

# Landfills and Air Construction Permitting

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**IowaDNR**

The Iowa Department of Natural Resources

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# Overview

- Air emissions from a landfill
- Federal air regulations that apply to a landfill
  - Subpart WWW and Cc
- Permit requirements for a landfill
- LandGEM
- What to expect in a construction permit



# Landfill – Air Contaminant Sources

- Landfilling of MSW (Municipal Solid Waste) has been the primary method of disposal in U.S.
- What is the source of air emissions at a landfill?
  - The landfill itself – gases generated either collected or uncollected
    - 1994 EPA determination that LFG can be “reasonably” captured
  - Other point sources – stationary engines, boilers, flares
  - Other fugitive sources – roads, waste handling

# Landfill Gas

- From landfill itself:
  - Gases created by decomposition of waste under anaerobic conditions (oxygen starved)
  - Primary gases created are:
    - Carbon dioxide (CO<sub>2</sub>), approx. 50%
    - Methane (CH<sub>4</sub>), approx 50%
    - Other organic compounds (Non methane organic compounds - NMOC), approx 1%
    - Other non-organic compounds (e.g. hydrogen sulfide)

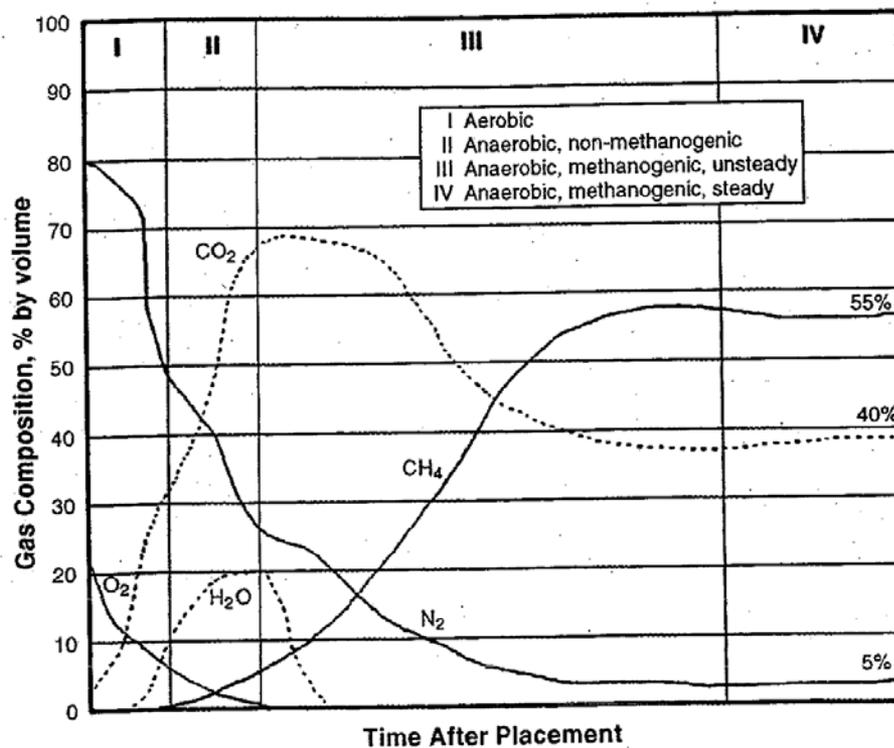


# Landfill Gas

- Gas composition and generation rate vary from landfill to landfill
- Depends on: waste composition, landfill design, anaerobic state
- Rate of gas generation varies over time
- EPA estimates that a landfill typically will emit gas at a stable rate for 20 years after it has been closed

# Landfill Gas

Guidance for Evaluating Landfill Gas



Note: Time scale (total time and phase duration) of gas generation varies with landfill conditions (i.e., waste composition and anaerobic state).



# Landfill gas

- Landfill gas may:
  - Contribute to ground level ozone formation
  - Cause an odor nuisance
  - Cause a fire potential due to methane migration
  - Contribute to toxics in ambient air which can cause health problems
  - Contribute to climate change problems due to large emissions of carbon dioxide and methane.

# Air Regulations

- March 12, 1996, EPA issued air regulations for MSW landfills
- EPA determined: *“MSW landfills cause or contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare”*.
- Air pollutant regulated: NMOC (nonmethane organic compounds)
- NMOC consists of Volatile Organic Compounds (VOC), organic hazardous air pollutants (HAP), odorous substances
- Regulations intend to significantly reduce problems caused for LFG emissions (including methane migration into buildings)



# Air Regulations - WWW

- Two regulations were written:
  - Subpart WWW and Subpart Cc
  - Regulations apply to the entire landfill (open and closed sections)
- Subpart WWW applies to:
  - MSW landfills that commenced construction, reconstruction or modification after May 30, 1991
  - Modification: increase in volume design capacity by either horizontal or vertical expansion
- No size cut-off for WWW applicability
- Applies to open and closed landfills
- Iowa DNR adopted WWW into IAC at 567 23.1(2)“rrr” by reference

