Lining systems – Protection layer

Landfill gas management – **Purpose and types of collection systems**

Landfill gas management systems are installed to **prevent** the **build up of gases** within the landfill and to prevent **migration of landfill gas** through the underlying strata.

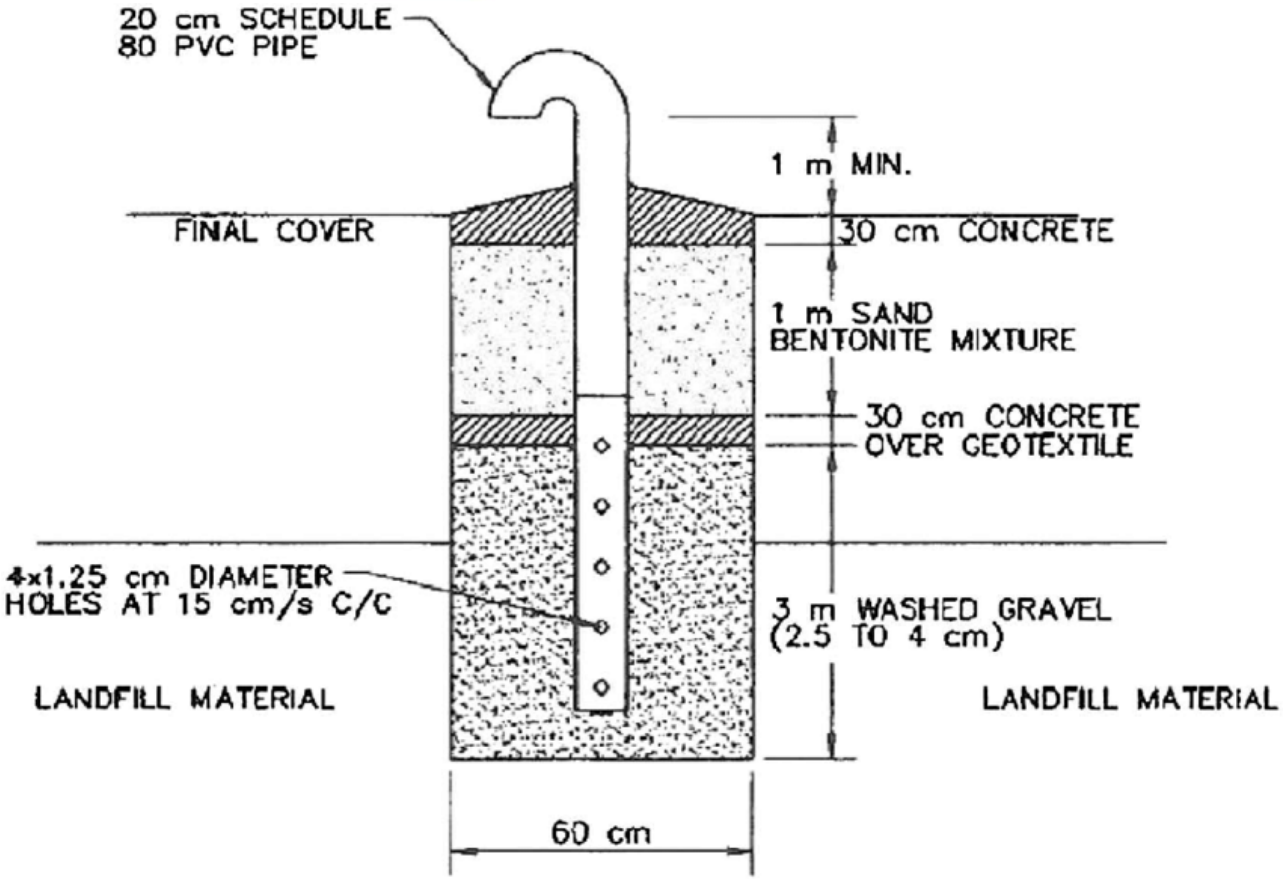
There are **2 ways** landfill gas can be managed:

Passive management systems comprise of wells with perforated tops to allow the gas to vent into the atmosphere

