# Modifying an Existing Sub-Slab Methane Mitigation System at Redeveloped Landfill Site after Years of Settlement

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# Outline

Site Background

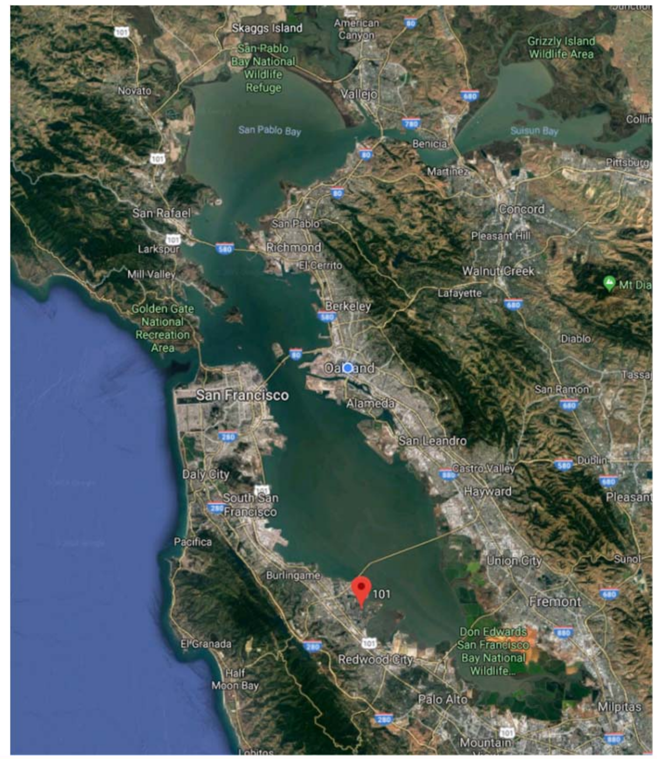
Objectives

Approach

Results

# Site Background - Location

- Bayshore Technology Park
- Redwood City, California
- 45 acres
- 20 office buildings





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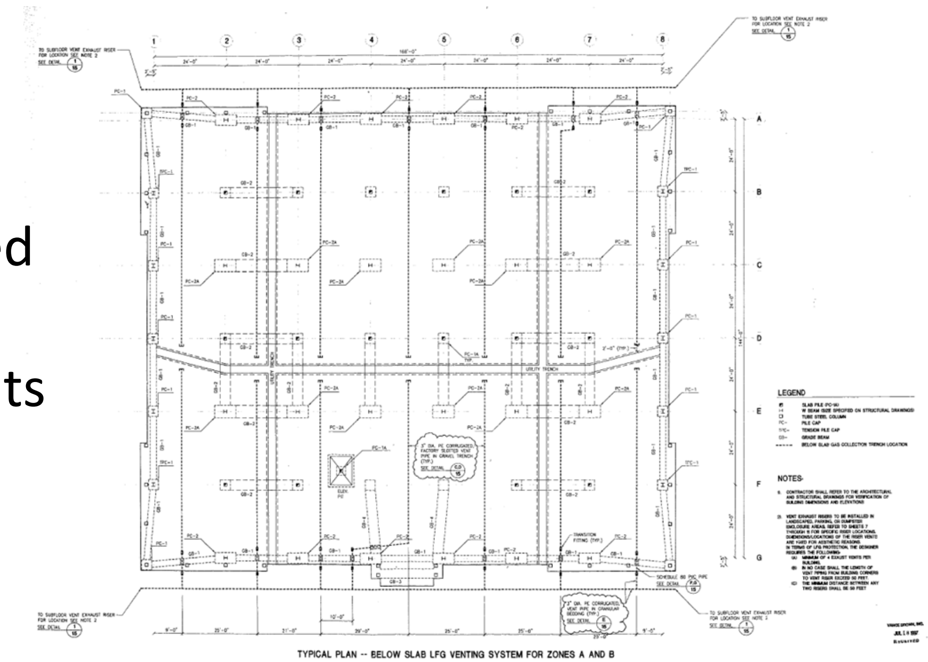
# Site Background - History

- Tidal marshlands until 1910
- Westport Landfill, 1948 – 1970, unlined
  - Municipal solid waste
  - 650,000 cubic yards of fill material
- 20 office buildings constructed in late 1990's and early 2000's
  - LFG control and protection system

