency response are covered by paragraph (p)(8) of this section (i.e., emergency response planning).

13.3.3.2 Other Training

OSHA and other regulatory agencies have training requirements that may be applicable to any facility that handles hazardous materials or hazardous wastes. Unlike OSHA 29 CFR 1910.120 training, these requirements are not specific to RCRA facilities. However, such training may be included in a facility's site-specific training program. The training-related topics of several of these regulations are presented below.

- Hazardous and Solid Waste Management including waste identification; hazardous waste accumulation and storage; record keeping and reporting; pre-transport and manifest requirements; proper treatment and/or disposal; waste disposal liability.

- US Department Transportation/International Air Transport Association shipping and packaging procedures including review of manifest records and review of procedures to select hazardous waste and hazardous material transporters.

- OSHA Safety including evaluation of procedures and equipment for controlling employee exposure to workplace hazards including chemical exposures, machine safety, ergonomics, and other factors in terms of applicable regulations; review of required record keeping.

- OSHA Hazard Communication including review of material safety data sheets (MSDSs); comparison of chemicals in workplace to existing hazard communications (HazCom) requirements.

- Industrial Hygiene including review of exposure hazards, ventilation systems, confined space entry hazards, noise/hearing conservation program, laboratory health and safety, indoor air quality.

- Emergency Response including evaluation of emergency response plans, including employee evacuation, and spill prevention containment and contingency (SPCC) plans for compliance with OSHA, EPA and other regulatory requirements.

13.4 Training at Interim Status /Permitted Facilities (40 CFR Parts 264/265)

This section describes the specific training and training related program activities of a typical RCRA Part 264/265 facility.

Both OSHA and EPA regulations require training at TSD facilities covered under 40 CFR 264 and 265. The regulations are consistent in that they both require training which is sufficient to enable employees to perform assigned duties safely and effectively and respond to emergencies.

Because of the overlap in training requirements and training course content many TSD facilities provide a single training course which satisfies both requirements. Consequently, the specific training requirements and associated costs reflect both EPA and OSHA requirements.

13.4.1 Minimum Training

The following basic training subject areas have been identified as being relevant for inclusion in training programs.

1. Training for personnel safety
   - Chemistry of hazardous materials and wastes
   - Health effects
   - Selection and use of personnel protective clothing and equipment

2. Release prevention and response
   - Contingency planning
   - Emergency response

3. Decontamination procedures

4. Facility operation and maintenance--(facility-specific)

5. High hazard operations

6. Maintenance documentation

13.4.2 Training Levels

For employees who are exposed to health and safety hazards the basic level of training is 24 training hours and refresher training for eight training hours annually. Training would encompass appropriate areas mentioned above plus other site-specific training.

Employees in supervisory and decision making positions would require broad training in all aspects of hazardous waste management pertinent to their facility. This training would encompass all of the six areas mentioned above plus additional site- specific training. This level of training is typically achieved with a 24-hour HAZWOPER training course or equivalent plus one or two days additional management training.
Employees whose job duties require a high degree of technical skill such as a waste management unit operator, would typically require 24 hours of instruction plus up to three days of on-the-job training.

13.4.3 Training Records Management

The owner or operator must maintain the following documents and records at the facility:
(1) The job title for each position at the facility related to hazardous waste management, and the name of the employee filling each job; (2) A written job description for each position including the requisite skill, education, qualifications and duties of each position; (3) a description of the amount and type of both initial and continuing training that will be given to each person; (4) documentation that required training was provided to appropriate facility personnel.

Training records on current employees must be kept until closure of the facility.

13.5 Training at Small Quantity Generating Facilities (40 CFR 262)

Under the provisions of this regulation generators must ensure that all employees are thoroughly familiar with proper waste handling procedures and emergency response procedures. Training content varies according to facility and job duties, and training level is usually less than that typical for TSD facilities. OSHA HAZWOPER training is not required for these facilities.

13.6 Assumptions

This section presents assumptions made to develop the cost estimates for compliance with the RCRA training requirements.

