Assessment of Perimeter Landfill Gas Monitoring Probe Functionality Using a Video Borehole Monitor

LEA/CIWMB Partnership Conference
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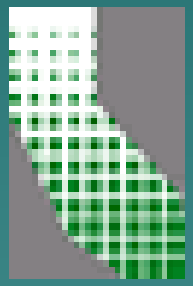

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Session Agenda

I. Introduction
II. Background
III. Site Selection Criteria

IV. Equipment
V. Work plan
VI. Data Gathering
VII. Preliminary Findings

VIII. Observations
IX. Questions

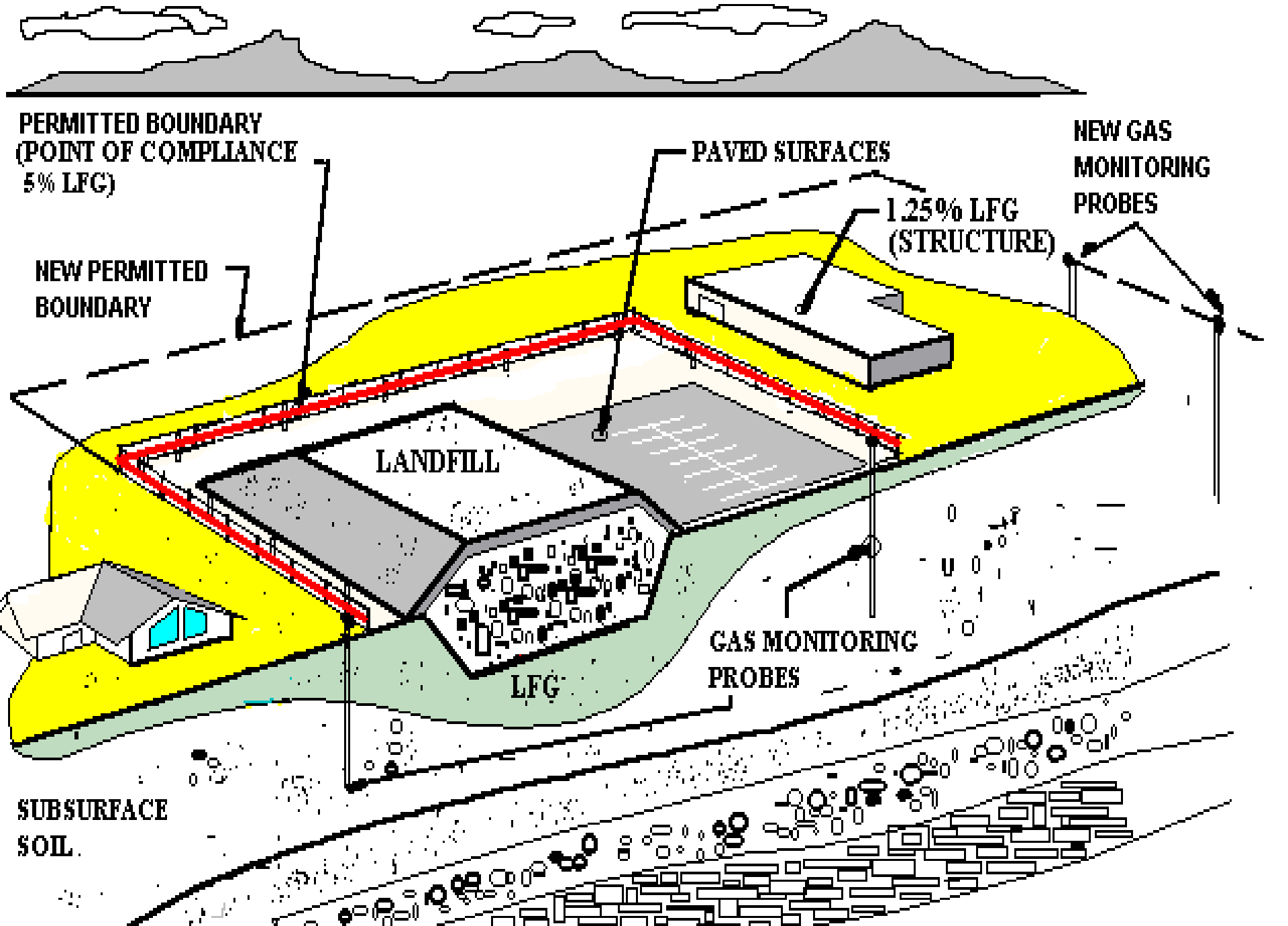
I.
Introduction

A properly designed and fully functional system of perimeter landfill gas monitoring wells and probes currently provides the best and usually only warning for the unwanted off-site migration of landfill gas.

Gas Monitoring & Control 27CCR 20918-20939

- Perimeter monitoring wells shall equal the maximum depth of waste
- Probes are to be designed to detect (5% at permitted facility boundary)
- Monitoring network wells are to the depth of waste & spaced at a 1000 ft maximum
- Monitoring network probes are to be multi depth with screens in permeable strata
- Probes are to be monitored for CH4, temperature and pressure

- Perimeter monitoring probes at both active and closed landfills are routinely monitored for the 5% standard at the permitted facility boundary or property boundary on a daily, weekly, monthly or quarterly basis.


PERMITTED BOUNDARY
(POINT OF COMPLIANCE
5% LFG)
NEW PERMITTED
BOUNDARY
PAVED SURFACES
1.25% LFG
(STRUCTURE)
NEW GAS
MONITORING
PROBES
LANDFILL
LFG
GAS MONITORING
PROBES
SUBSURFACE
SOIL

- It is assumed that these monitoring system probes are functional. Are they?

- This study, to my knowledge, is the first of its kind to evaluate landfill gas monitoring probe functionality using a video bore-scope

II.
BACKGROUND

- Landfills generate gas which can pose a direct threat to public safety from fire and explosion and can adversely effect groundwater and air quality

- In California there are currently over 145 active and over 2500 closed, illegal and abandoned landfills

- **Properly functioning perimeter landfill gas monitoring systems are the foundation for all efforts to ensure the protection of the public health and the environment at landfills**

