

SOLID WASTE FINANCIAL ASSURANCE PROGRAM REPORT



**OKLAHOMA DEPARTMENT OF ENVIRONMENTAL
QUALITY
WASTE MANAGEMENT DIVISION**



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Chapter 1

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Cardinal Engineering, Inc. would like to acknowledge and thank the numerous agencies, individuals and entities who provided input, oversight, and cost data to complete this study. We hope the results of this study help landfill and state agencies to better estimate and utilize fair and uniform cost estimates for closure and post-closure of landfills. Don Barrett, Kelly Dixon, Jon Roberts, and Catherine Sharp of the Oklahoma Department of Environmental Quality; Chris Varga of the Arizona Department of Environmental Quality; Casey Elliott of the Okmulgee Landfill; Ralph Triplett of the Woodward County Landfill; and Jerry Ihler of the City of Lawton provided oversight and guidance to complete this study. Jim Warram provided necessary leadership to successfully complete this study. Cost estimates generated by the Arkansas Department of Environmental Quality, Louisiana Department of Environmental Quality, New Mexico Environment Department, Texas Natural Resource Conservation Commission, Iowa Department of Natural Resources, Kansas Department of Health and Environment, Missouri Department of Natural Resources, Nebraska Department of Environmental Quality, Colorado Department of Health and Environment, Montana Department of Environmental Quality, South Dakota Department of Environment and Natural Resources, Utah Department of Environmental Quality, Wyoming Department of Environmental Quality, Minnesota Pollution Control Agency, Oklahoma Conservation Commission, Oklahoma Corporation Commission, Oklahoma Department of Environmental Quality, Oklahoma Department of Mines, Oklahoma Department of Transportation, Environmental Protection Agency, and R.S. Means Company were examined to complete this study. Twenty-seven businesses associated with drilling companies, environmental labs, publicly owned treatment works, geosynthetic companies, plumbers, and landfills provided cost estimates. The project's primary goals were to develop and document procedures to help landfills and regulatory agencies better estimate and utilize fair and uniform cost estimates for calculating landfill closure and post-closure costs. The cooperation and input from those mentioned above has been crucial in successfully achieving these goals.

LIMITATIONS

Cardinal Engineering has made every effort to assure the information contained in this report is accurate and an accurate estimate of costs which may be expected under the circumstances indicated. However, since actual closure and post-closure costs are determined by competitive bidding and negotiations, the actual closure and post-closure costs for a landfill may vary. This report is property of Cardinal Engineering, Inc. Neither this report nor any part may be reproduced or transmitted in any form or by any means without prior written permission from Cardinal Engineering. Product or corporate names found in this report may be trademarks or registered trademarks, and are used only for identification and explanation, without intent to infringe.

EXECUTIVE SUMMARY

Oklahoma solid waste regulations govern the permitting, construction, operation, and closure of three different types of solid waste landfills; municipal solid waste landfills (MSWLFs), construction and demolition (C&D) landfills, and nonhazardous industrial solid waste (NHISW) landfills. Since 1991, landfills have been required to provide financial assurance for completing closure and post-closure activities. Each facility's financial assurance amount must receive Department of Environmental Quality (DEQ) approval. The underlying motivation for posting financial assurance is the landfill owner may not physically or financially be able to complete closure and post-closure obligations. In this instance, the DEQ becomes financially responsible for all tasks and services associated with closure and post-closure of the landfill. The landfill conditions under which the cost estimate is computed may differ significantly from the conditions anticipated by the owner or operator at the end of the normal landfill life. The current estimates for completing final closure activities and post-closure monitoring of the 64 Oklahoma landfills are over \$100 million. If the DEQ's solid waste financial assurance program inaccurately estimates the necessary monies for closure and post-closure, sufficient funds will not be available and the financial responsibility is transferred to the State of Oklahoma and its citizens. Therefore, the solid waste financial assurance program must accurately identify and define the tasks and services for closure and post-closure activities and present defensible unit costs to ensure sufficient funds are available.

To aid landfill owners and operators in interpreting and applying the regulatory requirements, the DEQ developed a guidance document for calculating final closure and post-closure cost estimates. Recent scrutiny by the regulated community prompted the DEQ to review the guidance document and perform a thorough analysis of financial assurance calculation procedures through commissioning of this project.