# Site Background – Existing System

- Passive system
  - Sub-slab membrane
  - Lateral vent piping
  - Exhaust risers with wind-assisted turbines
- Sub-slab area broken into six sextants by utility trench



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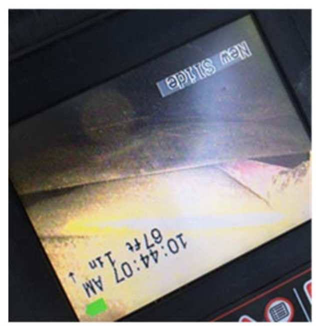
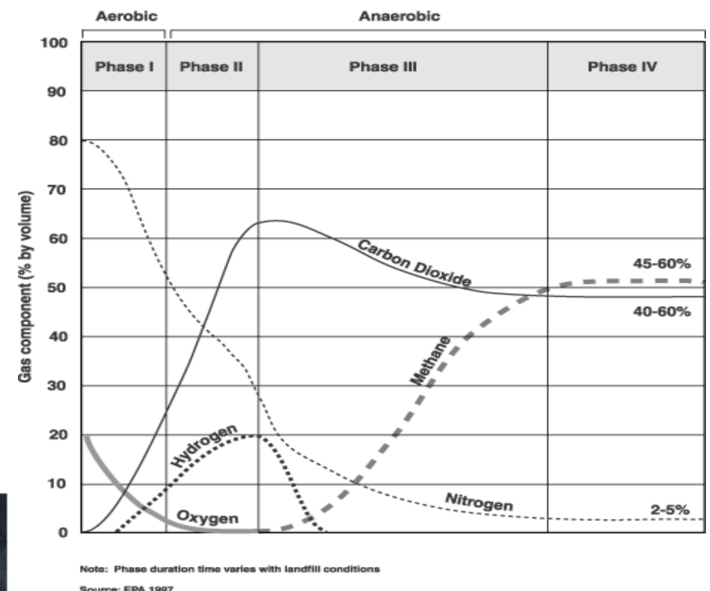
# Site Background - Problem

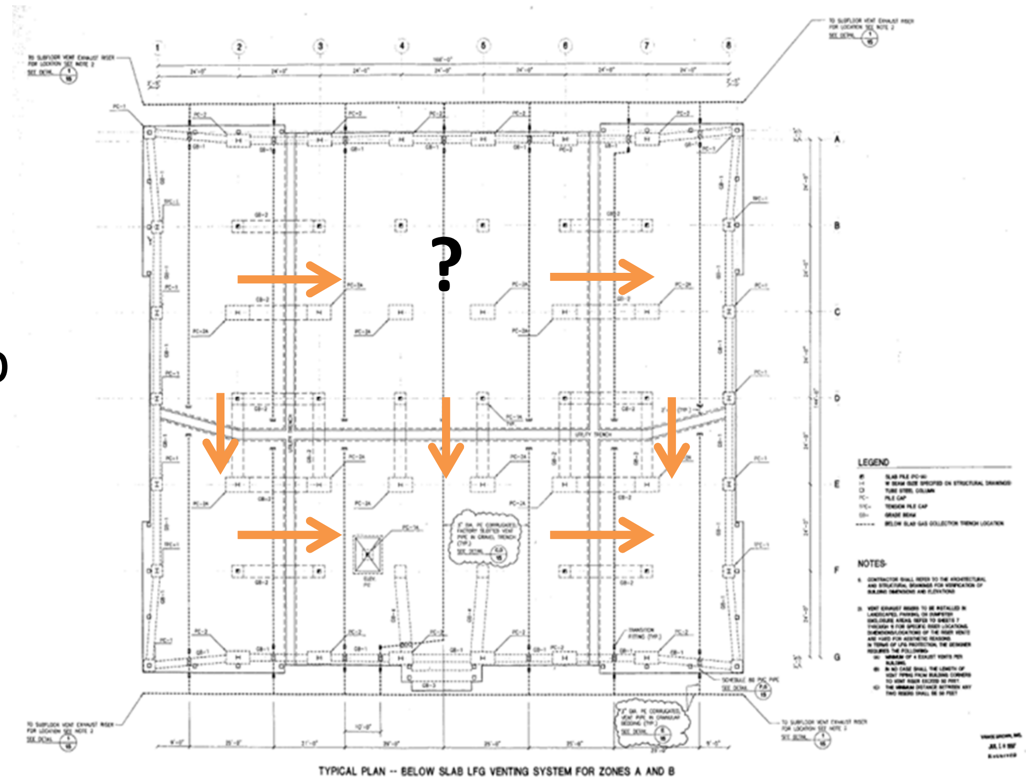
- Refuse degradation
- Methanogenesis
- Site settlement
    - Non-uniform
    - 3.5-5 feet
- Cell-crete placed for structural stability
- Methane intrusion in utility trench





