



TETRA TECH



Evapotranspiration Landfill Biocovers



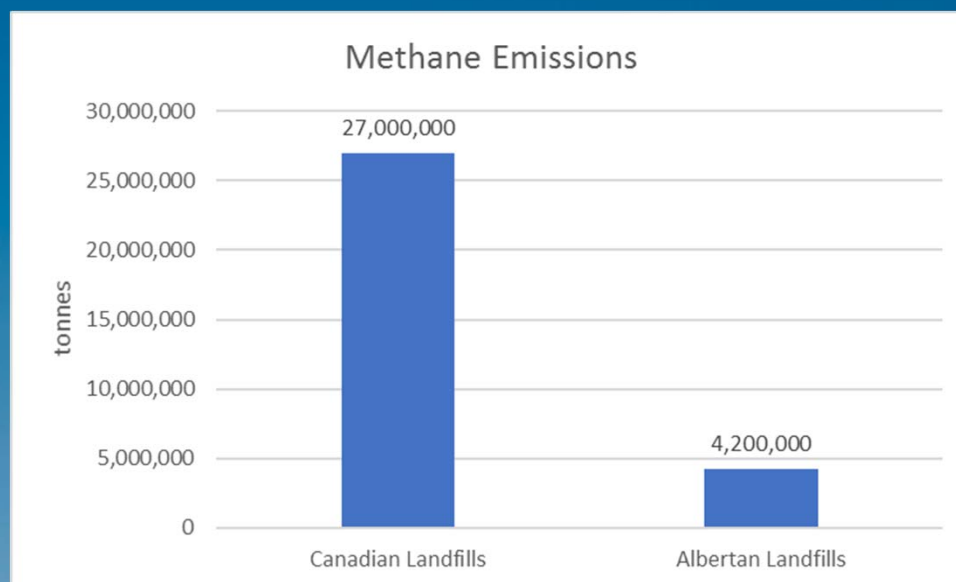
Why ET-LBC Biocovers?

- Alternative landfill closure system
- Addresses both infiltration and GHG emissions
- Active LFG systems can be costly to build and maintain, and may not be appropriate for some landfill sites.

