

**Landfill Review Procedures
for
New Source Review
and
Title V Permitting**

(Effective September 1, 1999)

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I. Purpose

This procedure provides guidance for the review of activities at municipal solid waste (MSW) landfills for the determination of New Source Review, NSPS, Emission Guideline and Title V applicability and requirements. More specifically, guidance is provided for the construction of new MSW landfills, the modification of existing MSW landfills, NSPS and Emission Guideline applicability at MSW landfills, installation of gas collection and control systems at existing MSW landfills, and Title V permitting at new and existing MSW landfills. The Emission Guideline is implemented through Chapter 40, Article 43 of Virginia regulations and is referred to as Article 43 in the remainder of this guidance. The quantity of material referenced in Section XII is an indicator of the complexity of this subject. An MSW Landfill applicability decision tree is included at the end of this guidance in Appendix A.

II. Source Description

A MSW landfill is a stationary source containing an excavation or area that receives and stores household waste and other non-hazardous waste, including municipal sludge and industrial non-hazardous waste, for permanent disposal. However, it is not unusual to find "hazardous materials" in a MSW landfill or in the gas or leachate from the landfill. A MSW landfill may receive conditionally exempt small quantity generator (CESQG) hazardous waste. Furthermore, items that would otherwise be a hazardous waste are not regulated as such when they are contained in household waste. The NSPS uses many of the same waste-type definitions that are used in the solid waste regulations. Unfortunately, these definitions are often inconsistent with the definitions used in the Incinerator and the Municipal Waste Combustor New Source Performance Standards, 40 CFR 60 subparts E, E_a and E_b.

At the landfill, the waste is placed in discrete storage areas called cells. As a cell is utilized, waste is dumped and spread within it, compacted and covered. A temporary daily cover of soil, fabric or other material is used while the cell is being filled. The full cell is covered with a permanent cover composed of soil, clay and/or synthetic materials, as specified in the landfill's solid waste permit.

The design capacity of a landfill may be expressed in terms of volume or in terms of mass. Typically, solid waste permits specify a footprint the landfill can occupy but may also specify the total volume of the landfill. This volume includes soil used as daily and final cover. Cover volume ranges from 17 percent of the landfill volume for deep landfills to 33 percent for shallow landfills. 25 percent is frequently used for estimating purposes.

The primary MSW landfill emissions are landfill gas and particulate matter. Landfill gas is primarily composed of methane and carbon dioxide, but also contains traces of nonmethane organic compounds (NMOCs) which may include hazardous air pollutants (HAPs), volatile organic compounds (VOCs), or ozone depleting substances (ODSs). Landfill gas emissions, at facilities without collection and control systems, are normally non-point source emissions. Point source emissions can occur at leachate treatment facilities and where vents have been installed to control the migration of landfill gas. The sources of particulate matter are fugitive dust from roads, earthmoving activities and waste placement and compaction activities.

Gas collection systems can be either active or passive. Passive systems allow landfill gas to vent under "natural" pressure. Active systems use a fan or other mechanical equipment to create either a positive or negative (vacuum) pressure gradient. Normally, active systems are the vacuum type. The gas collection system may be "uncontrolled" (vented) or controlled by flares, boilers, internal combustion engines, gas recovery for off-site use, or other energy recovery projects.

Solid waste regulations governing gas migration are concerned with preventing landfill gas migration and the accumulation of hazardous (explosive) concentrations of landfill gas. NSPS 40 CFR 60 Subpart WWW and Article 43 are concerned with maximizing the reduction of NMOC emissions from all landfills, considering the cost and effectiveness of the available gas collection and control systems (GCCS). The reduction of methane is an added benefit. MSW facilities that implement controls to comply with solid waste gas migration requirements will not necessarily have to implement controls under the NSPS or Article 43.

Prior to 1987, the EPA considered landfill gas emissions to be fugitive emissions that did not subject landfills to PSD or nonattainment review. In 1987, the EPA determined that, if a gas collection system was installed in a landfill, the emissions could no longer be considered fugitive; but they expected most landfills would not have gas collection systems installed. In his October 21, 1994, memorandum, John Seitz concluded that the EPA's 1987 guidance was in error and stated that, because landfill gas could be collected, it could not be considered fugitive and that new landfills should be evaluated for PSD and nonattainment applicability. The memo also stated that landfills that had already constructed should not be re-evaluated; the requirement to review landfill gas emissions only applied to landfills constructed or modified after the date of the memo. When the EPA issued the NSPS for Municipal Solid Waste Landfills on

March 12, 1996, it also added “Municipal Solid Waste Landfill Emissions (measured as nonmethane organic compounds): 45 megagrams per year (50 tons per year)” to the list of pollutants and emission rates which are “significant” for PSD review. The 50 tons per year significance level was based on the assumption that 80 percent of the NMOCs are VOCs. Much of the NSPS rulemaking effort was involved in determining which landfills could economically be controlled and how much they could be controlled.

NSPS 40 CFR 60 Subpart WWW was incorporated by reference into the Virginia Air Regulations effective May 1, 1997. Article 43 establishes the requirements that must be met by landfills that were constructed prior to May 30, 1991, became effective April 1, 1999.

Permit writers should also be aware of the existence of the U.S. EPA Landfill Methane Outreach Program. Under this program, the use of landfill gas as an energy resource is promoted. Under certain circumstances, Acid Rain SO₂ allowances may be earned by using landfill gas for fuel. The Landfill Methane Outreach Program may raise issues that will have to be addressed in the permit review process. The program may be accessed through EPA’s website or by calling 1-800-STAR-YES.

III. Definitions

“NSPS 40 CFR 60 Subpart WWW new landfill” means a MSW landfill that commenced construction, reconstruction or modification after May 30, 1991. For the purpose of the NSPS, “modification” means an increase in the permitted volume design capacity by either horizontal or vertical expansion. The modification does not occur until construction has commenced on the permitted change. (Derived from NSPS 40 CFR 60 Subpart WWW)

“NSPS 40 CFR 60 Subpart WWW and Article 43 existing landfill” means a MSW landfill which commenced construction, reconstruction or modification prior to May 30, 1991 and which has either accepted waste after November 8, 1987 or is not closed and has additional design capacity available for future waste disposal. (Derived from NSPS 40 CFR 60 Subpart WWW)

“New landfill for new source review, nonattainment review and PSD review” means any greenfield MSW landfill which started construction after October 21, 1994, which is not a transition landfill. (Derived from John Seitz October 21, 1994 memo, DEQ Air Division Policy Statement 1-96, Landfills, April 23, 1996, and amendment to list of “significant” emissions in PART 51)

“Modified landfill for 1999” means a MSW landfill which has increased the permitted design volume capacity by either horizontal or vertical expansion, after May 30, 1991. The modification does not occur until construction commences on the horizontal or vertical expansion. (Derived from NSPS 40 CFR 60 Subpart WWW)

“Transition landfill” means a MSW landfill which, as of April 23, 1996 had not obtained an air permit to construct but had obtained zoning approval, received notification that their solid waste permit application had been deemed complete, had entered into binding agreements or contractual obligations and had not begun actual construction. (DEQ Air Division Policy Statement 1-96, Landfills, April 23, 1996)

IV. New Landfills

All new MSW landfills are subject to NSPS 40 CFR 60 Subpart WWW and are required to submit an initial design capacity report to the administrator (DEQ Regional Director). MSW landfills with design capacities which exceed 2.5 million Mg and 2.5 million cubic meters are also required to estimate nonmethane organic compound emissions, report them to the Administrator and obtain a title V operating permit. Landfills are allowed to convert their design capacity from a volume to a mass and vice versa. This is explained in greater detail in section VIII.

Based on John Seitz’s October 21, 1994 memo, landfill gas emissions can reasonably be collected and therefore should not be considered fugitive for PSD and nonattainment permitting applicability after October 21, 1994. DEQ Air Division Policy Statement 1-96, Landfills, April 23, 1996 further clarified this point. All new or modified (expanded) MSW landfills constructed after April 23, 1996 are required to obtain a permit to construct and operate if the emissions are greater than the appropriate exemption limit. The permit may be a state minor permit, a PSD permit or a nonattainment permit, based on the review of the proposed landfill and its emissions.