# Approach - Goals

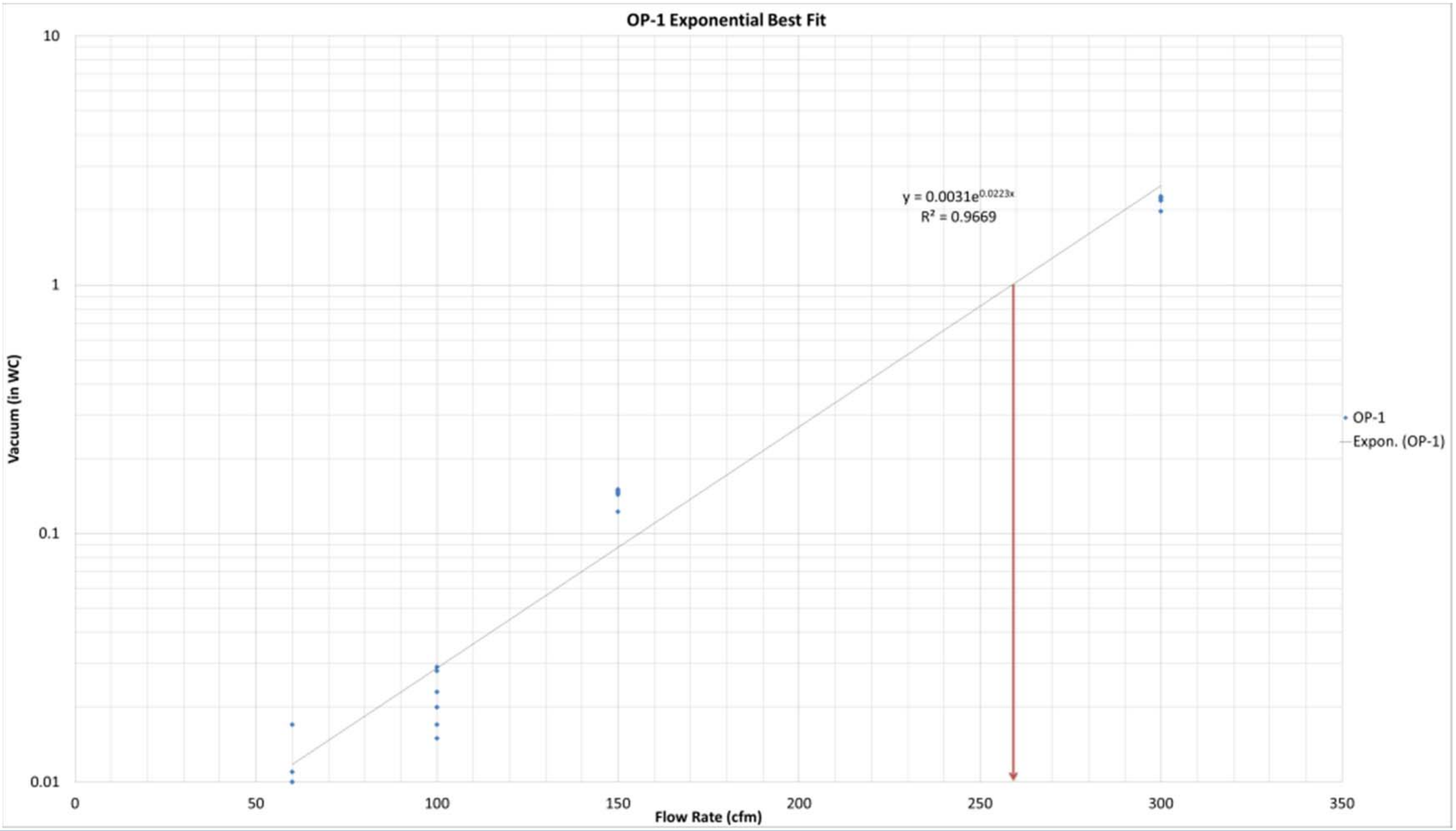
- Goals
  - Determine pneumatic connectivity of sub-slab space
  - Induce vacuum in sub-slab space
  - Decrease methane concentration in sub-slab space and utility trench



