## ENVIRONMENTAL PROTECTION AGENCY

### 40 CFR Parts 260, 261, 266, and 268

**[FRL–5337–9]**

**RIN 2050–AE07**

# Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Hazardous Waste Identification Rule (HWIR)

**AGENCY:** Environmental Protection Agency.

**ACTION:** Proposed rule, tentative response to Chemical Manufacturers Association petition and the Hazardous Waste Identification Dialogue Committee recommendations, and request for comments.

**SUMMARY:** The Environmental Protection Agency (EPA) today is proposing to amend its regulations under the Resource Conservation and Recovery Act (RCRA) by establishing constituent-specific exit levels for low-risk solid wastes that are designated as hazardous because they are listed, or have been mixed with, derived from, or contain listed hazardous wastes. Under this proposal, generators of listed hazardous wastes that meet the self-implementing exit levels would no longer be subject to the hazardous waste management system under Subtitle C of RCRA as listed hazardous wastes. Today's Notice, commonly referred to as the Hazardous Waste Identification Rule (HWIR), establishes a risk-based ''floor'' to hazardous waste listings that will encourage pollution prevention, waste minimization, and the development of innovative waste treatment technologies.

Many of the exit levels are established using an innovative risk assessment which evaluates potential exposure pathways, both direct and indirect, from a variety of sources, such as waste piles and surface impoundments. This assessment focuses on both human and environmental receptors and is presented for comment in today's Notice. The remaining exit levels are based on an alternative risk analysis.

The Agency is also proposing to modify some of the land disposal restriction (LDR) numerical treatment standards listed in subpart D of 40 CFR part 268. This notice proposes to cap technology-based treatment standards with the risk-based exit levels which minimize threats to human health and the environment. This notice also takes comment on several general approaches and one specific approach for conditional exemptions from subtitle C management. Today's notice also contains the Agency's tentative response to a petition for rulemaking submitted by the Chemical Manufacturers Association and the Agency's tentative response to the recommendations made by the Dialogue Committee on Hazardous Waste Identification. This committee was formally chartered in July 1993 in accordance with the Federal Advisory Committee Act (FACA).

**DATES:** EPA will accept public comments on this proposed rule until February 20, 1996. Comments postmarked after this date may not be considered. However, the Agency recognizes that, because of the complexity of this proposed rulemaking, some commenters may want to request additional time for comment submittal. In anticipation of these requests, EPA will be communicating with the litigants and the court regarding the implications on our rulemaking schedule of a possible extension of the comment period for this proposal. If the comment period is extended, the Agency will provide notice of such in the Federal Register.

Any person may request a public hearing on this amendment by filing a request with Mr. David Bussard, whose address appears below, by January 5, 1996.

**ADDRESSES:** The public must send an original, two copies, and whenever possible, a 3.5 inch computer disk containing the comments in a common word processing format such as WordPerfect version 5.1 [1]. to: EPA RCRA Docket (5305W), 401 M Street, SW., Washington, DC 20460.

Place ''Docket number F–95–WHWP–FFFFF'' on your comments. The RCRA docket is located at: EPA's Crystal Gateway Office, 1235 Jefferson Davis Highway, Arlington, Virginia, and is open from 9 a.m. to 4 p.m., Monday through Friday, excluding Federal holidays. The public must make an appointment to review docket materials by calling (703) 603–9230. The public may copy material from any regulatory docket at a cost of $0.15 per page. Copies of the background documents, Integrated Risk Information System (IRIS) chemical files, and other references (which are not readily available) are available for *viewing and copying only* in the RCRA docket.

Requests for a public hearing should be addressed to Mr. David Bussard, Director, Characterization and Assessment Division, Office of Solid Waste (OS–330), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

**FOR FURTHER INFORMATION CONTACT:** The RCRA/Superfund Hotline at (800) 424–9346 or at (703) 412–9810. For technical information contact Mr. William A. Collins, Jr., Mr. Greg Helms, or Ms. Pamela McMains, Office of Solid Waste (5304), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, DC 20460, (202) 260–4770.

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[1] This will greatly facilitate EPA's preparation of the comment responses and will significantly reduce the cost associated with responding to the comments.

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I. Authority

These regulations are proposed under the authority of sections 2002(a), 3001, 3002, 3004 and 3006 of the Solid Waste Disposal Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. 6912(a), 6921, 6922, 6924 and 6926.

II. Background

*A. Overview of the Hazardous Waste Identification Program*

Section 1004(5) of the Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA) of 1984, defines ''hazardous waste'' as ''a solid waste, or combination of solid waste, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in the mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.''

Section 3001 of RCRA requires EPA to identify those wastes that should be classified as ''hazardous.'' The Agency's hazardous waste identification rules designate wastes as hazardous in one of two ways. First, the Agency has established four hazardous waste characteristics which identify properties or attributes of wastes which would pose a potential hazard if the waste is improperly managed. See 40 CFR 261.21-261.24. Any generator of a solid waste is responsible for determining whether a solid waste exhibits any of these characteristics. See 40 CFR 262.11. Any solid waste that exhibits any of the characteristics remains hazardous until it no longer exhibits the characteristics. See 40 CFR 261.4(d)(1).

The other mechanism EPA uses to designate wastes as hazardous is ''listing.'' The Agency has reviewed data on specific waste streams generated from a number of industrial processes and has determined that these wastes would pose hazards if mismanaged for one or more reasons, including the presence of significant levels of hazardous constituents listed in appendix VIII to 40 CFR part 261, the manifestation of one or more of the hazardous waste characteristics, or the potential to impose detrimental effects on the environment. (See generally 40 CFR 261.11). As discussed in detail in the preambles and in associated dockets accompanying the listings, EPA has generally determined that these wastes contain toxic constituents at concentrations which pose risks which are unacceptable for human or environmental exposure and that these constituents are mobile and persistent to the degree that they can reach environmental or human receptors.

On May 19, 1980, as part of the final and interim final regulations implementing section 3001 of RCRA, EPA published two lists of hazardous wastes: One composed of wastes generated from non-specific sources (*e.g.*, spent solvents) and one composed of wastes generated from specific sources (e.g., distillation bottoms from the production of benzyl chloride). The Agency also published two lists of discarded commercial chemical products, off-specification species, container residues, and spill residues thereof which are hazardous wastes under specific circumstances. These four lists have been amended several times, and are currently published in 40 CFR 261.31, 261.32, 261.33(e) and (f), respectively.

*B. The Mixture and Derived-From Rules and the Contained-In Policy*

1. Mixture and Derived-From Rules

a. Scope and Purpose of the Rules

In 1980 EPA promulgated its first comprehensive regulatory program for the management of hazardous waste under RCRA. 45 FR 33066 (May 19, 1980). As part of that rulemaking EPA promulgated several rules to identify hazardous wastes. Two of these rules clarify the scope of the hazardous waste listings. Under the mixture rule, a solid waste is a hazardous waste if it is mixed with one or more listed hazardous wastes. 40 CFR 261.3(a)(2)(iv). Under the derived-from rule a solid waste generated from the treatment, storage or disposal of a listed hazardous waste is also a hazardous waste. 40 CFR 261.3(c)(2)(i).

EPA promulgated the mixture and derived-from rules to close potentially major loopholes in the subtitle C management system. Without a ''mixture'' rule, generators of hazardous wastes could potentially evade regulatory requirements by mixing listed hazardous wastes with other hazardous wastes or non-hazardous solid wastes to create a ''new'' waste that arguably no longer met the listing description, but continued to pose a serious hazard. Such a waste also might not exhibit any of the hazardous waste characteristics. Similarly, without a ''derived-from'' rule, hazardous waste generators and owners and operators of hazardous waste treatment, storage, and disposal facilities (TSDFs) could potentially evade regulation by minimally processing or managing a hazardous waste and claiming that resulting residue was no longer the listed waste, despite the continued hazards that could be posed by the residue even though it does not exhibit a characteristic. (See 57 FR 7628).

It is for these reasons that the Agency continues to believe that the mixture and derived-from rules are extremely important in regulating hazardous wastes and reducing risk to human health and the environment. However, EPA acknowledges that the mixture and derived-from rules apply regardless of the concentrations and mobilities of hazardous constituents in the waste. The purpose of this rulemaking is to reduce any overregulation of low-risk wastes captured by the mixture and derived-from rule.

b. Subsequent History

Numerous industries that generate hazardous wastes challenged the 1980 mixture and derived-from rules in *Shell Oil* v. *EPA*, 950 F. 2d 741 (D.C. Cir. 1991). In December 1991 the D.C. circuit vacated the rules because they had been promulgated without adequate notice and opportunity to comment. The court, however, suggested that EPA might want to consider reinstating the rules pending full notice and comment in order to ensure continued protection of human health and the environment.

In response to this decision, EPA promulgated an emergency rule reinstating the mixture and derived-from rules as interim final rules without providing notice and opportunity to comment. 57 FR 7628 (Mar.3, 1992). EPA also promulgated a ''sunset provision'' which provided that the mixture and derived-from rules would remain in effect only until April 28, 1993. Shortly after, EPA published the proposal containing several options for revising the mixture and derived-from rules. See 57 FR 21450 (May 20, 1992). This proposal also included options for exempting media contaminated with listed hazardous wastes that are regulated under the ''contained in'' policy.

The May 1992 proposal and the time pressure created by the ''sunset provision'' generated significant controversy. In response, Congress included in EPA's 1992 appropriations bill several provisions addressing the mixture and derived-from rules. Pub. L. No. 102–389, 106 Stat. 1571. First, Congress nullified the sunset provision by providing that EPA could not promulgate any revisions to the rules

before October 1, 1993 and by providing that the reinstated regulations could not be ''terminated or withdrawn'' until revisions took effect. However, to ensure that EPA could not postpone the issue of revisions indefinitely, Congress also established a deadline of October 1, 1994 for the promulgation of revisions to the mixture and derived-from rules. Congress made this deadline enforceable under RCRA's citizen suit provision.

On October 30, 1992 EPA published two notices, one removing the sunset provision, and the other withdrawing the May 1992 proposal. See 57 FR 49278, 49280. EPA had received many comments criticizing the May 1992 proposal. The criticisms were due, in a large part, to the very short schedule imposed on the regulation development process itself. Commenters also feared that the proposal would result in a ''patchwork'' of differing State programs because some states might not adopt the revisions. This fear was based on the belief that States would react in a negative manner to the proposal and refuse to incorporate it into their programs. Finally, many commenters also argued that the risk assessment used to support the proposed exemption levels failed to provide adequate protection of human health and the environment because it evaluated only the risks of human consumption of contaminated groundwater ignoring other pathways that could pose greater risks. Based on these concerns, and based on the Agency's desire to work through the individual elements of the proposal more carefully, the proposal was withdrawn.

Meanwhile, a group of waste generating industries challenged the March 1992 action that reinstated the mixture and derived-from rules without change. *Mobil Oil Corp.* v. *EPA,* 35 F.3d 579 (D.C. Cir. 1994). EPA argued that the 1992 appropriations act made the challenge moot because it prevented both EPA and the courts from terminating or withdrawing the interim rules before EPA revised them, even if EPA failed to meet the statutory deadline for the revisions. In September, 1994 the D.C. Circuit issued an opinion that dismissed the challenges as moot under the rationale that the Agency had offered.

In early October 1994 several groups of waste generating and waste managing industries filed citizen suits to enforce the October 1 deadline for revising the mixture and derived-from rules. The U.S. District Court for the District of Columbia Circuit entered a consent decree resolving the consolidated cases on May 3, 1993. *Environmental Technology Council* v. *Browner,* C.A. No. 94–2119 (TFH) (D.D.C. 1994) Under this decree the Administrator must sign a proposal to amend the mixture and derived-from rules by November 13, 1995 and a notice of final rulemaking by December 15, 1996. The decree also specifies that the deadlines in the 1992 appropriations act do not apply to any rule revising the separate regulations that establish jurisdiction over media contaminated with hazardous wastes.

c. Federal Advisory Committees Act (FACA) and Outreach

After the withdrawal of the HWIR proposal, the Agency initiated a series of public meetings with invited representatives from industry, environmental groups, hazardous waste treaters, and States. These meetings focused on three major issues: —RCRA regulation of low hazard wastes with a particular interest in addressing issues raised regarding the mixture and derived-from rules; concerns that full RCRA requirements for contaminated media may unnecessarily impede clean-ups; and need to regulate additional high-risk wastes outside the scope of the current listings and characteristics.

A strong and successful effort was made to encourage all the interested parties to participate in the public meetings. EPA forged a solid partnership with the States (both ASTSWMO and Environmental Commissioners under the National Governors Association) and the state representatives worked closely with EPA as co-regulators in our analyses of options.

In July of 1993, EPA chartered this group as an advisory committee under the Federal Advisory Committee Act (Pub. L. 92–463)(58 FR 36200).

The committee rather quickly formed two sub-committees to allow separate discussion of the low risk waste problem associated with the mixture and derived-from rules and the rules for managing contaminated media and other wastes during remediation.

By September of 1994 the low risk waste group had made significant progress in identifying options for creating exemptions for low risk wastes. Despite significant investment of time and effort, however, the group was unable to reach consensus on many key issues.

With the statutory deadline for revisions to the mixture and derived-from rules approaching, EPA requested that group to present a final report in late September of 1994. EPA and representatives from several state environmental agencies then took up the task of selecting options for creating an exit rule, crafting regulatory language, and developing necessary supporting materials. The FACA subcommittee's final report was taken into consideration during the development of today's proposal.

2. Contained-In Policy

The Agency also has interpreted its regulatory definition of hazardous waste to extend to mixtures of hazardous wastes and environmental media (such as contaminated soil and groundwater).[2] See 40 CFR 261.3(c)(1) and (d)(2). Media that are contaminated with listed or characteristically hazardous waste must be managed as hazardous wastes until they no longer contain such wastes. To date, the Agency has not issued any general rules as to when, or at what levels, environmental media contaminated with hazardous wastes are no longer considered to ''contain'' those hazardous wastes. Media that contain hazardous wastes with constituent concentrations below the levels proposed today will be eligible for exemption under the procedures proposed today. In addition, in a separate rulemaking, the Agency plans to propose additional rules reducing regulation of contaminated media during remediation activities.

C. Overview of Expected Impacts of the Exit Rule

1. Listed Wastes

The purpose of this rule is to exempt from hazardous waste regulation those solid wastes currently designated as hazardous waste even though they contain constituent concentrations at levels that pose very low risk to human health and the environment. While facilities generating such wastes can petition for delisting by rulemaking under the provisions of 40 CFR § 260.20 and 260.22, EPA believes that the detailed waste-stream specific review required under delisting is not necessary for the low risk wastes that are identified by today's proposal. The alternative, generic exit rule proposed today will be faster and less resource-intensive for both the Agency and the regulated community. By providing an opportunity for a more self-implementing exemption, the Agency intends to create incentives for effective and innovative waste minimization and waste treatment and to reduce unnecessary demand for Subtitle C disposal capacity, without

[2] EPA's ''contained in'' policy was upheld as a reasonable interpretation of 40 CFR 261.3(c)(1) and (d)(2) by the D.C. Circuit in *Chemical Waste Management, Inc* v. *U.S. EPA,* No. 869 F.2d 1526 (D.C. Cir. 1989).

compromising needed environmental protection.[3]

By proposing a risk-based ''floor'' to listed wastes, today's proposal should give a very strong incentive to generators of listed hazardous waste to apply pollution prevention to their processes to avoid Subtitle C control. This action should also give incentive for the development of innovative treatment technologies to render wastes less risky.

Today's proposed rule specifies sampling and analysis requirements, public participation, reporting and record keeping requirements. Most of these provisions are alternatives to the safeguard of waste-specific review provided under the delisting program. The exit levels are risk-based concentrations at which a human or wildlife species could be directly or indirectly exposed to the exempted waste, and would be unlikely to suffer adverse health effects. The exposure scenario used to develop these levels assume that the exempted waste will no longer be subject to Subtitle C control, but will be managed as a solid waste in one of a variety of non-hazardous waste management units regulated under Subtitle D.

2. Characteristic Wastes

Listed hazardous wastes exempted under today's proposed rule which exhibit any of the characteristics will continue to be regulated as hazardous wastes until the characteristic is removed. In a number of cases, wastes were listed on the basis of containing both toxic hazardous constituents and exhibiting one or more of the hazardous waste characteristics that do not relate to chemical toxicity (e.g., ignitability, corrosivity, or reactivity). If such a waste still exhibits any characteristic after complying with the exemption criteria proposed in today's proposed rule, it must continue to be managed as a characteristically hazardous waste.

III. Scope of Revisions to the Mixture and Derived-From Rules

The mixture and derived-from rules promulgated in 1980 and reinstated in 1992 require Subtitle C regulation of all mixtures of listed hazardous wastes and solid wastes and all residuals from treatment of hazardous wastes. The rules proposed today, however, allow rapid exemptions for mixtures and derived-from wastes that present no significant threats to human health and the environment. Those wastes that would remain subject to the mixture and derived-from rules typically will pose risks that warrant regulation under Subtitle C. To the extent that this is not true for a particular mixture or treatment residual, the delisting process remains available (at least at the state level) to exempt wastes with constituents at more site- and waste-specific levels. Consequently, EPA has tentatively determined that further revisions of the mixture and derived-from rules, with the exception of the one minor change to the derived-from rule discussed later in this section, are not warranted in this rulemaking. However, EPA requests comment on this conclusion.

*A. Rationale for Retention of the Mixture and Derived-From Rules*

EPA continues to believe that it had ample statutory and regulatory authority to promulgate the original rules and that it also has ample authority to maintain the rules without further revisions. The mixture and derived-from rules, particularly with the revisions proposed today, ensure that hazardous wastes that are mixed with other wastes or treated in some fashion do not escape regulation so long as they are reasonably likely to continue to pose threats to human health and the environment. They thus retain jurisdiction over listed hazardous wastes and clarify that such wastes are not automatically eligible for exit when they are mixed or treated. Although RCRA sets out criteria for the identification of hazardous wastes to *enter* the subtitle C system, it is silent on the question of how to determine that a waste is eligible to exit the system. EPA's interpretation of the statute is thus entitled to deference so long as it is reasonable and consistent with RCRA's purposes.

EPA believes that its decision to retain jurisdiction over major portions of the universe of waste mixtures and treatment residues is consistent with its authorities under sections 3002–3004 of RCRA to impose requirements on waste handlers until wastes have ''cease[d] to pose a hazard to the public''. *Shell Oil Corp.* v. *EPA,* 959 F.2d 741, 754 (D.C. Cir. 1991). See also *Chemical Manufacturers Assoc.* v. *EPA,* 919 F.2d 158, 162–65 (EPA may regulate the disposal of nonhazardous wastes in a hazardous waste impoundment under section 3004) and *Chemical Waste Management, Inc.* v. *EPA,* 976 F.2d 2, 8, 13–14 (D.C. Cir. 1992) (EPA may require further treatment of wastes under section 3004 even though they cease to exhibit a hazardous characteristic).

The mixture and derived-from rules are also valid exercises of EPA's authority to list hazardous wastes under section 3001. That provision gives EPA broad authority to promulgate listing criteria. EPA's 1980 criteria authorize the listing of classes of hazardous wastes when it has reason to believe that wastes in the class are typically or frequently hazardous. See 40 CFR 261.11(b). Such class listings are permissible even if some members of the class do not actually pose hazards. Nothing in the section 1004(5) definition of hazardous waste, in section 3001, or in EPA's listing criteria require EPA to prove that every member of a class poses a hazard. In fact, many waste listings describe ''classes'' of hazardous wastes because they cover a range of materials that are not identical in composition. The mixture and derived-from rules thus are fully authorized as class ''listings'' under section 3001.

EPA has also made a reasonable factual determination that these classes of waste warrant regulation under sections 3002–3004 and section 3001. In 1980 EPA determined that the hazardous constituents contained in these wastes are not generally eliminated or rendered nontoxic simply because a waste is mixed with other wastes or managed in some fashion. In 1992, when EPA repromulgated the mixture and derived-from rules, it documented numerous instances of mixed and derived-from wastes that continued to pose hazards. See 57 FR 7629 (March 3, 1992). Today, EPA is proposing that members of this class of wastes that pose low risks will be eligible for an expedited, self-implementing exemption from Subtitle C regulation. Accordingly, EPA has an even better basis for believing that wastes which remain within the scope of the mixture and derived-from rules pose threats warranting regulation.

