



# 25 Point Checklist for Odour Control/GHG Reduction

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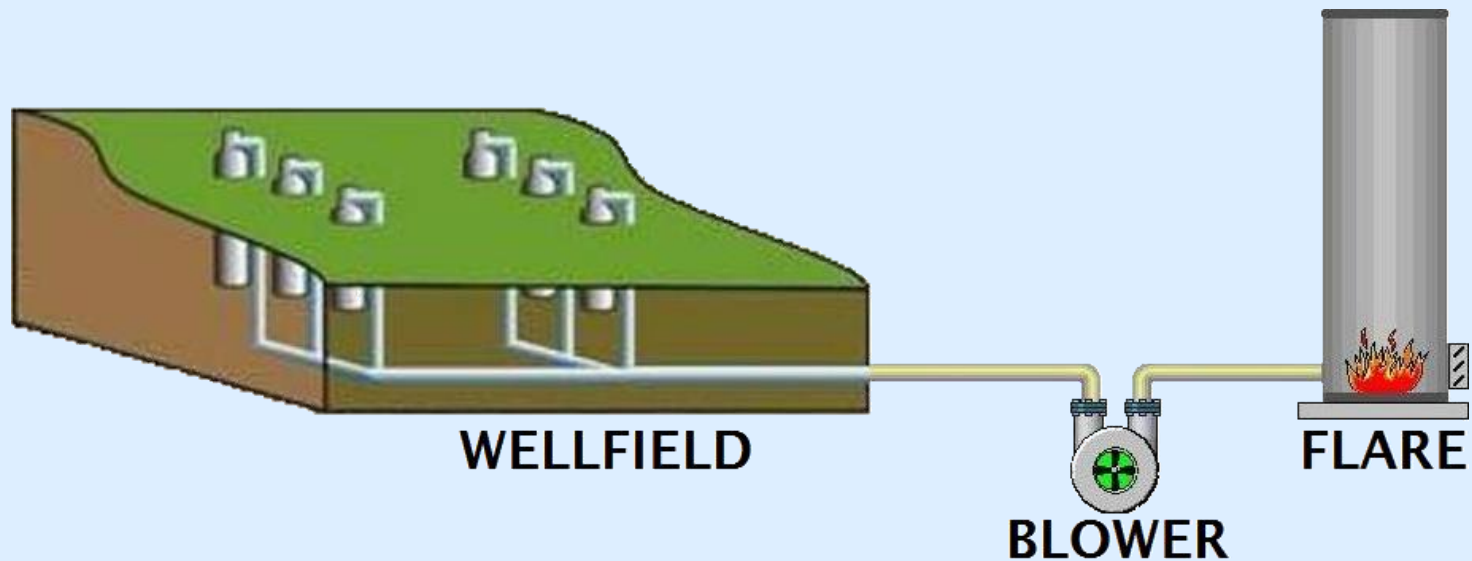
# LFG Basics

- Landfill Gas is typically 50-60% methane ( $\text{CH}_4$ )
- While  $\text{CH}_4$  is odourless, small amounts of odour causing components like sulphur compounds can lead to many odour complaints
- $\text{CH}_4$  is 25 times as potent a Greenhouse gas (GHG) as  $\text{CO}_2$
- It is important to control landfill gas to reduce odours and help reduce GHGs in our atmosphere



# Install a LFG Collection System

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# LFG Collection Pipe Sizing

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$$Q = \frac{2971 * d^{2.725}}{S_g^{0.425}} \left( \frac{h_1 - h_2}{L} \right)^{0.575}$$



Reach	length		no. wells/co	flow cfm	nt. pipe di./Inc. Pressure Drop	
	m	ft			inches	inches of water
blower to T	60	197		5200	24.5	0.152
T to lat 1	160	525	8	5200	24.5	0.404
lat 1 to 2	173	568	3	4660	24.5	0.361
lat 2 to 3	221	725	4	4457	24.5	0.427
lat 3 to 4	112	367	5	4187	24.5	0.194
lat 4 to 5	145	476	11	3849	24.5	0.217
lat 5 to 6	125	410	5	3106	24.5	0.129
lat 6 to 7	222	728	8	2769	24.5	0.187
lat 7 to 8	168	551	22	2229	24.5	0.097
lat 8 to 9	168	551	14	743	24.5	0.014
Total Pressure Drop (inches):			80			2.18

$$P_2^2 = P_1^2 - L \cdot \left( \frac{Q_h \cdot S_g^{0.425}}{2826 \cdot d^{2.725} \cdot 60} \right)^{1 \div 0.575}$$

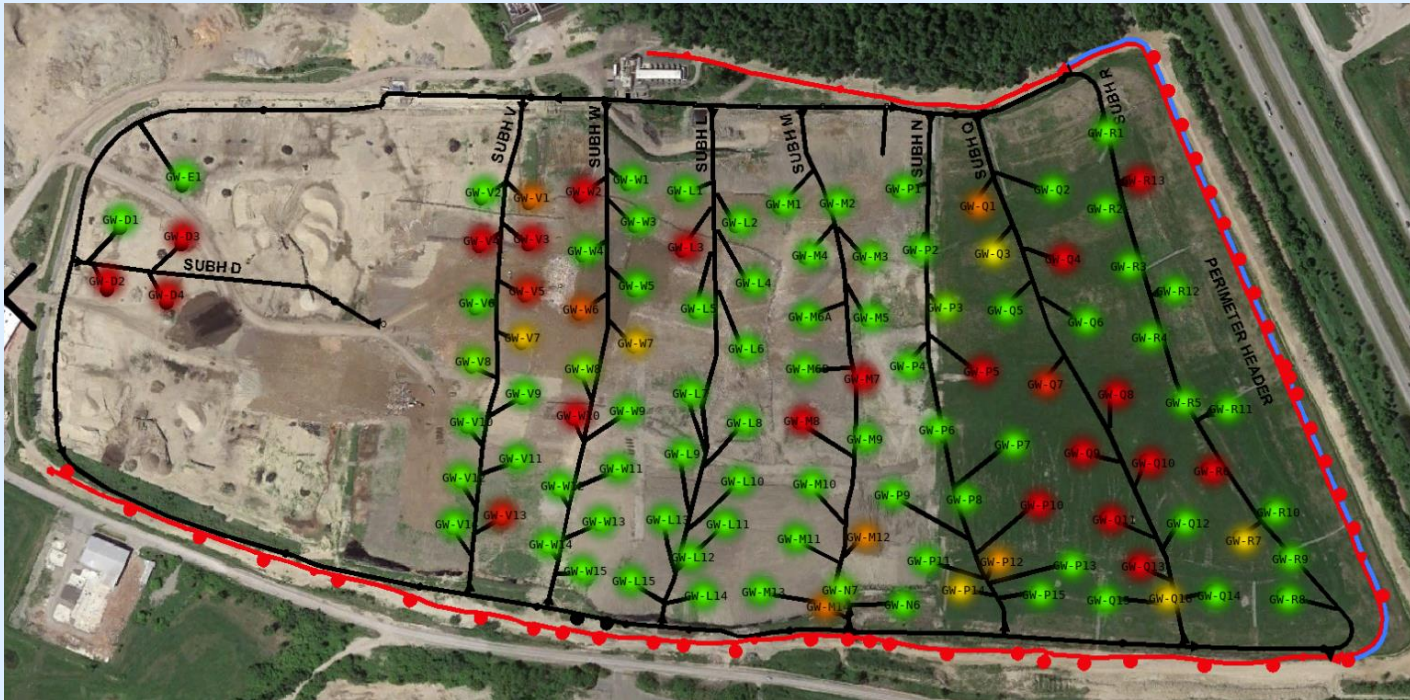
# Integrated Horizontal & Vertical System

