

Landfills - The Remediation Industry's Dirty Little Secret: Potential Liabilities During Design, Construction and Operation

ESAA RemTech 2009 Presentation

AMEC Earth & Environmental
October 16, 2009



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How Liability is Created

- Good judgment comes from experience. Experience comes from bad judgment (Nasrudin, 1208 AD)

Background

- Industrial development creates waste that needs to be managed
 - Process waste
 - Spills
 - Historic practices

- A significant percentage of remediation projects involve landfill disposal
 - Conventional dig and dump
 - “Source” removal
 - Failed remediation projects
 - Salt or metals
 - Heavy end hydrocarbons
 - Radionuclides



- Landfills often become the final resting place for material from remediation projects
- Reliance is placed by the generator, the regulator and the public that landfills are secure disposal locations
- Facilities that are designed, constructed and operated well have been shown to provide the desired containment

- Liability is long term, possibly in perpetuity
- Waste generator is ultimately responsible
- Problems can take decades to surface
 - Moisture holding capacity of waste
 - Contaminant retardation
 - Limited number of groundwater monitoring wells
- Facility audits can miss important design, construction and operation details

Landfill Liability

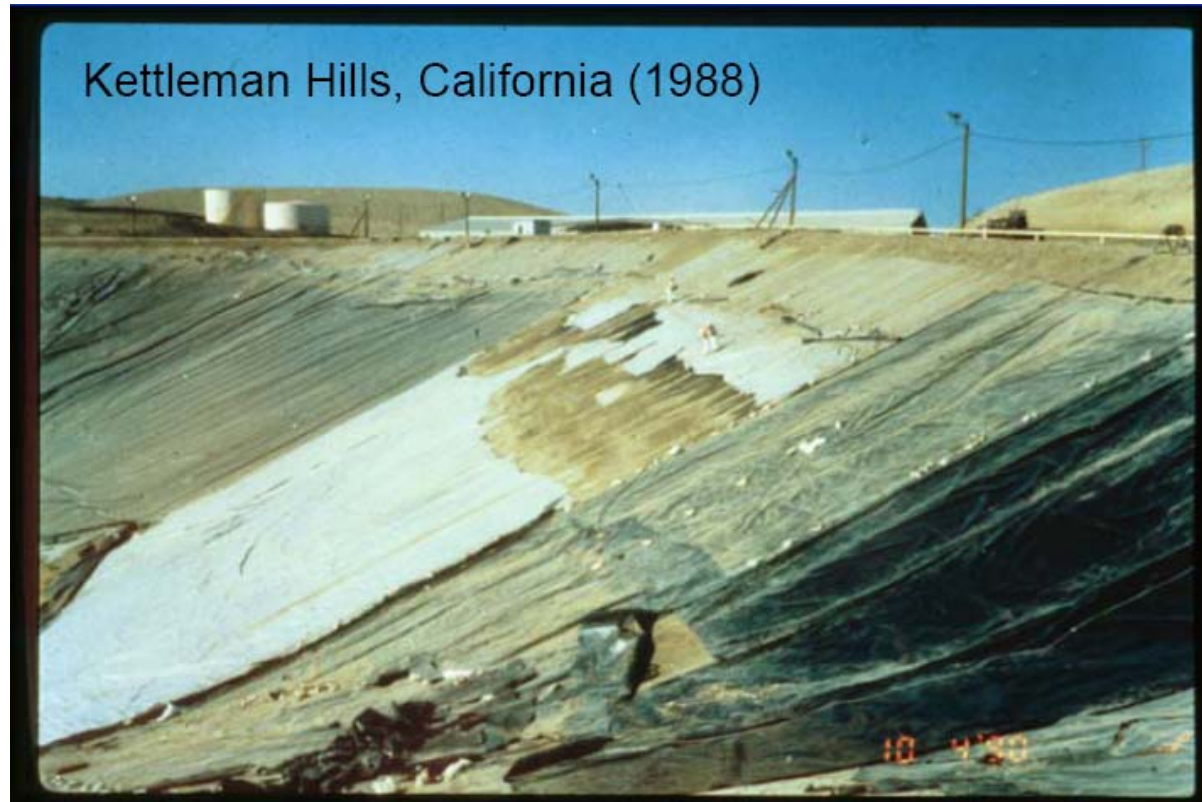
- Can arise because of problems with:
 - Landfill Design
 - Landfill Construction
 - Landfill Operation

Design Problems - Poor slope stability analysis (Kettleman Hills)



Courtesy of R. Thiel

Design Problems - Poor slope stability analysis (Kettleman Hills)



Courtesy of R. Thiel

Design Problems - Insufficient GCL seaming/overlap & no protective layer



Courtesy of R. Thiel

Design Problems - Chemical interaction resulting in leachate collection system clogging