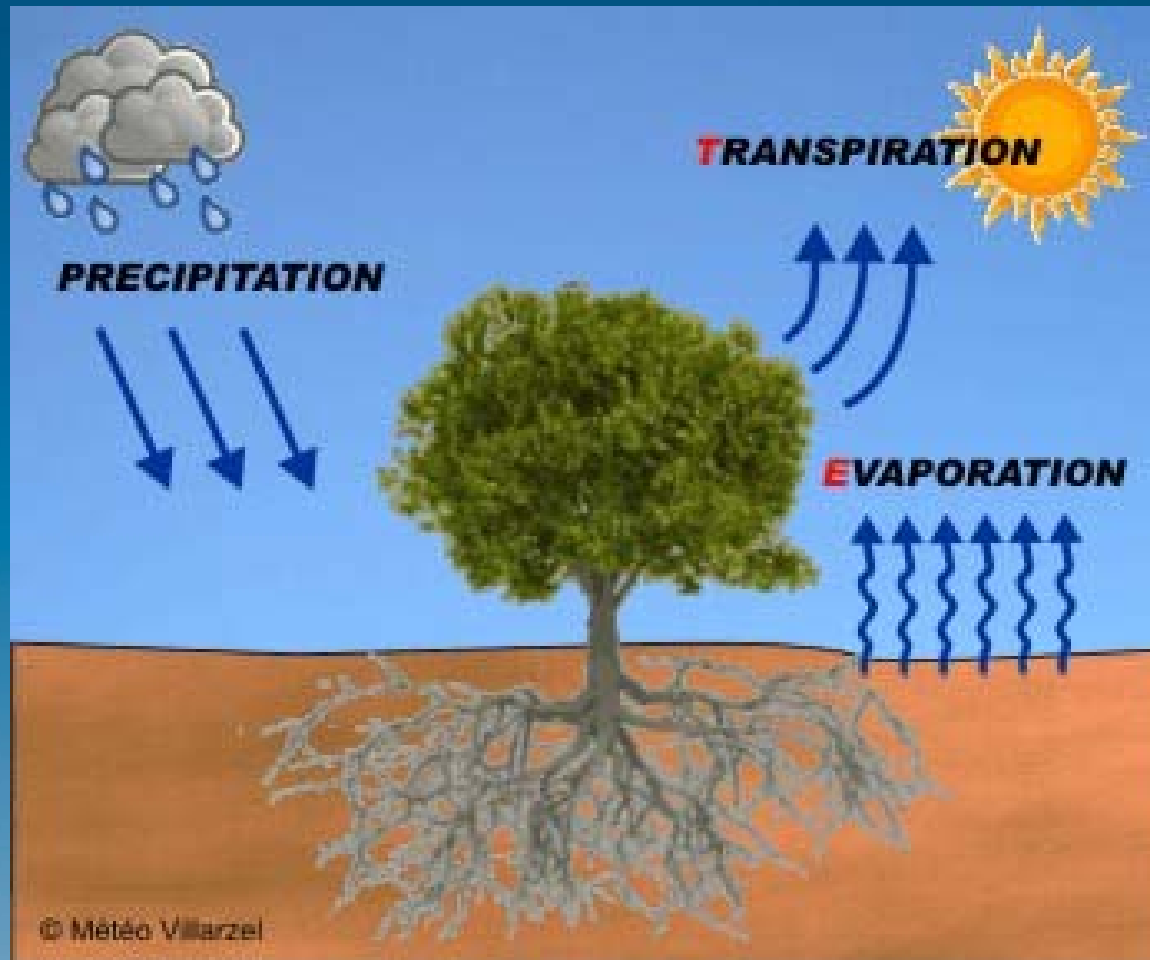


CO₂e Reduction Opportunity

- CH₄ has 25 times Global Warming Potential of CO₂
- ~25% of Canadian anthropogenic CH₄ emissions comes from landfills

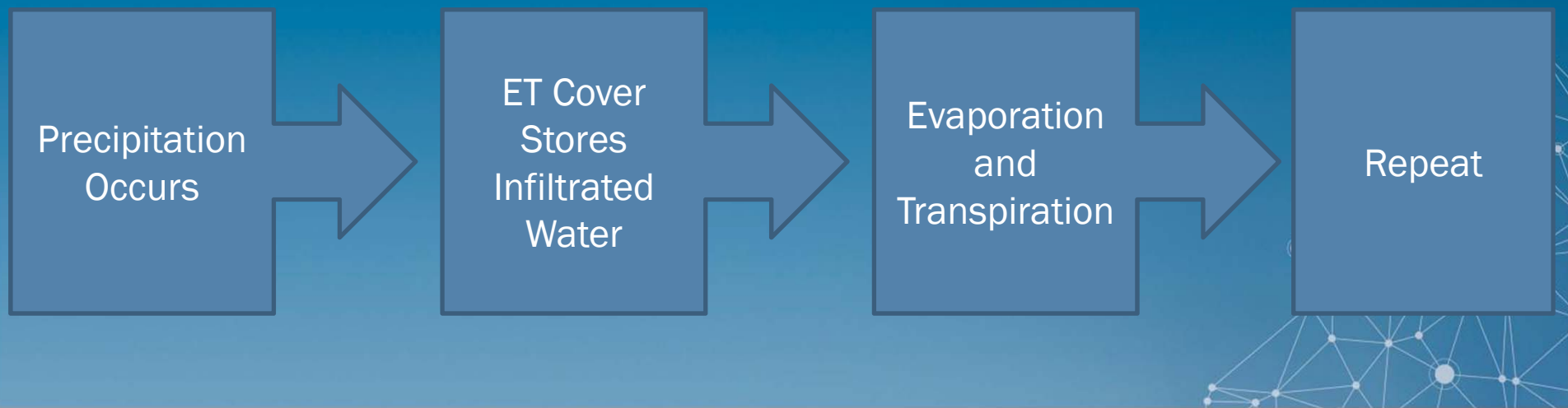


Evapotranspiration



Evapotranspiration Cover Systems

- Store moisture in soil - evaporation and transpiration
- Effective at limiting infiltration and leachate generation



Methane Oxidation

- Naturally occurring, aerobic organisms
- Methanotrophs convert CH_4 to CO_2



WE LOVE
METHANE!