The November 14, 1997 revisions to NSPS 40 CFR 60 Subpart WWW added *“When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this subpart shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in §§ 51.166 or 52.21 of this chapter using AP-42 or other approved measurement procedures.”* This applies to state minor permit applicability as well. The landfill gas emissions must also be evaluated for nonattainment applicability as well as Title V applicability for HAPs. For PSD and nonattainment applicability, the

regulated pollutants of concern are NO_x, VOC, and CO. Landfill gas and VOC emissions are estimated using the Landfill Air Emissions Estimation Model (LANDGEM), using the AP-42 emission inventory defaults. For landfills required to install controls, the AP-42 defaults for collection and control efficiency, and the AP-42 default emission factors for secondary compounds for NO_x and CO emissions should be used. The landfill gas VOC, NO_x, and CO emissions must be compared with the 250 ton per year PSD major source threshold and the nonattainment NO_x and VOC major source threshold, 50 tons per year in the Northern Virginia (serious) Nonattainment Area. Title V applicability for HAPs must also be evaluated using LANDGEM. The default HAP speciation is used to evaluate whether single HAP emissions exceed 10 tons per year and whether total HAP emissions exceed 25 tons per year. Estimating emissions is addressed in a later Section.

Using the waste estimator which is included in LANDGEM, any landfill where the fill footprint, in acres times the depth of fill, in feet, is less than 3,200 acre-feet is not expected to be subject to the NSPS or Article 43 because the Design Capacity is less than 2.5 million megagrams. Using the AP-42 default data, the same landfill also is not expected to be subject to Title V for HAPs, unless site specific data produce higher emission estimates than the AP-42 defaults, because 8 tons per year of toluene is the maximum expected of any single HAP and 18 tons per year is the highest expected total HAP at landfills where co-disposal occurred, which is the "worst-case" scenario. Co-disposal is the disposal of commercial/industrial waste and 'residential' waste in the same landfill.

If the design capacity is less than 2.5 million megagrams or 2.5 million cubic meters, the only other NSPS requirement for the source is to submit a revised design capacity report when a change in the design capacity increases the design capacity so that it equals or exceeds 2.5 million megagrams and 2.5 million cubic meters after the change.

If the design capacity of the MSW landfill exceeds 2.5 million megagrams and 2.5 million cubic meters, the landfill is required to calculate the NMOC emission rate annually, using the NSPS defaults, to determine when controls are required, and to obtain a title V operating permit. Controls are not required until the NMOC emission rate, calculated using the regulatory defaults, exceeds 23 Mg per year in northern Virginia and 50 Mg per year elsewhere.

NSPS 40 CFR 60 Subpart WWW requirements are discussed more in Section VI.

V. Modified Landfills

A modified MSW landfill is a MSW landfill that increased the permitted design capacity by either horizontal or vertical expansion after May 30, 1991. The modification does not occur until construction is commenced on the horizontal or vertical expansion. In addition, the March 9, 1998 revisions to NSPS 40 CFR 60 Subpart WWW specifically state that *“Activities required by or conducted pursuant to a CERCLA, RCRA, or State remedial action are not considered construction, reconstruction, or modification for the purposes of this subpart”*. A landfill that is going to modify must submit an initial (or revised) design capacity report, as discussed above for new landfills, listing the total design capacity. While a landfill may have a solid waste permit for each section, the entire landfill is one source under air regulations.

For PSD and nonattainment review purposes, modified landfills are treated the same as new landfills except where the existing landfill is already major for PSD or nonattainment purposes. Where the existing landfill is already major for PSD or nonattainment, municipal solid waste landfill emissions (measured as nonmethane organic compounds) which exceed the PSD and nonattainment significance level of 50 tons per year (40 tons per year of VOC) are subject to PSD and/or nonattainment review. The addition of controls at an existing landfill is not a modification under the state minor permit regulation nor under NSPS 40 CFR 60 Subpart WWW. However, EPA may consider it a modification under PSD and Nonattainment NSR review. Refer to the discussion of pollution control projects in the Estimating Landfill Emissions section of this guidance.

VI. NSPS Landfills

Any MSW landfill that commenced construction, reconstruction or modification after May 30, 1991, is subject to NSPS 40 CFR 60 Subpart WWW and must submit an Initial Design Capacity Report. For MSW landfills, reconstruction refers to the landfill, not to any control devices that may be installed, and, according to the EPA, has no practical meaning for landfills.

VII. Article 43 Landfills

MSW landfills which were constructed prior to May 30, 1991 and either accepted waste after November 8, 1987 (the date solid waste rules requiring gas control were promulgated) or which have additional capacity (have a solid waste permit which allows them to accept additional waste) are subject to the EG. Virginia has implemented the EG by revising 9 VAC 5 Chapter 40 Article 43 to incorporate the elements of the proposed federal implementation plan for the emission guideline,

40 CFR 62, subpart GGG. The revisions to Article 43 have an effective date of April 1, 1999. Although Article 43 is based upon the federal plan, it is organized according to the pattern set for Virginia regulations, which is considerably different from the organization used in the NSPS and the federal plan. If you are familiar with the NSPS, items in Article 43 may not be where you expect to find them, but they will be somewhere in the article. This is most noticeable in the location of the information concerning the “tiers” and when actions are due.

Existing MSW landfills must submit an initial design capacity report by June 29, 1999. Existing MSW landfills with a design capacity that exceeds 2.5 million Mg and 2.5 million cubic meters must also submit an initial NMOC report by June 29, 1999, and will become subject to title V operating permit requirements 90 days after EPA approval of the state’s 111(d) program which implements the emission guideline. A title V operating permit application is due one year after the date a source becomes subject to title V. An existing landfill which is subject to Article 43 and does not exceed the title V threshold is not required to obtain a permit but may desire to obtain a state operating permit to document the landfill’s obligations under Article 43.

In the Northern Virginia Non-attainment area, Article 43 applies to MSW landfills that have a design capacity exceeding 1.0 million Mg.

VIII. Guideline for the Review of Landfill Design Capacity Conversions

To determine applicability, landfills are allowed to convert their design capacity from a volume basis to a mass basis and vice versa. NMOC reports and title V permits are not applicable unless the landfill has a design capacity that exceeds both 2.5 million Mg and 2.5 million cubic meters. This is a change that was made in the 1998 revisions to 1999. The change has been incorrectly interpreted to imply that the default density is 1 Mg per cubic meter, which converts to 1,685.6 lb per cubic yard. The EPA has stated that they did not intend to imply a default density of 1 Mg per cubic meter when they changed the criteria. In fact, the EPA’s LANDGEM includes a calculator for Method 2E that includes a default density of 0.636 Mg per cubic meter (1,072 pounds per cubic yard.) On that basis, landfills that have a design capacity that is less than 3.9 million cubic meters probably do not have a design capacity that exceeds 2.5 million Mg. Landfills which have a design capacity that is less than 2.5 million cubic meters can be assumed to have a design capacity that is less than 2.5 million Mg. Landfills that have a design capacity that exceeds 2.5 million cubic meters should be encouraged to calculate their site-specific density and convert their design capacity to a mass based capacity.

Volume calculation at a landfill is not a simple, straight-forward matter. The landfill shape is dictated by the terrain in which it is situated. The bottom is rarely flat and level, the sides frequently follow the contour of the surrounding terrain, and the top is never flat and level. For the design capacity volume to mass conversion, the volume which is not "solid waste" may be excluded from the total volume of the landfill. Solid waste includes construction debris, contaminated soil and other waste types, in addition to municipal solid waste. As a result, it is really the volume of daily, intermediate, and final cover, and structures which have been placed in the landfill, which can be excluded from the permitted landfill volume when converting from volume to mass. Structures which may have been constructed in the landfill, and which have an impact on the volume, include leachate collection systems, bottom liners, gas collection trenches and wells, and drainage structures. The bottom liner is normally placed on top of a "lower liner" which consists of at least a 2-foot layer of compacted soil.

