RCRA Training Module

Solid Waste and Emergency Response
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Introduction to

Municipal Solid Waste Disposal Facility Criteria

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SUBTITLE D: MUNICIPAL SOLID WASTE DISPOSAL FACILITY CRITERIA

CONTENTS

1. INTRODUCTION

This module provides a summary of the regulatory criteria for municipal solid waste landfills (MSWLFs). In general, a MSWLF is a landfill that accepts garbage, or solid waste, from households. Wastes that are typically landfilled include bottles, cans, disposable diapers, uneaten food, scraps of wood and metal, newspapers, paper and plastic packaging, and old appliances, as well as some industrial and commercial nonhazardous wastes and construction and demolition (C&D) wastes. MSWLFs may also accept household hazardous wastes and conditionally exempt small quantity generator (CESQG) wastes that are not regulated as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

The MSWLF regulations promulgated on October 9, 1991 address location restrictions, facility design and operation standards, groundwater monitoring and corrective action measures, closure and post-closure care, and financial responsibility requirements (56 FR 50978). Implementation of these regulations, by states with approved programs, will reduce the environmental impact of existing and future MSWLFs.

When you have completed this module, you will be able to summarize the standards for MSWLFs and list the relevant statutory and regulatory citations. Specifically, you will be able to:

- provide the statutory authority under RCRA and the Clean Water Act (CWA) directing EPA to develop the MSWLF criteria in 40 CFR Part 258
- provide the Part 258 effective date and the compliance dates for providing demonstrations to satisfy individual regulatory requirements
- identify the types of facilities that qualify for the small landfill exemption
- explain the requirements of each subpart in Part 258 as they apply to states with EPA-approved MSWLF permit programs and states without approved permit programs
- compare the MSWLF environmental performance standards described in Part 258 to the corresponding requirements for hazardous waste management facilities in Part 264, which are generally more stringent.

Use this list of objectives to check your knowledge of this topic after you complete the training session.

2. REGULATORY SUMMARY

RCRA Subtitle D addresses solid waste management and was designed to assist waste management officials in developing and encouraging environmentally sound methods for the disposal of "nonhazardous" solid waste (RCRA §4001). Promulgated under the authority of Subtitle D, the MSWLF regulations in Part 258 establish a framework at the federal level for planning and implementing municipal solid waste landfill programs at the state and local levels. This framework sets minimum standards for protecting human health and the environment, while allowing states to develop more flexible MSWLF criteria.

The Part 258 standards are intended to provide the means to mitigate or expeditiously remediate potential adverse environmental impacts resulting from municipal landfills. However, other Subtitle D regulations existed prior to the revised MSWLF standards discussed in this module. RCRA §4004(a) authorized the promulgation of Part 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices (44 FR 53438; September 13, 1979). Part 257 established regulatory standards to satisfy the minimum national performance criteria for sanitary landfills. Since Part 258 became effective on October 9, 1993, Part 257 governs only those solid waste disposal facilities and practices that do not meet the definition of a MSWLF. Such facilities include waste piles, industrial nonhazardous waste landfills, surface impoundments, and land application units. EPA modified the Part 257 criteria on July 1, 1996, to address the fact that these non-municipal non-hazardous wastes landfills may receive CESQG hazardous waste (61 FR 34252). EPA revised Part 257 to further clarify that construction and demolition landfills may receive residential lead-based paint waste as Solid Waste Disposal Facilities without having to comply with the Part 258 standards for MSWLFs as long as all conditions are met (68 FR 36487; June 18, 2003). See the training module entitled Solid Waste Programs for further information.

Section 4010 of the Hazardous and Solid Waste Amendments of 1984 (HSWA) authorized EPA to revise its existing sanitary landfill criteria to establish specific regulations for facilities that receive household hazardous waste or CESQG hazardous waste. In response to §4010, EPA promulgated regulations on October 9, 1991 and added Part 258 requirements to address all aspects of MSWLF design and management (56 FR 50978). EPA designed the Part 258 requirements to be self-implementing, meaning that in unapproved states the owner and operator of a MSWLF can meet these standards without the oversight of the state agency. These revised, performance-based standards enable implementing agencies to strike a balance between environmental protection, cost, and site-specific factors. Integral to this regulatory approach is the significant flexibility granted to approved states for developing site-specific controls.

Since municipal solid waste management is more amenable to State and local, rather than federal, regulatory oversight, EPA intends for states to take the lead role in implementing the MSWLF regulations. EPA's goal is for states to receive approval of their MSWLF programs. States with approved programs are given flexibility to consider site-specific conditions regarding MSWLF design and other requirements in Part 258. If a state does not have an approved program, there is no mechanism by which a regulatory agency can exercise flexibility in implementing the Part 258 requirements.

This flexibility is a factor that motivates states to submit applications for approval of their programs as quickly as possible. EPA promulgated the State Implementation Rule (SIR) to encourage states to receive program approval and take advantage of this flexibility. SIR, finalized on October 23, 1998, provides a flexible framework for modifications of approved programs, establishes procedures for withdrawals of approvals, and confirms the process for future program approvals (63 FR 57026).

Throughout this module, the text will refer to the titles "State Director," meaning the chief administrative officer responsible for implementing the state municipal solid waste permit program, and "Director of an approved state," meaning the chief administrative officer responsible for implementing the state municipal solid waste permit program that is approved by EPA under §§2002 and 4005 of RCRA.

2.1 SUBPART A: GENERAL REQUIREMENTS

The Part 258 standards establish minimum national criteria under RCRA for all MSWLFs to ensure protection of human health and the environment. A MSWLF unit is a discrete area of land or an excavation that (1) receives household waste and (2) may not otherwise be defined as a land application unit, surface impoundment, injection well, or waste pile. A MSWLF unit may also receive other types of RCRA Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, CESQG waste, and industrial solid waste. Such a landfill may be publicly or privately owned.

A MSWLF unit may be a new MSWLF unit, an existing MSWLF unit, or a lateral expansion. Any MSWLF unit that has not received waste prior to October 9, 1993, is a new MSWLF unit. An existing MSWLF unit means any MSWLF unit that was receiving solid waste as of the effective date, October 9, 1993, of the final rule (56 FR 50978; October 9, 1991). A landfill cell could constitute an individual MSWLF unit. A lateral expansion is a horizontal expansion of the waste boundaries of an existing MSWLF unit.

