

## **Lecture 2**

# **Hazardous Waste Regulations and Hazardous Materials**

# Hazardous Waste

Superfund adopts lists from RCRA, CAA, CWA, TSCA

RCRA characteristic wastes:

Ignitability

Corrosivity

Reactivity

Toxicity

RCRA listed wastes:

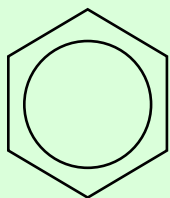
For example: F001 – waste halogenated solvents

# Units of contaminant measurement

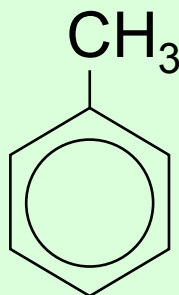
“Parts-per” concentration	Water concentration	Soil concentration
Parts per million (ppm)	mg/L milligrams per liter	mg/kg
Parts per billion (ppb)	$\mu\text{g/L}$ micrograms per liter	$\mu\text{g/kg}$
Parts per trillion (ppt)	ng/L nanograms per liter	



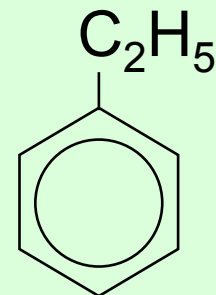
# Aromatic compounds (BTEX)



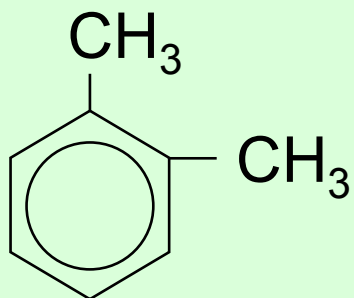
Benzene



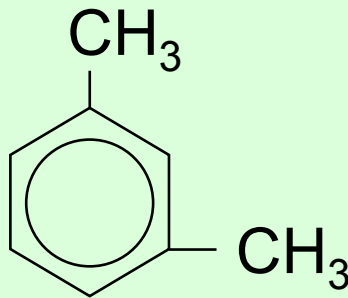
Toluene



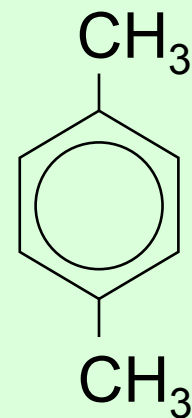
Ethyl benzene



Ortho-xylene



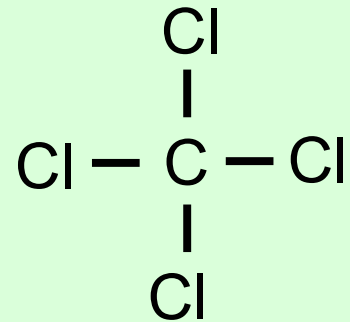
Meta-xylene



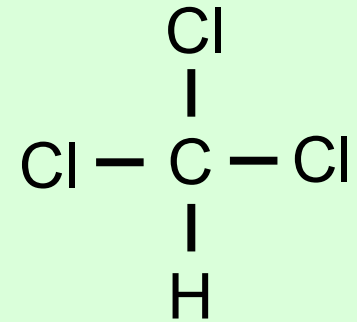
Para-xylene

# Chlorinated methanes

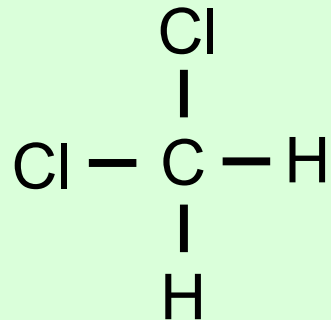
Carbon tetrachloride



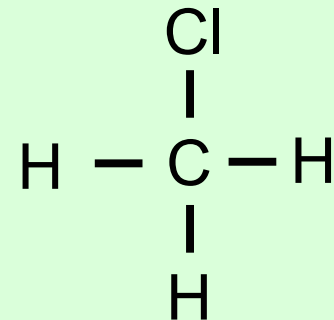
Chloroform



Methylene chloride  
or dichloromethane

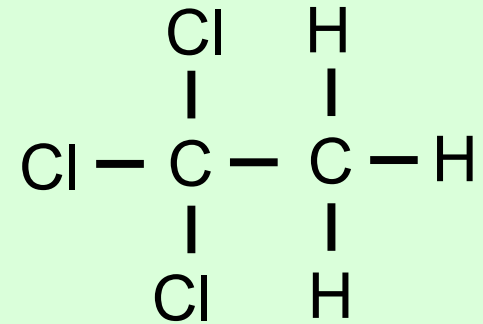


Methyl chloride

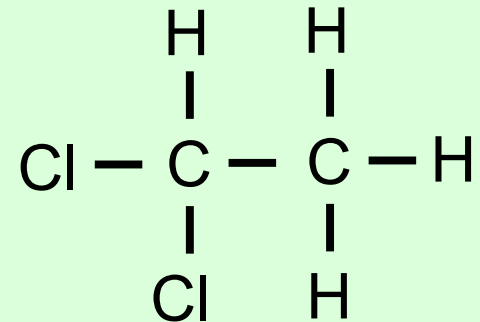


# Chlorinated ethanes

1,1,1-trichloroethane (1,1,1-TCA)

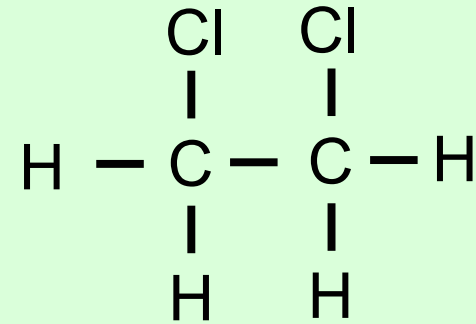


1,1-dichloroethane (1,1-DCA)

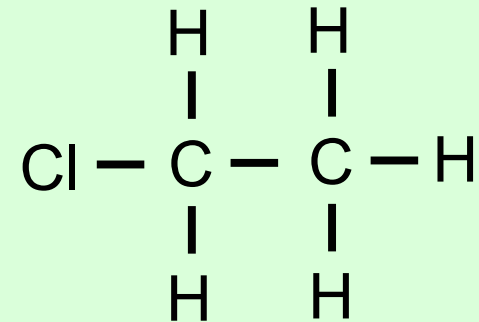


# Chlorinated ethanes

1,2-dichloroethane (1,2-DCA)



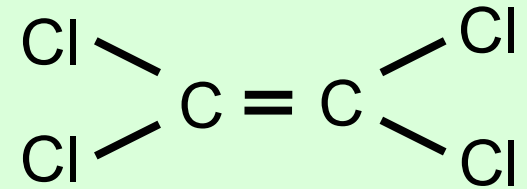
chloroethane



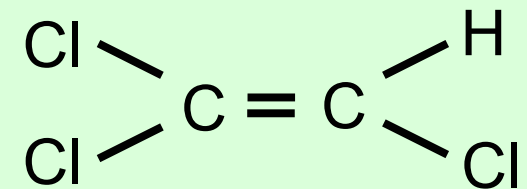


# Chlorinated ethenes

Tetrachloroethene, tetrachloroethylene, perchloroethylene (PCE or “perc”)

