



# CLOSED LANDFILL SEMINAR LOSCOE AND CRANBOURNE CASE STUDIES

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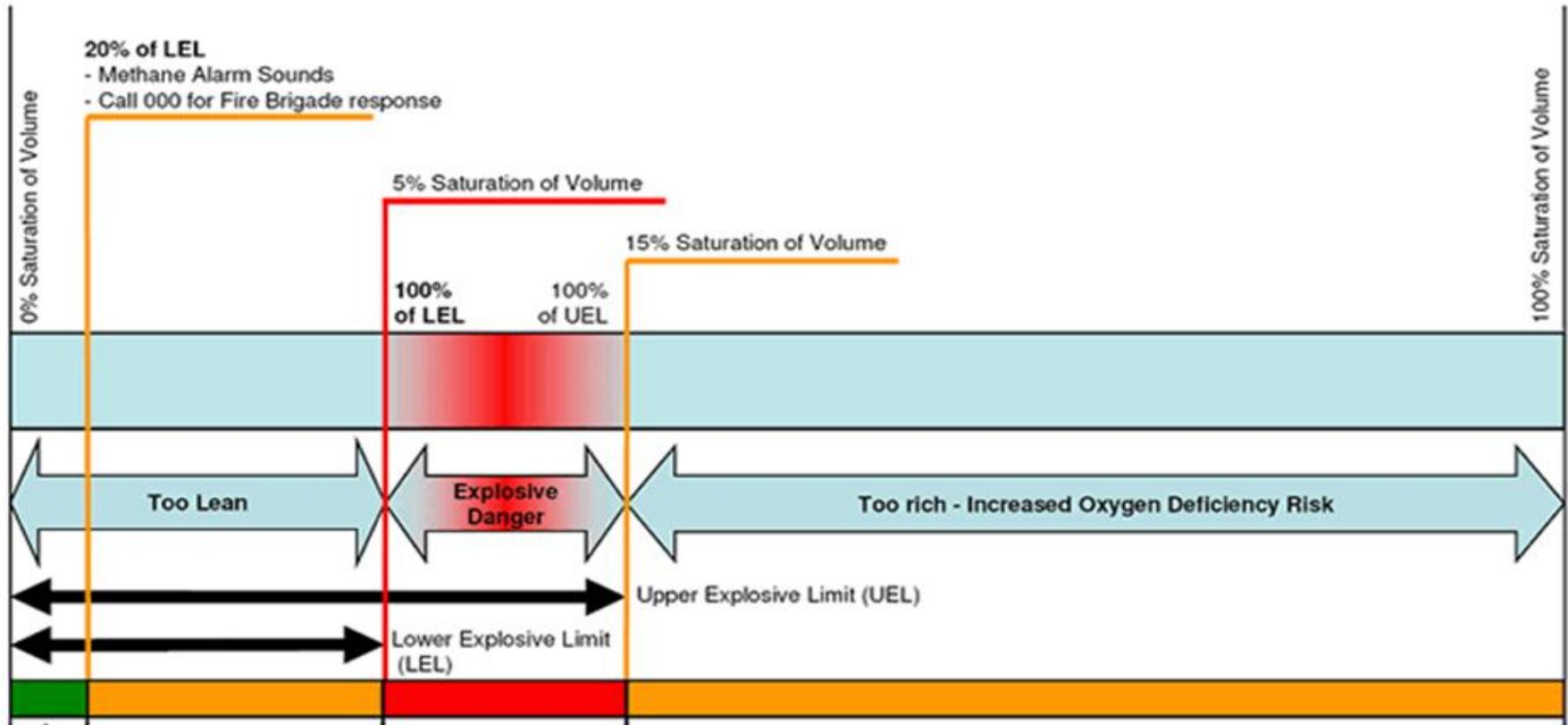
# Overview

- Brief discussion on landfill gas and leachate
- Case study: Loscoe (UK).
- Case study: Cranbourne (Victoria)

# What is Landfill Gas

- Produced by microbial decomposition of landfilled waste in an oxygen free (anaerobic) atmosphere.
- Approximately 65% methane and 35% carbon dioxide plus traces of other organic vapours.
- Its composition varies with age and the type of waste.
- The odour of landfill gas is associated with trace compounds such as hydrogen sulphide, mercaptans and ethylene.
- Methane has a flammable range of between 4.4% and 15% by volume in air.
- Carbon dioxide is highly toxic, headaches at 3%, fatal at 22%.
- Greenhouse gases (methane 20 times greater effect per kg than carbon dioxide)

# What is Landfill Gas?



Source: CFA 16 October 2008

## How far can landfill gas migrate?

- No set answer, as it depends upon size of source and subsurface conditions.
- Distances greater than 1500m have been observed, however more typically gas may migrate up to 150m (Brooklands Green Estate - Ombudsman report).