Units accepting municipal solid waste that do not meet the Part 258 criteria are classified as open dumps, and are prohibited by RCRA §4005(a). Accordingly, such units must be upgraded or closed.

EFFECTIVE DATES

Part 258 applies to owners and operators of new and existing MSWLFs and lateral expansions that receive waste after October 9, 1991. Owners and operators of units that ceased receiving waste between October 9, 1991, and October 9, 1993, only needed to comply with the final cover requirements in §258.60(a) (§258.1(d)). Compliance for these landfills entailed placing a final cover on the unit by October 9, 1994. Owners and operators who failed to comply with these final cover requirements by October 9, 1994, like those whose units continued to receive waste after October 9, 1993, needed to comply with all applicable Part 258 standards.

On October 1, 1993, EPA issued a rule delaying the effective date for certain existing smaller MSWLFs to April 9, 1994 (58 FR 51536). To qualify for the extension, the MSWLF units had

to accept 100 tons per day or less during a representative period prior to October 9, 1993, not be on the Superfund National Priorities List (NPL), and be located in a state that had submitted an application for state program approval by October 9, 1993; or be located on Indian lands or Indian country. MSWLFs qualifying for the extension were still required to install a final cover by October 9, 1994.

The effective date may also have been extended to April 9, 1994, for existing MSWLFs, regardless of size, in Midwest flood regions if a landfill owner and operator's state determined that an extension was needed to manage flood-related waste from federally designated disaster areas during the summer of 1993. These states were allowed six additional months beyond April 9, 1994, to comply with the federal regulations. The nine states within federal disaster areas were Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. Compliance dates for meeting individual regulatory requirements are listed in Figure 1.

SMALL LANDFILL EXEMPTION

When the landfill criteria were developed in the late 1980s, EPA determined that nearly half of the MSWLFs in the United States were small facilities serving communities of approximately 10,000 people or less (57 FR 50989; October 9, 1991). Because of the financial impact of the regulations on these facilities, EPA included in the final 1991 criteria an exemption for certain small MSWLFs from the requirements in Subpart D (design criteria) and Subpart E (groundwater monitoring) (§258.1(f)(1)). In 1993, EPA was subsequently sued and required to remove the groundwater monitoring exemption. In March 1996, the Land Disposal Program Flexibility Act (LDPFA) of 1996 was signed into law, reinstating the groundwater monitoring exemption for qualifying small landfills. This exemption was codified on September 25, 1996 (61 FR 50410). To qualify for this exemption, a unit must receive less than 20 tons of municipal solid waste daily based on an annual average, and must serve either:

- a community that experiences an annual interruption of at least 3 consecutive months of surface transportation that prevents access to a regional waste management facility; or

- a community that has no practical waste management alternatives, and the landfill is an area that annually receives less than or equal to 25 inches of precipitation.

In addition, there must be no evidence of existing groundwater contamination from the unit for the small landfill exemption to apply. If evidence of groundwater contamination from an exempted small landfill is discovered, the owner and operator must notify the State Director and thereafter fully comply with Subparts D and E (§258.1(f)(3)). MSWLF units meeting the small landfill exemption in §258.1(f) are exempt from all applicable regulations until October 9, 1997.

RESEARCH, DEVELOPMENT, AND DEMONSTRATION PERMITS

To promote innovative technologies, EPA published a final rule on March 22, 2004 (69 FR 13242), to revise the criteria for MSWLFs to allow states to issue research, development, and demonstration (RD&D) permits to new and existing MSWLF units and lateral expansions. The Director of an approved state may provide owners and operations variances from certain

MSWLF criteria provided that compliance with the RD&D permit will not increase risk to human health and the environment. The specific criteria that are eligible for the variances are the run-on control systems in §258.26(a)(1), the liquid restrictions in §258.28(a), and the final cover requirement in §258.60(a). No other variances from the criteria, unless already provided in the existing regulations, are allowed under the RD&D permit.

Figure 1

SUMMARY OF CHANGES TO THE EFFECTIVE DATE OF THE MSWLF CRITERIA

	MSWLF units accepting greater than 100 TPD	**MSWLF units accepting 100 TPD or less; not on the NPL; and located in a state that has submitted an application for approval by 10/9/93, or on Indian lands or Indian country**	**MSWLF units that meet the small landfill exemption in 40 CFR §258.1(f)**	**MSWLF units receiving flood-related waste**
General effective date[1,2,3] ***This is the effective date for location, operation, design, and closure/post-closure standards.***	October 9, 1993	April 9, 1994	October 9, 1997; exempt from design requirements	Up to October 9, 1994, as determined by state
Date by which unit must install final cover if it ceases receipt of waste by the general effective date[2,3]	October 9, 1994	October 9, 1994	October 9, 1998	Within one year of date determined by state; no later than October 9, 1995
Effective date of groundwater monitoring and corrective action provisions[2,3]	Prior to receipt of waste for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions	October 9, 1993 for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions	Exempt from the groundwater monitoring requirements.[5]	October 9, 1993 for new units; October 9, 1994 through October 9, 1996 for existing units and lateral expansions
Effective date of financial assurance requirements[3,4]	April 9, 1997	April 9, 1997	October 9, 1997	April 9, 1997

[1] If a MSWLF unit receives waste after this date, the unit must comply with all of Part 258.

[2] See the final rule and preamble published on October 1, 1993 (58 FR 51536) for a full discussion of all changes and related conditions.

[3] See the final rule and preamble published on October 6, 1995 (60 FR 52337) for a full discussion of all changes and related conditions.

[4] See the final rule and preamble published on April 7, 1995 (60 FR 17649) for a discussion of this delay.

[5] See the final rule published on September 25, 1996 (61 FR 50410).

2.2 SUBPART B: LOCATION RESTRICTIONS

The regulations establish special siting restrictions and performance standards for six types of MSWLF site locations: airports, 100-year floodplains, wetlands, fault areas, seismic impact zones, and unstable areas (Part 258, Subpart B). These six types of locations are sensitive areas that warrant additional regulatory controls. While all six location restrictions apply to new and laterally expanding MSWLF units, existing units are subject only to airport safety, floodplain, and unstable area controls.