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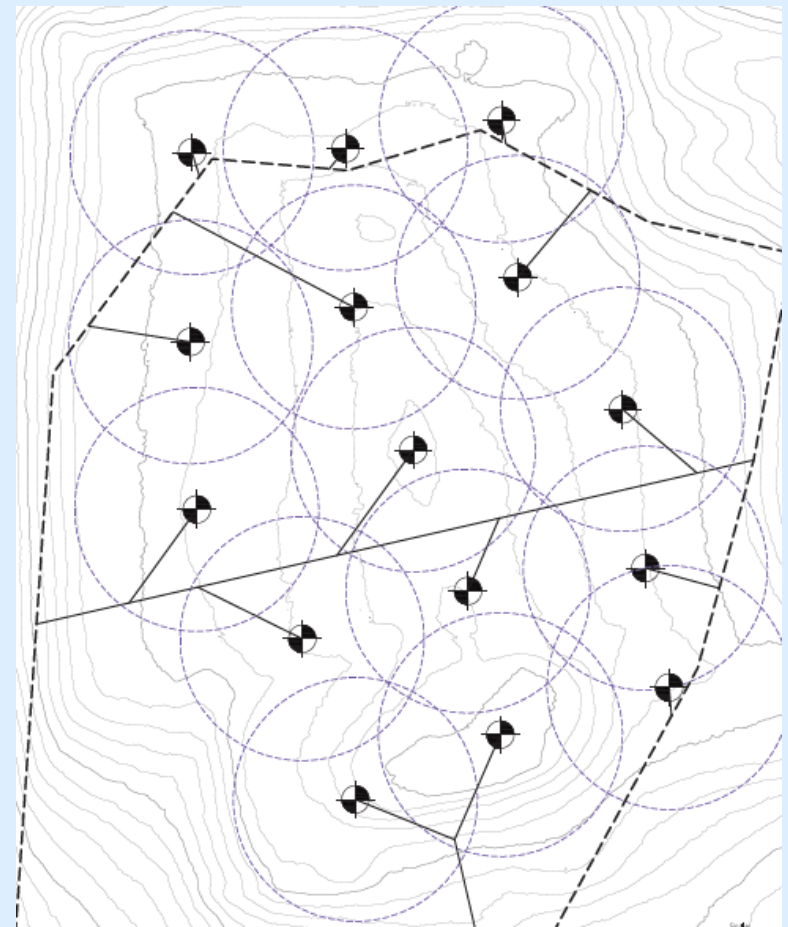
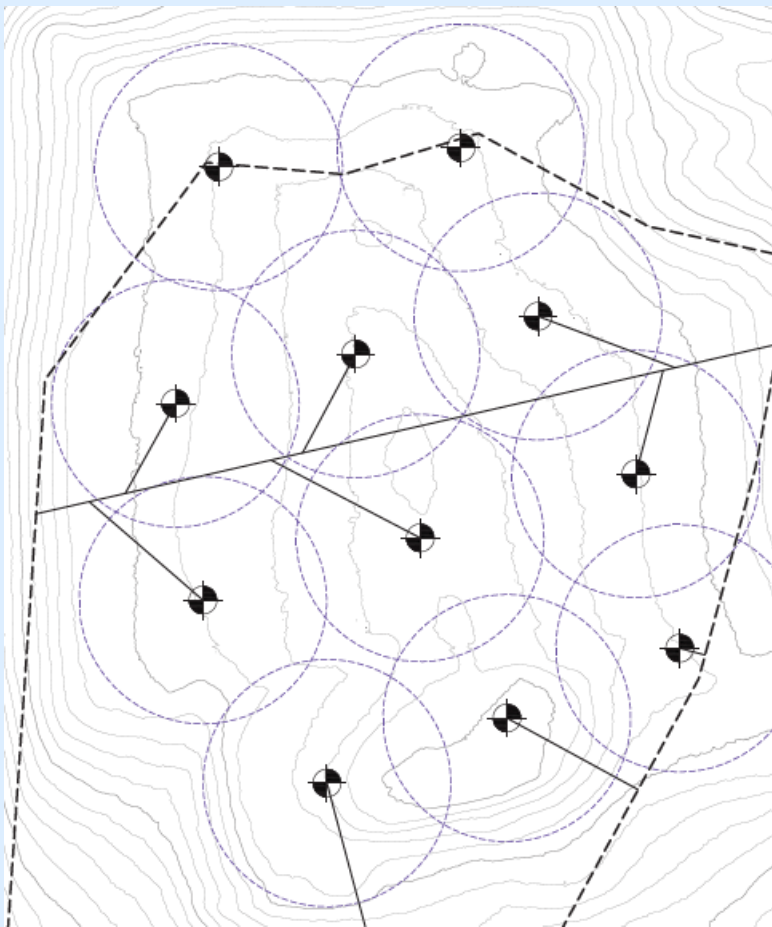
# Early Installation

