Regulatory Impact Analysis
of
Air Pollutant Emission Standards and Guidelines for Municipal Solid Waste Landfills

Prepared by
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC

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A Description of the Economic Impacts of, and Regulatory Options for, Clean Air Act §111(b) New Source Performance Standards and §111(d) Existing Source Emission Guidelines

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This Regulatory Impact Analysis was prepared by the Office of Air Quality and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

This report contains portions of the economic impact analysis report that are related to the industry profile.

Chapter 2

Background

2.1 "An Agenda for Action"

Municipal solid waste (MSW) disposal problems are legion. In response to the burgeoning MSW problem, EPA created a Municipal Solid Waste Task Force early in 1988 and directed it to fashion a strategy for improving the nation's management of MSW. The result is *The Solid Waste Dilemma: An Agenda for Action*[21], issued in February 1989. The *Agenda* calls for a systems approach to managing MSW, that is, the complementary use of source reduction, recycling, combustion, and landfills. The objective is to minimize the amount and toxicity of waste created by products we make and purchase, and to maximize the amount of waste materials that are reused or recycled. In short, EPA proposes to change the way we do business when it comes to waste generation and disposal.

EPA is preparing these Standards and Guidelines to decrease adverse health and welfare effects from landfilling. Similar standards and guidelines to decrease adverse health and welfare effects from combustion of waste were promulgated on February 11, 1991 (56 FR 5488 and 56 FR 5514). EPA is revising design and operational criteria for Subtitle D landfills, and working on municipal waste combustor (MWC) ash management plans as part of the Resource Conservation and Recovery Act (RCRA).

The MSW landfill Standards and Guidelines are a part of, and incorporate elements of, the *Agenda for Action.*

2.2 Project History

The regulation of MSW landfill air emissions originally was part of the revised RCRA Subtitle D criteria. In 1987, the Administrator decided to regulate these emissions under the authority of the Clean Air Act (CAA). This decision was announced in the *Federal Register* on August 30, 1988 (53 FR 33314). The Office of Air Quality Planning and Standards began technical and regulatory development of this proposal in October of 1987.

2.2.1 Existing Regulations

There are no existing federal regulations that control landfill air emissions except under Subtitle D of RCRA. Subtitle D requires monitoring for the lower explosion limit of methane and installation of explosion control if the methane concentration is considered dangerous. Explosion control generally is achieved by venting the landfill gas to the atmosphere; however, there are circumstances where a collection system is required.

2.2.2 Regulatory Approach

As was mentioned above, EPA published a notice of intent to regulate landfill air emissions under CAA §111 in 1988. CAA §111, *Standards of Performance for New Stationary Sources*, mandates imposition of emission controls (new source performance standards or NSPSs) on new sources that emit pollutants contributing to the endangerment of public health and welfare, and mandates imposition of emission controls (guidelines) on existing sources whenever (1) such sources would be subject to an NSPS if the sources were new and (2) the pollutant of concern is not regulated under CAA §108-110 or §112. The regulatory development process under §111 typically focuses on health effects as well as on welfare, cost, and other effects of the regulation. However, in the case of MSW landfill air emissions, the regulatory process focuses on technological feasibility and effectiveness. This will be discussed in the following section. Regulation under §111 is now proceeding with proposal planned for spring 1991 and promulgation approximately 14 months later.

Although §111 does not place upon EPA the burden of justifying regulations solely on health grounds, Executive Order 12291 does require some examination of the health benefits of the regulation. This is discussed further in Section 2.5.

2.3 The Nature of CAA §111

Section 2.2.2 above discusses why EPA elected to apply CAA §111 to control MSW landfill air emissions. A grasp of §111 is essential to understand how EPA has structured regulation under §111. There are two primary regulatory components under §111—the standards of performance and emission guidelines.

The CAA §111 *Standards of Performance for New Stationary Sources* directs EPA to require owners and operators of pollution sources either to meet emission performance standards, or to follow design, equipment, work practice, or operational standards that will accomplish the same objective. The sources of concern are non-transportation related activities that individually or collectively emit enough pollution to contribute significantly to ambient air pollution problems. These sources are termed "stationary sources" and they range in size from oil refineries and power plants on the one hand, to dry cleaners and homes with wood-burning stoves on the other. Once on the books, §111 regulations generally are delegated to the states for enforcement.

