AN ADVANSTAR PUBLICATION

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HAZMAT WORLD

The Magazine for Environmental Management

March 1993

Hazardous waste identification:

A guide to changing regulations

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Table 1. Definitions of solid and hazardous waste

Materials that are not solid wastes	Solid wastes that are not hazardous wastes
• Domestic sewage	• Household waste
• Industrial wastewater discharges subject to CWA	• Agricultural wastes returned to the soil as fertilizer
• Irrigation return flows	• Mining overburden returned to the mine site
• Nuclear source or byproduct material	• Fly ash, bottom ash, slag waste and flue-gas emission control waste from fossil fuel combustion
• *In-situ* mining materials not removed from the ground	• Drilling fluids, produced waters and wastes from energy exploration
• Reclaimed pulping liquors	• Trivalent chrome waste that fails the toxicity characteristic test only because of chromium
• Spent sulfuric acid used to produce virgin sulfuric acid	• Solid waste from extraction and processing of ores and minerals
• Reclaimed secondary materials	• Cement-kiln dust waste
• Spent wood-preserving materials	• Discarded wood products that fail the toxicity characteristic only because of the presence of arsenic
• Wastes from coke byproducts processes that are hazardous only because they exhibit the toxicity characteristic	• Petroleum-contaminated media and debris that exhibit certain toxicity characteristics
• Non-wastewater splash-condenser dross residue from treatment of K061	• Injected groundwater with certain toxicity characteristics and is used in hydrocarbon recovery
	• Reclaimed used CFC refrigerants
	(13-14; reserved)
	• Non-terne-plated used-oil filters that have been hot-drained

The Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and amended in 1984 by the Hazardous and Solid Waste Amendments (HSWA). Since then, federal regulations have generated a profusion of terms to identify and describe hazardous wastes. Regulations that define and govern management of hazardous wastes (Figure 1) are codified in Title 40 of the Code of Federal Regulations, "Protection of the environment" (40 CFR). Title 40 regulations are divided into chapters, subchapters and parts. To be defined as hazardous, a waste must satisfy the definition of solid waste (*40 CFR 261.2*), any discarded material not specifically excluded from regulation or granted a regulatory variance by the EPA Administrator. Some wastes and other materials have been identified as non-hazardous and are listed in *40 CFR 261.4(a)* and *261.4(b)*.

Certain wastes that satisfy the definition of hazardous waste nevertheless are excluded from regulation as hazardous if they meet specific criteria (Table 1). Definitions and criteria for their exclusion are found in *40 CFR 261.4(c)-(f)* and *40 CFR 261.5*.

