

LANDFILL GAS MONITORING & CONTROL STRATEGIES at DEVELOPED SITES

Sponsored by the:
CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

Developed and Presented by:
SCS Engineers & GC Environmental, Inc.



SCS ENGINEERS

COURSE OUTLINE FOR DAY TWO

- Case Studies
 - LEA Case Study
 - SCS Case Study
- CIWMB Tire Production Presentation
- CIWMB Roles & Responsibilities
- Group Exercises
- Course Assessment/Evaluation

CASE STUDIES

- LEA Case Study

County of Los Angeles
Department of Health Services

Solid Waste Local Enforcement Agency (LEA)

Belmont Shores Landfill

Gas Monitoring History

Presenter
Tom White

Site History

- Disposal site operation 1948-1956
- Development began:

Belmont Shores Mobile Estates

Gas Lamp Restaurant

Bahia Marina

Golden Sails Best Western

City Dump and Salvage 1956



1960



Approximate Locations of Belmont Shores
The Gaslamp, The Golden Sails Best Western
The PCH Club and The Bahia Marina



Current Property Use



Site History

- 1970 grading and settlement, and gas issues
- 1973 subsurface venting program 17 vents installed
- 1975 explosion in mobile home park, 1 death
- Continued settlement issues

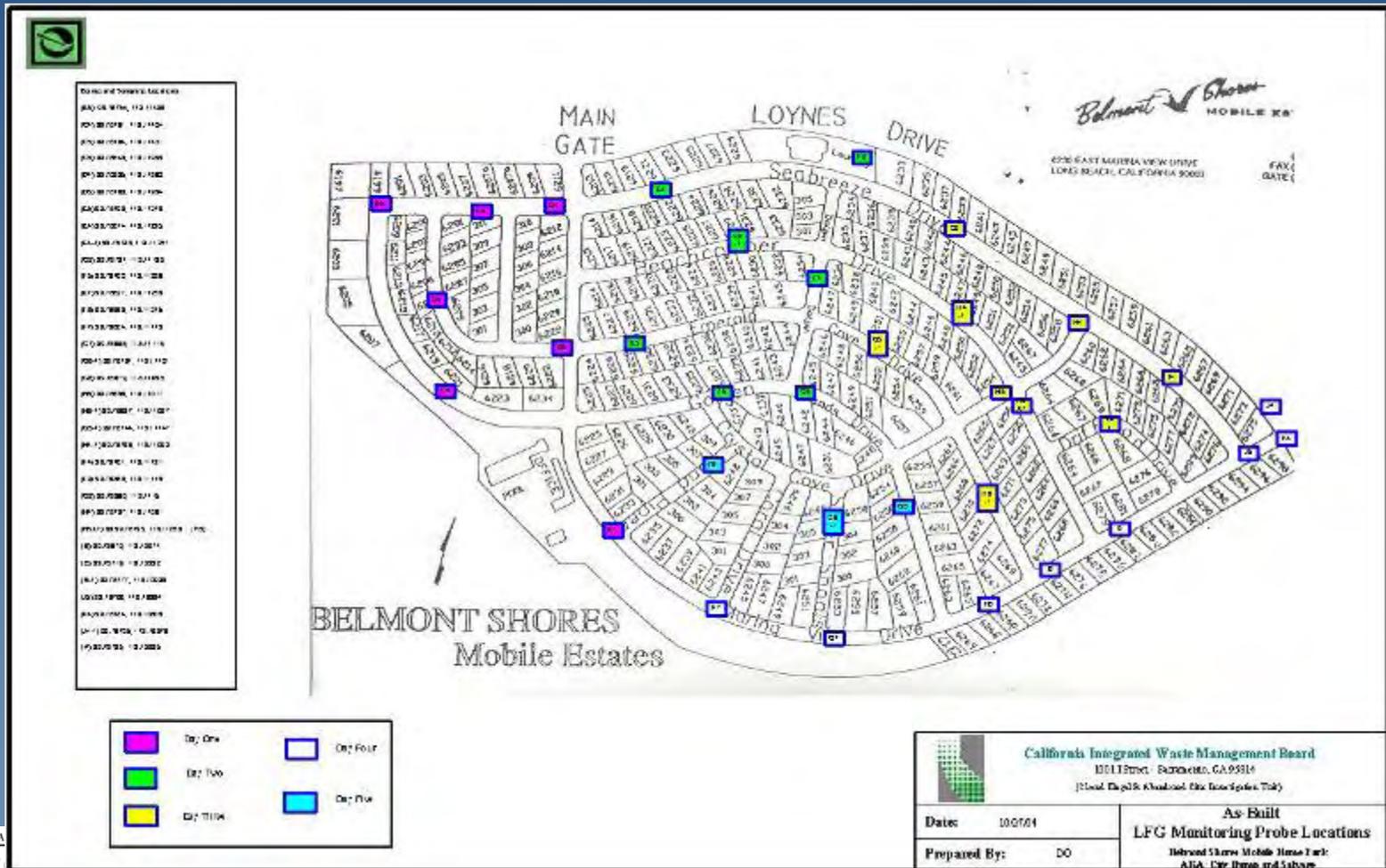
Site History

- Vents monitored by private consultant
- 1994 CIWMB called to evaluate issues with differential settlement
- Excessive gas found in storm drains and in vents
- Recommendations of a full scale monitoring program
- 1998 additional vent installed
- 2002 brought to the attention of the CIA group

Site Investigation

- 2004 Los Angeles county requests assistance from CIWMB's Closed, Illegal, and Abandoned Site unit (CIA) to conduct:
 - A phase 1 investigation
 - A phase 2 investigation
- Possible mitigation measures
- Focused on Belmont Shores Mobile Home Park

Investigation 33 Probe Locations



Investigation

- Geophysical
- Installation of 37 multi-level gas monitoring probes
- 33 in Belmont Shores
- 4 around the perimeter
- Gas samples taken and sent to Lab
- Bi-weekly monitoring conducted by LEA and CIWMB