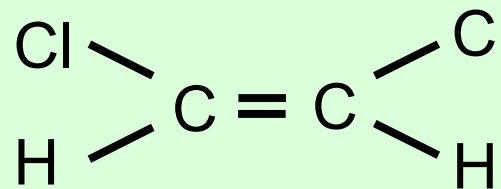


Trichloroethene, trichloroethylene (TCE)

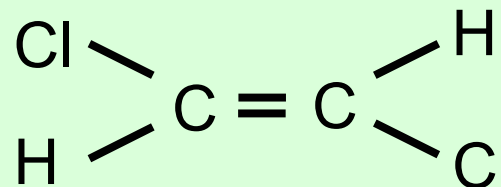


# Chlorinated ethenes

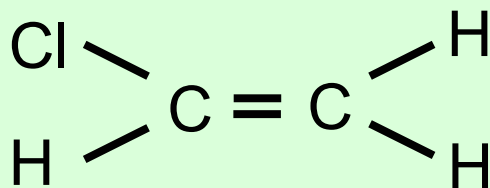
cis-1,2-dichloroethene, cis-1,2-dichloroethylene  
(cis-1,2-DCE)



trans-1,2-dichloroethene, trans-1,2-dichloroethylene  
(trans-1,2-DCE)

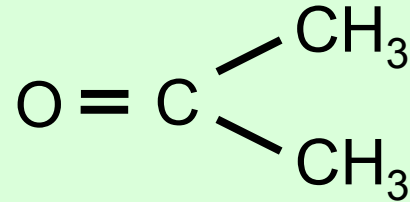


vinyl chloride

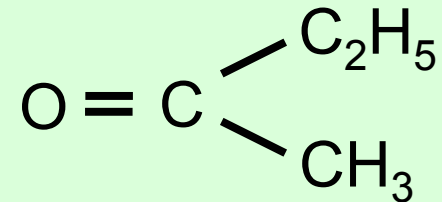


# Ketones

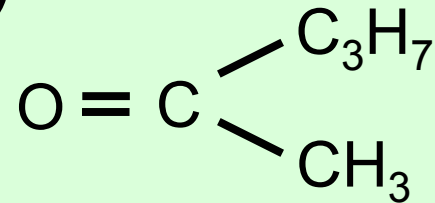
Acetone



Methyl ethyl ketone (MEK)  
2-butanone

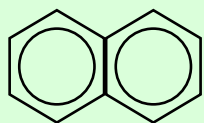


Methyl isobutyl ketone (MIBK)  
2-pentanone

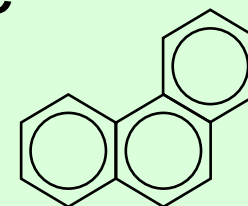


# Polynuclear aromatic hydrocarbons (PAHs or PNAs)

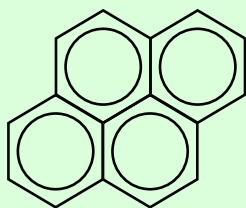
Naphthalene



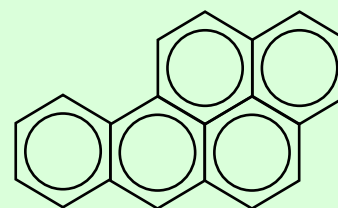
Phenanthrene



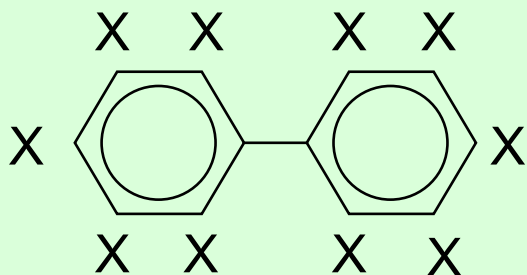
Pyrene



Benzo(a)pyrene (BaP)



# Polychlorinated biphenyls (PCBs)



X = possible Cl site

Congener – specific PCB molecule

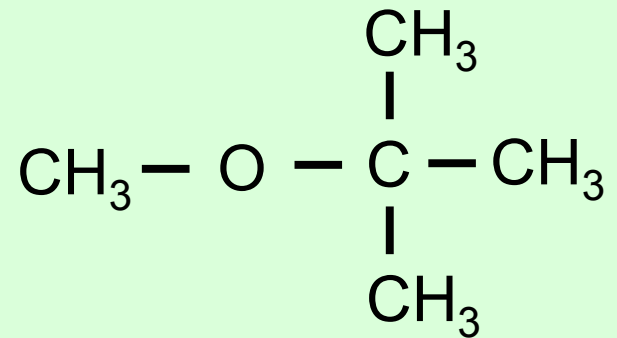
Homologs – molecules with same chemical formula