# Air Regulations - Cc

- Subpart Cc (emission guideline) applies to:
  - MSW landfills that **have not** commenced construction, reconstruction or modification after May 30, 1991
- Important: landfills closed prior to November 8, 1987 are not regulated by Subpart Cc
- Cc has same requirements as WWW
- No size cut-off for Cc applicability
- Applies to open and closed landfills
- Iowa DNR adopted Cc into IAC at 567 23.1(5)"a"



# WWW and Cc requirements

- Submit a design capacity report on capacity of landfill
  - Initial report to have been submitted to the Iowa DNR Air Quality Bureau by June 10, 1996
  - If landfill design capacity is less than 2.5 million megagrams or less than 2.5 million cubic meters, this is the only requirement from federal rules NSPS and Cc.
- Submit amended report if “small” landfill increases capacity up to or above the thresholds. Due 90 days after date of commencement of expansion.
  - Commenced construction will usually mean installing liner for new cell
- The design capacity is maximum amount of waste a landfill can ultimately accept. However, this capacity can be limited by a permit issued by the DNR.



# Design Capacity Report

- Required information to be submitted:
  - Map or plot of landfill, identifying all areas where solid waste may be landfilled
    - Includes closed areas
  - Maximum design capacity
    - Calculate using good engineering practices, per rule
    - Can be limited by construction permit
  - Design capacity can be either in volume or mass.
    - Should include site specific density of waste. This may change.



# WWW and Cc requirements

- If landfill's design capacity is equal to or greater than 2.5 million megagrams and 2.5 million cubic meters, there are additional requirements.
- Emissions of NMOC from entire landfill must be calculated and reported to Iowa DNR, Air Quality Bureau, annually.
  - Can be done as a five year estimate, with a report to DNR ever five years.
  - This report should include all data, calculations, sample reports and measurements.
- Subpart WWW spells out procedures used to estimate NMOC emissions
  - Tier method – must be followed



# NMOC Estimation

- Tier 1 (simplest method)
  - Estimate NMOC emissions (Megagrams/yr) using equation in W<sub>WW</sub> and regulatory default values:
    - 4000 ppm NMOC concentration in landfill gas ( $C_{nmoc}$ )
    - 0.05 for the methane generating rate ( $k$ )
    - 170 cu meters/mg for methane generation potential ( $L_o$ )
  - Very conservative
  - If NMOC emissions are greater than 50 Mg/yr, gas collection system required or use Tier 2 method

# NMOC Estimation

- Tier 2 (more accurate than Tier 1)
  - Estimate NMOC emissions (Mg/yr) from equation in WWW using **actual** measured concentration of NMOC in landfill gas and default values for methane generating rate ( $k$ ) and methane generation potential ( $L_0$ )
  - This requires the entire landfill to be sampled using EPA method 25 or method 25C. Two samples per hectare of landfill up to a maximum of 50 samples. Samples are analyzed and actual NMOC concentration determined.

# NMOC Estimation

- Tier 2 (continued)
  - If NMOC emissions are equal to or greater than 50 Mg/yr, gas collection system required or use Tier 3 method
  - If NMOC emissions are less than 50 Mg/yr, no gas collection system is required
  - Tier 2 sampling for NMOC must be done every five years
    - DNR - AQB should be notified before test is done
    - Results of Tier 2 sampling should be sent to DNR - AQB

# NMOC Estimation

- Tier 3 (most accurate)
  - Estimate NMOC emissions (Mg/yr) from equation in WWW using **actual** concentration of NMOC in landfill gas and **actual** value for methane generating rate (k)
  - If NMOC emissions are equal to or greater than 50 Mg/yr, gas collection system required
  - If NMOC emissions are less than 50 Mg/yr, Tier 2 sampling required every 5 years

# Gas collection and control

- If LFG collection and control required by WWWW to be installed\*:
  - Design plan must be submitted to AQB within 12 months
  - Plan must be reviewed and approved by AQB
  - System must be operating within 30 months

\* Only if NMOC emissions = or > 50 Mg/yr



# WWW requirements

- In addition to calculating and reporting NMOC emissions, large landfills (design capacity > 2.5 million Mg and 2.5 cu. meters) must also apply for a Title V operating permit for the landfill
  - Application to be submitted 15 months after commencing the construction or modification that put landfill over the threshold

# Summary of requirements

- Small landfills (capacity < 2.5 million Mg or 2.5 million cu. Meters)
  - Submit design capacity report
  - Have air construction permit with a capacity limit; modify permit when expanding capacity of landfill
- Large landfills
  - Submit design capacity report
  - Have construction permit and Title V operating permit
  - Calculate and report NMOC emissions annually
  - Install gas collection and control system as required by rule



# NESHAP Standard - AAAA

- A portion of NMOC emissions are hazardous air pollutants (HAP): toluene, vinyl chloride, xylene
- Part 63 Subpart AAAA regulates HAP emissions from landfill
- Applies to 3 types of MSW landfills:
  - 1. Landfill is major for HAPs
  - 2. Landfill is not major for HAPs, but is large and has uncontrolled NMOC equal to or greater than 50 Mg/yr
  - 3. Landfill has a bioreactor, is large, and was not permanently closed as of Jan. 16, 2003

# Questions

- Question on federal rules (Subparts WWW and Cc) applicability for your landfill?

