

Presumptive Remedies: Technology Selection Guide for Wood Treater Sites

Office of Emergency and Remedial Response
Emergency Response Division 5202G

Quick Reference Fact Sheet

Since the enactment of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) in 1980, the Superfund remedial and removal programs have found that certain site categories have similar characteristics, such as: types of contaminants present; types of disposal practices; or how environmental media are affected. Based on information acquired from evaluating and cleaning up many of these sites, Superfund is undertaking an initiative to develop presumptive remedies that are appropriate for specific types of sites and that are designed to accelerate the Superfund cleanup process. The objective of the presumptive remedies initiative is to draw upon past experiences to streamline site investigations and the remedy selection process in accordance with the Superfund Accelerated Cleanup Model (SACM). The Agency has developed presumptions that particular technologies are appropriate for certain types of sites by evaluating technologies that have been consistently selected and successfully used for past sites.

The Agency is developing a Generic Presumptive Remedies fact sheet which will outline and address the common issues (e.g., use of risk assessment, innovative technologies, how to rebut the presumptive remedy, etc.) anticipated with the use of a presumptive remedy at any site. In addition, the Agency is developing guidance on presumptive remedies for soils contaminated by volatile organic compounds, municipal landfills, polychlorinated biphenols, grain storage, coal gasification sites, and contaminated ground water.

Information on technology performance for wood treater sites is presented in this **Technology Selection Guide**; it will be supplemented by additional analyses of previous remedy selection decisions and remedy performance. This additional analyses will be developed into a **Presumptive Remedy Guide**. This document is intended for use by a decision-making team experienced with wood treater sites.

BACKGROUND

Abandoned wood treater sites typically contain the following contaminants either alone or in combination with each other or with total petroleum hydrocarbon (TPH) carrier oils: creosote (mainly, polynuclear aromatic hydrocarbons (PAHs)); pentachlorophenol (PCP); and chromated copper arsenate (CCA). These contaminants may be found in pure form (product), or in sludge, soil, sediments, surface waters, or ground water. Light Non-Aqueous Phase Liquids (LNAPLs) and Dense NAPLs (DNAPLs) may also be present in surface or ground water.

Removal and remedial program experience at full-scale projects indicates that there are some demonstrated treatment technologies capable of achieving defined clean-up goals at wood treater sites. These technologies

are presented in this guide; in addition, other technologies, with limited performance data, are also presented here.

IMPLEMENTATION

Choosing among remedies requires care to match treatment requirements with site specific conditions, but the process can be streamlined within the scope of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) remedy selection requirements. A focused site evaluation by experienced personnel with the use of the guide can greatly limit the feasible treatment options, identify early actions, and expedite the clean-up process. This guide provides a selection procedure outline (box below) and practical considerations for the facilitation of remedy selection. In addition, three tables are included in the guide: Table I, Technologies for Treatment of Sludge, Soil, and Sediment; Table II, Technologies for Treatment of Surface Water and Ground Water; and Table III, Information Needs and Process Limitations. Many of the tasks outlined in this guide can and should be conducted simultaneously to accelerate the process

and to minimize cost; however, a sequential process may be necessary at times.

WOOD TREATER TECHNOLOGY
SELECTION PROCEDURE OUTLINE

Site Characterization

- A. Identify Contaminant
 - 1. Type (i.e., CCA, PCP, creosote, or TPH)
 - 2. Alone or mixed (e.g., PCP/creosote/CCA)
- B. Establish Site Screening Criteria¹ Based on Actual or Anticipated Land and Water Uses
- C. Identify Media and Areas Needing Treatment:
 - 1. Product (drums, tanks, or recoverable NAPLs)
 - 2. Sludge (drums, tanks, or open or buried lagoons)
 - 3. Soil and sediments from:
 - a. process areas
 - b. drip areas and storage areas
 - c. lagoon or drainage areas (on-site/off-site)
 - 4. Surface Water
 - a. ponds/lagoons
 - b. runoff or drainage pathways
 - 5. Ground Water
- D. Identify Possible Treatment Options (Tables I and II) (include treatability studies for non-demonstrated technologies)
- E. Determine Extent, Volume, and Level of Contamination in Each Medium and Area of Concern
- F. Characterize Broadly the Physical/Chemical Nature of Each Treatment Medium in View of the Possible Treatments (Table III Identifies Additional Information Needs):
 - 1. Solids - Particle Size Distribution/ pH/Total Organic Carbon (TOC)/Cation Exchange Capacity/Moisture
 - 2. Liquids - Phases/pH/TOC
 - 3. Sludge - TOC/Moisture/Pumping Characteristics
- G. Select Final Clean-up Goals and Treatment Levels¹ Considering Anticipated Land and Water Uses and the Removal Efficiencies Required to Achieve Those Levels

