

Landfills 101

Regulations and Permitting

Module Objectives

- Provide a general introduction to landfills for an engineer who may not have had formal training.
- Touch on all aspects and lay a foundation for more advanced material.

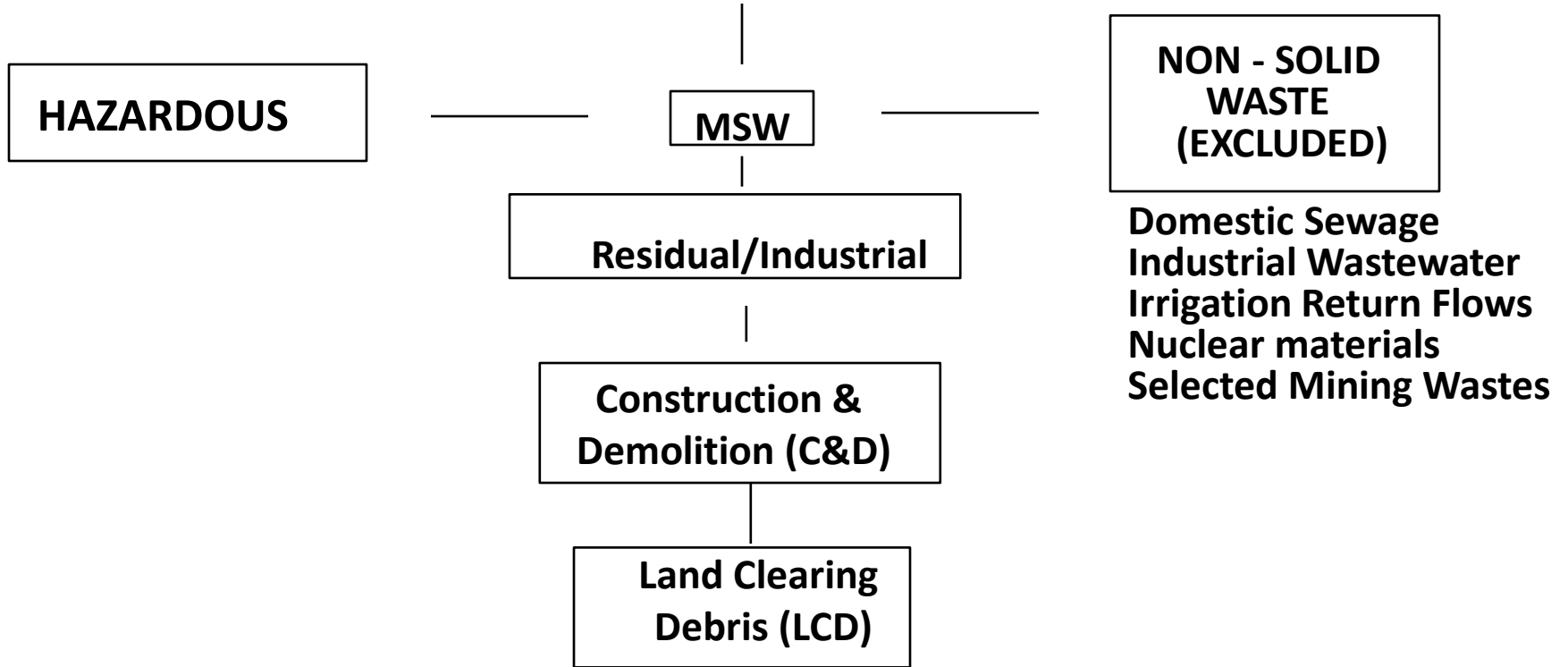
Part 1 Objectives

- Regulations
- Permitting
- Siting

EVOLUTION OF LANDFILLS

- Open Dumps (pre-1960)
- Sanitary Landfills (1960)
- In-Situ Lined landfills (1970)
- Composite-Lined landfills (1980)
- Double-Lined landfills (1981)