Most §111 regulations apply to sources that are constructed after the regulations are proposed by EPA. These regulations are the NSPSs, which EPA prepares under §111(b). For NSPSs regulating pollutants not regulated under CAA §108-110 or §112, the states adopt and apply the emission requirements of NSPSs to existing sources. This latter process occurs under §111(d), which directs EPA to adapt certain NSPSs to the special problems of existing sources and to issue guidelines to the states on how states should enforce the regulations for existing sources. For MSW landfills, the NSPSs are termed "Standards" in this report, and the guidelines are termed "Guidelines."

CAA §111(b) can be used only for pollutants that EPA has not listed as hazardous under §112. (Currently there are eight hazardous pollutants, another ten that EPA intends to list as hazardous, and many others that are

under study.) Often, as will be the case with the Standards and Guidelines, a §111 regulation directed at sources of nonhazardous pollutants will, as a side effect, also serve to control one or more hazardous pollutants. If a nonhazardous pollutant to be controlled with §111(b) NSPSs is *not* one for which EPA has issued a national ambient air quality standard under §108-110, the pollutant is called a "designated" pollutant. A designated pollutant invokes §111(d) and EPA issues §111(d) guidelines. The net effect of designating a pollutant is to use §111 for the control of new *and* existing sources. There is no requirement that standards for existing sources be the same as those for new sources. However, in the case of these Standards and Guidelines for MSW landfills, they are basically the same.

Except for certain situations, §111 requires EPA to issue *performance* standards. A performance standard is an emission limitation or reduction

> ...achievable through application of the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated.

Only when performance standards are infeasible may EPA promulgate design, equipment, work practice, or operational standards. Section 111 further provides for the replacement of design, equipment, work practice, and operational standards as soon as performance standards become feasible, and in certain other situations. In order to set a performance standard for a landfill gas collection system, it would be necessary to quantify the landfill gas available for collection in comparison to the amount collected. It is not technically feasible to measure the amount of gas available for collection, so a collection efficiency, or performance standard, cannot be measured. For this reason the Administrator has proposed design, operational, and work practice standards for collection systems in lieu of a performance standard.

Clean Air Act §111 regulations are subject to automatic review by EPA every four years.

2.4 Regulatory Initiatives Affecting MSW Management

EPA is developing new regulatory initiatives affecting MSW management. The principal ones are described below. They all affect to one degree or another the economics of MSW landfills.

Revised RCRA Subtitle D Criteria. RCRA Subtitle D governs the landfilling of non-hazardous and small amounts of hazardous wastes from households and small quantity generators. EPA proposed revised regulations in August 1988; the final promulgation package is currently under review. The revised regulations affect the siting of MSW landfills and also require that new landfills be designed with liners, leachate collection systems, and final covers to protect ground water.

Toxicity Characteristic Expansion and Modification of Lead MCL. Modification of the lead MCL (maximum contaminant level) was proposed in August 1988; final promulgation is expected in November 1990. The Toxicity Characteristic expansion was proposed in June 1986, and promulgated in March 1990. These two rules will affect the classification of solid wastes as hazardous or nonhazardous. They may result in classifying lower concentrations of toxic substances, such as municipal waste combustor (MWC) ash, as hazardous, thereby potentially decreasing the amount of MSW landfill capacity that is needed.

Superfund Municipal Settlement Policy. An interim policy was released in December 1989. The policy focuses on the issue of how municipalities that are potentially responsible parties at Superfund sites should be handled in the Superfund settlement process.

Municipal Waste Combustor Regulations. These regulations were promulgated on February 11, 1991. The CAA §111 standards and guidelines require regulated MWC units with capacities of 225 Mg per day and greater to install control systems for metals, acid gases, and other pollutants. Standards and guidelines that will cover emissions of additional pollutants and that will extend control to MWC units with smaller capacities are being developed pursuant to §111 and §129.

Municipal Waste Combustion Ash Disposal Regulations. The timetable is uncertain. For MWC ash disposal, the draft regulation includes the following requirements for MSW landfills: (1) double liners with leachate collection systems above and between them; (2) ground-water monitoring; (3) development of criteria and testing procedures for identifying characteristics of ash that may pose a threat to human health and the environment; and (4) closure requirements, post-closure care, corrective action, and financial assurance for these activities.

The initiatives and some of their potential impacts are summarized in Table 2.1.