Certain materials that are solid wastes have been approved for use as daily and intermediate cover. Petroleum contaminated soil and gypsum waste are examples. If a landfill used these materials for daily or intermediate cover, they may not be excluded when converting the design capacity from volume to mass. Some landfills use tarps as daily cover. In this case, there is no volume of daily cover to exclude.

When performing the volume conversion, it is important that everyone speak the same language. The "density of solid waste" may mean the mass of solid waste in the area occupied by the solid waste. It may also mean the mass of solid waste contained in the total landfill volume. Both meanings are "correct" yet the densities will be substantially different. Which meaning to use depends on how the density is determined. The preferred method is to use scale records to determine the mass accepted during a given time period and ground or aerial surveys to determine the corresponding change in volume. Obviously, this method requires use of the second meaning. Another method is to determine the volume available for placement of solid waste and determine the "in-place solid waste density." Both methods have limited accuracy, will result in different "densities" for the same landfill, yet should result in similar estimates of the total waste in place and design capacity.

For the portions of landfills that were constructed prior to 1991, a density that has been calculated by dividing the mass of solid waste by the total volume of the landfill should be considered acceptable if the result is between 500 and 950 lbs per cubic foot. For the portions of landfills constructed after 1991, the acceptable range is 800 to 1,200 lbs per cubic foot. Results falling in these

ranges should be accepted. Results falling outside of these ranges need further review to determine whether they should be accepted.

While most landfills today are very conscious of the cost of both landfill volume and cover material, that was not always the case. As a result, cover practices used today may be considerably different from those used earlier in the life of the landfill. Older guidelines for landfill planning recommended estimating the total landfill volume as 125% of the volume of solid waste to be land filled, while noting that the estimate could range from 117% for a very deep fill to 133% for a shallow fill. Daily cover is fill material that must be applied, on a daily basis, as the waste is placed and is used to control odor, vectors (organisms that carry disease), and wind-blown debris. Intermediate cover is additional cover material that is required on portions of the landfill that will not receive waste during the next 30 days. A "final cover" must be placed on any portion of the landfill which has received waste and will not receive additional waste within the next year. A landfill which has a large surface area and a low waste acceptance rate could require considerably more cover material than would be expected looking at only daily cover requirements.

Factors that affect the density of the material placed in a landfill are the composition of the material itself, the moisture content of the material, the method of compaction used during the collection and transportation of the waste, the method of compaction and lift depth used when the material is placed, and the compaction which results in lower lifts due to the loading from the lifts placed on top of them.

Waste that is taken to the landfill by the individual who generated the waste is usually in a loose or "least compacted" form. Material that is collected in "packer trucks" and transported to the landfill is partially compacted. Material that is taken to a transfer station by the packer truck is further compacted. Material that is baled is compacted even more.

The compaction that results from the vertical development of the landfill varies from almost no impact, which occurs on the top layer which only has the weight of the final cover imposed on it, to the maximum impact, which occurs at the bottom of the landfill and bears the weight of all of the material placed above it. While the landfill is active, the settlement results in "new volume" becoming available. After the landfill is closed, settlement becomes a limitation on acceptable uses for the site. Settlement is an ongoing process in the life of a landfill and is one reason why the reported density may change.

If a landfill wishes to demonstrate that its design capacity does not exceed 2.5 million Mg and 2.5 million cubic meters, the landfill must document its site-specific density. The documentation should include an explanation of how the density was calculated, the assumptions that were made, and the data used. Each landfill owner or operator who converts design capacity from mass to volume or vice versa must annually re-compute the site specific density and maintain readily accessible, on-site records of:

1. The annual recalculation of the site-specific density
2. The current design capacity
3. The supporting documentation.

Solid waste regulations require landfills to maintain "Reasonable records to include date, quantity by weight or volume, and origin of solid waste received and processed." (9 VAC 50-80-250 C.18.) And require that these records be made available.

As a point of reference, the following "typical" density ranges are given:

Waste		
loose refuse		100 to 200 lb per cy
packer truck		500 to 700 lb per cy
baled waste		up to 1,200 lb per cy
Soil		
loose		less than 2,430 lb per cy
medium dense		2,430 to 2,970 lb per cy
dense		2,970 to 3,510 lb per cy
very dense		greater than 3,510 lb per cy

Several sources have made recommendations for an acceptable density for solid waste:

1,100 lb per cy of in-place, compacted waste (Robert A. Corbitt, Standard Handbook of Environmental Engineering, (New York: McGraw-Hill, 1990) 8.118,

reasonable range for in-place, compacted waste, 950 - 1,500 lb per cy Corbitt, 8.122

compacted, in place MSW, 1,100 to 1,400 lb per cy
after settlement and decomposition, 1,700 to 1,900 lb per cy

default for compacted, in place waste, 1,160 lb per cy (Emission Factor Documentation for AP-42 Section 2.4 Municipal Solid Waste Landfills, Revised, (U.S. Environmental Protection Agency, U.S. Government Printing Office: Washington, D.C., 1997) 2.3

1,072 pounds per cubic yard, LANDGEM Method 2E calculator

IX. Gas Migration Control at non-NSPS, non-Article 43 Landfills

The installation of landfill gas controls to meet CERCLA, RCRA or state solid waste permit requirements does not trigger NSPS 40 CFR 60 Subpart WWW or Article 43.

The state minor source permit regulation, in the definition of modification, excludes *“The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or replaced by a system which the board considers to be less efficient”* from activities which are considered modifications. In most cases, the installation of gas migration controls will not require state minor source permit review. After the controls are installed, the source registration should be revised to reflect the change in landfill gas emissions and to account for the emissions from the control system. The one exception is when the landfill proposes to vent the landfill gas emissions without controlling them. While venting does not trigger NSPS 40 CFR 60 Subpart WWW or Article 43, it is considered a modification under the state minor source permit regulation (a change in the method of operation) and requires a review to determine whether a permit to construct is required.

Where passive venting is proposed, the collectable percentage of landfill gas emissions that will result from venting must be compared with the VOC permit exemption level of 10 tons per year for a modified source. If the landfill gas VOC emissions that are vented via the passive system increase more than 10 tons per year, a state minor source permit review must be completed and a permit to construct the passive venting system must be obtained before installing the vents. The landfill gas emissions must also be compared with the 250 ton per year PSD major source threshold and the nonattainment major source threshold, 50 tons per year in the Northern Virginia Nonattainment Area. The collectable percentage of landfill gas can be estimated by assuming a radius of influence for each passive well. Using the radius of influence and the number of passive wells, calculate the area vented and compare with the total area of the waste-containing portion of the landfill.

$$\% \text{ Collectable} = \frac{100 n B r^2}{\text{waste area}}$$

n = number of passive vents
 r = radius of influence. (100 ft is a conservative assumption)

Improved accuracy could be obtained by working with volume, rather than area, but the improvement in accuracy does not justify the additional effort that is required. If the passive vent is a trench, the area affected becomes a rectangle whose width is 2r and whose length is the length of the trench plus 2r.

To provide a benchmark, a fictional landfill has been modeled, whose capacity is 2.5 million megagrams and which is being filled at the rate of 100,000 Mg per year. Both the co-disposal and the non/unknown co-disposal cases have been evaluated, using the AP-42 defaults. The term “co-disposal” is not defined in the regulations. Based on the use of the term in AP-42, co-disposal is where a landfill has accepted other waste, such as commercial and industrial waste, in addition to household waste. According to the Background Document, the co-disposal history of most landfills should be considered “No/unknown.” This is inconsistent with EPA’s use of the term “co-disposal” to refer to a landfill which has accepted any other waste in addition to “household” waste, but does appear to fit with the observed C_{NMOC} concentrations.

Table IX-1. 2.5 Million Mg Landfill Modeling Results

	No/Unk. Co-disposal	Co-disposal
NMOCs, Max. Tons per year	28	112
VOCs, Max. Tons per Year	11	95
Toluene, Max. Tons per year	2	8
Total HAPs, Max.Tons/Year	12	18

Unless a landfill is known to have co-disposal or has site-specific data which result in a C_{NMOC} or an emission rate which is greater than the AP-42 defaults, a landfill which is not subject to the NSPS or Article 43 is not expected to exceed (1) the 250 ton per year PSD major level for VOC, (2) the 50 ton per year serious nonattainment threshold and (3) the 10 and 25 ton per year major HAPs threshold. A landfill where co-disposal is known to have occurred may exceed the 50 ton per year serious nonattainment threshold.

