Disposal of Polychlorinated Biphenyls (PCBs)

Final Rule

(40 CFR Parts 750 and 761)

Presented by

Battelle

Columbus, Ohio

Disposal of PCBs – Final Rule

- Properties of PCBs
- Background
- New PCB Rule

Disposal of PCBs – Final Rule

- **Properties of PCBs**
  - **toxicological, chemical, and physical properties**
- Background
- New PCB Rule

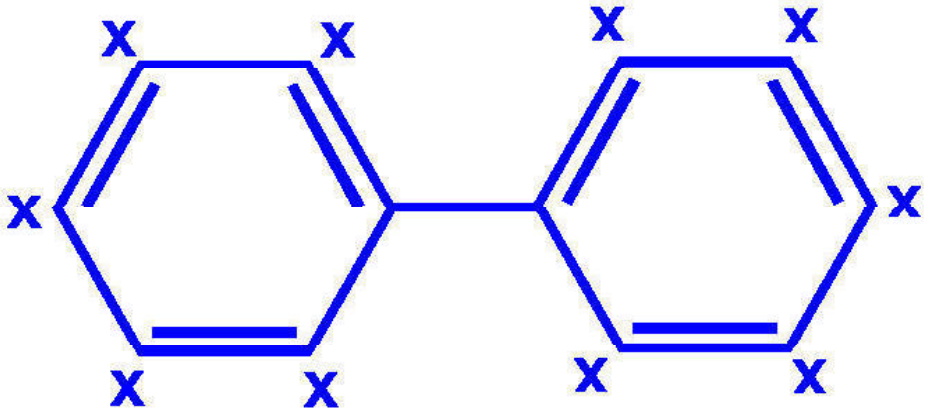
Human Health Effects

- Probable human cancer causing or promoting agent
- Neurotoxicity
- Reproductive and developmental toxicity
- Immune system suppression
- Liver damage
- Skin irritation
- Endocrine disruption

Ecological Effects

- PCBs do not break down readily in the environment
- Taken into the food chain by microorganisms
- Bioaccumulate in higher organisms
- Some of the highest concentrations have been found in fish

PCB Molecule



x = H (1-10) or Cl (10-1)
209 Congeners

Aroclor Formulations

1016, 1221

1232, 1242

1248, 1254

1260, 1262

last two digits are for Cl content
(% by weight)

Properties of Selected Aroclor

Composition* and Properties	Aroclor		
	1242	1248	1254
Biphenyl (%)	-	-	-
Monochlorobiphenyl (%)	1.0	-	-
Dichlorobiphenyl (%)	17.0	1.0	-
Trichlorobiphenyl (%)	40.0	23.0	-
Tetrachlorobiphenyl (%)	32.0	50.0	16.0
Pentachlorobiphenyl (%)	10.0	20.0	60.0
Hexachlorobiphenyl (%)	0.5	1.0	23.0
Heptachlorobiphenyl (%)	-	-	1.0
Octachlorobiphenyl (%)	-	-	-
Specific Gravity (@ 25/15.5°C)	1.38	1.41	1.50
Absolute Viscosity (cp @ 38°C)	24	70	700
Solubility (≒ g/L @ 25°C)	240	54	12
Vapor Pressure (mm @ 25°C)	0.0004	0.0004	0.00008
Log K_{ow}	4.1	6.1	6.5

*Composition is % by weight

(Source: Cohen et al., 1993)

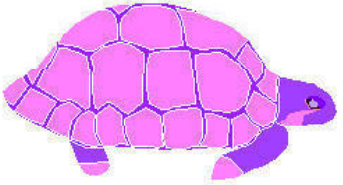
Disposal of PCBs – Final Rule

- Properties of PCBs
- **Background**
  - **production, use, environmental distribution, and regulations**
- New PCB Rule