# Approach - Testing

- Design Parameter Test
  - Modify existing exhaust riser
  - Attach extraction blower
  - Monitor methane and vacuum via 1-inch observation ports
  - Review data to design permanent system

# Approach – Testing Results, Building 1



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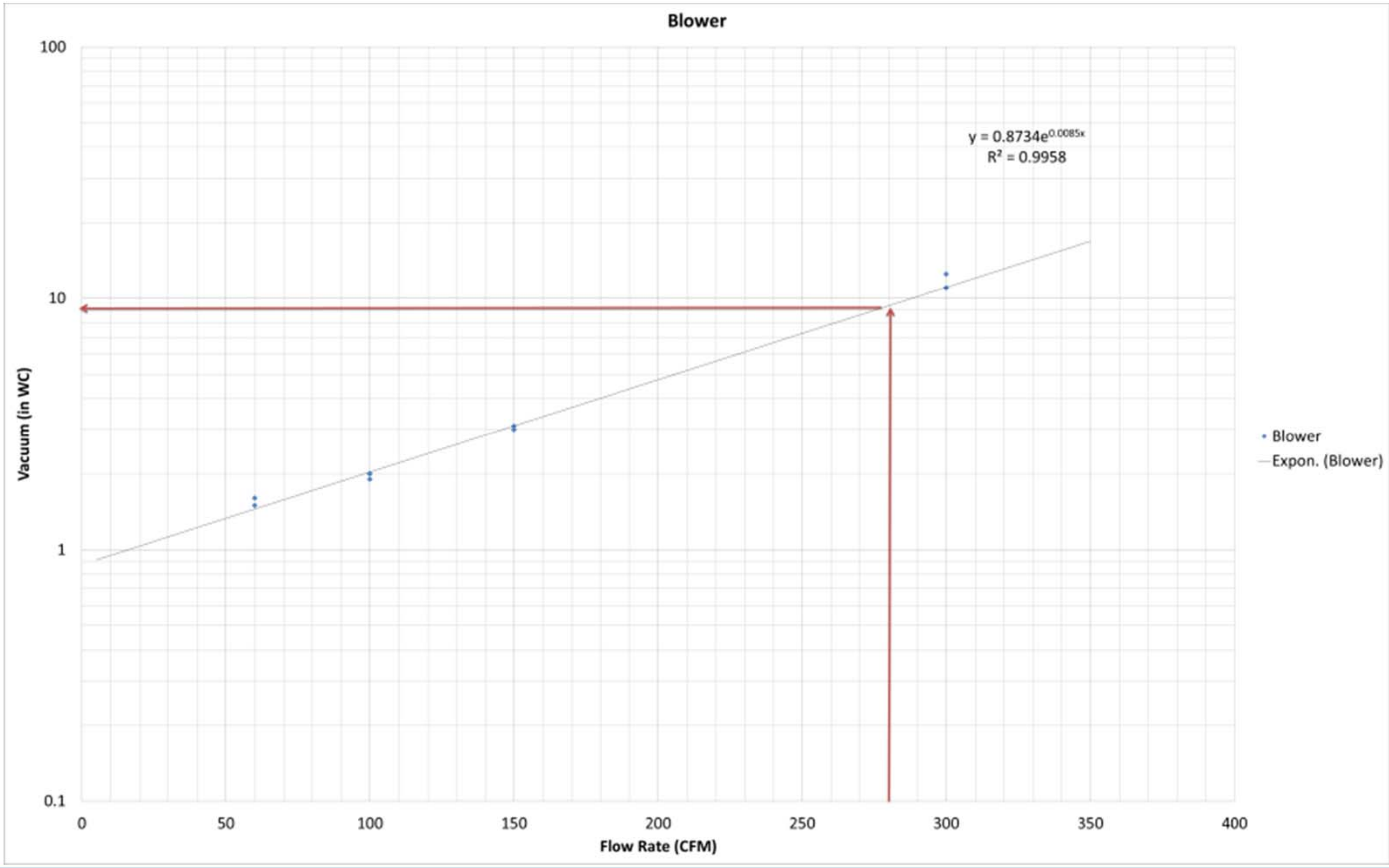