Unless the owner and operator of an existing MSWLF unit can make all applicable demonstrations required for airport controls (§258.10(a)), floodplains (§258.11(a)), and unstable areas (§258.15(a)), the unit must close by October 9, 1996, in accordance with §258.60. The owner and operator must also conduct post-closure activities in accordance with §258.61, as required by §258.16. Approved states may delay the October 1996 closure date by up to two years.

Because these landfill siting regulations involve substantial geological investigation, certain terms used in the regulations are unusually technical. Refer to Part 258, Subpart B, for definitions of specific terms.

AIRPORT SAFETY CONTROLS

Landfills can attract birds seeking food or nesting sites; therefore, landfills that are located near an airport may pose a risk of collisions between birds and aircraft. The airport safety restrictions in §258.10 define a danger zone in which special care must be taken to ensure that the likelihood of collisions between birds and aircraft is reduced (56 FR 50978, 51043; October 9, 1991). These provisions apply to new MSWLFs, existing MSWLFs, and lateral expansions located within 10,000 feet of any airport runway used by turbojet aircraft, or within 5,000 feet of any runway end used by piston-type aircraft only. The owner and operator of any unit located within these areas must demonstrate that the management practices of the landfill will minimize the incidents of bird hazards for aircraft.

Provided the owner and operator can make this demonstration, the airport safety criteria do not prohibit the disposal of solid waste within the specified distances. Likewise, the airport safety restrictions do not impact the location of airports or airport runways. In accordance with Federal Aviation Administration (FAA) Order 5200.5A, however, municipal landfills and lateral expansions proposed within a five-mile radius of any airport runway end used by turbojet or piston-type aircraft must notify the affected airport and the FAA in writing of such a proposal (§258.10(b)).

The Aviation Investment and Reform Act for the 21st Century (P.L. 106-181), which includes provisions that amend the MSWLF location criteria, was signed into law on April 5, 2000. The amendments come after Congress found that collisions between aircraft and birds have resulted in fatal accidents and pose special dangers to smaller aircraft. Since landfills have an inherent nature to attract birds, the law prohibits the location of new MSWLFs within six miles of airports served by general aviation aircraft and regularly scheduled flights of aircraft designed for 60

passengers or less. This restriction does not apply to existing landfills or expansions of existing landfills.

EPA published a direct final rule on July 11, 2002 (67 FR 45915), to amend the MSWLF location restriction criteria to incorporate the language of Aviation Investment and Reform Act. However, EPA subsequently withdrew this rule on October 8, 2002 (67 FR 62647), after receiving adverse comments. Finally, an informative note was added to §258.10 on October 15, 2003 (68 FR 59335), to reference the FAA guidance governing this restriction.

FLOODPLAIN CONTROLS

Floodplain regulations establish guidelines that must be followed when a new or existing MSWLF or a lateral expansion is located in a 100-year floodplain. A unit subject to these provisions must be designed and operated to minimize its effect on both the 100-year flood flow and the temporary water storage capacity of the floodplain. The unit's owner and operator must provide evidence that the landfill will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste.

WETLANDS CONTROLS

Swamps, bogs, marshes, and other wetlands are unique, critical ecosystems that serve an important role in flood control, help filter wastes from water, provide an important breeding ground for fish and wildlife, and constitute an important recreational resource. EPA has placed a high priority on wetlands protection, but believes an outright ban of new MSWLFs or lateral expansions in wetlands could severely restrict the sites available for new or expanding landfills. Thus, the Agency developed guidelines for the limited siting of MSWLFs in wetlands.

New units or lateral expansions are banned from wetlands unless the owner and operator make the following demonstrations to the Director of an approved state:

- rebut the presumption that a practicable alternative site is available
- show that landfill construction and operation will not violate certain state and federal standards designed to protect water quality and wildlife
- demonstrate that the MSWLF unit will not cause or contribute to significant degradation of wetlands
- demonstrate that steps were taken to achieve no net loss of wetlands.

Because these demonstrations must satisfy the Director of an approved state, §258.12(a) effectively bans the siting of new MSWLF units and lateral expansions in wetlands in unapproved states.

The Agency intends to keep these wetlands location restrictions consistent with all CWA regulatory modifications. As §404 of the CWA evolves in accordance with the wetlands

protection program, EPA will modify relevant portions of §258.12 accordingly (56 FR 51045; October 9, 1991).

FAULT AREA CONTROLS

Fault area restrictions ban the siting of new MSWLFs and lateral expansions within 200 feet of a fault that has experienced displacement in Holocene time (i.e., the past 11,000 years). This restriction reflects the Agency's belief that, in general, a 200-foot buffer zone is adequate to protect engineered structures, such as a new MSWLF, from seismic damage (56 FR 51046; October 9, 1991). In a state with an approved permitting program, however, the owner and operator may demonstrate that a setback distance less than 200 feet will prevent damage to the structural integrity of the unit and will be protective of human health and the environment.

SEISMIC IMPACT ZONES

In unapproved states, new MSWLFs and lateral expansions cannot be sited in a seismic impact zone, as defined in §258.14(b)(1). In a state with an approved permitting program, however, a MSWLF may be located in a seismic impact zone if the owner and operator can prove that all containment structures, liners, leachate collection systems, and surface water control systems are designed to resist the anticipated movement in geologic features at the site.

UNSTABLE AREA CONTROLS

Any location susceptible to events or forces capable of impairing a landfill's structural integrity is classified as an unstable area. Owners and operators must assess on-site and local factors, including soil conditions and geologic features, to determine whether an area is unstable. Unstable areas can include poor foundation conditions, areas susceptible to mass movement, and karst topography (§258.15(b)(3), (4), and (5)). New and existing MSWLFs and lateral expansions must not be located in an unstable area unless the owner and operator can demonstrate that engineering measures in the unit's design are sufficient to ensure that the integrity of structural components (e.g., composite liner and final cover) will not be disrupted (§258.15(a)).

2.3 SUBPART C: OPERATING CRITERIA

Operating criteria are controls for the day-to-day management of a MSWLF. For example, owners and operators must have a program in place to exclude regulated quantities of hazardous waste and polychlorinated biphenyl (PCB) wastes. Additional requirements include daily cover material, controlling disease vector populations (such as rodents and mosquitoes), restricting public access, and maintaining appropriate records. The operating criteria are summarized below.

PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE

All MSWLF unit owners and operators must institute a program to detect and prevent the disposal of regulated quantities of PCB wastes and RCRA hazardous wastes (except from CESQGs) (§258.20(a)). Facility personnel must be trained to identify regulated hazardous waste and PCBs and the owner and operator must either conduct random inspections of wastes brought to the facility, or take other steps to ensure that incoming loads do not contain regulated hazardous wastes or PCBs (e.g., arranging pre-acceptance agreements with haulers).

Upon detection of hazardous or PCB wastes, the owner and operator must notify the State Director or Regional Administrator. Even if the owner and operator receive the waste accidentally, they are responsible for ensuring that regulated hazardous waste is treated, stored, or disposed of in accordance with all applicable RCRA Subtitle C and state requirements (57 FR 51050; October 9, 1991).

COVER MATERIAL REQUIREMENTS

Exposed waste at landfills contributes to a range of health, safety, and aesthetic problems, such as disease vectors, fires, odors, blowing litter, and waste scavenging. To control these problems, §258.21 requires that at the end of each operating day, a cover of at least six inches of soil be placed over exposed waste in a MSWLF (§258.21). In states with approved permitting programs, the State Director is authorized to allow alternative cover materials or thicknesses, or to grant temporary waivers from the daily cover requirement if extreme seasonal weather conditions, such as heavy snow or severe freezing, make meeting this requirement impractical (56 FR 51051; October 9, 1991).

Section 258.21 was revised on July 29, 1997, consistent with the Land Disposal Program Flexibility Act (LDPFA) (62 FR 40708). The revision provides additional flexibility to approved states, allowing the Director of an approved state, after public review and comment, to establish alternative frequencies for daily cover for certain small MSWLFs, provided that the Director takes into account climatic and hydrogeologic conditions and determines that the alternative requirements are protective of human health and the environment.

DISEASE VECTOR CONTROL

Disease vectors are rodents, flies, mosquitoes, or other animals and insects capable of transmitting disease to humans (§258.22(b)). As stated above, one purpose for the daily cover requirement is to prevent the facility from becoming a breeding ground, habitat, or feeding area for disease vector populations. If compliance with the daily cover material requirement is insufficient to ensure disease vector control, the facility owner and operator must employ additional methods (e.g., shredding the waste) to protect human health and the environment.

EXPLOSIVE GASES CONTROL

The decomposition of organic waste produces methane gas. High concentrations of methane in MSWLF structures or the facility area create an explosion hazard for employees, facility users, and occupants of nearby structures. To mitigate potential hazards, a routine methane monitoring

program, conducted at least quarterly, must be implemented in accordance with §258.23(b) to ensure that the following conditions are maintained:

- in facility structures, the concentration of methane gas must not exceed 25 percent of the lower explosive limit for methane as defined in §258.23(d)

- at the facility property boundary, the concentration of methane gas must not exceed the lower explosive limit.

While §258.23(c) outlines the procedures that the owner and operator must follow if these methane levels are exceeded, states with approved programs may establish alternative response procedures (§258.23(c)(4)).

Consistent with the LDPFA, §258.23 was revised on July 29, 1997, to incorporate a provision allowing the Director of an approved state, after public review and comment, to establish alternative frequencies of methane monitoring for any small MSWLFs, provided that the Director takes into account climatic and hydrogeologic conditions and determines that the alternative requirements are protective of human health and the environment (62 FR 40708).

AIR CRITERIA

In general, air emissions from MSWLFs are regulated under the Clean Air Act (CAA), not under RCRA (56 FR 51053; October 9, 1991). Nevertheless, §258.24 prohibits open burning of nearly all solid wastes at MSWLFs; only the infrequent burning of agricultural wastes, silvicultural (forestry) wastes, land-cleaning debris, diseased trees, and debris from emergency cleanup operations is permitted (§258.24(b)). Additionally, landfill gas performance standards for new landfills and guidelines for existing landfills were promulgated under the authority of the CAA on March 12, 1996 (61 FR 9905). EPA published on January 16, 2003 (68 FR 2227), the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for MSWLFs.

ACCESS REQUIREMENTS

Access to MSWLF facilities must be controlled to prevent unauthorized people from entering the MSWLF. Owners and operators of all MSWLFs may use artificial or natural barriers, as necessary, to control public access to the facility and prevent unauthorized vehicular traffic and illegal dumping of wastes (§258.25).

RUN-ON AND RUNOFF CONTROL SYSTEMS

To prevent the flow of surface water onto or from a landfill unit, §258.26 requires all MSWLF units to have run-on and runoff control systems. The intent of the design, construction, and maintenance of a run-on control system is to prevent the flow of surface water onto the active portion of a unit during the period of greatest precipitation in a 25-year storm. These system controls are intended to mitigate erosion, reduce surface discharge of wastes in solution or suspension, and minimize run-on available to percolate down through waste that creates leachate (56 FR 51054; October 9, 1991). A runoff control system, likewise, must be designed and

operated to collect and control the water volume resulting from a 24-hour, 25-year storm (§258.26(a)(2)).

SURFACE WATER REQUIREMENTS

The runoff control measures would be largely undermined if collected waters were improperly managed. Runoff collected from the active portion of a landfill unit must be managed in accordance with §258.27, which requires that all MSWLFs be operated in compliance with the Clean Water Act.

BULK OR NONCONTAINERIZED LIQUIDS

Restricting the introduction of liquids into a landfill reduces the unit's potential to generate leachate (56 FR 51055; October 9, 1991). According to §258.28, only household waste (excluding septic waste), properly recirculated leachate, or gas condensate derived from the MSWLF may be disposed of in bulk or noncontainerized liquid form. Furthermore, the re-circulation of leachate or gas condensate in MSWLFs is limited to units equipped with composite liners and leachate collection systems (§258.28(a)(2)). EPA is researching bioreactor landfills, which re-circulate leachate to accelerate the decomposition and stabilization of the waste, in order to identify and prioritize future regulatory needs. Containers holding liquids may be disposed of in a MSWLF only if the waste is a household waste, the container is similar in size to one typically found in household waste, or the container is designed to hold liquids for use other than storage (e.g., beverage containers) (§258.28(b)).