SOLID WASTE



HAZARDOUS

MSW

**NON - SOLID
WASTE
(EXCLUDED)**

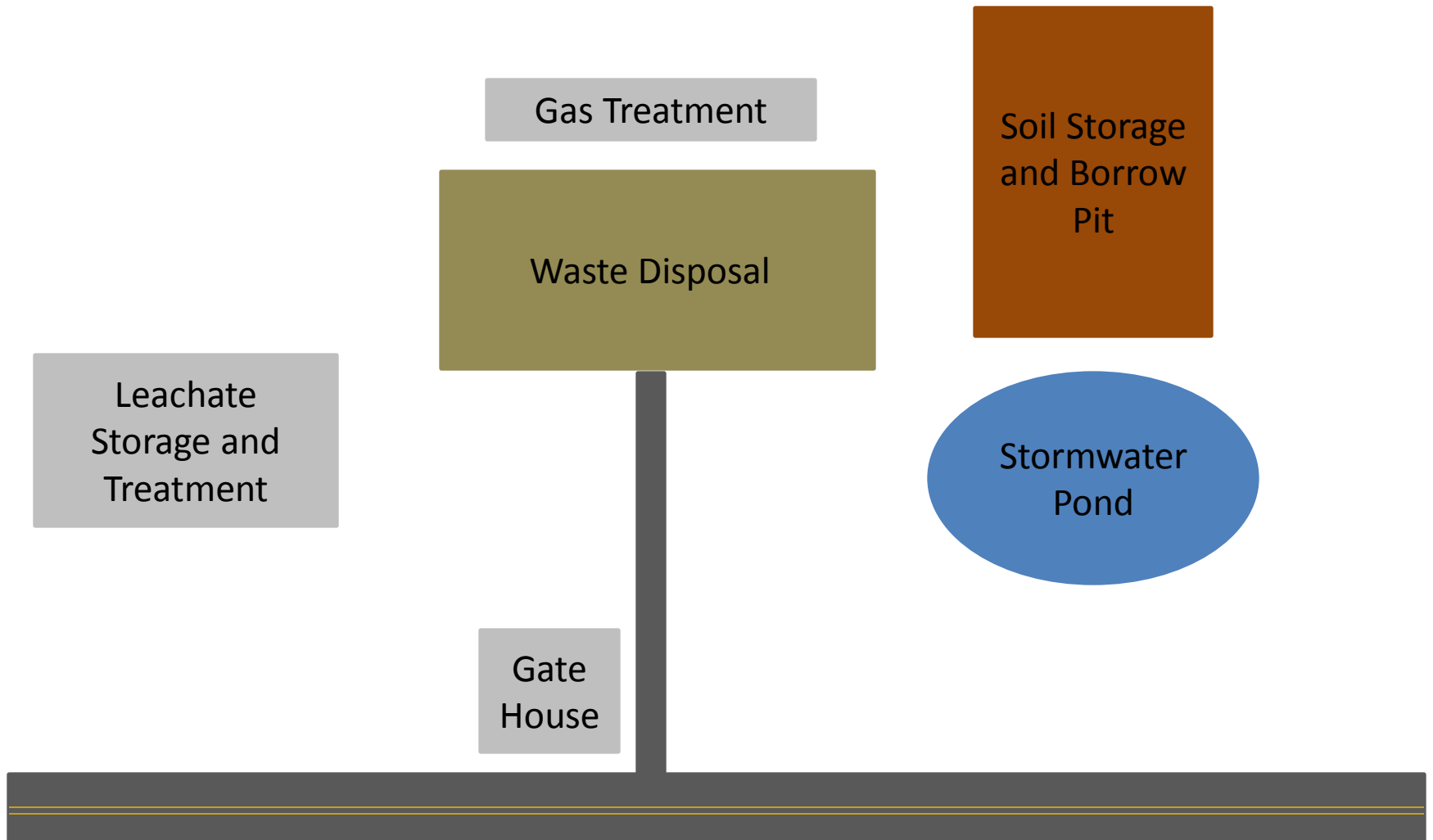
Residual/Industrial

**Construction &
Demolition (C&D)**

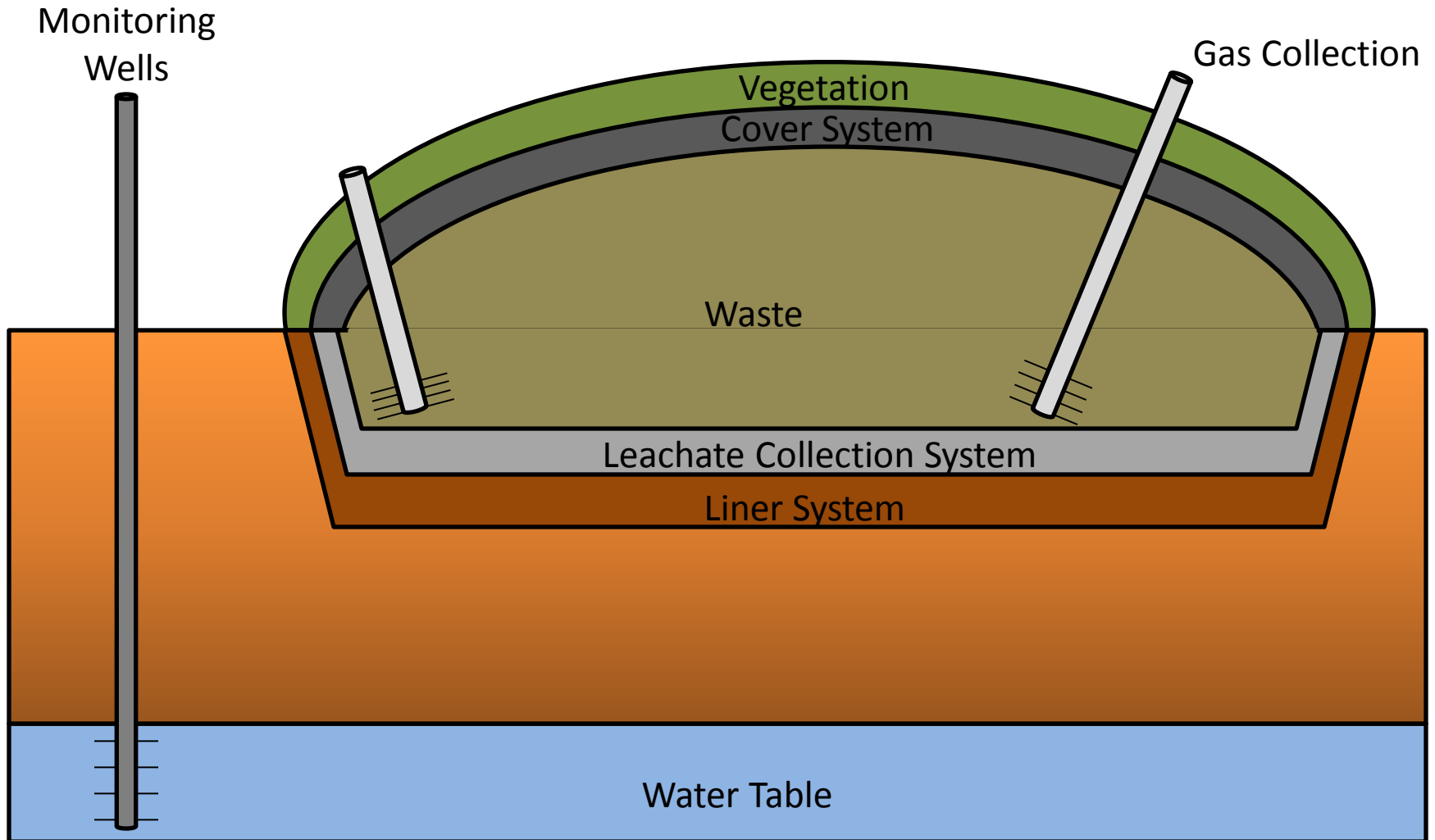
**Land Clearing
Debris (LCD)**

**Domestic Sewage
Industrial Wastewater
Irrigation Return Flows
Nuclear materials
Selected Mining Wastes**

Landfill Site Plan (simplified)