# Leachate

- Leachate is any liquid that passes through solid matter and extracts solutes
- The composition of leachate varies widely depending upon the age of the waste and type of waste.
- Leachate is produced through rainwater infiltration, and decomposition of carbonaceous material.
- Leachate creates anoxic (oxygen depleted) conditions, which in turn results in increased temperatures and reduced pH (acid conditions)

## THE LOSCOE INCIDENT – UK 1986

- On the night of 23<sup>rd</sup>/24<sup>th</sup> March 1986 a (very) low pressure system passed over Central England.
- Three people were sleeping at 51 Clarke Avenue in the village of Loscoe in Derbyshire.
- At 6:30am, as normal, the timer switched the central heating system on to warm up the house
- Then.....

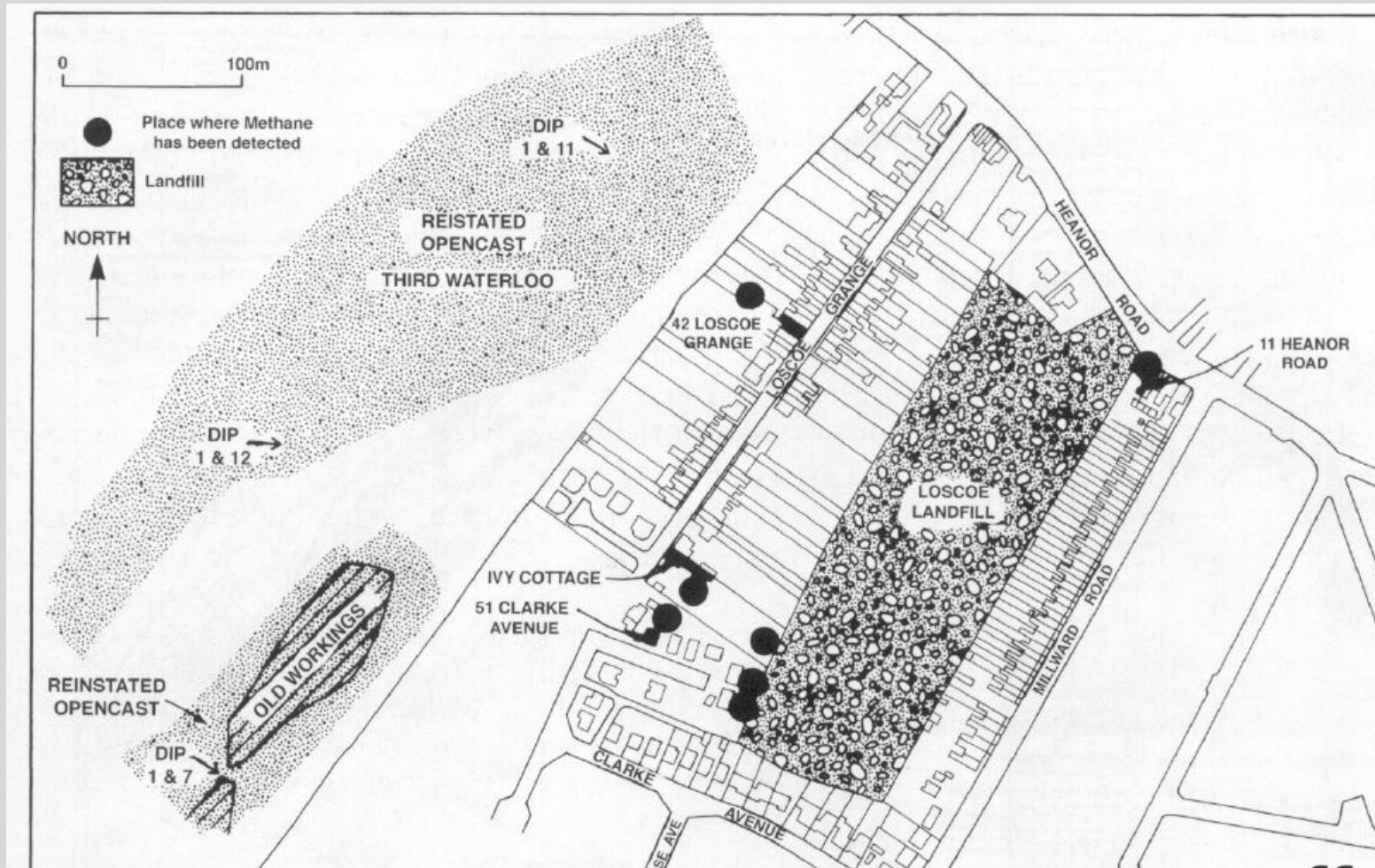
## THE LOSCOE INCIDENT





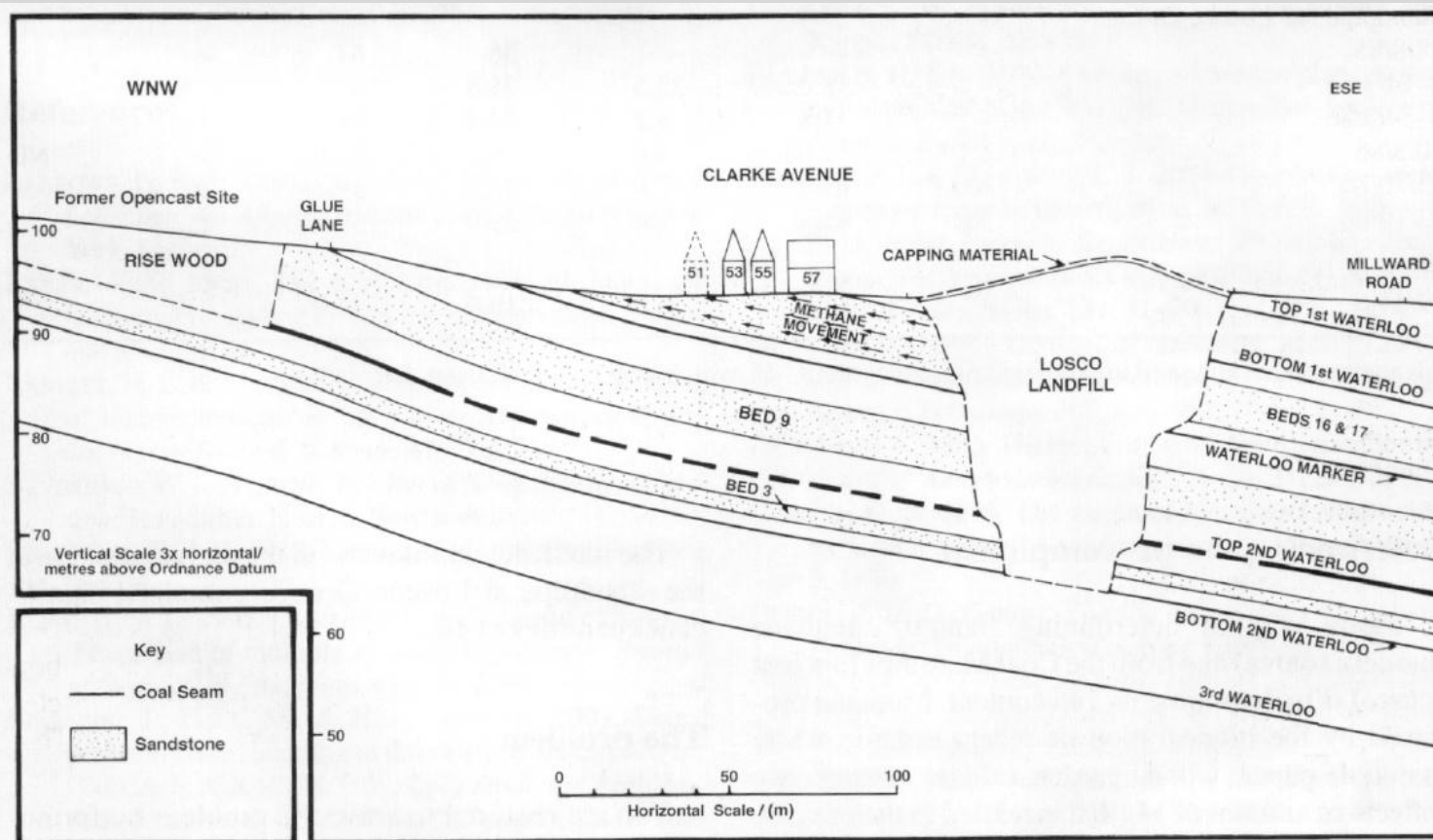
# The Loscoe Incident

- Brickworks from mid 19<sup>th</sup> Century until the early 1970's