Site specific C_{NMOC} data can be used as an indication that co-disposal has occurred, provided the high C_{NMOC} value is not due to ethane emissions. Ethane should not be counted as either a HAP or a VOC. C_{NMOC} values (excluding ethane) exceeding 1,000 ppmv, as hexane, are an indication that co-disposal may have occurred. Sections 4.2.3-4 of the Emission Factor documentation contain additional information.

Based on the above information, it is possible that installation of passive venting would exceed the state minor permit modification exemption level of 10 tons per year at a landfill with co-disposal. LANDGEM estimates methane generation. This information is used to make assumptions about the emission of methane and other pollutants. Each passive vent can only vent gas from a limited portion of the landfill. If the expected emissions from the entire landfill are close to or less than the VOC exemption level, the passive venting should be exempt from permitting. However, if the expected emissions from the landfill are very large, the amount of gas expected from the passive vents must be estimated and compared with the exemption level.

X. Estimating Landfill Emissions

While AP-42 and 40 CFR 60 subpart WWW give formulas which can be used to calculate landfill gas emissions, LANDGEM is the preferred method. It is important to remember that AP-42 and LANDGEM estimate methane generation. The emission estimates are based on the estimated methane generation and assumptions on the release of methane and other pollutants. LANDGEM contains both the regulatory default values, required in 40 CFR 60 subpart WWW for determining when controls must be added, and the inventory default values which are to be used for emissions inventories, as well as to determine PSD and nonattainment applicability. In using the inventory default values, two choices are given for the NMOC concentration, based on whether co-disposal was known to have occurred. The AP-42 defaults have not speciated all of the compounds present in landfill gas, only the ones for which valid test data exists. Test data indicate that co-disposal does not significantly affect the emissions of the speciated HAPs, with the exception of benzene and toluene. It does, however, have an impact on the total quantity of NMOC emitted.

Where valid, site specific data is available, it should be used rather than the default values. To be valid, the samples must be collected in accordance with EPA method 25C if a collection system has not been installed, or in accordance with subpart WWW 60.754 b. if a collection system has been installed, and the results must be corrected for air infiltration and sample dilution, as explained in AP-42 Section 2.4.4.1.

Table X-1. Landfill Air Emissions Estimation Model Default Values

	AP-42 Inventory	Subpart WWW
k, /yr	0.04	0.05
L ₀ , m ³ /Mg	100	170
C _{NMOC}	595	4,000
C _{NMOC} (if known co-disposal)	2,420	4,000

Before using LANDGEM to estimate HAP emissions, the air pollutant data must be edited to match the 10/97 version of AP-42. When running LANDGEM, it is essential to verify that LANDGEM used the parameters you selected. The current version allows you to select landfill type, either co-disposal or no co-disposal, but it always uses the C_{NMOC} value for no co-disposal. To estimate emissions at a landfill with co-disposal, you must select “user entered values” from the defaults menu and enter C_{NMOC}, k, and L₀ using the “parameter” menu. To estimate the quantity of landfill gas collected by the collection system, the AP-42 recommendation of 75% capture should be assumed.

Table X-2. AP-42 Default Values for VOC and HAPs

	No/unknown Co-disposal	Co-disposal
NMOC, ppmv as hexane	595	2,420
VOC, ppmv as hexane	235 (0.39 NMOC)	2,060 (0.85 NMOC)
Total HAPs, ppmv as hexane	256 (0.43 NMOC)	391 (0.16 NMOC)

VOC guidance is contained in a footnote to Table 2.4-2 and the total HAPs is the sum of the speciated HAPs in Tables 2.4-1 and 2.4-2.

To facilitate HAP estimation and review under the state toxics regulations, Appendix D. has been included. This appendix contains the AP-42 default list of HAPs with their concentrations and exemption levels under the state toxics rule. Toluene is the largest single HAP emitted from a landfill. For no/unknown co-disposal landfills, a landfill that emits more than 150 tons per year of NMOC would emit more than 10 tons per year of toluene. This landfill would have 64 tons per year of total HAPs. For co-disposal landfills, a landfill that emits more than 146 tons per year of NMOC would emit more than 10 tons per year of

toluene. This landfill would have 23 tons per year of total HAPs. (This illustrates that co-disposal has relatively little impact on HAP emissions. As the table above shows, the major impact of co-disposal is on the VOC emission rate.)

Acrylonitrile is the critical HAP, with an annual exemption level of 0.6 tons per year under the state toxics regulations. If the acrylonitrile emissions are exempt under the state toxics regulation, all other HAPs on the default HAP list will be exempt. Using the default concentrations, acrylonitrile emissions will be below the state toxics exemption levels as long as NMOC emissions do not exceed 56 tons per year. As a result, landfills with NMOC emission rates less than 56 tons per year do not require analysis for single HAPs exceeding 10 tons per year and for compliance with the state toxics regulations unless there is site-specific data which shows that the HAP emissions exceed the AP-42 defaults.

After the gas collection system is installed, the landfill gas emission rate may be determined by measuring the flow of landfill gas and using site specific values for C_{NMOC} , if the landfill determined them. A collection efficiency of 75 % should be assumed if the facility cannot measure the gas collected and the AP-42 destruction efficiency for the control device can be assumed if site-specific data is not available. While this is an extremely simplified assumption, obtaining more accurate information on emission rates is not cost effective for either the source or DEQ. The gas that is not collected and controlled should be reported as fugitive landfill gas emissions. Some states have required landfills to report capture efficiency based upon the difference between the AP-42 estimate of emissions and the measured gas collected. This is not recommended because the estimate of emissions is not accurate enough for this purpose and fails to consider other paths and fates, such as biological reduction, for the emissions.

Fugitive dust emissions can occur from many areas within the landfill and must be controlled. 9 VAC 5 Chapter 40 Article 1 (Emission Standards for Visible Emissions and Fugitive Dust/Emissions applies to MSW Landfills. Landfills that are not Title V should not be required to estimate their fugitive dust emissions. Some states have required title V landfills to estimate fugitive PM and fugitive PM₁₀ emissions. At present, Virginia does not consider fugitive dust a fugitive emission. As a result, landfills are required to employ fugitive dust controls but are not required to estimate fugitive PM and PM₁₀ emissions. This is subject to change. AP-42 13.2-1 Unpaved Roads, 13.2-3 Heavy Construction Operations and 13.2-5 Industrial Wind Erosion can be used to estimate fugitive dust emissions, if needed.

Other facilities which are co-located with the MSW landfill, such as composting operations, maintenance operations, scrap metal processing, and tub grinders may also require emissions estimates for pollutants emitted. This should only be required at title V landfills.

After controls have been installed, other pollutants may be emitted from the control device, such as NO_x, PM and CO, which are not otherwise emitted by the landfill. The type and quantity is dependent on the type of control device. AP-42 refers to these emissions as "Secondary Compounds Exiting Control Devices." The EPA has not defined the term "secondary compound" and has issued conflicting guidance concerning whether or not control device emissions require evaluation. An interpretation from EPA on this issue was requested. The EPA's response was that the NO_x, PM and CO emissions from the control device were not secondary emissions and require evaluation for PSD and nonattainment. The EPA is willing to consider the addition of controls at existing landfills, on a case by case basis, under the "Pollution Control Projects and New Source Review (NSR) Applicability" guidance memo by John Seitz, dated July 1, 1994. One of the examples used in this memo is an existing landfill that is adding a control device. Until this issue is resolved, it is recommended that sources adding control at existing landfills apply for the Pollution Control Projects exemption if the emissions from the control device would make the landfill subject to PSD or Nonattainment permit requirements. PCP Exemptions are approved by the permitting authority. With the approval of our PSD program, DEQ is now the permitting authority. The PCP Exemption must be obtained prior to commencing construction if, without the exemption, the source would be subject to PSD or Nonattainment permit requirements.