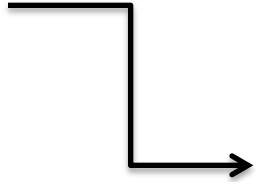
Landfill Cross Section (simplified)



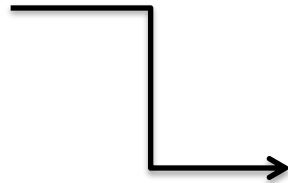
Part 1

REGULATIONS

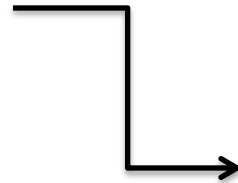
Legislation



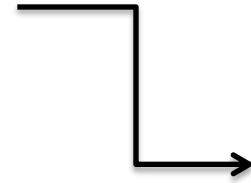
Statutes



Regulations



Guidance



Policy

Resource Conservation and Recovery Act (RCRA) Historical Overview

- Solid Waste Disposal Act of 1965
- Resource Recovery Act of 1970
- RCRA enacted in 1976
- Hazardous and Solid Waste Amendments in 1984

RCRA – 10 Subtitles

- **RCRA Subtitle D** – Designates States and Develop Solid Waste Management Plans
- **RCRA Subtitle C** – Addresses Hazardous Waste Management (not covered in this module)
- **RCRA Subtitle H** – Research, Development, Demonstration and Information (not covered in this module)

Technical Criteria under RCRA Subtitle D

- **Location**

- Airports
- Unstable Areas
- Fault Areas
- Floodplains
- Wetlands
- Seismic Impact Zones

Technical Criteria under RCRA Subtitle D

Continued

- **Operation**

- Procedures to Exclude Hazardous Waste
- Explosive Gases Control
- Cover Material
- Nuisance/Disease Vector Controls
- Air Criteria
- Access Requirements
- Run-on/Run-off Controls
- Recordkeeping
- Surface Water Requirements
- Liquids Restrictions

Technical Criteria under RCRA Subtitle D

Continued

- **Design (discussed in more detail in Landfill 101 – Part 2)**
 - Composite Liner
 - Upper: 30-mil (min) FML (HDPE \geq 60-mil)
 - Lower: 2' layer of CCL with $K \leq 1 \times 10^{-7}$ cm/s
 - Leachate Collection
 - To maintain <30 cm depth of Leachate over the liner
 - Groundwater Quality in the Uppermost Aquifer at the Point of Compliance
 - Hydrogeological conditions
 - Climatic factors
 - Volume of leachate
 - Point of Compliance

Technical Criteria under RCRA Subtitle D Continued

- **Groundwater Monitoring and Corrective Action**
 - Sampling and Analysis Requirements
 - Detection Monitoring
 - Assessment Monitoring
 - Assessment of Corrective Measures
 - Selection of Remedy
 - Implementation

Technical Criteria under RCRA Subtitle D

Continued

- **Closure**

1. **Must Minimize Erosion**

- $K \leq$ Base liner or 10^{-5} cm/s, whichever is less
- Infiltration layer
- Minimum 6" layer of vegetative soil

2. **Written Closure Plan**

- Final cover design
- Largest open area
- Maximum waste inventory
- Schedule

3. **Notification**

4. **Close within 30-days of last receipt or within one (1) year if site has remaining capacity and complete within 180-days.**

5. **Deed Notification**

Technical Criteria under RCRA Subtitle D

Continued

- **Post-Closure Care**
 - **30-Year Period**
 - Maintain final cover
 - Maintain leachate collection system
 - Groundwater monitoring
 - Maintain landfill gas system
 - **Prepare Written Plan**
 - Description of monitoring/maintenance activities
 - Contact person(s)
 - Planned site use(s)

Technical Criteria under RCRA Subtitle D

Continued

- **Financial Assurance for Closure**
 - **Written cost estimate**
 - **Largest open area**
 - **Adjustments (annually)**

- **Financial Assurance for Post-Closure**
 - **Written cost estimate**
 - **Most expensive costs during the care period**