The project's objective is to provide a solid waste financial assurance procedure that adequately addresses and documents costs for final closure and post-closure activities necessary to properly close and monitor a landfill. Successfully completing this project will help ensure correct and fair financial obligations are available to perform closure and post-closure requirements without posing a financial burden to the State of Oklahoma nor landfill owner/operators.

Determining legitimate third-party costs is difficult due to the number of cost variables associated with closing a landfill and monitoring during the post-closure period. Closure and post-closure costs for a solid waste landfill can range significantly depending on the landfill type, final cover design, geographical location, and other variables. Evaluating and developing a financial assurance program with justifiable unit costs accounting for these variables must begin with a thorough understanding of the regulations combined with practical experience of performing these tasks and services at actual operating landfills. Through knowledge, research, and input from the regulated community, this report develops a comprehensive list of tasks and services for closure and post-closure activities. The research encompassed surveying agencies in 16 different states performing similar regulatory missions as the DEQ in the central United States region, other Oklahoma state agencies, landfill owner/operators, and service providers. After identifying the closure and post-closure tasks and services, legitimate third-party unit costs were ascertained from researching the regulated community, vendors, service providers, and standard

references. A successful financial assurance program must use unit costs from identifiable resources that are capable of being validated. Recognizing some costs fluctuate with geographical location, a mechanism was developed to adjust for regional variations. Other adjustments account for landfills having designed operational lives measured in decades and regulatory post-closure monitoring requirements ranging from eight to 30 years. Facilities operating over such long periods of time will witness new developments and changes in the regulations that govern their operation. Mechanisms were developed to account for inflation, changing regulatory requirements, changes in applicable tasks or services, and periodic review and re-verification of unit costs. The report presents a subsection for each closure and post-closure task and service unit cost that:

- describes and defines the task and service;
- determines if the task or service is subject to regional variation;
- identifies units of measurement;
- identifies and explains constants and conversion factors;
- explains assumptions;
- presents associated unit cost; and
- and evaluates whether changes in regulatory language is necessary to support including task or service in calculating financial assurance.

The report concludes with a detailed procedure to calculate final closure and post-closure cost estimates for posting financial assurance. The procedure presents brief and concise explanations for each identified task and service along with the associated unit cost. The tasks and services included in this procedure are based on the more complex closure and post-closure requirements for MSWLFs. C&D and NHISW landfills will find each task and service they require is included in this procedure. However, not every task and service included is required for C&D and NHISW landfills. Owners/operators of C&D and NHISW landfills should determine which unit costs are applicable to calculate closure and post-closure cost for their facility. Users of the procedure are able to input site specific information to calculate the necessary financial assurance. The procedure is contained in Chapter 5 of the report and contains sufficient information to stand alone as a guidance document available to owners and operators to calculate the necessary financial assurance amount.

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Chapter 1 - Introduction

1.1 Report Summary

The report is divided into the following five chapters:

- Chapter 1 Introduction
- Chapter 2 State and Federal Solid Waste Financial Assurance Programs
- Chapter 3 Comprehensive List of Tasks and Services
- Chapter 4 Unit Costs
- Chapter 5 Procedure for Calculating Final Closure and Post-Closure Costs

Chapter 1 provides background information on solid waste financial assurance, historical perspective on Oklahoma financial assurance regulations, and discussions on different types of facilities and final cover designs.

Chapter 2 summarizes research of other states' solid waste regulatory agencies' and the United States Environmental Protection Agency's (USEPA's) solid waste financial assurance programs.

Chapter 3 develops comprehensive lists of tasks and services necessary for conducting final closure and post-closure activities at a landfill. This chapter also discusses how tasks and services can be modified due to technical or regulatory changes.

Chapter 4 identifies and documents legitimate third-party unit costs for variable and non-variable tasks and services determined in Chapter 3. Development of unit costs will be completed by research of regulated community, vendors, service providers, and standard references. Mechanisms are presented for adjusting unit costs for inflation, changes in required tasks or services, and periodic review and re-verification.

Chapter 5 presents the procedure for calculating final closure and post-closure cost estimates. The procedure will present brief and concise explanations for each identified task and service along with the associated unit cost. Users will be able to input site specific information to calculate the necessary financial assurance. This chapter contains sufficient information to stand alone as a guidance document available to owners and operators to calculate the necessary financial assurance. A recommendation section will be included that identifies potential regulatory language changes to support the solid waste financial assurance program.