RECORDKEEPING REQUIREMENTS

MSWLF owners and operators must retain certain records and documents near the facility in an operating record. In unapproved states, the following materials must be kept in the operating record (§258.29(a)):

- location restriction demonstrations required under Subpart B
- inspection records, training procedures, and notification procedures required by §258.20
- gas monitoring results and any remediation plans required by §258.23
- MSWLF unit design documentation for placement of leachate or gas condensate in a unit as required by §258.28(a)(2)
- demonstrations, certifications, findings, monitoring, testing, or analytical data required by Subpart E groundwater monitoring and corrective action
- closure and post-closure care plans and any monitoring, testing, or analytical data as required by §§258.60 and 258.61
- cost estimates and financial assurance documentation required by Part 258, Subpart G
- information demonstrating compliance with the small landfill exemption required by §258.1(f)(2).

The Director of an approved state may allow an alternative location for these records and establish alternative schedules for complying with most of the recordkeeping and notification requirements.

2.4 SUBPART D: DESIGN CRITERIA

To prevent unit failures, the regulations establish a uniform design standard for new units and lateral expansions, allowing for site-specific MSWLF designs in approved states (56 FR 50978, 51059; October 9, 1991). In states without approved permitting programs, the MSWLF design criteria require construction with a composite liner and leachate collection system. For new units and lateral expansions in approved states, §258.40(a)(1) allows greater flexibility in design.

COMPOSITE LINER SYSTEM

The uniform design criteria require a composite liner and a leachate collection system. The composite liner system consists of an upper component, which is a flexible membrane liner (FML) that satisfies specific thickness standards. The lower component must be constructed of at least a 2-foot layer of compacted soil and must exhibit a hydraulic conductivity of no more than 1×10^{-7} cm/sec. EPA believes that the combination of an FML and a compacted soil layer ensures adequate protection by providing both a highly impermeable upper liner to maximize leachate collection and removal and a lower soil layer to serve as a back-up in the event of FML failure (56 FR 51060; October 9, 1991). The leachate collection system must be designed and constructed to maintain less than a 30-cm depth of leachate over the liner (§258.40(a)(2)).

SITE-SPECIFIC DESIGNS

Flexibility in design requirements is allowed for approved states. The performance-based standard in §258.40(a)(1) requires that a MSWLF's design be capable of controlling migration of hazardous constituents into the uppermost aquifer. This design performance standard requires that maximum contaminant levels (MCLs) not be exceeded in the uppermost aquifer at the relevant point of compliance. In general, the relevant point of compliance must be located within 150 meters of the waste management boundary on the landfill owner's property.

The Director of an approved state determines whether a proposed design meets the performance standard. When reviewing a design plan, the Director of an approved state must evaluate hydrogeologic characteristics, climatic factors, and volume, physical, and chemical characteristics of the landfill's leachate (§258.40(c)).

On March 22, 2004 (69 FR 13242), EPA issued a Final Rule for Research, Development, and Demonstration Permits for Municipal Solid Waste Landfills to allow approved states to issue RD&D permits for new and existing MSWLFs in order to provide variances from certain Part 258 criteria and for new and innovative technologies associated with landfilling of municipal solid waste.

2.5 SUBPART E: GROUNDWATER MONITORING AND CORRECTIVE ACTION

Similar to the regulations for hazardous waste treatment, storage, and disposal facilities (TSDFs) in Subpart F of Part 264, MSWLF groundwater monitoring and corrective action requirements consist of three sequential phases. Detection monitoring, minimally required for all units, is designed to measure concentrations of certain indicator parameters. Statistically significant increases (SSI) in these indicators trigger groundwater assessment monitoring for hazardous constituents. Finally, a corrective action program is required if remediation of contaminated groundwater is necessary.

APPLICABILITY, WAIVERS, AND EXEMPTIONS

The groundwater monitoring and corrective action requirements in Part 258, Subpart E, apply to all MSWLFs, except in two instances. First, as a result of the LDFPA, MSWLF units meeting the small landfill exemption in §258.1(f) are exempt from the groundwater monitoring requirements in Subpart E. Second, the Director of an approved state may waive the groundwater monitoring requirements if the owner and operator can demonstrate that there is no potential for migration of hazardous constituents into the uppermost aquifer during the unit's active life and the post-closure care period (§258.50(b)). A qualified groundwater scientist, as defined in §258.50(g), must certify the demonstration.

SCHEDULE OF COMPLIANCE

Once established, groundwater monitoring must be conducted throughout the active life and post-closure care period of the MSWLF unit. While new units must be in compliance with the groundwater monitoring requirements prior to accepting waste, the compliance date in unapproved states for each existing landfill depends on its distance from a drinking water intake, as shown in Figure 2.

Figure 2

GROUNDWATER MONITORING COMPLIANCE DEADLINES FOR UNAPPROVED STATES

Proximity of an Existing MSWLF to a Drinking Water Intake	Groundwater Monitoring Compliance Date
Less than one mile	October 9, 1994 (§258.50(c)(1))
More than one mile, but less than two miles	October 9, 1995 (§258.50(c)(2))
More than two miles	October 9, 1996 (§258.50(c)(3))

In states with approved programs, the Director may establish an alternative groundwater monitoring schedule of compliance for existing MSWLF units and lateral expansions (258.50(d)). In developing this compliance schedule, the Director of an approved state should consider certain risk factors: the proximity of receptors; the size, age, and design of the unit; types and quantities of wastes disposed; and the resource value of the underlying aquifer.

The resulting schedule must ensure that, excluding units not subject to the groundwater monitoring requirements, at least 50 percent of the existing MSWLF units in the state are in compliance by October 9, 1994, and that all such existing units in the state are in compliance by October 9, 1996. The Director of an approved state may also establish alternative schedules for Subpart E notification, sampling, assessment, and recordkeeping requirements (§258.50(h)).

GENERAL GROUNDWATER MONITORING SYSTEM REQUIREMENTS

A groundwater monitoring system must be installed to yield samples from the uppermost aquifer that represent both the quality of background groundwater (usually from an upgradient well) and the extent of groundwater contamination at the waste management unit boundary (from downgradient wells). Each time groundwater is sampled, the owner and operator must determine the rate and direction of groundwater flow and measure the water elevation in each well.