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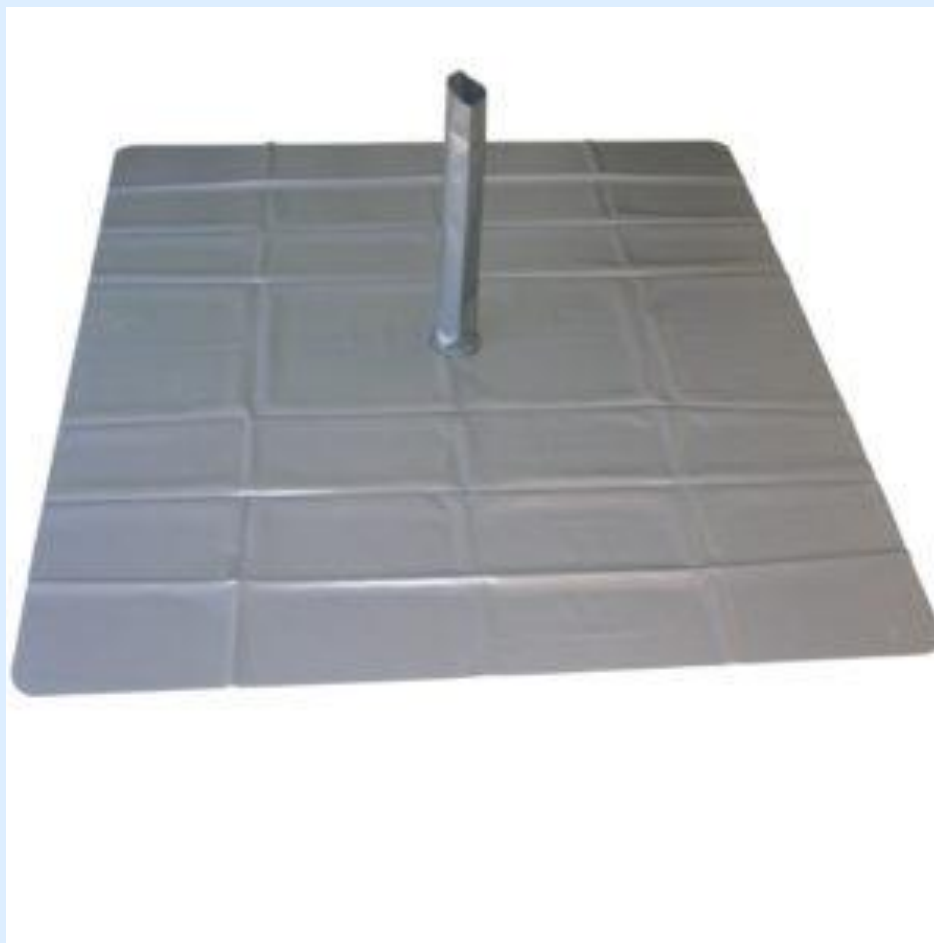
# Tighter Spacing of LFG Wells

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# Well Bore Seals

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**NEW PUMP OR ASSEMBLY  
INSTALLED ON NEW 100# PVC  
PIPE SEE DETAIL  
WT-304-2**

**75# PVC GATE VALVE**

**75# "BARBLED" #101PS  
FLEX HOSE ATTACHED WITH  
"BANPLET" AND GUARANTEED  
POWERLOCK CLAMP.**

**75#x50# PVC REDUCER TIE WITH  
50#x25# SPECCO BETWEEN BURNING  
WITH 25# WPT PLUG**

**75#x100# PVC REDUCER BURNING**

**100# PVC FLANGE  
100# HOPE FLANGE**

**TRACED CABLE  
WENT AROUND SODIUM  
AROUND WELL**

**NEW LANTERN WEB-BOT YELLOWISH SOIL  
THAT WEIRD ONE STAPLES STEEL CLAMP  
WHICH INSTALLED ON WELL BODY SHEATHING**

**90 HOSE BARBED END  
SWED CLAMP**

**100# HOSE SUB-LATERAL PIPE  
CONNECTING TO LATERAL  
SEE DETAIL  
WT-301-4**

**NEW 75# COMPRESSED AIR &  
75# FORCEMAIN PIPE ALONGSIDE EXISTING  
100# SUB-LATERAL, WHICH INSTALLED ON  
PLAN & ON VELL-SHEATHING LINE-UP  
THE DRAWING. (CAUTION OFFER UP FOR  
CLARITY) SEE DETAIL  
WT-301-2**

**NEW 50# WPT PLUG  
REPLACES SEE DETAIL  
WT-304-3**

**NEW 100#x100# PVC  
REDUCER TIE WITH  
100#x75# REDUCER  
BURNING**

**AFTER NEW  
VELL LABEL**

**NEW PUMP/COUNTER  
ASSEMBLY SEE DETAIL  
WT-304-1**

**NEW SS CLAMP,  
SEE DETAIL NOTES**

**DRAWN**

**MINIMUM COVER SEE  
TYPICAL DETAIL**

**REMOVE ALL  
EXTRUSIONS IN  
YELLOWISH SEAL**

**±600**

**±500**

**±400**

**150# SOL BG PVC PIPE  
FROM GAS EXTRACTOR WELL**

**INSTALL PUMP  
AND ABOVE  
BOTTOM OF WELL**

**NEW FORCEMAIN CAP  
AIRSHIELD SEE DETAIL  
WT-304-4**

**NEW COMPOSITE  
AIR CAP ASSEMBLY  
SEE DETAIL  
WT-304-5**

# Capacity and Redundancy of Equipment

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**Fully Enclosed LFG Flare**



**Candle Stick (Open-Style) Flare**



# Enhanced O&M

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Monthly

- Gas, vacuum, flow, temperature at each LFG extraction well
- Wellfield Balancing

Quarterly

- Water Levels at each LFG extraction well

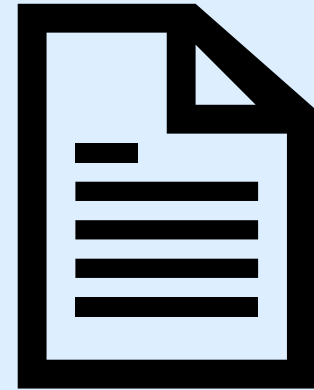
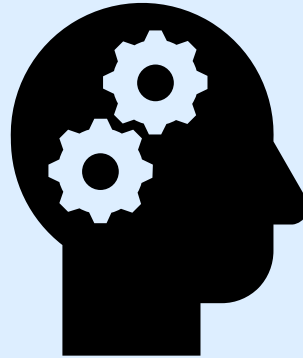
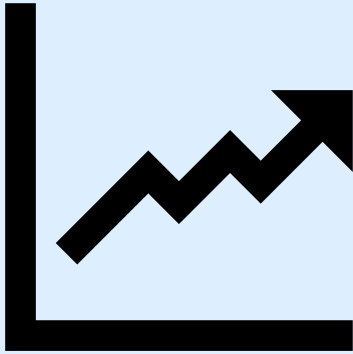
Continuous

