

APPENDIX C

EXAMPLES OF COST ESTIMATION PACKAGES

1. INTRODUCTION

Estimates can be performed in a variety of ways. Some of these are for projects for an undefined scope, a conventional construction project, or where there is a level of effort required to complete the work. Examples of cost estimation packages for these types of projects are described as follows.

2. EXAMPLE OF AN ENVIRONMENTAL MANAGEMENT COST ESTIMATION PACKAGE

Following is an example of a well-documented cost estimation package. The data is from the example estimate from the EM-30 Cost and Schedule Estimating Guide and is for a level-of-effort-type estimate. To demonstrate the estimate building process, this example walks through the steps for a fictitious hazardous waste drum storage area.

A. Purpose

The purpose of this estimate is to prepare an FY95 operating budget for the operation of the hazardous waste drum storage facility at the XX site.

B. Technical Scope

The hazardous waste drum storage facility consists of a metal building (100 feet by 40 feet) over a concrete pad. The facility has a capacity of over 500 waste drums, single-stacked. Operations associated with this facility include transporting hazardous waste in 55-gallon drums and smaller containers from 22 points of generation within the site to the storage building via truck: off-loading the waste containers; visually inspecting them; collecting samples from 10 percent of the containers; labeling and dating the containers based upon their contents; preparing hazardous waste manifests; preparing the wastes to meet U.S. Department of Transportation (DOT) shipping regulations and the waste acceptance criteria of the receiving facility; staging the containers for off-site shipment within 90 days of

their being filled; and checking them out of the inventory system as they are loaded onto the contractor's truck for off-site shipment. Ancillary activities associated with the facility include waste profiling, record keeping, housekeeping, small spill cleanup, training, and security.

For the past 3 operating years (1990, 1991, and 1992), this facility has received, stored, and prepared an average of 4,300 drums per year. A similar level of activity is anticipated in FY95.

The estimator must make some assumptions in the preparation of the estimate. They are as follows.

- The amount of waste generated by the production areas served by this storage facility will be the same as last year (4,300 drums).
- Ninety percent of the waste will be packaged in 55-gallon drums in good condition for off-site shipment. Ten percent of the waste materials will require consolidation, repackaging, or overpacking.
- Waste containers, with the exception of overpack drums and a limited number of drums used to consolidate wastes, will continue to be provided by the waste generating unit.
- Motor vehicles, including a stake-body truck with power-lift gate, a pick-up, and a fork lift, will continue to be supplied by the motor pool.
- There will be no significant changes in regulations affecting this facility.

C. Work Breakdown Structure

The work breakdown structure is established as follows:

1. Activity Data Sheet (ADS) 9876, Hazardous Waste Management
- 1.2. U.S. Department of Energy (DOE) Facility X, Waste Management Operations
- 1.2.4. Hazardous Waste Storage, TDD 4809

1. On-Site Transportation (1243.0111000)

- Drives a stake-body truck to 1 or more of the 22 satellite accumulation areas in the production facilities.
- Checks labels and documentation for each container upon arrival.
- Transports the hazardous waste in 55-gallon drums and smaller containers from satellite accumulation areas to the truck via handcart.
- Loads the waste containers onto the truck using a power-lift tailgate and secures the containers to the truck. In most cases, multiple drums will be collected from the same building at the same time.
- Upon collecting a full load of containers from various areas, returns to the drum storage building and unloads the drums for check-in.

2. Security Escort (1243.0112000)

Required to accompany on-site waste transporter into restricted production areas to collect waste containers for transfer to the storage facility.

3. Waste Container Acceptance (1243.0113000)

- Visually inspects container for damage to ensure it is properly labeled and dated.
- Enters container identification number and contents description into the computerized inventory control system.
- Collects a waste sample from 10 percent of all containers received for verification of contents and sends sample to on-site laboratory.
- Consolidates, repackages, or overpacks any drums that require special treatment (approximately 10 percent of all drums received).
- Sorts and moves drums to an appropriate location within the building based on waste type and compatibility.
- Checks waste sample analyses against waste profiles as received from laboratory.