37 Multi-Depth Gas Probes 33 at Belmont Shores Park



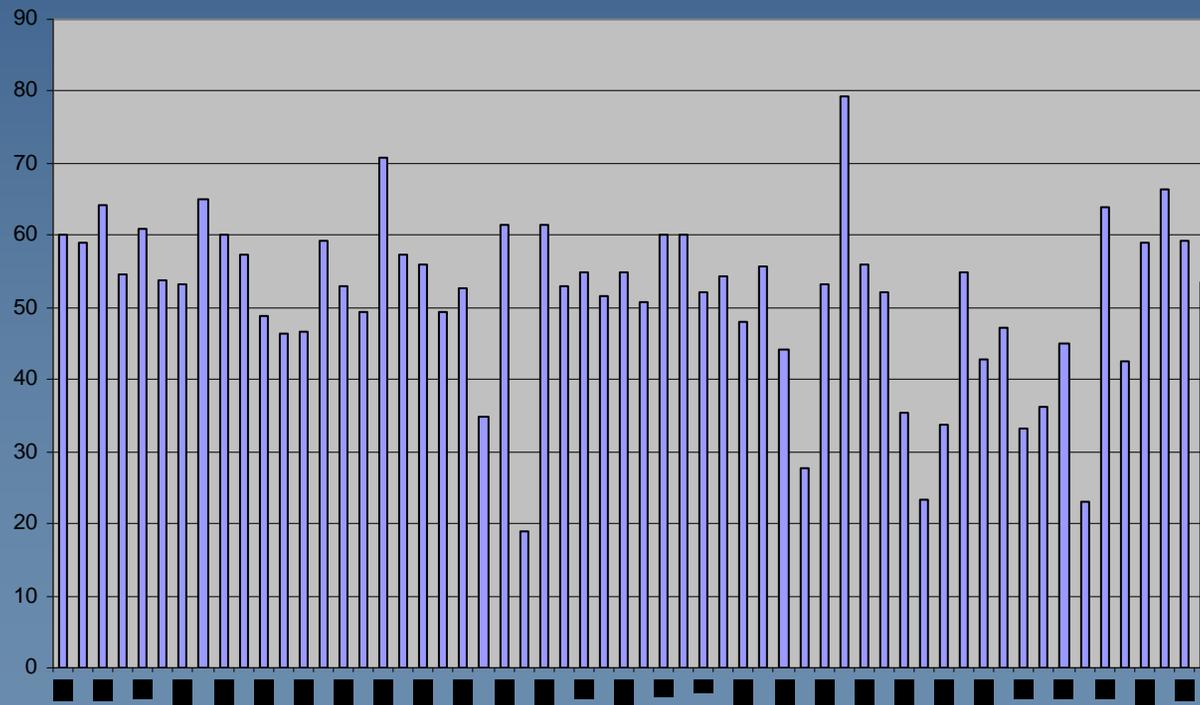
Gas Sampling



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Average Gas Concentration 51.20% Under The Cap

Gas Readings @ Probes (Average Concentration)



Structure Gas Monitoring Regulations in 27 CCR

- 20921 (a) (1) requires that "...The concentration of methane gas must not exceed 1.25% by volume in air within on-site structures..."
- 20931 (a) "...monitoring network design shall include provisions for monitoring on site structures, including but not limited to buildings, subsurface vaults, utilities or other areas where potential gas buildup would be of concern..."
- 20931 (c) "...Structures located on top the waste disposal area shall be monitored on a continuous basis..."
- 20934 (a)(1) "...monitoring reports shall include: (1) the concentrations of the methane...within each on-site structure..."
- 20937 (a)(3) "...the documentation of date, time, barometric pressure, atmospheric pressure, general weather conditions and probe pressures..."