- The training costs for compliance with a typical 40 CFR Part 264 facility are approximately the same as for a Part 265 facility, and by extension, a LQG facility.

- It is a common practice in the hazardous waste industry to structure training courses to meet the requirements of both RCRA (40 CFR 264/265 and OSHA (1910.120).

- Costs associated with providing owner/operator-developed training are approximately the same as those for hiring a local consulting firm to provide training.

- The regulatory-required training represents the minimum training at a facility; additional on-the-job or classroom training is typically provided to employees having specialized technical responsibilities (e.g., equipment operator, hazardous waste technician) or supervisory responsibilities.

- Costs of providing training documentation are included in the training provider costs.

- The facility will have administrative and clerical support available for training records maintenance and management. The cost estimates reflect that records management is performed by the facility.

13.7 Costs

This section provides compliance cost estimates (in 1997 dollars) for providing training at RCRA facilities. Tables 13-1 and 13-2 present the initial and annual training costs associated with RCRA Parts 264/265 training. Costs have been separated into several "typical" Part 264/265 facility labor categories.

Training costs associated with SQG facilities have not been tabulated. These costs are estimated to be a maximum of one day training ($150 plus labor costs) per employee for initial training. Costs for annual training and upkeep are estimated to be approximately $100 per employee.

TABLE 13-1 INITIAL TRAINING COSTS (1997 DOLLARS)

Labor Categories and Loaded Hourly Wage Rate	24 Hour TSD			On-The-Job Training			Records Management[2]	Total
	Training	Labor Cost[1]	Total	Training	Labor Cost[1]	Total		
General Facility Laborer (@$30/hr)	$450	$720	$1,170	N/A			$100	$1,270
Equipment Operator (@$40/hr)	$450	$960	$1,410	$450	$960 (3 days)	$1,410	$100	$2,920
Chemist (@$50/hr)	$450	$1,200	$1,650	$300	$800 (2 days)	$1,100	$100	$2,850
Supervisor (@$142/hr)	$450	$3,408	$3,858	$750	$2,272 (2 days)	$3,022	$100	$6,980
Engineer (@$103/hr)	$450	$2,472	$2,922	$450	$1,648 (2 days)	$2,098	$100	$5,120

1. Represents costs for time away from work at basic salary rate.
2. Represents additional training costs associated with each job.

TABLE 13-2 ANNUAL TRAINING COSTS (1997 DOLLARS)

Labor Categories and Loaded Hourly Wage Rates	8 Hour Annual			Records Management	Total
	Training	Labor Costs[1]	Total		
General Facility Laborer (@$30/hr)	$150	$240	$390	$100	$970
Equipment Operator(@$40/hr)	$150	$320	$470	$100	$570
Chemist (@$50/hr)	$150	$400	$550	$100	$650
Supervisor (@$142/hr)	$150	$1,136	$1,286	$100	$1,386
Engineer (@$103/hr)	$150	$824	$974	$100	$1,074

1. Represents costs for time away from work at basic salary rate.

13.8 References

Barnes, Elizabeth, USEPA Region I II, 1996, personal communication with Bob Stewart (SAIC), September 25, 1996.

RCRA Personnel Training Guidance for ;Owners or Operators of Hazardous Waste Management Facilities . (EPA/SW-915)

U.S. Department of Labor, Occupational Safety and Health Administration, HAZWOPER Interpretive QUIPS Document.

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER).

29 CFR 1910.1200, "Hazard Communication."

40 CFR 264.16, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - Personnel Training."

40 CFR 265.16, "Inte rim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - Personnel Training."

APPENDIX A - UPDATING COSTS

All of the costs reported in this cost document are reported in 1996 dollars. Dollars values collected from existing documents, such as information collection requests have been inflated into 1996 dollar values. In subsequent years the various unit costs will increase or decrease, changing the total costs for noncompliance. This appendix presents the methodology for updating the costs presented in this document.