Additionally, EPA continues to believe, as it did in 1980, that it would be virtually impossible to try to identify all possible waste mixtures and treated wastes and assess their hazards individually. EPA's rule reasonably retains jurisdiction over both broad classes and places the burden of proof on the regulated community to show that a particular waste has ceased to present a hazard. Today's self-implementing exit proposal will reduce that burden significantly, ensuring that the mixture and derived-from rules represent a reasonable approach to regulating these classes of wastes.

[3] As will be discussed further in this notice, the Agency believes that the delisting process will continue to be valuable for certain types of wastes which are not eligible for an exemption under this proposal. Thus the Agency is not proposing to eliminate or modify the delisting program as a result of this proposal.

*B. Revision to Derived-from Rule for Wastes Listed Because They Exhibit the Characteristics of Ignitability, Corrosivity, or Reactivity*

In 1981 EPA responded to a number of comments on the scope of the original 1980 mixture rule by promulgating a number of exemptions for mixtures of solid wastes and listed hazardous wastes which, according to information submitted by commenters, posed no significant risk to human health and the environment. See 46 FR 56582 (Nov. 17, 1981). The 1981 rule included an exemption for mixtures of solid wastes and hazardous wastes listed solely because they exhibited one or more of the hazardous waste characteristics, if the resultant mixtures no longer exhibited a characteristic. The exemption was based on a finding that such mixtures did not pose threats to human health and the environment warranting Subtitle C regulation. See 46 FR 56568 and the current text of the exemption at § 261.3(a)(2)(iii). EPA notes that it has never promulgated any listings for wastes solely on the basis that they exhibit either the 1980 EP toxicity characteristic or the 1990 toxicity characteristic; consequently, only mixtures containing wastes listed because they exhibit the characteristics of ignitability, corrosivity, or reactivity have been eligible to exit Subtitle C when they no longer exhibit the characteristic.

The 1981 notice focused exclusively on issues concerning the mixture rule. Consequently, EPA did not propose any parallel exemption for such wastes for the separate derived-from rule (codified at § 261.3(c)(2)(i)), even though the derived-from wastes would appear to present similarly low risks if they no longer exhibited a characteristic and were treated to meet LDR standards before land disposal. Recent inquiries from the public have highlighted the discrepancy in the scope of the mixture rule and the derived-from rule for wastes listed solely because they exhibit characteristics. EPA believes it has no reason to treat derivatives of wastes listed solely because they exhibit the characteristic of ignitability, corrosivity, or reactivity any differently from the way it treats mixtures of such wastes because both present similar low risks to human health and the environment.

Consequently, EPA is today proposing a revision to the derived-from rule that will closely resemble the 1981 revision to the mixture rule. Since no listings to date have been based on the toxicity characteristic, EPA is proposing to limit the new revision to the derived-from rule to wastes listed because they exhibit only the characteristics of ignitability, corrosivity, or reactivity. EPA is also not proposing to exempt wastes that might in the future be listed only because of the toxicity characteristic because (as this rule proposal indicates) there can be risk concerns with the TC constituents below TC levels. EPA requests comment on this proposal to create a new exemption to the derived-from rule for this limited category of listed wastes.

The proposed exemption will also remind the regulated community of the separate duty to comply with requirements imposed by the part 268 regulations implementing the LDR program. In *CWM* v. *EPA*, 976 F.2d 2 (D.C. Cir. 1992), the U.S Court of Appeals for the D.C. Circuit interpreted RCRA section 3004(m) as requiring treatment of de-characterized hazardous wastes to meet LDR treatment standards even after the wastes cease exhibiting a characteristic. EPA believes that de-characterized derived-from residues from wastes listed because they exhibit characteristics also must meet LDR requirements, unless they are either delisted or are exempt at the point of generation pursuant to other provisions proposed in this rule (*e.g.*, meeting HWIR levels at the point of generation).

In 1992 EPA amended the 1981 exemption to mixture rule to provide a similar cross-reference and clarification for mixtures containing de-characterized listed wastes. See 57 FR 37194, 37210–11 (Aug. 18, 1992). That 1992 clarification, however, only covers nonwastewater mixtures. As explained in that mixture rule preamble, EPA then regulated de-characterized wastewaters much less stringently under the LDR program. Consequently, EPA did not believe it was necessary to remind the regulated community to comply with LDR requirements for wastewater mixtures.

Later in 1992 the *CWM* v. *EPA* decision invalidated most of the distinctions between the LDR rules for wastewaters and nonwastewaters. EPA is now revising the LDR program to comply with that decision in the LDR Phase III and Phase IV rulemakings. To reflect the changes in LDR regulation of wastewaters, the derived-from rule exemption proposed today reminds the regulated community of the need to comply with part 268 LDR requirements for all types of derived-from residues. EPA requests comment on this clarifying language. EPA also requests comment on whether it should revise the LDR clarification for the mixture rule as well.

IV. Development of Exit Levels and ''Minimize Threat'' Levels

*A. Need for the Exit*

The primary purpose of this rule is to address listed hazardous wastes, mixtures of listed hazardous wastes and solid wastes, and residues derived-from managing listed hazardous waste that, under current rules, continue to be designated as ''hazardous waste'' although they are either generated with constituent concentrations that pose low risks or treated in a manner that reduces constituent concentrations to low levels of risk.

EPA notes that there are currently exemptions, both codified and contained in policy directives, from the hazardous waste identification system, particularly the mixture and derived-from rules, for certain types of wastes or wastes with certain constituent concentrations. See e.g. 40 CFR 261.3(a)(2)(iv)(A) through (E) and policy memorandums such as the ''Skinner Memorandum'' dated August 23, 1995. EPA is not proposing to modify or replace any of these exemptions and policy statements.

B. *Overview of the Exit*

For 191 of the 376 constituents of concern, EPA conducted a detailed human health risk analysis to develop risk-based levels for either the wastewater or nonwastewater form of a constituent (or both). To conduct this analysis, EPA identified five types of units actually and rather frequently used to manage nonhazardous wastes that covered the full range of environmental releases needing analysis. The May 1992 proposal of exit levels for listed wastes, like many previous RCRA rules, assessed only risks from releases to groundwater. In response to complaints that such an assessment would not protect human health and the environment from other types of releases, EPA also assessed potential releases to air, surface water and soil in this proposal.

For each category of releases, EPA evaluated both relatively simple pathways (such direct human ingestion of contaminated groundwater) and more complex pathways (such as the deposition of windblown waste particles on agricultural land, followed by crop uptake, consumption of the crop by cattle, and consumption of contaminated beef or milk by humans). EPA assessed approximately 8 to 27 release pathways depending on the type of waste management unit.

Additionally, EPA screened the same group of 191 constituents to identify the highest priorities for assessment of

ecological receptors. In addition, EPA considered for its assessment the toxicological effects of silver on ecological receptors. EPA conducted a specific assessment of ecological risks for 47 constituents using the same five units and the same pathways (modified to reflect ecological exposures) for each unit. This risk assessment is described in more detail in sections V.B. and C.

Data limitations and resource constraints prevented EPA from conducting a risk analysis for the remaining constituents of concern. For each of these constituents, EPA extrapolated exit levels from levels derived-from the risk assessment for similar chemicals. EPA's extrapolation methodology is described in section IV.F.

The current capabilities of analytical chemistry constrain EPA's ability to use some of concentrations as exit levels. For approximately one-fourth of the constituents, EPA found that available methods could not routinely measure the constituent at the modeled or extrapolated risk-based exit level.

C. *Selection of Constituents of Concern*

1. Development of the Master List

EPA developed an initial ''Master List'' of 506 constituents to be evaluated for purposes of establishing exit criteria. This master list was developed by combining the constituents specifically listed in the following appendices of 40 CFR part 261: Appendix VII, Basis for Listing Hazardous Waste; Appendix VIII, Hazardous Constituents; and appendix IX of part 264, the Ground-Water Monitoring List. The master list includes the full list of constituents referenced in appendix VII, including the F039 constituents.

Appendix VII to part 261, which was originally promulgated on May 19, 1980 (45 FR 33084) sets out the chemical constituents found to pose threats to human health and the environment that served as the actual basis for each of EPA's original hazardous waste listings. Appendix VIII to Part 261, also promulgated in 1980, is a more general listing of chemicals found to pose potential threats to human health and the environment. (45 FR 33084). EPA considers wastes containing appendix VIII constituents to be candidates for listing determinations. EPA amends appendix VII from time to time as EPA identifies additional potentially toxic constituents.

EPA later promulgated appendix IX to part 264 to identify those appendix VIII constituents which it could routinely expect owners and operators of permitted hazardous waste treatment, storage and disposal facilities to monitor in groundwater. EPA also included in this appendix 17 additional constituents found to pose significant risks that the Superfund program routinely monitored in groundwater. (52 FR 25942, July 9, 1987).

EPA established in these rulemakings that each of these constituents had significant potential to threaten human health, and, by implication, potential to threaten the environment. (Most of the data EPA utilized predicted toxic effects on humans.) EPA finds it reasonable to include each of these constituents on the list of chemicals of concern.

Further, EPA believes that, with the exception of the six chemicals identified below, the three appendices identify the chemicals of current concern to EPA that are likely to be found in listed wastes.

The Agency requests comment on whether the master list should also include six constituents that are not listed in any of the above sources. These six constituents, which are listed in Table 1, are found in six ''U'' listed wastes (commercial chemical products that become hazardous wastes when discarded). See 40 CFR 261.33(f). EPA originally listed these wastes because they routinely exhibited the characteristic of ignitability. Since the original listings, however, sufficient toxicity data have become available for these constituents. (The risk number for dimethylamine was recently withdrawn; however, EPA understands that it will shortly be replaced). Because of the toxicity data associated with these constituents, the Agency is taking comment on whether exit levels should be established for these six constituents in today's rulemaking. The Agency also requests comment on whether these six constituents should be added to Appendix VIII.

TABLE 1.—CONSTITUENTS NOT ON APPENDICES VII, VIII, OR IX

| CAS # | Constituent | Wastewater | Nonwastewater | |
|---|---|---|---|---|
| | | | Totals | Leach |
| 75–07–0 | Acetaldehyde (ethanal) | | | |
| 98–82–8 | Cumene | .67 | 18,000 | 2.5 |
| 124–40–3 | Dimethylamine | | | |
| 110–00–9 | Furan | .16 | 1300 | .06 |
| 79–10–7 | Acrylic acid | (1) | (1) | (1) |
| 98–01–1 | 2-Furancarbox- aldehyde (furfural) | (1) | (1) | (1) |

[1] No exit levels because no EQC is available for this constituent. The criteria for exit would be to meet LDR treatment standards in § 268.

Full documentation concerning the selection of constituents of concern is available in the docket under *The Background Document to Support Development of the Final Constituent List under the Waste Exit Rule.*

2. Development of the Exit Constituent List

The Agency narrowed the list of 506 constituents to consist of 376 constituents that are included in the exemption list. 130 constituents were deleted from the master list. Criteria for constituent deletions from the master list include: Reactivity in air, analysis as a different constituent, reactivity in water, hydrolysis in soil or water, or is part of a chemical class with a specific constituent represented on the list. Because different methods and quantitation limits are necessary for solid and liquid matrices, two separate analyses were conducted. *The Background Document to Support Development of the Final Constituent List under the Waste Exit Rule* in the docket further justifies deletions of constituents from the master list and lists the deleted constituents.

Molybdenum is not on the Appendices VII, VIII, or IX, which provided the scope of today's master list of constituents. In anticipation of the Petroleum listing, due to a Drinking Water Sewage Sludge regulatory level, and due to available toxicity information, the Agency has included molybdenum on the exemption list. Due to modeling time constraints, Molybdenum was not modeled for groundwater risk. The groundwater

leach level was estimated by assuming a DAF of 10 and using the RfD. The Agency requests comment on whether molybdenum should be on the list.

Two modeled constituents do not have estimated quantitation criteria (EQCs—see section IV.G.) and therefore do not have associated exit levels. These constituents are ethylene thiourea and phenyl mercuric acetate. The Agency requests comment on how to deal with these two constituents. The following table represents modeled results for these constituents for comment.

TABLE 2.—MODELED CONSTITUENTS WITHOUT EQCS

| CASNUM | Constituent | NWW totals | NWW leach | WW totals |
|---|---|---|---|---|
| 96–45–7 | Ethylene thiourea | 0.51 | 0.00017 | .00053 |
| 62–38–4 | Phenyl mercuric acetate | 0.0093 | 0.0045 | 0.012 |

EPA modeled chromium VI in the risk assessment. However, totals chromium appears on the exit tables based on the exit levels calculated from modeling chromium VI. This approach is consistent with the Toxicity Characteristic approach to chromium. The Agency asks for comment on this approach.

The cyanide exit level was extrapolated. It is meant to be totals cyanide. The Agency requests comment on whether testing for totals cyanide is appropriate.

The values in the exit tables for silver do not represent results of human toxicity data for silver, rather they represent ecological results from the risk assessment. The Agency has determined that the effect of silver on humans is not a human health problem, rather it is an aesthetic problem. The groundwater model did not model ecological exposure, therefore, there is no groundwater risk level for silver.

3. Constituents of Ecological Concern

As explained above, EPA established in previous RCRA rulemakings that the constituents on the exit list (376) present significant threats to human health. Numerous comments submitted on EPA's May 1992 proposal to establish exit levels urged EPA to conduct a more specific and detailed analysis of threats to non-human species. Consequently, in this rulemaking EPA determined the constituents it believed to also be reasonably likely to pose risks to ecological receptors.

EPA has not set benchmarks for ecological impacts for a large number of constituents under any of its programs. Establishing such benchmarks for this proposal would be a resource-intensive and time-consuming task. Accordingly, EPA narrowed the list of exit constituents for which ecological receptors would be evaluated. First, EPA decided to consider only the 191 constituents which it had already targeted for analysis to protect human health. Second, the Agency developed a methodology for screening the 191 constituents to identify those most likely to pose significant risks to ecological receptors.

Based on an extensive review of available literature, EPA developed five criteria to indicate the potential for ecological risks:

(1) Constituents that bioaccumulate (and possibly biomagnify) in the food chain that can present elevated exposures to certain predators;

(2) Persistent constituents that are likely to increase long-term multi-generational exposures in wildlife;

(3) Constituents that cause reproductive and developmental effects that can elicit adverse effects at sensitive life stages;

(4) Constituents that may cause ecological effects that have no human analog (e.g., eggshell thinning); and

(5) Constituents that may cause effects to ecological receptors continuously exposed.

EPA also developed operational definitions for each criterion. The definitions were quantitative where possible. Further details can be found in appendix B of the Technical Support Document for the Risk Assessment for Human and Ecological Receptors.

EPA decided to designate as constituents of ecological concern the 47 constituents that exhibited at least two of the five criteria. The Agency believes these constituents present the highest priorities in terms of environmental risk. An additional 36 constituents exhibited only one criterion. EPA, however, chose not to designate them as constituents of concern because time and resource constraints would prevent the Agency from completing an analysis with these constituents. EPA, nevertheless, believes it has identified and analyzed sufficient constituents of concern to ensure that the exit levels proposed today provide for reasonable protection of the environment. Only 83 of 191 screened constituents showed any significant potential to pose threats to the environment at levels protective of human health. Further, as discussed in more detail below, of the 47 constituents that EPA actually assessed for ecological impacts, only 6 wastewater constituents and 18 nonwastewater constituents required exit levels to protect environmental receptors lower than those necessary to protect human health under the baseline proposal. Consequently, EPA believes it is unlikely that all of the remaining constituents will present significant threats to ecological receptors at levels that would adequately protect human health.

*D. Risk-Based Information*

The Agency's proposed option for establishing exit values is based on risk modeling to a hazard quotient of 1 and a $1 \times 10^{-6}$ cancer risk. The Agency chose a hazard quotient of 1 as its toxicity benchmark value for non-carcinogens because evaluation of these compounds presumes there is a threshold exposure above which individuals would be at significant risk of suffering the adverse effects attributable to the compound. The HQ is the Agency's best attempt to estimate that level. Therefore, the Agency believes all exposures should remain below HQ 1. Some Agency programs rely on HQ values less than 1 in standard setting (the drinking water program uses an HQ of 0.20 to provide a safety factor which allows for exposure to the constituent from sources other than drinking water).

The Agency chose a toxicity benchmark of $1 \times 10^{-6}$ cancer risk for carcinogens for several reasons. A cancer risk level of $1 \times 10^{-5}$ risk was used as a clearly hazardous level in establishing the toxicity characteristic. Second, in the listings program, a $1 \times 10^{-4}$ cancer risk is used as the presumptive listing risk, and a $1 \times 10^{-6}$ as the presumptive no-list level. A cancer risk of $1 \times 10^{-5}$ represents a level of initial concern about risk. Therefore, in allowing listed hazardous waste to exit the requirements of Subtitle C, the Agency was targeting waste that is clearly not hazardous. Thus, the Agency believes the risk level should be at the

low end of the risk range used to bring waste into the hazardous waste system.

Similarly, the Agency sought to be protective of public health in developing its fate and exposure modeling. For the groundwater evaluation, the Agency used a DAF 10 (which represents an approximate 90th percentile protection level) for infinite source type constituents. (Constituent-specific DAFs were developed using the same input assumptions, and different DAFs result from modeling of degradation or retardation factors in the environment). This is the generic DAF used in the delisting program for large volume wastes. Since this is a national program which will largely benefit the largest volume generators, the DAF 10 assumption is consistent with delisting practice. Also, the toxicity characteristic used a DAF of 100 (representing an approximate 85th percentile protection level) for identifying clearly hazardous waste (for infinite source type constituents; regulation of hydrolysers was deferred). Again the policy goal of exits was to strive to be well below clearly hazardous levels. The Agency also modeled exposure at the nearest downgradient well. The TC rule restricted well placement to within the plume. Today's proposal attempts to balance the protectiveness level and well placement by requiring a more protective level than the TC rule, but is less restrictive in well location, e.g., wells outside of the plume, at significantly lower risk, are averaged in.

For modeling of the non-groundwater pathways, the Agency used four high-end parameter values for which the modeling outcome is most sensitive as inputs to the analysis to be protective of public health and the environment. These include: Two high-end parameters in the waste management unit characterization and fate portions and two high-end parameters in the exposure portions of the model. The remaining input parameters were evaluated at typical values or central tendency values. The Agency sought to be protective of a high percentile exposed population (at least 90th percentile).

1. Human Health Benchmarks

For each constituent on the master list, the Agency evaluated the existing toxicity information to determine whether there were sufficient toxicity data to establish a benchmark. For those constituents with adequate data, the data were evaluated either by the Agency's CRAVE (Carcinogen Risk Assessment Verification Endeavor) Workgroup, Reference Dose/Reference Concentration (RfD/RfC) Workgroup, or the Office of Research and Development. This approach is consistent with the approach used in the Agency's other risk-based RCRA programs such as the Toxicity Characteristic, delisting petition evaluations, listings, as well as the CERCLA program. See Section 4, ''Benchmarks,'' of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors for more details.

a. Non-carcinogens

The Agency proposes to use oral reference doses (RfDs) and inhalation reference concentrations (RfCs) as the basis for developing the exit criteria for non-carcinogenic constituents. An RfD or RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to a constituent for the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The approach used to derive an RfD or RfC is to identify the highest test dose of a constituent associated with no effects or effects that are not considered adverse in an appropriate animal bioassay test. These experimental no-observed-adverse-effect-levels (NOAELs) or no-observed-effect-levels (NOELs) are considered to be an estimate of the animal population's physiological threshold for adverse effects. The RfD or RfC is derived by dividing the NOAEL or other toxicity benchmark by suitable uncertainty and modifying factors. In the event that an appropriate NOAEL or NOEL is not available, the lowest-observed-adverse-effect level (LOAEL) may be used with additional uncertainty factors.

It is important to note that the contributions of the constituent from various sources in the environment (*e.g.*, air, food, water) are not considered in the development of an RfD or RfC. Rather, the RfD or RfC reflects the estimated total permissible daily human exposure from all sources of exposure. RfDs and RfCs have been calculated for many, but not all, of the non-carcinogenic constituents for which the Agency is establishing exit criteria.