Aroclor – mixture of PCBs of certain percentage chlorine

# FUEL ADDITIVES

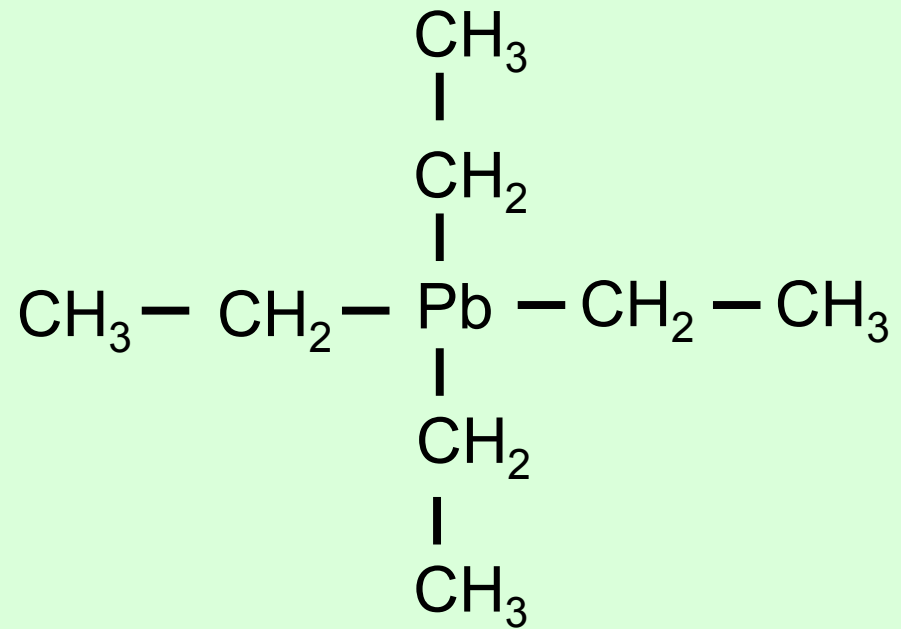
MTBE

Methyl tertiary butyl ether



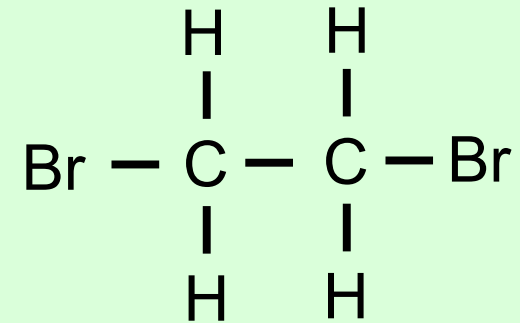
# FUEL ADDITIVES

Tetraethyl lead



EDB

Ethylene dibromide



# Inorganics

## Metals:

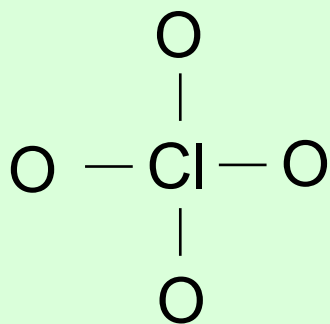
Arsenic (As), Cadmium (Cd), Chromium (Cr),  
Lead (Pb), Mercury (Hg)

## Cyanide

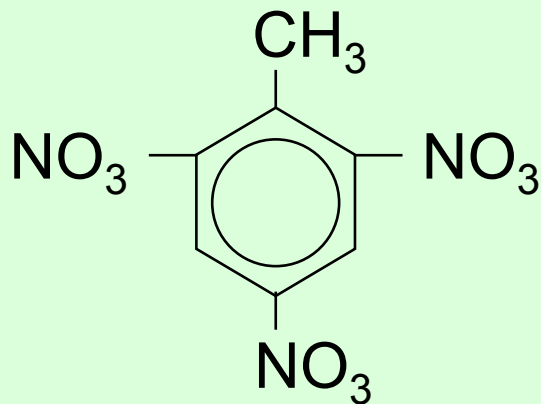
CN



# Explosives and propellants



Perchlorate  
 $\text{ClO}_4^-$



TNT



RDX

# Mixtures

Aroclor – mixture of PCBs

Coal tar and creosote – PAHs, monoaromatic hydrocarbons, trace metals

Gasoline – mixture of aliphatic and aromatic hydrocarbons

(plus additives:

tetraethyl lead, EDB, EDC in leaded gasoline

MTBE, ethanol, other oxygenates in unleaded)

# Hydrocarbon Mixtures

Other petroleum hydrocarbon mixtures:

Diesel fuel

Jet fuel (kerosene)

Mineral spirits (Stoddard solvent)

Hydraulic fluid (possibly with PCBs)

Lubricating oils, cutting oils

No. 2 Fuel oil (home heating oil)

No. 4 and 5 Fuel oil (Bunker B and C)

Waste oil

# Sources of Information on Chemicals

*The Merck Index.* Merck & Co., Inc., Rahway, New Jersey.

Verschueren, K., 1983. *Handbook of Environmental Data on Organic Chemicals.* Van Nostrand Reinhold Company, New York.

Montgomery, J. H., 1996. *Groundwater Chemicals Desk Reference - Second Edition.* CRC Press, Inc., Boca Raton, Florida.

# Major US Hazardous Waste Laws

**CERCLA  
or  
Superfund**

**Comprehensive Environmental  
Response, Compensation, and  
Liability Act of 1980**

**RCRA**

**Resource Conservation and  
Recovery Act of 1976**

# Major US Hazardous Waste Laws

**CERCLA  
or  
Superfund**

**Consultant's Early Retirement  
and Comfort for Life Act**

**RCRA**

**Resource Conservation and  
Recovery Act of 1976**

# Timeline of Major Legislation

- 1970 Clean Air Act
- 1972 Federal Water Pollution Control Act
- 1974 Safe Drinking Water Act
- 1976 RCRA
- 1976 TSCA (Toxic Substances Control Act)
- 1977 Clean Water Act
- 1980 Superfund
- 1986 EPCRA (Emergency Planning and Community Right-To-Know Act)

# CERCLA Timeline

## 1980 CERCLA

Established \$1.6 billion “Superfund” and rules for hazardous waste site identification and cleanup

## 1986 SARA – Superfund Reauthorization and Amendments

Increased fund to \$8.5 billion

Created more stringent cleanup requirements



# Provisions of CERCLA

- Established National Priorities List (NPL) of sites to be cleaned up
- EPA to revise National Contingency Plan
- EPA can conduct/require “removals”
- EPA can conduct/require site “remedies”
- Remedies must attain “applicable or relevant and appropriate requirements” (ARARs)
- EPA can recover from Potentially Responsible Parties (PRPs) (also called the “Polluter Pays Principle”) -- with treble damages!

# CERCLA Removal Actions

Short-term cleanup actions

Designed to address emergencies

Limited in:

- cost (<\$2 million)

- duration (<12 months)

# CERCLA Removal Action



## Union Chemical Superfund Site, Hope, Maine

**Sept. 1984**

Source: Maine DEP files.