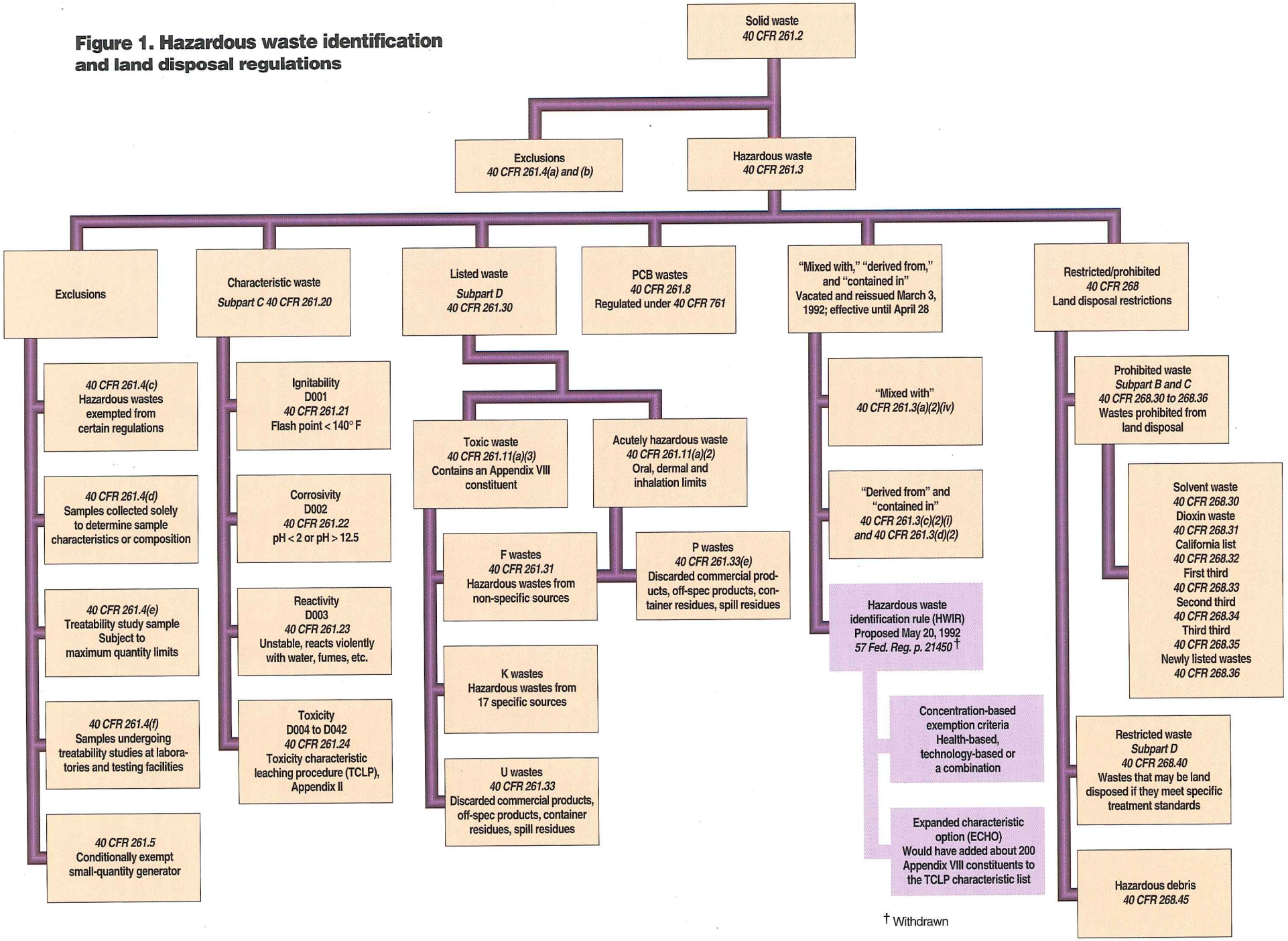
"Characteristic" wastes are so called because they exhibit one or more characteristics of ignitability, corrosivity, reactivity or toxicity. Ignitable wastes may be liquid (less than 24 percent alcohol by volume with a flashpoint less than 60 degrees Celsius), solid (capable of causing fire by friction, absorption of moisture or spontaneous chemical change), or a compressed gas or oxidizer. These wastes are identified by the EPA hazardous waste designation D001.

Corrosive wastes are characterized by a pH of less than 2 or more than 12.5, or are liquids that corrode steel at a rate above 6.35 millimeters per year. Corrosive wastes are identified by EPA as D002 wastes.

Reactive wastes are unstable and react violently with water, generating toxic gases and fumes. They also may be explosive or capable of detonation. This category, designated D003, includes cyanide and sulfide-bearing wastes that can generate toxic fumes in non-corrosive conditions.