Cost Updating Methodology

Costs in this document may be updated by using an inflation factor derived from the most recent Implicit Price Deflator for Gross Domestic Product published by the U.S. Department of Commerce, Bureau of Economic Analysis in the *Survey of Current Business.* The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year. Economic Indicators are published monthly and the Implicit Price Deflator for Gross Domestic Product is reported quarterly in this publication. If the annual Deflator is not yet available, the user can estimate the annual Deflator by averaging the quarterly Deflators.

Table A-1 below indicates the Implicit Price Deflators for the years 1992 through 1996 and the inflation/deflation factor to translate dollars into either 1992 or 1996 dollars. For example, assume the cost estimate for a violation is $100,000 (in 1992 dollars). The latest published deflator for 1996 (available for second quarter only) is 109.5; and the published annual deflator for 1992 is 100.0. Dividing 109.5 by 100.0 gives the inflation factor, 1.095. Multiplying $100,000 by 1.095 gives a result of $109,500 for an adjusted cost estimate in first quarter 1996 dollars.

Table A-1 Implicit Price Deflators (1992 = 100)

Year	Implicit Price Deflator	Deflation Factor if Base Year is 1992	Inflation Factor if Base Year is 1996
1992	100.0	1	1.095
1993	102.6	0.975	1.067
1994	104.9	0.953	1.044
1995	107.6	0.929	1.018
1996	109.5	0.913	1

Source: U.S. Department of Commerce, Economics and Statistic Administration, Bureau of Economic Analysis. Survey of Current Business, August 1996, Volume 76, Number 8. Table 7.1

APPENDIX B - LABOR COSTS

A number of assumptions were necessary for determining labor type and cost. First, the type of labor needed was estimated by reviewing information collection requests for the various regulatory actions. Second, the particular type of labor necessary to fulfill that specific function was estimated by reviewing the Department of Labor's 1992 Occupational Compensation Survey. Third, the hourly rate for that the specific category was obtained by the Occupational Compensation Survey. In all instances the wage rate selected was the mean value for private industry as a whole. Wage rates were not obtainable from the compensation survey for the Facility Labor category laborer. The hourly rate for laborers was obtained from the Bureau of Labor Statistics from the table "Manufacturing Industries Employer Costs per Hour Worked for Employee Compensation, Private Industry by Occupation Categories" March 1995. This wage rate reported here is for non-unionized labor. The table below indicates the Labor Category and corresponding labor category used from the Occupational Compensation Survey to determine the wage rate.

Labor Category	Department of Labor's Occupation and Level	Mean Weekly Compensation 1992 Dollars
Facility Labor		
• President	Engineer VIII	2,002
• Plant Manager	Engineer VII	1,695
• Facility Engineer	Engineer IV	1,021
• Environmental Coordinator	Engineer II	725
• Plant Laborer [1]	NA	8.65
• Clerical	Clerk, General II	307
Consultant		
• Attorney	Attorney III	1,188
• Project Manager	Engineer VII	1,695
• Paralegal	Clerk, General IV	453
• Project Engineer	Engineer V	1,230
• Engineering Assistant	Engineer I	633
• Drafting Technician	Drafter III	592
• Field Technician	Engineering Technician II	471
• Clerical	Clerk, General II	307

The wage rate used for this category was obtained from the Department of Labor Statistics and is 1995 dollars. This category was not included in the Occupational Compensation Survey.

In order to simplify the calculations, once the labor rates were inflated to 1996 dollars, the labor rates were rounded to the nearest dollar. Table B-1 below, indicates the hourly rate for all labor categories presented in this document in 1992 dollars, 1996 dollars, and rounded 1996 dollars. Throughout this document costs have calculated using the 1996 dollar values, but have rounded to the nearest dollar for presentation purposes only.