The PCB Universe

- 1.55 billion lb of PCBs were manufactured in the U.S.
- 50% to dielectric, hydraulic, and heat transfer fluid uses
- 50% of the PCBs in use were disposed of prior to regulation in 1978
- 700 million tons of PCB wastes
- Disposal rate at 600 million kg/yr

Background on PCB Regulations



1976 – Toxic Substances Control Act (TSCA)

1977 – Production of PCB restricted

1978 – PCB regulations under TSCA

1991 – Advanced notice of proposed rule making for PCB disposal

(June 10 1991; 56 FR 26738)

1994 – PCB rule proposed

(December 6, 1994; 59 FR 62788)

1998 – PCB rule finalized

(June 29, 1998; 63 FR 35384) Became effective August 28, 1998

Why the New PCB Rule?

- Delete outdated requirements
- New uses identified
- New studies/data on health effects
- Clarifications and/or modifications

Objectives and Scope of New Rule

- Provides (relatively) less burdensome mechanisms for obtaining EPA approval for a variety of activities
- Clarifies and/or modifies certain provisions where (some) implementation questions have arisen
- Modifies the requirements regarding the use and disposal of PCB-contaminated equipment

Objectives and Scope of New Rule (continued)

- Provides (some) flexibility in selecting disposal technologies for PCB wastes
- Addresses outstanding issues associated with the notification and manifesting of PCB wastes and changes in the operation of commercial storage facilities

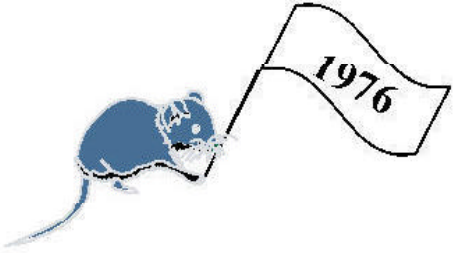
Objectives and Scope of New Rule
(continued)

- Summary: Deregulatory in Nature

Is it really true?

What Has EPA Changed in 40 CFR Part 761?

- **32 original sections** (§761.1 – §761.218)
- **15 unchanged** (including Subpart G – PCB Spill Cleanup Policy)
- **17 amended**
- **17 new**
- **Total sections under new rule = 49**



Disposal of PCBs – Final Rule

- Properties of PCBs
- Background
- **New PCB Rule**
  - **Part §750 – Procedures for Rule Making (TSCA Sec. 6)**
  - **Part §761 – PCBs Manufacturing, Processing, Distribution in Commerce and Use Prohibitions**

New PCB Rule
(40 CFR Parts 750 and 761)