4. Inspection and Inventory Check (1243.0114000)

- Conducts a walk-around visual inspection of all drums in the storage building; checks for leaks, spills, or other damage.
- Spot checks dates on drum labels to ensure compliance with the 90-day storage limit.
- Counts the drums and cross-checks with the inventory control system.
- Checks the inventory control system to ensure that no drums are stored longer than 90 days after filing.

5. Drum Preparation (1243.0115000)

- Prepares and labels drums to conform to DOT and U.S. Environmental Protection Agency regulations.
- Moves drums to staging area to await pick-up by contractor.

6. Record Keeping Reporting; Environmental, Health and Safety Compliance (1243.0116000)

- Performs all record keeping and information submissions to maintain compliance with Federal and state environmental and health and safety requirements associated with operating a “less-than-90-day” hazardous waste storage area.
- Develops new or updated standard operating procedures as needed for handling and storing new or changing waste streams.
- Prepares or updates waste characterization profiles as waste streams change, or as required by Federal and state regulations.
- Acts as regulatory liaison during inspections or incident responses.

7. Safety and Technical Training (1243.0117000)

Each employee working at this facility (either full-time or part-time) must attend Occupational Safety and Health Administration-approved hazardous waste worker health and safety training/refresher annually, hazardous waste

response training/refresher annually, DOE security training/refresher annually, and miscellaneous one-time procedures improvement seminars.

D. Backup

On-Site Transportation (1243.0111000) (Variable Cost)

1991 - 2,155 labor-hours/4,288 drums
Average Time - 0.5 labor-hours per drum
FY95 Number - 4,300 drums per year
Labor Rate - \$45.38/labor-hour

Security Escort (1243.0112000) (Variable Cost)

1991 - 2,150 labor-hours/4,288 drums
Average Time - 0.5 labor-hours per drum
FY 95 Number - 4,300 drums per year
Labor Rate - \$51.26/labor-hour

Waste Container Acceptance (1243.0113000) (Variable Cost)

1991 - 4,503 labor-hours/4,288 drums
Average Time - 1.05 labor-hours per drum
FY95 Number - 4,300 drums per year
Labor Rate - \$47.04/labor-hour

Inspection and Inventory Check (1243.0114000) (Fixed Cost)

1991 - 531 labor-hours/265 inspections
Average Time - 2.0 labor-hours per drum
FY95 Number - 260 inspections per year (1 per work day)
Labor Rate - \$47.04/labor-hour

Drum Preparation (1243.0115000) (Variable Cost)

1991 - 2,573 labor-hours/4,288 drums
Average Time - 0.6 labor-hours per drum
FY95 Number - 4,300 drums per year
Labor Rate - \$47.04/labor-hour

Record Keeping; Reporting; Environmental, Health and Safety Compliance
(1243.0116000) (Fixed Cost)

1991 - 2,052 labor-hours per waste stream
Average Time - 114 labor-hours per waste stream
FY95 Number - 18 waste streams per year
Labor Rate - \$47.04/labor-hour

Safety and Technical Training (1243.0117000) (Fixed Cost)
1991 - 349 labor-hours/7 employees
Average Time - 50.0 labor-hours per employee
FY95 Number - 7 employees
Labor Rate - \$47.04/labor-hour

Basis for Activity Time Estimates

The time estimates for each of the activities listed above have been developed by calculating the average time spent on each activity per unit of work. Time sheet summaries that capture activity time data were used to determine the total time spent by all employees on each activity. The time sheet summaries also provided the average hourly labor rate spent for each activity. The storage facility logbook and computerized inventory system were used to determine the number of times a work unit was performed. For example, time sheet summaries show that for 1991, 2,155 hours were spent transporting 4,288 drums (including all other work associated with transportation) from the satellite accumulation areas to the storage facility. This averages to 0.502 hours per drum. For the purpose of this estimate, therefore, we have assumed that transporting each drum requires 0.5 hours of work.

