

Closed Landfill Methane Measurement & Technologies for Methane Mitigation

Dave Lake, P.Eng. – Dillon Consulting

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Objectives

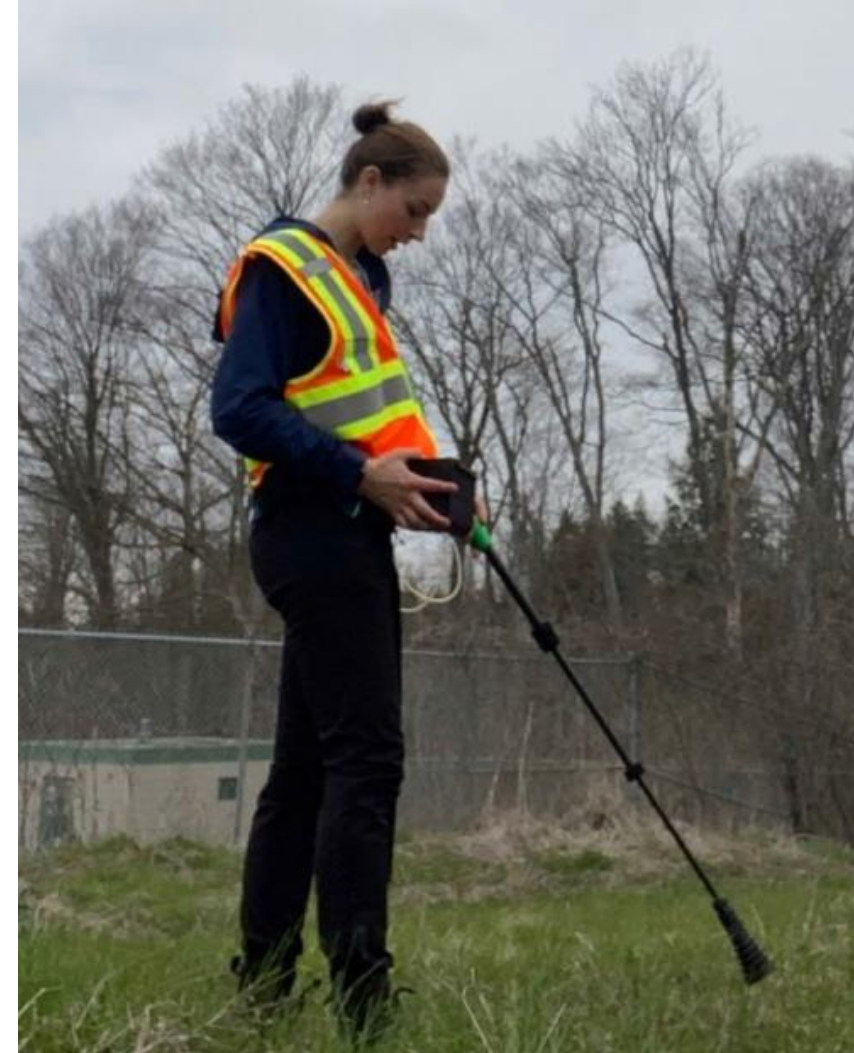
- Discuss four different methods for measure fugitive methane emissions from closed landfills
 - Handheld Multi Gas Meters
 - Portable Methane Detectors
 - Drone Surveys
 - Flux Chambers
- Look at different technologies for lowering GHG emissions through reducing methane to carbon dioxide
 - Miniflares
 - Methane Oxidation Biosystems

