RCRA Requirements for Land-Based Units

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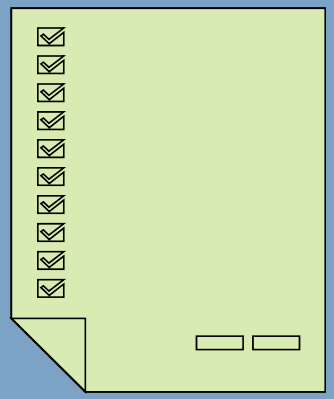
Outline

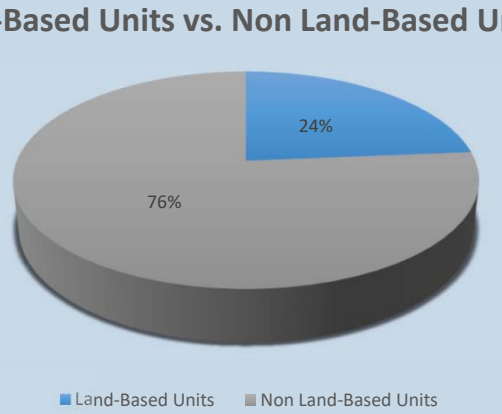
- Land Disposal Restrictions (LDR's)
- Types of Land-Based Units (LBUs)
- RCRA and State Requirements

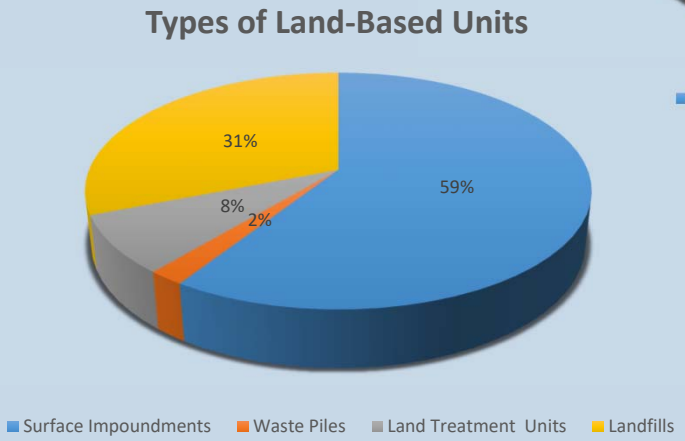


Types of Land-Based Units

- Surface Impoundments
- Waste Piles
- Land Treatment Units
- Landfills
- Corrective Action Management Units (CAMU)

Land Based Units in Texas





Requirements and Standards

- 40 CFR Part 264 and 30 TAC Chapter 335
- Location Standards
- Design Standards
- Operation Standards
- Closure Standards
- Post-Closure Care Standards

RCRA Requirements

- 40 CFR Part 264
  - Subpart B – General Facility Requirements
  - Subpart K – Surface Impoundments
  - Subpart L – Waste Piles
  - Subpart M – Land Treatment Units
  - Subpart N – Landfills
  - Subpart S – Special Provisions for Clean-up

Land Disposal Restrictions (LDRs)

- 40 CFR 268
- Apply to waste that is land disposed
  - Surface Impoundments
  - Waste Piles
  - Landfills
  - Land treatment units
  - NOT APPLICABLE to CAMU's
- All waste must meet LDRs prior to disposal

Location Standards (40 CFR Part 268)

- Seismic Considerations
  - Not within 200ft of a fault with displacement in the Holocene
- Floodplains
  - Must be designed to prevent washout from 100-year flood
- Salt Formations
  - Liquids prohibited

Location Standards (30 TAC 335, Subchapter G)

- Unsuitable Site Characteristics
  - With 100-yr floodplains
  - Wetlands
  - Recharge zone of sole-source aquifer
    - Edwards Aquifer in Texas
  - Landfills may not overlie a regional aquifer unless
    - Evaporation exceeds precipitation by >40 inches
    - depth to groundwater is >100 feet
    - 10 feet of low permeability material beneath landfill containment structure and regional aquifer

Location Standards (30 TAC 335, Subchapter G)

- LBUs may not be located:
  - Where soil units within 5ft of the containment structure have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a permeability greater than 10^{-5} cm/sec
  - Exceptions:
    - Evaporation exceeds rainfall by more than 40 inches
    - The soil unit does not provide a pathway for waste migration.

