Hudson Valley
Landfill Biofilters Project Kick-off

Hudson Valley Regional Council

Agenda

- Project Background
- Landfills and Biofilters
- Project Planning
- Next Steps

Introductions

- Carla Castillo, Executive Director, Hudson Valley Regional Council (HVRC)
- Eleanor Peck, Deputy Executive Director, Hudson Valley Regional Council (HVRC)
- Mary Lambert, Climate Action Planning Manager and Landfill Biofilters Project Manager, Hudson Valley Regional Council (HVRC)

Project Background

About the Grant

EPA United States Environmental Protection Agency

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- Tackling Climate Pollution

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Hudson Valley Regional Council (New York)

CLIMATE POLLUTION REDUCTION GRANTS
U.S. Environmental Protection Agency

On this Page:

- Overview
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- Key Things to Know

Overview

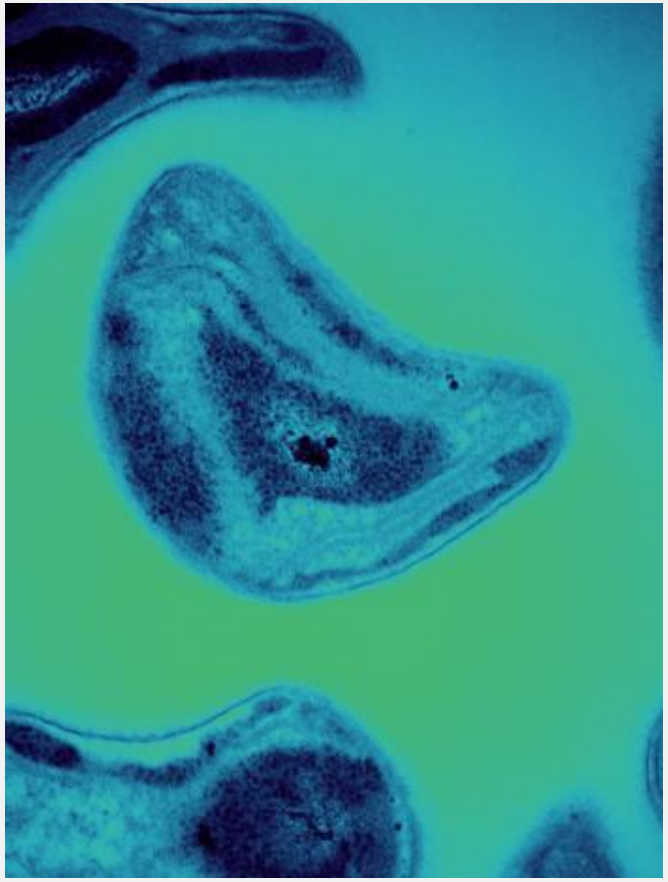
Anticipated Award Amount	$3,059,400
Applicant	Hudson Valley Regional Council (New York)
Application Title	Mid-Hudson Municipal Landfill Emissions Mitigation
Sectors	Agriculture and Working and Natural Lands Electric Power Waste and Materials Management
Estimated GHG Reductions [1]	**Cumulative 2025-2030:** **0.17** million metric tons CO_2 equivalent **Cumulative 2025-2050:** **0.47** million metric tons CO_2 equivalent

Landfill Issues?

- Municipal landfills are often by far the largest source of government operations greenhouse gas emissions in a given municipality.
- Most landfills are too small to warrant methane capture for energy production – or even flaring.
- Many are contaminated and under investigation from NY State.
- Some emit foul smells and/or do not support native habitat

Why Biofilters?

- Biofilter microorganisms (methanotropes) break down methane emissions converting them into energy or other relatively harmless byproducts.
- Reduce other common pollutants, such as volatile organic compounds (VOCs), hydrogen sulfide and ammonia.
- Mitigate foul odors.



Credit: Oak Ridge National Laboratory

Why Biofilters?

- Put landfills to use – as a source of municipal GHG emissions reductions.
  - Assist NYS towards reaching CLCPA goals
  - Earn points under NYS Climate Smart Communities program
  - Potential generation of carbon credits
- Position landfill as a potential source of revenue generation (solar), climate resilience (battery storage).
- Leverage landfill borders for local ecosystem support (native pollinators).
- Opportunity to create a positive narrative of landfill as a climate mitigation and adaptation solution.