Caution must be used when using the AP-42 emission factors for secondary pollutants: the factors are based on the quantity of **methane** emitted, not **landfill gas**. The emission factor is also unusual in that it uses dscf per minute to estimate the lbs per hour emission rate.

XI. Permit Contents and Emission Limits

An applicability matrix and supplemental boilerplate conditions have been developed to address the specific new source permitting requirements of MSW landfills and to identify appropriate Title V conditions.

The permit review for new and for modified landfills should include using LANDGEM to determine whether or not NMOC emissions could trigger PSD or nonattainment review. If controls are required to avoid PSD or Nonattainment review, the emissions from the proposed control device also must be evaluated

to determine whether these emissions trigger PSD or Nonattainment review and whether the source should apply for a Pollution Control Projects Exemption. If controls are required for a new or modified landfill, the permit must specify the control efficiency and when the controls must be installed, but should not include pound per hour and ton per year limits based on LANDGEM. This information should be part of the permit package and should be used for the emission inventory, but it does not meet the practical enforceability criteria required for emission limits. MSW Landfill Boilerplate MSWLAND1.CND is for new and mmodified MSW landfills which do not exceed the design capacity criteria and are not subject to title V permit requirements.

For existing landfills, the requirement to add a landfill gas collection and control system may not occur for many years after the opening of the landfill, or may not occur at all. The selection of a control device need not occur until the landfill is required to submit a landfill gas collection and control plan. As a result, the type of control device to be used normally will not be known at the time of permitting a new landfill. Title V permits do not require hourly and annual emission limits for landfill gas, VOCs and HAPs. LANDGEM should be used to estimate NMOC and HAP emissions for the inventory and for fees. MSW Landfill Boilerplate MSWLAND2.CND is for Title V landfills that have not had to install a gas collection and control system. Since the permittee is not required to identify the control device until he is required to submit the LFG collection and control plan, permit limits should not be included for emissions from the control device. However, a landfill that must install controls (becomes major) will have to report the emissions from those controls, will have to pay emissions fees on those emissions, and will have to amend its Title V operating permit to reflect the addition of the control device and the added 1999 or Article 43 requirements for the operation of the particular control device installed. The permit must specify the control efficiency, but the AP-42 data should not be used to set hourly and annual emission limits from the control device. MSW Landfill Boilerplate MSWLAND3.CND is for Title V landfills that have had to install a gas collection and control system.

It is very important that the monitoring, record-keeping, and reporting requirements under 1999 or Article 43 be specified in the permit for those facilities subject to 1999 or Article 43.

Table XI-1. NSPS and Article 43 Applicability

	Register	NSPS	EG	D-C RPT	NMOC RPT	Permit Review	Add NSPS Control	Remarks
Constructed Prior to May 30, 1991								
Closed Prior to November 08, 1987								
No controls	NO	NO	NO	NO	NO	NO	NO	No requirements
Added control after closing	May	NO	NO	NO	NO	After 10-21-94	NO	SOP for Controls
Small, no capacity increase after May 30, 1991	YES	NO	YES	YES*	NO	NO	NO	
Small, no capacity increase after May 30, 1991 added control	YES	NO	YES	YES*	NO	After 10-21-94	NO	SOP for Controls
Small, increased capacity after May 30, 1991	YES	YES	NO	YES	NO	NO	NO	
Small, increased capacity to "large" after May 30, 1991	YES	YES	NO	NO	YES	After 10-21-94		
Large, NMOC < 50 Mg/yr	YES	NO	YES*	NO	YES*	NO	NO	
Large, NMOC < 50 Mg/yr, added controls	YES	NO	YES*	NO	YES*	After 10-21-94	NO	SOP for Controls
Large, NMOC => 50 Mg/yr	YES	NO	YES*	NO	YES*	NO	YES	
Large, NMOC => 50 Mg/yr, added capacity after 05-30-91	YES	YES	NO	NO	YES	After 10-21-94	YES	SOP for Controls

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	Register	NSPS	EG	D-C RPT	NMOC RPT	Permit Review	Add NSPS Control	Remarks
Constructed After May 30, 1991 and								
Before October 21, 1994								
Small	YES	YES	NO	YES	NO	NO	NO	
Small, added controls	YES	YES	NO	YES	NO	NO	NO	
Large, NMOC < 50 Mg/yr	YES	YES	NO	NO	YES	NO	NO	
Large, NMOC < 50 Mg/yr, added controls	YES	YES	NO	NO	YES	After 10-21-94	NO	SOP for Controls
Large, NMOC => 50 Mg/yr	YES	YES	NO	NO	YES	NO	YES	
After October 21, 1994								
Small	YES	YES	NO	YES	NO	YES	NO	
Large, NMOC < 50 Mg/yr	YES	YES	NO	NO	YES	YES	NO	
Large, NMOC => 50 Mg/yr	YES	YES	NO	NO	YES	YES	YES	

*due June 29, 1999 (90 days after the effective date of Article 43, April 1, 1999)

Small = design capacity less than 2.5 million Mg
and 2.5 million cubic meters

D-C RPT means Design Capacity Report

Large = design capacity equal to or greater than 2.5 million Mg
and 2.5 million cubic meters

NMOC RPT means NMOC Emission Rate Report

Permit Review includes state minor, PSD and nonattainment permit requirements

A State Operating Permit may be required to make the controls enforceable to avoid New Source Review

All "large" NSPS landfills are subject to Title V. All "large" Article 43 landfills will be subject to Title V when the state 111.d. plan implementing Article 43 is approved by EPA.

XII. References

40 CFR 60 subpart WWW Standards of Performance for Municipal Solid Waste Landfills, March 12, 1996, amended March 9, 1998.

40 CFR 60 subpart Cc, Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills, March 12, 1996, amended March 9, 1998.

OPATS Summary of NSPS 40 CFR 60 Subpart WWW and Emission Guideline Cc, 1996 (undated)

Emission Factor Documentation for AP-42 Section 2.4, Municipal Solid Waste Landfills, October, 1997

AP-42 Section 2.4, Municipal Solid Waste Landfills, October, 1997

User's Manual, Landfill Air Emissions Estimation Model, Version 1.1, September, 1997

"Emission Inventories for Existing Municipal Solid Waste Landfills with Design Capacities Below 2.5 million Mg or 2.5 million m³," EPA memo from Bruce C. Jordan and Richard G. Kellam to Regional Air Directors, Regions I-X., January 27, 1997

DEQ Air Division Policy Statement 1-96, Landfills, April 23, 1996

9 VAC 5 Chapter 40 Article 43, Emission Standards for Sanitary Landfills, April 1, 1996

ENABLING DOCUMENT FOR THE NEW SOURCE PERFORMANCE STANDARDS AND EMISSION GUIDELINE FOR MUNICIPAL SOLID WASTE LANDFILLS, EPA-453/R-96-004, MARCH, 1996

"Permit Amendments for Gas Controls at Landfills," memo from Hassan ViKili to Peter Schmidt, January 29, 1996

"Impact of Ogden Projects v. New Morgan Landfill," letter from W. Michael McCabe to Kurt W. Reike, January 23, 1996

Air Emissions from Municipal Solid Waste Landfills - Background Information for Final Standards and Guidelines, EPA-453/R-94-021, December, 1995

Ogden Projects Inc. v. New Morgan Landfill Company, Inc. U.S. District Court Decision, September 21, 1995, reversed by presiding Judge February 8, 1996

“Municipal Solid Waste Landfill New Source Performance Standards (NSPS) and Emission Guidelines (EG) ---Issues and Answers,” EPA Guidance, December 3, 1996

“Assignment of SCC Codes to the Municipal Landfills Source Category,” memo from Kenneth R. Meardon to Susan Fairchild-Zapata, November 30, 1994

“Classification of Emissions from Landfills for NSR Applicability Purposes,” memo from John S. Seitz to EPA Regional Air Directors, October 21, 1994

“Eagle Mountain Landfill” letter from Kenneth F. Bigos to Joseph M. Tramma, July 24, 1994

“Pollution Control Projects and New Source Review (NSR) Applicability” guidance memo by John Seitz, dated July 1, 1994.