What is an Evapotranspiration Landfill Biocover

Evapo-
Transpiration

Evapotranspiration
Landfill Biocover

Methane
Oxidation



Methane Emission Mitigation

Active System

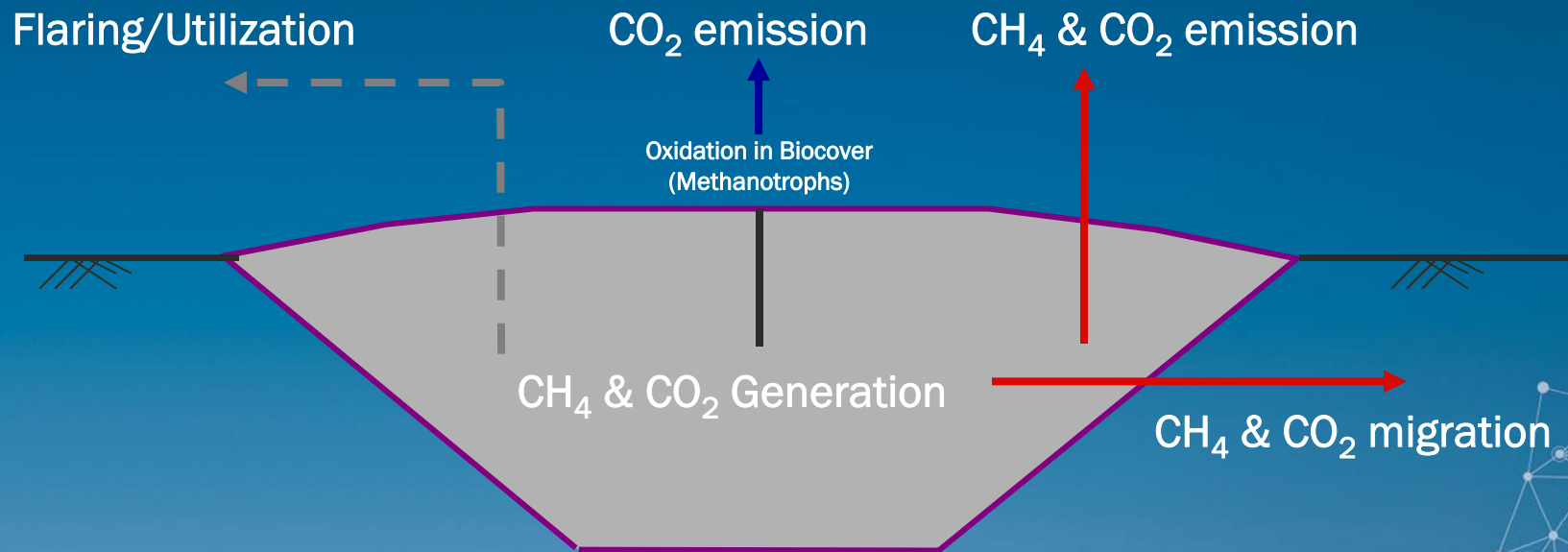


Passive ET-LBC

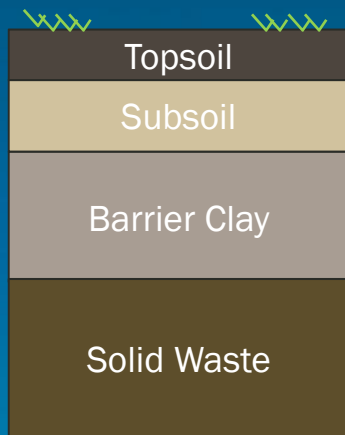


- ET-LBC technology can be an alternative or complementary to active LFG collection.
- Applicable to small landfill site where active collection either impractical or not feasible