2.5 Executive Order 12291

The President issued Executive Order 12291 in February 1981.[25] It requires EPA to prepare regulatory impact analyses (RIAs) on all "major" regulations. An RIA describes the benefits and costs of proposed regulations and explores alternative regulatory and non-regulatory approaches to accomplishing the desired objectives.[17, 24] A "major" regulation is one that, among other things, may have an annual effect on the economy of $100 million or more, and/or may result in a significant increase in prices. The Standards may have social costs to the nation of around $30 million yearly for the first five years after proposal, and the Guidelines of nearly $300 million yearly. As existing landfills are closed and replaced by new ones, the cost of the Standards will rise and in less than fifteen years should exceed $100 million annually. Both the Standards and the Guidelines in particular may result in significant increases in tipping fees in a few local areas. Thus, EPA considers the Standards and Guidelines to be major regulations and is issuing this RIA.

In addition to asking for an analysis of benefits and costs, the Executive Order specifies that EPA, to the extent permitted (in this case) by the Clean Air Act and court orders, demonstrate (1) that the benefits of the Standards and Guidelines will outweigh the costs and (2) that net benefits will be maximized. Chapter 12 describes the benefits. As explained in that chapter, EPA cannot quantify some of the benefits. Consequently, EPA cannot demonstrate *quantitatively* that the benefits of the Standards and Guidelines will outweigh the costs. Notwithstanding this quantification problem,

Table 2.1: Impacts of Regulatory Initiatives in the MSW Area

Initiative	Impacts
Revised Subtitle D Criteria	Increased cost may induce a small shift away from MSW landfills to MWCs, source reduction, and recycling. Will increase cost of MSW landfills (ground-water monitoring, liner systems, leachate collection systems, covers, potential corrective actions).
Toxicity Characteristic Expansion	Regulation of some MWC ash as hazardous may encourage shift to source reduction, recycling, and MSW landfilling. Will increase MSW landfill costs if leachate and gas condensate exhibit high toxic characteristics. Will increase MWC costs if ash exhibits toxic characteristics.
Superfund Municipal Settlement Policy	May encourage shift to MWC, source reduction, and recycling to avoid liability. May increase costs of MSW landfills.
Municipal Waste Combustors Regulations	Will encourage shift from MWCs to landfills. Will increase combustion costs by requiring air pollution control systems.
MWC Ash Disposal Regulations	May increase MWC costs. Overall impact difficult to predict.

EPA has determined that CAA §111 requires issuance of the Standards and Guidelines at the level of stringency described in the next chapter. For more elaboration on this point, see Chapter 13 and the *Federal Register* preambles[1] to the Standards and Guidelines.

2.6 Guide to the References

Most of this regulatory impact analysis report is a summary of research reports, analyses, correspondence, minutes of meetings and hearings, policy directives, legal notices, laws, regulations, and other documents relating to the development of CAA §111 regulations for MSW landfills. The principal references are listed in the Bibliography at the end of this report. Consult these references, as well as the preambles that accompany proposal of the Standards and Guidelines in the *Federal Register*, for more detailed information on the Standards and Guidelines. References are held in public dockets and are available for inspection and copying—a fee may be charged for copying—during normal business hours. Contact:

Air Docket (LE-131)
Room M-1500,
Waterside Mall
401 M Street, S.W.
Washington, D.C. 20460

Hours: 8:30 a.m. to noon, 1:30 to 3:30 p.m.
Phone: (202)382-7549

Refer to Docket A-88-09 for all material relating to these Standards and Guidelines.

[1]These preambles will accompany proposal of the Standards and Guidelines in the *Federal Register* later this year.

Chapter 3

The Standards and Guidelines in Brief

3.1 Applicability

The Standards as proposed will apply to MSW landfills that begin receiving waste on or after the date of proposal. The Guidelines will apply to landfills that received waste any time between November 8, 1987[1] and the date of proposal. An MSW landfill is defined as the entire disposal facility in a contiguous geographical space where MSW is placed in or on land. Portions of an MSW landfill may be separated by access roads. An MSW landfill may have sections that are closed or no longer active. However, if a portion of the landfill received waste during the dates mentioned above, the Standards or Guidelines apply to the entire landfill.

The garbage going into MSW landfill facilities is refuse, more than 50 percent of which is waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustible materials; and noncombustible materials such as glass, metal, and rock. It

[1]The Hazardous and Solid Waste Amendments to RCRA of 1984 required states to establish a permit program or other system of approval to ensure that facilities that receive hazardous waste from households and/or small quantity generators are in compliance with 40CFR Part 257. This permit program was to be established by November 8, 1987. The EPA views this permit program as a readily available resource for states to implement the Guidelines.

includes household wastes as well as waste from institutional, commercial, governmental, and some industrial sources, but does not include industrial process wastes, or infectious hospital or medical wastes.