Work sheets, time sheet summaries, and storage facility inventory records supporting each of the time estimates are on file in the central file of the Waste Management Office, Budget File Number 1.2.4.3.93.

Supplies Needed for FY95

55-gallon drums (50 @ \$35.00)	\$1,750.00
Overpack drums (15 @ \$65.00)	\$975.00
Sample bottles (450 @ \$1.75)	\$790.00
Office supplies	\$350.00
Chemical absorbent (100 bags @ \$6.00)	\$600.00
Hand tools, miscellaneous	\$500.00
Coveralls, gloves, booties, safety glasses, and shoes	\$5,000.00
SUBTOTAL	\$9,965.00
Tax (5%)	\$500.00
TOTAL	\$10,465.00

Number of drums	4,300
Price per drum	\$2.43

Basis for Material Estimates

Material estimates are based upon the quantities actually used during 1991 and price quotes from local vendors and suppliers. Copies of the price quotes and quantity calculations are on file in the central file of the Waste Management Office, File Number 1.3.5.2.92.

Subcontracts for FY95

Laboratory Analytical Support

Fingerprint analysis (430 @ \$150)	\$64,500
Number of drums	4,300
Price per drum	\$15.00
Waste profile analysis (36 @ \$350)	\$12,600

E. Indirects

We have used an indirect rate of 25 percent for this cost estimate. This percentage includes an allocated cost for all functions, such as general site security, power usage, and site administrative costs. Record keeping for this operation, safety and technical training, and drum storage security escorts are included as direct costs.

F. Estimate, Time-Scaled Logic Diagram, and Resource Loaded Schedule

Following is the Cost Estimate (Table C-1), the Time-Scaled Logic Diagram (Table C-2), and the Resource Loaded Schedule (Table C-3). These documents complete the cost estimation package.

DOE Location X
Job No. XXXXXXXXXX
Page: 1
Date: 12/01/92 14:14
By DGS & MAH

**HAZARDOUS WASTE STORAGE OPERATIONS
FACILITY OPERATIONS & MAINTENANCE
REPORT UC3: UNIT COST/ESTIMATE DETAIL BY FACILITY**

-Work Breakdown- Facility Standrd.WKPKG	Description	Quantity	Labor Hours	Labor	Material	Analytic Lab Cost	Overhead	Total Dollars
1	ADS 9876 Facility Ops/Maint.							
1243	FY 95, Storage Operations							
1243 .0111000.	On-site transportation .5 labor hours per drum	4300 drums	0.500	22.69			5.67	28.36
			2150				24387	121933
1243 .0112000.	Security escort .5 labor hours per drum	4300 drums	0.500	25.63			6.41	32.04
			2150	110209			27552	137761
1243 .0113000.	Waste container acceptance, including label, sample, inspect, repack, verifications	4300 drums	1.050	49.39	2.43	15.00	16.71	83.53
			4515	212386	10449	64500	71834	359169
1243 .0114000.	Inspection and inventory check; 2 labor hours per inspection, 260 inspections per year	260 ea	2.000	94.08			23.52	117.60
			520	24461			6115	30576
1243 .0115000.	Drum prep for offsite transportation	4300 drums	0.600	28.22			7.06	35.28
			2580	121363			30341	151704
1243 .0116000	Recordkeeping, reporting, and compliance per waste stream type	18 ea	114	5362		700.00	1515	7578
			2052	96526		12600	27282	136408
1243 .0117000.	Safety and technical training average 50 hours/person/year	350 hr	1.000	47.04			11.76	58.80
			350	16464			4116	20580
	Total FY 95, Storage Operations		14,317	678,955	10,449	77,100	191,627	958,131
	Total ADS 9876 Facility Ops and Maintenance		14,317	678,955	10,449	77,100	191,627	958,131
	Report Total		14,317	\$678,955	\$10,449	77,100	191,627	\$958,131

Table C-1. Cost Estimate.