- Data logging system for all data collected at the flaring facility, ensure preventative maintenance of the facility is completed and spare parts on hand



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# Master Planning



# Surface Emission Monitoring

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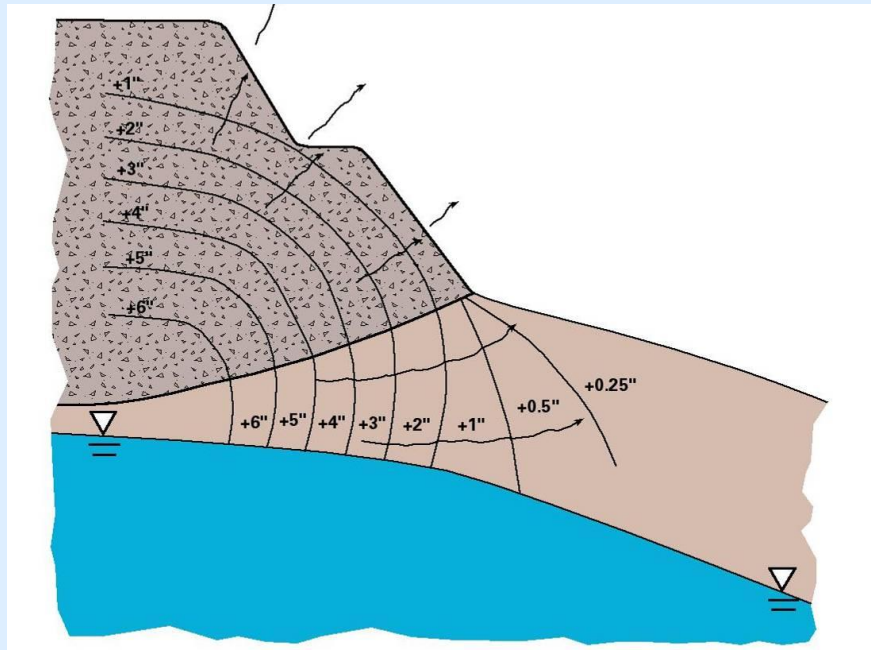
**FID or IR sensor**



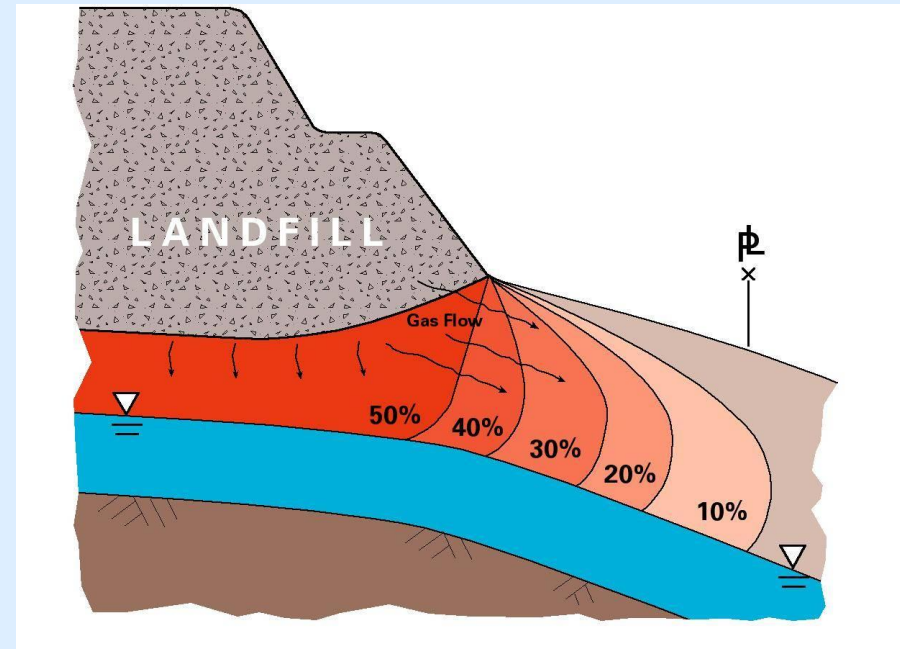
**Drone Based/  
or Satellite  
Imaging**

# Enhanced Gas Migration Monitoring

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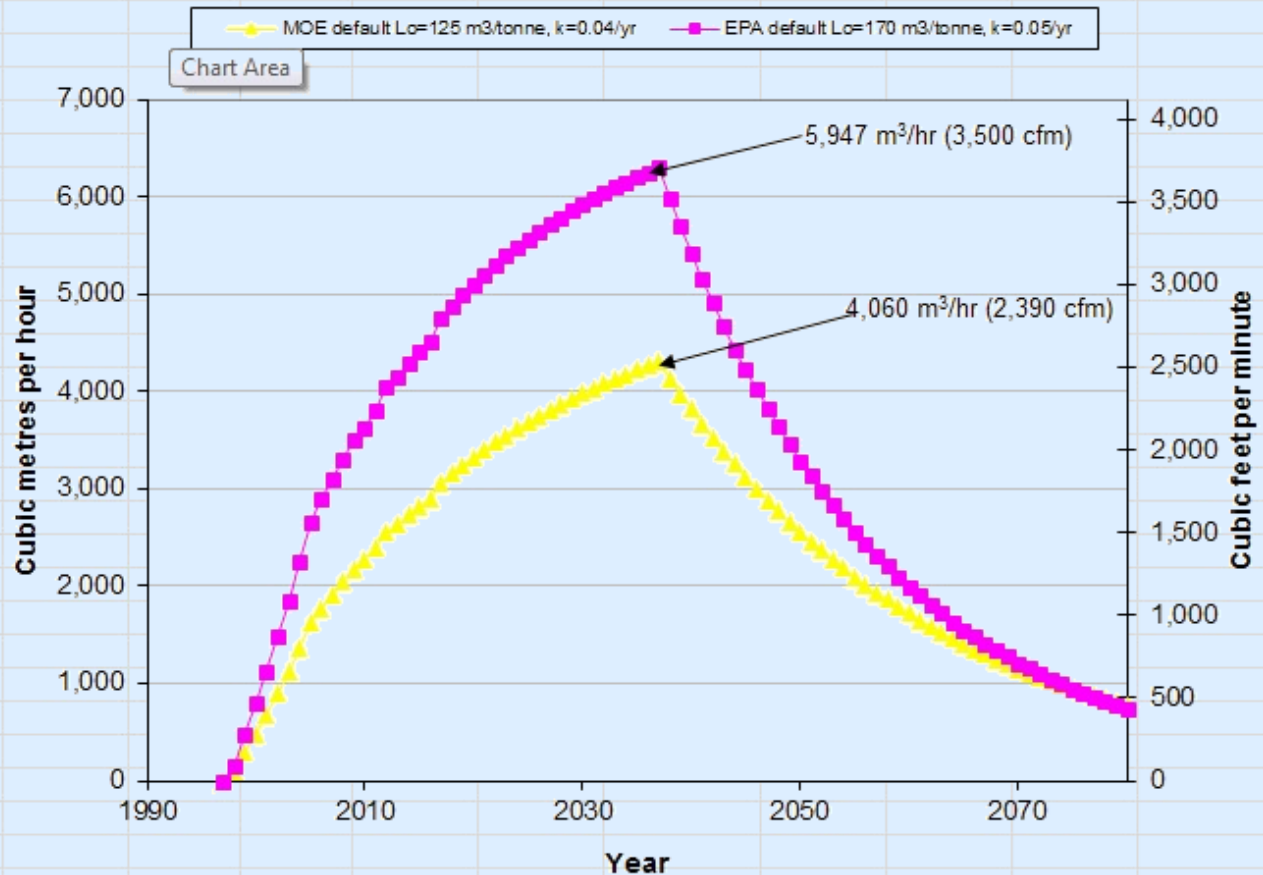
**Pressure Impact**