- Yet along with the potential for deterioration, monitoring probes may not be designed or installed correctly to begin with and
- There are no national standards for monitoring probe design, construction and maintenance

- Technology has now developed to a point that we can for the first time assess monitoring probe functionality
- We first field tested a video bore-scope in late 2005 with great success
- This success resulted in the Board approving a grant for this landmark study

III.
SITE SELECTION CRITERIA

- 20 Landfills were chosen for the study
- 50 % Active Landfills

- 50 % Closed Landfills
- Of the active sites 5 were public & 5 private

Site Distribution

- 10 Northern California sites from Redding to Fresno
- 10 Southern California sites from Los Angeles to San Diego

Additional Selection Criteria

- The majority of the probes should be at least 10 years old
- The majority of probes should be at least 30-40 feet deep
- Probes should not be deeper than 99 feet
- 10 probes would be evaluated at each site in no less than 4 monitoring wells
- Board staff will pick the probes to be studied on the day of the study

- A few newly constructed probes were evaluated
- A few fairly shallow probes were evaluated
- A few probes could not be completely evaluated due to unforeseen circumstances
- The average probe depth was about 45 feet

IV. EQUIPMENT

Primary Study Equipment

- Everest™ XLC 800 video bore-scope
- LANDTEC GEM 2000™ gas monitor
- RKI Eagle™ gas monitor
- Pressure gauges
- Vacuum pump
- Handheld GPS instrument
- BRUNTON handheld wind meter
- Power inverter
- Notebook computer


Everest-VIT


XLg
Everest VIT


SM 11


EAGLE
RKI INSTRUMENTS, INC.
POWER/ ENTER
RESET/ SILENCE
DISP/ ADJ
LEL/ PPM
AIR/
SHIFT


MAGNEHELIC
0
.20
.40
.60
.80
1.0
MAGNEHELIC
0
2
4
6
8
10


- 12.3
" H2O
ON
OFF
ZERO
STORE
HOLD
MEMORY
UNITS
LOC
SERIES 477
DIGITAL - MANOMETER
Dwyer

V.
WORKPLAN

The CIWMB, through a competitive bidding process, selected SCS Engineers to perform this study under my guidance as project manager. SCS Engineers developed the workplan for this study based on the RFP scope of work , performed all field work and are in the process of analyzing all data collected to produce a final report of study findings.