Courtesy of R. Thiel



Courtesy of R.K. Rowe

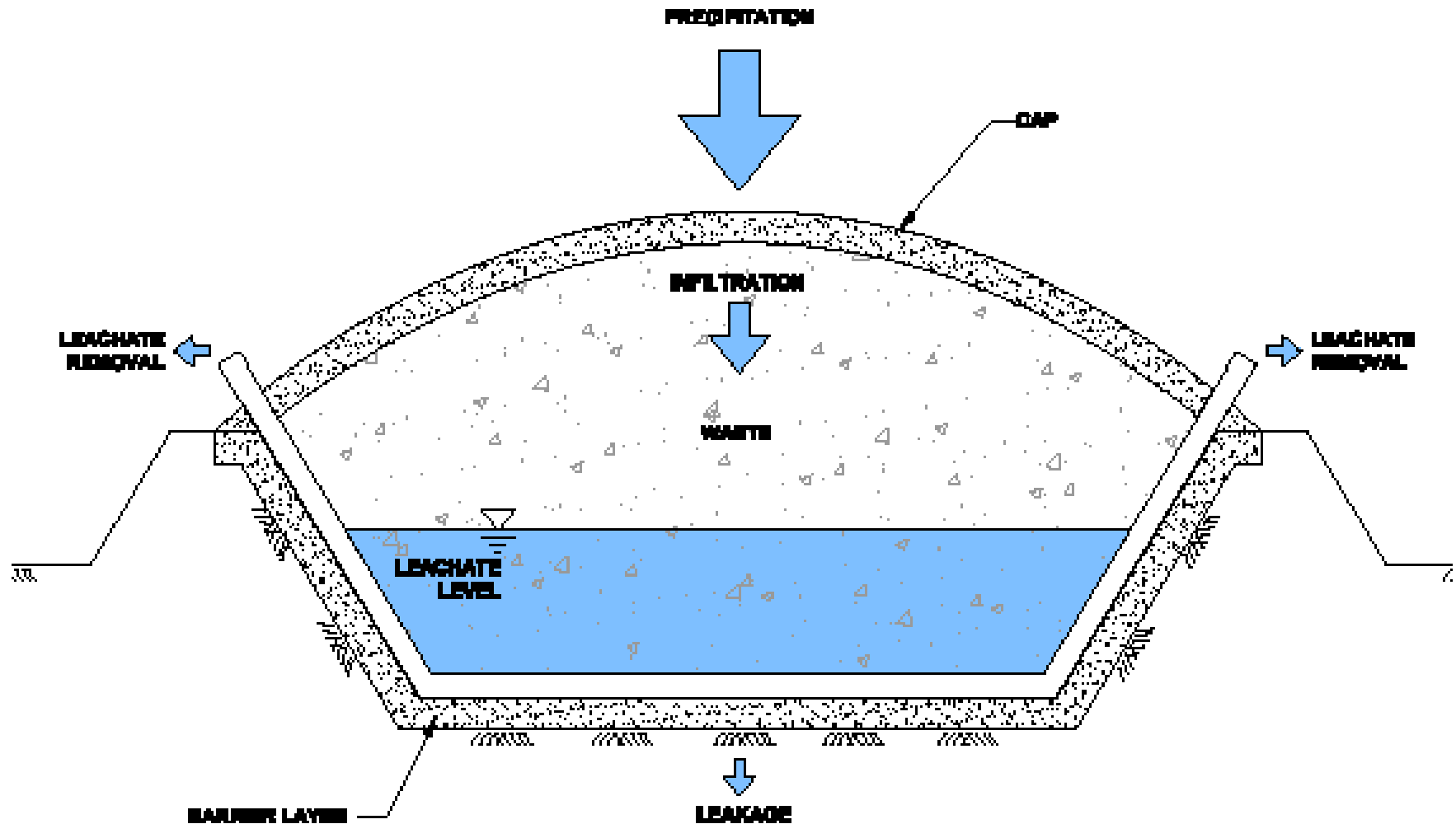
Design Problems - Geotextile wrap resulting in leachate collection system clogging



Design Problems - Poor LCS penetration design (high risk of leakage)



Design Problems - Cap more permeable than base (LCS operation in perpetuity)



Construction Problems - Poor geomembrane seaming / subgrade preparation



Construction Problems - Equipment operation on side slopes



Before



After

Construction Problems - Poor subgrade preparation (rocks, frozen ground, etc.)



Construction Problems - Puncture of geomembrane from subgrade



Operating Problems - Poor leachate management



Operating Problems - Poor leachate management



Operating Problems – Leachate build up leading to spill



Operating Problems - Poor waste placement resulting in leachate outside of lined area



Operating Problems - Dumping waste from top of slope (pull out of geosynthetics)



Operating Problems -

Forgetting your landfill has a liner (equipment damage to geomembrane)



Operating Problems - Forgetting your landfill has a liner (equipment damage to geomembrane)



Operating Problems -

Forgetting your landfill has a liner (equipment damage to geomembrane)



Operating Problems – Repairs (if found) take time and money



Moral of the Story

- Learn from the mistakes of “others”
- Don’t forget about your “dirty little secret”
- Cover your asset well



MacLeod Boot – patent pending