**Concentration Impact**

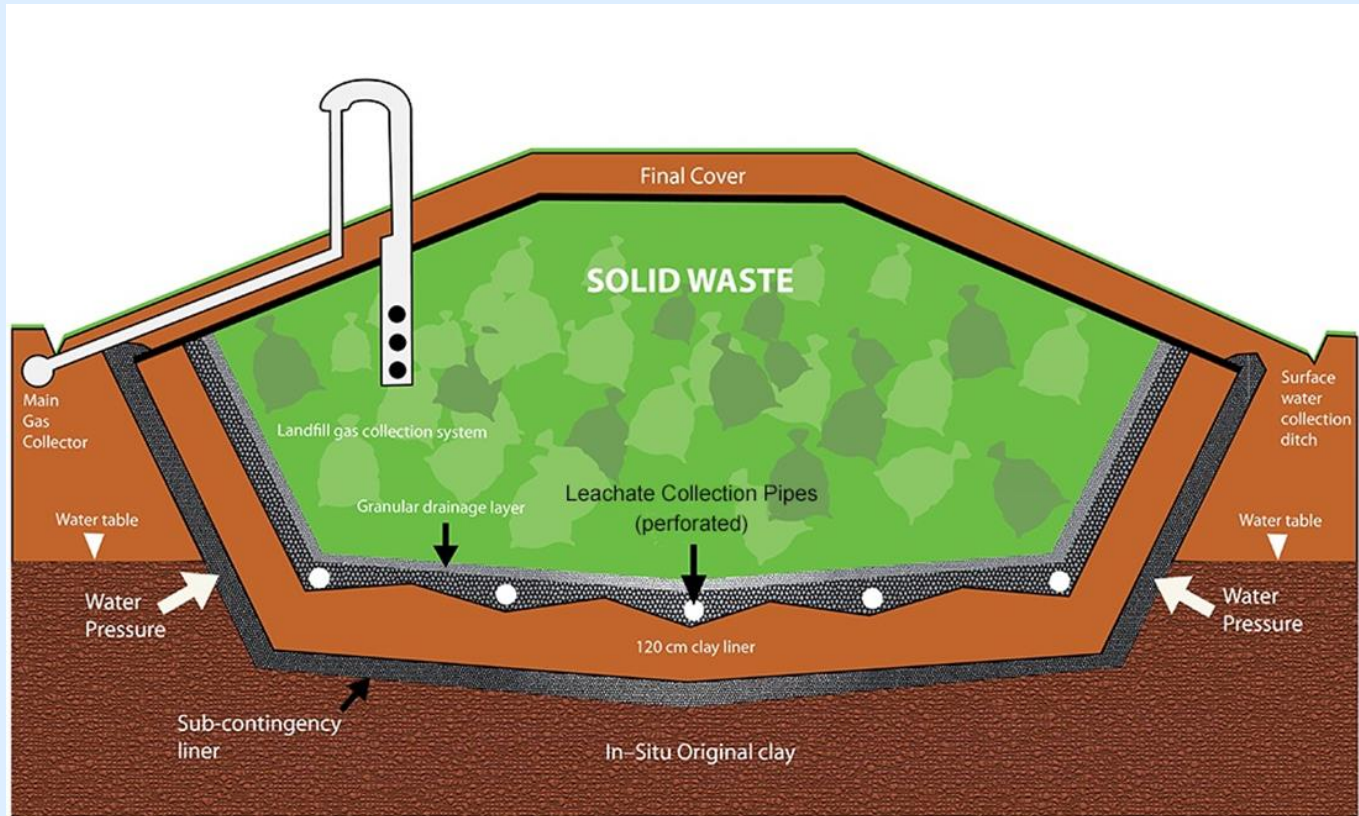
# Improved Modeling & Testing

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# Cover Leachate Collection System Layer