PCB Home Page

http://www.epa.gov/opptintr/pcb/

PCB Federal Register Website

http://www.epa.gov/opptintr/pcb/pcbdisp.htm

or

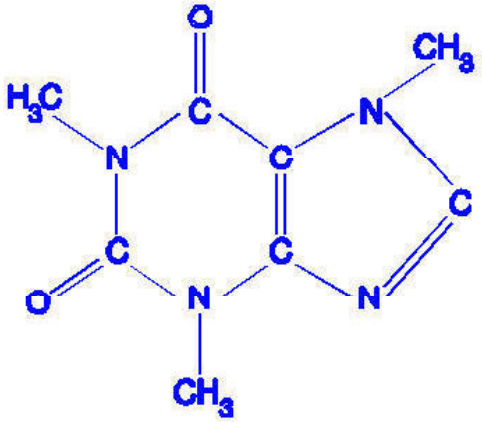
http://www.epa.gov/fedrgstr/

40 CFR Parts 750 and 761 Website

http://www.access.gpo.gov/nara/cfr/cfr-table-search.html

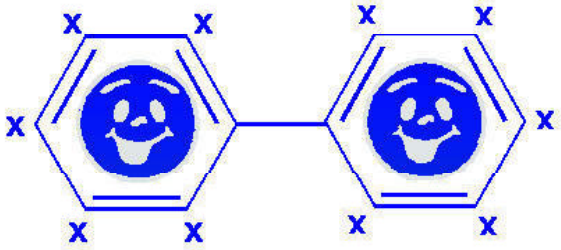
Detailed Attachments

- Fact Sheet
- New Rule (Parts 750, 761)
- Notification form
- References



Caffeine

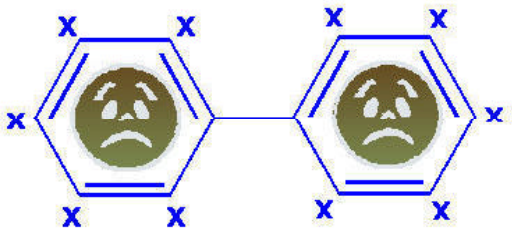
New PCB Rule
(40 CFR Parts 750 and 761)
(continued)



Topics covered:

- Definitions
- Authorizations
- Storage and Disposal – Applicability
- Waste Disposal Requirements
- PCB Remediation Waste

New PCB Rule
(40 CFR Parts 750 and 761)
(continued)



Topics not covered:

- Procedures for Rule Making (Part 750)
- Prohibitions and Exceptions (§761.20)
- Storage for Reuse (§761.35)
- Disposal of PCB Bulk Product Waste (§761.62)
- Much more...

New PCB Rule
(40 CFR Parts 750 and 761)
(continued)

- **Definitions (§761.3)**
- Authorizations
- Storage and Disposal – Applicability
- Waste Disposal Requirements
- PCB Remediation Waste

PCB-Contaminated Materials

Concentrations are

- not cleanup goals
- to define PCB equipment in use
- to indicate what's covered under TSCA

PCB-Contaminated Materials (continued)

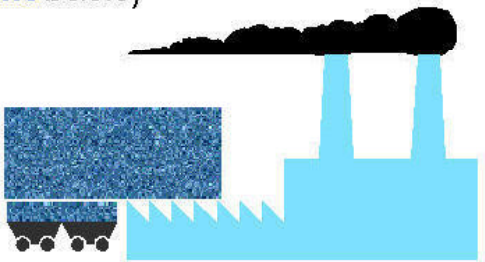
- **Liquid material**
  - Liquid: flowable material
  - ≤ 0.5% by weight non-dissolved material
- **PCB-contaminated liquids**
  - 500 ppm > [PCB] ≥ 50 ppm

PCB-Contaminated Materials
(continued)

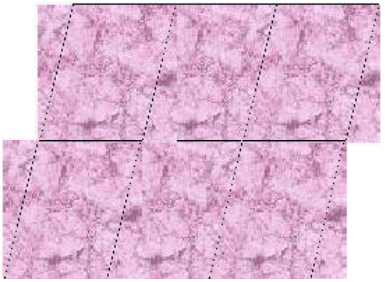
Liquid PCB Conc. (ppm)	PCB Item
≥500	PCB Transformers
<500, ≥50	PCB-Contaminated Transformers
<50	?

PCB-Contaminated Materials
(continued)

- **Non-liquid material**
  - Non-liquid: does not flow at 25°C/77°F
  - No liquids from paint filter test, i.e., a representative sample of 100 g or ml on Mesh # 60±5 at 25°C/77°F is allowed to drain for 5 min
- **PCB-contaminated non-liquids**
  - 500 ppm > [PCB] ≥ 50 ppm
  - (PCB concentrations measured on **dry-weight** basis)

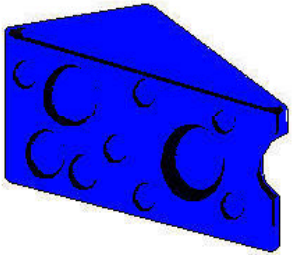


PCB-Contaminated Materials (continued)



- **Non-porous surfaces**
  - Smooth, unpainted solid surface
  - No penetration beyond immediate surface
  - Smooth metal/glass/glazed ceramics, impermeable polished building stones (marble, granite), high-density plastics (polycarbonates, melamines) that do not absorb organic solvents
- **PCB-contaminated non-porous surfaces**
  - 100 µg/100 cm^2 > [PCB-surf] > 10 µg/100 cm^2
  - (PCB surface concentration as measured by the standard wipe test)