TABLE B-1. WAGE RATES IN 1992 AND 1996 DOLLARS

Labor Category	1992 Dollars	1996 Dollars	Rounded Value 1996 Dollars
Facility Labor			
• President	$125.38	$136.53	$137
• Plant Manager	$106.15	$115.60	$116
• Facility Engineer	$63.94	$69.63	$70
• Environmental Coordinator	$45.40	$49.44	$50
• Plant Laborer	$21.67	$21.88	$22
• Clerical	$19.23	$20.94	$21
Consultant			
• Attorney	$89.10	$97.03	$97
• Project Manager	$127.13	$138.44	$138
• Paralegal	$33.98	$37.00	$37
• Project Engineer	$92.25	$100.46	$100
• Engineering Assistant	$47.25	$51.70	$52
• Drafting Technician	$44.40	$48.35	$48
• Field Technician	$35.33	$38.47	$38
• Clerical	$23.03	$25.07	$25

REFERENCES

1. U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Compensation Survey Part 1: Pay in the United States and Regions, June 1992*. Bulletin 2439-1. June 1994.

2. U.S. Department of Commerce, Economics and Statistic Administration, Bureau of Economic Analysis. *Survey of Current Business*, August 1996, Volume 76, Number 8. Table 7.1.

APPENDIX C - ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS [a]

Method 8010

Benzyl chloride
Bis(2-chloroethoxy)methane
Bis(2-chloroisopropyl)ether
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chloroacetaldehyde
Chlorobenzene
Chloroethane
Chloroform
1-Chlorohexane
2-Chloroethyl vinyl ether
Chloromethane
Chloromethylmethyl ether
Chlorotoluene
Dibromochloromethane
Dibromomethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
trans- 1,2-Dichloroethene
Dichloromethane
1,2-Dichloropropane
trans- 1,3-Dichloropropene
1,1,2,2-Tetrachloroethane
1,1,1,2-Tetrachloroethane
Tetrachloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Trichlorofluoromethane
Trichloropropane
Vinyl chloride

Method 8015

Acrylamide
Diethyl ether
Ethanol
Methyl ethyl ketone (MEK)
Methyl isobutyl ketone (MIBK)
Paraldehyde (trimer of acetaldehyde)

Method 8020

Benzene
Chlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethyl Benzene
Toluene
Xylenes

Method 8030

Acrolein
Acrylonitrile
Acetonitrile

Method 8040

2-sec-Butyl-4,6-dinitrophenol (DNBP)
4-Chloro-3-methylphenol
2-Chlorophenol
Cresols (methyl phenols)
2-Cyclohexzyl-4,6-dinitrophenol
2,4-Dichlorophenol
2,6-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Methyl-4,6-dinitrophenol
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
Tetrachlorophenols

APPENDIX C

ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS (continued)

Trichlorophenols
2,4,6-Trichlorophenol

Method 8060

Benzyl butyl phthalate
Bis(2-ethylhexyl) phthalate
Diethyl phthalate
Dimethyl phthalate
Di-n-butyl phthalate
Di-n-octyl phthalate

Method 8080

Aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (Lindane)
Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Methoxychlor
PCB-1016
PCB-1221
PCB-1232
PCB-1242
PCB-1248
PCB-1254
PCB-1260

Method 8090

Isophorone
Nitrobenzene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Dinitrobenzene
Naphthoquinone

Method 8100

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(j)fluoranthene
Benzo(k)fluoranthene
Benzo(ghi)perylene
Chrysene
Dibenz(a,h)acridine
Dibenz(a,j)acridine
Dibenzo(a,h)anthracene
7H-Dibenzo(c,g)carbazole
Dibenzo(a,e)pyrene
Dibenzo(a,h)pyrene
Dibenzo(a,i)pyrene
Fluoranthene
Fluorene
Ideno(1,2,3-cd)pyrene
3-Methylcholanthrene
Naphthalene
Phenanthrene

APPENDIX C

ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS (continued)

Pyrene

Method 8120

Benzal chloride
Benzotrichloride
Benzyl chloride
2-Chloronaphthalene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclohexane
Hexachlorocyclopentadiene
Hexachloroethane
Tetrachlorobenzenes
1,2,4-Trichlorobenzene
Pentachlorohexane