with a clay pit 70m from the Clarke Ave houses which were built in the 1970's



# The Loscoe Incident

- The clay pit comprised an elliptical hole with three stepped quarry faces.
- In 1977 a licence was granted to tip a wide variety of wastes, including 50 tons per day of untreated domestic waste.



## The Cranbourne Incident – Victoria 2008

- Former domestic waste landfill (1996 to 2005)





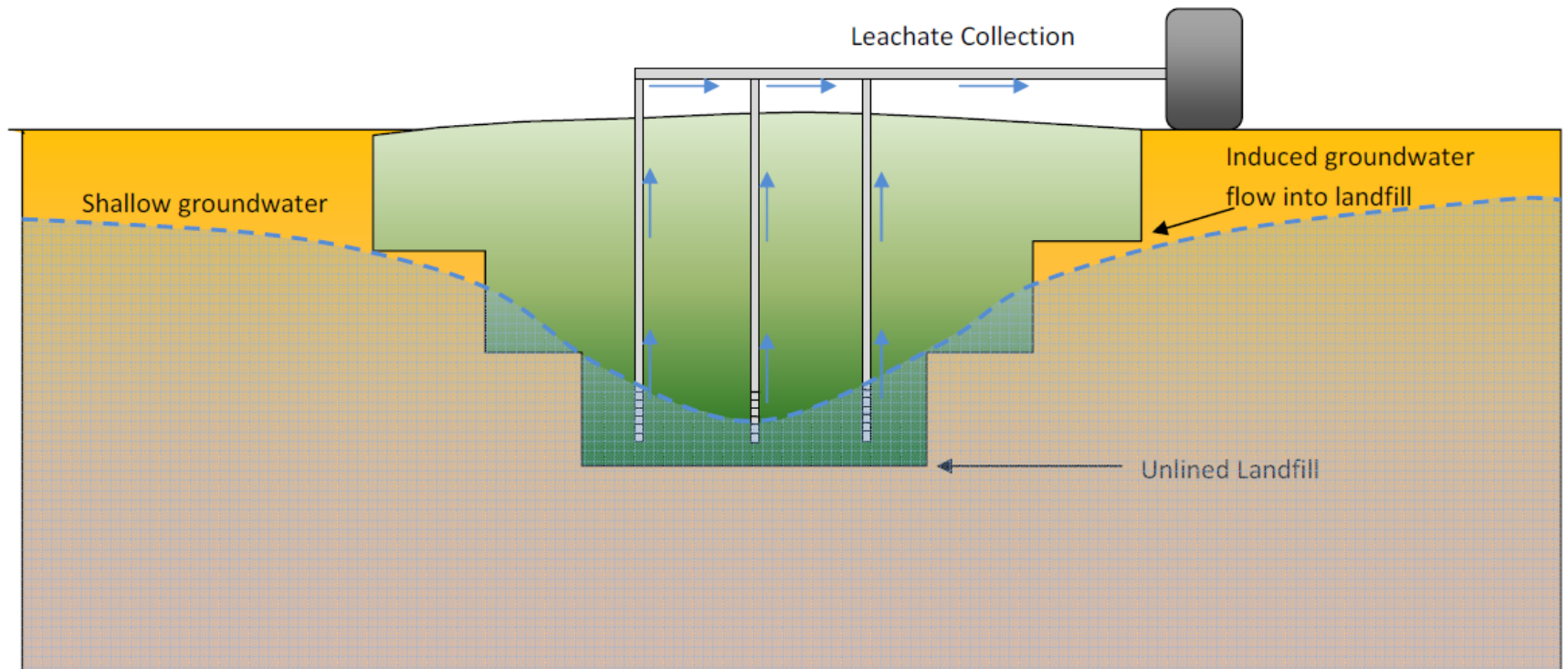
# The Cranbourne Incident – Victoria 2008