Location Standards
(30 TAC 335, Subchapter G)

- An LBU may not be located in areas of active geologic processes.
  - unless designed, constructed and operated to prevent adverse effects

Location Standards
(30 TAC 335, Subchapter G)

- In areas protected by a barrier island or peninsula
- Within 1,000 ft. of an area subject to active coastal shoreline erosion.
    - unless designed, constructed and operated to prevent adverse effects resulting from storm surges or scouring.

Location Standards (30 TAC 335, Subchapter G)

- An LBU may not be located near a fault
  - Within 30 feet of the upthrown side
  - Within 50 feet of the downthrown side
  - Actual or inferred surface expression
  - Demonstrated displacement of shallow Quaternary sediments or man-made structures
  - unless designed, constructed and operated to prevent adverse effects resulting from fault motion

Surface Impoundments

- Design and Operational Requirement's
  - 40 CFR Subpart K and 335.168
- Liner Systems (after July 29, 1992)
  - Top Liner (geomembrane)
  - Leachate Collection System (LCS)/Leak Detection System (LDS)
    - $k = 10^{-1}$ cm/sec
    - Typically sand/gravel or geonet

Surface Impoundments

- Liner Systems (after July 29, 1992)
  - Composite bottom liner
    - Upper component – geomembrane
    - Lower component – compacted clay
      - 3 feet thickness
      - k less than/equal to 10-7 cm/sec

Surface Impoundments

- Action Leakage Rate
  - Maximum design flow rate that LDS can remove without the fluid head on the bottom liner thickness of drainage media.
    - Average daily flow rate for each sump (gallons per acre per day)
    - Calculated weekly during active life and closure period, monthly during post-closure care

Surface Impoundments

- Alternative Designs
  - Must be at least as effective as composite liner system
  - Must include a LDS
  - GCL is common

Surface Impoundments

- Monitoring and Inspection Requirements
  - Weekly and after storms
    - Freeboard (2')
    - Deterioration
    - Malfunctions
    - Severe Erosion
    - Leaks
    - Presence of Leachate in Sumps

Surface Impoundments

- Perimeter Dikes
  - Structural Integrity Certified by P.E.
    - Able to withstand pressure exerted by waste placement
    - Will not fail due to scouring or piping

Surface Impoundments

- Closure
  - Remove and decontaminate all waste and containment system components
  - Unit may be closed as a Landfill if:
    - Eliminate free liquids, stabilize remaining wastes (Meets LDR)
    - Final cover surface impoundment
      - Provide long term minimization of migration of liquids
      - Function with minimum maintenance
      - k less than or = k of bottom liner

Surface Impoundments

- Post-closure care
  - For units closed as a Landfill
  - Maintain Final Cover
  - Maintain and monitor leak detection system
  - Maintain groundwater monitoring system

Surface Impoundments

- If Minimum Technology Requirements (MTR) not meet
  - Facilities constructed prior to 1992
  - Removal of Waste
  - Decontamination of containment system components
  - Contingency Plan to address waste left in place
    - Final Cover System, groundwater monitoring

Waste Piles

- Design and Operating Requirements
  - 40 CFR Subpart L and 30 TAC 335.170
- Liner system
  - Top liner – (geomembrane)
  - Composite bottom liner –
    - Upper component – geomembrane
    - Lower component – compacted clay liner
      - 3 feet thick
      - k less than/equal to 10^{-7} cm/sec

Waste Piles

- Leachate Collection System/Leak Detection system
  - k is 10^{-2} cm/s and 12” thickness; or
  - geonet where k is 10^{-5} cm/s or greater

Waste Piles

- Closure
  - Must remove waste
  - Decontaminate all containment system components
  - If contaminated soils can't be removed, must close to landfill requirements
    - Post-closure plan