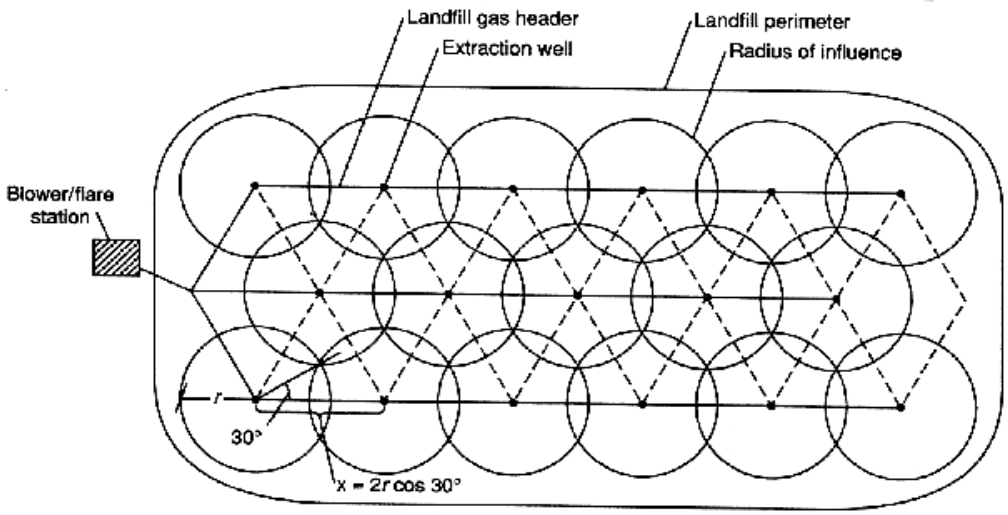
Active management systems involve the active extraction of the gas.

The extracted gas can be used to generate electricity.