1.2 Objectives

Determining legitimate third-party costs is difficult due to the number of cost variables associated with closing a landfill and monitoring during the post-closure period. Closure and post-closure costs for a solid waste landfill can range significantly, depending on the primary variables identified in [Table 1.1](#).

Table 1.1 Primary Variables Affecting Closure and Post-Closure Costs for Landfills

VARIABLE	RANGE
Landfill Type	MSWLF, Nonhazardous Industrial Solid Waste Landfill, and Construction & Demolition
Final Cover	Clay, Composite, or Permit Specific
Geographical Location	Altus to Oologah Broken Bow to Woodward Elk City to Sallisaw
Developed Disposal Area	5 acres or 150 acres
Condition of Landfill	Well maintained and operated or poorly maintained and operated
Leachate Collection System	Yes or No, if Yes - leachate removal system and leachate treatment/disposal method
Availability of Clay	On-site or Off-site, if Off-site what is hauling distance
Availability of Topsoil	On-site or Off-site, if Off-site what is hauling distance
Availability of Water	On-site or Off-site, if Off-site what is hauling distance

Developing unit costs for different landfill types, final cover designs, geographical locations, and the other variables listed in [Table 1.1](#) presents many obstacles. Obstacles initially identified for the solid waste financial assurance project are presented below.

- Limited examples or information from researching programs in other states;
- Wide range for specific unit costs;
- Regional and facility variations;
- Documentation of actual third-party unit costs
- Documented unit costs becoming obsolete; and
- Lack of supporting regulatory language.

Therefore, the objective is to provide a solid waste financial assurance report that adequately addresses and documents costs of the final closure and post-closure activities necessary to properly close and monitor a landfill. Providing defensible unit costs to the DEQ and owner/operators will help ensure adequate funds are available to conduct final closure and post-closure activities without posing a financial liability to the State of Oklahoma and it's citizens.

1.3 Background and Purpose

Oklahoma Statutes Title 27A, §2-10-701 requires certain disposal sites determine real third-party costs for closure and post-closure care of their facilities. The costs represent what the Oklahoma Department of Environmental Quality (DEQ) would expend if it were to oversee and ensure proper closure and post-closure monitoring of a landfill, presuming the owner was unable to do so. The landfill conditions under which the cost estimate is predicated may differ significantly from the conditions anticipated by the owner or operator at the end of the normal landfill life.

Given the underlying presumption that the owner will not be physically or financially able to complete closure and post-closure obligations, the DEQ becomes financially responsible for all tasks and services associated with closure and post-closure of the landfill. Required closure and post-closure tasks and services are derived from applicable statutes and regulations. Municipal solid waste landfills (MSWLF) must estimate costs to complete regulatory requirements in Oklahoma Administrative Code (OAC) 252:510. Nonhazardous industrial solid waste landfills (NHISW) and construction and demolition landfills (C&D) must estimate costs to complete regulatory requirements in OAC 252:520.

The current estimates for completing final closure activities and post-closure monitoring of all the landfills in Oklahoma are over \$100 million. A solid waste financial assurance program that accurately identifies and defines the tasks and services for closure and post-closure activities and presents defensible unit costs is important in ensuring correct financial assurances are available. If the DEQ's solid waste financial assurance program inaccurately estimates the necessary monies for closure and post-closure sufficient funds will not be available and the financial responsibility is transferred to the State of Oklahoma and its citizens.

The purpose of this project is to develop correct unit costs for calculating financial assurance, assist the DEQ in implementing the financial assurance regulation and help landfill owners and operators prepare cost estimates that satisfy these regulations. In particular, this project:

- identifies and describes the tasks and services involved in proper closure and post-closure care of solid waste landfills in Oklahoma;
- identifies and validates third-party unit costs for variable and non-variable tasks and services;
- describes and defines the procedure for calculating financial assurance;
- provides procedure for updating or adjusting costs;
- reviews applicable regulations and makes recommendations for language supporting the financial assurance requirement; and
- provides a guidance document to assist the DEQ and regulated community in calculating closure and post-closure cost estimates.

Successfully completing this project will help ensure correct and fair unit costs are available to complete closure and post-closure requirements while not posing a financial burden to the State of Oklahoma nor landfill owner/operators.