In Summary

- Natural and Environmentally friendly
- Cost-effective
- Low maintenance post-implementation
- Efficient

Landfill biofilter and biocover studies / projects from the Italy, Denmark, Germany and the U.S. (among others) for decades have demonstrated methane reductions anywhere from 30-95%.

Biofilter Criteria?

- Landfill has declining gas flow and declining gas quality.
- Gas wells are not producing significant methane.
- Wells are not connected to an active gas collection system.
  - Active wells use vacuum pumps or blowers to actively pull landfill gas from the surrounding waste material.
  - This system contrasts with passive wells, which rely solely on natural pressure gradients for gas movement.
  - Active systems often produce high flow rates and pressures that biofilters are not designed to manage.
  - Active gas collection systems are usually tied to energy recovery or flare systems.

Biofilters Research

sustainability

MDPI

Article

Mitigation of Methane, NMVOCs and Odor Emissions in Active and Passive Biofi... at Municipal Solid Waste Landfills

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Abstract: Biofiltration systems are emerging technological solutio
and odors from landfill gas when flaring is no longer feasible. This
two full-scale biofiltration systems: biofilter and biowindows. The e
non-methane volatile organic compounds (NMVOCs) and odors duri
monitoring period was studied. In addition to diluted methane, mo
detected in the inlet raw landfill gas and the sulfur compounds resu
value. Both systems, biofilter and biowindows, were effective for the c
88.05%, respectively), for the mitigation of NMVOCs (higher than 8(
and 93.82% respectively). As for the biofilter monitoring, it was p
efficiency trend and in fact to guarantee that for an oxidation effici
must be less than 6.5 g CH_4/m^2h with an oxidation rate of 5.2 g CH_4

Performance of a passively vented field-scale biofilter for the microbial oxidation of landfill methane

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Mitigation of methane and trace gas emissions through a large-scale active biofilter system at Glatved landfill, Denmark

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Mitigation efficiency

ABSTRACT

Biocover systems are a cost-effective technology utilised to mitigate methane (CH_4) and trace gas emissions from landfills. A full-scale biofilter system was constructed at Glatved landfill, Denmark, consisting of three biofilters with a total area of 3950 m^2. Landfill gas collected mainly from shredder waste cells was mixed with ambient air and fed actively into the biofilter, resulting in an average load of 60–75 g m^{-2} d^{-1} for CH_4 and 0.15–0.21 g m^{-2} d^{-1} for trace gases (e.g., aromatics, chlorofluorocarbons (CFCs), aliphatic hydrocarbons). The initial CH_4 surface screening showed uneven gas distribution into the system, and elevated surface concentrations were observed close to the gas inlet. Both positive and negative CH_4 fluxes, ranging from −0.36 to 4.25 g m^{-2} d^{-1}, were measured across the surface of the biofilter. Total trace gas emissions were between −0.005 and 0.042 g m^{-2} d^{-1}, and the emission flux of individual compounds were generally small (10^{-8} to 10^{-3} g m^{-2} d^{-1}). Vertical gas concentration profiles showed that the oxidation of CH_4 and easily degradable trace compounds such as aromatics and aliphatic hydrocarbons happened in the aerobic zones, while CFCs were degraded in the anaerobic zone inside the compost layer. In addition, oxidation/degradation of CH_4 and trace gases also occurred in the gas distribution layer, which contributed significantly to the overall mitigation efficiency of the biofilter system. Overall, the biofilter system showed mitigation efficiencies of nearly 100% for both CH_4 and trace gases, and it might have the potential to work under higher loads.

of residual landfill methane. Biofilter methane
l automated chamber measurements, by mea-
rates, and by evaluating the methane load in
urse of barometric pressure. Methane removal
nit of biofilter methane oxidation capacity was
thane entering the filter. The analysis of meth-
ion-oscillating landfill gas emission, however,
pply. At the oxygen-restricted capacity limit,
flow rate (negatively) as a measure for the dis-
phases. The investigated biofilter capacity, as
% of the methane load emitted annually. Field
cations.