Waste Piles In Texas

- Approximately 6 initially permitted
- All closed or undergoing closure

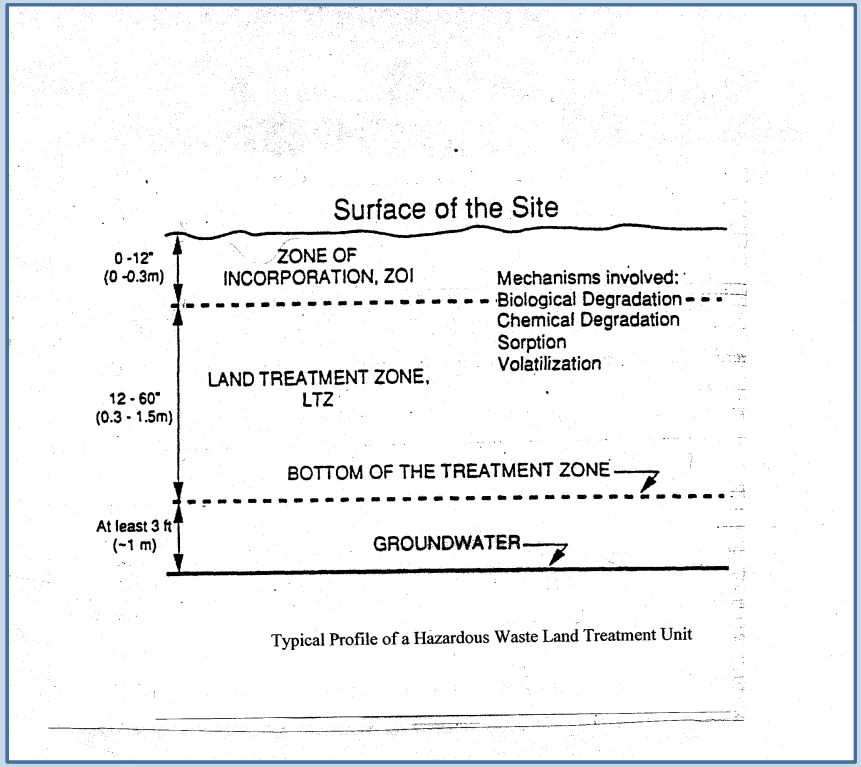
Land Treatment Units (LTU)

- 40 CFR 264 Subpart M and 30 TAC 335.171
- Program to ensure
  - Degradation;
  - transformation or;
  - immobilization
    - Of all hazardous constituents

LTU Treatment Program

- Treatment demonstration
  - Wastes that are capable of being treated
  - Field tests, laboratory analysis, operating data
- Operated in a manner to maximize degradation, transformation and immobilization
- Unsaturated (Vadose) Zone Monitoring

LTU Profile



Typical Profile of a Hazardous Waste Land Treatment Unit

LTU Treatment Demonstration (LTD)

- Field tests, laboratory analysis, operating data
- Must simulate operating conditions
    - Wastes
    - Climate
    - Topography
    - Soil characteristics
    - Operating practices

Land Treatment Units

- Design and Operation Requirements
  - Must continue to maximize degradation, transformation and immobilization of wastes
  - Use same conditions as LTD
    - Rate and Method of Waste Application
    - Measures to control soil pH
    - Measures to enhance microbial activity
    - Measures to control moisture

Land Treatment Unit

- Design and Operation Requirements
  - Maintain run-on control system from 25-year storm
  - Manage run-off from 24-hour, 25-year event
  - Inspect LTU weekly and after storms
    - Deterioration
    - Malfunctions

Land Treatment Units

- Unsaturated Zone Monitoring
  - Monitor soil and soil-pore liquid beneath treatment zone
    - Obtain background soil core and soil-pore liquid concentrations
    - Sample for principal hazardous constituents
    - Site specific locations and frequency
      - Statistical analysis allowed

Land Treatment Units

- Closure
  - Cease receipt of new waste
  - Continue operation
    - Maximum Degradation, Treatment, and Immobilization
  - Maintain
    - Aeration
    - Moisture
    - pH
    - Nutrients
  - Unsaturated Zone Monitoring
    - Soil-pore monitoring may be terminated after 90 days
    - If documented SSI – continue until no migration demonstrated

Land Treatment Units

- Closure (cont.)
  - Minimize run-off of hazardous constituents
  - Maintain run-on/off control systems
  - Continue Groundwater monitoring
- Closure Activities
  - 180 day completion
    - Longer period may be approved
    - Period Dependent on :
      - Waste loading rate at closure
      - Waste degradation rate
    - Typically can be completed in 90 to 360 days

Land Treatment Units

- Post-Closure Care
  - Begins once Unsaturated Zone Monitoring Data shows equilibrium or background
  - Active Management may continue
    - Tilling
    - Soil Amendments
    - Vegetative Cover
  - No post-closure release of hazardous constituents

Land Treatment Units

- Groundwater Monitoring during Post-Closure
  - Required unless
    - Hazardous Constituents do not exceed background
    - No SSIs in Unsaturated Zone during active life
- Releases
  - PHCs migrated beyond treatment zone are above MCL or Background
    - Removal of Contaminated Soil
    - Placement of impermeable cap
    - Continued management and monitoring