The Agency prefers to use only RfDs and RfCs that have been evaluated and verified by the RfD/RfC Workgroup as the basis for setting regulatory levels. However, for some constituents, the Agency has not yet completed its verification process; thus, RfDs and RfCs under development are being used for purposes of this proposal for those constituents. If the final verified RfDs and RfCs differ from the RfDs and RfCs under development proposed in today's notice, the Agency will adopt the new (*i.e.*, verified) values for the final rule after noticing the data in the Federal Register.

b. Carcinogens

The Agency proposes to use the oral cancer slope factor and inhalation cancer unit risk as the basis for developing exit levels for carcinogenic constituents unless the non-carcinogenic effects occur at lower levels. EPA's CRAVE Workgroup and Office of Research and Development have estimated the carcinogenic slope factor (CSF) (*i.e.*, the slope of the ''dose-response'' curve) and inhalation unit risks for humans exposed to low-dose levels of carcinogens in the environment. The slope factors indicate the upper-bound confidence limit estimate of excess cancer risk for individuals experiencing a given exposure over a 70-year lifetime. In practice, a given dose multiplied by the slope factor gives an upper estimate of the lifetime risk to an individual of developing cancer. By specifying a level of lifetime risk (no matter how small), one can also estimate the corresponding dose using the slope factor.

EPA proposes to quantify on a weight-of-evidence basis, as described below. EPA promulgated ''Guidelines for Carcinogen Risk Assessment'' on September 24, 1986 (51 FR 33992), which defined a scheme to characterize substances based on experimental data and the kinds of responses induced by a suspect carcinogen. These guidelines specify the following five classifications:

Group A—Human carcinogen (sufficient evidence from epidemiologic studies)

Group B—Probable human carcinogen

Group $B_1$—Limited evidence of carcinogenicity in humans

Group $B_2$—A combination of sufficient evidence in animals and inadequate or no evidence in humans

Group C—Possible human carcinogen (limited evidence of carcinogenicity in the absence of human data)

Group D—Not classifiable as to human carcinogenicity (inadequate human and animal evidence of carcinogenicity or no data available)

Group E—Evidence of non-carcinogenicity for humans (no evidence of carcinogenicity in at least two adequate animal tests in different species or in both adequate epidemiologic and animal studies).

The weight-of-evidence basis was used to eliminate Group D and E constituents from further consideration as carcinogens.

Under each of the regulatory options presented in today's proposal, the Agency is using the same risk level for Groups A, B, and C carcinogens. This approach is consistent with the way carcinogens were treated in the 1990 Toxicity Characteristic rule, hazardous waste listing determinations, and the delisting program. The rationale for this approach is that while the classifications indicate the type (human or animal) and strength of the studies available which reflects upon the uncertainty about the carcinogenic potential, the severity of the effect, cancer, warrants equal treatment. It is important to note that a few Group C carcinogens do not have slope factors or unit risks. In these cases the Agency used the benchmark developed for the non-cancer endpoint.

c. Consideration of MCLs

The Agency is proposing two approaches for setting human health-based levels for carcinogens and non-carcinogens in routes of exposure involving water ingestion. For the first approach, the Agency is proposing to use Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act (SDWA) of 1974, as amended in 1986, as the human health-based levels for the constituents for which they have been established. In general, MCLs for non-carcinogens are derived from the Reference Doses (RfDs), while MCLs for most carcinogens are set as close to zero as technically and economically feasible; this normally corresponds to risk levels that range from $10^{-4}$ to $10^{-6}$. (Note that, although the derivation of MCLs considers feasibility of treatment, analytic chemistry, and cost factors in addition to health effects, it also considers other routes of exposure. The Agency's policy has been to use MCLs, when available, in other similar concentration-based programs.) For those constituents which do not yet have MCLs, the Agency is proposing to use oral reference doses (RfDs) for non-carcinogens and oral slope factors for carcinogens as described above. However, if new MCLs are finalized under the SDWA prior to the promulgation of today's rule, the Agency proposes to substitute the new MCLs for the RfDs and slope factor-derived human health-based levels for water ingestion presented in today's notice.

For the second approach, the Agency intends to propose to use only RfDs and slope factors in deriving human health-based levels for water ingestion. The Agency requests comment on these two approaches.

2. Ecological Benchmarks

Ecological benchmarks were developed for a variety of ecological receptors based on the availability of data. Benchmarks were needed for mammals, birds, plants, soil fauna, fish, aquatic invertebrates, aquatic plants, and benthos (sediment-dwelling organisms). A much smaller number of constituents have been evaluated by the Agency for ecological effects than have been for human health effects, as discussed under V.A. In general, measurement endpoints were selected: (1) For consistency with the Agency's Framework for Ecological Risk Assessment (U.S. EPA 1992x), the Great Lakes Initiative, and other ecological efforts within the Agency, and (2) relevance to the ecological receptor. As discussed in ''Section D—Risk Assessment'' the ecological assessment focussed on inferring the sustainability of populations and communities within ecosystems. Therefore, benchmarks were derived from measurement endpoints (i.e., reproductive, developmental, growth, survival, and mortality) from which such inferences could be made. Reproductive studies (e.g., number of viable young per female) were preferred over other endpoints. For some constituents, acute or mortality studies were used, however, this occurred only for developing benchmarks for fish, aquatic invertebrates, and benthos where protocol exists (AWQC development) for using such data. The Agency seeks comment on the measurement endpoints selected for each ecological receptor.

The toxicological benchmarks were established using the more conservative no effects level (or concentration) approach for ecological receptors as compared to a 20% effects level. The 20% effects level is the lowest level for ecological effects that can be detected in field population analyses (Suter et al., 1992). Although the 20% effects level may indeed be the lower limit that could be reliably confirmed in field studies, this level reflects our current analytical abilities and not necessarily the ecological significance of the effects level. The no effects approach was taken because the ecological analysis infers the sustainability of various populations under the assumption that if a sufficient number of populations within an ecosystem is protected, then the likelihood of adverse effects that are causally related to the chemical stressor will be reduced at the ecosystem level. The Agency was concerned that if an effects approach was taken, then the assumption underlying the ecological analysis would no longer be valid. The Agency seeks comment on the approach taken for setting toxicological benchmarks.

Given the number and variety of ecological receptors included in the analysis (predatory birds to soil fauna) as well as the variety of effects and endpoints considered, the benchmark development process required an approach that was internally consistent and acknowledged, at least qualitatively, the uncertainty involved in estimating ecological benchmarks. The Agency, therefore, developed a benchmark classification scheme to incorporate both the relationship of the benchmark to the entire toxicity data set and the adequacy of the database used to derive the benchmark. Three classifications were established: Adequate, provisional, and interim. These classifications were developed on a receptor group-specific basis (i.e., fish and aquatic invertebrates, benthos, mammals, birds, soil fauna, and terrestrial plants) and represent a weight-of-evidence designation for the toxicological benchmark. In many respects, this classification scheme is similar in meaning to the human carcinogen weight-of-evidence groups and the difference between ''verified'' values on IRIS and ''unverified'' values in HEAST. The classifications relate to the certainty assigned to a given ecological benchmark. The benchmarks were treated the same in the analysis regardless of classification. See Section 4 in the ''Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors'' for details on each classification and how they were used for each ecological receptor group. The Agency seeks comment on the classification developed for the analysis.

Below is a discussion of how benchmarks were developed for each of the receptor groups. For a detailed discussion of each of their developments, see Section 4, ''Benchmarks,'' and Appendix B, ''Toxicological Profiles for Ecological Receptors,'' of the ''Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors.'' The Agency seeks comment on the overall development of each of the ecological benchmarks generated for this proposed rule.

For populations of birds and mammals, the overall approach used to establish toxicological benchmarks was similar to the methods used to establish RfDs for humans as described in IRIS. Each method uses a hierarchy for the selection of toxicity data (e.g., no effects

levels are generally preferred to lowest effects levels) and extrapolates from a toxicity benchmark for the test species to a toxicity benchmark for the desired species. However, the procedures used to develop benchmarks (i.e., RfDs) for the protection for human health establish an acceptable daily dose for all individuals (including sensitive sub-populations) while the development of ecological benchmarks for this analysis establish a level that will sustain the reproductive fitness in a local population. Consequently, benchmarks for birds and mammals were established using three key guidelines. First, because the reproducing population was selected as the assessment endpoint, the benchmarks were developed from measures of reproductive success or, if unavailable, other effects that could conceivably impair the maintenance of the population.

Second, the taxon of the test species was matched to the taxon of the wildlife species to the greatest extent possible. The evolutionary processes that result in obvious differences in taxa (e.g., morphology) also result in differences in the physiological processes that govern chemical response. Moreover, taxonomic similarities are generally associated with similarities in feeding habits, physiology, and chemical sensitivity at the family classification and, to a lesser extent, the order classification. For example, herbivores are generally more resistant to toxicants than predators because they are exposed to plant toxins, and the enzymatic system that detoxifies plant toxins also detoxifies pesticides and other organic chemicals.

Third, a default safety factor of 10 was adopted only for extrapolating from an lowest-observed-effects level (LOEL) to a no-effects level (NOEL). A ten-fold safety factor was not applied to sub-chronic studies since reproductive and developmental toxicity studies are frequently short-term. Even among target organ toxicity studies, there are many instances where sub-chronic studies are actually more sensitive than chronic studies carried out on the same substance. Also, for mammals and birds, differences in interspecies uncertainty were indirectly addressed through the use of the species-scaling equation described in Section 4 of the ''Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors.'' The Agency requests comment on the use a safety factor of 10 when extrapolating from a LOEL to a NOEL. The Agency also requests comment on the use of a scaling approach to address interspecies uncertainty as described above. Furthermore, the Agency seeks comment on the inability of the Risk Assessment to evaluate the inhalation and dermal routes of exposure for birds and mammals.

For the terrestrial plants, the approach used to establish toxicological benchmarks was adapted from the Effects Range Low (ER-L) approach developed by the National Oceanographic and Atmospheric Administration (NOAA). The NOAA ER-L approach estimates a percentile of the distribution of various toxic effects thresholds. The measurement endpoints were generally limited to growth and yield parameters because (1) they are the most common class of response reported in phytotoxicity studies and, therefore, will allow for benchmark calculations for a large number of constituents, and (2) they are ecologically significant responses both in terms of plant populations and, by extension, the ability of producers to support higher trophic levels. It should be noted that these benchmarks were limited to soil concentrations and do not explicitly consider the adverse impacts on plants from ambient contaminant concentrations in the air. Further details can be found in section 4.3.3 of the ''Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors.'' The Agency solicits comment on the overall approach taken to develop benchmarks for the terrestrial plant community.

For the soil fauna, the toxicological benchmarks were established based on methods developed by the Dutch National Institute of Public Health and Environmental Protection (RIVM). The RIVM approach estimates a confidence interval containing the concentration at which the no observed effects concentration (NOEC) for p percent (95th percentile was selected) of the species within the community is not exceeded 50% of the time. A minimum data set was established in which key structural and functional components of the soil community (e.g., decomposer and grazing organisms) encompassing different sizes of organisms (i.e., microfauna, mesofauna, macrofauna) were represented. As with the Ambient Water Quality Criteria, measurement endpoints included reproductive effects as well as measures of growth, survival, mortality. The Agency requests comment on the use of the RIVM methodology, and protecting 95 percent of the community 50 percent of the time. The Agency also requests comment on its inability to fully quantify the effect of soil characteristics on toxicity of constituents to soil organisms.

For populations of fish and aquatic invertebrates (represented by daphnids), a hierarchical approach was taken for use of data sources in deriving benchmarks. The first choice was final chronic values (FCVs) from the Sediment Quality Criteria effort by the EPA Office of Water, followed by values from the Great Lakes Initiative (GLI) effort, and finally, the Ambient Water Quality Criteria (AWQC). If these benchmarks were not available, then a benchmark was developed using AWQC procedures or, if data were inadequate, the GLI Tier II procedures for establishing chronic values (termed secondary chronic values—SCVs). The AWQC ranked third since many years have passed since their establishment and the SQC and GLI efforts re-evaluated the toxicity data sets of several of these. The Agency solicits comment on the hierarchical approach described above for deriving toxicity benchmarks.

For aquatic plants, the approach used to establish toxicological benchmarks was adapted from the ER-L approach developed by NOAA. The NOAA ER-L approach estimates a percentile of the distribution of various toxic effects thresholds. However, due to the general lack of toxicity data, the default ER-L approach was used wherein the lowest LOEC for either vascular plants or algae was used. The Agency solicits comment on the overall approach taken to develop benchmarks for aquatic plants.

For the sediment organisms, the approach used to establish toxicological benchmarks for non-ionic, hydrophobic organic chemicals was based on sediment quality criteria methods for non-ionic constituents. Two key assumptions form the basis for the proposed sediment quality criteria. First, benthic species, defined as either epibenthic or infaunal species, have a similar toxicological sensitivity as water column species. As a result, FCVs (or SCVs) developed for the fish and aquatic invertebrates can be used for the benthic community. Second, pore water and sediment carbon are assumed to be in equilibrium and the concentrations are related by a partition coefficient, Koc. This assumption, described as equilibrium partitioning (EqP), provides the rationale for the equality of water-only and sediment-exposure-effects concentrations on a pore water basis: The sediment-pore water equilibrium system results in the same effects as a water-only exposure. The Agency requests comment on the use of this approach in support of today's proposal. In some cases, protecting these

ecological receptors represents the critical pathway that limits the projected exit level for management of a waste stream outside of the Subtitle C hazardous waste program. These ecological receptors serve as the basis for the proposed exit levels for 18 constituents, including 6 metals. To the extent that contaminants from these waste streams reach off site areas, the Agency based its proposal on modeling the ecological receptors on a neighboring land area of 500 acres or an adjacent stream (with a total length of 12 miles). This approach as currently modeled, may only serve as an indicator of a potential nearby threat to ecological receptors (e.g., the soil fauna and plant life), rather than serving as a measure or indicator of a broader threat to the environment. The Agency solicits comment on the appropriateness and relevance of these receptors as the basis for exit levels under the HWIR program.

3. Sources of Data

a. Human

The two primary sources used to identify human health benchmarks were the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST). Both of these sources were developed and are maintained by the USEPA. For a few constituents, other Agency sources such as Carcinogen Assessment Group (CAG) profiles, Health Effect Assessments (HEAs), and Health Assessment Documents (HADs) were used to fill data gaps.

IRIS is the Agency's official repository of Agency-wide consensus chronic human health risk information. IRIS evaluation are conducted by the Agency's Work Group review process that leads to internal Agency scientific consensus regarding risk assessment information on a chemical. This information is recorded on IRIS and is considered to be ''Work Group Verified.''

The HEAST is prepared by EPA's Office of Research and Development. They contain risk assessment information on chemicals that have undergone a more limited review and have the concurrence of individual Agency program offices; each is supported by an Agency reference. The information has not, however, had enough review to be recognized as Agency-wide consensus information.

b. Ecological

A thorough literature review was conducted to identify toxicological data from laboratory and field studies for each of the constituents of ecological concern. The review included secondary sources such as the Synoptic Review Series published by the U.S. Fish and Wildlife Service, the Ambient Water Quality Criteria documents, and other Federal compendia of toxicity data (e.g. HEAs, the Derivation of Proposed Human Health and Wildlife Bioaccumulation Factors for the Great Lakes Initiative, Agency for Toxic Substances and Disease Registry documents, PHYTOTOX, GRIN, TERRETOX, and AQUIRE). Toxicity data on soil organisms were obtained for several constituents from van de Meent et al. (1990). In addition to AQUIRE, the other primary data source for toxicity data on aquatic plants were the Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota:1994 Revision (Suter and Mabrey, 1994). On-line literature searches were conducted to identify primary sources of toxicity data on constituents lacking sufficient data in the secondary sources. Additional studies were identified in conventional literature reviews.

*E. Risk Assessment*

1. The Non-groundwater Risk Assessment

a. Introduction

The risk assessment underlying today's proposed rule is based upon a comprehensive approach to evaluating the movement of many different waste constituents from their waste management units, through different routes of exposure or pathways, to the points where human and ecological receptors are potentially exposed to these constituents. This risk assessment is being used in today's proposed rule to determine which listed hazardous wastes can be defined as ''low-risk'' wastes, able to exit the Subtitle C system and be managed in non-Subtitle C units. The previous approach taken in the May 20, 1992, proposed HWIR rule also addressed the risks associated with the management of wastes containing hazardous constituents with very diverse physical and chemical properties; however, only groundwater ingestion exposures from landfill units were evaluated. That approach led to a concern by the Agency, as well as commenters on the proposed rule, that leachate from landfills contaminating groundwater and subsequent consumption of the contaminated groundwater by humans may not be the only exposure pathway important to evaluate. Although the ingestion of contaminated groundwater pathway may be appropriate to propose exit levels for some wastes and constituents, it may be under-protective for others, depending on the physical and chemical properties of each waste constituent. (For example, some constituents have a high potential to bioaccumulate or bioconcentrate in living organisms. Pathways in which these constituents come in contact with fish, grazing livestock, wildlife, or edible plants would be important to evaluate.) In addition, over the past 14 years of implementing the RCRA program, the Agency has learned more about potential routes of release to the environment from various management practices.

Therefore, for today's proposal the Agency undertook an extensive risk assessment that examines numerous exposure pathways, rather than just the groundwater ingestion pathway. In selecting the exposure pathways, previous rulemakings were used as a guide, as well as other special studies by the Agency that implement analyses examining numerous pathways. (Tables A–1 and A–2 contain the human and ecological pathways, respectively, evaluated in the assessment, and are presented in appendix A to today's preamble.) With regard to waste management units considered in the assessment, it is important to note that because today's proposal establishes criteria for waste to exit the Subtitle C system, the assessment evaluated exposures associated with managing wastes in non-Subtitle C units. The human and ecological receptors considered in the assessment were selected to represent a range of behaviors, activities, dietary habits, and trophic levels that influence exposure levels.

The risk assessment supporting this proposal is currently undergoing review by the Science Advisory Board and EPA's Office of Research and Development. As a result of these reviews, and of comments received during the public comment period, it is likely that EPA would make changes to the risk assessment or other parts of the rule. Topics on which the Agency has received informal comment include the use of ecological benchmarks for regulation and the overland transport of waste constituents. The Agency, to the extent consistent with the schedule negotiated in the consent decree for this rulemaking, would publish a supplemental notice proposing any significant changes before finalizing the rule.

b. How the Assessment is Structured

The non-groundwater assessment acknowledges that not all human and ecological pathways arise from each

source; for example, movement of particles from an active surface impoundment is not expected to occur. To account for this, the assessment matched the environmental transport pathways with both the releases from various types of waste management units and the various receptors for the nearly 200 constituents examined. All constituents were assessed in all pathways deemed plausible for a given waste management unit, if the data permitted. Tables A–3, A–4, and A–5 of appendix A show the pathways assessed for each waste management unit, human receptors assessed for each pathway, and ecological receptors assessed for each pathway, respectively. The assessment estimated the constituent-specific concentrations in a waste at the management unit that could be expected to result in an acceptable exposure for a human or ecological receptor (determined through using the toxicity benchmarks discussed in section V.B.), taking into account the various pathways by which the constituent may move through the environment from the waste management unit to the receptor.

The waste management units considered in the assessment are not all-inclusive but were selected to reflect those that might be commonly associated with the management of exited hazardous wastes (from wastewaters to nonwastewaters) in non-Subtitle C waste management units. These units were identified as commonly used in the management of solid wastes in the 1988 Report to Congress entitled *Solid Waste Disposal in the United States Report.* The Agency believes that risks posed by other types of management of these exited wastes will be no greater than those from the units assessed.

There is a high degree of variability in the physical and chemical properties of the approximately 200 constituents evaluated. An understanding of those properties and how they interact with the physical and chemical properties that control persistence and mobility in the environment is an essential element of the assessment. The management units could potentially be located in the range of environments that exist across the United States. These environments have differing characteristics (e.g., meteorological conditions, soil type) that are more conducive for the movement of certain constituents in certain pathways than others. For example, an environment with a high precipitation and high organic soil content may result in significant exposures to fishers by constituents that readily adsorb to soils (i.e., have a high log $K_{ow}$) through erosion of contaminated soil and uptake in the food chain. For other pathways, however, an environment with these characteristics may result in relatively low exposures. The assessment was designed to determine what conditions would need to exist to cause higher exposures for each pathway rather than developing a scenario and determining all the types of exposures and receptors for that scenario. By determining the appropriate conditions for which higher exposures from a given pathway will occur, the Agency believes that environments where the conditions are not as likely for a constituent to move through a pathway are protected.