The number, spacing, and depths of monitoring wells depend on site-specific characteristics such as aquifer thickness and groundwater flow rate and direction. Unless approved by the Director of an approved state, these system specifications must be certified by a qualified groundwater scientist (§258.51(d)(2)). In addition, all monitoring well bore holes and other measurement, sampling, and analytical devices must be operated to meet design specifications for the duration of the groundwater monitoring program (§258.51(c)).

The Agency recognizes that local conditions can make installation of a monitoring well system around each landfill unit difficult. In approved states, multiple MSWLF units may share a

common groundwater monitoring system, provided that sharing the multiple unit system is as protective of human health and the environment as installing a separate monitoring system for each unit (§258.51(b)).

GROUNDWATER SAMPLING AND ANALYSIS PROGRAM

Consistent sampling and analytical procedures are essential to obtain reliable monitoring results that accurately measure hazardous constituents and other parameters established in either detection monitoring or assessment monitoring programs. Each MSWLF's groundwater monitoring program must be developed to ensure that monitoring results provide an accurate representation of groundwater quality at both background and downgradient wells. For example, sampling and analysis programs must include procedures and techniques for sample collection, sample preservation and shipment, analytical procedures, chain of custody control, and quality assurance and quality control (QA/QC) procedures (§258.53(a)).

In evaluating groundwater quality monitoring data, the owner and operator must use one of the statistical methods in §258.53(g). The selected method, which will be used to identify statistically significant evidence of groundwater contamination at a monitoring well, must be appropriate for the type and distribution of chemical constituents detected, or suspected to be present, in the groundwater (§258.53(h)(1)). The frequency and number of groundwater samples necessary to establish groundwater quality vary with the statistical method (56 FR 51072; October 9, 1991).

DETECTION MONITORING PROGRAM

A detection monitoring program includes monitoring for 62 constituents listed in Appendix I of Part 258 (§258.54(a)). The Director of an approved state may delete any of these monitoring constituents or establish a list of alternative inorganic indicator parameters in lieu of some or all of the heavy metals constituents, on a site-specific basis (§258.54(a)(1)).

The owner and operator must monitor for all Appendix I constituents (or alternative parameters) at least semiannually throughout the facility's active life and post-closure period (§258.54(b)). The Director of an approved state may allow an alternate frequency, but nothing less than annually. Detection of any Appendix I constituent at levels significantly higher than background concentrations requires the owner and operator to notify the State Director of the statistically significant increase (SSI) (§258.54(c)). Within 90 days after detecting an SSI, the owner and operator must establish an assessment monitoring program in accordance with §258.55.

Demonstrating that the evidence of contamination resulted from an error (e.g., an error in sampling, analysis, or statistical evaluation, or a natural variation in groundwater quality), or that a source other than the MSWLF unit caused the contamination, nullifies the assessment monitoring requirement. This demonstration allows the owner and operator to continue the detection monitoring program (§258.54(c)(3)). A qualified groundwater scientist must certify or the Director of an approved state must approve a report documenting this demonstration. Failure to make such a demonstration within 90 days triggers the assessment monitoring requirement.

ASSESSMENT MONITORING PROGRAM

An assessment monitoring program is implemented when an SSI of hazardous constituent concentrations over background levels is confirmed. Within 90 days of beginning an assessment monitoring program, and annually thereafter, the owner and operator must sample and analyze the groundwater for all Part 258, Appendix II, constituents. If any Appendix II constituent is detected in a downgradient well, background levels for that constituent must be established through analysis of at least four independent samples from each well.

The Director of an approved state is authorized to delete any of the Appendix II constituents from the assessment monitoring program or to specify an appropriate subset of wells to be sampled and analyzed (§258.55(b)). In addition, the Director may implement an alternative sampling and analysis frequency for Appendix II constituents based on factors identified in §258.55(c).

Within 90 days of establishing Appendix II background levels and on at least a semiannual basis thereafter, the owner and operator must resample for all Appendix I constituents and those Appendix II constituents detected during the initial phase of assessment monitoring (§258.55(d)(2)). Again, the Director of an approved state may specify an alternative monitoring frequency based on consideration of the site factors delineated in §258.55(c).

Groundwater Protection Standard

The MSWLF owner and operator must establish a groundwater protection standard (GWPS) for each Appendix II constituent detected in the groundwater (§258.55(h)). The GWPS represents the maximum constituent concentration level permissible in groundwater. This standard must be based either on the Safe Drinking Water Act (SDWA) MCL for the constituent or, if no MCL has been established, on the background concentration level at the site. In cases where the background level is higher than the promulgated MCL for a constituent, the GWPS should be set at the background level.

In accordance with §258.55(i), the Director of an approved state may establish an alternative GWPS for constituents that have no established MCLs. When establishing an alternative standard, the Director may consider multiple contaminants in the groundwater, such as exposure threats to sensitive environmental receptors and other site-specific factors (e.g., the reliability of exposure data and the weight of scientific evidence). Any alternative GWPS must satisfy the health-based criteria set forth in §258.55(i)(1) through (4).

Monitoring Results Determination

The owner and operator may return to detection monitoring only after concentrations of all Appendix II constituents are shown to be at or below background values for two consecutive sampling events (§258.55(e)). If the concentration of any Appendix II constituent is detected at statistically significant levels above the established GWPS, however, the owner and operator must notify the Director and all appropriate government officials (§258.55(g)). The owner and operator must then characterize the nature of the release and ascertain whether contaminants have migrated past the facility boundary, installing additional monitoring wells as necessary. If

well sampling indicates that contaminants have migrated offsite, all persons who own or reside on land that directly overlies any part of the plume of contamination must be notified (§258.55(g)(1)(iii)).

If the owner and operator are able to make a successful demonstration that a source other than the MSWLF caused the contamination, or that the SSI resulted from an error, then the owner and operator may continue assessment monitoring and return to detection monitoring when all Appendix II constituents are at or below background levels (§258.55(g)(2)). Unless the demonstration is made within 90 days, the owner and operator must initiate an assessment of corrective measures (§258.55(g)(1)(iv)).