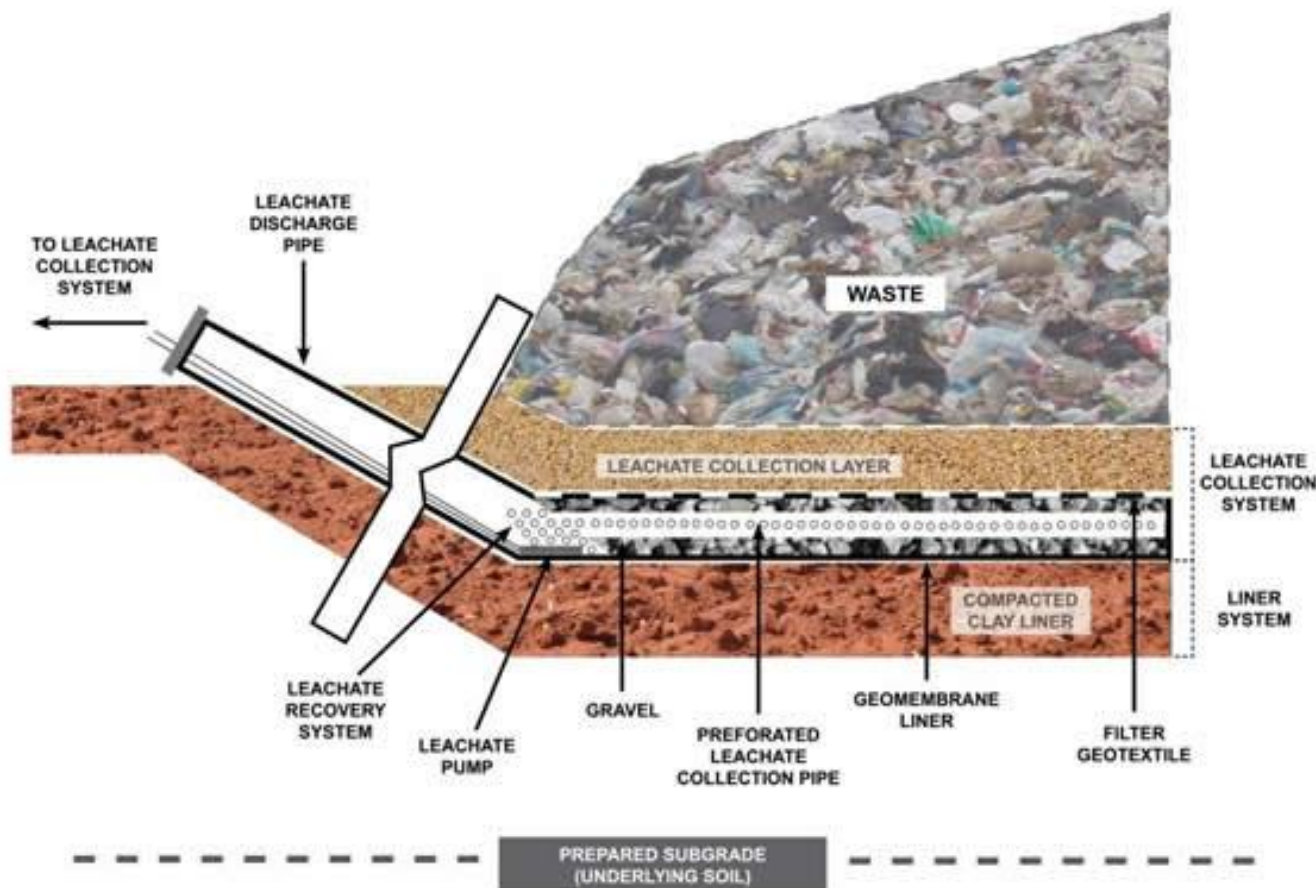
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# Connect Leachate Collection System to Gas Collection System

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LEACHATE COLLECTION & RECOVERY SYSTEM (IMAGE NOT TO SCALE)