Methane Measurement – Handheld Multi Gas Meters

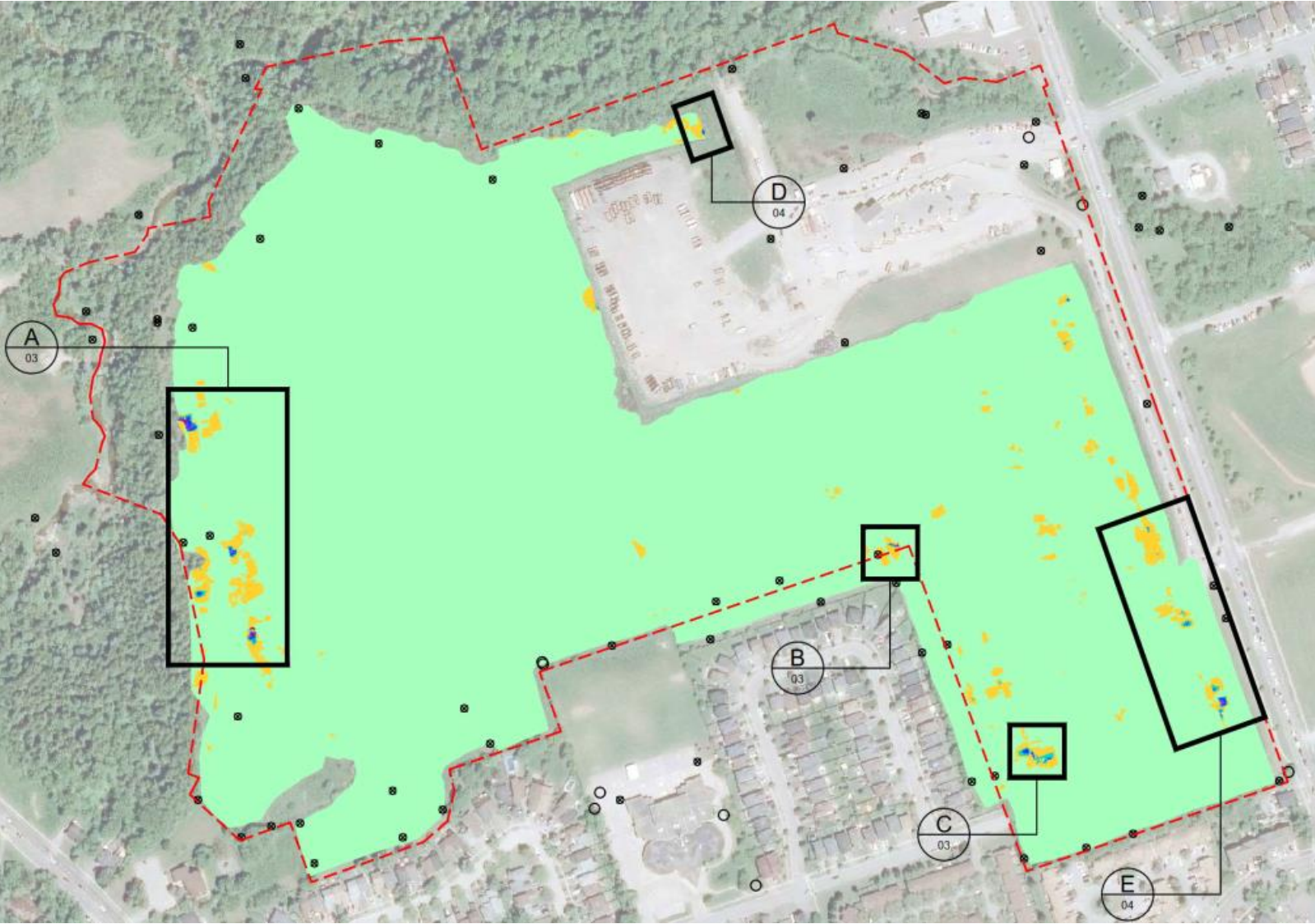
- Commonly used for monitoring LFG at landfill sites
- Typically monitor a handful of relevant gas concentrations, including methane
- Lower end of monitoring range is typically 1% LEL or 500 ppm
- Ideal to monitoring LFG concentrations at property boundaries
 - But not sensitive enough for surface emission monitoring

Methane Measurement – Portable Methane Detectors

- Methane monitoring units that only detect methane gas
- Designed for surface emission monitoring
- Lower end of monitoring range is typically 0.001% LEL or 0.5 ppm
- Includes continuous recording of results with linked GPS data



Methane Measurement – Surface Emission Monitoring Results



GAS VALUE TABLE			
NUMBER	MIN. VALUE (ppm)	MAX. VALUE (ppm)	COLOR
1	0	5	Light Green
2	5	50	Yellow
3	50	100	Cyan
4	100	200	Blue
5	200	300	Purple
6	300	400	Magenta
7	400	500	Red
8	500	51500	Dark Red

Methane Measurement – Drone Surveys

- Drone surveys are becoming an efficient way of surveying a large, remote area quickly
- Methane measurements are based on the sensor mounted and can be as sensitive as portable methane detectors
- Drone surveys pose their own unique challenges with data collection:
 - How high is the methane plumb and is the drone above it?
 - Is there anything blocking the unit for detecting to ground level like trees or tall vegetation?

Methane Measurement – Flux Chambers



- Do not detect gas concentrations on their own but used in conjunction with a methane monitoring unit
- By recording the rate of methane concentration increase over time you can determine the flow rate of methane at that location
- With this information you can calculate the rate of methane emission in terms of equivalent tonnes of CO₂ over time

So What Do We Do With This Information?