ASSESSMENT OF CORRECTIVE MEASURES

After exceeding any GWPS, within 90 days the owner and operator must initiate an assessment of various corrective measures, a process that must be completed within a reasonable period of time (§258.56(a)). Based on this assessment, the owner and operator must then select a remedy. Sections 258.56 and 258.57 set forth the criteria for determining what types of potential remedies to consider and criteria for evaluating each remedy.

When evaluating a potential remedy, the MSWLF owner and operator must assess its long- and short-term effectiveness and protectiveness, its ability to control the source and minimize further releases, the ease or difficulty of implementation in light of practical considerations (including technical and economic factors), and the degree to which it addresses community concerns. Prior to final selection of a remedy, the unit owner and operator must discuss the results of the assessment of potential remedies in a public meeting with interested and affected parties (§258.56(d)).

Per §258.57(e), the Director of an approved state may determine that remediation of a release of an Appendix II constituent is not necessary based on one of the following demonstrations:

- the groundwater is contaminated by multiple sources and cleanup of the MSWLF release would provide no significant reduction of risk

- the contaminated groundwater is not a current or potential source of drinking water and is not hydraulically connected with waters to which hazardous constituents are migrating or are likely to migrate in a concentration that would exceed the GWPS

- the remediation is not technically feasible or would result in unacceptable cross-media impacts.

IMPLEMENTATION OF THE CORRECTIVE ACTION PROGRAM

After the remedy is selected, the MSWLF owner and operator are required to implement the corrective measure, establish a corrective action groundwater monitoring program, and take any necessary interim measures (56 FR 51011; October 9, 1991). First, a schedule for initiating and completing all activities associated with implementing the selected remedy must be established. In accordance with this schedule, the owner and operator must develop and implement the

corrective action groundwater monitoring program to indicate the effectiveness of the selected remedy, to meet the minimum requirements of the assessment monitoring program, and to comply with established GWPSs (§258.58(a)(1)).

During implementation of the corrective action remedy, the owner and operator are responsible for taking any interim measures consistent with the objectives and performance of the remedy that may be necessary to ensure protection of human health and the environment (§258.58(a)(3)). Similarly, the owner and operator must implement alternative methods or techniques necessary to achieve compliance with the minimum standards for any selected remedy set forth in §258.57(b).

Completion of Corrective Action

Once implemented, remedial activities at the unit must continue until the MSWLF owner and operator achieve compliance with the established GWPSs for three consecutive years, and demonstrate that all required actions have been completed (§258.58(e)). The Director of an approved state may however, specify an alternative period of time for demonstrating compliance with any GWPS (§258.58(e)(2)). Upon completion of corrective action, the owner and operator must obtain certification that the remedy is complete and notify the State Director.

2.6 SUBPART F: CLOSURE AND POST-CLOSURE CARE

MSWLFs not adequately closed and maintained after closure may pose a continuing threat to human health and the environment. As with hazardous waste facilities, EPA established requirements for MSWLF closure and post-closure care to address wastes left in place at a facility may pose a threat even after disposal activities have ceased.

CLOSURE CRITERIA

Closure standards require owners and operators to install a final landfill cover system that is designed to minimize soil erosion and infiltration of liquids through the cover. The cover's infiltration layer, consisting of at least 18 inches of earthen material, must be at least as impermeable as any bottom liner system or natural subsoils, but in no case may the permeability be greater than 1×10^{-5} cm/sec. While this standard does not explicitly require the use of a synthetic membrane in the final cover, the Agency anticipates that if a MSWLF has a synthetic membrane in the bottom of the unit, then the infiltration layer in the final cover will, in all likelihood given today's technologies, include a synthetic membrane in the final cover. The erosion layer must be a minimum of six inches of earthen material that can sustain native plant growth. The Director of an approved state may allow an alternative final cover design if the cover layers provide equivalent reduction of infiltration and protection from wind and water erosion.

Section 258.60(a) was revised on July 29, 1997, to provide additional flexibility to approved states, allowing the Director of an approved state, after public review and comment, to establish alternative infiltration barriers in the final cover for any small MSWLF (62 FR 40708). This provision is contingent on the Director accounting for climatic and hydrogeologic conditions and

a determination that the alternative requirements are protective of human health and the environment.

CLOSURE PLAN

The owner and operator must prepare a written closure plan describing the measures necessary to close each MSWLF unit at a facility at any point during the unit's active life (§258.60(c)). The closure plan must include at least the following:

- a description of the final cover, and the methods and procedures used to install the cover
- an estimate of the largest area of the MSWLF that may ever require a final cover during the unit's active life
- an estimate of the maximum inventory of wastes maintained on site during the active life of the landfill facility
- a schedule for completing all activities necessary to satisfy the closure criteria specified in §258.60.

ONSET AND COMPLETION OF CLOSURE ACTIVITIES

Subpart F specifies a closure timetable for MSWLFs. In general, no later than 30 days after a MSWLF unit receives the final volume of waste, the owner and operator must begin closure activities (§258.60(f)). A unit with remaining capacity may receive additional wastes and is allowed one year following the most recent receipt of wastes to initiate closure activities. After closure begins, all closure activities must be completed within 180 days (§258.60(g)). Finally, the owner and operator must obtain either an independent registered professional engineer's certification or a Director of an approved state's approval verifying that closure has been completed in accordance with the established closure plan (§258.60(h)). In approved states, deadlines for closure activities may be extended.

POST-CLOSURE CARE REQUIREMENTS

Post-closure care entails a 30-year period after closure during which the owner and operator must conduct monitoring and maintenance activities to preserve the integrity of a MSWLF system. The purpose of post-closure care is to ensure that landfills are closed in a manner that controls, minimizes, or eliminates the escape of waste, leachate, contaminated rainfall, or waste decomposition products to soils, waters, and the atmosphere. Post-closure care requires maintaining the following:

- the integrity and effectiveness of all final covers
- the leachate collection system, in accordance with §258.40
- the applicable groundwater monitoring system, in accordance with Subpart E requirements
- the methane gas monitoring system required by §258.23.

In an approved state, the Director can modify the length of post-closure care as necessary to protect human health and the environment (§258.61(b)).

In addition to the closure plan, the owner and operator must prepare a written post-closure plan that provides a description of monitoring and maintenance activities, information identifying the facility contact for the post-closure period, and a description of the planned uses of the property during the post-closure period. Pursuant to §258.61(c)(3), any planned uses must not disturb either the integrity of the final covers and liners or the function or components of the monitoring and containment systems.