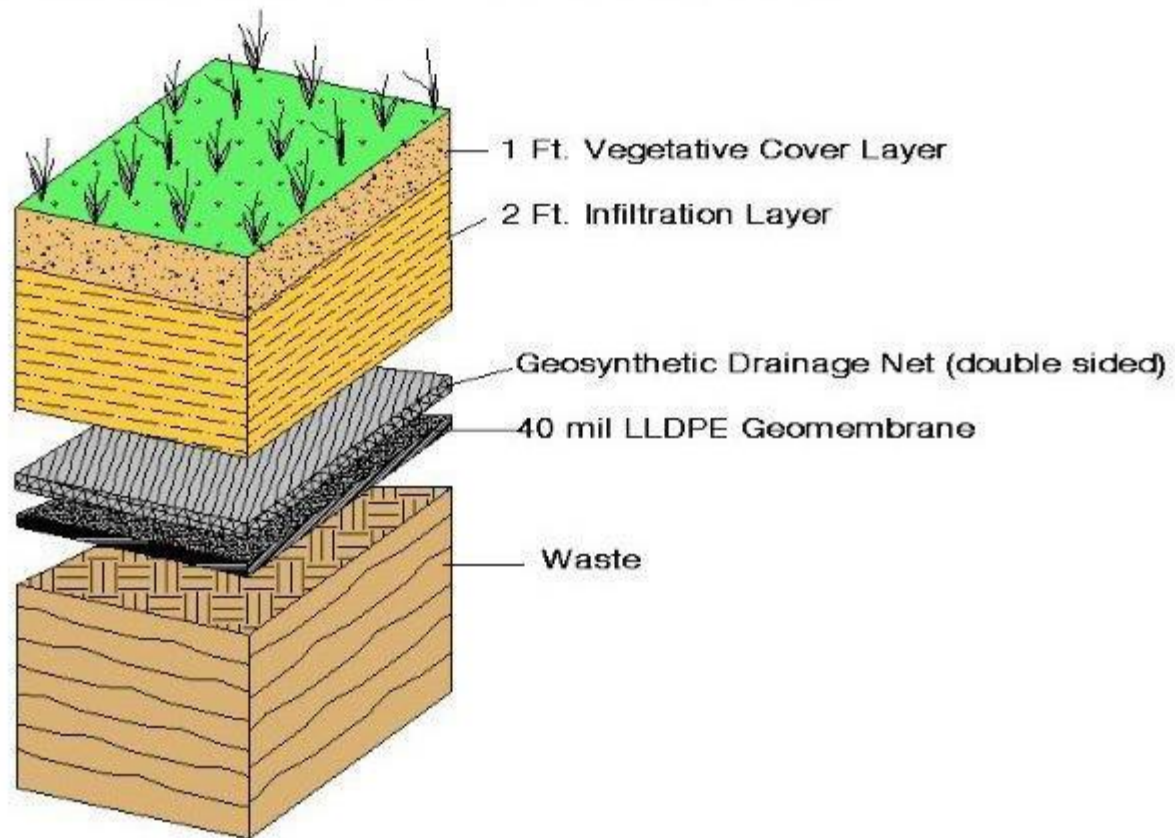
# Special Low Quality Flare

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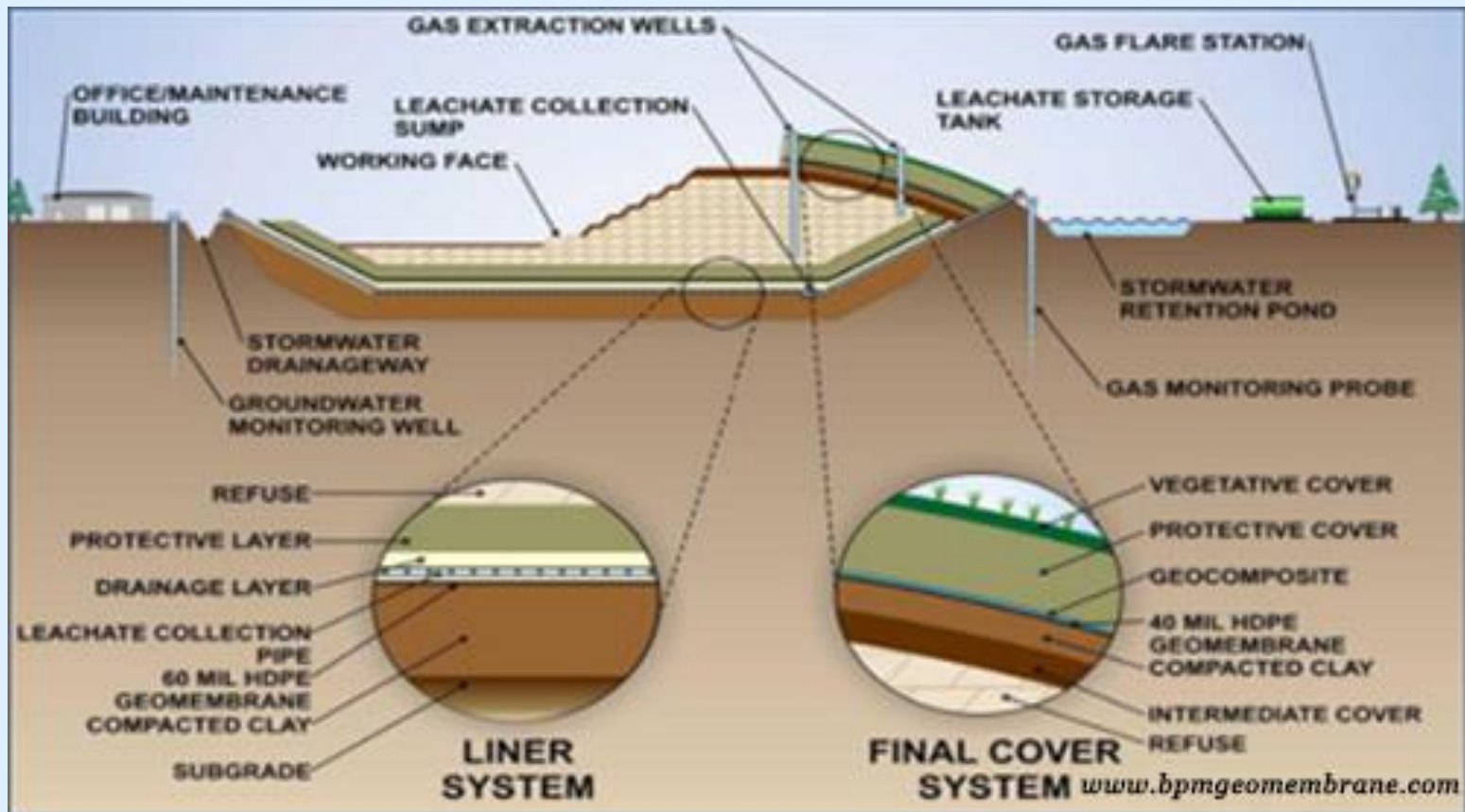
# Covers for Better LFG Collection

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# Timing of Final Cover Systems

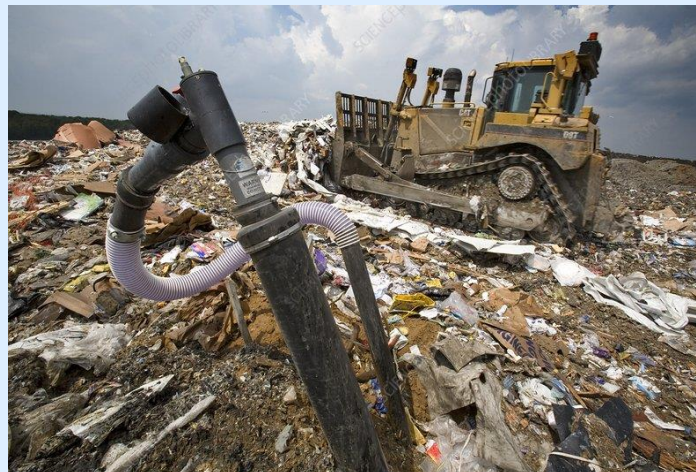
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# Impact of Daily Landfill Operations

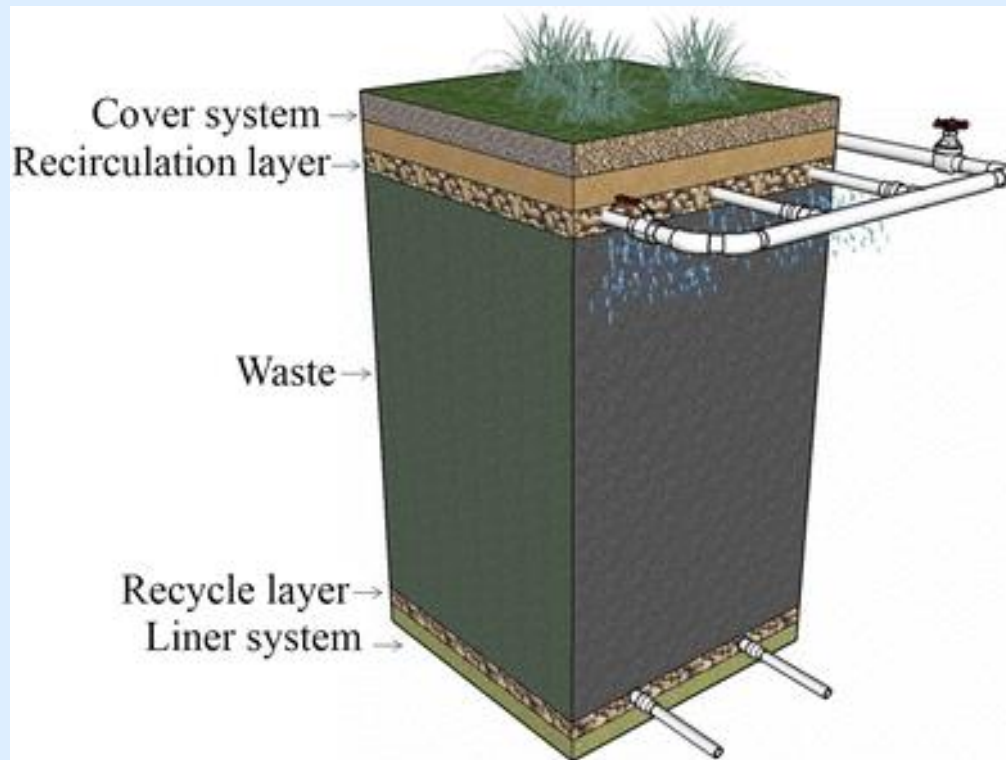
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- **Ensure operations allow for installation of a successful LGCS**
- **Avoid collection system damage by working with operations ie. GPS in compactors, design system with landfilling in mind**