Toxicity is determined by analyzing leachate from the waste and comparing conta-

Figure 1. Hazardous waste identification and land disposal regulations



† Withdrawn

Table 2. 1992 Hazardous waste and land disposal regulations

Date	Title	Federal Register †	Action
Jan. 9, 1992	Land disposal restrictions for newly listed wastes and contaminated debris; proposed rules	***57 Fed. Reg. 958***	Six categories of debris (concentration- or technology-based treatment); 18 treatment technologies in three groups; 20 newly listed wastes; and new "containment building"
March 3, 1992	Hazardous waste management system; definition of hazardous waste; mixture and derived-from rules; interim final rule	***57 Fed. Reg. 7628***	Reissue of *40 CFR 261.3* on an interim basis
March 3, 1992	Hazardous waste management system; definition of hazardous waste; mixture and derived-from rules; proposed rule	***57 Fed. Reg. 7636***	Solicits comments on *40 CFR 261.3*; invites comment on concentration-based exemption
May 15, 1992	Hazardous waste management system; land disposal restrictions	***57 Fed. Reg. 20766***	One-year extension of regulations' effective date to hazardous-debris managers
May 20, 1992	Hazardous waste management system; identification and listing of hazardous waste; proposed rule	***57 Fed. Reg. 21450***	Hazardous waste identification rule; CBEC, ECHO alternatives; "continuum of control" approach; exemption constituent list
May 20, 1992	Hazardous waste management system; identification and listing of hazardous waste; used oil; final rule	***57 Fed. Reg. 21524***	Excludes from hazardous waste regulation used oil filters that have been gravity hot-drained
June 22, 1992	Hazardous waste management system; identification of hazardous waste; exclusions; final rule	***57 Fed. Reg. 27880***	Excludes from hazardous waste regulation coke by-product residues that are recycled
June 26, 1992	Hazardous waste management system; land disposal regulations	***57 Fed. Reg. 28628***	D008 lead materials storage rule deadline extended to May 8, 1993
July 1, 1992	Hazardous waste management system; general; identification and listing of hazardous waste; used oil	***57 Fed. Reg. 29220***	Corrections of typographic errors in rule published May 20, 1992
July 10, 1992	Hazardous waste management system; identification and listing of hazardous waste; toxicity characteristic; corrections	***57 Fed. Reg. 30657***	Correction to toxicity characteristic rules; amends *40 CFR 261.4(b)(9)* to exclude from hazardous waste regulation arsenical-treated wood, returning it to its status under the EP-toxicity rule.
Aug. 11, 1992	Land disposal restrictions "no migration" variances; proposed rule	***57 Fed. Reg. 35940***	Requires a petition for disposal of restricted hazardous waste demonstrating that there will be no migration of hazardous constituents in hazardous concentrations beyond the boundary of a disposal unit
Aug. 14, 1992	Deferral of petroleum-UST-contaminated media and debris from RCRA hazardous waste requirements; notice of data availability	***57 Fed. Reg. 36866***	Notification of availability of EPA studies, "TC study of petroleum-contaminated media" and "The impacts of removing the TCLP deferral for petroleum-contaminated media at underground storage tank sites"; requests public comment on permanently exempting UST petroleum-contaminated media and debris from the TC Rule.
Aug. 18, 1992	Hazardous waste; land disposal restrictions for newly listed wastes and hazardous debris	***57 Fed. Reg. 37194***	Requires hazardous debris to be treated before land disposal using one of 17 extraction, destruction or immobilization technologies; defines treatment technologies and standards for 20 newly listed wastes; revises treatment standards for F001 through F005 wastes; finalizes alternate treatment standards for F006 and K062 wastes; establishes a new waste management unit known as a "containment building."
Aug. 18, 1992	Identification and listing of hazardous waste; CERCLA hazardous designation; reportable quantity adjustment; coke byproducts waste	***57 Fed. Reg. 37283***	Adds seven hazardous waste listings to the coking subgroup of 40 *CFR 261.32* (K141-K145, K147 and K148); excludes from the definition of solid waste nine K-wastes that are hazardous only because of TC, if they are recycled.
Aug. 25, 1992	Burning of hazardous waste in boilers and industrial furnaces; final rule	***57 Fed. Reg. 38558***	Technical amendments and corrections to the final rule for boiler and industrial furnaces burning hazardous waste published Feb. 21, 1991 (*57 Fed. Reg. 7134*).