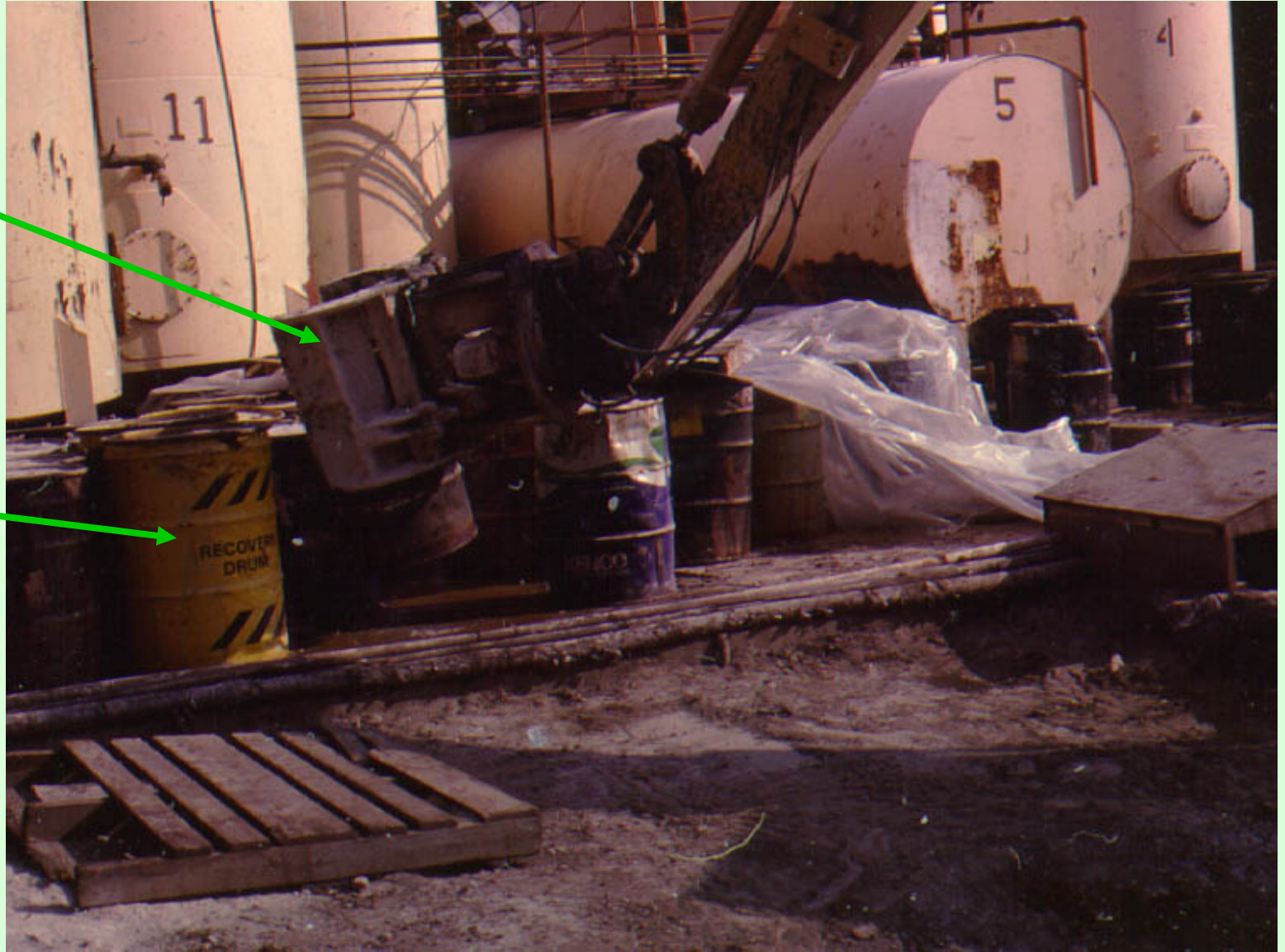
See also: McDonald, B. D., 1988. Site Analysis, Union Chemical Company, South Hope, Maine. TS-PIC-88072. Environmental Photographic Interpretation Center, Environmental Monitoring Systems Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Warrenton, Virginia. May 1988.

Courtesy of The Maine Department of Environmental Protection, Bureau of Remediation and Waste Management. Used with permission.

# CERCLA Removal Action

Drum grapppler

Drum overpack





# CERCLA Removal Action – Drum Consolidation



Source: Maine DEP files.

Courtesy of The Maine Department of Environmental Protection, Bureau of Remediation and Waste Management. Used with permission.

# CERCLA Removal Action – Drum Consolidation



Source: Maine DEP files.

Courtesy of The Maine Department of Environmental Protection, Bureau of Remediation and Waste Management. Used with permission.

# ARARs (Applicable or relevant and appropriate requirements)

Example of applicable:

RCRA regulations for off-site disposal of site soils

Example of relevant and appropriate:

Maximum contaminant levels (MCLs) set under Safe Drinking Water Act are used as clean-up levels for ground water

# PRP Liability

Includes any of:

- Current facility owner or operator
- Owner or operator when site was contaminated
- Those who arranged to treat or dispose waste at facility
- Transporters of waste to facility
- Generators of waste
- May include individuals, corporate officers, corporations, landlords



# “Strict, joint and several liability”

## Strict:

Government does not need to prove intent or negligence

## Joint and several:

Each and every PRP at Superfund site can be held liable for **entire** cleanup cost

Government has flexibility to find PRPs with “deep pockets”

# Superfund and Litigation

Government can pursue some or all PRPs in court

PRPs can sue other PRPs for contribution

PRPs are also subject to citizen suits for health or property damage

PRPs can sue for insurance coverage

# Identifying Superfund Sites

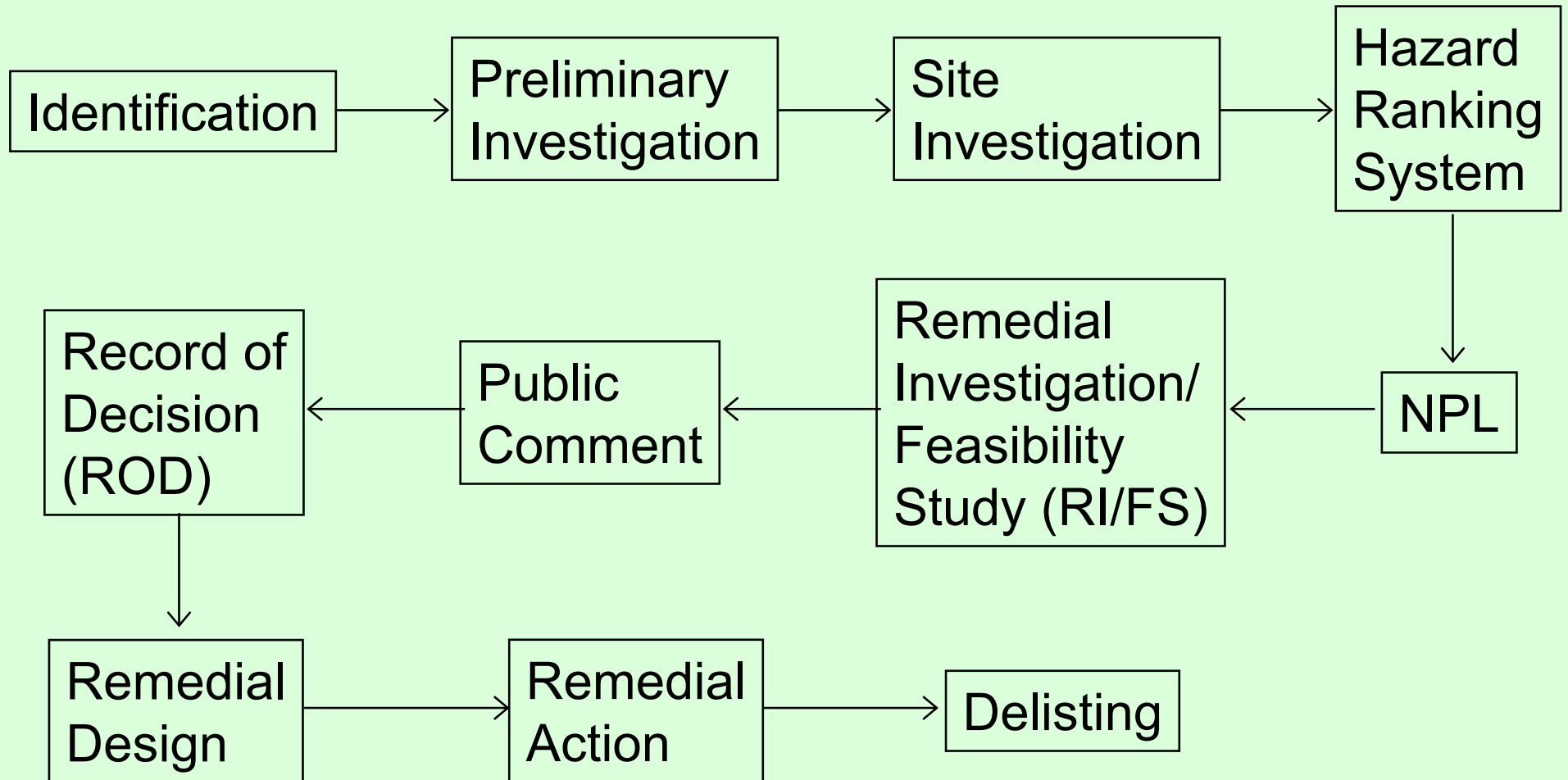
Spills in excess of “reportable quantity” of hazardous substances must be reported