1.4 Historical Perspective

The Oklahoma Solid Waste Management Act (SWMA) was first enacted in March 17, 1970. The Solid Waste Management Act's purpose is to regulate the collection, transportation, processing, and disposal of solid waste in Oklahoma. Implementation of the SWMA is accomplished through solid waste regulations. The history of Oklahoma solid waste regulations is outlined in [Table 1.2](#).

Table 1.2 History of Oklahoma Solid Waste Regulations

Date	Title	Citation
July 1, 1969	Sanitary Landfill Operation	O.D.H. Engineering Bulletin No. 0523
June 13, 1971	The Oklahoma Solid Waste Management Act of 1970 with Rules and Regulations	O.D.H. Engineering Bulletin No. 0524
July 1, 1973	The Oklahoma Solid Waste Management Act of 1970 with Rules and Regulations	O.D.H. Bulletin No. 0524
March 27, 1982	Solid Waste Management Rules and Regulations Including Sludge Management Rules and Regulations	OSDH Bulletin No. 0524
July 25, 1985	Regulations Governing Solid Waste and Sludge Management	OSDH Bulletin No. 0524
April 2, 1987	Regulations Governing Solid Waste and Sludge Management	OSDH Bulletin No. 0524
October 24, 1991	Regulations Governing Solid Waste and Sludge Management	OSDH Bulletin No. 0524
December 31, 1991	Solid Waste and Sludge Management	OAC 310:360
October 9, 1993	Municipal Solid Waste Landfills	OAC 252:510
May 26, 1994	Solid Waste Management	OAC 252:500
November 4, 1995	Solid Waste Management	OAC 252:520
Pending	Solid Waste Management	OAC 252:530

A review of solid waste regulations listed in the above history reveals financial assurance for landfills was not required until the October 24, 1991 amendments to OSDH Bulletin No. 0524, Regulations Governing Solid Waste and Sludge Management. Subsequent regulations ending with the currently applicable regulations, OAC 252:510 and OAC 252:520, have all retained the financial assurance requirement.

Since landfill owner/operators were required to provide financial assurance in 1991, the regulatory agency developed guidance documents to assist owner/operators with calculating closure and post-closure costs. Based on the closure and post-closure requirements in OAC 310:360, the first financial assurance guidance document was developed and dated July 8, 1992 (see Attachment 1a). The purpose was to illustrate how landfills should calculate cost estimates for final closure and post-closure activities. The guidance document provided brief descriptions of each task and an associated unit cost. The guidance document was reviewed, updated, and reissued on December 8, 1994 (see Attachment 1b). The following tables illustrate the changes in tasks/services and unit costs between the two guidance documents for closure and post-closure, respectively.

Table 1.3 Comparison of Final Closure Task/Services and Unit Costs from Previous Agency Guidance Documents

Final Closure Task/Service		Unit Costs	
		July 8, 1992	December 8, 1994
1	Control Grading	\$500.00 per acre	\$500.00 per acre
2	Clay Cover	\$3.00 per cubic yard	\$3.00 per cubic yard
3	Top Soil	\$6.00 per cubic yard	\$6.00 per cubic yard
4	Vegetation	\$1,500.00 per acre	\$500.00 per acre
5	Temporary Building	\$3,500.00 lump sum	\$3,500.00 lump sum
6	Equipment	\$2,000.00 lump sum	\$2,000.00 lump sum
7	Surface Drainage Ditches	\$3.50 per linear foot	\$3.50 per linear foot
8	Replace Defective Groundwater Monitoring Wells	\$2,500.00 each	\$2,500.00 each
9	Plug Defective Groundwater Monitoring Wells	\$1,000.00 each	\$1,000.00 each
10	Soil Sampling	No unit cost provided	Deleted†
11	Air Sampling	No unit cost provided	Deleted†
12	Gas Sampling	\$35.00 per probe	Deleted‡
13	Groundwater Monitoring Well Sampling and Analysis	\$2,000.00 per well	Deleted‡
14	Surface Water Sampling and Analysis	\$85.00 per sample	Deleted‡
15	Collection Costs	\$500.00 per day-2 days	Deleted‡
16	Final Closure Survey	\$75.00 per hour-2 man crew for 24 hrs	\$4,000.00 lump sum
17	Drafting	\$45.00 per hour-24 hrs	Included in Item 16
18	Leachate Collection System Installation and/or Sedimentation and Drainage Control	\$0.40 per square foot	Deleted‡
19	Leachate Treatment	\$0.15 per gallon	Deleted‡
20	Administrative Costs	20%	20%
21	Contingency Costs	10%	10%

† Identified as a contingency item with an unassigned unit cost and therefore was deleted from the guidance document.