WOOD TREATER TECHNOLOGY
SELECTION PROCEDURE OUTLINE
(continued)

Treatment Selection

- A. Confirm the Volumes, Matrix Homogeneity and Consistency, and Contaminant Concentrations
- B. Evaluate On/Off-Site and Pre-Treatment Options
- C. Evaluate Capping/Containment Option
- D. Assess Excavation, Segregation, and Stockpiling
- E. Select Candidate Treatment Options (Tables I and II)
- F. Evaluate Treatment Limitations and Information Needs Using Table III
- G. Select Final Treatments and Perform Site Specific Treatability Studies to Obtain Design Data for Procurement Specification

¹Site Screening Criteria are operational indicators, such as action levels resulting from an exposure risk assessment for a specific land use; they trigger the need for clean-up. Clean-up Goals and Treatment Levels reflect projected exposures for particular land uses; these levels describe the suitability of a resource for its intended use.

PRACTICAL CONSIDERATIONS FOR
FACILITATING TECHNOLOGY SELECTION

- 1. If the product is still in original containers it should be returned to the manufacturer. Reuse of material (i.e., process liquids) and relocation of equipment to other permitted facilities should be considered. Phase separation should be conducted; water and emulsified product could be treated on site. LNAPLs and DNAPLs may or may not be recyclable depending on the purity of the recovered phase.
- 2. Where any of the principal wood treating chemicals (creosote, PCP, or CCA) can be recovered in high enough concentrations to warrant reuse in any process, recycling becomes the preferred technology. The recognized Waste Exchanges are listed in Appendix A. The alternative to reuse or recycling is to treat the material as waste along with other contaminated liquids or solids.

3. If the product, (e.g., PCP), is in storage tanks, then it should be analyzed for cross contaminants such as dioxins/furans. Total pumpable and non-pumpable sludge in tanks and drums should also be determined.
4. Site characterization should proceed as a single, multi-media sampling event whenever possible. Field screening methods should be integrated into the sampling and analysis plan in order to accelerate information gathering. Data quality objectives must reflect the ultimate use of the results, but all samples taken during a single event may not require the same level of data quality.
5. Site preparation and bulk material handling needs require evaluation wherever soil treatment is being considered. Pretreatment renders a material suitable as feed for a treatment process. The technology selection should be evaluated for consistency with the overall remedy for the site. Site preparation and pretreatment activities include but are not limited to the following:
 - A. Site Stabilization
 1. Fencing and security
 2. Capture and treatment of runoff
 3. Containment of leaking vessels
 4. Use of liners and covers
 5. Capping and containment
 6. Evaluation of on-site pretreatment for off-site disposal
 - B. Material Handling, Waste Segregation, and Pretreatment
 1. Surface material removal (poles, tanks, buildings, product, etc.)
 2. Excavation & stockpiling
 3. Sizing
 - a. Screening of inert and oversized materials
 - b. Particle fractionation or hydrosieving
 - c. Debris handling
 4. Chemical pretreatment or Sterilization
6. In general, other than in processing areas and storage tanks, the highest concentrations of contaminants may be found in surface and buried waste lagoons. Contamination can migrate vertically from these lagoons to significant depths. Hydrogeologic studies may be necessary to discern such contamination and additional technologies for remediation may have to be considered.
7. Surface lagoons, soil areas, drip pads, and sediments should be gridded and sampled to determine the

horizontal and vertical extent of contamination. Soil and sludge characterization relevant to treatment selection should reflect the information needs detailed in Table III.

8. Excavation of contaminated soil should generally not be done until the final treatment technology has been selected, except where it is deemed necessary to reduce an imminent hazard or to control migration. Where possible, excavated organic and inorganic contaminants, and high and low concentration materials should be staged separately.
9. It is usually too expensive to ship quantities of greater than 5,000 cubic yards of contaminated soil off-site for disposal. Pretreatment of soil and water may be required prior to shipment or discharge to another treatment facility.
10. Circumstances may arise where capping and containment of material with relatively low toxicity and mobility is an appropriate remedy. Such instances will require careful evaluation.
11. Representative sampling and analysis for verification of expected treatment efficiencies should be consistent with accepted Superfund quality assurance/quality control guidance.
12. Health and safety considerations enter into the technology selection process as described in the Health and Safety Plan (HASP). Air monitoring to support the HASP includes both on-site and off-site components.