Facilities that treated, stored, or disposed of hazardous substances must report unless covered by RCRA

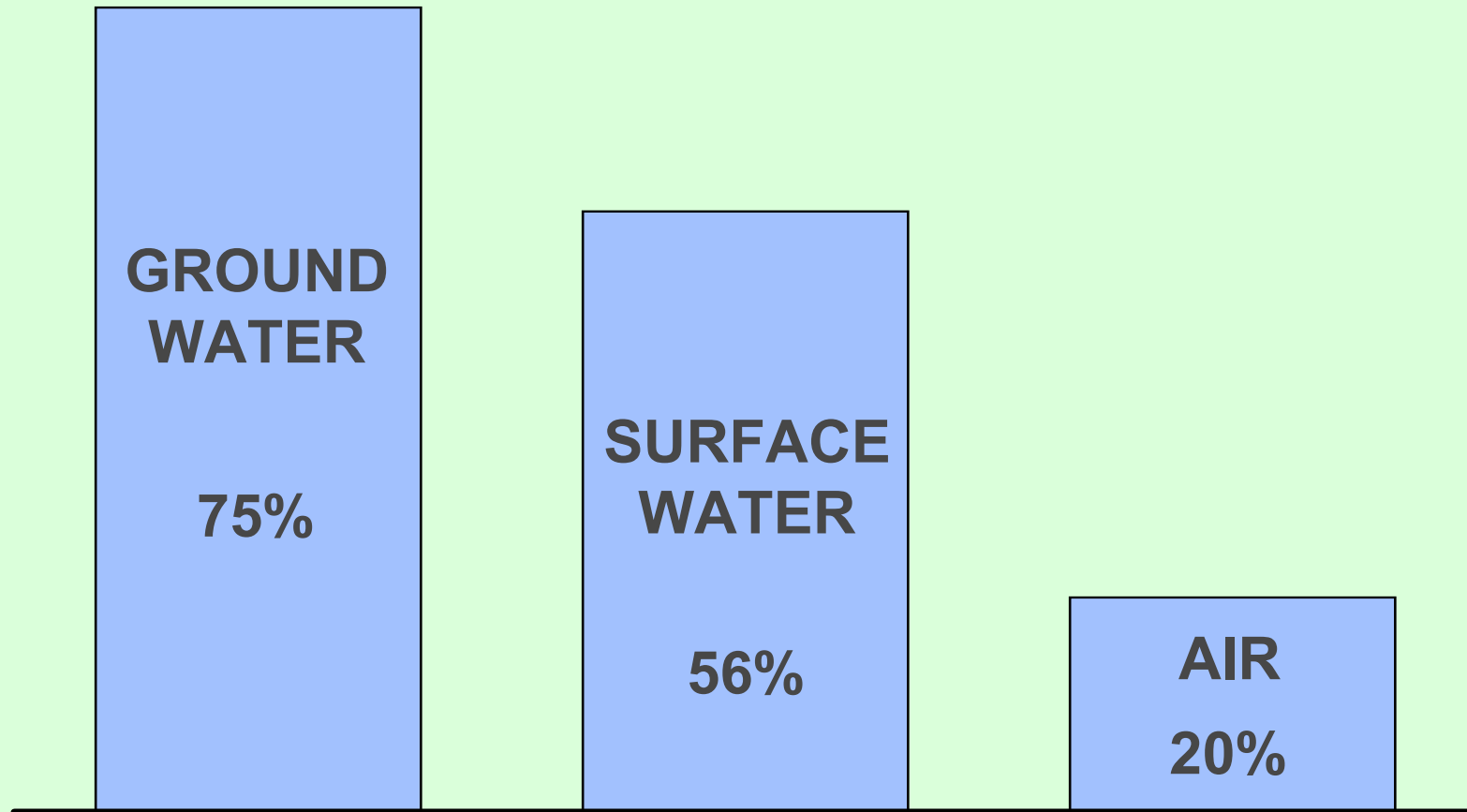
# Superfund Reportable Quantities

Substance	Reportable Quantity (pounds)
Arsenic	1
Benzene	10
Coal tar residuals	1
Dichlorobenzene	100
Methyl ethyl ketone	5000
Naphthalene	100
Tetrachloroethylene	100
Trichloroethylene	100