Methane Emission Mitigation



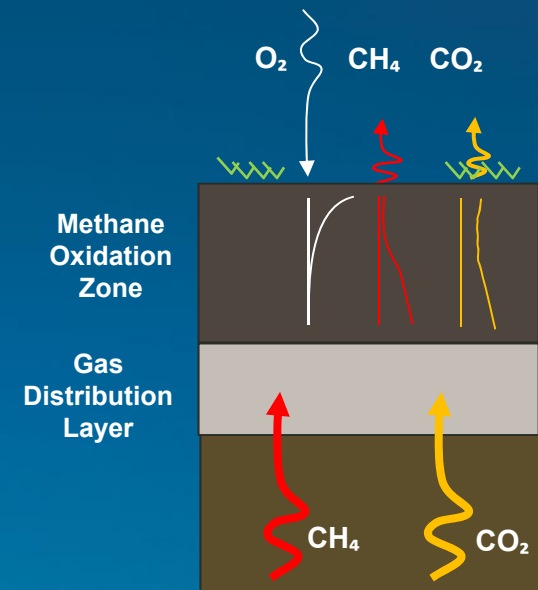
How do We Apply this to Landfill Covers?



Clay Barrier Cover



ET Cover/Biocover

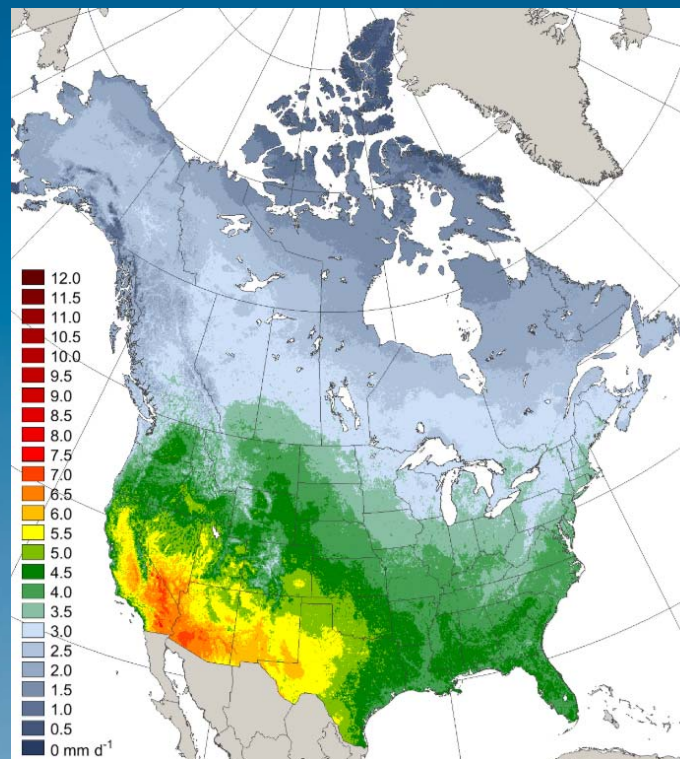


Methane Oxidation

Where is it Applicable?

- Where potential evapotranspiration > precipitation
- Evapotranspiration = evaporation + transpiration

PET rates in
North America



U of C Material Study

- Focus on materials that were:
 - Locally available
 - Low cost
 - Fulfill ET functions
 - Yield high methane oxidation

