

4. Modern Landfill (English)



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Introduction to Modern Municipal Landfill

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Introduction

- MSW generation rate ~ 1 ton/yr/capita in the USA
- Since 1989, the number of municipal solid waste landfills in the United States has declined from 7,379 to 2,216 in 1999.
- The average amount of waste received by a landfill has increased from 92 tons per day to 300 tons per day.
- It will typically operate between 10 and 20 years.

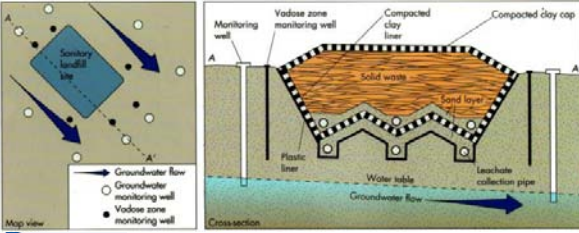
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Waste-by-Rail Landfills



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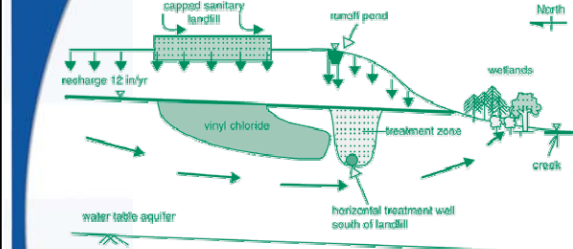
Potential Environmental Problems - Groundwater



http://earthsci.org/education/teacher/basicgeol/solid_waste/sanitary-landfill.jpg

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Potential Environmental Problems - Wetlands and Streams Protection

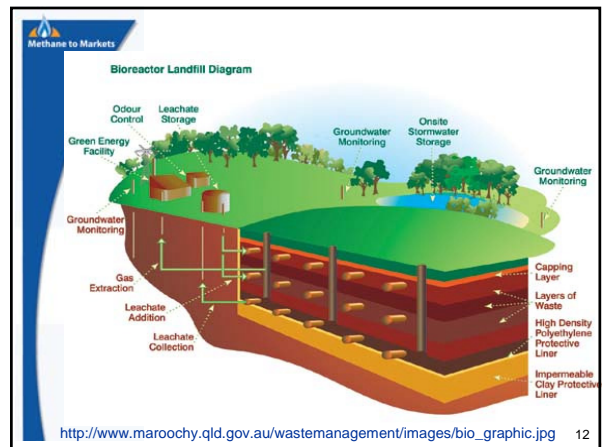
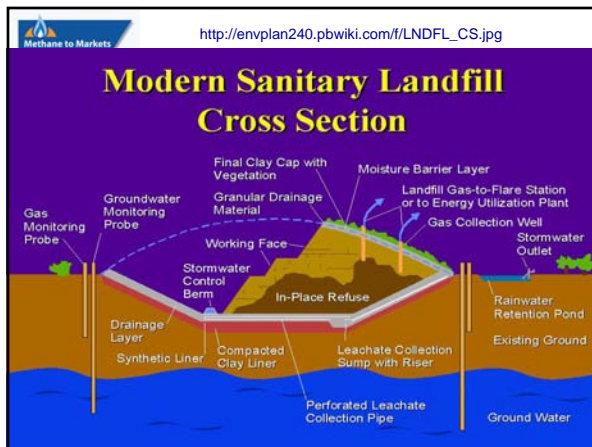
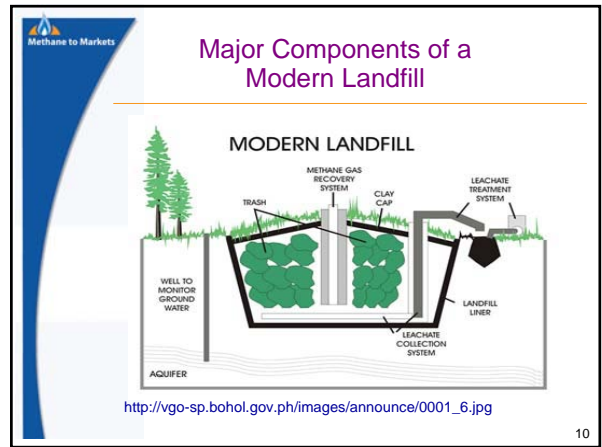
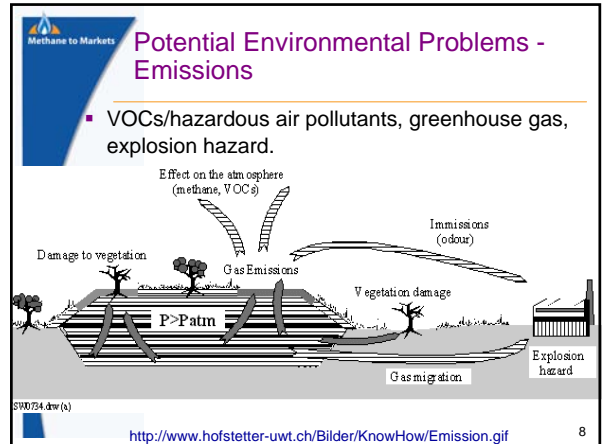
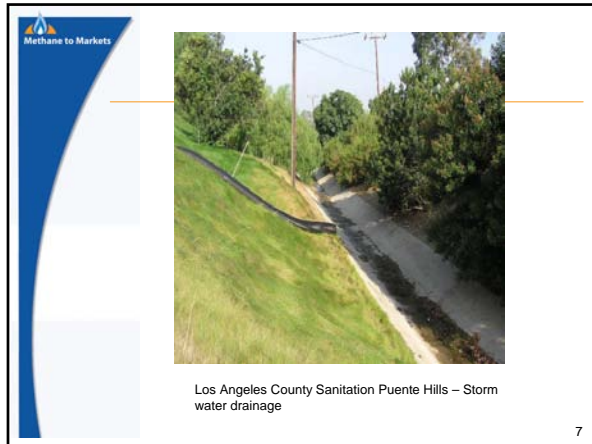