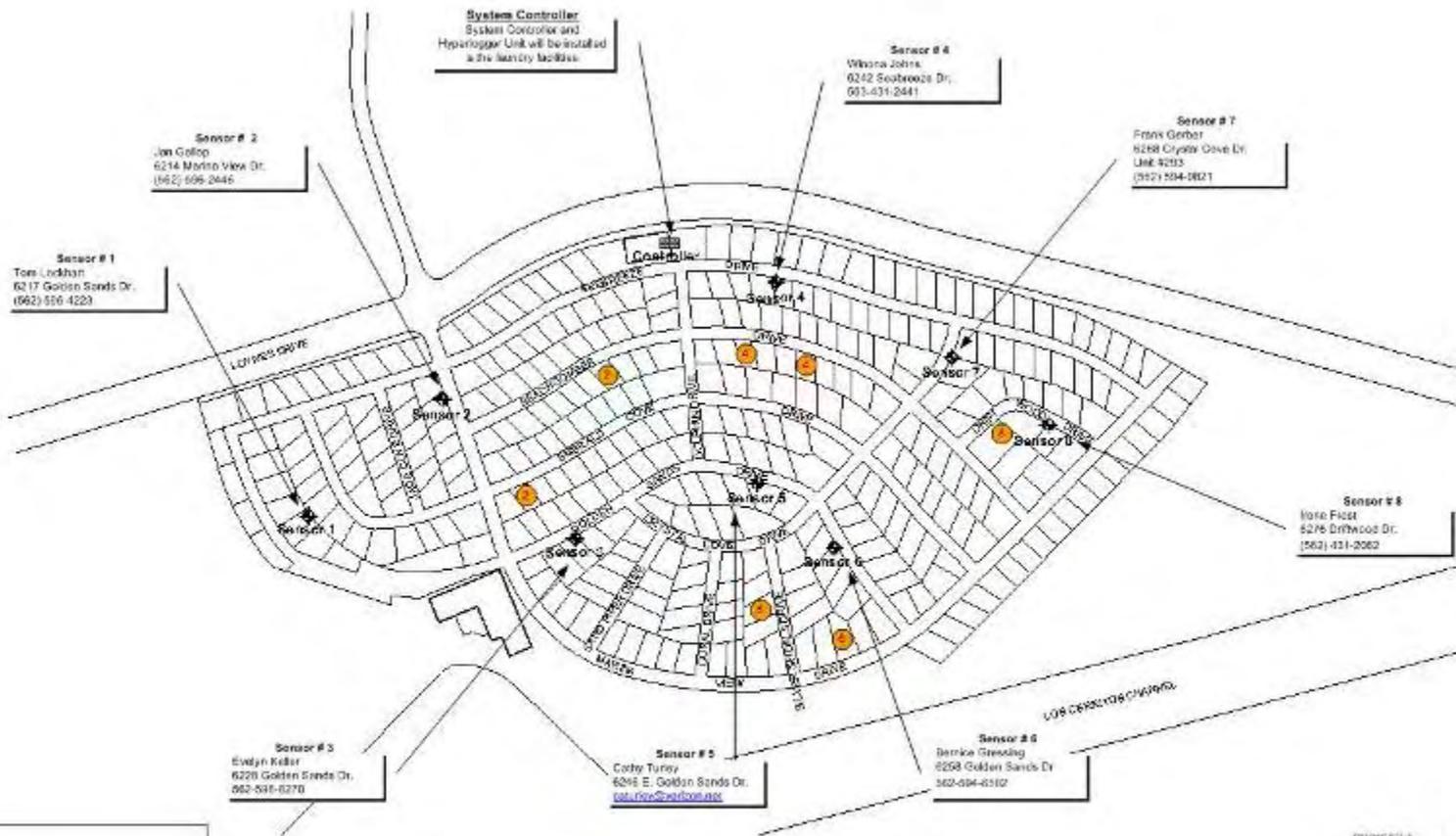
Structure Gas Monitoring Data Analysis

- Time-trend continuous monitoring data for one year from 8 gas sensors placed throughout the park will be reviewed by the CIWMB/KEA to determine if 1.25% gas is exceeded in monitored coach skirts
- **Important Note:** Based on the results of the CIWMB Gas Investigation Report (Feb 2005), it is recommended that all coaches be required to be equipped with continuous gas monitoring systems (fixed combustible gas detection systems) since the integrity of the disposal site cap is unknown under each coach
- Applicable Regulation: 20937 Control (d) "...When the results of monitoring in on site structures indicate levels in excess of those specified in Section 20923(a), the operator shall take appropriate action to mitigate the effects of landfill gas accumulation in on site structures, and public health and safety, shall include one or more of the following:...(4) Alarms, ...(5) Ignition source control...(7) Ventilation..."

Investigation Phase 2

- Need to determine if surface migration exists
- Logic for sensor locations chosen (zones)
- Placement of 24/7 methane sensors
- 8 locations

Sensor Locations



Notes:

1. At each sensor location, a radio transmitter (RSP7002T) will also be installed to pair with a sensor.
2. Optional locations are to be used in case a first choice location is not suitable for sensor installation due to unforeseen circumstances.

Legend:

- ◆ Remote Sensor (Proposed Location)
- ▣ Controller & Logging System Location
- Additional/Optional Locations



