

# Actionable Science for Communities

## Causes and Mitigation of Subsurface Heat Accumulation in Landfills

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### Rationale

- 1,900 operating MSW landfills in the U.S with 3,700 annual fires
- Includes site fires and demolition debris landfills
- Not a unique U.S. Phenomenon

### Objectives

This research aims to summarize the current body of knowledge related to municipal solid waste landfills experiencing subsurface smoldering event (SSE), distinguishing between what is known about SSE landfills and what is still being researched.

### Approach

- Literature review
- Site data evaluation

### Intended End Users

- Office of Land and Emergency Management
- State Regulators and Engineers

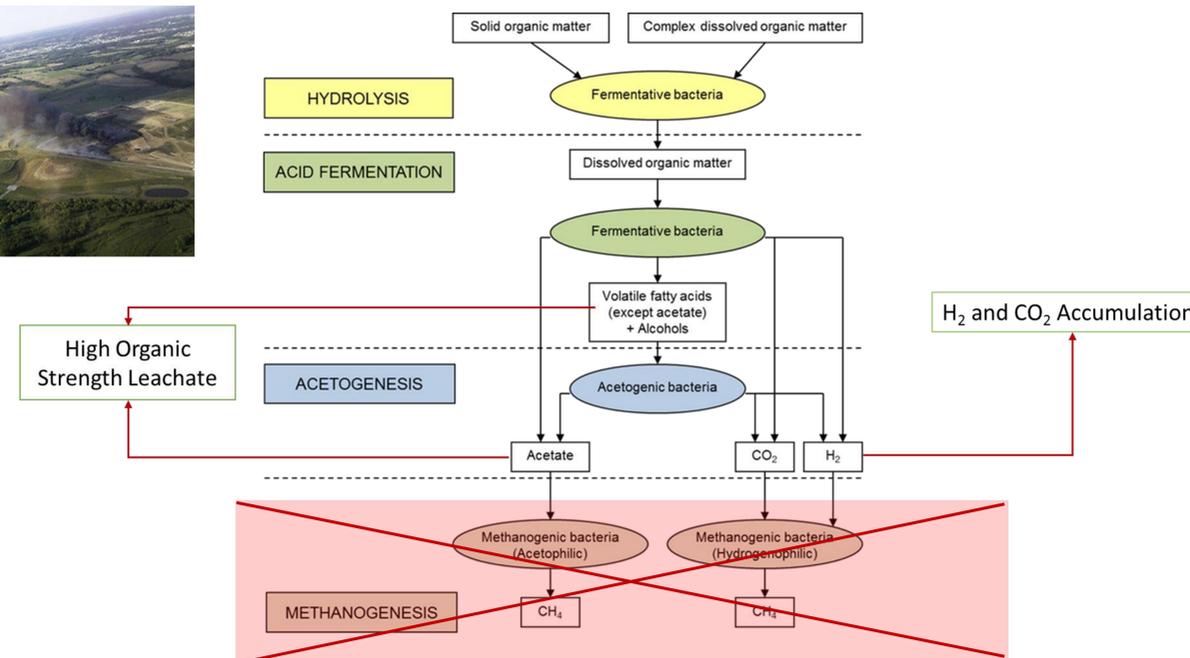
### Next Steps

- External review
- Potential laboratory experiments to quantify leachate and gas changes

### Lessons Learned

Exothermic landfill processes:

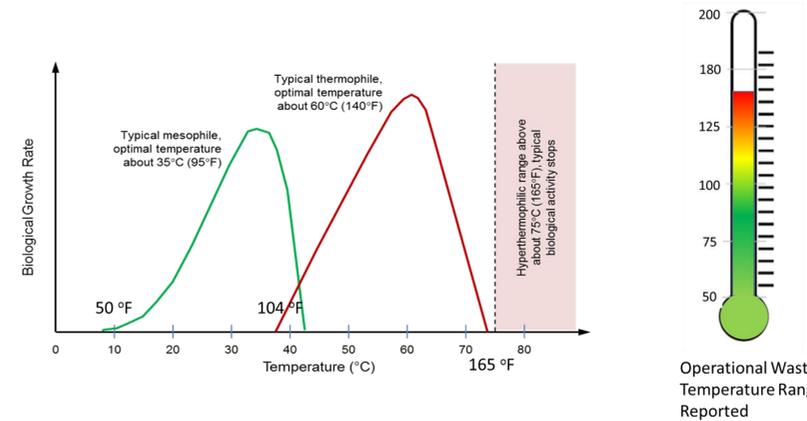
- Decomposition
- Metal reaction (iron corrosion, aluminum waste etc.,)
- Ash hydration
- Acid-base neutralization
- Pyrolysis



Heating event indicators

- *Gas indicators*
  - Increase in landfill gas temperature
  - Decreased methane flow rate and content
  - Increase in carbon monoxide content
  - Hydrogen in landfill gas

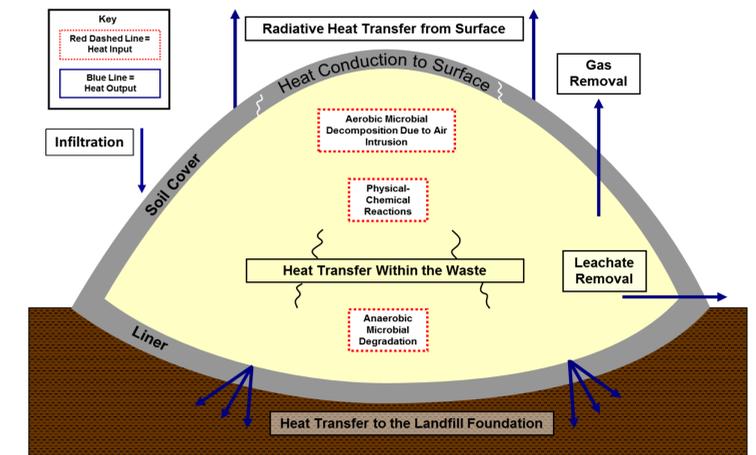
- *Leachate indicators*
  - Temperature increase
  - Stronger/darker leachate
  - Higher flow rate



### Event Detection and Control

Methods for detecting subsurface fires:

- Non-Intrusive (indirect) Methods
  - Infrared Thermography
  - Geophysical Methods
  - Leachate Temperature and Composition
  - Landfill Gas Temperature and Composition
- Direct Detection Methods
  - IR thermography paired with ground penetrating radar



Control

- Extinguishing surface and near-surface fires
- Upgrading gas collection system
- Cooling of hot areas
  - Water injection
  - Closed-loop heat exchanger
  - Foam injection
  - Cryogenic liquid/gas injection
  - Capping and Isolation

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