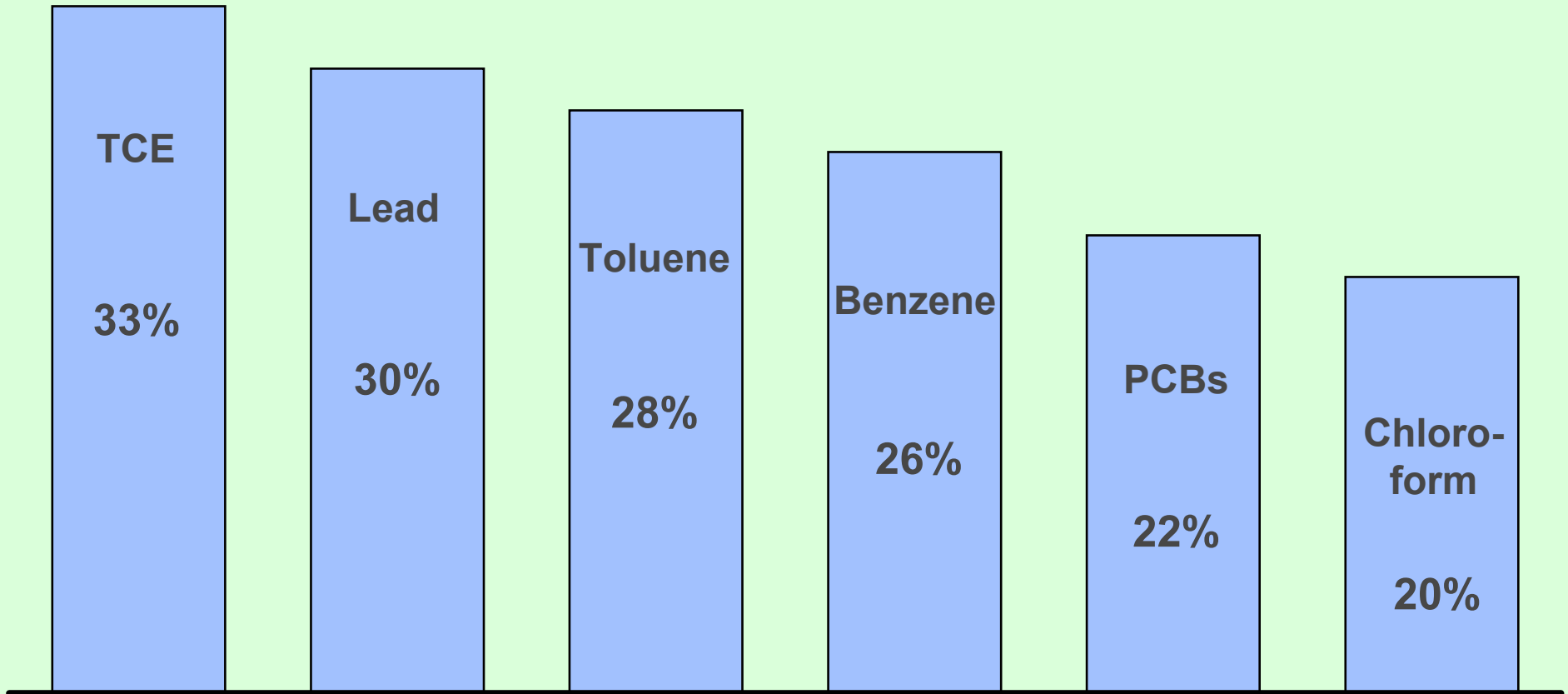
# Superfund Process



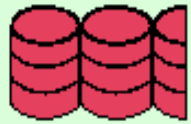
# Superfund Sites: Resource Contaminated



# Superfund Sites: Chemical Contaminants



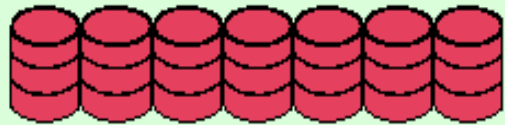
# Superfund Sites: Site Use



**LANDFILLS, TANKS, OTHER**



**= 2% OF SITES**



**MANUFACTURING**



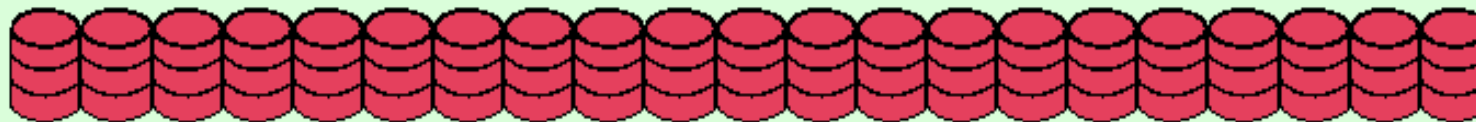
**RECOVERY AND RECYCLE**



**TRANSPORT AND TREATMENT**



**DISPOSAL**



**STORAGE**



# Estimated NPL Cleanup Expenditures

Source of funds	Annual expenditure
PRP cleanup costs	\$1,560 million
Superfund tax	\$1,330 million
General revenue	\$250 million
PRP transaction costs	\$420 million
Insurer transaction costs	\$360 million
Total	\$3,920 million

Probst, K. N., D. Fullerton, R. E. Litan, and P. R. Protney, 1995. *Footing the bill for Superfund Cleanups, Who Pays and How*. The Brookings Institution and Resources for the Future, Washington, D.C.

# ESTIMATED AVERAGE SITE CLEANUP COSTS

Site type	Cost (\$ million)	Site type	Cost (\$ million)
Chemical manufacturing	41	Surface impoundment	25
Drum recycling	19	Plating	14
Landfill	29	Mining	170
Waste oil	32	Wood treating	41
Leaking tank	34	Manufacturing	14

Probst, K. N., D. Fullerton, R. E. Litan, and P. R. Protney, 1995. *Footing the bill for Superfund Cleanups, Who Pays and How*. The Brookings Institution and Resources for the Future, Washington, D.C.

# Other Models for Site Cleanup

United Kingdom – makes site identification and cleanup enforcement a local responsibility with recovery from responsible parties

Denmark – negligence standard through 2000; strict liability thereafter

Netherlands – cleanup standard depends on use, “Dutch list” cleanup standards used by many countries

Poland – remediation negotiated as part of privatization

Japan – negligence standard

# European Union Principles

Polluter Pays under strict liability

Cleanup standard is use-dependent

No retroactive liability

Countries have the option of how to enforce liability  
(e.g. operators only or other parties, proportional liability rather than joint and several)

Lenders, individuals in companies not liable

Government permit-issuing authorities may be liable

# RCRA Timeline

1965 Solid Waste Disposal Act

1970 Resource Recovery Act

1976 RCRA

Established “cradle to grave” system for tracking hazardous waste

1984 HSWA (Hazardous and Solid Waste Amendments)

Established “Corrective Action”

# RCRA Subtitles

- A. General Provisions
- B. Office of Solid Waste
- C. Hazardous Waste Management
- D. State or Regional Solid Waste Plans
- E. Resource and Recovery

- F. Federal Responsibilities
- G. Miscellaneous Provisions
- H. Research, Development, Demonstration and Information
- I. Underground Storage Tanks

# RCRA Corrective Action

## Superfund Process

Preliminary Assessment/  
Site Investigation (PA/SI)

Remedial Investigation (RI)

Feasibility Study (FS)

Remedial Design/Remedial  
Action (RD/RA)

## RCRA CA Process

RCRA Facility Assessment (RFA)

RCRA Facility Investigation (RFI)

Corrective Measures Study (CMS)

Corrective Measures  
Implementation (CMI)

# Laws and Regulations

Law or statute – general statement of intent passed by U.S. Congress

Regulation – specific rules written by EPA for carrying out law (e.g., 40 CFR 300)

Policies and guidance – informal rules issued by EPA



Electronic Code of Federal Regulations

*e-CFR*  
TM

**Title 40--Protection of Environment**

**CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY**

**PART 258--CRITERIA FOR MUNICIPAL SOLID WASTE  
LANDFILLS**

- 
- [258.1](#) Purpose, scope, and applicability.
  - [258.2](#) Definitions.
  - [258.3](#) Consideration of other Federal laws.
  - [258.10](#) Airport safety.
  - [258.11](#) Floodplains.
  - [258.12](#) Wetlands.
  - [258.13](#) Fault areas.
  - [258.14](#) Seismic impact zones.
  - [258.15](#) Unstable areas.
  - [258.16](#) Closure of existing municipal solid waste landfill units.
  - [258.20](#) Procedures for excluding the receipt of hazardous waste.
  - [258.21](#) Cover material requirements.
  - [258.22](#) Disease vector control.
  - [258.23](#) Explosive gases control.