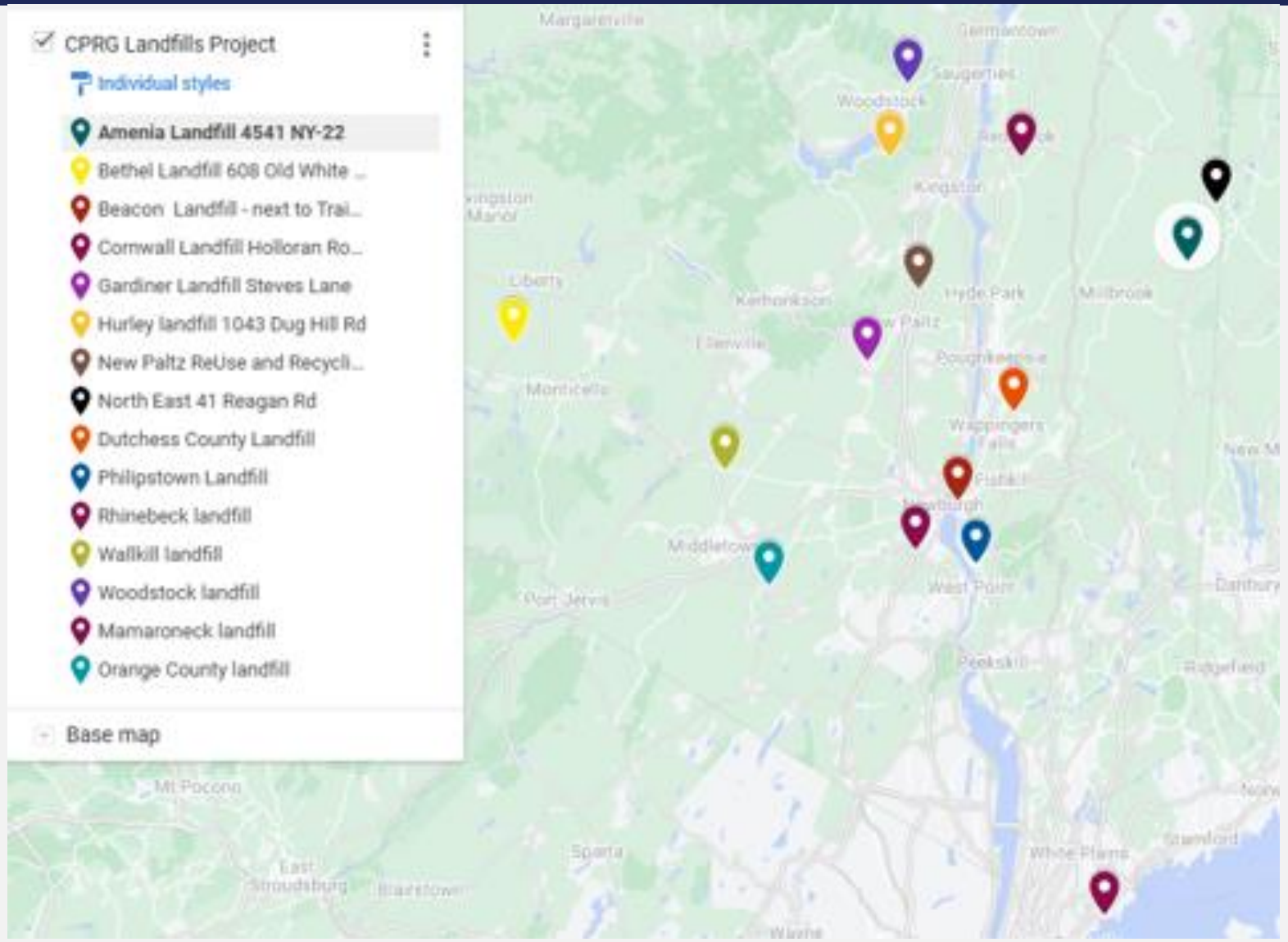
Hudson Valley Regional Council

Project Participants

Amenia Town Landfill
Town of Bethel Landfill
Beacon City Landfill
Cornwall Town Landill
Dutchess County Airport Landfill
Town of Gardiner Landfill
Town of Hurley Landfill
Mamaroneck Taylor's Lane
New Paltz Landfill
North East Town Landfill
Philipstown Landfill
Rhinebeck Town Landfill
Wallkill Town Landfill
Woodstock Town Landfill

Facility Name	Biofilters	Pollinators	Solar Feasibility	Battery Storage	TOTAL
Amenia Town Landfill	1	1	1	1	4
Town of Bethel Landfill	1	1			2
Beacon City Landfill	1	1			2
Cornwall Town Landfill	1				1
Dutchess County Airport Joint Landfill	1				1
Town of Gardiner Landfill	1	1			2
Town of Hurley Landfill	1	1	1	1	4
Mamaroneck Taylor's Lane	1	1		1	3
New Paltz Landfill	1	1		1	3
North East Town Landfill	1	1		1	3
Philipstown Landfill	1		1	1	3
Rhinebeck Town Landfill	1		1		2
Wallkill Town Landfill	1	1			2
Woodstock Town Landfill	1	1	1	1	4
TOTAL	**14**	**10**	**5**	**7**	**36**