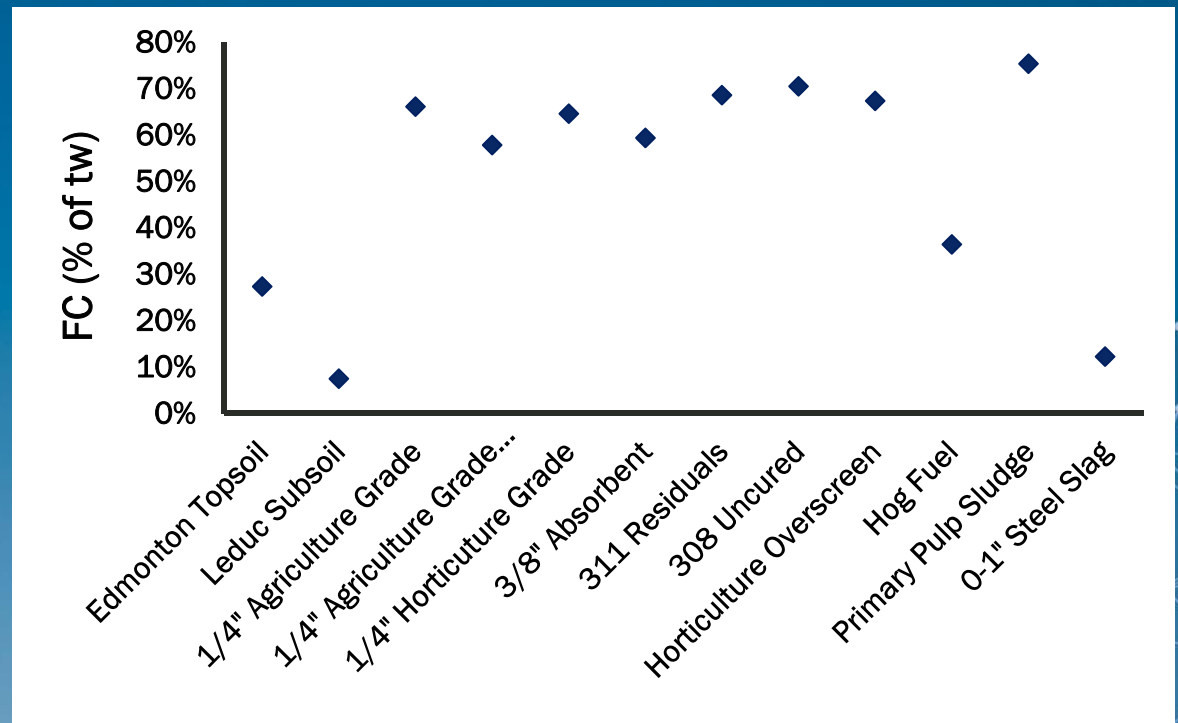


Methane Oxidation
Column



Material Properties

- Main physical considerations:
 - Organic content
 - pH
 - C/N ratio
 - Field capacity



Results

- The most promising materials proved to be topsoil and soil amendments (compost)
- The chosen amendment was compost screenings



Compost Screenings



Topsoil

Hat-Trick!

1. Organics diversion
2. Use for previously landfilled byproduct
3. Reduces emissions



1. Organics Diversion

- Composting programs
- Reduce LFG emissions
- Reduce settlement, increase airspace opportunity