Following completion of the post-closure care period for each MSWLF unit, the owner and operator must obtain either certification of post-closure by an independent registered professional engineer or verification of completion of post-closure care activities by the Director of an approved state. The certification or approval must indicate that post-closure care has been completed in accordance with the post-closure plan (§258.61(e)).

2.7 SUBPART G: FINANCIAL ASSURANCE CRITERIA

The Part 258, Subpart G, financial assurance criteria require demonstration of responsibility for the costs of closure, post-closure care, and known corrective action. EPA believes that compliance with these requirements will help ensure responsible planning for future costs. Adequate funds must be available to hire a third party to carry out all necessary closure, post-closure care, and known corrective action activities in the event that the owner and operator declare bankruptcy or lack the technical expertise to complete the required activities (56 FR 51110; October 9, 1991).

APPLICABILITY AND EFFECTIVE DATE

Except for state and federal government entities, owners and operators of all new and existing units and lateral expansions must be in compliance with the MSWLF financial assurance requirements by April 9, 1997 (§258.70(b)). Local governments and Indian tribes are subject to the Subpart G criteria. Small landfills that qualify for the small landfill exemption under §258.1(f) must be in compliance with financial assurance requirements by October 9, 1997.

COST ESTIMATES

The amount of financial assurance, using acceptable financial mechanisms, must equal the cost of a third party conducting these activities. To determine these costs each MSWLF owner and operator must prepare a written, site-specific estimate of the costs of conducting closure, post-closure care, and known corrective action.

Closure

The owner and operator must calculate a detailed cost estimate for closure based on the largest area of a MSWLF unit that may ever require a final cover during its active life. The cost estimate must equal the expense of closing the area when the extent and manner of operation would make closure most expensive (§258.71(a)(1)).

As stated in §258.71(a)(3), the owner and operator must increase both the closure cost estimate and the amount of financial assurance maintained if the closure plan is adjusted or if changing unit conditions (e.g., increases in design capacity) raises the maximum cost of closure. The closure cost estimate and the amount of financial assurance maintained may also be reduced if, as a result of changes in facility conditions (e.g., partial closure of a landfill), the existing cost estimate exceeds the maximum cost of closure during the remaining life of the MSWLF unit. The owner and operator must document evidence supporting such a reduction.

Post-Closure Care

The financial assurance requirements for post-closure are similar to the requirements for closure of MSWLF units. The owner and operator must have a detailed, site-specific written estimate of the cost of hiring a third party to conduct post-closure care for the MSWLF unit (§258.72). This cost estimate must account for the total costs of conducting post-closure care, including annual and periodic costs described in the post-closure plan. Post-closure care cost estimates must be based on the most expensive costs during the post-closure care period (§258.72(a)(1)). As with closure cost estimates, changes in facility conditions or the post-closure plan may require the owner and operator to modify the post-closure care cost estimate and the amount of financial assurance.

Corrective Action

In accordance with §258.73, the owner and operator of a MSWLF unit required to undertake corrective action per §258.58 must have a detailed, site-specific written estimate of the cost of hiring a third party to perform corrective action for known releases. The corrective action cost estimate must account for the total expense of activities described in the corrective action plan. Again, the corrective action cost estimate and amount of financial assurance must increase or decrease in response to changes in either the corrective action program or MSWLF unit conditions.

Adjustments for Inflation

Due to changes in inflation and interest rates, cost estimates must be annually adjusted for inflation (§§258.71(a)(2), 258.72(a)(2), and 258.73(a)(1)). Updated cost estimates must account for added inflationary costs to ensure that adequate funds will be available if needed (56 FR 51111; October 9, 1991). The Subtitle C financial assurance provisions offer guidance on adjusting cost estimates using an inflation factor based on the implicit price deflator. Review the module entitled Financial Assurance for explanations of the terms and concepts in this section.

ALLOWABLE MECHANISMS

The mechanisms used to demonstrate financial assurance must ensure that the funds necessary to meet the costs of closure, post-closure care, and known corrective action will be available when needed. Owners and operators may use any of the following financial mechanisms:

- trust fund (§258.74(a))
- surety bonds guaranteeing payment or performance (§258.74(b))
- letter of credit (§258.74(c))
- insurance (§258.74(d))
- corporate financial test (§258.74(e))
- local government financial test (§258.74(f))
- corporate guarantee (§258.74(g))
- local government guarantee (§258.74(h))
- state-approved mechanism (§258.74(i))
- state assumption of financial responsibility (§258.74(j)).

In addition, the Agency expects to add financial tests and guarantees as allowable mechanisms for corporations to demonstrate financial assurance.

The performance standard in §258.74(l) requires that approved financial assurance mechanisms satisfy the following criteria:

- The amount of funds assured is sufficient to cover the costs of closure, post-closure care, and corrective action for known releases when needed.

- The funds will be available in a timely fashion when needed.

- The mechanisms for closure and post-closure care must be established by the owner and operator by the effective date of these requirements or prior to the initial receipt of solid waste, whichever is later. The mechanisms for corrective action must be secured no later than 120 days after the corrective action remedy has been selected pursuant to §258.58, and maintained until the owner and operator are released from financial assurance responsibilities.

- The mechanisms must be legally valid, binding, and enforceable under state and federal law.

In approved states, the owner and operator may satisfy the Subpart G requirements using a state-approved mechanism. Such an alternative financial mechanism must meet the criteria specified in the performance standard and be approved by the Director of an approved state (§258.74(i)). Furthermore, the owner and operator will remain in compliance with the financial assurance requirements if the Director either assumes legal responsibility for the Subpart G requirements or ensures that funds will be available from state sources to cover these requirements (§258.74(j)). Any such state assumption of financial responsibility must satisfy the performance standard.

Finally, as with Subtitle C financial assurance, nothing precludes the MSWLF owner and operator from combining multiple financial mechanisms to satisfy the Subpart G requirements (§258.74(k)). The mechanisms must comply with all applicable requirements specified in §258.74(a) through (j), except that the combination of mechanisms, rather than any individual mechanism, must provide financial assurance for an amount at least equal to the current cost estimate for closure, post-closure care, or corrective action.