The assessment was structured using a deterministic approach. A deterministic approach uses a single, point estimate of the value of each input or parameter and calculates a single result based on those point estimates. The assessment used the best data available to select typical (i.e., approximately 50th percentile) and high-end (i.e., approximately 90th percentile) values for each parameter or parameter group as discussed in Section E.2. below. Sometimes full distributions were available but, more commonly, ranges of values or point values were available with no description of distributions or variability. If there was not a sufficient distribution for the parameter, best professional judgement was used in determining typical and high-end values (which sometimes would be the maximum).

The assessment is constructed as a set of calculations that begin with an acceptable exposure level for a constituent at a receptor, and back-calculates to a concentration in a waste in a management unit that corresponds to the acceptable exposure level. For the human receptors, the assessment was designed to determine constituent concentrations in waste for each waste management unit that would correspond to protecting receptors at the high-end of exposure (i.e., above the 90th percentile of each of the receptor populations and types of exposures being assessed). The Agency estimated waste concentrations corresponding to the high-end exposure by identifying four critical or sensitive parameters in the source/pathway/receptor equations and using high-end input values for those parameters and using central tendency values for the remaining parameters. The Agency also estimated central tendency (approximately the 50th percentile) and bounding estimates (worst-case) of constituent concentrations in waste for each of the receptor populations and types of exposures being assessed. For ecological receptors, the approximate percentile level of protection is difficult to discern. The Agency believes the ecological analysis is conservative with respect to the overall assessment endpoint (e.g., sustainability of the reproducing populations) because of the way the source, fate and transport parameters are set, the dietary habits assumed, and how the toxicity benchmarks are developed. However, the degree to which this conservativeness transfers to ecosystems is not known.

The steps of the assessment which provide estimates of acceptable constituent-specific concentrations in waste include the following:

Step 1—Specify acceptable risk levels for each constituent and each receptor. See Section V.B. in today's preamble for a discussion of how benchmarks are set for both human and ecological receptors.

Step 2—Specify the exposure medium. Using the toxicity benchmarks as a starting point and the exposure equations, the assessment back-calculates the concentration of contaminant in the medium (e.g., beef, milk, plant, air, water, soil) that corresponds to the ''acceptable'' exposure level. The exposure equations include a quantitative description of how a receptor comes into contact with the contaminant and how much the receptor takes in through specific mechanisms (e.g., ingestion, inhalation, dermal adsorption) over some specified period of time. Thus, for the subsistence farmer eating contaminated beef, the exposure specifies the amount of beef eaten on a daily basis, the period of time over which the contaminated beef is eaten, and descriptions for the individual such as body weight and lifetime. For this example, the concentration in the beef is what is back-calculated.

Step 3—Calculate the point of release concentration from the exposure concentration. Based on the back-calculated concentration in the exposure medium (from Step 2), the concentration in the medium to which the contaminant is released to the environment (i.e., air, soil, groundwater) for each pathway/receptor was modeled. The end result of this calculation is a medium concentration at the point of release from the waste management unit.

Step 4—Calculate the concentration in the waste that corresponds to the medium concentration at the point of release. This step depends on the characteristics (e.g., area, cover practices, waste consistency) of the waste management unit.

The output of the assessment is a range of constituent concentrations, reflecting the range of pathway-receptor combinations considered for each waste management unit. The lowest concentration (per constituent) of this range represents the highest exposure pathway-receptor combination for that waste management unit.

c. How Uncertainty is Addressed

Any analysis of the magnitude used in this rule-making will have uncertainty associated with the outputs generated. The uncertainty can be associated with the models or equations used and the data relied on for the model parameters. In addition, policy assumptions, such as waste management units assessed and receptors assessed, may also affect the degree of representativeness of the assessment. In order to be consistent with Agency policy on the characterization of risk, stochastic and deterministic approaches were considered. A stochastic approach, such as Monte Carlo analysis, which produces a distribution of constituent concentrations, was initially considered due to the tremendous interest in, and use of, these techniques in risk assessment. However, after evaluation of the models and data available for use, the Agency decided to use a deterministic approach for the non-groundwater assessment.

The Agency's deterministic approach used for this assessment, like most such approaches, uses point values in all calculations and produced point estimates of constituent concentrations for waste in each management unit-exposure pathway-receptor combination. However, in selecting and developing point values for parameters, EPA considered all available data. Wherever possible, the Agency developed both a central-tendency and high-end value for each parameter used in the assessment. This was not possible in all cases because some parameters were a property, such as density of water, and because some values were fixed by Agency-wide policy decisions. (For example, EPA used standard Agency-wide human toxicity benchmarks and body weights.) EPA then calculated constituent concentrations based on a mixture of central-tendency and high-end values.

EPA believes that the deterministic approach described above (based on identifying critical parameters and using higher-end values only for those parameters and central-tendency values for the other parameters) allowed it to derive constituent concentrations in waste for each waste management unit that are reasonably protective across a range of conditions and for a range of receptors. EPA also believes that this approach is consistent with EPA's risk assessment policy.

EPA further believes that the approach chosen allows both the Agency and the public to determine more easily which parameters played the most critical roles in determining the constituent concentrations in waste for each waste management unit. This furthers general understanding of the assessment and helps commenters effectively target their resources for reviewing what EPA is proposing. It has also helped EPA target its own data collection and input selection efforts. It is often more difficult to identify critical parameters in a stochastic assessment because of the greater number of iterations and because results are reported as probability distributions. This is particularly true for an analysis with a large number of parameters such as the assessment used for this proposed rule.

EPA notes that stochastic approaches are also consistent with Agency risk assessment policy. In fact, EPA applied a stochastic ''Monte Carlo'' approach to the separate analysis of dilution and attenuation of groundwater performed for this proposal. That analysis, however, has been under development for many years and EPA is more familiar with the underlying data and the relationships between various parameters. In addition, the public has had a chance to comment on aspects of that analysis in previous rule-makings. EPA was more comfortable applying a stochastic analysis for the groundwater analysis than a stochastic approach to the non-groundwater analysis.

EPA believes that it is not necessary to resolve all issues relating to the relative merits of the two approaches or to determine which approach would be ideal for each of the assessments described above. Rather, the debate should focus on whether the approaches chosen allowed EPA to reach reasonable regulatory decisions.

The Agency solicits comment on the use of a deterministic approach as described above. Specifically, the Agency seeks comment on whether the approach proposed is a reasonable approach for setting protective levels across a set of types of management units and exposure pathways.

d. Linkage of the Non-groundwater Risk Assessment to the Groundwater Risk Assessment

In the non-groundwater risk assessment, the pathways involving potentially contaminated groundwater (e.g., bathing) are back-calculated from the receptor to the wellhead (i.e., the assessment provides constituent concentrations in the groundwater at the well). In order to determine the concentration of a constituent in leachate coming from a waste management unit that would result in the estimated constituent concentration at the water well, the Agency used a separate groundwater fate and transport risk analysis. That analysis is described in detail in Section D.8. elsewhere in today's proposal. The well concentrations estimated from the pathways involving bathing are used as input to the groundwater fate and transport modeling from which a leachate concentration is determined.

e. Risk Targets Used

As previously discussed in Section V.B. of today's proposed rule, the Agency used existing toxicity benchmarks when available. However, many ecological benchmarks were developed for this rule-making, as discussed in Section V.B. of today's proposed rule. As described in that section, the Agency used a cancer risk target of $1\times10^{-6}$, and a hazard quotient equal to 1 for non-carcinogens. For ecological benchmarks, a hazard quotient equal to 1 was used. The Agency solicits comment on the risk targets being used for today's proposed rule.

2. Detailed Overview of the Non-groundwater Risk Analysis

The assessment can be broken down into six components: Constituents; toxicity benchmarks; receptors; exposure; fate and transport; and waste management units. Each of these components is discussed in turn below, except the constituents and toxicity benchmarks which were discussed earlier in section V.A and V.B. It is important to recognize that the assessment was not able to evaluate all constituents in all receptor-pathway-waste management unit combinations because of data gaps in either toxicity or chemical properties, or inadequate methodologies. Many of these gaps have been identified in different sections of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors'' (denoted ''Uncertainties and Issues of Concern''). The Agency requests additional data or other information that would assist in filling these gaps.

a. Waste Management Units

The manner in which constituents are released to environmental media and the relative quantity released to each

medium will affect the pathways of most concern for a particular constituent. The pathway presenting the highest risk to human or ecological receptors is not always easily determined because of the complex interactions of the waste management unit and its types of releases, the physical and chemical properties of the constituent, and the properties that control mobility and persistence in a particular environmental medium. For some constituents, the management practice will determine which exposure pathway is of most concern. For example, benzene tends to migrate to both air and groundwater. Upon examining the risks from exposure to these two media arising from releases from a quiescent surface impoundment, the groundwater ingestion pathway may pose the highest risks. But, when examining the risks from these two media for releases from an aerated tank, the air inhalation pathway may pose the higher risks. Further, the air inhalation risks may even be higher than groundwater ingestion risks from the quiescent surface impoundment.

Therefore, and as stated earlier, the selection of non-Subtitle C waste management units examined in the assessment attempted to reflect both the influence of the type of unit on pathways and those that might be commonly associated with the management of exited hazardous wastes in non-Subtitle C waste management units. Again, the Agency believes that risks posed by other types of management of these exited wastes will be no greater than those from the units assessed. The management units examined include the following:

- Aerated treatment tanks. Relative to all other types of management, aerated tanks containing wastewaters can potentially have the most significant releases of volatile organics to air.
- Quiescent surface impoundments. This type of unit containing wastewaters also can potentially result in significant releases of volatile organic constituents to air. These units also have a potential to affect surface water bodies if the unit is not well maintained or constructed. The sludges generated, which may contain high concentrations of metals and hydrophobic constituents, may impact groundwater. (As discussed above, the groundwater fate and transport analysis was conducted in a separate analysis.)
- Land application. This type of unit, when used for non-wastewaters can potentially have significant releases of certain constituents to nearby land and surface water bodies through erosion and runoff, particularly if run-on and run-off control measures are not practiced. In addition, significant releases of volatile organics constituents to air are possible. Further, after the unit is closed, significant on-site exposures to some persistent and relatively immobile constituents may occur as well as continued long-term releases to the nearby land and surface water bodies. The Agency believes such units will pose higher exposures relative to landfills in all pathways except those arising from groundwater. Therefore, the non-groundwater assessment did not examine landfills, but they were examined in the groundwater fate and transport analysis.
- Ash monofill. This type of unit used for ash disposal can potentially have significant releases of particulates to air which may be inhaled or may deposit on land and plants, and result in exposure through food and soil ingestion.
- Wastepiles. This type of unit used for nonwastewaters can have significant releases of particulates to air as well as significant releases of particulates through erosion and runoff.

Each of the pathways that evaluates a receptor using contaminated groundwater other than as a source of drinking water (i.e., bathing) are back-calculated to a concentration in a drinking water well. The pathways are applicable to all of the waste management units modeled (except tanks). All of the waste management unit and chemical-specific portions of the groundwater fate and transport analysis and subsequent estimated leachate concentrations are contained in the Agency's separate groundwater fate and transport analysis (see Section E.3 below).

One exception to the above discussion of the types of waste management units evaluated involves the combustion of wastes. Although the Agency attempted to include this type of management in the assessment, it became clear that the emissions from combustion are not easily predicted from the waste inputs to the units. The combustion process both destroys and creates constituents. Although destruction of constituents can be predicted based on certain operating characteristics of combustion units, the creation of other constituents, referred to as products of incomplete combustion (PICs), is not easy to predict. It may be possible to make such predictions for a specific waste and a specific combustion unit; however, the extensive data (e.g., on the variety of combustion units, waste types, constituent combinations) needed for the assessment used in this rulemaking relating wastes with emissions are not available. Therefore, acceptable constituent levels in waste going to a combustion unit could not be established. However, the Agency is developing emission standards for various types of combustion units and those emission standards may be a more appropriate vehicle for addressing combustion.

In addition, the assessment does not address accidental or catastrophic releases, such as transportation accidents or tank failures. The Agency determined that, although such releases are possible, they are of low probability and non-routine and, therefore, are not appropriate for developing exit criteria that apply to all wastes.

The Agency has identified several specific areas giving rise to uncertainty in the characterization of the waste management units and for which the Agency seeks comment:

(1) Use of Subtitle D Survey.

- The Agency relied upon data from a 1987 survey of Subtitle D facilities to characterize waste management units. That survey, used in the 1988 Report to Congress on Solid Waste Disposal in the United States, was designed primarily to collect estimates of the following parameters:
- Number of establishments that manage Subtitle D wastes on site;
- Number of establishments that manage Subtitle D wastes on site in land application units, wastepiles, surface impoundments, or landfills;
- Number of land application units, wastepiles, surface impoundments, or landfills used to manage Subtitle D wastes;
- Amount of Subtitle D wastes managed on site in land application units, wastepiles, surface impoundments, or landfills.

In addition to these parameters, data were also collected for some other parameters, such as the area of the waste management units. Although the survey was not designed to collect accurate estimates for these other parameters, it is the most comprehensive date available to characterize these other parameters. One difficulty encountered in using these data is that the survey requested information on total area or waste quantity for all of each type of units at a facility. The total area or waste quantity was divided by the number of each type of unit at the facility (number of each unit being one of the primary parameters the survey was designed to estimate) to estimate average unit area. Further, it is not certain how well the on-site units (which are used routinely for wastes generated on-site) reflect the characteristics of off-site units. Uncertainty related to the

representativeness of the data is important because exited wastes could be managed in units off-site as well as on-site. The Agency seeks comment on the use of the Subtitle D survey to characterize the waste management units.

In evaluating the waste management unit components of the risk assessment, the Agency made certain assumptions when data were not available or were incomplete. A description of the waste management unit parameters for which there was little to no data is described below. The rationale behind these assumptions is presented (e.g., results of any sensitivity analyses, references to other work, etc.). The Agency requests comment on the specific issues raised for each management unit.

(2) Fate and Transport

Fate processes, particularly biodegradation and hydrolysis, were accounted for only in the land application unit since that unit had wastes applied intermittently and that unit was being examined for on-site risks after closure (assuming human occupation of the site begins 10 years after closure occurs). Because waste is continuously applied to the other waste management units, biodegradation and hydrolysis were presumed to have minimal influence on the subsequent availability of constituents to the above ground pathways. The Agency requests comment on not considering biodegradation and hydrolysis in waste management units other than the land application unit. The Agency also requests comment on the appropriateness of the data and methods used to account for the fate and transport of constituents in waste management units, with particular emphasis on data and methods of determining biodegradation and hydrolysis of constituents in land application units.

(3) Ash Monofill

(i) Particle Size Distribution for Air Dispersion Modeling

A size distribution of ash particles that become airborne from an ash monofill was not available. Therefore, a sensitivity analysis was performed to assess the importance of the particle size distribution in the calculation of air concentrations and deposition rates. Different distributions were modeled reflecting a variety of assumptions for particle size distributions between PM10 and PM30 classes. The greatest deviation among the modeled conditions in the estimated air concentration of PM10 was 12 percent; for the estimated deposition rate for PM30 the greatest deviation was 59 percent. Given the uncertainties and variabilities inherent in the assessment, these variations were considered minor, therefore, the Agency assumed an equal distribution of particle sizes between the two size classes used in the assessment.

(ii) Monofill Characterization

Because limited data were available to characterize hazardous waste ash monofills, data from municipal waste ash monofills were used. However, because ash generation rates for municipal waste incinerators ere more than 100 times greater than ash generation rates for hazardous waste incinerators and reuse-as-fuel combustors resulting in significantly larger municipal monofills, EPA calculated an ash monofill volume for this analysis based on generation rates reported in the 1988 National Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities, assumed bulk density of the ash, and assumed lifetime of the monofill. The Agency is not certain that hazardous waste monofills should be sized in the same manner as municipal waste monofills. The Agency also assumed that each waste monofill would accept ash from only a single combustor. Accepting wastes from more than one combustor may underestimate monofill size.

(iii) Vehicle Traffic

The estimates of number of ash trucks per day are dependent on the size of truck. Limited data were available on the sizes of trucks hauling ash. These data were used to characterize a range of truck sizes. The truck sizes may either under- or overestimate the size of trucks actually used at hazardous waste ash monofills depending on the representativeness of municipal waste ash truck sizes.

No data were available on other vehicular traffic; therefore, these values were estimated, introducing additional uncertainty into the overall amount of traffic at the ash monofill.

(iv) Emission Equations for Ash Blown From Trucks and During Spreading and Compacting

The emission equation used for ash blown from trucks was developed for windblown emissions from storage piles. This was adapted to trucks by using the truck speed to estimate frequency of wind greater than 5.4 m/s. Because this equation was not derived for windblown emissions from moving trucks, the results of its application to such emissions are uncertain. It may over- or underestimate actual emissions of particulates blown from trucks.

Similarly, the emission equation used for spreading and compacting was developed for agricultural tilling. Agricultural tilling was thought to approximate the process of spreading and compacting; however, the use of this equation may under- or overestimate emissions due to spreading and compacting.

(4) Land Application Unit

(i) Particle Size Distribution for Air Dispersion Modeling

A size distribution of soil particles that become airborne was not available. The same assumption was made for soil particles as was done for ash particles when modelling the monofill (see above). As described above for ash particles, the Agency assumed an equal distribution of particle sizes between the two size classes.

(ii) Area of Land Application Unit Relative to Agricultural Field

The assessment examined the impact of subsistence farming on the land application unit beginning 10 years after closure. Based on the distribution of sizes for land application units and agricultural fields, the Agency selected a combination of fields such that the central tendency land application unit (61,000 $m^2$) is smaller in area than the central tendency agricultural field (2,000,000 $m^2$). The significantly larger size of the agricultural field suggests that the model may inappropriately average the constituent concentration over the agricultural field. However, the Agency does not believe this to be a significant impact on the analysis because: (1) The area of the agricultural field is not an explicit input to the model; (2) the size of the land application unit is large enough to support a subsistence farmer; and (3) this pathway is driven by the assumptions for the high-end analysis. The Agency requests comment on the relationship between the land application unit and the agricultural field.

(iii) Application Rate

The waste application rate is an important parameter in determining the constituent's soil concentration after application. In practice, this rate is a function of the characteristics of the waste being applied, the characteristics of the receiving soil, the environmental conditions, and the purposes for which the waste is being applied. Information from the Subtitle D survey was used to calculate the rates, since those rates

were not expressly requested in the survey. The rates were calculated from the area receiving the wastes and the waste quantity applied. This introduces uncertainty for it combines rates applicable to both treatment of wastes and rates for specific uses (e.g., farming, mine reclamation). To account for the potential of having application rates be much too high for the site they are being applied to, the data on receiving area and waste quantity applied were linked.

(iv) Waste Characteristics

Limited data were available on the characteristics of wastes being land applied. As a result, soil values for most parameters (e.g., hydraulic conductivity, moisture retention index) were used to characterize nonwastewaters. It is not known to what extent these soil values differ from the waste properties.

(v) Depth of Contamination

Depth of contamination affects the amount of constituent available for exposure. For the non-groundwater pathways, only constituents at the soil surface were assumed available for each exposure pathway. The Agency selected tilling depth as the depth of contamination available to the non-groundwater pathways as over time, the depth of the waste layer would increase and a portion of the mass of waste would move out of the zone available for the surface pathways. The model kept the depth of contaminated soil constant that was available for the surface pathways. The Agency recognizes that the use of the tilling depth may underestimate the depth of contamination in some cases and overestimate it in others. Thus, the Agency requests comment on the use of tilling depth as a surrogate for depth of contamination.

(vi) Partitioning

Releases from the land application unit were partitioned among volatilization, evaporative losses, hydrolysis, erosion, runoff, and leaching. Periodic application of waste was factored into the partitioning model during the active life of the unit. Biodegradation was factored in during both the active life and closed period. The finite source Jury model was used to estimate volatilization emissions. The Jury model, which models the convection of constituents caused by the flux of water in soil, was used for evaporative losses. Runoff and leaching losses were calculated using the soil-water partition coefficient ($K_d$) to determine constituent concentration in the soil water and multiplying that by the land application unit area and runoff rate for run-off losses or recharge rate for leaching losses. (See Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors, Section 7, Land Application for full description.)