TABLE I

Technologies for Treatment of Sludge, Soil, and Sediment

Contaminant	Treatment Technologies	Treatability (RREL Database) ³	Treatment Trains ⁴
CCA	Immobilization ¹	80 - 90% TCLP (B,P,F)	Soil Washing/ Immob ²
PCP	Incineration ¹ Other Thermal Treatment ² Biotreatment ² Dechlorination ²	90 - 99% (B,P,F) --- --- ---	--- Soil Washing/Bio ² --- ---
Creosote	Incineration ¹ Other Thermal Treatment ² Biotreatment ²	90 - 99% (B,P,F) --- ---	--- Soil Washing/Bio ²
PCP + Creosote	Incineration ¹ Other Thermal Treatment ² Biotreatment ²	95 - 99% (B,P,F) --- ---	--- Soil Washing/Bio ²
Creosote + CCA	NA	4	Incin/Immob Ash ¹ Soil Washing/Bio/ Immob ²
PCP + CCA	NA	4	Incin/Immob/Ash ¹ Soil Washing/Bio/ Immob ² Dechlorin/Immob ²

1. This technology recommendation assumes that the specified treatment efficiency can be achieved for a given site; it assumes that no site-specific constraints exist.
2. These other technologies may warrant site-specific evaluations, RI/FSSs, focused feasibility studies (FFSs), or engineering evaluations/cost analyses (EE/CAs) because they lack full-scale performance data. Site-specific conditions also may favor a subset of the major technology. Bench-scale and/or pilot studies may be necessary to refine the selection of the most appropriate specific treatment method.
3. Performance data are from the Risk Reduction Engineering Laboratory (RREL). The database is derived from bench scale (B), pilot scale (P), or full scale (F) demonstration projects. Dashes indicate insufficient data. The RREL is updated on a regular basis and is available through the Alternative Treatment Technology Information Center (ATTIC).
4. Performance efficiency for treatment trains is a function of contaminant concentration, matrix and volume. It can generally be presumed that the performance of treatment trains will equal or exceed that of the individual treatment technologies.

TABLE II

Technologies for Treatment of Surface Water and Ground Water

Contaminant	Treatment Technologies	Treatability (RREL Database)*	Treatment Trains
CCA	Precipitation Reverse Osmosis Ion Exchange	97 - 99% (B,P,F) 99% (P) ---	Precip/Immob Precip/RO/Immob Precip/Ion Ex/Immob
PCP	Carbon Treatment Biotreatment Oxidation	95 - 99% (P) 99% (B,P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
Creosote	Carbon Treatment Biotreatment Oxidation	82 - 99% (P,F) 99% (P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
Creosote + PCP	Carbon Treatment Biotreatment Oxidation	82 - 99% (P,F) 99% (B,P,F) 99% (B,P)	Phase Sep/Carb Phase Sep/Bio Phase Sep/Oxidation
Creosote + CCA	Carbon Treatment Oxidation Precipitation	---	Phase Sep/Treat Organic/Treat Metals
PCP + CCA	Carbon Treatment Oxidation Precipitation	---	Phase Sep/Treat Organic/Treat Metals

KEY: Treat Organic = Carbon Treatment or Chemical (O₃, ClO₂, H₂O₂) or Ultraviolet Oxidation

Treat Metals = Reverse Osmosis or Ion Exchange or Chemical Precipitation and Immobilization of Residues

* Performance data from the RREL (Risk Reduction Engineering Laboratory). Database is derived from bench scale (B), pilot scale (P), or full scale (F) demonstration projects. Dashes in the table indicate insufficient data.