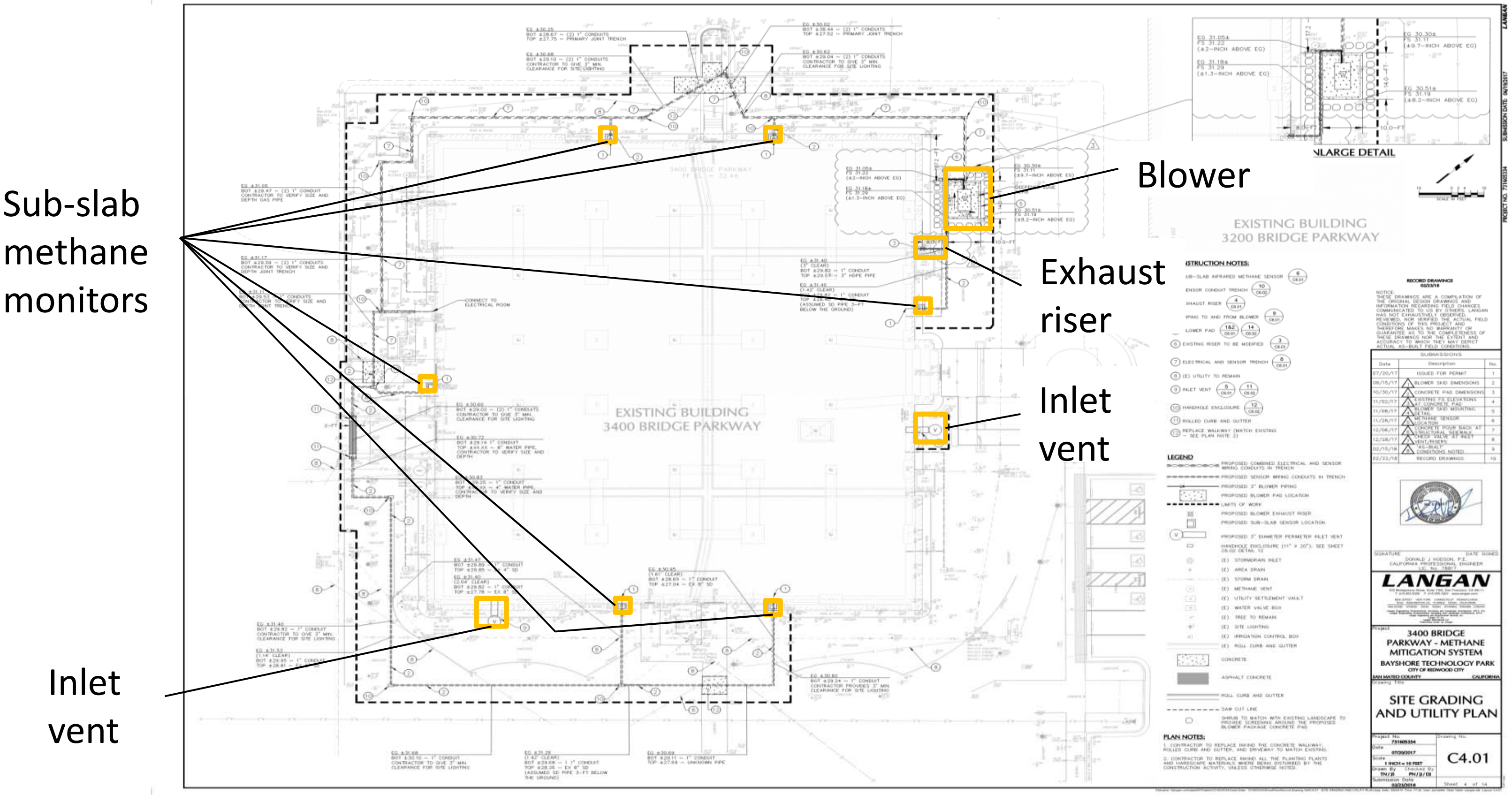
# Approach – Testing Results, Building 1



# Approach – Design, Building 1



# Approach – Testing Results, Building 2

- Different from Building 1
  - Negligible vacuum effect
  - Greater decrease in methane concentration
- Performed two Design Parameter Tests
- Temporal and spatial variations in methane beneath building