http://www.state.fl.us/

↑  
State  
2-letter  
abbreviation

Example:  
Florida - FL



MyFlorida.com  
**my**  
Search MyFlorida.com

WELCOME TO FLORIDA

Go [directory](#) | [contact us](#) | [411](#) | [newsletters](#) | [first time user](#)

**Categories**

- [Agriculture](#)
- [Business & Industry](#)
- [Calendar & Events](#)
- [Community](#)
- [Resources](#)
- [Consumer Assistance](#)
- [Disaster Management](#)
- [Education](#)
- [Elders](#)
- [Employment](#)
- [Environment](#)
- [Health & Human Services](#)
- [Licensing & Permitting](#)
- [Public Safety](#)
- [Science & Technology](#)
- [Transportation](#)

**Quick Topics**

- [Deferred Comp. Program](#)
- [Volunteers & Donations](#)
- [Military Service](#)
- [Compensation Law](#)

**Governor Bush's Recommended Budget for FY 2002-2003**

**BLACK HISTORY MONTH**

**Florida's Latest News**

**FIRST BATTLE IN WAR ON RESIDENTIAL CITRUS CANCKER IS WON: COMMISSIONER BRONSON CREDITS HILLSBOROUGH COUNTY RESIDENTS WITH SUCCESS**

**TALLAHASSEE-** Florida Agriculture Commissioner Charles H. Bronson has announced the lifting of the 20 square mile citrus cancker quarantine zone in Hillsborough County, including Sun City Center. The quarantine zone has been in effect since citrus cancker was first discovered in the area in the fall of 1999. This marks the first quarantine removal in an area where the 1,900 foot cutting policy has been applied.  
[More Info](#), [Archives](#), [Agency News](#)

**GOVERNOR BUSH CELEBRATES GRAND OPENING OF NEW COCA-COLA SHARED SERVICES**

**e-Government Services**

- [Corporations](#)
- [DBPR Online Services](#)
- [DOI Online Licensing](#)
- [Driver's License](#)
- [Vehicle Registration](#)
- [e-Renewals @ Health](#)
- [eTaxes for Business](#)
- [Fishing/Hunting License](#)
- [High Tech Jobs](#)
- [Unemployment/ Reemployment](#)

**Find an Agency**

Governor's Office

Go

[Governor's Information](#)  
[Find a State Employee](#)  
[Find a State Job](#)

**Governor's e-Newsletter**

Type your e-mail address and click subscribe.

Subscribe

**Legislative Update**

- [From the Legislature](#)
- [Senate News](#)



Search MyFlorida.com



## ENVIRONMENTAL SERVICES

[directory](#) | [contact us](#) | [411](#) | [newsletters](#) | [first time user](#)

Go

### Categories

[Agriculture](#)  
[Business & Industry](#)  
[Calendar & Events](#)  
[Community Resources](#)  
[Consumer Assistance](#)  
[Disaster Management](#)  
[Education](#)  
[Elders](#)  
[Employment](#)  
[Environment](#)  
[Health & Human Services](#)  
[Licensing & Permitting](#)  
[Public Safety](#)  
[Science & Technology](#)  
[Transportation](#)

Find an Agency

Governor's Office

Go

### Environment

#### [Air Resources](#)

[Air Quality Monitoring](#) | [Florida's Ozone Network](#) | [Partnership for Ecosystem Protection](#) | [Permitting](#) | [Pollutants](#) | [Publications](#) | [Rules & Statues](#) | [Small Business Assistance Program](#)

#### [Beaches & Coastal](#)

[About Beaches & Coastal Systems](#) | [Aquatic Toxins](#) | [Beach Publications](#) | [Beach Water Quality](#) | [Clean Marina & Vessel Grant](#) | [Coastal Data](#) | [Coastal & Aquatic](#) | [Harmful Algae Blooms](#) | [Invasive Species](#) | [Permits](#)

#### [External Affairs](#)

[Communications](#) | [Energy](#) | [Environmental Education](#) | [Everglades Restudy](#) | [General Counsel](#) | [Inspector General](#) | [Legislative & Governmental Affairs](#) | [Strategic Projects & Planning](#) | [Ombudsman](#)

#### [Geology](#)

[About the Florida Geological Survey](#) | [Data & Maps](#) | [Geological Topics](#) | [Geology Programs](#) | [Geology Questions](#) | [Publications](#) | [Sinkhole Report & Oil/Gas Forms](#)

#### [Health & Human Services](#)

[Compressed Air](#) | [Drinking Water](#) | [Florida Clean Indoor Air Act](#) | [Food Hygiene](#) | [Food & Waterborne Illness](#) | [Onsite Sewage](#) | [Pesticide Surveillance](#) | [Radiation Control](#) | [Radon](#) | [Smoking in Public Places Regulations](#)



## **Land Programs**

[About Greenways & Trails](#) | [Agriculture](#) | [Coastal & Aquatic](#) | [Invasive Species](#) | [Plant Life](#) | [State Lands](#)

## **Law Enforcement**

[Clean Marina](#) | [Emergency Response](#) | [Environmental Investigations](#) | [Marine Enforcement](#) | [Park Patrol](#) | [Public Education & Training](#) | [Wildlife Violators](#)

## **Marine Mammals**

[Manatee](#) | [Marine Turtles](#) | [Right Whale](#)

## **Marine Research**

[Florida Marine Research Institute](#)

## **Resource Assessment**

[Environmental Laboratories](#) | [Laboratory Contacts](#) | [Everglades](#) | [GIS Data](#) | [Guidance](#) | [Library](#) | [Mercury](#) | [QA](#) | [Reports](#) | [SOPs](#) | [Training](#)

## **Transportation**

[Environmental Management](#) | [Highway Beautification Program](#) | [Scenic Highway Program](#) | [Transportation Enhancement Program](#)

## **Waste Management**

[Batteries](#) | [Brownfields](#) | [Cleansweep-Pesticides](#) | [Contaminated Soils Forum](#) | [Drycleaning](#) | [Electronics](#) | [Full Cost Accounting](#) | [Hazardous Waste](#) | [Institutional Controls Registry](#) | [Mercury](#) | [Pesticide Poisoning](#) | [Petroleum Cleanup Programs](#) | [Pollution Prevention](#) | [Recycling](#) | [Site Investigation](#) | [Solid Waste](#) | [Solid Waste Grants](#) | [Storage Tank Regulation](#) | [Tires](#) | [Used Oil](#) | [Voluntary Cleanup](#) | [Waste Cleanup](#)