Land Treatment Units in Texas

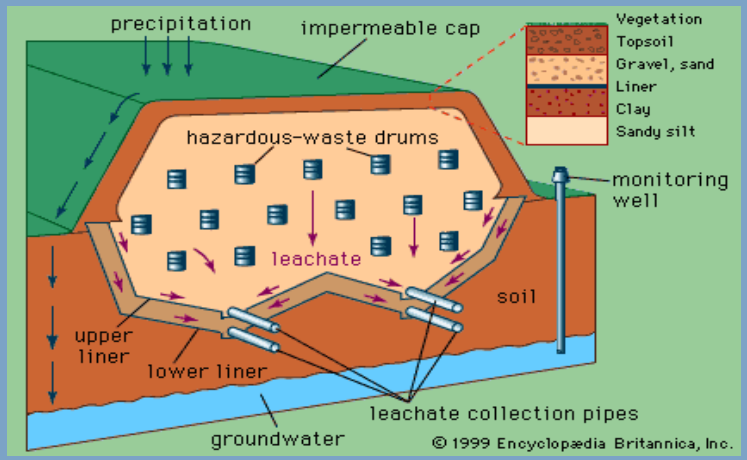
- Approx. 24 Units are permitted in 1980s
  - 11 undergoing closure or post-closure care
  - 1 never constructed

Landfills

- 40 CFR 264 Subpart N
- Design and Operating Requirements
  - Liner System
    - Top liner – i.e. geomembrane
    - Leachate Collection System/Leak Detection System
      - 10^{-2} cm/sec and 1' thickness or geonet with 10^{-5} cm/sec or greater
    - Composite bottom liner –
      - Upper component – geomembrane
      - Lower component – compacted clay liner
        - 3 feet thick
        - k less than/equal to 10^{-7} cm/sec

Landfills

- Cover System
  - Long-term minimization of liquid migration
  - k less than or equal to that of the bottom liner system



Landfills

- Alternative Designs
  - Must be at least as effective as composite liner system
  - Leak Detection
- Operating Requirements
  - Must prevent run-on from a 25-year storm
  - Must contain a 24-hour, 25-year storm event

Landfills

- Action Leakage Rate (ALR)
  - Maximum design flow rate that LDS can remove without the fluid head on the bottom liner exceeding thickness of drainage media.
    - Average daily flow rate for each sump (calculated as gallons per acre per day)
    - Calculated weekly during active life and closure period, monthly during post-closure care

Landfills

- Response Action Plan (RAP) – if flow rate exceeds ALR
  - Notify TCEQ within 7 days
  - Submit assessment report within 14 days
  - Determine if waste receipt should cease
  - Within 30 days, report your action taken and action planned

Landfills

- Closure
  - Final cover system
    - Provide long term minimization of migration of liquids
    - Function with minimum maintenance
    - Promote drainage and minimize erosion
    - Accommodate settling and subsidence
    - k less than k of bottom liner
  - Components (Bottom to Top)
    - 3ft of compacted clay with k of 10^{-7} cm/sec or less.
    - Geomembrane
    - Drainage Layer
    - Soil capable of sustaining native plant growth

Landfills

- Post-closure care
  - Maintain final cover
  - Continue to operate
    - leachate collection system
    - leak detection system
  - Continue GW monitoring
  - Prevent run-on and run-off from storm events damaging cover system

Corrective Action Management Units (CAMU)

- 40 CFR 264, Subpart S – Special Provisions for Cleanup
- Special Unit for the disposal of waste from on-site clean up.
- Implemented to remove the disincentives to clean-up

Corrective Action Management Units (CAMU)

- Design Standards
  - Composite Liner
  - 2 foot thick clay with k =10^{-7} cm/sec
  - FML = 30-mil or HDPE = 60-mil
  - Leachate Collection System
    - Maintain less than 1' of leachate over liner
- Alternative Designs
  - Must be at least as effective as proscribed liner system
  - Leachate Collection System

Corrective Action Management Units (CAMU)

- Closure
  - Final cover system
    - Provide long term minimization of migration of liquids
    - Function with minimum maintenance
    - Promote drainage and minimize erosion
    - Accommodate settling and subsidence
    - k less than k of bottom liner
  - Groundwater Monitoring Required
    - Existing/Suspected releases to from within CAMU
    - Wastes will remain in place after closure of the CAMU

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