Landfill Gas Energy Utilization: Technology Options and Case Studies, EPA-600/R-92-116, June, 1992

40 CFR 258, Criteria for Solid Waste Landfills, October 9, 1991

40 CFR 60 1999 Proposed Standards of Performance for Municipal Solid Waste Landfills and Guideline, May 30, 1991 (56 FR 24468)

“Emissions from Landfills,” memo from Gerald A. Emison to David P. Howekamp, October 6, 1987

Frederick S. Merritt, Standard Handbook for Civil Engineers, 3rd ed. (New York: McGraw-Hill, 1983) 22-66,67.

David F. McCartney, Essentials of Soil Mechanics and Foundations, Basic Geotechnics, 3rd ed. (Englewood Cliffs, NJ: Prentice Hall, 1988) 73.

Robert A. Corbitt, Standard Handbook of Environmental Engineering, (New York: McGraw-Hill, 1990) 8.118, 8.122

Emission Factor Documentation for AP-42 Section 2.4 Municipal Solid Waste Landfills, Revised, (U.S. Environmental Protection Agency, U.S. Government Printing Office: Washington, D.C., 1997) 2.3

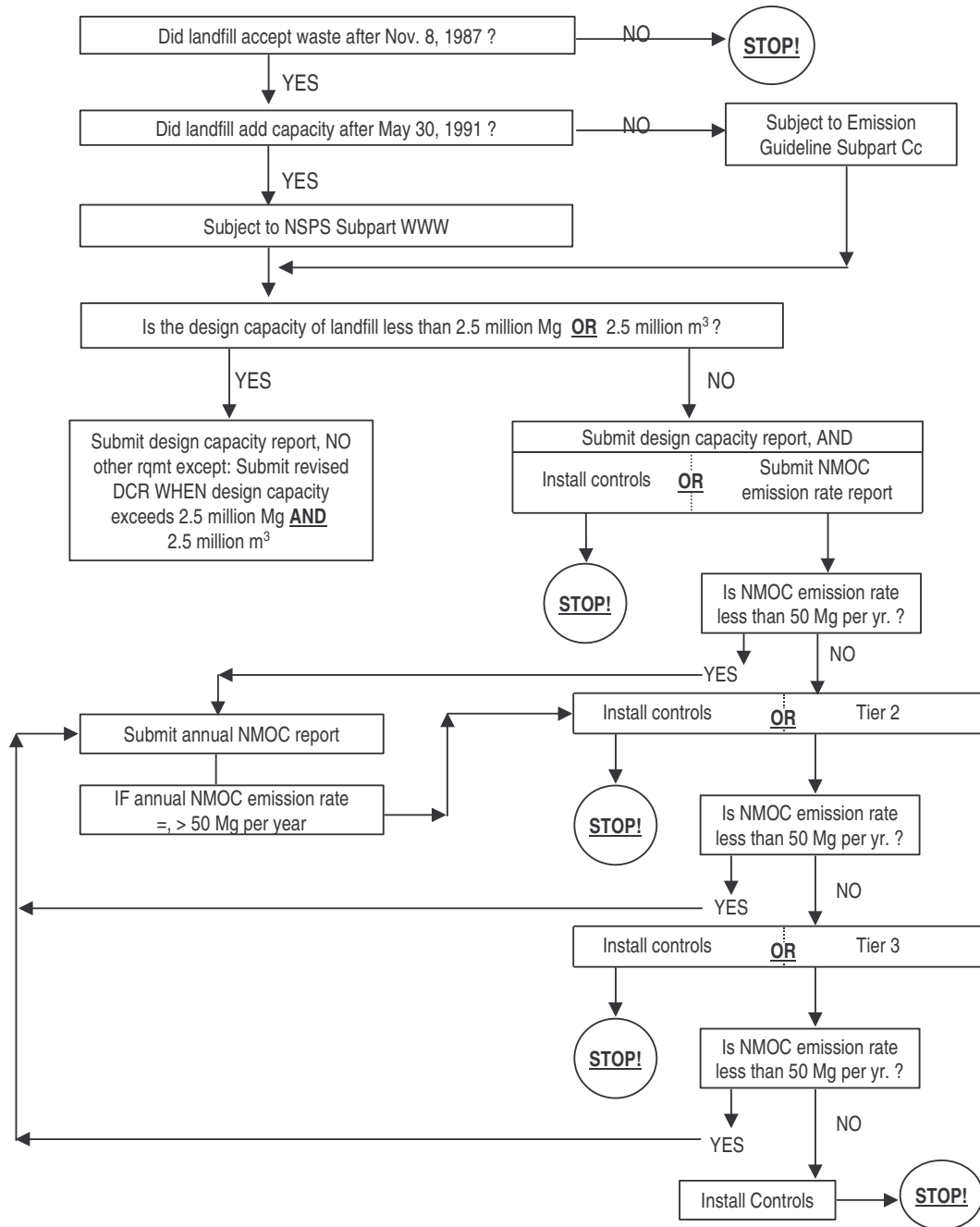
P. Aarne Vesilind & J. Jeffrey Peirce, Environmental Pollution and Control, 2 nd ed. (Boston: Butterworths, 1983) 155

Calvin R. Brunner, Handbook of Incineration Systems, (New York: McGraw-Hill, 1991) 1.11

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Appendix A

MSW Landfill Applicability Decision Tree



Appendix B

The following highlights of 40 CFR 60 1999 are based on a review of the 1996 subpart prepared by the Office of Permit Assistance. The highlights have been revised to reflect the March 9, 1998 revisions to the subpart, which are redlined.

HIGHLIGHTS: 40 CFR 60 1999

§60.750 Applicability, designation of affected facility.

Applies to each MSW landfill that commenced construction, reconstruction or modification on or after May 30, 1991. Physical or operational changes made to an existing MSW landfill solely to comply with Subpart Cc, CERCLA, RCRA or State remedial action are not considered construction, reconstruction or modification for purposes of this section.

§60.751 - Definitions

This section contains 27 definitions of terms used in the regulation.

§60.752 - Standards for air emissions from MSW landfills.

(a) Any MSW landfill having a design capacity less than 2.5 million megagrams by mass or 2.5 million cubic meters by volume shall:

*(1) Submit an initial design capacity report to the Administrator
(DEQ regional director);*

(2) Submit an amended design capacity report if there is an increase in design capacity; if changed design capacity results in a revised design capacity \geq 2.5 million megagrams (Mg) mass and 2.5 million cubic meters volume, the owner or operator shall comply with the provisions of paragraph (b).

! For purposes of Title V of the federal Clean Air Act Amendments of 1990, a landfill with a design capacity < 2.5 million megagrams or 2.5 million cubic meters does not require an operating permit unless otherwise subject to part 70 or 71. Title V operating permits apply to major sources of air emissions; they require annual permit fees based on emissions of pollutants.

(b) Any MSW landfill having a design capacity \geq 2.5 million megagrams and 2.5 million cubic meters shall:

(1) Calculate NMOC emissions (see §60.754) and, if the calculated emission rate is less than 50 megagrams per year, shall:

(i) Submit an annual emission report (See text of the regulation for exceptions);

(ii) Recalculate the NMOC emission rate annually until calculated emission rate is \geq 50 megagrams or the landfill is closed. If rate is \geq 50 megagrams per year, install a collection and control system. If landfill is closed, submit a closure notification.

(A) If the calculated NMOC emission rate is \geq 50 megagrams per year, the owner or operator shall install a collection and control system to comply with (2) below.

(B) If the landfill is permanently closed, a closure notification shall be submitted to the DEQ Regional Director.

(2) If the calculated NMOC emission rate is \geq 50 megagrams per year, the owner or operator is required to:

(i) Submit a collection and control system design plan within 1 year (See text of Sub-part WWW for more details);

(ii) Install a collection and control system within 30 months after the first annual report with an NMOC calculated rate greater than 50 Mg per year. (See text of the Sub-part for more details.)

(iii) Route all collected gas to a control system such as; an open flare designed and operated in accordance with §60.18; a control system designed and operated to reduce NMOC by 98 weight percent, or when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen; route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All emissions from any atmospheric vent from the treatment system shall be subject to the requirements of this section.