- Brookland Greens Estate development



# The Cranbourne Incident – Victoria 2008

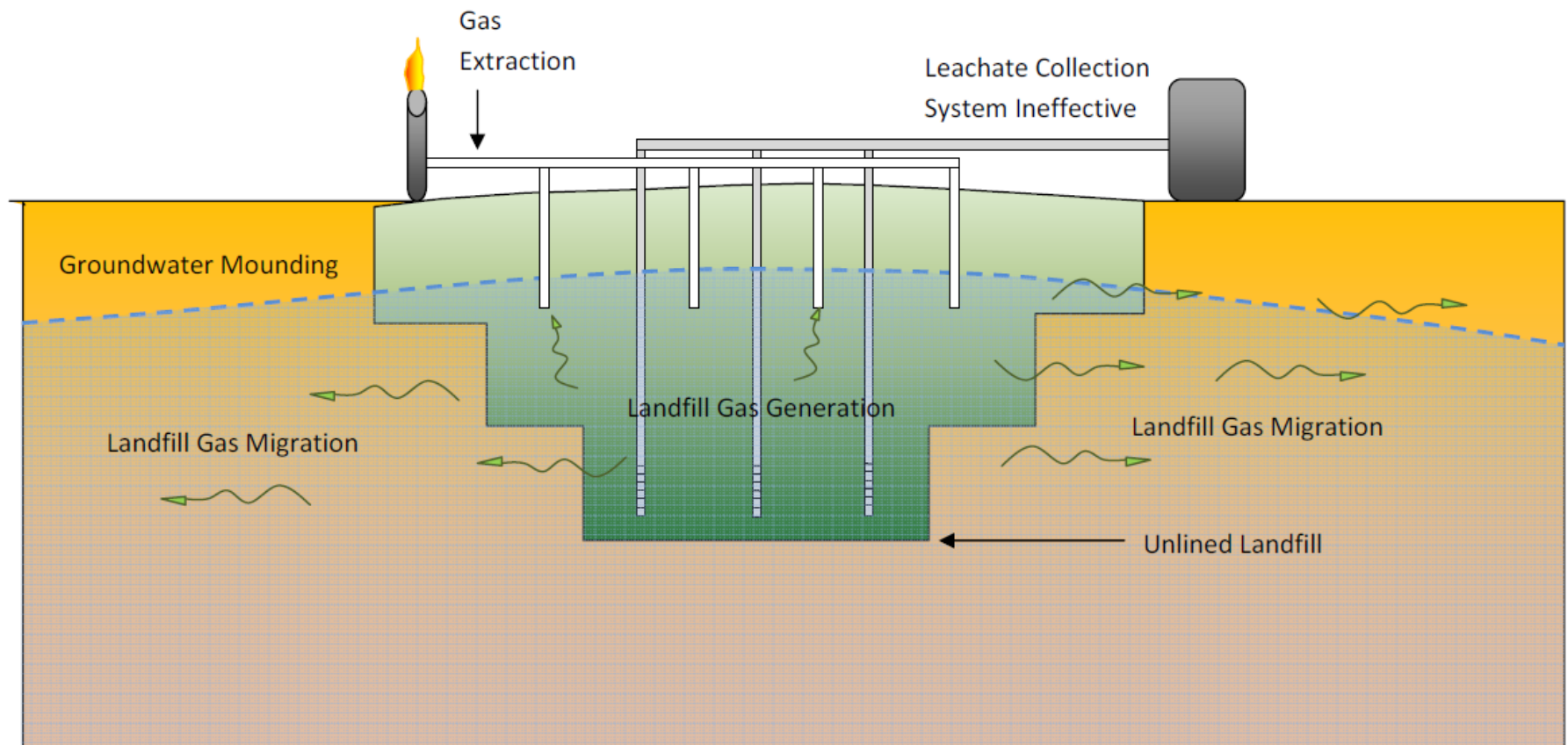
- Landfill was designed and constructed in early to mid 1990's