- Nova Scotia and PEI have banned organics from MSW landfills for decades already, other Provinces are implementing a ban soon or are starting to consider one
- There are thousands of closed MSW landfills in Canada and most are beyond the point of producing sufficient LFG to sustain a utilization technology but will still be producing methane for many decades to come
- There are innovative systems that can mitigate methane emissions after utilization technologies are not viable anymore

Mitigation Technologies – Miniflares



- Designed as a passive landfill gas treatment system
- Solar powered, including ignition system
- Can be equipped with a data logger to record up time and gas flow through the unit
- Operating parameters:
 - Flow rates from a few m³/hr to 200 m³/hr
 - Methane concentrations from 30% to 90% by volume
- Each unit does need a relatively constant supply of methane

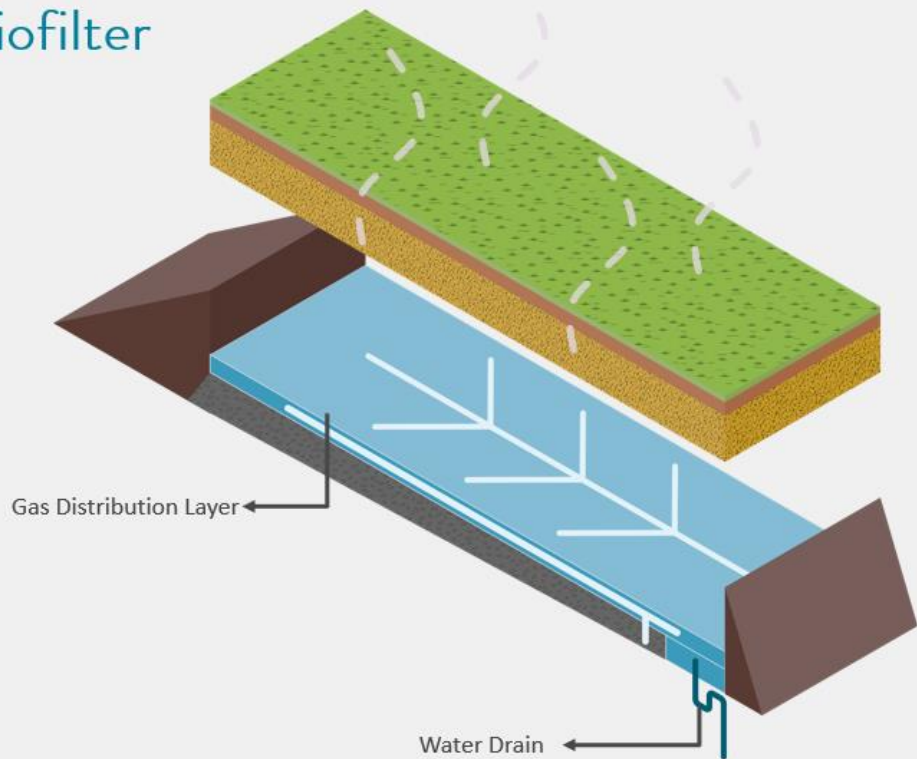
Mitigation Technologies – Methane Oxidation Biosystems



- Methane oxidation biosystems use bacteria to reduce methane into carbon dioxide
- Completely passive systems with no mechanical or electrical components required for operation
- Work under a wide range of methane concentrations, much lower than other technologies
- No maintenance required for operation

Mitigation Technologies – Methane Oxidation Biofilter

Biofilter

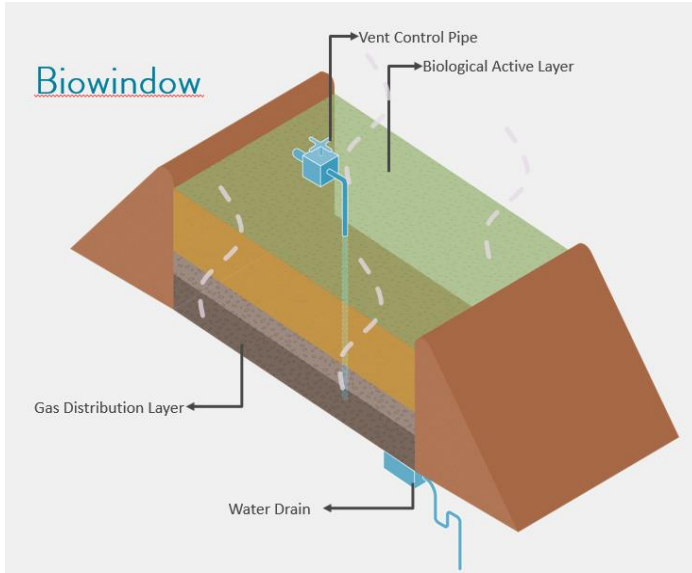


- Collect LFG from a collection network and distribute through the active media
- Operating parameters:
 - Flow rates up to 10 m³/hr for a single unit
 - Any range of methane concentration
- Well suited for connecting to an existing LFG collection network or installation of a new LFG extraction network
- Achieving over 90% reduction of methane in the field

Mitigation Technologies – Methane Oxidation Biofilter



Mitigation Technologies – Methane Oxidation Biowindow



- Well suited for placement over hot spots of methane emissions
- Operating parameters:
 - Flow rates up to 5 m³/hr for a single unit
 - Any range of methane concentration
- Achieving over 70% reduction of methane in the field

Thank You For Your Time!

Questions?