(iv) Operate the collection and control device installed to comply with this subpart in accordance with the provisions of §§ 60.753 (Operational standards for collection and control systems), 60.755 (Compliance provisions) and 60.756 (Monitoring of operations).

! The owner or operator of an MSW landfill subject to this subpart with a design capacity \geq 2.5 million megagrams and 2.5 million cubic meters is subject to Title V operating permit requirements. When a landfill is closed, and either never needed control or meets the conditions for control system removal, a Title V operating permit is no longer required.

§60.753 - Operational standards for collection and control system.

This section deals more with solid waste landfill management. Consult the Waste and Water Divisions for assistance or refer to Sub-part WWW and the Enabling Document for details of requirements.

§60.754 - Test methods and procedures.

This section gives the formulas for calculating the NMOC emission rates as required by other sections of the subpart. See the text of the regulation for details.

§60.755 - Compliance provisions.

This section specifies the methods for calculating gas flow rates used for determining whether the gas collection system's design can handle the maximum expected gas flow from the entire area of the landfill. Results are compared with the standards in §60.752. Consult the Enabling Document for assistance. See the text of the regulation for details.

§60.756 - Monitoring of operations.

This section specifies the monitoring and instrumentation requirements for an active gas collection system. Results are compared to the standards in §60.752. See text of Sub-part WWW for details.

§60.757 - Reporting requirements.

(a) The owner or operator is required to submit an initial design capacity report to the DEQ Regional Director, giving:

(1) The initial design capacity and the required notification of construction commencement date, no later than the earliest day from;

(i) June 10, 1996, for landfills that commenced construction, modification, or reconstruction on or after May 30, 1991 but before March 12, 1996 or

(ii) Ninety days after the date of commenced construction, modification, or reconstruction on or after March 12, 1996.

(2) The following additional information:

(i) A map or plot of the landfill, providing the size and location of the landfill, and identifying all areas where solid waste may be landfilled according to the provisions of the State or RCRA construction or operating permit;

(ii) The maximum design capacity of the landfill. Where the maximum design capacity is specified in the State or RCRA construction permit, a copy of the permit may be submitted as part of the report.

(3) The amended design capacity notice of any increase in capacity of the landfill which results in the capacity going to or above 2.5 million megagrams ~~or~~ and 2.5 million cubic meters. The report is to be submitted within 90 days of the issuance of an amended construction or operating permit ...

(b) The owner or operator is required to submit an NMOC emission rate report to the DEQ Regional Director initially and annually thereafter. See the text of the regulation for exceptions.

(1) The report is to contain an annual or 5-year estimate of emission rate calculated using the applicable formula and procedures in §60.754.

(i) The report is to be submitted within 90 days of the date waste acceptance commences ...A subsequent NMOC emission rate report is to be submitted annually thereafter. See the text of Sub-part WWW for exceptions.

(ii) NMOC emission rate reported annually to the DEQ Regional Director, if less than 50 megagrams per year in each of the next 5 consecutive years, may be submitted by the owner or operator, as an estimate of the NMOC emission rate for the next 5-year period in lieu of the annual report.

(2) The report shall include all the data, calculations, sample reports and measurements used to estimate the annual or 5-year emissions.

(3) The owner or operator subject to the requirements of this subpart is exempted from the requirements of paragraphs (b) (1) and (2) above, after the installation of a collection and control system, during times when it is in operation and is in compliance with operational standards for collection and control system under §60.753 and the compliance provisions under §60.755.

(c) An owner or operator subject to the provisions of §60.752(b)(2)(i) is to submit a collection and control system design plan within 1 year of the first report, required under paragraph (b) of this section, in which the emission rate exceeds 50 megagrams per year.

§60.758 - Recordkeeping requirements.

(a) The owner or operator of an MSW landfill subject to the provisions of §60.752(b) is to keep, for at least 5 years, up-to-date, readily accessible, on-site records of the maximum design capacity, the current amount of solid waste in place and the year-by-year waste acceptance rate.

(b) The owner or operator of a controlled landfill is to keep up-to-date, readily accessible records for the life of the control equipment of data listed in paragraphs (b)(1) through (b)(4) of this section as measured during the initial performance test or compliance determination. (See text for details of (b)(1) through (4).)

(c) The owner or operator of a controlled landfill subject to the provisions of 1999 is to keep, for 5 years, up-to-date, readily accessible continuous records of the equipment operating parameters specified to be monitored in §60.756 as well as up-to-date, readily accessible records for periods of operation during which the parameter boundaries established during the most recent performance test are exceeded.

(See (1)(i) & (1)(ii) for details in text which constitute exceedances) ...

(2) The owner or operator subject to the provisions of this subpart is to keep up-to-date, readily accessible continuous records of the indication of flow to the control device or the indication of bypass flow or records of monthly inspections of car-seals or lock-and-key configurations used to seal bypass lines, specified under §60.756.

§60.759 - Specifications for active collection systems.

This section specifies the site of collection wells in active systems and provides a formula for calculating the NMOC emission rate. It also specifies the materials of construction for the equipment or procedures to be used in the landfill gas extraction system. This section deals more with landfill gas collection system design and operation. The Waste and Water divisions and the Enabling Document should be consulted in regard to this section.

Appendix C

40 CFR 60 1999 - Article 43 Cross-reference

Requirement	1999	Article 43
Applicability, Affected Facility. Delegation	60.750	5800
Applicability	60.750(a)	5800 A
Delegation	60.750(b)	NA
Activities That Are Not a Modification	60.750(c)	5800 D
Definitions	60.751	5810 C
Standard for Air Emissions	60.752	5820
Design Capacity < 2.5 MG or M ³ . Initial Design Capacity Report	60.752(a)	5820 B
Amended D C Report	60.752(a)(1)	5820 B 1
DC ≥ 2.5 MG or M ³	60.752(a)(2)	5820 B 2
Design Capacity ≥ 2.5 MG or M ³	60.752(b)	5820 C
NMOC < 50 Mg/year	60.752(b)(1)	5820 C 1
Initial NMOC Report	60.752(b)(1)(i)	5820 C 1 a
Annual or 5 yr Recalculation	60.752(b)(1)(ii)	5820 C 1 b
NMOC ≥ 50 Mg/year	60.752(b)(2)	5820 C 2
GCCS Plan or Tier 1	60.752(b)(2)(i)	5820 C 2 a
GCCS Specification or Tier 2,3	60.752(b)(2)(ii)	5820 C 2 b
Active System Specification	60.752(b)(2)(ii)(A)	5820 C 2 b (1)
Passive System Specification	60.752(b)(2)(ii)(B)	5820 C 2 b (2)
Control System Specification	60.752(b)(2)(iii)	5820 C 2 b (2) (c)
Open Flare	60.752(b)(2)(iii)(A)	5820 C 2 b (2) (c) (1)
98% reduction or Enclosed Combustor	60.752(b)(2)(iii)(B)	5820 C 2 b (2) (c) (2)
Sale or Use of Landfill Gas	60.752(b)(2)(iii)(C)	5820 C 2 b (2) (c) (3)
Operate IAW 60.753,755-6	60.752(b)(2)(iv)	5820 C 2 b (2) (d)
GCCS Removal Specification	60.752(b)(2)(v)	5820 C 2 b (2) (e)