*Based on information contained in Ombudsman Report (2009)*

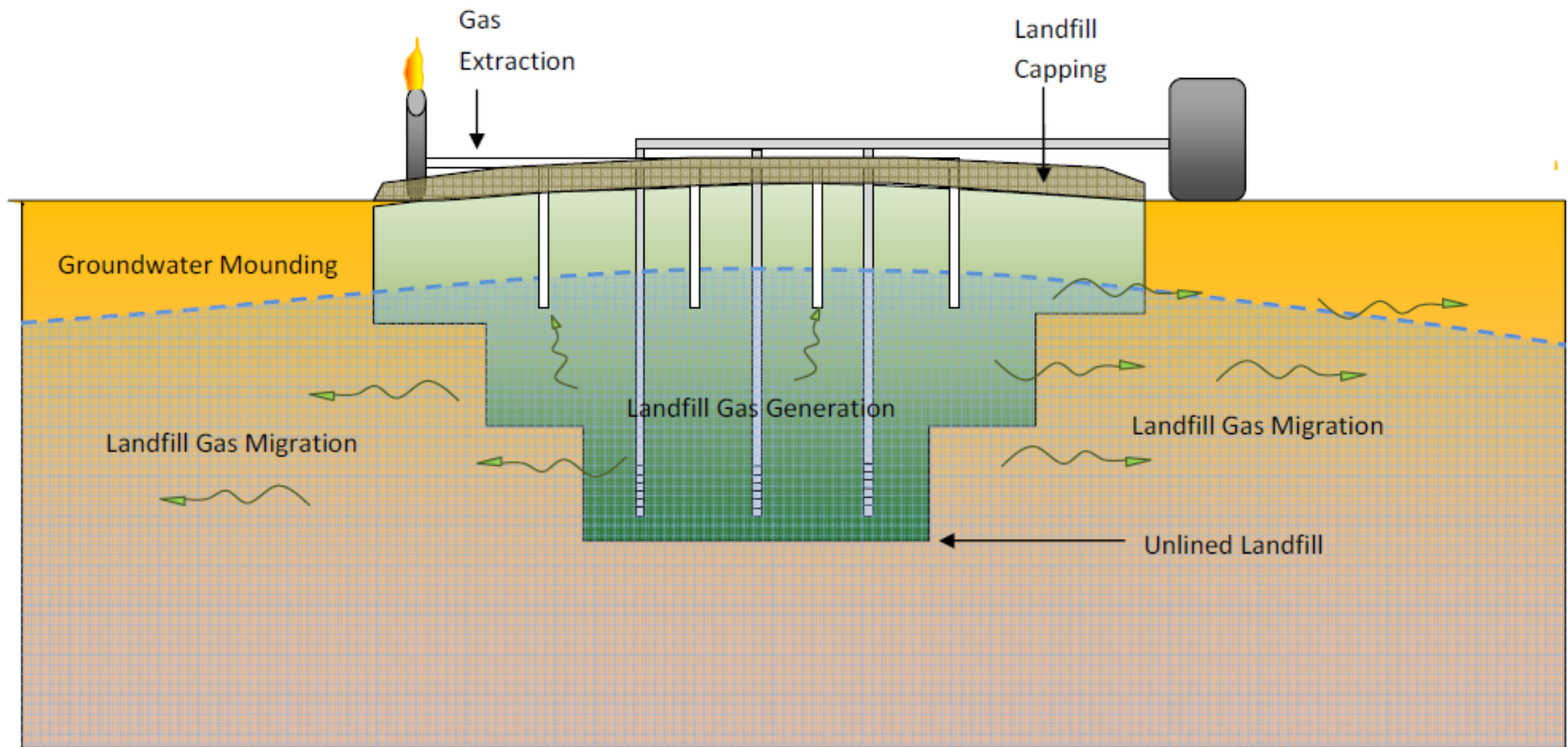
## The Cranbourne Incident – Victoria 2008

- Extraction system flooded, inhibiting effective gas removal and resulting in increase methane generation (concentration and volume).



# The Cranbourne Incident – Victoria 2008

- Final capping of the landfill exacerbated lateral gas migration.