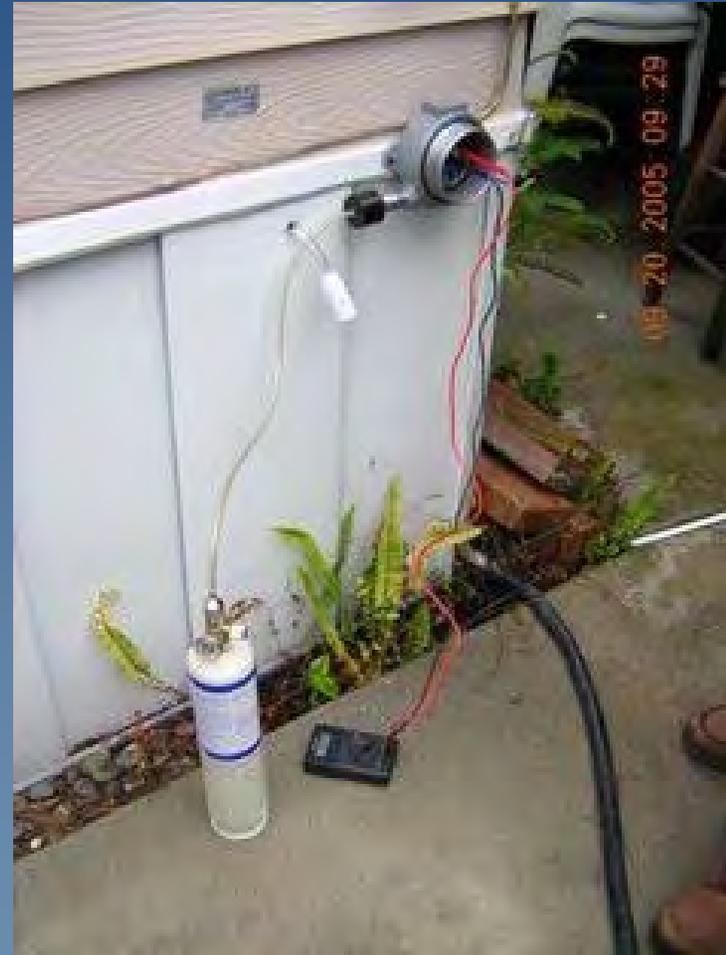
Controller and Data Logger System is Currently Operating



Sensor Unit and Transmitter



Calibration



Sensor Operation and Housing



Structure Gas Monitoring Results

- **End State**: The site will be judged to be in compliance with applicable regulations (27 CCR 20931 & 20937) when all coaches are continuously monitored for landfill gas and actions are taken to prevent the accumulation of gas in coaches where concentrations exceed 1.25% $V_{\text{gas}}/V_{\text{air}}$

Current Conditions

- Each coach is being modified with a sensor
- Other locations
 - Gas lamp
 - Bahia marina
 - Golden Sails Best Western