# Florida

Department of Environmental Protection



## Categories

[Waste Home](#)

[Batteries](#)

[Brownfields  
Redevelopment](#)

[Cleansweep-  
Pesticides](#)

[Contaminated  
Soils Forum](#)

[Drycleaning](#)

[Electronics](#)

[Full Cost  
Accounting](#)

[Hazardous  
Waste](#)

[Hazardous  
Waste](#)

[Financial  
Responsibility](#)

[Institutional  
Controls](#)

[Registry &  
Procedures](#)

[Guidance](#)

[Mercury](#)

[Petroleum  
Cleanup](#)

[Programs](#)

[Pollution](#)

[Home](#) | [Contact DEP](#) | [Search MyFlorida.com](#) | [Site Map](#)

## Solid Waste Main Page



### Solid Waste Rules & Forms

- ▶ **Chapter 62-701, F.A.C., Solid Waste Management Facilities** Effective 5/27/01  
 [Acrobat PDF](#) [Word](#)
- ▶ **Solid Waste Management Facilities [Forms](#)**
- ▶ **Chapter 62-702, F.A.C., Solid Waste Combustor Ash Management** Effective 1/12/99  
 [Acrobat PDF](#) [Word](#)
- ▶ **Chapter 62-704, F.A.C., Certification of Resource Recovery and Recycling Equipment** Effective 12/17/96  
 [Acrobat PDF](#) [Word](#)
- ▶ **Chapter 62-708, F.A.C., Full Cost Accounting** Effective 11/11/90  
 [Acrobat PDF](#) [Word](#)
- ▶ **Chapter 62-709, F.A.C., Criteria for the Production and use of Compost Made from Solid Waste** Effective 10/22/00  
 [Acrobat PDF](#) [Word](#)
- ▶ **Compost Rule [Forms](#)**



- Top of Document
- 62-701.100 Intent
- 62-701.200 Definitions
- 62-701.210 Documents Incorporated by R
- 62-701.220 General Applicability
- 62-701.300 Prohibitions
- 62-701.310 Approval of Alternate Procedu
- 62-701.315 Permit Fees for Solid Waste A
- 62-701.320 Solid Waste Management Fac
- 62-701.330 Landfill Permit Requirements
- 62-701.340 General Criteria For Landfills
- 62-701.400 Landfill Construction Requirem
- 62-701.410 Hydrogeological and Geotechr
- 62-701.420 Geotechnical Investigation Re
- 62-701.430 Vertical Expansion of Landfills
- 62-701.500 Landfill Operation Requiremer
- 62-701.510 Water Quality and Leachate Iv
- 62-701.520 Special Waste Handling
- 62-701.530 Gas Management Systems
- 62-701.600 Landfill Final Closure
- 62-701.610 Closure Procedures
- 62-701.620 Long -Term Care
- 62-701.630 Financial Assurance
- 62-701.640 Closure of Existing Landfills
- 62-701.700 Materials Recovery Facilities
- 62-701.710 Waste Processing Facilities
- 62-701.720 Industrial Solid Waste Dispos
- 62-701.730 Construction and Demolition C
- 62-701.801 General Permit for Solid Wast
- 62-701.802 General Permit for Land Appli
- 62-701.803 General Permit for Off-site Dis
- 62-701.900 Forms

The landfill owner or operator demonstrates that delaying placement of final cover will not cause or contribute to any significant increase in leachate escaping from the solid waste disposal unit into the environment.

(c) In addition, a solid waste disposal unit which will be mined in the future shall have a temporary final cover installed.

Specific Authority: 403.061, 403.704, 1S.

Law Implemented: 403.702, 403.704, 403.707, 1S.

History -- New 1-6-93, Amended 1-2-94, 5-19-94, Formerly 17-701.600, Amended 5-27-01

#### 62-701.610 Closure Procedures.

(1) Closing inspections. The Department shall specify in the closure permit which particular closing steps or operations must be inspected and approved by the Department before proceeding with subsequent closure actions.

(2) Survey monuments. For landfills with a final elevation of less than 20 feet above the natural land surface, concrete monuments shall be installed to mark the boundaries of the landfill property and other permanent markers shall be installed to outline the general waste filled areas. These markers shall be tied to one or more of the boundary markers by a survey performed by an engineer or a registered land surveyor. The location and elevation of all markers shall be shown on a site plan filed with the "Declaration to the Public" described in subsection (5) of this section.

(3) Final survey report. When landfill operations have been conducted which have raised the final elevations higher than 20 feet above the natural land surface, a final survey shall be performed after closure is complete by an engineer or a registered land surveyor to verify that final contours and elevations of the facility are in accordance with the plans as approved in the permit. Aerial mapping techniques which provide equivalent survey accuracy may be substituted for the survey. The survey or aerial mapping information shall be included in the report along with information reflecting the conditions of the landfill as constructed. Contours shall be shown at no greater than five-foot intervals. The landfill owner or operator shall submit this report to the Department in accordance with the closing schedule.

(4) Certification of closure construction completion. A certification of closure construction completion, signed, dated and sealed by a professional engineer independent of the contractor, shall be provided to the Department upon completion of closure. All substantial deviations from the permitted closure plans shall be noted.

(5) Declaration to the public. After closing operations are inspected and approved by the Department, the landfill owner or operator shall file a declaration to the public in the deed records in the office of the county clerk of the county in which the landfill is located. The declaration shall include a legal description of the property on which the landfill is located and a site plan specifying the area actually filled with solid waste. The declaration shall also include a



# SOURCES OF GROUND-WATER CONTAMINATION

## Designed discharges

- On-site wastewater disposal
- Injection wells
- Land application

## Storage, treatment and disposal

- Landfill
- Open dumps
- Residential disposal
- Surface impoundments
- Waste tailings
- Waste piles
- Material stockpiles
- Graveyards
- Animal burial
- Aboveground storage tanks
- Underground storage tanks
- Containers
- Open burning and detonation
- Radioactive disposal

## Transport and transmission

- Pipelines
- Materials transport

## Activities with incidental releases

- Irrigation
- Pesticide application
- Fertilizer application
- Animal feeding operations
- De-icing salt application
- Urban runoff
- Atmospheric deposition
- Mining and mine drainage

## Activities altering flow patterns

- Oil and gas production wells
- Other wells
- Excavation

## Natural sources

- Surface-water interaction
- Natural leaching
- Salt-water intrusion

# USEFUL WEB RESOURCES

[EPA Wastes Home Page](#)

[EPA Wastes Publications](#)

[EPA Wastes Topics](#)

[EPA Superfund Publications](#)

[EPA RCRA Corrective Action](#)

[EPA Federal Register](#)

[Remediation Technologies Screening Matrix](#)

[CLU-IN Cleanup Information](#)

[Ground Water Remediation Technologies](#)

[TechDirect Newsletter](#)