About the 14 Cohort Participants



North
Woodstock, Hurley, and Rhinebeck
East
Northeast and Amenia
Central - East
Dutchess, Beacon, Philipstown
Central - West
New Paltz, Gardiner, Cornwall
West
Bethel, Walkill, Orange County (wait list)
South
Mamaroneck

Outreach and Engagement Partner

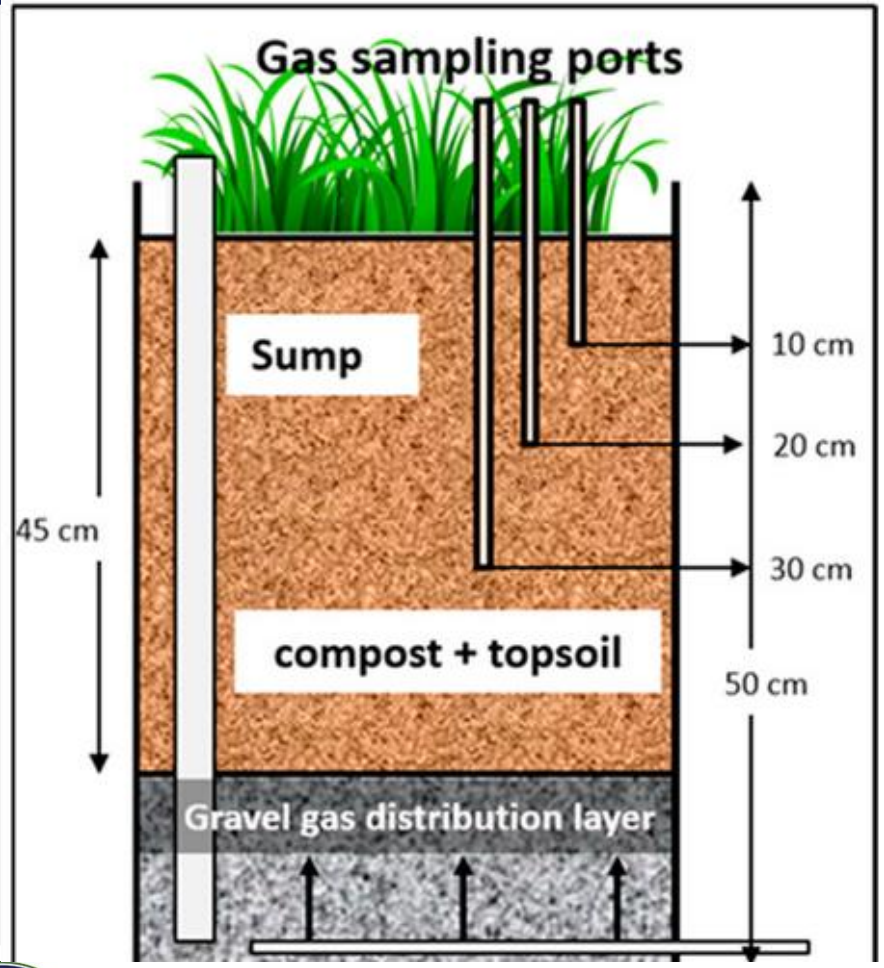
New Jersey Institute for Technology

- Educational Materials
- Community Engagement
- Event Coordination
- Panels
- Marketing

Landfills and Biofilters

Biofilter Solution

Biofilter Solution



3 Steps

- The contaminated gas stream enters the biofilter through a porous layer, such as gravel.
- The gas then permeates through the biofilter medium, which is usually compost or soil.
- The treated gas exits the biofilter after methane and other contaminants are reduced.