(5) Waste Pile

(i) Waste Pile Height

No data were available on this parameter; therefore, the value is an estimate based on heights attainable by a front-end loader. This parameter is important in the air dispersion modeling, which is sensitive to the height of the pile. The Agency requests suggestions for alternatives to determining waste pile height and any data which would support those determinations.

(ii) Particle Size Distribution for Air Dispersion Modeling

The same sensitivity analysis and assumptions discussed above for ash monofills were used for waste piles. Given that the air dispersion analysis is not very sensitive to particle size distribution, the simple assumption described above was believed to be an adequate approximation for the assessment.

(iii) Waste Characteristics

Limited data were available on the characteristics of wastes in waste piles. As a result, soil values for most parameters (e.g., hydraulic conductivity, moisture retention index) were used to characterize the nonwastewaters disposed in piles. It is not known to what extent these soil values differ from the waste properties. The soil values, however, were not used for the ash waste pile. The ash disposed in the piles had the same properties as that disposed of in a monofill.

(iv) Vehicle Traffic

The estimates of number of trucks per day are dependent on the size of truck and waste quantity. Limited data were available on truck sizes. These data were used to characterize a range of truck sizes. These truck sizes may either under- or overestimate the size of trucks actually used around waste piles.

(v) Emission Equation for Ash Blown from Trucks

As described in the section above on ash monofills, the emission equation used for ash blown from trucks was developed for windblown emissions from waste piles. It may over- or underestimate actual emissions of particulates blown from trucks.

(6) Surface Impoundment

(i) Two-Phase Sludge Formation Model

The two-phase sludge formation model simplifies the solids concentration gradient in a surface impoundment into two distinct and homogeneous layers, a liquid layer with the same average solids content as the inflow and a sediment or sludge layer with a much higher solids concentration.

(ii) Dilution of Waste During a Spill

Overflows or breaches associated with surface impoundments are a waste release examined in the assessment. The algorithm used for spills does not account for dilution of the wastewater caused by excess run-on. Such run-on is presumably relatively uncontaminated; thus the spill volume, consisting partly of contaminated wastewater from the impoundment and partly of uncontaminated run-on would have a lower concentration than the wastewater in the impoundment. By using the concentration in the impoundment, the mass of contaminant released to surface water is overestimated. This effect could be considerable for the central tendency impoundment, as the quantity of run-on is significant compared to the capacity of the central tendency impoundment. However, to determine the extent of such dilution, the degree to which such run-on becomes mixed with the wastewater would need to be estimated. No model has been found to assist in this estimation.

(7) Tank

(i) Unit characterization

Limited data were available on Subtitle D tanks. The assessment used the profiles (specifies design and operating parameters) for uncovered aerated treatment tanks developed in the *Hazardous Waste TSDF—Background Information for Proposed RCRA Air Emission Standards* (TSDF—BID, U.S. EPA, 1991)

(ii) Volatilization

The Agency used the well-mixed flow model. This model assumes that the contents of the system are well mixed and that the equilibrium concentration in the system is equal to the effluent concentration. The equilibrium concentration is the average concentration throughout the unit and the driving force for volatile emissions.

(8) Combustors

For the reasons stated below, EPA did not modelled a combustion unit in the risk analysis for this regulation. EPA,

however, asks for comments on that decision.

In initial analyses (see Multipathway Analysis Background Document available through the docket), EPA modeled potential risks from several types of combustion units, using engineering judgment to make a best estimate for destruction and removal efficiencies for non-hazardous waste combustors. Early comments suggested that the assumptions might have overstated or understated the estimated risks by not reflecting actual practice in industrial boilers or other likely combustion facilities not regulated by Subtitle C. However, initial comparisons indicated that the combustion risk estimates back-calculated to the combustion unit were not often the most significant risk and, therefore, would not be the basis for the limiting exit criteria.

EPA also recognized that there are many issues related to organics that are produced during the combustion process, but are not necessarily originally in the waste. The amount and type of these ''products of incomplete combustion'' are generally believed to be dependent on a number of aspects of the design and operation of a facility, and not easily related to the composition of the wastes fed into the combustion unit. For purposes of this proposal, EPA decided that because of the high degree of uncertainty associated with developing waste concentrations from combustion units, it was not appropriate to use risks from combustion as a factor in deciding what wastes remain under the hazardous waste regulations. Rather, EPA believes there are more appropriate ways to regulate emissions from combustion units through various regulatory authorities, including regulation of a range of units under the Clean Air Act.

EPA, however, asks comment on the appropriateness of this approach. In particular, there may be some constituents (e.g., certain metals that are difficult to capture in pollution control equipment) where a better correlation exists between waste input and potential risk from combustor emissions than for organics that are in the waste and also created as PICs during the combustion process.

b. Fate and Transport

(1) Pathways

In selecting environmental fate and transport pathways to include in the assessment, EPA used as a guide previous rulemakings and other special studies by the Agency that examine numerous pathways. For example, the Agency has used similar risk assessment methodologies in several recent rules including: Wastes from Wood Surface Protection, Final Rule (59 FR 458, January 4, 1994); Standards for Use or Disposal of Sewage Sludge, Final Rule (58 FR 32, February 19, 1993); Corrective Action Management Units, Final Rule (58 FR 29, February 16, 1993); and rulemaking efforts on the Pulp and Paper Industry (56 FR 21802, May 10, 1991 and 58 FR 66078, December 17, 1993).

The sewage sludge and pulp and paper rulemakings in particular examined both human and ecological risk. Other rulemakings under development within the Office of Solid Waste also use non-groundwater risk assessment methodologies including various hazardous waste listing determinations and the dioxin emission rules for hazardous waste combustion units. Most of these assessments rely on several Agency guidance documents issued in recent years. In January 1990, the Agency issued an interim report, Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions (EPA/600/6–90/003 and referred to as the Indirect Exposure Document). This document served as the basis for further development of non-groundwater pathway assessments by the Agency. In November 1993, the Agency issued an Addendum to the Indirect Exposure Document that updated and revised portions of the methodology presented in the Indirect Exposure document. In April 1994, OSW issued a draft implementation guidance entitled Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Units. In June 1994, the Agency released a review draft of Estimating Exposure to Dioxin-Like Compounds: Volumes I–III (EPA/600/6–88/005C), which presents an extensive and expanded version of the Agency's previous multiple pathway exposure assessments. Finally on November 16, 1994, the Agency issued Draft Soil Screening Guidance (59 FR 59225), which presents a multiple pathway assessment using air, groundwater, and soil pathways for soil screening levels at Superfund sites. The risk assessment presented relies on the methodologies presented in these Agency guidance documents to maintain consistency with previous Agency efforts.

Based on these efforts by the Agency in conducting non-groundwater pathway assessments, comments by reviewers on previous draft versions of the risk assessment, and some screening analyses to identify pathways that are either very similar or unimportant compared to other pathways, the Agency selected the human and ecological exposure pathways presented in Table A–1 (human exposure pathways) of appendix A and Table A–2 (ecological exposure pathway) of appendix A. These exposure pathways are described in greater detail in the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors.

Tables A–1 and A–2 presents four columns: column 1 (exposure media), identifies the medium, such as air or soil, to which the receptor is exposed; column 2 (route of exposure), identifies the route, such as inhalation or ingestion, by which a receptor is exposed to the exposure medium; column 3 (type of fate and transport), classifies the pathway by the primary mode of fate and transport of the contaminant to the exposure medium, including direct air, air deposition, air diffusion, groundwater, overland, and soil; and column 4 (exposure scenario), identifies the compartments in the pathway (e.g., source to air to humans), and describes the exposure scenario (e.g., inhalation of volatiles).

The fate and transport pathways examined can be grouped into six types of initial release and movement away from a waste management unit, as follows:

- Direct air pathways—air emissions of volatiles and respirable ($PM_{10}$) particulates;
- Air deposition pathways—air emissions of particulates that deposit on soil or plant surfaces;
- Air diffusion pathways—air emissions that, while in the vapor phase, diffuse directly into surface water or plants;
- Groundwater—groundwater releases (These are the pathways that link to the separate groundwater fate and transport analysis that then links to the waste management units.);
- Overland pathways—overland transport (i.e., surface runoff and soil erosion) to surface water or transport by soil erosion to off-site fields;
- Soil pathways—on-site soil exposures.

There are three types of pathways not included in the analysis. Pathways involving the use of contaminated water (groundwater and surface water) for irrigation were removed due to modeling difficulties that could not be resolved, however early results indicated these are not the most significant pathways for any of the waste management units. Pathways involving the deposition of contaminated particles directly onto

surface water bodies were not included because previous efforts by the Agency have shown these pathways not to be as significant when compared to particle deposition onto the watershed and subsequent erosion to the surface water body. Pathways involving wet deposition were not examined. An air model recently developed evaluates the impact of wet deposition and was not available to use at the time of this proposed rule. This new model also was addressing problems with the area component of earlier models. When the model is available, the Agency will determine whether its use will have an impact on the proposed exit criteria. If the Agency determines that there will be an impact, it will provide an opportunity for public comment on use of the updated model.

As stated earlier, not all exposure pathways were evaluated for all waste management units. Constituents may be released from each waste management unit by a variety of mechanisms. Each release mechanism may be associated with certain exposure pathways. By examining the release mechanisms assumed for each waste management unit and identifying the exposure pathways associated with those release mechanisms, the appropriate pathways to be modeled for each waste management unit were identified. The exposure pathways modeled for each waste management unit are presented in Table A–5 of appendix A.

b. Equations

Since the objective of the assessment was to generate acceptable levels in waste rather than determining risks posed by waste, the equations, which are designed to calculate risks, had to be turned around or run in reverse. The assessment began with a target risk (or acceptable risk to the receptor) that was used to back-calculate what constituent concentration in a waste would not exceed the target risk.

Wherever appropriate, the equations used in the back-calculation were taken from Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions (U.S. EPA, 1990x; hereafter, the Indirect Exposure document, or IED) as modified by the November 10, 1993, draft of Addendum: Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions, Working Group Recommendations (U.S. EPA, 1993x; hereafter, the Addendum). The Addendum is currently being revised based on comments from the Science Advisory Board and is being combined with the IED to generate a single methodology guidance document. Therefore, the equations may change after that revision is completed. If this occurs, the assessment used for this rule-making will be revised. If such a revision is needed and occurs, the Agency will provide an opportunity for public comment on those changes. For convenience, the methodology presented in the IED as modified by the Addendum will be referred to as the Indirect Exposure Methodology, or IEM.

The equations presented in the IEM were modified to estimate the soil concentration for constituents eroding to an off-site field. The IEM did not address this pathway because it was developed for stack emissions from combustors rather than releases from land-based units. However, because soil erosion is a critical release pathway for this analysis, the Agency applied the Universal Soil Loss Equation (USLE) and other equations presented in the IEM to calculate soil erosion to the off-site field. However, the application of these equations resulted in concentrations greater at the receptor than in the waste management unit. This phenomenon, first noted in the Dioxin reassessment, occurred because the equations assumed that the amount of uncontaminated soil that was eroded into the field was negligible in comparison to the total mass of soil in the field. Therefore, the Agency modified these equations to reflect erosion of uncontaminated soil together with the constituents.

Certain modifications to the equations used in the assessment were made for dioxin-like compounds to reflect the different behavior of these constituents in the environment. These modifications were based on Estimating Exposure to Dioxin-like Compounds, Volume III: Site-Specific Assessment Procedures (U.S. EPA, 1994x), hereafter referred to as the Dioxin document. The Dioxin document defines dioxin-like compounds as ''* * * compounds with nonzero Toxicity Equivalency Factor (TEF) values as defined in the 1989 International scheme * * * [which] assigns nonzero values to all chlorinated dibenzodioxins (CDDs) and chlorinated dibenzofurans (CDFs) with chlorines substituted in the 2,3,7,8 positions. Additionally, the analogous brominated compounds (BDDs and BDFs) and certain polychlorinated biphenyls (PCBs) have recently been identified as having dioxin-like toxicity * * * and thus are also included in the definition of dioxin-like compounds.''

Although the modifications presented in the Dioxin document may be applicable to other highly lipophilic compounds, in keeping with this definition, the modifications for dioxin-like compounds were made only for 2,3,7,8–TCDDioxin Toxicity Equivalents (TEQs), and PCBs. Other dioxin congeners are addressed through the 2,3,7,8-TCDDioxin TEQ. The Agency solicits comment on not using these modifications for other highly lipophilic compounds.

(3) Specific Issues on Pathways and Equations

Below are specific issues of the risk assessment related to the modeling of the fate and transport pathways on which the Agency is requesting comment on their use, improvements to them, or alternative ways to model them. A detailed discussion of these aspects is in Section 6, Fate and Transport Modeling, of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors. (Air emission and dispersion modeling is discussed in Section 7, Waste Management Units, in the technical support document. To be consistent, issues related to that modeling were presented earlier in this preamble in Section D.2.a.)

(i) Hydrolysis

The Agency accounted for fate processes (e.g., biodegradation, hydrolysis) and transport processes (e.g., volatilization) for constituents throughout their movement from the point at which the constituent leaves the waste management unit until it reaches the location at which contact with the receptor occurs. During an initial screen, the Agency identified four constituents that were known to hydrolyze completely or rapidly. These constituents were not included in the detailed assessment and include: Benzotrichloride (98–07–7); maleic anhydride (108–31–6); phthalic anhydride (85–44–9); and 1,2-diphenylhydrazine (122–66–7). In addition, 16 inorganic salts known to dissociate completely were also not assessed. These included: Calcium cyanide (592–01–8); copper cyanide (544–92–3); potassium cyanide (151–50–8); potassium silver cyanide (506–61–6); silver cyanide (506–64–9); sodium cyanide (143–33–9); thallium (I) carbonate (6533–73–9); thallium (I) chloride (7791–12–0); thallium (I) nitrate (10102–45–1); thallium (I) sulfate (7446–18–6); zinc cyanide (557–21–1); zinc phosphide (1314–84–7); cyanogen bromide (506–68–3); cyanogen chloride (506–77–4); hydrogen cyanide (74–90–8); and thallium acetate (563–68–8). The Agency solicits comment on not assessing these constituents.

Of the 192 constituents evaluated in the non-groundwater analysis, the Agency directly accounted for chemical hydrolysis for 18 constituents. For the remaining constituents, hydrolysis was not considered for the following reasons: The constituent has no hydrolyzable chemical group; hydrolysis is not expected to be important or significant; the degradation half-life of the chemical, which includes hydrolysis, is greater than one year; or, there was no data available for the constituent.

The extent to which fate and transport processes play a role in the removal of a constituent from a pathway, or its movement from one environmental compartment to another is determined by site-specific environmental conditions as well as chemical-specific parameters. To simplify the analysis, the Agency used fate and transport data based on one set of environmental conditions to represent all possible spatial and temporal environments encountered in any given exposure pathway. The Agency solicits comments on this simplification for modeling fate and transport processes throughout the exposure pathways considered in the MPA.

(ii) Other Fate and Transport Processes

Fate and transport processes other than hydrolysis may be important in determining the concentration of a constituent reaching a receptor. The Agency's approach to incorporate consideration for these other processes involved the use of biodegradation and volatilization rates into the fate and transport pathways, when applicable. The Agency recognizes that the rate for many chemical-specific fate and transport processes (in particular, biodegradation) varies with characteristics of the environment (e.g., temperature, soil type). However, the Agency simplified the non-groundwater analysis by applying chemical-specific fate and transport rates generically across environmental settings found in the various exposure pathways. This simplification may overestimate the exit level in some instances and underestimate the exit level in other instances. The Agency solicits comments on this simplification for modeling fate and transport processes throughout the exposure pathways considered in the non-groundwater analysis.

(iii) Bioavailability

With regard to the metals examined in the risk assessment, there is considerable uncertainty about their bioavailability that affects their fate, transport, and uptake in various media (e.g., plant tissue, animal tissue) and receptors. Speciation and associated solubility of metal species in wastes which contain metals are key factors that influence the bioavailability of metals. The Agency had no information on the speciation, solubility, or availability of the metals in the wastes in which they are disposed or how they may transform in the environment. The Agency assumed that the metals were in a soluble form, mobile, and available. In the absence of this information, the Agency assumed that metals are soluble, mobile, and bioavailable. The Agency seeks comment on this approach, and requests data on the speciation and solubility of metals in wastes, together with the conditions of the waste (e.g., pH) that could be disposed by the methods considered in this rulemaking and methodologies that account for the transformation of the metals through changing environmental conditions.

(iv) Meteorological Data

The approach for setting central-tendency and high-end meteorological conditions in the risk assessment was to evaluate sets of meteorological data from a variety of locations, and then select locations that reflect central tendency or high-end conditions for a given exposure pathway.

The Agency used the set of 29 meteorological stations identified during its efforts to develop soil screening levels for Superfund sites. These are considered representative of the United States. Central-tendency and high-end locations were then selected from these 29 locations for the exposure pathways where meteorological conditions were required as input to the models; these were the air pathways and overland pathways. The meteorological data were evaluated as location sets as opposed to individual parameters. Once locations were selected, the annual average values for those locations were used.

For air pathways, which required data on wind speed, wind direction, temperature, sunshine, cloud cover, and air mixing height, selection of meteorological data was waste management unit-specific and based on extensive sensitivity analysis. EPA considered only the effect of meteorological data on emissions and dispersion in selecting locations for air pathways. However, for consistency, once a pair of high-end and central tendency locations were selected for a pathway, any meteorological data used in that pathway were selected to correspond to the locations chosen, even in any overland transport component of the pathway.

Overland pathways were driven by soil erosion, for which the critical meteorological input is the Universal Soil Loss Equation (USLE) rainfall factor (R). Therefore, to select central tendency and high-end locations for overland pathways, the 29 locations were ranked based on the rainfall factor, and the 50th and 90th percentile locations chosen for all overland pathways.

See Section 6.8, Fate and Transport Inputs and Section 7.1.5. Air Modeling, of the Technical Support Document for the Hazardous waste Identification Rule: Risk Assessment for Human and Ecological Receptors for a detailed discussion of how meteorological data were selected and used. The Agency solicits comment on how meteorological data was selected and used in the risk assessment.

(v) Soil Data

A variety of soil parameters were required for the modeling. These parameters are interdependent and vary with the type of soil (e.g., loam, clay). However, values for these parameters also vary within a soil type. Due to the interdependence of the parameter, the Agency chose to maintain them as a set and determine a central-tendency property set and a high-end property set.

The Agency used loam type soils to characterize all soils simulated in the risk assessment because these types of soils are fairly prevalent in the United States. All soils are composed of varying percentages of sand, silt, and clay. Loam, by definition, is composed of equal proportions of sand, silt, and clay; therefore, it represents a combination of each of the physical properties of the individual soil textures. Central tendency and high-end values were selected from the range of values for loam soil so that each individual soil parameter required by the model is consistent with a loam soil. (Sec Section 6.8, Fate and Transport Inputs, in the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors for more detail.) The Agency solicits comments its approach for characterizing soil in the assessment.

(vi) Soil Pathways

The Agency seeks comment on the following issues related to the modeling of soil pathways:

- Use of the Universal Soil Loss Equation to predict soil erosion in a generic application - This is a widely-used model intended for site-specific

applications where specific input data can be used for relatively small fields. Its use in a generic application, and for fairly large waste management units, may overestimate quantities of soil eroded.

• Handling of the Soil Loss Constant - This term is the sum of loss rates for leaching, erosion, runoff, biodegradation, hydrolysis, and volatilization. Possible uncertainties may arise because: the assessment assumes that these terms are first-order decay rates and therefore can be added together; loss processes are calculated independently, even though they may occur simultaneously.

• Use of the Soil Water Content Equation to predict soil water content in a generic application - The equation is from the Superfund Exposure Assessment Manual (U.S. EPA, 1988x), and was developed for site-specific applications.

• Area of garden and agricultural field - No data were available on the size of home gardens, gardens on subsistence farms, or yards of residential lots (for soil ingestion). Therefore, a single set of central tendency and high-end values was estimated for these, based on best professional judgment; this set is referred to as garden area, even though it might also apply to a yard. Because a larger area leads to greater dilution of deposited or eroded contaminant, a high-end garden would be one that was relatively small.