‡ Identified as an item already addressed in calculating post-closure costs and therefore was deleted from the guidance document.

Table 1.4 Comparison of Post-Closure Task/Services and Unit Costs from Previous Agency Guidance Documents

Post-Closure Task/Service		Unit Costs	
		July 8, 1992	December 8, 1994
1	Routine Inspection	\$500.00 per inspection	\$500.00 per inspection
2	Maintenance of On-site Improvements	\$2,000.00 per acre	\$2,000.00 per acre
3	Final Plugging of Groundwater Monitoring Wells	\$1,000.00 each	\$1,000.00 each
4	Maintaining Vegetation	\$250 per acre	\$250 per acre
5	Repairing Final Cover	\$6.00 per cubic yard	Included in Item 2
6	Maintaining Surface Drainage Structures	\$3.50 linear foot	\$3.50 linear foot
7	Replace Defective Groundwater Monitoring Wells	\$2,500.00 per well	\$2,500.00 per well
8	Plug Defective Groundwater Monitoring Wells	\$1,000 per well	\$1,000 per well
9	Air Sampling	No unit cost provided	Deleted†
10	Soil Sampling	No unit cost provided	Deleted†
11	Gas Sampling	\$35.00 per probe	\$35.00 per probe
12	Groundwater Monitoring Well Sampling and Analysis	\$2,000.00 per well	\$1,000.00 per well
13	Surface Water Sampling and Analysis	\$85.00 per sample	\$100.00 per sample
14	Collection Costs	\$500 per day - 2 days	Included in Items 11, 12, and 13
15	Leachate System Maintenance	Not identified*	\$0.25 per linear foot
16	Leachate Management	\$0.15 per gallon	\$0.15 per gallon
17	Administrative Costs	10%	10%
18	Contingency Costs	10%	10%

† Identified as a contingency item with an unassigned unit cost and therefore was deleted from the guidance document.

* Item was not identified as a task or service.

Comparing the tasks and services included in the 1992 and 1994 documents demonstrates how the DEQ worked at simplifying closure and post-closure activities. One area of simplification was the deletion of post-closure monitoring items included in both the closure and post-closure lists and contingency items such as soil and air testing. This simplification benefited landfill owner/operators by removing redundant and ambiguous tasks or services. Comparing the unit costs between the two documents shows the DEQ lowered several different unit costs. Although preservation of supporting documentation is limited, the revised unit costs were based on internal research conducted by the DEQ to determine realistic and current third-party costs.

As discussed above, Oklahoma landfills were first required to calculate cost estimates for financial assurance in 1991. To aid landfill owners and operators in interpreting and applying the regulatory requirements, guidance documents were developed for calculating final closure and post-closure cost estimates. These guidance documents have become institutional by both the regulated community and regulators. However, recent scrutiny by the regulated community has prompted the DEQ to perform a more broad and thorough analysis of calculating financial assurance. The first step in evaluating or developing a financial assurance program with defensible unit costs must be a thorough understanding of the regulations combined with the practical experience of performing these tasks and services at actual operating landfills. Therefore, the unit costs for a comprehensive list of tasks and services must consider the different types of facilities and cover designs, and must allow input from the regulated community.

1.5 Facility Types

Oklahoma Administrative Code (OAC) 252:510 and OAC 252:520 govern the permitting, construction, operation, and closure of three different types of solid waste landfills. Municipal solid waste landfills (MSWLFs) are regulated under OAC 252:510. Construction & demolition (C&D) landfills and nonhazardous industrial solid waste (NHISW) landfills are regulated under OAC 252:520. All regulated solid waste landfills, processing facilities except transfer stations, and composting facilities that principally manage municipal solid waste must provide financial assurance. The June 2000 DEQ solid waste inventory of operating facilities lists 40 MSWLFs, 18 NHISW landfills, and four C&D landfills. Comparing the July 1999 DEQ solid waste financial assurance inventory list to the operating facility list finds 41 MSWLFs, 18 NHISW landfills, and four C&D landfills have provided financial assurance.