† Citations indicate first page of document

Date	Title	Federal Register †	Action
Aug. 28, 1992	Land disposal restrictions for newly listed wastes and hazardous debris	***57 Fed. Reg. 39275***	Corrects effective date of Aug. 18, 1992, rule from Nov. 16, 1992, to Nov. 19, 1992
Sept. 9, 1992	Land disposal restrictions for newly listed wastes and hazardous debris	***57 Fed. Reg. 41173***	Corrects effective date of Aug. 28, 1992, correction from Nov. 19, 1992, to Nov. 9, 1992
Sept. 10, 1992	Hazardous waste management system; identification and listing of hazardous waste; recycled used oil management system; final rule	***57 Fed. Reg. 41566***	Establishes management standards for storage, transport and management by processors and marketers; bans use of used oil as dust suppressant and storage in surface impoundments, and specifies furnaces and boilers that may burn used oil for energy recovery.
Sept. 28, 1992	Land disposal restrictions "no migration" variance; proposed rule	***57 Fed. Reg. 44545***	Extends public comment period for the proposed rule published Aug. 11, 1992, to Oct 23, 1992
Oct. 15, 1992	Hazardous waste management system; identification and listing of hazardous waste and CERCLA hazardous substance designation; reportable quantity adjustment, chlorinated toluenes production wastes; final rule	***57 Fed. Reg. 47376***	Adds three chlorinated toluenes (K149, K150 and K151) to list of hazardous wastes; effective April 15, 1993
Oct. 20, 1992	Hazardous waste management system; land disposal restrictions; approval of interim final hazardous soil case-by-case capacity variance	***57 Fed. Reg. 47772***	Approves effective date of an interim final case-by-case extension of the land disposal restrictions to May 8, 1993, for third-third hazardous soils whose BDAT is incineration, retorting, vitrification or handling with mixed-waste soils
Oct. 22, 1992	Corrective action for solid waste management units (SWMUs) at hazardous waste management facilities; notice of availability of data	***57 Fed. Reg. 48195***	Announces availability of data for developing final rules for corrective action management units (CAMUs) proposed on July 27, 1990 (*55 Fed. Reg. 30798*)
Oct. 30, 1992	Hazardous waste management system; definition of hazardous waste; mixture and "derived-from" rules; final rule	***57 Fed. Reg. 49278***	Removes the April 28, 1993, expiration date from the March 3, 1992, reinstatement of the mixture and derived-from rules
Oct. 30, 1992	Hazardous waste management system; definition of hazardous waste; mixture and derived-from rules; notice of withdrawal of proposed rule	***57 Fed. Reg. 49280***	Withdraws proposed regulation of May 20, 1992, to include a new hazardous waste identification rule (HWIR); description of CBEC and ECHO options
Nov. 18, 1992	Hazardous waste management; liquids in landfills; final rule	***57 Fed. Reg. 54452***	Final rule on landfill disposal of containerized liquids mixed with sorbents; adopts the paint filter test, lists classes of non-biodegradable sorbents, identifies two tests for non-biodegradability and requires use of non-biodegradable sorbents in lab packs
Nov. 24, 1992	Hazardous waste management system; identification and listing of hazardous waste; toxicity characteristic revision; final rule	***57 Fed. Reg. 55114***	Removes the quality assessment requirement from Method 1311 for correcting measured TCLP values for analytical bias
Dec. 18, 1992	Extension of states' interim authorization option to implement HSWA regulations; interim final rule	***57 Fed. Reg. 60129***	Extends until Jan. 1, 2003, availability of interim authorization for states to implement HSWA requirements
Dec. 24, 1992	Wood preserving; identification and listing of hazardous waste; standards and interim status standards for owners and operators TSDFs; final rule	***57 Fed. Reg. 61492***	Modifies technical standards for drip pads that collect preservative drippage from treated wood; modifies listings for F032, F034 and F035 wastes from wood preserving
Dec. 24, 1992	Suspension of the toxicity characteristic rule for non-UST petroleum product-contaminated media and debris; proposed rule	***57 Fed. Reg. 61542***	Suspends the toxicity characteristic rule for D018-D043 wastes three years for environmental media and debris contaminated by petroleum products released from sources other than RCRA Subtitle I-regulated USTs pending further studies and exploration by EPA of regulatory modifications unique to remediating petroleum-release contamination

† Citations indicate first page of document

Compliance basics

minant concentration levels to regulatory limits. The analytic procedure used for this was adopted in September 1990 and is named the toxicity characteristic leaching procedure (TCLP). It is described in *40 CFR 261, Appendix II.* The procedure formerly used to determine toxicity was the extraction procedure for toxicity (EP-toxicity test procedure). EPA's adoption of TCLP was accompanied by the addition of 26 contaminants for which maximum concentration levels were set. The 40 contaminants having specified maximum concentrations are identified by EPA hazardous waste numbers D004 through D043.

A solid waste is a hazardous waste if it is listed in Chapter I, Subpart D, of *40 CFR.* Such so-called "listed wastes" are assigned an EPA hazardous waste number, which can be found in *40 CFR 261, Appendix VIII.* Solid wastes are listed only if they are toxic or acutely hazardous. Listed toxic wastes exhibit a characteristic of hazardous waste as determined by TCLP. Acutely hazardous wastes are listed, because they are fatal to humans in low doses or, in the absence of human toxicity data, have toxicological indices corresponding to:

Oral LD_{50} (rat) — less than 50 milligrams per kilogram body weight;

Inhalation LC_{50} (rat) — less than 2 milligrams per kilogram body weight; or

Dermal LD_{50} (rabbit) — less than 200 milligrams per kilogram body weight.

(LD_{50}, or "lethal dose 50," refers to a single dose of a substance, expressed as milligrams per kilogram of body weight, that would cause the death of half an animal population exposed by any means other than inhalation. LC_{50}, or "lethal concentration 50," refers to concentration of a substance in air that would cause the death of half an animal population as a result of a single exposure during a specified time period, typically one hour.)[1]

Toxic and acutely hazardous wastes are further grouped according to their sources. Toxic wastes are listed in groups designated as "F", "K" and "U." Acutely hazardous wastes are listed in groups "P" and "F."

Wastes listed in group F are toxic or acutely hazardous wastes from non-specific sources. Toxic wastes deriving from 17 specific sources are in group K. The source of each K-listed waste is a specific industrial process that produces a unique wastestream. U-listed wastes are those deriving from commercial chemical products, the manufacture of chemical intermediates or off-specification chemical products.