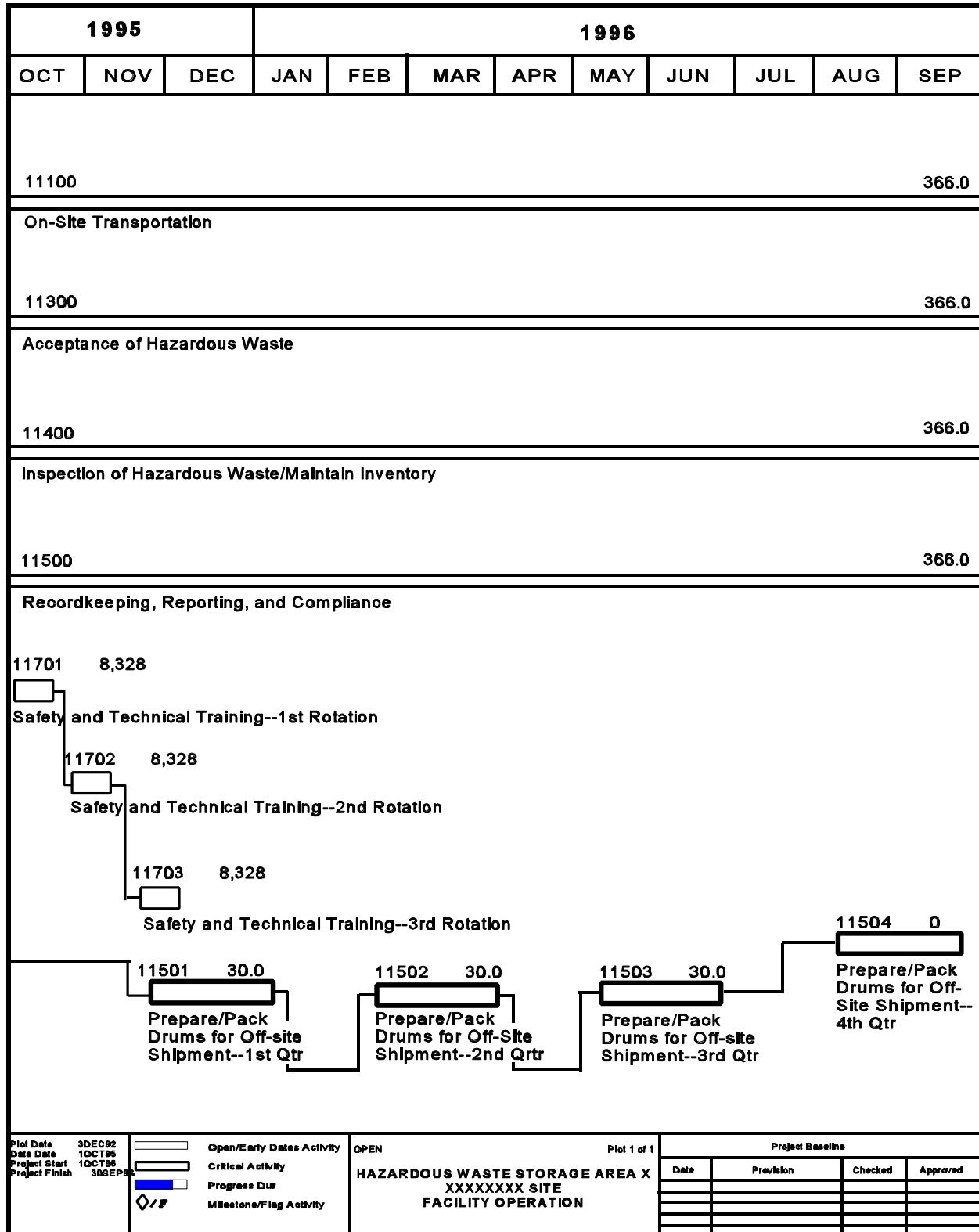


Figure C-1. Time-Scaled Logic Diagram.