As of June 2000, the DEQ database listed 50 processing facilities, of which 38 are transfer stations. Processing facilities include municipal solid waste incinerator, biomedical autoclave, tire recycling facility, composting facility, and recycling facility. The variation in different types of processing facilities and employed processes makes establishing a list of tasks and services for a set financial assurance program infinite. Therefore, this report does not address financial assurance for processing facilities. However, a specific unit cost described herein may be applicable for a particular facility design or operation. In those instances, the financial assurance procedure described in this report may be used.

OAC 252:510-19 and OAC 252:520-23 describe closure and post-closure tasks for MSWLFs and NHISW landfills and C&D landfills, respectively. [Table 1.5](#) compares current closure tasks for MSWLFs, NHISW landfills, and C&D landfills. [Table 1.6](#) compares current post-closure tasks for MSWLFs, NHISW landfills, and C&D landfills. Both [table 1.5](#) and [1.6](#) include relevant regulatory citations.

Table 1.5 Comparison of Current Closure Tasks for Different Types of Landfills with Regulatory Citation

TASK		MSWLF OAC 252:510- 19	NHISW OAC 252:520- 23	C&D OAC 252:520-23
1	Amending Closure Plan	2(b)	7(3)(c)	7(3)(c)
2	A description of the final cover and the methods and procedures to be used to install it	3(1)	ns	ns
3	An estimate of the largest area of the landfill ever requiring a final cover during the active life	3(2)	ns	ns
4	An estimate of the maximum inventory of wastes ever on-site over the active life of the site	3(3)	ns	ns
5	A schedule for completing all activities	3(4)	ns	ns
6	The cost of contracting for technical and professional services	3(5)	8(b)(1)	8(b)(1)
7	The cost of providing administrative overhead for oversight and record keeping (12)	3(6)	8(b)(2)	8(b)(2)
8	A plan for identifying temporary buildings and other improvements not designated as permanent in the permit application and removing each from the site (5)	3(7)	8(b)(3)	8(b)(3)
9	A plan for identifying all equipment to be removed from the site after closure has been certified as complete (6)	3(8)	8(b)(4)	8(b)(4)
10	A plan for reworking or replacing any defective groundwater monitor wells and other defective monitoring equipment, monitoring ground and surface water, and collecting and analyzing soil and water samples (8 & 9)	3(9)	8(b)(5)	8(b)(5)
11	A procedure for disposing of final wastes and affected soil	3(10)	8(c)(2)	8(c)(2)
12	A plan for maintaining site security and access control	3(11)	8(b)(6)	8(b)(6)
13	A plan for redesigning final closure in accordance with existing site conditions and applicable regulations	3(12)	8(c)(1)	8(c)(1)
14	A description of the final cover construction, including a calculation of the amount of material needed for each phase of closure, the identification of the soil type and location to be used for the final cover, analysis of the proposed cover material's permeability, and the schedule and method of placement of the final cover	3(13)	8(c)(3)	8(c)(3)
15	A method for obtaining, hauling and placing soil for final cover (1, 2, & 3)	3(14)	8(c)(4)	8(c)(4)
16	A schedule for grading, planting, fertilizing and establishing vegetation on disturbed areas and final cover (4)	3(15)	8(c)(5)	8(c)(5)

TASK		MSWLF OAC 252:510- 19	NHISW OAC 252:520- 23	C&D OAC 252:520-23
17	A plan for constructing additional or reworking existing surface drainage and erosion control measures as necessary (7)	3(16)	8(c)(6)	8(c)(6)
18	A plan for remedying all former improper closure at the site	3(17)	8(c)(7)	8(c)(7)
19	A procedure for collecting, treating and properly disposing of leachate	3(18)	8(c)(8)	8(c)(8)
20	A plan for preparing final closure certification and other final closure reports and notices required	3(19)	8(b)(7)	8(b)(7)
21	A proposal for performing any other tasks necessary to achieve complete and final closure of the site (14)	3(20)	8(b)(8)	8(b)(8)
22	Conducting the final closure survey (10)	ns	8(b)(9)	8(b)(9)

NOTE: Tasks in bold are included in the December 8, 1994 Closure and Post-Closure Guidance Document with respective item number.

ns - Not specifically listed in the regulations

Table 1.6 Comparison of Current Post-Closure Tasks for Different Types of Landfills with Regulatory Citation