Air Emission Standards History

- Clean Air Act (CAA) of 1970 establishes:
 - National Ambient Air Quality Standards (NAAQS)
 - New Source Performance Standards (NSPS)
 - National Emission Standards for Hazardous Air Pollutants (NESHAPs)
- CAA Amendments of 1977 establishes:
 - Prevention of Significant Deterioration (PSD) requirements of sources in areas attaining NAAQS
 - New Source Review (NSR) for sources in non-attainment areas
- CAA Amendments of 1990 establishes “Title V” operating permits for “major” emitters of NAAQS pollutants or Hazardous Air Pollutants (HAP)

New Source Performance Standards (NSPS)/Emission Guidelines (EG)

- NSPS for “new” MSW landfills that commenced construction or made modifications after May 30, 1991.
- EG for “existing” MSW landfills that commenced construction on or before May 30, 1991, and accepted waste after November 8, 1987.
- Title V permitting required if design Capacity threshold is >2.5 million cubic meters AND 2.5 million megagrams (Mg) (1 Mg = 1 metric ton or 1000 kg)
- Landfill gas collection/control required if non-methane organic compound (NMOC) emissions >50 Mg per year.
- NSPS/EG adds design, operations, monitoring, recordkeeping, reporting requirements.

Landfills NESHAP Rule –Requirements

- **MSW landfills subject to the rule must follow all the provisions of the Landfills NSPS/EG rule, with the addition of :**
 - Semi-annual reporting instead of annual reporting
 - Bioreactor landfills (40% moisture or greater) must install a GCCS within 180 days of reaching 40%.
- **Landfills that require GCCS:**
 - Continuous parameter monitoring under 40 CFR 60.756(b)(1), (c)(1), and (d) of the rule; and
 - Development and implementation of a Start-up, Shut-down, and Malfunction (SSM) plan.

Greenhouse Gas Reporting and Permitting

- **Mandatory Greenhouse Gas (GHG) Reporting Rule**
 - Applied to sources that emit 25,000 Mg or more GHGs
 - Equivalent to approximately 250 cfm of LFG
- **GHG Tailoring Rule**
 - Requires PSD permitting for expansions of existing sources that increase GHGs by 75,000 tons
 - Increased threshold from 250 tons for NAAQS pollutants from landfills
 - Current deferral of permitting of CO₂ emissions from biogenic sources (including landfills) or combustion of biomass (including LFG)

Regulations and Permitting

- **Local Permitting** – typically under land development and zoning ordinances.
- **State Permitting** – must minimally address federal regulations (but may be more stringent) - varies across the country.

Local Approval and Preliminary Site Study

- **Conceptual Pre-Design**
 1. **Alternative “Footprints”**
 2. **Buffers**
 3. **Support Facilities for Full Build-Out**
 4. **Restrictions**
 5. **Benefits**
 6. **Application**

Local Approval and Preliminary Site Study Continued

- **Zoning and Land Use Criteria and Restrictions (Town, City, County, or Tribal)**
 - **Traffic**
 - **Noise**
 - **Environmental Protection** (stormwater, vectors, ground and surface waters, air quality, nuisances)
 - **Property Values**
 - **Aesthetics**
 - **Harmony**
- **Conditional Use and Special Use**
 - **Application**
 - **Hearings – Quasi-Judicial**

State Process

- **Three Part Process**
 - **Initial Application**
 - **Siting Application**
 - **Design Application**

Initial Application

- **Contacts**
- **Location Map**
- **Description**
- **Fees**

Siting Application – Formats Vary

- Hydrogeological Studies
- Geotechnical Studies
- Environmental Studies
- Initial Design
- Administrative Completeness Review
- Technical Review/Deficiencies
- Response
- Approve or Deny

Design Application – Formats Vary

- Engineering Drawings
- Special Waste Handling Plan
- Radiation Protection
- Groundwater Monitoring Plan
- Contingency Plan
- Design and Operation Plans
- Engineering Report
- Calculations Supporting Design
- Closure/Post-Closure Plans
- Technical Specifications
- Construction Quality Assurance Plans