The major provisions of the Standards and Guidelines are identical. The proposed Standards and Guidelines for MSW landfill emissions will require the calculation of the annual nonmethane organic compound, NMOC, emission rate at each affected or designated facility that has a design capacity of greater than 100,000 Mg. (See reference [7] for the basis for selecting this value.) At each facility where the emission rate is equal to or exceeds the regulatory cutoff of 100 Mg NMOC per year, the proposed Standards and Guidelines specify the installation of a well-designed gas collection system and a control device with at least 98 percent destruction efficiency (with or without recovery of energy from gas).

The Standards are expected to apply to about 11 percent of new MSW landfills. The Guidelines will apply to about 12 percent of existing MSW landfills.

3.2 Design Standards and Other Requirements

The Standards and Guidelines will limit emissions from MSW landfills. The composite pollutant, MSW landfill emissions, designated for regulation, includes methane and nonmethane organic compounds, some of which are toxic. EPA views these emissions as a complex aggregate of pollutants that taken together poses a threat to public health and welfare based on the adverse effects of the specific components. A number of factors determine the specific proportion of each constituent of MSW landfill emissions, such as composition, age, and amount of refuse in the landfill, moisture content and pH of the refuse, climate, and the presence of nutrients and/or toxic substances in the landfill. Landfill management practices, such as waste separation, may also affect the composition of the emissions generated. Given the variability of these factors, the exact composition of MSW landfill emissions can vary significantly from landfill to landfill, but the types of compounds are typically the same. The EPA views the air emission mixture in general, from landfill to landfill, to be similar enough to regulate as

one designated pollutant. In order to reduce the burden and complexity of measuring and monitoring the various constituents of landfill gas, NMOC is being specified as the surrogate for measurement purposes.

The proposed Standards and Guidelines are based on the conclusion that the best demonstrated technology will require reducing air emissions of MSW landfills emitting above the regulatory limit with: (1) a well-designed and well-operated gas collection system and (2) a control device capable of reducing NMOC in the collected gas by 98 weight percent. No control is specified for landfills emitting below the regulatory limit.

The following paragraphs summarize the design and equipment standards and other requirements of the Standards and specifications of the Guidelines.

3.2.1 Landfill Gas Collection System

A well-designed and well-operated collection system will, as a minimum:

1. be capable of handling the maximum gas generation rate,
2. allow the operator to monitor and adjust the operation of the system,
3. be able to effectively collect gas from all areas of the landfill that warrant control, and
4. be expandable by addition of further collection system components from new areas of the landfill as they require control.

3.2.2 Control Techniques

There are two basic types of landfill gas control/treatment options available: combustion and purification of the landfill gas. The combustion techniques can be further divided into those based on destruction, such as flares and incinerators, and those based on energy recovery, such as boilers, turbines, and internal combustion (IC) engines.

The Standards will require and the Guidelines will specify that the air emissions collected with the gas collection system be directed through an

emission control device that recovers energy or achieves destruction of the non-methane organic components by a 98 percent minimum weight reduction or by a 20 ppmvd NMOC outlet concentration at 3 percent oxygen.

Gas purification can be performed by the removal of the CO_2 and other contaminants to produce pipeline quality gas. Recovery through purification processes is allowed if the NMOC vent streams from purification systems are routed to control devices with the same specifications mentioned in the previous paragraph (98 percent overall reduction in NMOC).

3.3 Recordkeeping and Reporting

Although an MSW landfill may be accepting refuse under the Standards or Guidelines, the requirement to install collection and control systems will not occur until the time when the calculated NMOC emission rate equals or exceeds the regulatory cutoff. The Standards and Guidelines include initial notification provisions. In addition, if the maximum design capacity of a landfill equals or exceeds 100,000 Mg, the owner or operator would periodically report the NMOC emission rate until such time that either the collection and control systems are installed, or the landfill closes permanently.

Under either the proposed Standards or Guidelines, there are specific reporting requirements addressing the design and installation of the collection and control system. A collection system design plan must be submitted within one year of the date when NMOC emission rate reaches 100 Mg/yr. After the installation of collection and control systems, a report of the initial performance test and semiannual reports will be required to verify proper operation and monitoring of both the collection and control systems.

The Standards will also require and the Guidelines will specify that the following records be maintained: the accumulated refuse in place; the annual calculation of the NMOC emission rate; the collection system design (when applicable), including well or trench locations, depths and spacing; the control device vendor specifications; the initial performance test results; and the monitoring parameters established during the initial performance test of the control device.

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