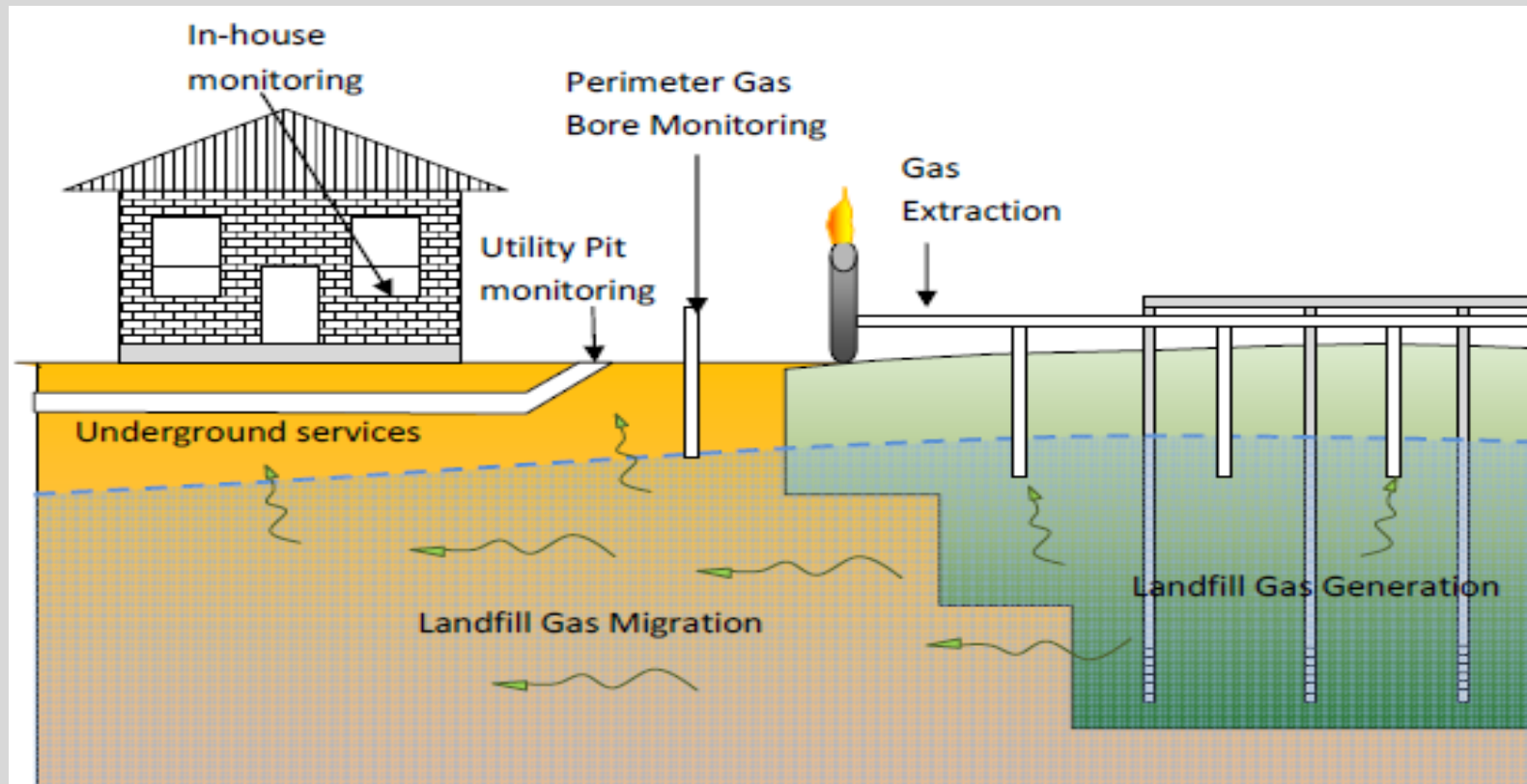


Based on information contained in Ombudsman Report (2009)



# The Cranbourne Incident – Victoria 2008

- March 2006 EPA aware that landfill gas was migrating.
- Methane at 63% detected within adjacent house in August 2008, an Emergency Management Plan was lead by the CFA.