# Construction Permitting

- Construction permitting for a landfill
  - IAC 567 – 20.1 “Scope of title”:
  - The department has jurisdiction over the atmosphere of the state to prevent, abate and control air pollution, by establishing standards for air quality and by regulating potential sources of air pollution through a system of general rules or specific permits.

# Construction Permitting

- The construction and operation of any new or existing stationary source which emits or may emit any air pollutant requires a specific permit from the department unless exempted by the department.
- Air construction permits required for construction, reconstruction or modification after 9/23/70.

# Construction Permitting

- Landfills are regulated by solid waste rules, and the air quality State and Federal rules.
- DNR Solid Waste operates separately from DNR Air Quality Bureau.
- Any air related issues/projects should be directed to Air Quality Bureau (reports, notifications, applications, etc.)

# Air construction permit for the landfill itself

- Iowa rule requires either a permit or exemption. Per 567-22.1(1) “...a permit shall be obtained prior to the initiation of construction, installation or alteration of any portion of the stationary source”.
- Landfills are able to capture the gas, therefore emissions are not considered fugitive (EPA Determination, Seitz Memo, 10/21/94).

# Air construction permit for the landfill itself

- What are fugitive emissions?
  - *Those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening*
- EPA determined that emissions from landfills can be reasonable captured because gas collection systems have been installed.

# Air construction permit for the landfill itself

- AP-42 states that reported collection efficiencies range from 60-85% with an average collection efficiency of 75% assumed.

# Air construction permit for the landfill itself cont.

- The permit will cover the landfill such that if additional collection wells/vents are added, a permit amendment is not required. This allows the landfill greater operational flexibility.

# Landfill permitting cont.

- The permit could be used to limit the capacity of the landfill to keep below 2.5 MMMg and 2.5 MM cubic meters thereby avoiding Title V. Permit required even if not taking limits.
- Additional limitation may be necessary to remain syn. minor for any future Greenhouse Gas (GHG) regulations. LandGEM calculates NMOC and GHG emissions.

# Landfill permitting cont.

- NOTE: The permit will cover only the landfill. Any other emission source would still need a separate air construction permit or exemption.
- Additional note: the permit applies to all parts of the landfill, open and closed.

# Construction Permit Applications

- Permitting the landfill would require:
  - Coverletter, Forms: FI (facility information); EU (Emission Unit); EP (emission point); EC (emission calculations); GHG (Greenhouse Gas); EI (emission inventory); and FRA (Federal Regulatory Applicability).

# Construction Permit Applications cont.

- Permitting the other emission units would require:
  - Coverletter, Forms: FI (facility information); EU (Emission Unit); EP (emission point); EC (emission calculations); GHG (Greenhouse Gas); EI (emission inventory); FRA (Federal Regulatory Applicability), MD (modeling determination); MI-1 (plot plan); & MI-2 (modeling information).

# Permitting Class

- DNR is going to hold a permitting class to assist landfills in filling out the forms.
- There will be a survey given out at the end of this meeting to determine the best format, i.e.
  - Group training;
  - One-on-one training;
  - Group training w/ one-on-one training at DNR office;
  - One-on-one training at the field office.

# Construction Permit Applications

- Form EC: In order to determine emissions, LandGEM would need to be completed and submitted.
- LandGEM emissions would be used to fill out Form EI. The PTE is used to determine the status of the landfill (i.e. Minor, Syn. Minor, Major for Title V, Major for PSD).

# Construction Permit Applications

- LandGEM also used to determine GHG emissions (see LandGEM example).
- If there are other emission sources at the landfill, air construction permit(s) are required.
- Typical sources include: engines, flares, chippers/shredders.

# Construction Permit Applications cont.

- All emission units are required to be included in Form EI (emission inventory).
- Haul roads considered fugitive and a permit is not required.

# Construction Permit

- What to expect in a construction permit
- See example permit for a “small” landfill
- Each landfill is different and actual permit that is issued may be different
- Facility can be issued a draft permit if requested

# Questions?

- NOTE: There is a FAQ on landfills available on the web:

[www.iowadnr.gov/air/prof/const/const.html](http://www.iowadnr.gov/air/prof/const/const.html)

# Contact Information

- Contact information for any questions on training or obtaining air construction permits.
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