PCB-Contaminated Materials
(continued)



- **Porous Surfaces**
  - Allow PCBs to penetrate or pass into them (e.g., paint or coating on metals, corroded metals, unglazed ceramics, low-density plastics [styrofoam], coated [varnished or painted] or uncoated wood, concrete or cement, wallboard, rubber, asphalt)
  - May fall under non-liquid materials
  - For cleaning and disposal, porous surfaces have different requirements than non-porous surfaces

PCB Remediation Waste

Date[1]	PCB Concentration[2] (ppm)		PCB Remediation Waste
	Source[3]	Material[4,5]	
Before 1/18/78	NA	≥ 50	yes
	NA	< 50	no
4/18/78 - 7/1/79	≥500	NA	yes
	< 500	> 50	yes
	< 500	< 50	no
After 7/1/79	≥ 50	NA	yes
	< 50	NA	no

NA Not applicable (i.e., any concentration)

1 Time of release, spill, or unauthorized disposal

2 These concentrations define PCB waste, but are **not** cleanup goals

3 At the time of release, spill, or unauthorized disposal

4 Concentration at present

5 Materials at any concentration are PCB remediation wastes if PCBs are from a source not authorized under TSCA. "Materials" include environmental media (soil, gravel, sediment, dredged material, aqueous decantate from sediment); sewage sludge; and building and other man-made structures (e.g., concrete/wood floors or walls).

High Occupancy vs Low Occupancy Areas*

Media	High Occupancy (e.g., daycare center, residence, school, cafeteria, control room, work station)	Low Occupancy (e.g., electrical substation, unoccupied area, non-office space in a warehouse– occupancy is transitory)
Non-porous surface	≥16.8 hrs/wk	<16.8 hrs/wk
Bulk PCB remediation waste	≥6.7 hrs/wk	<6.7 hrs/wk

*Individual not wearing dermal and respiratory protection

Different from previous residential/non-residential, restricted/non-restricted access, and high/low contact areas

New PCB Rule
(40 CFR Parts 750 and 761) (continued)

- Definitions
- **Authorizations (§761.30)**

  (p) continued use of porous surfaces
- Storage and Disposal – Applicability
- Waste Disposal Requirements
- PCB Remediation Waste

Continued Use of PCB-Contaminated Porous Surfaces ($>10\mu g/100cm^2$)

- Source removal
- Clean accessible surfaces by double wash/rinse
- 24-hour drying
- Cover all the surfaces by
  1. encapsulation (two-coatings of paint)
  2. solid barriers
- Mark with large PCB mark (M_L)

Marking Formats

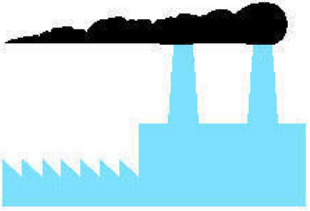
Large PCB Mark – M_L

Small PCB Mark – M_S

New PCB Rule
(40 CFR Parts 750 and 761) (continued)

- Definitions
- Authorizations
- **Subpart D – Storage and Disposal Applicability (§761.50)**
- Waste Disposal Requirements
- PCB Remediation Waste

Landfill



Incinerator

Storage and Disposal – Applicability

(a) General PCB Waste Storage and Disposal Requirements

- No open burning
- No processing of liquid PCBs to non-liquids
- Discharges to treatment works or navigable waters: < 3 µg/L (or NPDES limits) [NPDES]
- Spills/uncontrolled discharges at ≥ 50 ppm constitute PCB disposal
- May avoid sampling of non-liquid waste by assuming ≥ 500 ppm PCBs
- Should determine and comply with all other applicable Federal, state, and local laws and regulations

Storage and Disposal – Applicability (continued)