Title V Permit	60.752(c)	5800 C
Landfill Closure	60.752(d)	5800 D
Operational Standards for Collection & Control Systems	60.753	5822
Collect From Each Area....	60.753(a)	5822 A
Operate With Negative Pressure...	60.753(b)	5822 B
Interior Wellhead Temp, N ₂ or O ₂	60.753(c)	5822 C
CH ₄ < 500 ppm, Surface Concentration	60.753(d)	5822 D
Vent Gasses To A Control System	60.753(e)	5822 E
Operate Control System At All Times....	60.753(f)	5822 F
Monitored Exceedence Not A Violation If...	60.753(g)	5822 G
Test Methods and Procedures	60.754	5860
NMOC Rate Calculation	60.754(a)	5860 B 1
Year by Year Waste Acceptance Known	60.754(a)(1)(i)	5860 B 1 (a)
Year by Year Waste Acceptance Unknown	60.754(a)(1)(ii)	5860 B 1 (b)
Tier 1	60.754(a)(2)	5860 B 2
Tier 2	60.754(a)(3)	5860 B 3
Tier 3	60.754(a)(4)	5860 B 4
Alt. C _{nmoc} and k determination	60.754(a)(5)	5860 B 5
Post-GCCS NMOC Rate	60.754(b)	5860 C
NMOC Rate For PSD & NSR	60.754(c)	5860 D
Perf. test for 60.752(b)(1)(ii)(B)	60.754(d)	5860 E
Compliance Provisions	60.755	5850
Compliance for 60.752(b)(1)(ii)	60.755(a)	5850 C
Max Gas Flow for 60.752(b)(1)(ii)(A)(1)	60.755(a)(1)	5850 C 1
Gas Collector Density for 60.752(b)(1)(ii)(A)(2)	60.755(a)(2)	5850 C 2
GCCS flow Rate for 60.752(b)(1)(ii)(A)(3)	60.755(a)(3)	5850 C 3
Expansion Not Required First 180 Days	60.755(a)(4)	5850 C 4
Monthly Well Monitoring	60.755(a)(5)	5850 C 5
Compliance for Alternative Designs	60.755(a)(6)	5850 C 6
Well Installation for 60.753(a)	60.755(b)	5850 D
Surface Monitoring for 60.753(d)	60.755(c)	5850 E

Surface Monitor Specification	60.755(d)	5850 F
Start-up, Shutdown and Malfunction	60.755(e)	5850 G
Monitoring of Operations	60.756	5870
Active Collection System for 60.752(b)(2)(i)(B)	60.756(a)	5870 C
Enclosed Combustor for 60.752(b)(2)(iii)	60.756(b)	5870 D
Open Flare for 60.752(b)(2)(iii)	60.756(c)	5870 E
Other Device for 60.752(b)(2)(iii)	60.756(d)	5870 F
Alternative Monitoring Approval	60.756(e)	5870 G
Surface Monitoring Frequency for 60.755(c)	60.756(f)	5870 H
Reporting Requirements	60.757	5880
Initial Design Capacity Report	60.757(a)	5880 C
NMOC Emission Rate Reports	60.757(b)	5880 D
Gas Collection And Control System Design Plan	60.757(c)	5880 E
Closure Report	60.757(d)	5880 F
Equipment Removal Report	60.757(e)	5880 G
Active Collection System Annual Report	60.757(f)	5880 H
Performance Test Report for 60.8 and 60.752(b)(2)(iii)	60.757(g)	5880 I
Recordkeeping Requirements	60.758	5890
Design Capacity, Waste in Place & Waste Acceptance	60.758(a)	5890 C
Performance Test Parameter Results	60.758(b)	5890 D
Equipment Parameter Monitoring for 60.756 and Exceedences to Report in 60.757(f)	60.758(c)	5890 E
Plot of GCCS System and Excluded Areas	60.758(d)	5890 F
Operational Parameter Exceedences for 60.753	60.758(e)	5890 G
Annual Density Re-calculation	60.758(f)	5890 H
Specifications for Active Collection Systems	60.759	5824
Gas Collection System Design Specification	60.759(a)	5824 A
Gas Collection System Material & Installation	60.759(b)	5824 B
Gas Mover Sizing	60.759(c)	5824 C

Appendix D.

LFG Constituent Default Concentrations and Toxic Exemption Levels

Hazardous Air Pollutant	Default Concentration (ppmv)	Exemption Levels	
		(lb/hr)	(ton/yr)
1,1,1-Trichloroethane (methyl chloroform)	0.48	22.8	100
1,1,2,2-Tetrachloroethane	1.11	0.5	1.0
1,1-Dichloroethane (ethyldene dichloride)	2.35	22.8	58.7
1,1-Dichloroethene (vinylidene chloride)	0.2	2.6	2.9
1,2-Dichloroethane (ethylene dichloride)	0.41	2.6	5.8
1,2-Dichloropropane (propylene dichloride)	0.18	16.8	50.3
Acrylonitrile	6.33	0.3	0.6
Benzene - Co-disposal	11.1	2.1	4.6
Benzene - No or Unknown Co-disposal	1.91	2.1	4.6
Carbon disulfide	0.58	2.0	4.5
Carbon tetrachloride	0.004	2.1	4.5
Carbonyl sulfide	0.49	n/a	n/a
Chlorobenzene	0.25	3.0	6.7
Chloroethane (ethyl chloride)	1.25	22.8	100
Chloroform	0.03	3.2	7.1
Dichloromethane (methylene chloride)	14.3	11.5	25.2
Ethylbenzene	4.61	17.9	62.9
Hexane	6.57	11.6	25.5
Mercury	2.92E-04	0.001	0.001
Methyl ethyl ketone	7.09	22.8	85.6
Methyl isobutyl ketone	1.87	10.1	29.7
Perchloroethylene (tetrachloroethylene)	3.73	22.8	49.1
Toluene - Co-disposal	165	12.4	27.3
Toluene - No or Unknown Co-disposal	39.3	12.4	27.3
Trichloroethylene (trichloroethene)	2.82	22.8	39
Vinyl chloride	7.34	0.9	1.9
Xylenes	12.1	21.5	62.9

Acrylonitrile is the critical HAP. Exemptions may reach state toxics exemption level of 0.6 TPY when NMOC emission rate exceeds 56 TPY.

Toluene is the largest single HAP emitted.

Appendix E.

Landfill Applicability Example

An Existing landfill is proposing to expand and wants to know if the modification requires a permit under New Source Review.

The current landfill capacity is 1,497,550 Mg.

The proposed expansion has a capacity of 911,220 Mg and a 10-year life. The expansion is projected to open in the year 2000 and have a uniform waste acceptance rate of 91,122 Mg/year. The landfill is projected to close in 2011.

Emissions from the existing landfill and expansion were calculated using EPA's Landfill Gas Emissions Model, Version 2.0. Input parameters are summarized below:

Expansion Design Capacity:	911,220 Mg
Methane Generation Rate (k):	0.4 l/Yr
Potential Methane Generation Capacity (Lo):	100 m ³ /Mg
Landfill Type:	Municipal/No Co-Disposal
NMOC (ppmv hexane)	595
Year Landfill Opens:	2000
Year Landfill is Full	2010
Year Landfill Closes:	2011

Peak NMOC annual emissions occur the year the landfill is filled (2010) and are estimated at 37 tons per year by assuming 1,497,550 Mg of waste was all put in place the year in 1999. (While conservative, it is the only choice with the available data) By modeling the expansion alone, the peak NMOC emission rate due to the expansion is determined to be 14 tons per year.

Maximum VOC emissions from the expansion are 5.5 tons per year, based on VOC fraction of NMOC of 0.39 for municipal landfills with no/unknown co-disposal status. (14 tons/yr NMOC x 0.39). Also, the facility is not major for either NMOC or VOC before and after the expansion.

Total HAP emissions are from the expansion are estimated at 6.0 tons per year, based on total HAP fraction of NMOC of 0.43 for municipal landfills with no/unknown co-disposal status. (14 tons/yr NMOC x 0.43). Therefore the expansion is not major for a single HAP as well as total HAPs.

Total HAP emissions from the expanded landfill are 15.9 tons per year. The expanded landfill will not be major for total HAP, but it could be for a single HAP. To find the largest single HAP emitted, the default HAP list from AP-42 is used. This list is provided as Appendix D. Toluene has the highest concentration on the list, 39.3 ppmv. The toluene fraction is 0.066 (39.3 ppmv) 595 ppmv). Toluene emissions are 2.4 tons per year (37 tons /yr NMOC x 0.066).

For state toxics evaluation, the default HAP list from AP-42 is used. This list, with exemption levels, is provided as Appendix D. Since the NMOC emission rate is less than 56 tons per year, all toxic emissions are expected to be below the state toxics exemption level.

Since the change is not major for any single HAP or for total HAPs, is exempt under the state toxics regulation, and the 5.5 tons per year are below the VOC modification exemption level of 10 tons per year, the modification is exempt from NSR permitting.