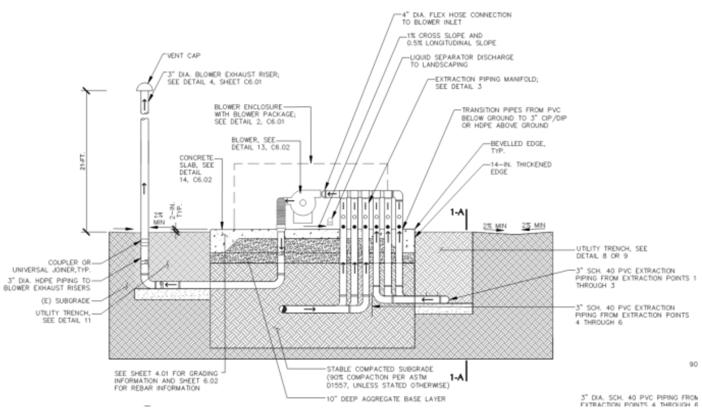
Table 1
Extended Design Parameter Test Summary
1300 Island Drive

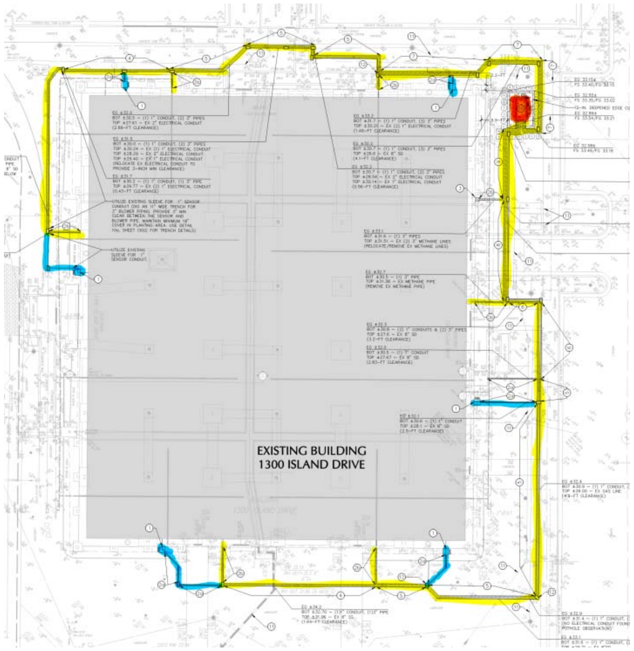
November 2017

| Location | Baseline Methane (% by volume) | Methane After Extraction[1] (% by volume) | % Decrease During Extraction | Final Methane[2] (% by volume) | Estimated Methane Generation Rate[3] (g $CH_4$/$m^3$ air/hour) | Estimated Methane Generation Rate (lb $CH_4$/day) |
|---|---|---|---|---|---|---|
| OP-1 | 26.2 | 4.25 | 83.8 | 15.50 | 3.06 | 10.12 |
| OP-2 | 32.5 | 0.1 | 99.7 | 3.95 | 0.71 | 0.46 |
| OP-3 | 40.5 | 4.25 | 89.5 | 6.82 | 0.74 | 1.13 |
| OP-4 | 35.1 | 11.7 | 66.7 | 13 | --* | --* |
| OP-5 | 35.6 | 2.5 | 93.0 | 8.2 | 1.78 | 0.89 |
| OP-6 | 42.5 | 0.35 | 99.2 | 21.7 | 6.48 | 7.4 |
| Total | n/a | n/a | n/a | n/a | n/a | 20.00 |
| Average | 35.4 | 3.9 | 88.6 | 11.5 | | |

# Approach – Testing Results, Building 2

- Considered multiple alternatives due to uncertainty in testing results
- Chose Alternative 2
    - Extract from all six sub-slab sextants
        - Flow control valves
    - Six sub-slab methane monitors
    - No inlet vents



# Results – Building 1

- Functioning System
  - System optimization ☑
  - Successfully decreases methane concentrations ☑
  - No building alarms ☑
- Key Lessons
  - Blower cycling frequency
    - Conduit seals
    - Sensor proximity to extraction point
  - Sub-slab moisture level
    - Moisture traps for methane sensors

# Results – Building 1

# Results – Building 2

- Design is going through City and County review

- Incorporated key lessons from Building 1
  - Moisture protection for sensors
  - Distance between sensor and extraction point
  - Better blower access

- Will undergo optimization period
  - Regulate extraction from each sextant to minimize methane and blower cycling



# Questions