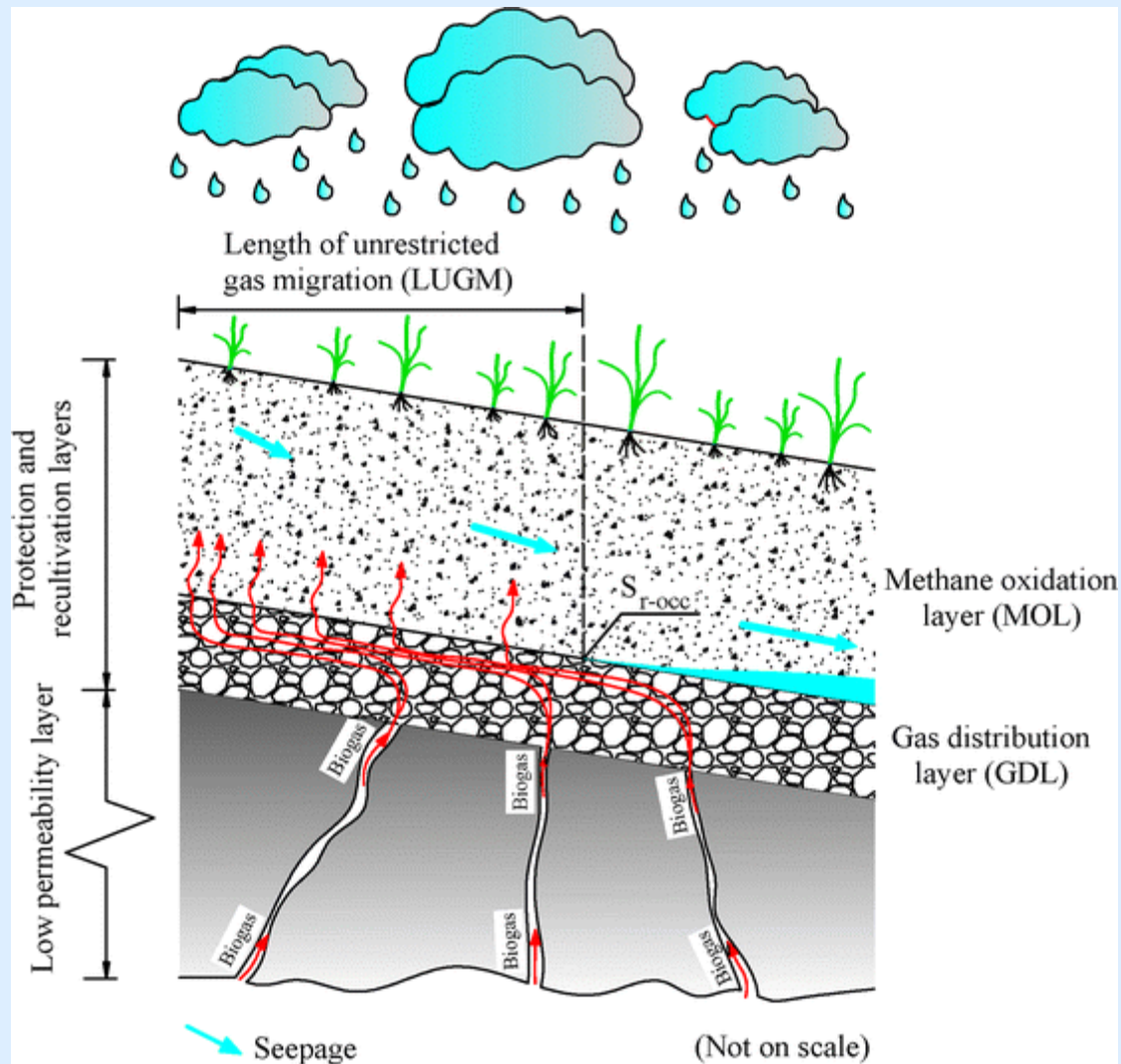
# Leachate Recirculation

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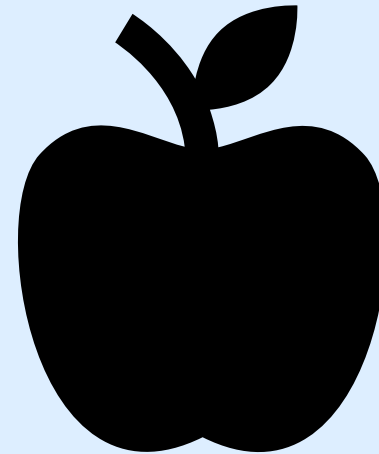
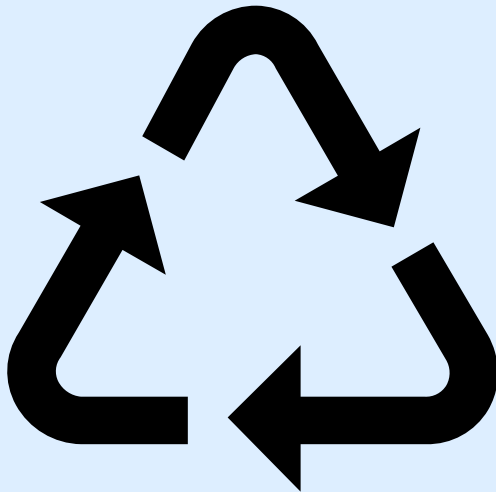
# Biocovers/Compost

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# Promote Diversion & Green Bins

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# Odour Control Systems

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# Change Waste Intake Streams

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# Closing & Discussion

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