Acutely hazardous wastes from commercial chemical products, the manufacture of chemical intermediates or off-specification chemical products carry the designation P.

PCB wastes are regulated under *40 CFR 761(D).* PCB-containing fluids and equipment regulated under this section of the code and that are hazardous only because they fail the TCLP are exempt from regulation under *40 CFR 261-265*, as well as *40 CFR 268* (the land disposal restrictions, or land bans) and *40 CFR 270* (EPA-administered permit programs).

"Mixed with," "derived from" and "contained in" are terms used to describe contaminated media and process wastes consisting of mixtures of solid and listed wastes, where the mixture is hazardous because it exhibits a characteristic of toxicity. The rule for mixed wastes is part of the definition of hazardous waste and is described in detail in *40 CFR 261.3(a)(2)(iv).* The derived-from and contained-in rules are found in *40 CFR 261.3(c)(2)(i)* and *40 CFR 261.3(d)(2).* These rules require media contaminated with hazardous waste to be managed as a hazardous waste until they no longer contain the waste, exhibit the characteristic of the waste, or the waste is delisted.

The portion of federal environmental regulations containing these rules was challenged in *Shell Oil vs. EPA* [950 F.2d 741, D.C. Cir., 1991)]. The court found that the Agency did not provide the required public comment period before promulgating the regulations. As a result, the rules were vacated, then reissued on an interim basis in March 1992.

Following these actions, EPA issued a notice of proposed rulemaking to solicit comment on a Hazardous Waste Identification Rule, which presented two alternatives (***HW*** "Feature Report," October). One alternative, use of concentration-based exemption criteria (CBEC), would have set health- or technology-based threshold levels for exempting waste from regulation under the current system. CBEC would have used existing hazardous waste identification rules to specify when a waste must enter the hazardous waste management program and would have defined a new set of minimum concentration levels for exemptions applying to listed wastes.

The second alternative, the expanded characteristics option (ECHO), would have expanded the number of toxic constituents covered by the toxicity characteristics rule. Under ECHO, a waste would be exempted from regulation as a hazardous waste if it could be demonstrated that it no longer exhibited characteristics of ignitability, corrosivity, reactivity or toxicity. EPA in 1992 withdrew both proposed alternatives pending further study (***HW***, "News & Analysis," November).

RCRA prohibits land disposal of untreated hazardous wastes. For treated hazardous waste to be disposed on land (for example, in a landfill or by deep-well injection), HSWA required EPA to develop, on a phased schedule, contaminant concentration levels or waste treatment methods that would substantially reduce the toxicity or mobility (migration) of hazardous constituents. Alternatively, untreated hazardous waste could be disposed in a unit from which there would be "no migration."

By May 1990, the Agency had developed land disposal restrictions and waste treatment standards for all wastes listed or identified as hazardous at the time HSWA became law in 1984. The regulations provided for a phased program to prohibit groups of wastes from land disposal after certain deadlines. Within each group, certain wastes or waste subgroups had "windows" of time for compliance. Because waste managers knew what the regulatory requirements would be and when they would become effective, they referred to regulations that applied during their window of compliance as a "soft hammer" and the closing of the window at the compliance deadline as a "hard hammer." The closing date for the last of the wastes subject to the land bans was May 8.

EPA on Aug. 18 published a final rule establishing treatment and recycling standards for 20 wastes that were identified or listed after HSWA was signed into law. These 20 wastes are referred to as "newly listed."

Another topic receiving attention recently is the hazardous debris rule. Debris is defined as a manufactured object, plant or animal matter, or natural geologic material exceeding 60 millimeters in particle size. Hazardous debris is debris containing a listed waste or exhibiting a characteristic of hazardous waste. Regulations were promulgated defining hazardous debris and establishing treatment standards similar to those for hazardous wastes. Treated according to these regulations, debris may be conditionally excluded from the definition of hazardous waste.

Before the debris rule was issued, debris contaminated with a prohibited hazardous waste and destined for land disposal was subject to treatment standards for that listed waste. Now, to be acceptable for land disposal, hazardous debris must be treated by extraction, destruction or immobilization.

Table 2 presents a chronology of actions published in the *Federal Register* in 1992 that impact hazardous waste identification or the land disposal restrictions. ▼

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Footnote

[1]Adapted from *The MSDS Pocket Dictionary*, Schenectady, N.Y.: Genium Publishing Corp., 1991.