• Areas for agricultural fields were estimated from data in the 1992 Census of Agriculture (U.S. Department of Commerce, 1992). The Census gives average farm acreage by State for 48 States (the data are not yet complete for the two missing States). No percentile data were available. These data do not distinguish between commercial and subsistence farms.

• Mixing Depth—Mixing depth reflects the depth of soil to which deposited or eroded contaminant is mixed. It is important to distinguish between soil that is tilled for agricultural purposes and soil that is untilled in determining appropriate mixing depth values. A smaller mixing depth results in less dilution of a constituent, and therefore higher soil concentrations; therefore, a high-end mixing depth would be smaller than a central tendency mixing depth.

(vii) Surface Water Pathways

Water column as well as benthic sediment concentrations were estimated. Water column concentrations include dissolved, sorbed to suspended sediments, and total (sorbed plus dissolved, or total contaminant divided by total water volume). Benthic sediment concentrations included: Dissolved in pore water, sorbed to benthic sediments, and total. The model accounts for three routes of constituent entry into the water-body were examined: Sorbed to soils eroding into the water-body; dissolved in runoff water; and diffusion of vapor phase contaminants into the water-body. Air deposition of constituents bound to particles into a water-body was not examined because earlier analysis demonstrated that its contribution would be negligible when compared to that of eroding particles. Volatilization of dissolved constituents and removal of constituents through burial in bed sediments were modeled as loss processes.

Important assumptions made for the surface water modeling included: Water-body sufficiently large to support certain ecological receptors; sufficient fish to support a subsistence fisher; uniform mixing within the water-body (this tends to be more realistic for smaller water-bodies as compared to large river systems); and equilibrium is established between constituents within the water column, bed sediments, and air.

The Agency seeks comment on the following issues related to the modeling of surface water pathways:

• Water-body/Watershed Characterization—The water-body characterization parameters are another example of a set of parameters that are interdependent and therefore were used as a group. Watershed characterization relates to the water-body (in the case of the assessment, a stream) characterization. Streams are characterized (flow, water-body area, watershed area, depth, and various other parameters) by their ''order.'' A first-order stream has no tributary channels; a second-order stream forms when two first-order streams converge, and so on through stream order 10. The Agency used a stream order 4 as the high-end estimate because EPA believes this stream order would be among the smallest stream orders that would support sufficient fish or a subsistence fisher and the receptors assessed. A stream order 5 was used as the central-tendency estimate based on the number of streams within each stream order. (See Section 6.8 in the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors for more detail.)

• Total Suspended Solids—Total suspended solids (TSS) can range from 1 to 100 mg/L with a typical value being 10 mg/L for streams and rivers. This value is used as the central tendency value. No data on frequency of values in actual streams was available to estimate a 90th percentile value. Since 80 mg/L is believed to be the maximum tolerable value for aquatic life; this value was used as the high-end value.

• Bed Sediment Concentration—The bed sediment concentration term is analogous to the bulk density for soil in that it describes the concentration of solids in terms of a mass per unit volume. A single value of 1 kg/L was used in the assessment given that this is considered a reasonable value in most situations and the range is quite narrow, 0.5 to 1.5 kg/L.

• Gas-Phase Transfer Coefficient—The gas-phase transfer coefficient is used to estimate volatile losses from the water-body. Volatile losses are calculated using a two-layer resistance model that incorporates a gas-phase transfer coefficient and a liquid-phase transfer coefficient. Both transfer coefficients are controlled by flow induced turbulence in flowing systems. The liquid-phase transfer coefficient is calculated based on chemical-specific properties. A single value of 36,500 m/yr. was used. There is some uncertainty related to setting this parameter to a single value that is not chemical specific. It is reasonable to assume that chemical properties affecting volatility would have some effect on this value, although it is not known how large such an effect would be.

• Fraction Organic Carbon in Bottom Sediment—The fraction organic carbon in bottom sediment is derived from the fraction organic carbon in watershed soils. For a fraction organic carbon of about 0.01 in the watershed, the fraction organic carbon for bottom sediments is typically 0.03 to 0.05. The midpoint of this range, 0.04, divided by the fraction organic carbon of the watershed (0.01) derives a multiplier of 4 for calculating fraction organic carbon in bottom sediments from fraction organic carbon in watershed soils. The fraction organic carbon values used of 0.024 and 0.008 correspond to the central tendency and high-end values for soil fraction organic carbon of 0.006 and 0.002, respectively. The fraction organic carbon in the bottom sediments was varied with the fraction organic carbon in soil.

(viii) Food-Chain Pathways

The Agency seeks comment on the following issues related to the modeling of food-chain pathways: (Please note the fish uptake methodology is described below in Section D.2.c.2), Ecological Receptors and Exposure; the littoral methodology is used for humans):

• Use of regression equations based on Kow to derive biotransfer factors for plants—The biotransfer factors are based upon empirical relationships with Kow defined by studies on relatively few chemicals.

• The lack of accounting for translocation of contaminants within plants—The plant uptake models do not account for translocation of contaminants (should such a translocation occur) from one part of a plant to another. The Agency is considering two models developed by Stephan Trapp, plantx and plantE, and solicits comment on their use.

• Use of regression equations based on Kow to derive biotransfer factors for beef and milk—The biotransfer factors for beef and milk are based upon empirical relationships with Kow defined by studies on relatively few chemicals.

c. Receptors

Both human and ecological receptors are considered in the assessment. The human receptors evaluated were selected to represent a range of behaviors and activities that influence exposure levels. The Agency believes that these represent typical and more exposed types of behaviors and activities that might exist around waste management units or media contaminated by releases from waste management units. Each receptor was evaluated for individual exposure pathways (i.e., exposure to multiple pathways was not included). For ecological receptors, populations or communities were selected for the generic terrestrial and freshwater ecosystems based on behavior patterns such as dietary habits (plant-eater vs. meat-eater) as well as qualities such as significance and representativeness with respect to trophic structure in the ecosystem (bald eagle). The selection of ecological receptors was limited by the level of characterization available such as food intake and body weight. Again, the Agency believes that these represent the types of organisms that might exist around waste management units or media contaminated by releases from waste management units.

(1) Human Receptors and Exposure

Human receptors assessed in the assessment included the following:

• Adult resident living in the vicinity of a management unit—This individual is representative of the general population in the United States and is evaluated independently through the following potential exposure pathways: Inhalation, ingestion of contaminated soil, ingestion of contaminated drinking water, dermal contact with contaminated soil, and dermal contact during bathing. In addition, the analysis evaluates exposures to an adult resident living on-site of a land application unit begining 10 years after closure of the unit.

• Child resident living in the vicinity of a management unit—Children are a special population considered in certain pathways because of their low body weight compared to high intake rates or surface area. A child is evaluated through the following potential exposure pathways: ingestion of contaminated soil, dermal contact with contaminated soil, and dermal contact during bathing.

• Home Gardener—This individual represents a sub-population that supplements their fruit and vegetable consumption with fruits and vegetables they grow on contaminated land.

• Subsistence Fisher—This individual represents a sub-population that subsists on contaminated fish.

• General Fish Consumer—This individual represents a sub-population that consumes contaminated fish and supplements their intake with other non-contaminated foods.

• Subsistence Farmer—This individual represents a sub-population that grows or raises most of their own food on contaminated land. This individual is evaluated independently through the following exposure pathways: beef ingestion, milk ingestion, and fruit and vegetable ingestion.

• On-site Worker—This individual represents the working population that may be found at the waste management units. This individual is evaluated during the active phase of the unit for the following on-site exposures: Inhalation and dermal contact with contaminated soil.

Each of the receptors has been matched with the most relevant exposure routes. Table A–3 in appendix A shows the pathways were modeled for each receptor.

As previously discussed, the assessment begins with a target human toxicity benchmark and exposure assumptions tailored to each receptor, and back-calculates to constituent-specific concentrations in each media. In characterizing the exposure, two exposure parameters are set to high-end values and the rest of the exposure parameters are set to central tendency or default values. The two high-end exposure values were typically exposure duration and a parameter affecting intake of, or exposure to, a contaminant (e.g., fraction contaminated, consumption rate, inhalation rate).

The exposure equations used for back-calculating media concentrations are based on standard risk equations used in most Agency risk assessments. For all inhalation and ingestion pathways, these equations were adapted from Risk Assessment Guidance for Superfund (RAGS): Volume I—Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals) (U.S. EPA, 1991x; hereafter, RAGS Part B) and subsequent modifications. For dermal pathways, which are not covered in RAGS Part B, the equations presented in Dermal Exposure Assessment: Principles and Applications, Interim Report (U.S. EPA 1992x; hereafter, the Dermal document) were used; this document reflects the current techniques for assessing dermal exposure. The Agency requests comment on the data sources and assumptions used in the human exposure portion of the risk assessment, described in detail in Section 5.0 of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors.

The Agency seeks comment on the following types of human exposure that were not examined:

• Ingestion of contaminated water by humans while bathing or swimming—The ingestion rate of water while swimming or bathing is 30 times smaller than the normal consumption rate of water used in the drinking water ingestion pathways; therefore, the drinking water ingestion pathways should be protective of the incidental water ingestion pathways.

• Inhalation of volatiles while bathing—No appropriate, chemical-specific equations could be found to address this pathway.

• Ingestion of airborne particulates—The ingestion rate of soil used in the soil ingestion pathways is many times larger than the ingestion rate from airborne particulates; therefore, the soil ingestion pathways should be protective of the ingestion of airborne particulates. Also, given the way the soil ingestion rates were empirically derived, ingestion of airborne particulates should, in effect, be accounted for in the estimated soil ingestion rates.

• Ingestion of contaminated soil by resident on active site—While the waste management units are active, it is assumed that access is limited to workers.

(2) Ecological Receptors and Exposure

In addition to the human receptors, ecological receptors were evaluated in the assessment. Lacking an Agency precedent for the selection of ecological

receptors for a generic analysis, a simple framework was developed for ecological receptor identification based on EPA's Framework for Ecological Risk Assessment (U.S. EPA, 1992x). During the problem formulation phase, a suite of ecological receptors was selected to include species that represent each of the trophic levels or feeding habits within an ecosystem. At best, one can only infer that an ecosystem is protected from chemical stressors. In addition, the toxicological data support the evaluation of individuals, populations, and occasionally communities, but are inadequate to address the complexities of an ecosystem in most cases. Thus, the approach taken in the assessment was to estimate protective levels for the populations and communities (inferred from the measurement endpoints used) found in generic ecosystems. The species included in the ecological assessment encompass a wide range of dietary preferences, sizes, and trophic levels.

In selecting ecological receptors for the assessment, a number of ecosystem types (e.g., lakes, streams, estuaries, deserts, forests, grasslands) were considered because the waste could be disposed anywhere once it has exited the Subtitle C system. Two generic ecosystems were designed: A freshwater-based ecosystem and a terrestrial-based ecosystem. Specific details of these ecosystems are described in Section 3, Receptors, in the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment of Human and Ecological Receptors. The Agency solicits comment on both the adequacy of the design of the ecosystems used in the assessment and the use of generic ecosystems to assess potential ecological hazards.

Generally, ecological receptors were identified at different trophic levels as well as at different levels of biological organization and included species of relatively low ecological significance but high societal relevance (e.g., American kestrel). The final selection of receptors was based primarily on the availability of data with which to assess the risks to that receptor. As suggested in the Framework for Ecological Risk Assessment (1992x), the process of selecting appropriate assessment endpoints was iterative, including information from the other activities included in the assessment phase—the characterization of ecological effects. The ecological receptors included in the assessment were:

- Mammals—Mammals were evaluated for both generic ecosystems and include upper trophic level predators such as the mink or red fox, lower trophic level consumers such as the whitetail deer, and insectivores such as the meadow mole; species were selected to represent a variety of body sizes, habitats, and dietary habits for which data on body weight, food intake, etc., are available. Mammals may be exposed by eating contaminated prey items (e.g., fish, other vertebrates, insects) or plants, through incidental ingestion of contaminated soil while eating or preening, or through lactation or placental transfer.
- Birds—Birds were also evaluated for both generic ecosystems and include upper trophic level predators such as the red-tailed hawk and lower trophic level consumers such as the American robin; species were selected to represent a variety of body sizes, habitats, and dietary preferences for which input parameters (e.g., body weight, diet, ingestion rates) are available. Birds are exposed through the ingestion of contaminated prey items (e.g., fish, worms), through incidental ingestion that occurs while eating or preening, or through maternal transfer to eggs.
- Terrestrial Plants—Vascular plants that might be common in a generic terrestrial ecosystem were evaluated. The species of plants used to represent plants within the terrestrial ecosystem were determined by the availability of data and included primarily forage grasses and food crops. Plants are exposed through soil-to-root uptake, deposition on the surface of leaves or bark, and during air-to-leaf transport of volatile or semi-volatile constituents.
- Soil Community—Representative species for the soil community were based on six metrics for measuring ecological function: (1) Location, (2) size, (3) abundance, (4) taxon richness, (5) trophic structure, and (6) energy metabolism. Organisms living in or on the soil are exposed through direct contact (e.g., insects), through the ingestion of contaminated soil (e.g., earthworms), and through the ingestion of other soil dwellers (e.g., centipedes). The Agency solicits comment on the representative species selected to comprise the soil community.
- Fish—Given the small percentage of freshwater species for which toxicological data are available, all species of freshwater fish were considered as potential receptors, regardless of size or dietary habits. Fish are subject to continuous exposure to contaminated water via gill exchange and may be exposed to bioaccumulative chemicals through the food chain.
- Aquatic Invertebrates (Daphnids)—Aquatic invertebrates are believed to be among the most sensitive aquatic species (Suter, 1993x), daphnids were selected to represent free living aquatic invertebrates. Continuous exposure to contaminated water is considered the primary route of exposure.
- Aquatic Plants—Vascular aquatic plants and algae typical of aquatic ecosystems were evaluated. Aquatic plants are exposed during sediment-to-root uptake and through water-to-leaf transport.
- Benthic Community—Representative species include organisms that fall within any of the eight taxonomic genera used in the development of the Ambient Water Quality Criteria for the protection of aquatic life. Because these organisms spend most (if not all) of their lives in the sediment, they are exposed through direct contact and ingestion of contaminated sediments as well as through the ingestion of other sediment dwellers.

Each of these receptors has been matched with the exposure pathways and waste management units likely to result in exposure. Table A–4 of appendix A shows which pathways were modeled for each receptor. The Agency solicits comment on the use of a single species to represent major trophic elements.

The development of medium-specific concentrations for the protection of ecological receptors was based on ingestion of contaminated vegetation, water, soil, or prey or through continual contact with a contaminated medium (e.g., aquatic invertebrates with water or soil fauna with soil).

Numerous studies have demonstrated the capacity of hydrophobic organic chemicals to bioaccumulate in the food chain that are orders of magnitude above the concentration in the contaminated medium (e.g., Oliver and Niimi, 1988x). However, it is important to recognize that food-chain pathways may be significant even for constituents that do not bioaccumulate appreciably. Dietary exposure to constituents that concentrate weakly in fish tissue (e.g., bioconcentration factor below 10) may be more significant than exposure to contaminated drinking water simply because a particular animal may ingest relatively more fish than water.

For constituents that bioaccumulate, particularly those that biomagnify, benchmarks should account for exposure through the ingestion of contaminated prey as well as contact with or ingestion of contaminated media. The majority of toxicological studies examined a single route of exposure and seldom considered the potential increase in exposure concentrations through successive

trophic levels. As a result, toxicity benchmarks for bioaccumulative constituents cannot be used as acceptable medium exposure concentrations; exposure estimates must incorporate the bioaccumulation potential in the food chain. For nonbioaccumulating constituents, where toxicity benchmarks that are medium specific (i.e., concentration units—mg/kg or mg/L)) can be used as acceptable medium concentrations for ecological receptors (e.g., Ambient Water Quality Criteria).

In the aquatic ecosystem, for bioaccumulative chemicals (log $K_{ow}$>4), bioaccumulation factors (BAFs) were estimated using models developed by Thomann (1989x) for the limnetic (or pelagic) food chain and Thomann et al. (1992x) for the littoral food chain (i.e., sediment-based). However, for constituents with log $K_{ow}$ above 6.5, only measured values were used. The Agency is considering using the Gobas model since it can be used for constituents with log $K_{ow}$ above 6.5. Further, switching to the Gobas model would be consistent with the Great Lakes Initiative which recently switched to that model. The results produced by either the Thomann models or the Gobas model are very similar. The tissue concentration (TC) was estimated for prey based on the intake, body weight, and dietary preference (i.e., trophic level of fish consumed) of the representative predator species. Protective surface water concentration was calculated by dividing the tissue concentration (TC) by the bioaccumulation factor for the appropriate trophic level. For nonbioaccumulative chemicals, the protective surface water concentration for fish and aquatic organisms was the Final Chronic Value (FCV) or Secondary Chronic Value (SCV) as described in Section 4 of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors. For upper trophic level aquatic wildlife such as mink and osprey, protective surface water concentrations were calculated based on the consumption of contaminated fish and water. The benthic community was included in the littoral ecosystem. Protective sediment concentrations were estimated using the equilibrium partitioning (Eqp) methods developed by Di Toro et al. (1991x). As explained in Section 4 of the Technical Support Document for the Hazardous Waste Identification Rule: Risk Assessment for Human and Ecological Receptors, the sediment benchmark was calculated by multiplying the FCV (or SCV) by the octanol/carbon partition coefficient ($K_{oc}$) and adjusting for the fraction organic carbon ($f_{oc}$) in the sediment. EPA requests comment on the selection of the bioaccumulation model, the potential switch to the Gobas model, BAFs used, dietary assumptions, and how tissue concentrations were calculated.

For receptors in the generic terrestrial ecosystem, methods used represented a range of dietary habits across trophic levels for wildlife, including plants and organisms that live in the soil (i.e., soil fauna). (See the discussion on the development of soil and plant benchmarks elsewhere in today's rule.) For higher trophic level wildlife, dietary preferences, daily intake, and bioconcentration factors for prey items were identified or estimated to calculate protective soil concentrations. The key equation used to back-calculate soil concentrations as a function of dietary exposure (including soil ingestion), and the exposure inputs (e.g., body weights, daily intake) for ecological receptors are discussed in Section 5.3 of the Risk Assessment. The Agency requests comment on the equations and inputs used in the generic terrestrial ecosystem modeling.

The following types of exposure were not assessed in the assessment:

- Inhalation by ecological receptors—No suitable methodology was available.
- Dermal contact with soil—No suitable methodology or sufficient toxicity data were available.
- Dermal contact with water—No suitable methodology or sufficient toxicity data were available.

3. Groundwater Fate and Transport Modeling

In the risk analysis previously described in the section, the pathways involving groundwater are only modeled (back-calculated) to the wellhead, i.e., to the point of exposure at a water well. For groundwater modeling from the waste management unit (i.e., surface impoundment) to the water well, the Agency used a separate fate and transport analysis. This section describes the groundwater model and the modeling procedures for the various waste management scenarios for the groundwater path. The details of the model and the modeling procedures are presented in the background documents (USEPA, 1995 a-f).

The Agency has developed specialized subsurface fate and transport modeling for four waste management options: (1) Landfills; (2) surface impoundments; (3) waste piles; and (4) land application units. All four waste management scenarios assume that the waste if exempted could be managed in the respective RCRA Subtitle D units. In deriving the exemption levels, the Agency needs to evaluate the fate and transport of constituents from the waste unit to the nearby drinking water wells. The potential migration of constituents from a waste unit to the leachate at the bottom of the waste unit can be simulated by the laboratory test, the Toxicity Leaching Procedure (TCLP), or the Synthetic Precipitation Leaching Procedure (SPLP), Method 1312. Although one procedure may be more applicable for some wastes than the other procedure, as described on page 21483 of the Federal Register Notice of May 20, 1992 (57 FR 21450), the Agency is soliciting comments on the applicability and use of one test over the other for this proposal.

The fate and transport of constituents in leachate from the bottom of the waste unit through the unsaturated zone and to a drinking water well in the saturated zone is estimated using a fate and transport model. The Agency proposes to use EPACMTP (EPA's Composite Model for leachate migration with Transformation Products) for this purpose. The EPACMTP considers not only the subsurface fate and transport of chemical constituents, but also the formation and the fate and transport of transformation (daughter) products. The Agency also solicits comments on the technical correctness and applicability of the model and the data for this proposal.