Questions

CASE STUDIES

- SCS Case Study

Landfill #1 - Setting



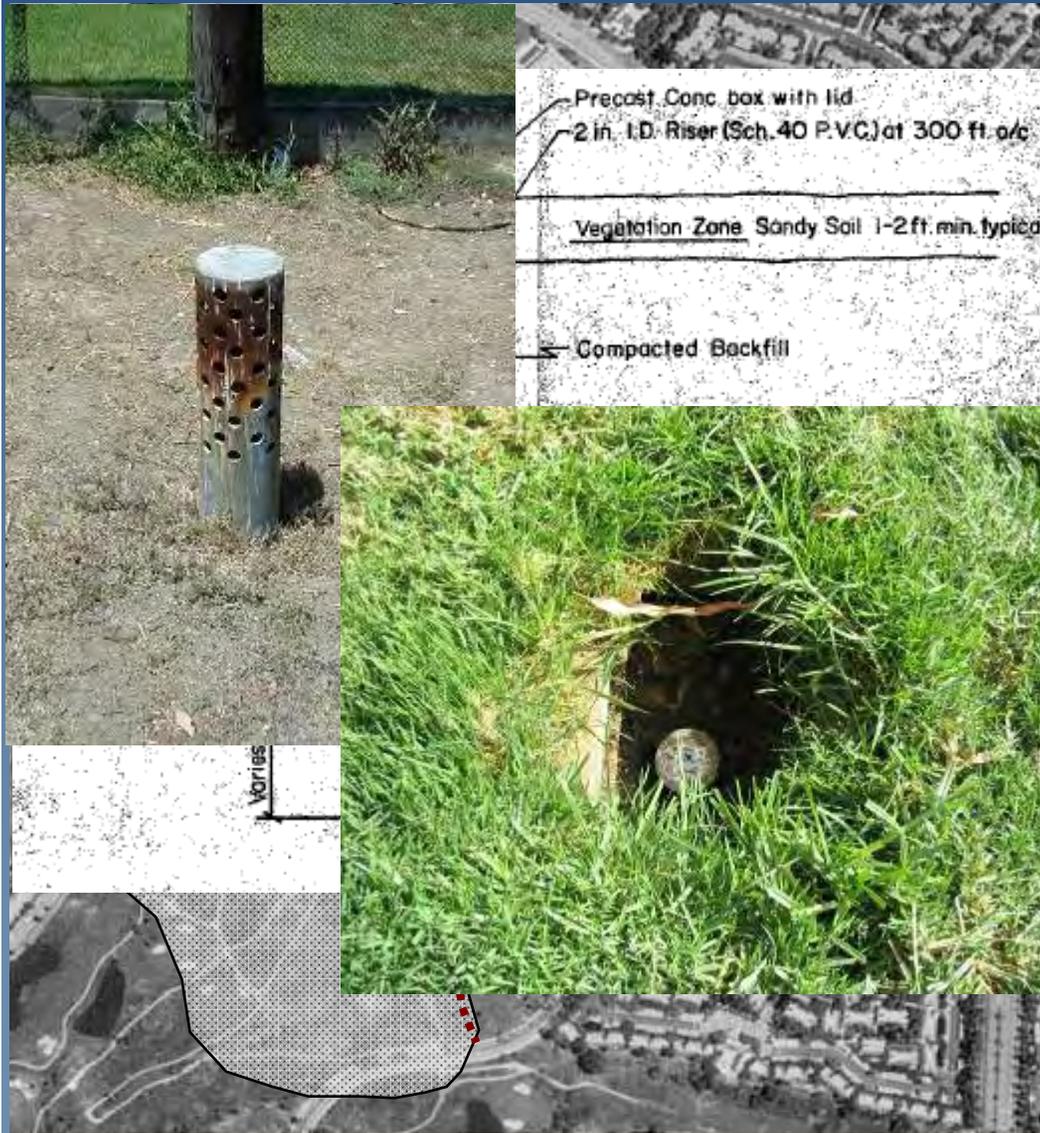
- 115-acre cut and cover operation
- Operated over 5 years (1960-1964)
- Property and surrounding area undeveloped at time of closure
- Golf course development on-site since 1965

Landfill #1 – Setting Refuse Extent



- Original landfill Extent (at time of closure)
 - A portion of refuse excavated for residential and commercial development
 - Current refuse Extent
-

Landfill #1 – Setting Historic Perimeter Gas Barrier



- Perimeter Gas Barrier/Passive Vent Trench installed prior to adjacent developments
- Perimeter Gas Barrier/Vent Trench Detail
- Limited, non-contiguous remnants of vent system identified on-site

Landfill #1 – Setting Perimeter Probe Installation



- Original network of 11 perimeter probes installed at site in 2002
- Based on exceedances, 24 additional probes installed
- 29 out of the 35 probes (eastern perimeter) have methane levels above 5%

Landfill #1 – Emergency LFG Monitoring



- In-house monitoring of residential structures performed over Thanksgiving Holiday due to elevated probe readings

Landfill #1 – Perimeter GCCS



- 28 perimeter extraction wells will be installed at the site
- Wells interspersed with probes at 100-foot spacing
- Wells to be located in refuse and/or soil, based on field conditions

Landfill #1 – Perimeter GCCS

- Proposed perimeter GCCS must integrate with the existing golf course
 - Subgrade header installed adjacent to cart path
 - Installation of system split into separate sections to allow for installation during slow season
 - Former Gas Barrier/Vent Trench integrated with GCCS by running laterals to vent risers