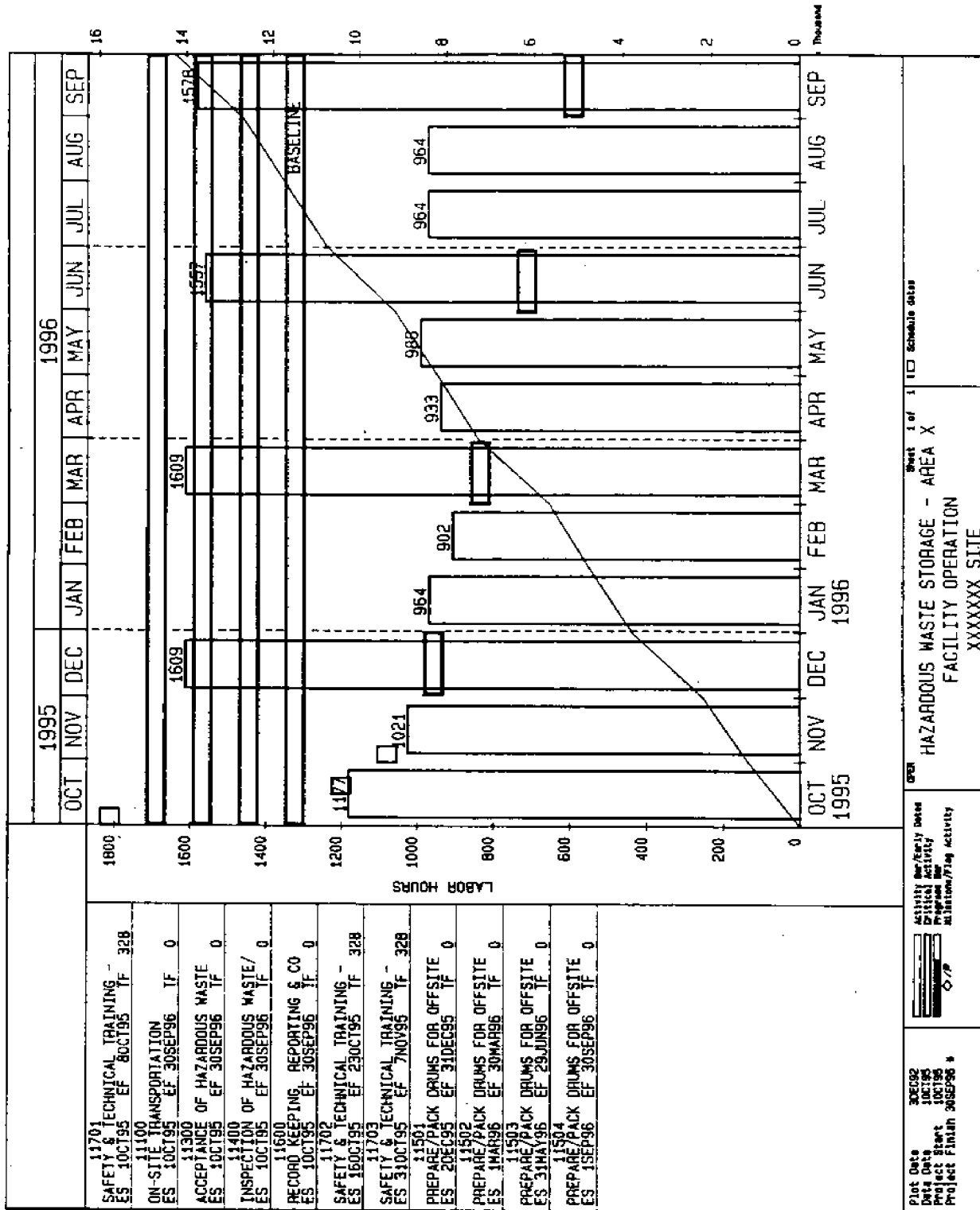


Table C-2. Resource-Loaded Schedule.