The Agency proposed the use of a subsurface fate and transport model (EPASMOD) on June 13,1986 (51 FR 21648) in the Toxicity Characteristic (TC) Rule. However, after receiving numerous comments, the Agency revised the model and the data used in the model (53 FR 28692) and the enhanced model (EPACML) was used in the TC Final Rule (55 FR 11798). The EPACMTP replaces the EPACML for use in this proposal. The EPACMTP was recently published in a refereed journal (Kool, Sudicky and Saleem, Journal of Contaminant Hydrology 17(1994) 69–90) and has been reviewed by the EPA's Science Advisory Board (SAB). The SAB commended the Agency for making for its significant improvements to the model. They also stated that it represents the state of the art for such analyses. However, they also recommended additional testing of the model.

The modeling approach used for this proposed rulemaking includes three major categories of enhancements over the EPACML and the approach for the TC rule. The enhancements fall into the

following categories: (1) Incorporation of additional fate and transport processes (e.g., degradation of chemical constituents); (2) Use of enhanced flow and transport solution algorithms and techniques (e.g., three-dimensional transport); and (3) Revision of the Monte Carlo methodology (e.g., site-based implementation of available input data). A discussion of the key enhancements which have been implemented in the EPACMTP is presented here and the details are provided in the background documents (USEPA, 1995a-g). The Agency is soliciting comments on the modeling enhancements and the modeling methodology as well as on the values derived for individual chemical constituents:

(1) Fate and Transport Processes

*Effects of groundwater mounding underneath waste unit.*—The EPACML was limited to conditions of uniform groundwater flow. It could not handle accurately the conditions of significant groundwater mounding and non-uniform groundwater flow due to a high rate of infiltration from the waste units. These conditions increase the transverse horizontal as well as the vertical spreading of a contaminant plume. The EPACMTP accounts for these effects directly by simulating groundwater flow in the vertical as well as horizontal directions (USEPA, 1995 a).

*Transformation products.*—The EPACMTP model has capability to simulate the formation and fate of multiple transformation products (up to seven) in the unsaturated as well as in the saturated zones. For constituents which have toxic transformation products, the EPACMTP can provide an assessment of the groundwater impact of the transformation products, along with that of the parent constituent. This methodology has been implemented for hydrolyzing organic constituents included in this proposal.

*Fate and transport of metals.*—The EPACMTP can simulate fate and transport of metals, taking into account geochemical influences on the mobility of metals. The EPA's MINTEQA2 (USEPA, 1995 f) metals speciation model is used to generate effective sorption isotherms for individual metals, corresponding to a range of geochemical conditions. The transport modules in EPACMTP have been enhanced to incorporate the nonlinear MINTEQ sorption isotherms. This enhancement provides the model with capability to simulate, in the unsaturated and in the saturated zones, the impact of Ph, leachate organic matter, natural organic matter, iron hydroxide and the presence of other ions in the groundwater on the mobility of metals.

(2) Enhanced Solution Algorithms and Techniques

*Linkage between unsaturated zone and saturated zone modules.*—The saturated zone module implemented in the EPACML was based on a Gaussian distribution of concentration of a chemical constituent in the saturated zone. The module also used an approximation to account for the initial mixing of the contaminant entering at the water table underneath the waste unit. The approximate nature of this mixing factor could sometimes lead to unrealistic values of contaminant concentration in the groundwater close to the waste unit, especially in cases of a high infiltration rate from the waste unit. The enhanced model incorporates a direct linkage between the unsaturated zone and saturated zone modules which overcomes these limitations of the EPACML.

*Numerical transport solution modules.*—To enable a greater flexibility and range of conditions that can be modeled, the analytical saturated zone transport module has been replaced with a numerical module, based on the highly efficient state-of-the-art Laplace Transform Galerkin (LTG) technique. The enhanced module can simulate the anisotropic, non-uniform groundwater flow, and transient, finite source, conditions. The latter requires the model to calculate a maximum receptor well concentration over a finite time horizon, rather than just the steady state concentration which was calculated by the EPACML. The saturated zone modules have been implemented to provide either a fully three-dimensional solution, or a highly efficient quasi-3D solution. The latter has been implemented for Monte Carlo applications and provides nearly the same accuracy as the fully three-dimensional option, but is more computationally efficient. Both the unsaturated zone and the saturated zone transport modules can accommodate the formation and the transport of parent as well as of the transformation products.

*Solution for nonlinear metals transport.*—A highly efficient semi-analytical unsaturated zone transport module has been incorporated to handle the transport of metals in the unsaturated zone and can use MINTEQA2 derived linear or nonlinear sorption isotherms. Conventional numerical solution techniques are inadequate to handle extremely nonlinear isotherms. An enhanced method-of-characteristic based solution has been implemented which overcomes these problems and thereby enables the simulation of metals transport in the Monte Carlo framework. Non-linearity in the metals sorption isotherms is primarily of concern at higher concentration values; for low concentrations, the isotherms are linear or close to linear. Because of the attenuation in the unsaturated zone, and the subsequent dilution in the saturated zone, concentrations in the saturated zone are usually low enough so that properly linearized isotherms are used by the model in the saturated zone without significant errors.

*Elimination of biases in determination of receptor well location.*—The internal routines in the model which determine placement of the receptor well relative to the areal extent of the contaminant plume have been revised and enhanced to eliminate bias which was present in the implementation in the EPACML. The calculation of the areal extent of the plume has been revised to take into consideration the dimensions of the waste unit. The logic for placing a receptor well inside the plume limits has been improved to eliminate a bias towards larger waste unit areas and to ensure that the placement of the well inside these limits, for a given radial distance from the unit, is truly randomly uniform. However, for this proposal, *the closest drinking water well is located anywhere on the downgradient side of the waste unit and the Agency is soliciting any comments on this procedure.*

(3) Revisions of Monte Carlo methodology for nationwide assessment

*Data sources.*—The data sources from which parameter distributions for nationwide Monte Carlo assessments are obtained have been evaluated, and where appropriate, have been revised to make use of the latest data available for modeling. Leachate rates for Subtitle D waste units have been revised using the latest version of the HELP model with the revised data inputs. Source specific input parameters (e.g., waste unit area and volume) have been developed for various different types of industrial waste units besides landfills. Input values for the groundwater related parameters have been revised to utilize information from a nationwide industry survey of actual contaminated sites.

*Finite-source methodology.*—The original version of the model was implemented for Monte Carlo assessments assuming continuous source (infinite source) conditions only. This methodology did not take into account the finite volume and/or operational life of waste units. The EPACMTP model has been

implemented for Monte Carlo assessments of either continuous source or finite source scenarios. In the latter scenario, predicted groundwater impact is not only based on the concentrations of contaminants in the leachate, but also on the amount of constituent in the waste unit and/or the operational life of the unit. The Monte Carlo methodology was enhanced to allow determination of regulatory threshold levels for these two waste characteristics USEPA, 1995.

*Site-based regional analysis.*—The Monte Carlo methodology has been fundamentally revised and enhanced to account for the interdependency among the various model input parameters based on regional distributions. The original methodology simply assumed that a waste site could be located anywhere in the US, and that the probability distributions of individual model parameters (e.g., infiltration rate, depth to groundwater, etc.) at any waste site were mutually independent and given by their nationwide frequency distributions. The model therefore only had limited capability to account for correlations and dependencies among the model parameters. To address this limitation, a site-based methodology has been implemented, based on the OSW's surveys of existing waste facilities in the US, and their geographical locations. The information of geographical location is used in this enhanced approach to select the other model parameters, such as infiltration rate and hydrogeological characteristics. A number of different sources were reviewed for the development of the site-based approach. Four of these sets were selected to derive the regional characteristics of the more important parameters for each sampled site: The OSW's survey of industrial waste management units (EPA, 1986); the infiltration and recharge analysis performed for U.S. climatic regions; the U.S. Geological Survey inventory of groundwater resources; and the API's (American Petroleum Institute) survey of hydrogeologic parameters for the different groundwater environments in the U.S.

(4) Implementation of EPACMTP

The specific modeling options selected for the modeling analyses are summarized in Table 3 below. All modeling analyses were conducted in the finite source, Monte Carlo mode, for four industrial Subtitle D waste management scenarios. The groundwater fate and transport model was used to predict the maximum concentration at a receptor well placed down gradient from the waste unit. A 10,000 years time limit was imposed on the exposure time period, i.e., the calculated concentration is the highest exposure concentration occurring within 10,000 years following the initial release from the waste unit. The Monte Carlo fate and transport simulation provides a probability distribution of receptor well exposure concentrations as a function of waste and leachate concentrations. For this proposal, the groundwater modeling results were used to derive leachate concentration thresholds. For carcinogenic constituents, the exposure concentration calculated by the model corresponds to the maximum 30-year average receptor well concentration. For non-carcinogenic constituents, the peak receptor well concentration is used. The regulatory threshold leachate concentration limits were determined using a back-calculation procedure, to correspond to an approximate 90th percentile protection level. This means that the closest downgradient drinking-water wells at 90% of the industrial Subtitle D waste management units would have water concentrations below the HBN/MCL. The wells further away at 90% of the sites would be protected at higher protection levels. The wells at the other 10% of the sites would be protected at lower protection levels.

The Agency uses a 95th percentile protection level in the RCRA Delisting program and the 85th percentile for the toxicity characteristic program. These two programs have slightly different goals from the exemption proposed today. The recently developed Superfund soil-screening levels use a 90th percentile protection level to identify sites at which no additional investigation for possible remediation is required. The exit proposed today is similar to the soil-screening levels program. Today's proposed exit is intended to identify wastes no longer needing Subtitle C management. Finally, the 90th percentile was chosen because it is nearly consistent with the protectiveness level in the other pathways of the multipath risk assessment performed for today's proposal as far as could be identified.

Table 3 provides a summary of the methodology and/or data sources used to obtain values for the source-specific parameters, chemical-specific parameters, unsaturated zone parameters, saturated zone parameters, and receptor well location parameters. Because the groundwater pathway analysis was performed in Monte Carlo mode, all parameters are in principle described by their probability distributions. Details on the actual distributions used are provided in the background documents (USEPA, 1995a-g). Probability distributions used for the unsaturated zone parameters, the saturated zone parameters, and receptor well location parameters were the same for all waste management scenarios and individual constituents that were analyzed for today's exit.

(5) Waste Management Scenarios

The waste management unit represents the source term in the fate and transport model for the waste management scenarios evaluated for groundwater contamination. In the modeling framework, the source is defined in terms of four key parameters: (i) Waste unit area, (ii) Leachate flux (infiltration) rate, (iii) Leachate concentration, and (iv) Duration of leachate pulse. The first of these parameters, waste unit area, was determined from the nationwide OSW survey of industrial Subtitle D waste management facilities (USEPA, 1995 a-b). After screening out records with unreliable waste site area and/or volume, the OSW Industrial Subtitle D survey provides data on location, area and volume of 790 landfills, 1655 surface impoundments, 774 waste piles, and 311 land application sites nationwide. The weighted distributions of waste unit characteristics used as input to the model are based on the results of the survey.

The leachate flux, or infiltration rate, and duration of the leachate pulse are determined from the design and operational characteristics of the waste management scenario being modeled. Consideration of a leachate pulse of finite duration is a fundamental aspect of the present analysis and distinguishes it from the continuous source (infinite source) assumption used for the 1990 Toxicity Characteristic (TC) Rule (55 FR 11798). It should be emphasized though that the results of the finite source analysis are not necessarily different from those of the continuous source analysis. If the source leaching duration is long enough to drive the maximum receptor well concentration to its steady state value, the finite source and continuous source analyses are in fact the same. In practice, the distinction between continuous source and finite source analysis is the most important for chemicals which are subjects to sorption, speciation, and/or degradation, including hydrolyzing organics and metals.

The leachate concentration of specific constituents in the waste forms the basis for regulating the wastes. The leachate concentration is not specified a-priori, but rather it is back-calculated at the end of the Monte Carlo analysis to satisfy the regulatory criterion that the

maximum groundwater exposure concentration should be at, or below, the constituent-specific health-based drinking water standard, in at least 90 % of the cases.

The following sections present background on the determination of the source parameters for each waste management scenario.

*Landfills.*—The key characteristic of the landfill scenario is that the duration of the leachate pulse is independent of the operational life of the waste management unit, i.e., the period of time required to fill the landfill. The landfill is taken to be filled to capacity and covered when leaching begins. The time period during which the landfill is filled-up, usually on the order of 20 years, is considered to be small relative to the time required to leach all of the constituent mass out of the landfill. The model simulation results indicate that this assumption is not unreasonable; the model calculated leaching duration (see below) is typically on the order of several hundred years.

The leachate flux, or infiltration rate, is determined using the HELP model. The net infiltration rate is calculated using a water balance approach, which considers precipitation, evapo-transpiration, and surface run-off. The HELP model was used to calculate landfill infiltration rates for a representative subtitle D landfill with 2-foot earthen cover, and no liner or leachate collection system, using climatic data from 97 climatic stations located throughout the US. These correspond to the reasonable worst case assumptions as explained in the Risk Assessment Background Document (USEPA, 1995b). The model calculates the daily water balance for the total period for which climatic data are available. For each waste site in the OSW survey, an infiltration rate was calculated using the data from the closest climate station (USEPA, 1995b).

In the landfill scenario, the duration of the leaching period is not prescribed. Instead it is calculated as part of the Monte Carlo simulation from the total mass of constituent in the landfill, and the rate of leaching. This relationship is derived from a straight-forward mass balance principles. The methodology is documented in the Background Document for the Finite Source Procedure (USEPA, 1995-c); only the most salient aspects are presented here.

The duration of the leachate pulse, $T_p$, is determined by the total mass of constituent that is initially present in the landfill, and the rate at which the constituent is removed by leaching:

$$A_w \cdot d \cdot F_h \cdot P_{hw} \cdot C_W = A_w \cdot I \cdot C_L \cdot T_P$$

or

$$T_P = \{d \cdot F_h \cdot P_{hw}\} \text{ over } \{I\}\ C_W \text{ over } C_L$$

where

$A_w$=Area of the waste unit ($m^2$),
d=Depth of waste unit (m),
$F_h$=Fraction of waste unit volume occupied by this waste,
$P_{hw}$=Density of the waste ($g/cm^3$),
I=Leachate flux (Infiltration) rate (m/y),
$C_W$=Constituent waste concentration (mg/kg), and
$C_L$=Constituent leachate concentration (mg/L).

The determination of $T_p$ according to (2) tacitly assumes that the constituent does not degrade inside the waste unit, does not consider removal by mechanisms other than leaching (e.g., volatilization), and assumes that all of the constituent mass will eventually leach out. The formulation given above also assumes that the leachate concentration, $C_L$, remains constant until all of the constituent mass has leached out. The methodology was adapted to handle a time-varying leachate concentration, e.g., a gradually diminishing leachate concentration to represent the depletion of the contaminant mass in the landfill over time. If it is assumed that the leaching of the constituent from the waste into the water phase is controlled by a linear equilibrium partitioning process, the reduction of the leachate concentration with time can be modeled as a first-order decay process (EPA, 1995c):

$$C_L(t) = C_L^0 e\{-\lambda t\}$$

where

$C_L^0$=Initial leaching concentration (mg/L)
$\lambda$=Apparent decay constant ($y^{-1}$)
t=Time (y)

The rate at which the leachate concentration is reduced is determined by the coefficient $\lambda$, which is given by:

$$\lambda = \{I\} \text{ over } [\{d\ F_{hw} P_{hw}\}\{C_W \text{ over } C_L^0\}]$$

Using (3), the leachate concentration will gradually and asymptotically be reduced to zero. The total amount of constituent that is released into the subsurface will be the same whether a constant leachate concentration of finite duration, or a gradually diminishing leachate concentration is assumed. In the latter case, the duration of the release period is longer, but the average leachate concentration lower, as compared to the former case.

It can be seen from either (2) or (4) that the duration of the leachate pulse, or the rate of depletion, respectively, can be expressed as a function of the initial leachate concentration, $C_L$. For the modeling analyses, equation (3) was used for organic constituents. The underlying assumption that the concentration is controlled by linear equilibrium partitioning is reasonable for organic constituents. For metals, the pulse release option (equation 2) with constant leaching concentration was used.

The calculation of $T_p$ (or $\lambda$) requires a number of ancillary source and waste parameters. These are the depth of the waste unit (d), the fraction of the waste unit occupied by the waste ($F_h$), and the waste density ($P_{hw}$). The waste unit depth is obtained directly from the OSW waste site survey. The survey provides data on both landfill areas and volumes, which allows the depth to be calculated for any landfill selected during the Monte Carlo simulation. The fraction of waste in the landfill is assigned a uniform distribution with lower and upper limits of 0.036 and 1.0, respectively, based on analysis of waste composition in Subtitle D landfills (EPA, 1995). The lower bound assures that the waste unit will always contains a minimum amount of the waste of concern. The waste density is assigned a value based on reported densities of hazardous waste, and varies between 0.7 and 2.1 $g/cm^3$ (EPA, 1995c).

*Surface Impoundment.*—The surface impoundment waste management scenario is that of a non-hazardous waste industrial impoundment. The area of the impoundment is obtained from the OSW Subtitle D Industrial Survey (USEPA 1995 b). No direct data is available on the rate of infiltration from surface impoundments. The rate of infiltration from the impoundment is calculated inside the EPACMTP fate and transport model. The rate of infiltration is calculated, using Darcy's Law, as a function of surface impoundment depth, and hydraulic conductivity and thickness of a low-permeability sediment layer at the base of the impoundment.

Impoundment depth is obtained from the OSW survey, for each impoundment site in the survey, in the same way as the landfill depth is obtained (see above). The sediment layer at the base of the impoundment is taken to be 2 feet thick, and have an effective equivalent saturated conductivity of $10^{-7}$ cm/s . These values were selected in recognition of the fact that most non-hazardous waste surface impoundments do have some kind of liners in place (USEPA, 1995b). During the Monte Carlo fate and transport simulation, the infiltration rate is calculated using the impoundment depth value for the specific unit selected for each Monte Carlo realization.

The leachate concentration again is not determined a priori, but is determined after the analysis, based on

the desired regulatory protection level (90th percentile). The surface impoundment is taken to have a 20-year operational life. After this period, the impoundment may be filled in, or simply abandoned. In the latter case, the waste in the impoundment will drain and/or evaporate relatively quickly. In the modeling analysis, the duration of the leaching period is therefore set equal to 20-years.

*Waste Pile.*—The waste pile management scenario is conceptually similar to that of the landfill, but differs in a number of key aspects. In contrast to landfills which represent a long-term waste management scenario, waste piles represent a more temporary management scenario. During the operational life of the waste pile, it may be regarded as an uncovered landfill. Typically at the end of the active life of a waste pile, the waste material is either removed for land filling, or the waste pile is covered and left in place. If the waste is removed, there is no longer a source of potential contamination. If a waste pile is covered and left in place, it then becomes equivalent to a landfill, and consequently is to be regulated as a landfill. For the analyses, therefore, only the groundwater impacts associated with the period that the waste pile is active, are considered.

Data on the waste pile area are obtained from the OSW Subtitle D survey. Infiltration rates for the waste pile are obtained by treating the waste pile as an uncovered landfill. HELP model derived landfill infiltration rates assuming a sandy loam soil cover were used to assign infiltration rates for waste piles. A sandy loam cover represents the most permeable cover considered for the landfill scenario, and most closely resembles a situation in which no cover is present. The methodology for assigning an infiltration rate to any specific waste pile in the OSW survey follows that used for landfills (see above).

An active life of 20 years is assumed for the waste pile. This also determines the duration of the leaching period. As with the landfill and surface impoundment scenario, the leachate concentration is determined at the end of the analysis, to satisfy the regulatory protection level.

*Land Application Units.*—Data on the location, area and waste application rates at industrial land application sites were obtained from the OSW survey of industrial Subtitle D sites. Location-specific infiltration rates were estimated for each land application site by applying the HELP model, using climatic data from the nearest climate station. Because wastes applied at land application sites typically have a high liquid content, this factor was accounted for in the water balance calculations. An annual waste application rate of six inches of waste, containing 85% water was assumed. This is typical of sludges which constitute a large fraction of waste at land application sites. Therefore, an additional 5.1 inches of water were added to the natural precipitation for the water balance evaluation at each land application site.