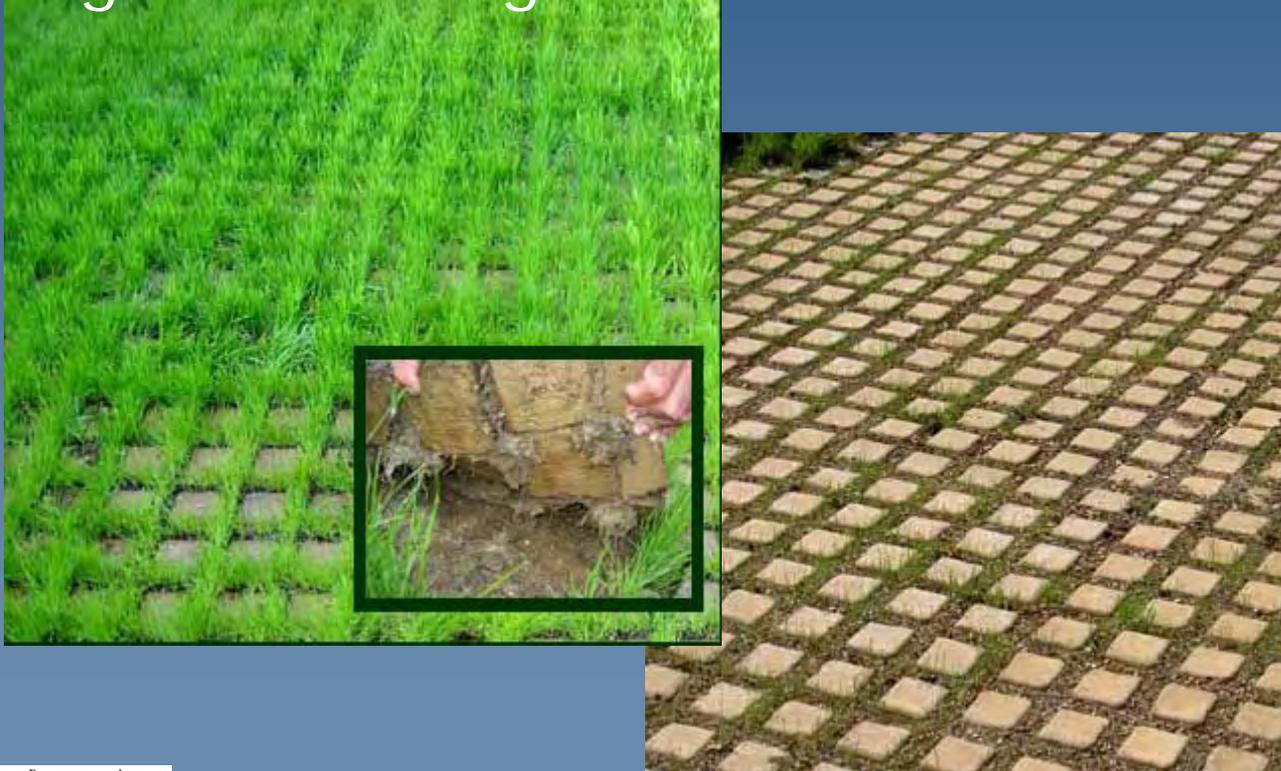
Landfill #1 – Northern Perimeter Probe Issues



- Probe violation (>5%) in February 2006, after 3 years of non-detect
 - Exceedances continued through August '05
 - No exceedances since August '05
- Probe located in adjacent to unlined drainage alignment
- Significant rains during '04-'05 season

Landfill #1 – Northern Perimeter Probe

- Drainage area repaved to expand parking area
- Proposed parking area paving altered to allow for LFG migration through landfill cover



GROUP EXERCISES

- Two Scenarios will be Presented

ASSESSMENT & EVALUATION

- Conduct End-of-Course Assessment.
- Trainee Course Evaluation.