Method 8140

Azinphos methyl
Bolstar
Chlorpyrifos
Coumaphos
Demeton-O
Demeton-S
Diazinon
Dichlorvos
Disulfoton
Ethoprop
Fensulfothion
Fenthion
Merphos
Mevisphos
Naled
Parathion methyl
Phorate
Ronnel
Stirophos (Tetrachlorvinphos)
Tokuthion (Prothiofos)
Trichloronate

Method 8150

2,4-D
2,4-DB
2,4,5-T
2,4,5-TP (silvex)
Dalapon
Dicamba
Dichloroprop
Dinoseb
MCPA
MCPP

Method 8240

Acetone
Benzene
Bromodichloromethane
Bromomethane
Bromoform
2-Butanone
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Dibromochlorometrhane
1,1-Dichloroethane

APPENDIX C

ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS (continued)

1,2-Dichloroethane
1,1-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
cis-1,3-Dichloropene
trans- 1,3-Dichloropropene
Ethyl benzene
2-Hexanone
4-Methyl-2-pentanone
Methylene chloride
Styrene
Tetrachloroethene
Toluene
Total Xylenes
1,1,2,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Vinyl acetate
Vinyl Chloride

Method 8270

Acenaphthene
Acenaphthylene
Acetophenone
Aldrin
Aniline
Anthracene
4-Aminobiphenyl
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260
Benzidine
Benzoic acid
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)bluoranthene
Benzo(ghi)perylene
Benzo(a)pyrene
Butyl alcohol
α-BHC
β-BHC
δ-BHC
γ-BHC
Bis(2-chloroethoxy) methane
Bis(2-chloroethyl) ether
Bis(2-Chloroisopropyl) ether
Bis(2-ethylhexyl) Phthalate
4-Bromophenyl phenyl ether
Butyl benzyl phthalate
Chlordane
4-Chloroaniline
1-Chloronaphthalene
2-Chloronaphthalene
4-Chloro-3-methylphenol
2-Chlorophenol
4-Chlorophenyl phenyl ether
Chrysene

4,4'-DDD
4,4'-DDE
4,4'-DDT
Dibenz(a,j)acridine
Dibenz(a,h)anthracene
Dibenzofuran
Di-n-butyl phthalate

APPENDIX C

ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS (continued)

1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
2,6-Dichlorophenol
Dieldrin
Diethylphthalate
p-Dimethylaminoazobenzene
7,12-Dimethylbenz(a)anthracene
α, α Dimethylphenethylamine
2,4-Dimethylphenol
Dimethylphthalate
4,6-Dinitro-2-methylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Diphenylamine
1,2-Diphenylhydrazine
Di-n-octylphthalate
EndosulfanI
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
Ethyl methanesulfonate
Fluoranthene
Fluorene
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno (1,2,3-cd) pyrene
Isophorone
Methoxychlor
3-Methylcholanthrene
Methyl methanesulfonate
2-Methylnaphthalene
2-Methylphenol
4-Methylphenol
Naphthalene
1-Naphthylamine
2-Naphthylamine
2-Nitroaniline
3-Nitroaniline
4-Nitroaniline
Nitrobenzene
2-Nitrophenol
4-Nitrophenol
N-Nitroso-di-n-butylamine
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitroso-di-N-propylamine
N-Nitrosopiperidine
Pentachlorobenzene
Pentachloronitrobenzene
Pentachlorophenol
Phenacetin
Phenanthrene
Phenol
2-Picoline
Pronamide
Pyrene
1,2,4,5-Tetrachlorobenzene
2,3,4,6-Tetrachlorophenol
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol

APPENDIX C

ORGANIC CONSTITUENTS DETECTED BY EPA ANALYTICAL METHODS (continued)

2,4,6-Trichlorophenol
Toxaphene

[a] The following are methods commonly used and the organic constituents that may be detected by each method. This list is not intended to be complete. Additional test methods are provided in SW-846.

Source: U.S. EPA, "Test Methods for Evaluation Solid Waste," SW-846, November, 1986.