TABLE III

Information Needs and Process Limitations

Treatment Technology	Information Needs	Process Constraints and Limitations
Thermal Treatment - Incineration	<ul style="list-style-type: none"> i) BTU value ii) Volatile metals concs. iii) Alkali metals (Na,K) concs. iv) Elemental analysis (N,S,P,Cl,etc.) v) Moisture content vi) Pumping chars. and viscosity 	<ul style="list-style-type: none"> i) High moisture content ii) High alkali metals soil iii) Elevated levels of mercury, organic phosphorus iv) Volume <3000-5000 cu. yds.
Thermal Treatment - Desorption	<ul style="list-style-type: none"> i) Melting and boiling points ii) Volatile metals concs. iii) Flash points iv) Elemental analysis (N,S,P,Cl,etc.) v) Vapor pressures vi) Optimum desorption and destruction temperatures vii) Moisture content 	<ul style="list-style-type: none"> i) High boiling points over 500°F (260°C) ii) Elevated levels of halogenated organics iii) Presence of mercury iv) Corrosivity
Immobilization	<ul style="list-style-type: none"> i) TOC (oils, TPH, humic material, etc.) ii) Grain size distribution iii) Soluble salts iv) Cation Exchange Capacity (CEC) 	<ul style="list-style-type: none"> i) TPH >1% ii) Humic matter <20%
Biotreatment - In-situ	<ul style="list-style-type: none"> i) Indigenous microorganisms ii) Degradation rates iii) Solubility iv) Nutrient requirements and existing conditions of pH, temp., oxygen, moisture, etc. v) Depth to ground water and thickness of contaminated zone vi) Permeability of the soil 	<ul style="list-style-type: none"> i) Toxic metals, chlorinated organics, pH outside 4.5-9, limiting growth factors ii) Ambient temp. below 15°C iii) Short time/growth season iv) Rainfall/evapotranspiration rate/percolation rate ratios too high or too low v) Limiting initial and final concs.
Biotreatment - Ex-situ	<ul style="list-style-type: none"> i) Indigenous microorganisms ii) Degradation rates iii) Solubility iv) Nutrient requirements and existing conditions of pH, temp., oxygen, moisture, etc. 	<ul style="list-style-type: none"> i) Lack of indigenous microbes ii) Toxic metals, highly chlorinated organics, pH outside 4.5-9, limiting growth factors iii) See also "In-situ", above
Base-Catalyzed Dechlorination	<ul style="list-style-type: none"> i) Heavy metals conc. ii) Reactivity at high pH iii) Elemental analysis (N,P,S,Cl, etc.) iv) Redox potential v) TOC, humic material and clay content 	<ul style="list-style-type: none"> i) Heavy metals and excess soil moisture (>20%) may require special treatment ii) High organic and clay content may extend reaction time
Soil Washing	<ul style="list-style-type: none"> i) Solubilities and partition coefficients ii) Grain size distribution iii) TOC and humic material content iv) Cation Exchange Capacity (CEC) 	<ul style="list-style-type: none"> i) High hydrophobic TOC and humic material content inhibits detergency ii) >30% silt and clay particles cancels out volume reduction benefit of process iii) Surfactant solutions may cause operating problems

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Removal Program Representative Sampling Guidance, Volume 4: Hazardous Waste - Interim Final OSWER Directive Document in Preparation by USEPA, OERR, June 1992

Innovative Treatment Technologies: Overview and Guide to Information Sources, EPA/540/9-91/002, USEPA OSWER, TIO, October 1991

APPENDIX A - U.S. Waste Exchanges

CALIFORNIA WASTE EXCHANGE

Robert McCormick
Department of Health Services
Toxic Substances Control Division
400 P Street
Sacramento, CA 95812
(916) 324-1807

INDIANA WASTE EXCHANGE

Environmental Quality Control
1220 Waterway Boulevard
P.O. Box 1220
Indianapolis, IN 46206
(317) 232-8188

INDUSTRIAL MATERIAL EXCHANGE SERVICE

Diane Shockey
2200 Churchill Road, #31
Springfield, IL 62794-9276
(217) 782-0450
FAX: (217) 782-9142

INDUSTRIAL MATERIALS EXCHANGE

Bill Lawrence
172 20th Avenue
Seattle, WA 98122
(206) 296-4899
FAX: (206) 296-0188

PACIFIC MATERIALS EXCHANGE

Bob Smee
1522 No. Washington St.
Suite 202
Spokane, WA 99205
(509) 325-0551
FAX: (509) 325-2086

NATIONAL WASTE EXCHANGE NETWORK

1-800-858-6625

RENEW

Hope Castillo
Texas Water Commission
P.O. Box 13087
Austin, TX 78711
(512) 463-7773
FAX: (512) 463-8317

INDUSTRIAL WASTE INFORMATION EXCHANGE

William E. Payne
New Jersey Chamber of Commerce
5 Commerce Street
Newark, NJ 07102
(201) 623-7070

MONTANA INDUSTRIAL WASTE EXCHANGE

Don Ingles
Montana Chamber of Commerce
P.O. Box 1730
Helena, MT 59624
(406) 442-2405

NORTHEAST INDUSTRIAL WASTE EXCHANGE

Lewis M. Cutler
90 Presidential Plaza
Suite 122
Syracuse, NY 13202
(315) 422-6572
FAX: (315) 422-9051

SOUTHEAST WASTE EXCHANGE

Maxi May
Urban Institute
Dept. of Civil Engineering
Univ. of North Carolina
Charlotte, NC 28223
(704) 547-2307

SOUTHERN WASTE INFORMATION EXCHANGE

Gene Jones
P.O. Box 960
Tallahassee, FL 32313
(904) 644-5516
FAX: (904) 574-6704