Key Factors

- Humidity
- Temperature
- Oxygen levels / Oxidation

Biofilter Design

Biofilter vs Biocover

Jefferson County, Washington, US

Uggelose, Denmark

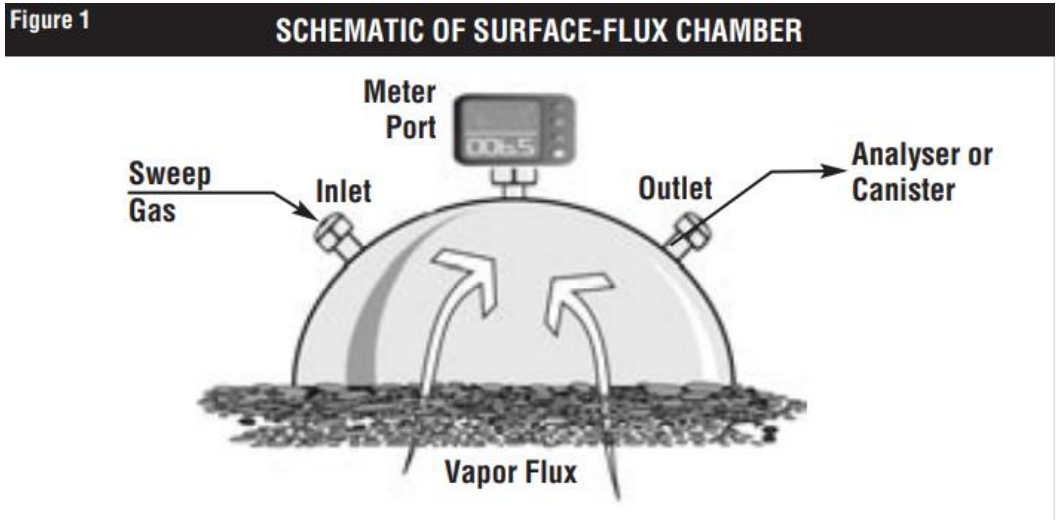
Hudson Valley Regional Council

Different Methane Vents

Landfill Gas (LFG) Monitoring Options

GEM 5000 Landfill Gas Analyzer

Flux Chamber Method



Biofilter Solution

- **Size:** Small, mobile – as small as 2x4 raised beds or piles of mulch
- **Cost:** ~$40-$60K to design and construct biofilter on small landfill. More for larger landfills.
- **Maintenance:** Replenish mulch every 2-5 years – spot treatments as needed (bears, storms, etc.)

Project Planning

Work Completed to Date

Fall

- Award Contract Formalization and Program Kick-off (November 1)
- Initiated Program Planning and Research
- Initiated participant communications: conversations, surveys
- Press conference
- Conversations with DEC and EPA
- Met with Outreach and Engagement Partner: NJIT
- Drafted and Circulated Environmental Scientist job description

December

- Continued participant communications
- Job Interviews Environmental Scientist
- EPA Quality Assurance Plan

25Q1-Q2 Timeline - HVRC

- 25Q1: HVRC Hires Environmental Scientist. Job Description is HERE on HVRC's web site.
- 25Q1: HVRC Completes Quality Assurance Plan for EPA.
- 25Q1-Q2: HVRC conducts site visits to landfills.
- 25Q1-Q2: HVRC issues RFP for biofilter design and installation.
- 25Q2-Q4: Initiate monthly monitoring of landfill gas concentration and flow to understand baseline emissions.
- 25Q3-Q4: HVRC contracts with firm to complete biofilter installation.

- Biofilter installation will most likely not begin until 2026

24Q4 - 25Q2 Timeline - Participants

- 24Q4: Gather relevant feedback on landfills
- 24Q4: Confirm project team
- 24Q4: Fill out survey
- 24Q4: Set up meeting with HVRC to review survey and landfill documents
- 25Q1: Coordinate on-site landfill visit

How to Stay Informed

- CPRG Landfill Biofilters Project Web Site
- Monthly cohort virtual meeting (*at least until the biofilters are installed*)
- Technical assistance one-on-one calls (*project leads with HVRC*)
- Monthly office hours (*optional*)
- Subgroup meetings for solar feasibility studies and battery storage (*Native Pollinator Plantings eventually*)
- Semi-annual progress reports to EPA
- Project Sharepoint folder for program related documents, Invitation forthcoming.

- Mary Lambert: mlambert@hudsonvalleyrc.org Mobile: 914-498-9811

Next Steps

What does HVRC Need from you?

1. Gather landfill information – reports from municipality, DEC, engineers, etc.
2. Determine municipal project lead and volunteers (*public outreach*)
3. Signed Memo of Agreement (*expanded letter of commitment*)
4. Make DPW aware
5. Fill out this quick survey
6. Schedule a 30 minute virtual meeting with Mary
7. Schedule a site visit

Questions?