(b) PCB Waste

- **PCB liquids**
- PCB items (transformers, PCB equipment)
- **PCB remediation waste**
- PCB bulk product waste (derived from manufactured products)
- PCB household waste
- **PCB research and development (R&D) waste**
- PCB/radioactive waste

(c) Storage for Disposal

Storage and Disposal – Applicability (continued)

(d) Performance Specifications for Disposal Technologies:

- Incinerators (§761.70)
- High-efficiency boilers (§761.71)
- Scrap metal recovery ovens and smelters (§761.72)
- Chemical waste landfills (§761.75)

(e) TSCA PCB Coordinated Approval

New PCB Rule
(40 CFR Parts 750 and 761)
(continued)

- Definitions
- Authorizations
- Storage and Disposal – Applicability
- **Subpart D – Storage and Disposal: Waste Disposal Requirements (§761.60)**
- PCB Remediation Waste

Waste Disposal Requirements

(a) PCB Liquids (liquids removed from use)

PCB Concentrations (ppm)	Disposal Option
≥ 500	TSCA Incineration
< 500, ≥ 50	TSCA Incineration, High-Efficiency Boiler, or TSCA Landfill*

*liquids from incidental sources – such as condensation or leachate – associated with PCB activities or non-liquid PCB wastes

Waste Disposal Requirements
(continued)

(b) PCB Articles

- Transformers – TSCA incinerator or TSCA landfill if free liquids are removed
- Capacitors – TSCA incinerator or, after containerizing, TSCA landfill. (Small capacitors may be in municipal solid waste landfill.)
- Others – hydraulic machines, electrical equipment, natural gas pipeline systems

(c) Containers

(d) [reserved]

Waste Disposal Requirements (continued)

(e) Waivers for Alternative Technologies

- An alternative PCB destruction method should achieve the level of performance of the TSCA incinerator (§761.70), or high-efficiency boiler (§761.71)
- Approval required from EPA Regional Administrator (RA) or the Director for the National Program Chemical Division (NPCD); NPCD Director if more than 1 region
- No person may use an alternate method of destroying PCBs or PCB items prior to obtaining permission from the appropriate EPA official

(f) Treatment/Disposal Facility Operation

- 30-day advance notice to EPA

Waste Disposal Requirements
(continued)

(g)(1)(iii) Analysis of PCB Samples

Gas chromatographic (GC) methods only

- EPA Mtd. 608, "Organochlorine Pesticides and PCBs", (40 CFR Part 136, App. A)
- EPA Mtd. 8082, "PCBs by Capillary Column GC", (SW-846)
- ASTM Mtd. D-4059, "Standard Test Methods for Analysis of PCBs in Insulating Liquids by GC".

Waste Disposal Requirements (continued)

(g)(2) Requirements for R&D for PCB Disposal

The following apply, except for self-implementing requirements

- EPA may require a TSCA R&D permit to ensure no unreasonable risk or injury to health or the environment
- If a permit is required, obtain approval from EPA RA for < 500 lb, or from NPCD Director for ≥ 500 lb

Waste Disposal Requirements (continued)

(j) Self-implementing Requirements for R&D for PCB Disposal

No prior EPA approval is required, but the following apply:

- File notification and obtain EPA ID #
- EPA RA, state and local regulatory agencies notified 30 days prior to R&D activities
- Quantity: ≤ 500 gallons; concentration: ≤ 10,000 ppm
- ≤1 kg of total PCBs is disposed per year
- R&D activity should not last more than 1 year
- Storage and disposal of all wastes/residues should comply with applicable TSCA regulations; untreated material may be returned to original location; manifest appropriately
- Comply with DOT manifesting requirements (49 CFR parts 171-180)
- Comply with record keeping (§760.180)

New PCB Rule
(40 CFR Parts 750 and 761)
(continued)

- Definitions
- Authorizations
- Storage and Disposal – Applicability
- Waste Disposal Requirements
- **PCB Remediation Waste (§761.61)**
  (Site Cleanup and Disposal of Waste)