Landfill gas management – **Passive collection systems**

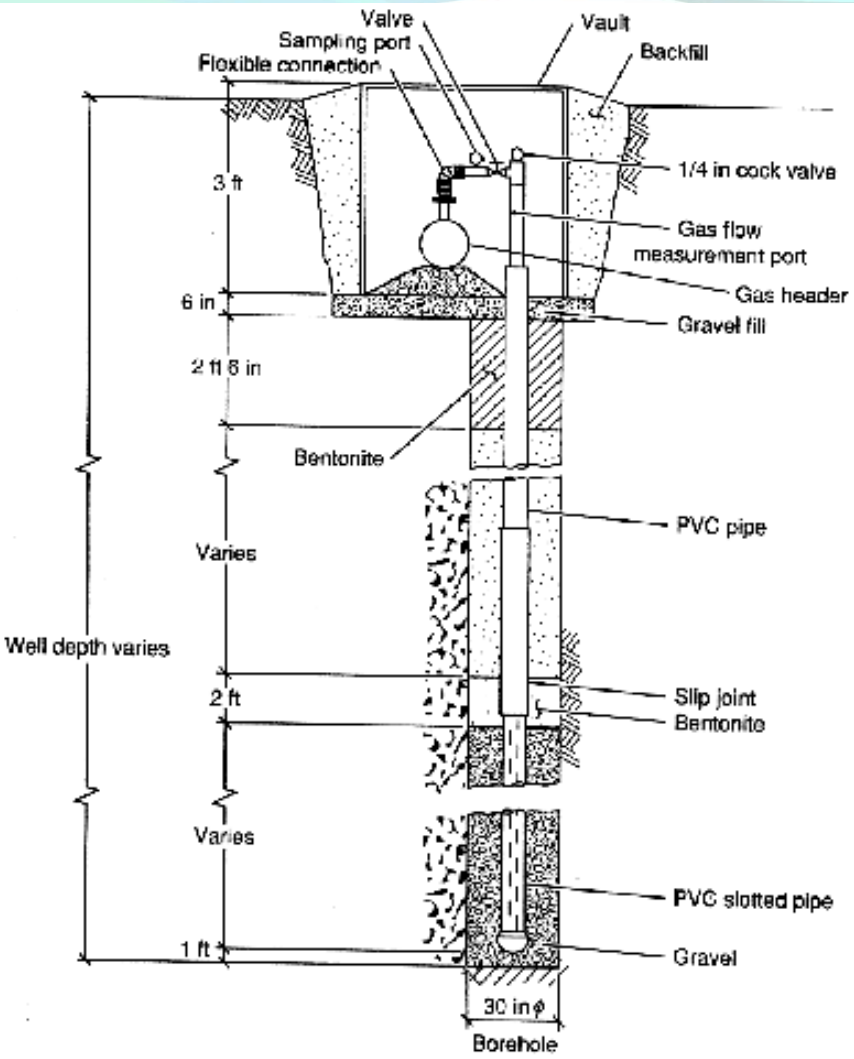


Landfill gas management – **Active collection systems**

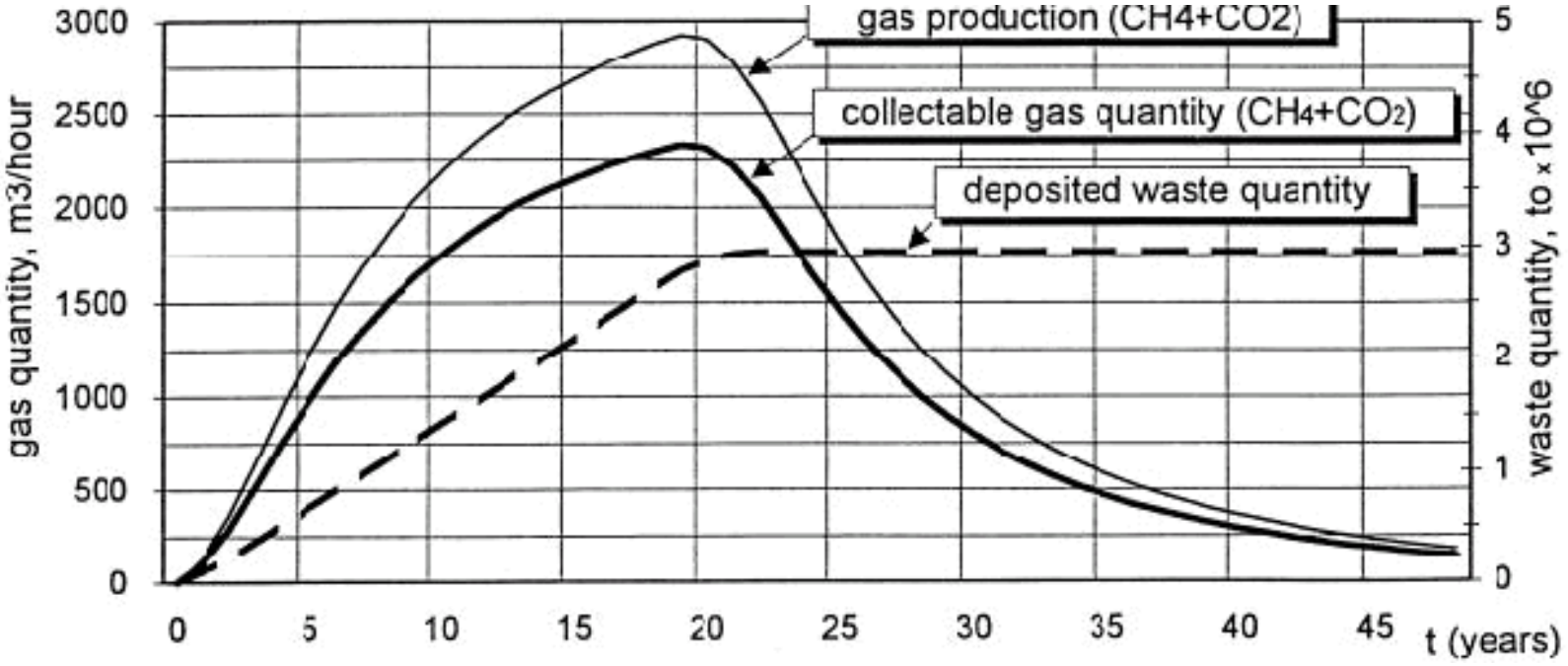


Gas flow, scfm	Pressure in well, in of H_2O	Well depth, ft	Radius of influence, ft	Medium	Location
30	-7.5	40 (4"/8")*	200	Refuse	Winnebago, WI
36	-6.5	45 (6"/36")	150	Refuse	Kitchener, Ontario
41	-7.0	27 (12"/24")	100	Sand	Kitchener, Ontario
45	-	27 (12"/24")	200	Refuse	Winnebago, WI
235	-39	- (6"/-)	500	Refuse	Seattle, WA
240	-40	40 (6"/-)	-	Refuse	Seattle WA
320	-14	110 (-/-)	500	Refuse	Palos Verdes, CA

* Well pipe diameter/borehole diameter



Landfill gas management – **Active collection systems**



Landfill gas management – **Active collection systems**

LandGEM - Landfill Gas Emissions Model, Version 3.02

U.S. Environmental Protection Agency

Model Design:

Worksheet Name	Function
INTRO	Contains an overview of the model and important notes about using LandGEM
USER INPUTS	Allows users to provide landfill characteristics, determine model parameters, select up to four gases/pollutants (total landfill gas, methane, carbon dioxide, NMOC, and 46 air pollutants), and enter waste acceptance rates
POLLUTANTS	Allows users to edit air pollutant concentrations and molecular weights for existing pollutants and add up to 10 new pollutants

About LandGEM:

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at

A | B | C | D | E | F | G | H | I | J

1 METHANE — **Landfill Name or Identifier:**

2

3 First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^{n} \sum_{j=0.1}^{1} kL_o \left(\frac{M_i}{10}\right) e^{-kt_{ij}}$$

4 Where,

5 Q_{CH4} = annual methane generation in the year of the calculation ($m^3/year$)

6 i = 1-year time increment

7 n = (year of the calculation) - (initial year of waste acceptance)

8 j = 0.1-year time increment

9 k = methane generation rate ($year^{-1}$)

10 L_o = potential methane generation capacity (m^3/Mg)

11

12 **When Model Calculates Closure Year**

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

Model Parameters from User Inputs:

k = 0,050 $year^{-1}$

L_o = 170 m^3/Mg

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