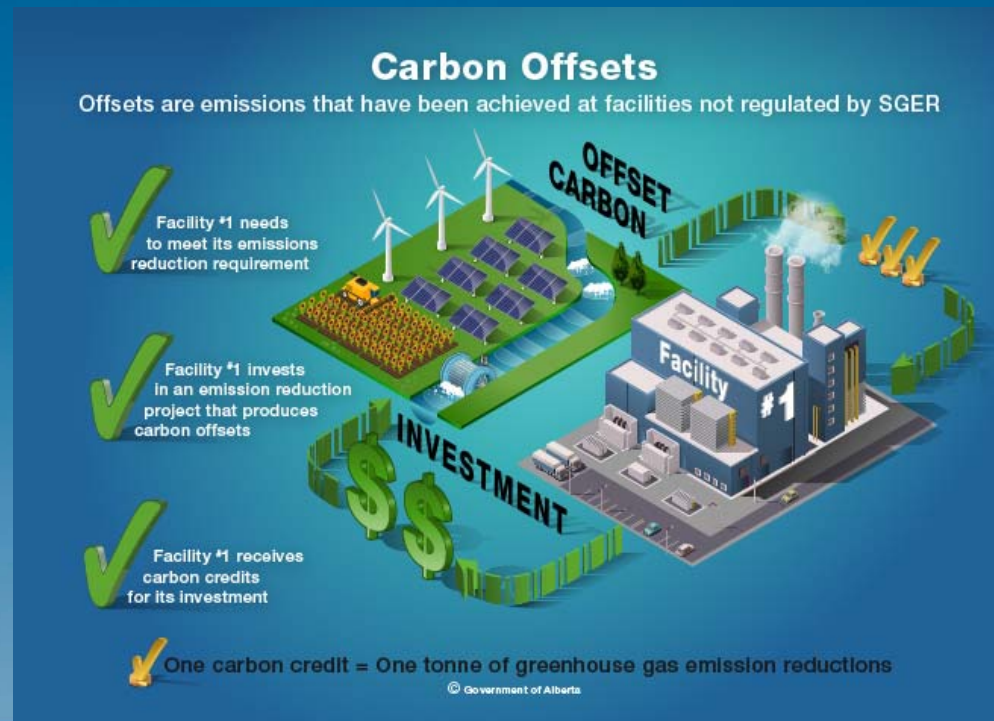
2. Previously Landfilled Byproduct

- Screenings from compost are usually landfilled
- Opportunity to use as soil amendment
- Nutrient supplement for methanotrophs



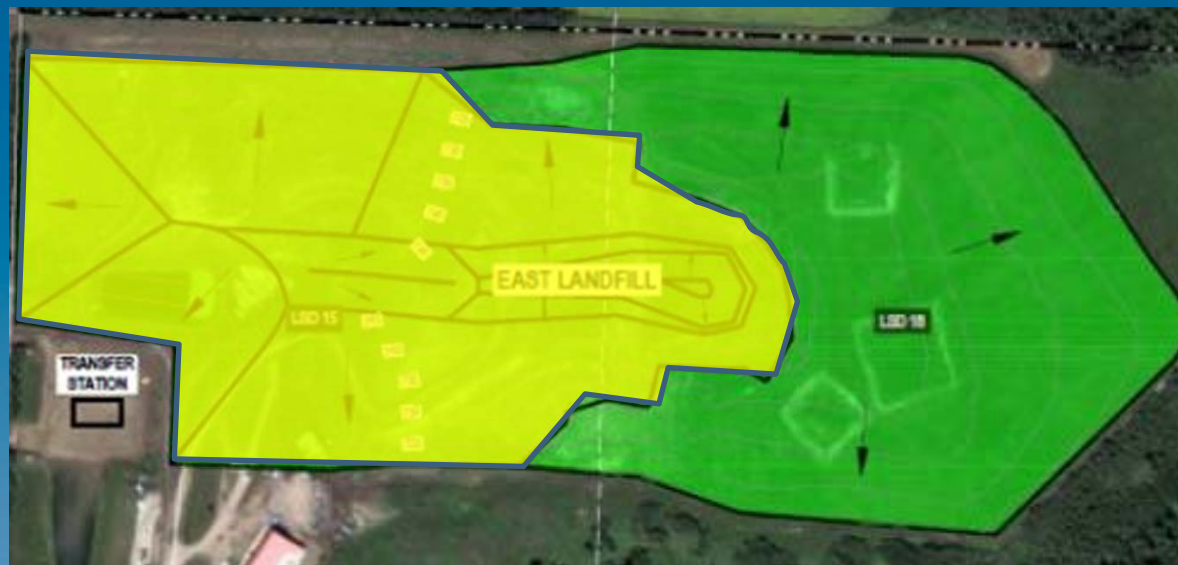
3. Reduced GHG Emissions

- Methanotrophic oxidation of methane
- Reduced GHG fugitive emissions
- Possible GHG credits?



Leduc Landfill ET-LBC Project

- Phase II of the landfill - surface area: 10.6 ha
- Estimated Waste Volume: 1.0M m³



Test Plot Demonstration

- Two test plots installed in closed area of landfill
- Measured performance of methane oxidation, vegetation growth, soil moisture, and temperature
- Sensors installed to measure soil moisture and temperature