  (a) Self-Implementation

  (b) Performance-based disposal

  (c) Risk-based disposal

Self-Implementation: Applicability

Applicable to:

- Moderate-sized sites only

Not applicable to:

- Surface water or groundwater
- Marine or freshwater sediments
- Sewers/sewerage systems
- Drinking water sources/systems
- Grazing lands and vegetable gardens

Self-Implementation: Applicability (continued)

Self-implementation cleanup provisions shall not be binding upon cleanups conducted under other authorities, including but not limited to, action conducted under CERCLA (Sections 104, 106) and RCRA (Sections 3004 [u], 3004 [v], 3008 [h])

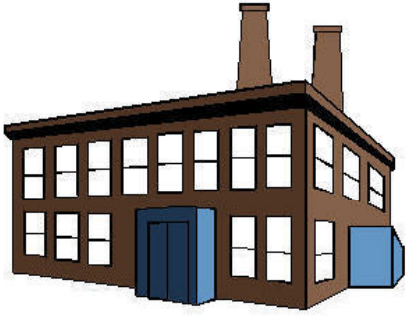
Self-Implementation: Cleanup Levels

(a) Soils in high occupancy areas

- ≤ 1 ppm, without further conditions
- > 1 ppm and ≤ 10 ppm with a cap

(b) Soils in low occupancy areas

- ≤ 25 ppm
- > 25 ppm to ≤ 50 ppm fenced and marked with a sign
- > 25 ppm and ≤ 100 ppm with a cap



Self-Implementation: Cleanup Levels (continued)

(c) Non-porous surfaces in high occupancy areas:

- ≤ 10 µg/100 cm^2

(d) Non-porous surfaces in low occupancy areas:

- ≤ 100 µg/100 cm^2

(e) Porous surfaces in high and low occupancy areas:

- Concrete – if spill is <72 hrs old, decontamination standard is ≤ 10 µg/100 cm^2
- Disposing of porous surfaces based on bulk PCB remediation waste standards
- For continuous use of porous surfaces (if surface PCB concentration >10 µg/100 cm^2) see §761.30(p)

Self-Implementation: Cleanup Levels
(continued)

(f) Water:

- < 200 ppb for non-contact waters
- < 3 ppb (or NPDES) discharge limits
- ≤ 0.5 ppb for unrestricted use

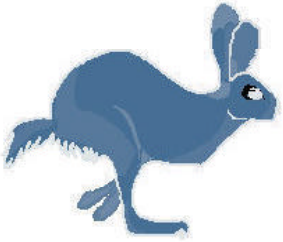
(g) EPA RA may require more stringent cleanup levels, based on proximity to potentially sensitive areas (e.g., nursing homes, playgrounds, estuaries, wetlands)

Self-Implementation: Site Characterization

- **Subpart N**
  - Methods for collecting new site characterization data
  - Assessing the sufficiency of existing site characterization data
- **Adequately characterize the site to complete *Notification and Certification***

Self-Implementation: Notification and Certification

Following site characterization and at least 30 days prior to site cleanup, notify EPA RA and appropriate state and local authorities of:



- Nature of contamination and contaminated material/media
- Location and extent of contamination
- Sampling and analysis methods
- Cleanup plan, including schedule, disposal technology, and approach (verification sampling, etc.)
- Written certification by the site owners and party cleaning up the site

Self-Implementation: Remediation/Disposal Technologies

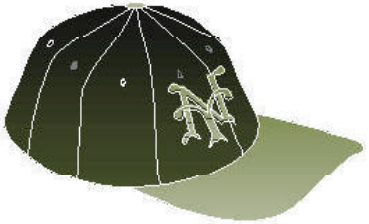
- **Incinerators, high-efficiency boilers, metal recovery ovens and smelters, chemical-waste landfills.**
- **Soil washing is acceptable, provided:**
  1. A non-chlorinated solvent is used
  2. The process occurs at ambient temperature
  3. It is not exothermic
  4. No external heat is used
  5. Secondary containment is applied
  6. Solvent disposal recovery and/or reuse complies with appropriate TSCA requirements.
- **Off-site disposal occurs at approved facilities**

Self-Implementation: Remediation/Disposal Technologies (continued)

- **Other technologies included in the proposed rule but not in the final:**
  - vitrification
  - microencapsulation

NOTE: EPA initiated development of presumptive remedies for PCB wastes in 1991; but not planning to finalize.