VI.
DATA GATHERING

- A data gathering routine was established by the contractor SCS Engineering based on the contract study's scope of work.
- The routine was followed for each of the 200 study probes

Data Gathering Activities

- Take digital photographs of each well and the view of the top of probes in each well
- Take a GPS position on each well
- Note atmospheric pressure, temperature and wind conditions

Data Gathering Activities (contd.)

- Note the type and accuracy of each probe's identification and verify its identity with site records and site personnel
- Do a surface sweep for gasses around each well
- Record visible probe condition
- Monitor ambient pressure in each probe

Data Gathering Activities (contd.)

- Monitor each probe for combustible gasses as methane, CO2, H2S, O2
- Perform a vacuum test on each probe
- Remove the probe valve head and insert the video bore-scope
- Lower the video bore-scope to the bottom of each probe focusing on all points of interest & recording the entire process including screen length & probe depth
- Replacing the probe valve head

VII. PRELIMINARY FINDINGS

- What factors can effect probe functionality?

- Time
- Design / Construction
- External factors

Effects of Time

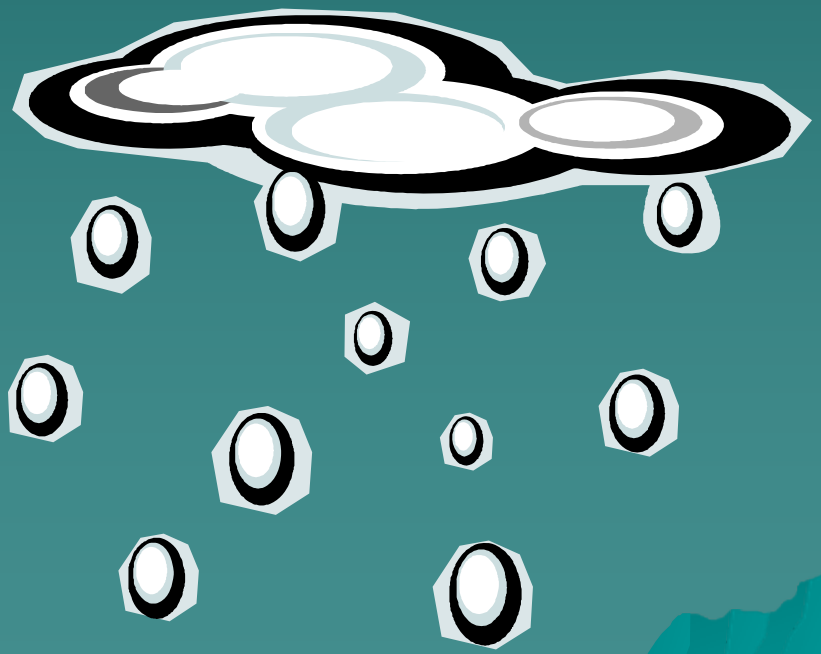
The effects of time on functionality were not as readily apparent as the effects of other factors

- Joint leaks
- Tree root growth through screens
- Leakage by local clay/bentonite
- Blockage of screens and probes by soil/bentonite

- Effects of design / construction

- Probes not constructed as designed
- Questionable probe designs

- Effects of external factors



Groundwater was responsible for the greatest number of non functioning probes

VIII. OBSERVATIONS

With over 25% of the study probes either nonfunctional or not configured to function properly, there is clearly the possibility that significant gas migration may be going undetected and thus uncontrolled not just at the study sites, but at other sites around the state.

- A number of probe identification and labeling issues were observed


GW5
GW-5

- Based on personal observations, it would seem prudent to carefully monitor well and probe construction and installation

- Actual boring logs obtained during the construction of each monitoring well could be used to customize as-built screen sizes and locations

QUESTIONS