Legend
 → Water Flow Direction

http://clu-in.org/products/newsletters/tnandt/images/200305_fig2.gif

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Landfill Phases

- Phase 1: Site Selection and Investigation - Evaluated from a geotechnical standpoint, as well as from a variety of environmental factors, concurrent with a public participation program.
- Phase 2: Design and Regulatory Approval - Detailed plans and specifications are prepared, regulatory approvals and financial commitments are received, and construction is initiated.
- Phase 3: Site Construction - This involves development of the support facilities, and the development of the landfill's first one or two cells.

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Landfill Phases

- Phase 4: Operation - As cells are filled, additional cells are constructed. Landfill operation is a long-term construction project.
- Phase 5: Site Closure - As the cells within the landfill are filled to capacity, that area is closed. The landfill then is monitored for > 30 years.
- Phase 6: Long-Term Care - If environmental problems are detected, the owner is responsible for taking remedial action. During the long-term care period, the owner also is responsible for any facility maintenance.

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Overview of Design Criteria

- Performance-based
 - Contaminant level shall not be exceeded in the uppermost aquifer at the relevant point of compliance, which shall not be more than 150 m from the unit boundary and still on the property
- Technology-based
 - a composite liner: top FML >30 mil (60 mil for HDPE) and lower compacted soil ($K < 1E-7$ cm/s) with a leachate collection system.
 - or approved alternative design.

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Landfill Construction - Disposal Cell Preparation




- Bartholomew County Sanitary Landfill, IN
- 1st Cell is 5 acres and 80 feet deep.
- Soil is saved for daily coverage of trash.
- Must have 2 feet of clay over bedrock.

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Landfill Construction - Leak Detection Layer



An 18 inch sand layer will contain perforated PVC pipe to collect leachate in case of main collection level failure.

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Leak detection pipe installation




Monitoring Well

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Landfill Construction - Soil Liner



- 3 feet of soil is then placed on top of the leak detection layer.
- All rocks and objects are removed to assure smooth surface in preparation for plastic liner.

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Landfill Construction - Leachate Collection Layer




A 60 mil HDPE plastic liner is placed on top of the soil liner as the first phase of the leachate collection layer.

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Liner is then seamed and tested.

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All of the disposal cell is lined.

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Perforated PVC pipe is then installed. This layer is the main leachate collection level and will collect liquids that seep through the trash.

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The leachate collection pipe and plastic liner are then covered with a protective layer of soil 18 inches thick.

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Collection pipe is installed to pump percolating fluids from the disposal cell to the leachate holding pond.

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Leachate Ponds




- 2 leachate collection ponds hold 100,000 gallons of water each.
- Water is then pumped directly to the local waste water treatment facility and cleaned.

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Sediment Ponds



Rainwater that does not come in contact with trash is collected in sediment ponds.

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Overview of Landfill Operation

- Procedure to exclude hazardous waste
- Apply daily cover
- Control disease vectors
- Control explosive gases
- Control access to LF
- Control run-on and run-off
- Protect surface water and groundwater
- Restrict liquid
- Maintain operating records

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Landfill Operation - Scale House

- Every load of trash entering the landfill must be weighed and inspected.
- Users will be charged \$27.50 per ton over 500 lbs.



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Landfill Operation - Disposal Cell



- Large loads of waste are directed to the disposal cell.
- The working face of the cell is a 10,000 sq. foot area.

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- A compactor will run over the trash all day long.
- 250-275 tons are disposed of each day at the landfill.

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The working face is covered at the end of the day with a geo-textile tarp or 6 inches of soil to keep odors down and rodents away.

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- A 24 inch soil barrier is placed on top of the gas venting layer.
- A 30 mil. minimum plastic liner is placed over the cell and seamed to the original cell liner, entombing the waste.

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- Then comes a 12 inch drainage layer of sand.
- Next, an 18 inch minimum layer of soil and 6 inches of top soil, all sloped 4% for drainage.
- Vegetation such as grasses and legumes are then planted.

- It is required to maintain the landfill for minimum of 30 years after closure.

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Benefits of a Modern Landfill



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Los Angeles County Puente Hills Energy Recovery System

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