TASK		MSWLF OAC 252:510-19	NHISW OAC 252:520-23	C&D OAC 252:520-23
1	Amending Post-Closure Plan	2(b)	7(3)(c)	7(3)(c)
2	A plan to comply with all applicable technical requirements	ns	14(e)(1)	14(e)(1)
3	The cost of contracting for technical and professional services	6(1)	14(e)(2)	14(e)(2)
4	The cost of providing administrative overhead for oversight and recordkeeping (13)	6(2)	14(e)(12)	14(e)(12)
5	The schedule for inspecting site routinely (1)	6(3)	14(e)(3)	14(e)(3)
6	The procedures for repairing and maintaining all on-site permanent improvements and equipment (2)	6(4)	14(e)(5)	14(e)(5)
7	The procedures for repairing and maintaining surface drainage structures	6(5)	14(e)(7)	14(e)(7)
8	The procedures for reworking or replacing any defective required groundwater monitor wells and other defective monitoring equipment and installing new wells and equipment as required (4, 5, & 6)	6(6)	14(e)(8)	14(e)(8)
9	The protocol for collecting and analyzing soil and water samples as required (7, 8, & 9)	6(7)	14(e)(9)	14(e)(9)

TASK		MSWLF OAC 252:510-19	NHISW OAC 252:520-23	C&D OAC 252:520-23
10	The methods to be used to properly collect, treat and dispose of leachate (10 & 11)	6(8)	14(e)(4)	14(e)(4)
11	The methods for maintaining site security and access control	6(9)	17	17
12	The methods for maintaining vegetation and other erosion controls in permitted areas	6(10)	14(e)(6)	14(e)(6)
13	The procedures to be used to repair erosion and maintain final cover (3)	6(11)	14(e)(10)	14(e)(10)
14	The schedule for mowing and fertilizing final cover vegetation and other areas as needed (3)	6(12)	14(e)(11)	14(e)(11)
15	The outline for preparing annual maintenance and monitoring post-closure report	6(13)	14(e)(13)	14(e)(13)
16	The requirements for preparing post-closure certification	6(14)	14(e)(14)	14(e)(14)
17	A description of any other tasks necessary to accomplish adequate post-closure care (15)	6(15)	14(e)(15)	14(e)(15)

NOTE: Tasks in bold are included in the December 8, 1994 Closure and Post-Closure Guidance Document with respective item number.

ns - Not specifically listed in the regulations

Comparing closure and post-closure requirements for MSWLFs, NHISW landfills, and C&D landfills listed in [Table 1.5](#) and [Table 1.6](#) illustrates different landfills must complete very similar activities.

1.6 Landfill Final Cap Designs

Landfills in Oklahoma must install a final cap after completing filling operations. The final cap designs differ depending on the type of landfill. Municipal solid waste landfills in Oklahoma can be subdivided into two landfilling categories: (1) Placing waste on soil liner or (2) Placing waste on composite liner. OAC 252:510-19-4 specifies final cover systems have permeabilities less than or equal to the permeability of any bottom liner system, or natural subsoils present, or a permeability no greater than 1×10^{-5} cm/sec, whichever is less. Therefore, Category 1 MSWLFs are only required to install a soil cap and Category 2 MSWLFs must install a composite cap. Regulations allow alternative cover designs that technically demonstrate equivalent performance.

Cap design for NHISW landfills must comply with OAC 252:520-23, which allows flexibility for different cap types appropriate for the specific landfill. These cap designs range from placing topsoil and vegetation to using a composite cap similar to that required by MSWLFs. OAC 252:520-9-11(7) specifies C&D landfills construct soil caps. [Table 1.7](#) illustrates the different landfills and cap designs.

Table 1.7 Different Cap Designs for Different Landfills

LANDFILL TYPE	CAP DESIGN
Category 1 MSWLF (soil liner)	Clay cap (3 feet of clay)
Category 2 MSWLF (composite liner)	Composite cap (2 feet of clay, flexible membrane liner, and 1 foot soil)
NHISW landfill	Ranges between topsoil and composite cap with different thicknesses
C&D landfill	Clay cap (3 feet of clay)

Category 2 MSWLFs cap design requirements are the most technically complex. Defining tasks and services for a MSWLF and determining defensible unit costs produces the most comprehensive financial assurance procedure for the three different landfills. NHISW landfill and C&D landfill financial assurance is calculated from including only the applicable tasks and services with unit costs presented for MSWLFs.