Self-Implementation: Cap Requirements



- **Must be of sufficient strength and integrity**
- **Specifications**
  - soils: > 10 inches thick, permeability $\leq 1 \times 10^{-7}$ cm/sec. Meet other §761.75 soil requirements.
  - concrete or asphalt: ≥ 6 inches
- **Cover material contamination ≤ 1 ppm PCB**
- **Meet closure and post closure requirements [§264.310(a)]**
- **Repairs within 72 hours**

Self-Implementation: Deed Restrictions

(Applicable to caps, fences, low occupancy areas)

- **Maintenance by the site owner**
- **Within 60 days, record in the deed where normally examined during a title search** (include contamination/cleanup levels, existence of a cap and/or fence, applicable regulations)
- **If cleaned up later, remove deed notice after 30 days**

Performance-Based Disposal

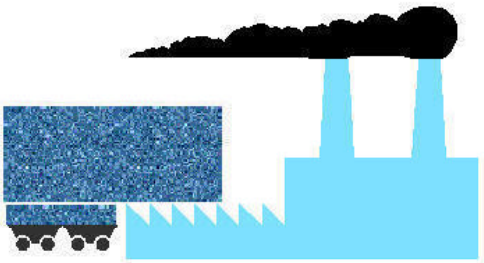
Liquid PCB remediation waste:

- Incineration or high-efficiency boiler
- TSCA landfill for liquids from incidental sources
- Other approved method
- Decontaminate per §761.79

Performance-Based Disposal
(continued)

Non-liquid PCB remediation waste:

- TSCA-approved incinerator
- Approved alternate method [§761.60(e)]
- TSCA landfill
- Facility with coordinated approval (§761.77)
- Decontaminate per §761.79



Performance-Based Disposal
(continued)

Dredge material containing PCBs <50 ppm

- Manage per Clean Water Act (Section 404) and applicable regulations of U.S. Army Corps of Engineers

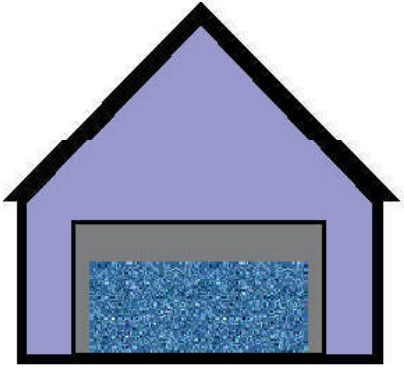
Risk-Based Disposal Approval

For sampling, cleanup, and disposal that do not follow Self-Implementation or Performance-Based Disposal

- Apply to EPA RA with information given in §761.61 (a)(3)
- EPA may require additional information (e.g., human health and/or eco-risk assessment)
- No time-frame specified
- No person may conduct cleanup activities without EPA's approval

PCB Waste Storage for Disposal

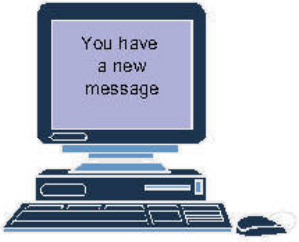
- Within 1 year from the decision for disposal
- One-year extension under specified conditions
- Additional extensions may be granted
- Increased storage times may be granted for approved treatment/storage/disposal facilities



Points of Contact

Battelle
505 King Avenue
Columbus, OH 43201

phone: (614) 424-4698

Naval Facilities Engineering Service Center
1100 23rd Avenue
Port Hueneme, CA 93043-4370

phone: (805)982-4855