Test Plot Construction

Material Placement



Material Mixing



Test Plot Observations – Moisture

July 1, 2017 – February 1, 2018

Clay Cover

ET-LBC Cover

50
40
30
20
10
0

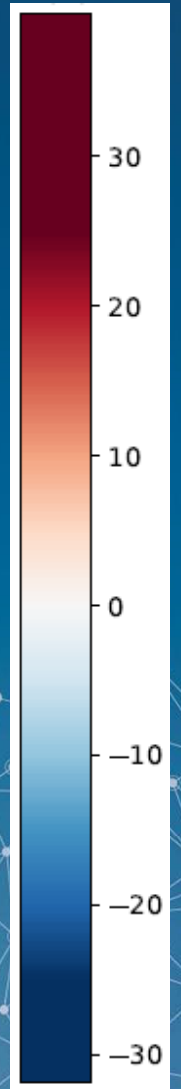
Test Plot Observations – Temperature

July 1, 2017 – February 1, 2018



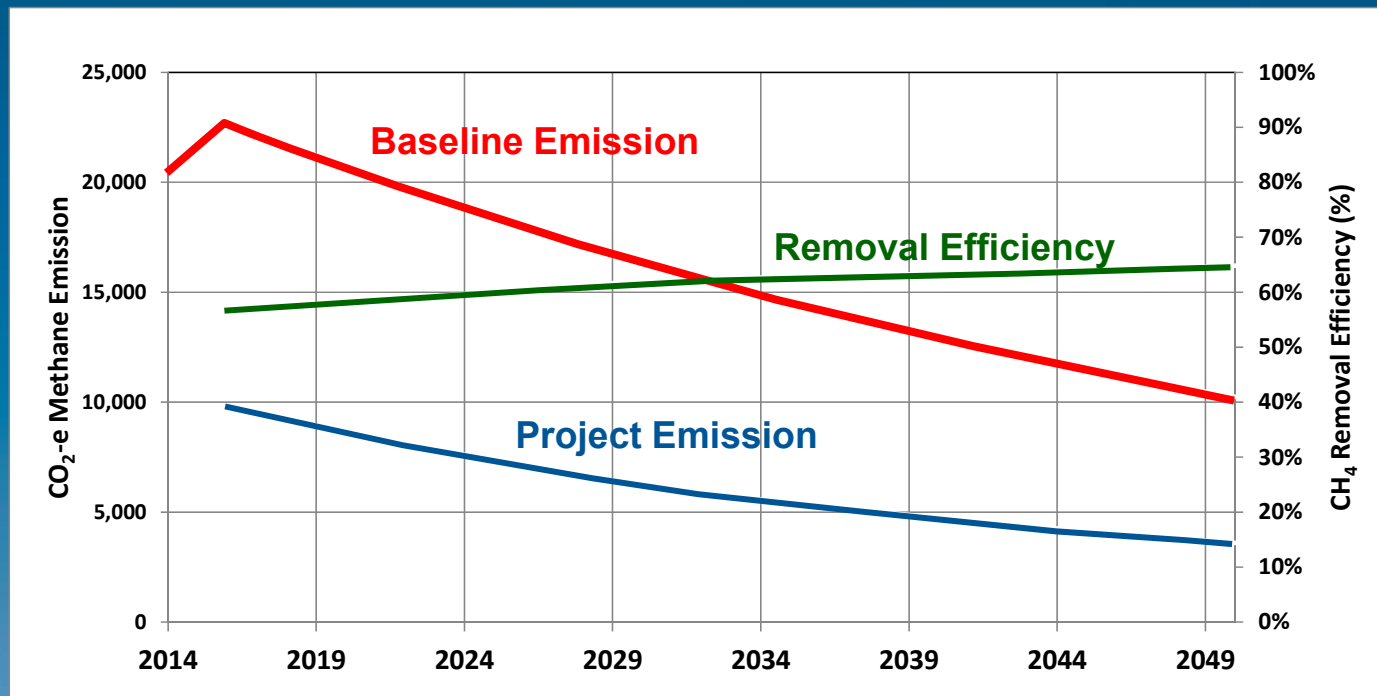
Clay Cover

ET-LBC Cover



CO₂e Reduction Opportunity

- In situ observations of methane oxidation of 71-97%



Test Plot Observations - Issues



Conclusions

- ET-LBC are low tech, and cost effective
- Can be applied at small landfill sites
- Performance meets requirements for clay covers (in certain environments)
- Low operations and maintenance costs
- Biological oxidation of methane reduce GHG emissions
- Constructed using composting byproducts
- Potential for offset emissions credits



To Be Continued!!



**Leduc and District Regional
Waste Management
Authority**



**UNIVERSITY OF
CALGARY**

**EMISSIONS
REDUCTION
ALBERTA**



Thank you to our project partners.