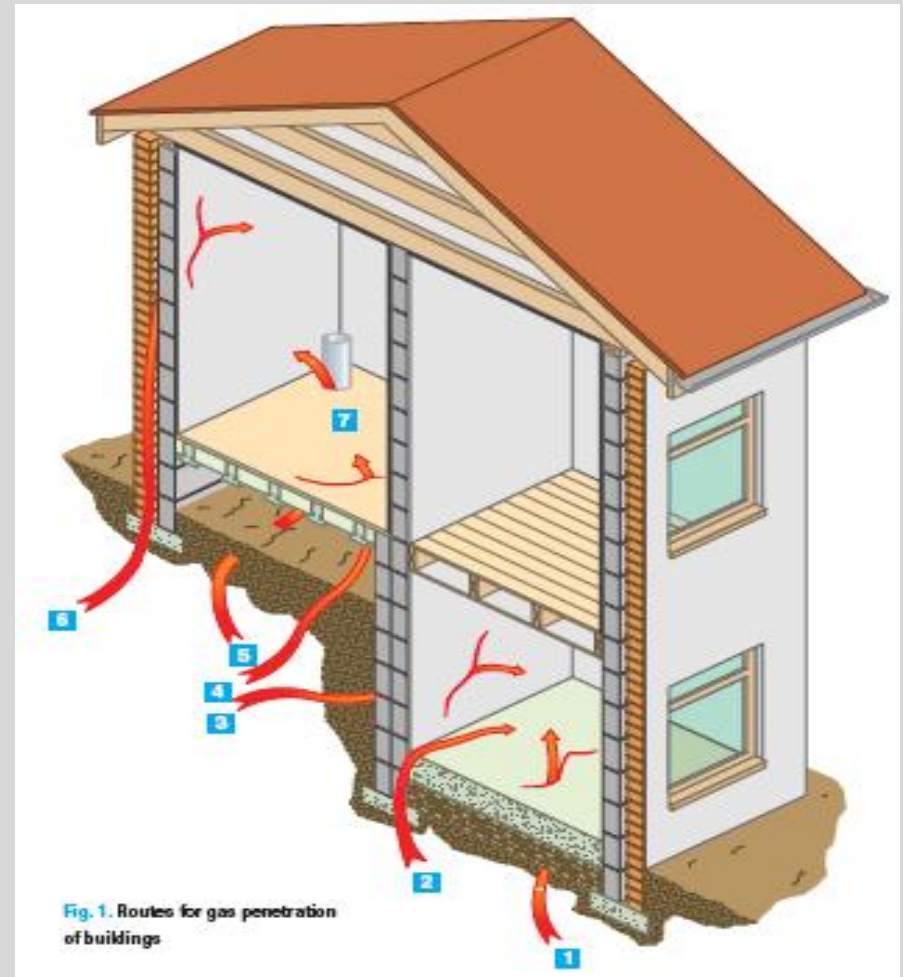


*Based on information contained in Ombudsman Report (2009)*



# Routes of Ingress

1. Cracks in solid floors
2. Construction joints
3. Cracks in walls below ground level
4. Gaps in suspended concrete or timber floors
5. Gaps around service pipes
6. Cavities in walls
7. Soil and vent pipe



Source: Monarflex

# The Cranbourne Incident

- Supreme Court approved a Deed of Settlement of \$23.5M to the class action group (affected residents). \$13.5M coming from City of Casey Council, and \$10M from EPA.
- EPA issued Casey Council with a new Pollution Abatement Notice on 29 June 2012 that required it to continue to take all practicable measures to meet the required levels of gas beyond the landfill
- In the long term, the total cost of rehabilitating the landfill is expected to exceed \$100 million (Ombudsman Report).
- This stands in stark contrast to the 1992 estimated cost of \$500,000 to line the landfill as a preventative measure to protect people and the environment, which the Shire of Cranbourne rejected on the basis of expense (Ombudsman Report).

## What can we learn from Cranbourne and Loscoe?

- Loscoe and a number other incidents in the UK in the 1980s that lead to advancements in the investigation and assessment of landfill gas in the UK, which have been adopted in Australia over recent years
- 65 recommendations from the Ombudsman report for Cranbourne.
- Many of the recommendations are in relation to changes to EPA and Council processes.
- In general, good landfill practices include:
  - Landfill construction standards to EPA Best Practice Guidelines,
  - Leachate collection and level control, and
  - Gas collection systems.
- Maintain buffer distances (where possible).

# THANKS