The leaching duration for the land application unit was set to 40 years, consistent with the release period modeled for the air pathway. No reliable data were available for the active life of land application units. Using a longer value than for surface impoundments and waste piles is warranted because part of the applied waste material may remain in the soil at the end of the active life of a land application unit, and may continue as a source of contaminant leaching.

(6) Determination of Regulatory Waste and Leachate Concentration Limits

The objective of the Monte Carlo fate and transport analysis is the determination of regulatory limits for the concentration of individual toxic constituents in the leachate, $C_L$. These limits are determined so as to satisfy the regulatory criterion that disposal of a waste in a subtitle D waste management unit should not lead to an exceedance of the health-based value or the drinking water standard, at a receptor well placed down gradient from the waste unit, in at least 90% of the cases.

The $C_L$ limits are specific to each waste management scenario, and are also constituent specific. $C_L$ limits are constituent specific because of their dependence on constituent specific health-based standards, as well as on constituent specific fate and transport characteristics that affect the concentration received at the receptor well. The latter factors are discussed in the following section; this section discusses the determination of regulatory $C_L$ thresholds.

Using Equation (2) or (3) and (4), the groundwater exposure concentration calculated by the fate and transport model can be expressed as a function $C_L$. All other parameters used in the modeling analysis are obtained from prescribed probability distributions. Consequently, by comparing the predicted exposure concentration to the appropriate regulatory standard, e.g., health-based value or a drinking-water standard, threshold levels of $C_L$, can be calculated. Wastes for which the leachate concentration exceeds the $C_L$ threshold would not be exempted. Because the Monte Carlo analysis produces a probability distribution of exposure concentrations, the back-calculation of $C_L$ threshold levels can be performed for any desired level of protection.

For those constituents that degrade (see next subsection) and produce toxic degradation products, the development of regulatory threshold values for $C_L$ considers not only the exposure concentration and toxicity of the parent constituent, but also the exposure concentration and toxicity of toxic transformation products. For instance, consider two waste constituents that have similar toxicity values, i.e., similar health-based levels, as well as similar fate and transport characteristics, so that they show comparable values for the model simulated receptor well exposure concentration. However, if one of the two chemicals produces toxic off-spring, but the other chemical does not, the chemical which has toxic daughter products will have more stringent limits for $C_L$.

(7) Chemical—Specific Fate and Transport Processes

The Monte Carlo fate and transport analysis considers chemical-specific sorption and hydrolysis (degradation) characteristics. These characteristics directly affect the model-predicted groundwater exposure concentration. Chemicals which are subject to sorption and/or hydrolysis will exhibit lower exposure concentration as compared to non-sorbing, non-degrading chemicals. This translates into higher regulatory waste and concentration limits. Two broad groups of chemicals are considered under today's proposal. They are organic constituents and metals.

*Organic Constituents.*—Organic constituents account for the largest group of chemicals addressed under today's proposal. The groundwater pathway analyses were performed for a total of 222 organic constituents. The fate and transport analysis accounts for sorption of organics onto soil and aquifer organic matter, as expressed by a chemical-specific organic-carbon partition coefficient (Koc), and degradation due to hydrolysis reactions, as expressed by chemical-specific hydrolysis constants. Sorption is modeled as a reversible, linear equilibrium process. Degradation due to hydrolysis is modeled as a first-order kinetic process. The groundwater pathway analysis utilizes a comprehensive set of Koc values and hydrolysis rate constants compiled by the EPA–ORD (Environmental Fate

Constants for Organic Chemicals Under Consideration for EPA's Hazardous Waste Identification Projects , EPA/600/R–93/132). Chemicals with identical Koc values and hydrolysis constants will exhibit the same fate and transport behavior, and given the same leachate concentration and leaching period, they will result in the same exposure concentration. Note, however, that they may still have different regulatory leachate concentration limits, if they have different health-based drinking water standards and/or produce toxic transformation products.

For the groundwater pathway analysis, organic constituents with a hydrolysis half-life of 6,900 years or less (first-order degradation rate of $10^{-4}$ or greater) were classified as degraders, the remainder were classified as non-degraders. The EPACMTP can simulate the formation and subsequent fate and transport of transformation daughter products, enabling the groundwater exposure concentrations of any toxic transformation products to be determined and, therefore, included in the determination of leachate concentration thresholds.

It has been established, by analyzing modeling results for different constituents with a range of sorption and degradation characteristics that, after normalizing the results against the chemical-specific HBN/MCL, the effect of sorption and degradation on the regulatory values can be expressed as a function of the Koc and hydrolysis rate coefficients, using a straight-forward scaling relationship. After these relationships have been established, it is not actually necessary to conduct the Monte Carlo fate and transport computer simulations for each individual constituent. Instead, for each waste management scenario of concern, a set of reference $C_L$ values are generated by running the Monte Carlo model for a selected range of values of Koc and hydrolysis rate coefficients using a normalized HBN/MCL of 1 mg/L. Constituent-specific $C_L^{MIN}$ values are then determined in two steps: First, the reference curves are scaled to the constituent specific Koc value, and (for degraders) hydrolysis rate coefficients. Secondly, an adjustment is made for the constituent-specific value of the drinking water standard. The final values of $C_L^{MIN}$ are obtained by multiplying the concentration limits based on the normalized drinking water standard, by the actual value of the drinking water standard of that particular constituent. For constituents with toxic transformation products, this procedure is repeated for the transformation products, to find the minimum values of $C_L$ ($C_L^{MIN}$) which ensure that the exposure concentrations of the parent constituent and any daughter products will not be exceeded. The benefit of this approach is that if additional constituents are to be regulated, or a different value of the drinking water standard HBN/MCL, the appropriate $C_L^{MIN}$ can be determined with less effort, because it is not necessary to repeat the time-consuming complete Monte Carlo simulation.

*Metals.*—Fate and transport of metals in the subsurface may be controlled by complex geochemical interactions. To account for these processes, the OSW has developed and implemented a modeling approach which utilizes the MINTEQA2 metals speciation model in conjunction with the EPACMTP subsurface fate and transport model. The MINTEQ model has been applied to generate effective sorption isotherms reflecting variations in four geochemical master variables affecting metals fate and transport. These factors are: Ph, leachate organic matter natural organic matter in the soil or aquifer, and ironhydroxide content. Each of these parameters has a range of values, reflecting their nationwide probability.

TABLE 3.—EPACMTP MODELING OPTIONS

| | |
|---|---|
| Management Scenarios | Industrial Subtitle D: (i) Landfill; (ii) Surface Impoundment; (iii) Waste Pile; and (iv) Land Application Unit. |
| Modeling Scenario | Finite Source Monte Carlo. |
| Regulatory Protection Level | 90% (yields an approximate DAF of 10 for a continuous source landfill). |
| Source Parameters: | |
| Waste Unit Area | Site based, form OSW Industrial Subtitle D Survey. |
| Waste Unit Volume | Site based, from OSW Industrial Subtitle D Survey. |
| Infiltration Rate: | |
| *Landfill* | Site-based, derived from water balance using HELP model. |
| *Surface Impoundment* | Site-based, derived from impoundment depth using Darcy's law. |
| *Waste Pile* | Site-based derived from water balance using HELP model. |
| *Land Application Unit* | Site-based, derived from water balance using HELP model. |
| Leaching Duration: | |
| *Landfill* | Derived, continues until all constituent has leached out. |
| *Surface Impoundment* | 20 years (operational life of waste unit). |
| *Waste Pile Land* | 20 years (operational life of waste unit). |
| *Application Unit* | 40 years. |
| Chemical Specific Parameters: | |
| Decay Rate: | |
| *Organics* | Hydrolysis rates based on measurements or based on appropriate structure-activity relationships. |
| *Metals* | No decay. |
| Sorption: | |
| *Organics* | $K_{oc}$ estimated from $K_{ow}$, which is based on measurements or based on appropriate structure-activity relationships. |
| *Metals* | MINTEQ sorption isotherms (Pb, Hg, Ni, Cr (III), Ba, Cd).<br>pH dependent isotherms (As, Cr (VI), Se (VI), Th) |
| Unsaturated Zone Parameters: | |
| Depth to groundwater | Site-based, from API/USGS hydrogeologic database. |
| Soil Hydraulic Parameters | National distribution for the main soil types. |
| Fraction Organic Carbon | National distribution for the main soil types. |
| Bulk Density | National distribution for the main soil types. |
| Saturated Zone Parameters: | |
| Recharge Rate | Site-based, derived from precipitation/evaporation and soil type. |

TABLE 3.—EPACMTP MODELING OPTIONS—Continued

| | |
|---|---|
| Saturated Thickness | Site-based, from API/USGS hydrogeologic database. |
| Hydraulic Conductivity | Site-based, from API/USGS hydrogeologic database. |
| Porosity | Effective porosity derived from national distribution of aquifer particle diameter. |
| Bulk Density | Derived from porosity. |
| Dispersivity | Derived from a national distribution and is based on distance to the receptor well. |
| Groundwater Temperature | Site-based, from USGS regional temperature map. |
| Fraction Organic Carbon | National distribution, from EPA STORET database. |
| pH | National distribution, from EPA STORET database. |
| Receptor Well Location: | |
| Radial Distance | Nationwide distribution based the survey. |
| Angle Off-Center | Uniform within ± 90° from plume centerline. |
| Depth of Intake Point | (No restriction to be within plume) Uniform throughout saturated thickness of aquifer. |

4. Other Risk Assessment Issues

a. Differences Between the Groundwater and Non-groundwater Analyses

As mentioned previously, the Agency conducted separate analyses for the evaluation of risks from groundwater and non-groundwater pathways. The groundwater pathways relied on a full Monte Carlo analysis; whereas the non-groundwater pathway analyses were performed using high-end and central tendency parameters, consistent EPA's risk characterization guidance (EPA 1995).

Although the approaches to the modeling differed, the Agency used the same data for parameter inputs (i.e., OSW's Industrial Subtitle D Survey, U.S. EPA 1986) to describe the waste management units common to both analyses (i.e, surface impoundments, waste piles, and land application units). However, even though the same data were used, some differences exist based on the different modeling approaches. These differences are discussed below.

(1) Infiltration

For the groundwater pathway analysis, the Agency used the HELP model to calculate the net infiltration rate for landfills, land application units and waste piles, as a function of regional climatic conditions and waste unit design characteristics (see EPACMTP background Document). The analysis used the meteorological data from 93 meteorological stations located throughout the United States to develop infiltration rate distributions using the HELP model.

For the non-groundwater analysis, the Agency used rainfall to calculate the recharge rate. The rainfall was selected from 29 meteorological stations distributed among 9 climate regions. However, the method for selecting the rainfall factor differed between the air release pathways and the overland release pathways.

- For the air release pathways, the Agency conducted a sensitivity analysis for each waste management unit type to rank the 29 meteorological stations with respect to several air modeling outputs, including maximum air concentration of pollutants, average air concentrations over the agricultural field and water body, and average deposition over the agricultural field and water body. Based on these sensitivity analyses, the Agency selected a central tendency location and high-end location for the air pathway for each of the waste management units. Thus, locations with meteorologic data, including the rainfall factor, approaching the central tendency and high-end values were selected for each waste management unit.
- For the overland release pathways, the Agency ranked the rainfall factors from the 29 meteorological stations and selected the 50th and 90th percentile based on the distribution of the 29 meteorological stations.

(2) Density of Waste Applied to the Land Application Unit

The approach used in the groundwater analysis assumed the bulk density of the applied waste to be 1 gram per cubic centimeter (g/cc) because the waste was assumed to be comprised predominantly of water. However, changes in the density of applied waste do not significantly affect the results of the groundwater modeling results.

The approach used in the non-groundwater analysis assumed the bulk density of waste to be analogous to the density of sewage sludge (i.e., 1.4 g/cc). The waste in the LAU is a mixture of industrial waste and soil. The central tendency bulk density for soil (i.e., 1.5 g/cc) is similar to the bulk density assumed for industrial waste. Because the waste is incorporated into soil, the properties of the waste/soil mixture are needed. There is little variability in bulk density for the type of soil used in the analysis (i.e., loam), thus, the same value was used for central tendency and high-end estimates of the waste/soil mixture bulk density.

(3) Unsaturated Zone Characteristics

The groundwater pathway analysis used the characteristics (e.g., percent organic matter, saturated hydraulic conductivity) of the entire unsaturated zone as input into the modeling analysis. The non-groundwater pathway analysis used as input the characteristics of only the upper portions of the unsaturated zone because these characteristics were those significant for the surface exposure pathways.

(4) Hydrolysis Rates

The hydrolysis rate for a chemical constituent is used in the Monte Carlo groundwater pathway analysis as a function of temperature and pH of the groundwater at the Monte Carlo realized site. The Agency used hydrolysis rates for constituents that have been measured through appropriate structure activity relationships. They have been reviewed by a panel of experts from the Agency's Office of Research and Development (USEPA, 1993). The non-groundwater pathway analysis used hydrolysis rates from the ''Handbook of Environmental Fate and Exposure Data for Organic Chemicals'' (Howard et. al, 1993).

b. Other Groundwater Pathway Analysis Issues

(1) Use of 1,000 Year Versus 10,000 Year Exposure Time Horizon

The Agency's proposal is based on a 10,000 year time horizon for the groundwater pathway. This means that the determination of leachate concentration limits is based on the highest (30-year average) concentration that occurs within 10,000 years from the start of the release. Although this longer time horizon has been used in other programs (U.S. Nuclear Regulatory

Commission and U.S. Department of Energy), the Agency is considering using 1,000 years as an alternative time horizon. The Agency requests comment on this issue which is described in more detail below.

Using this shorter time horizon results in an increase of the leachate concentration limit for a number of constituents. The constituents affected are those which are strongly sorbed in the subsurface, and which therefore tend to migrate slowly. These constituents include organics with retardation factors (R) significantly greater than one. The organic carbon partition coefficient ($k_{oc}$) values for these constituents are about 3,500 g/cm$^3$ or greater, and certain metals such as lead and chromium(III). For organic constituents with $k_{oc}$ values less than about 3,500 g/cm$^3$, the highest receptor well exposure concentration is generally reached in less than 1,000 years. Reducing the modeling time horizon from 10,000 to 1,000 years therefore does not affect the results of the pathway analysis for these constituents. The effect of using a 1,000 year versus a 10,000 year time horizon is illustrated in Table 4. The constituent-specific differences are shown in Table B–1 of appendix B to the preamble. The table is based on a landfill waste management scenario, and all constituents are assumed to have identical toxicity values and not be subject to hydrolysis. For reference, the leachate concentration limit for constituents with $k_{oc}$=0 (no sorption, R=1), and a 10,000 year time horizon is equal to 1.0 mg/L. This table shows that the increase in leachate concentration limit for organic constituents is affected for a shorter modeling horizon (1,000 years) only when $k_{oc}$ values (or R values) are very large. (About fifteen percent, out of a total of approximately 200, including eight metals, fall into this category.) The effect of hydrolysis rate is not considered in results shown in the table. While hydrolysis influences the magnitude of the exposure concentration at a receptor well, the time that it takes for a contaminant to reach the receptor well is independent from the chemical-specific hydrolysis rate. It is, however, strongly influenced by chemical-specific sorption characteristics, which for organics are expressed in terms of $k_{oc}$ or R values.

TABLE 4.—EFFECT OF 1,000 YEAR VERSUS 10,000 YEAR MODELING TIME HORIZON ON LEACHATE CONCENTRATION LIMIT

| $k_{oc}$ (cm$^3$/) | 10,000 years | 1,000 years |
|---|---|---|
| 0.0 | 1.0 | 1.0 |
| 3,384 (R=10) | 1.0 | 1.0 |
| 37,224 (R=100). | 1.0 | 60 |

(2) Implementation of Parameter Bounds in Monte Carlo Procedure

The Monte Carlo modeling procedure used in the groundwater pathway analysis uses data on waste site location from the EPA's Industrial Subtitle D Survey (USEPA, 1986). These data are combined with other data sets for climatic and hydrogeological parameters. Auxiliary parameters for which no direct data is available are calculated internally in the model. For instance, ground-water velocity is calculated from hydraulic conductivity, gradient and effective porosity, and the dispersivity is calculated from the receptor well distance (See EPACMTP Background Document and User's Manual). Each parameter furthermore can have specified upper and lower bounds to guard against the possibility that physically infeasible parameters and/or parameter combinations are not used. When the latter condition occurs, the particular Monte Carlo realization is rejected, and another realization is generated. The Agency is considering an alternative procedure in which only the offending parameter is regenerated, or, if necessary, set equal to its upper or lower bound to avoid selection of values beyond the minimum to the maximum values range. In first case, the frequency distribution of parameter values generated by the Monte Carlo module, may be different from its input distribution. The Agency has determined that the two alternative procedures have little impact on the overall modeling results in the case of landfills and land application units, but that the default procedure tends to favor the selection of sites with larger waste unit area in the case of waste piles and surface impoundments. Therefore it produces more conservative (lower) values for the final leachate concentration limits. The analysis results show that for the two alternative Monte Carlo procedures for surface impoundments, the default procedure results in a leachate concentration limit of 1.0 mg/L, the alternative procedure results in a concentration limit of about 31 mg/L for a chemical with R=1. The effect of changes in the hydrolysis rate or the R value on the resultant regulatory leachate concentration do not impact the results obtained by using the alternative Monte Carlo procedure described in this subsection. The Agency is also soliciting comments on the Monte Carlo parameter rejection procedure used for the results presented in this subsection.

(3) Hydraulic Conductivity of Surface Impoundment Bottom Layer

The surface impoundment scenario modeled in the groundwater pathway analysis incorporates a 2 feet thick layer at the base of the impoundment. In the base case for this proposal, the layer is assigned a hydraulic conductivity of 10–7 cm/sec. The Agency recognizes that this value may or may not be appropriate value for bottom sediments as a nationwide typical for industrial Subtitle D surface impoundments. To evaluate the impact of varying this parameter, the Agency has compared modeling results obtained using a 10 times higher conductivity of 10–6 cm/sec. A higher conductivity value corresponds to a greater leachate flux from the impoundment, and generally higher receptor well concentrations, which translates into a more conservative (lower) regulatory leachate concentration limit. The regulatory limit calculated for a conductivity value of $10^{-7}$ cm/sec is 1.0 mg/L, the corresponding value for a conductivity of $10^{-6}$ cm/sec would be 0.35 mg/L. The effect of changes in hydraulic conductivity on the results is believed to be independent of the sorption or the hydrolysis characteristics of the chemical. The Agency is inviting comments on the appropriate value for the hydraulic conductivity of the bottom sediment layer for industrial D surface impoundments. In addition, the Agency requests the submission of hydraulic conductivity data for industrial Subtitle D surface impoundment bottom sludges.

(4) Waste Pile Infiltration Rates

The Agency used the HELP model to calculate the net infiltration rate for landfills, land application units and waste piles, as a function of regional climatic conditions and waste unit design characteristics (see EPACMTP background Document). For waste piles, the Agency considered two alternatives. The procedure used in the base case considered a waste pile, for the purpose of estimating infiltration rates, to be similar to an uncovered landfill. The Monte Carlo modeling analysis therefore used landfill infiltration rates corresponding to the most permeable (sandy loam) of the three cover types

used for landfill modeling. As an alternative, the Agency has used the HELP model to calculate infiltration rates for waste piles directly. In the initial evaluation, the runoff used in the water balance calculation was computed by the HELP model as a function of soil texture and vegetative cover (bare ground).The Agency has evaluated the impact of representative bare, but unevenly surfaced, waste piles on simulated runoff using the HELP model. A comparison of the impact of using this alternative procedure against the values used in this proposal for the base case, on the regulatory leachate concentration limit, was conducted. The comparison of regulatory leachate concentration limits is based on a non-degrading, non-sorbing constituent, which has a concentration limit of 1.0 mg/L in the proposal. Using the alternative procedure, the corresponding leachate concentration level changes to 0.77. The Agency is inviting comments on the two methods for the waste piles for the estimation of infiltration rates through them. If you have any data and other information to support your comment, send it along with your comments to the Docket.

(5) Land Application Unit Infiltration Rates

In the calculation of infiltration rates for land application units for the base case in the proposal, it was assumed that land application units receive, on average, 1,295.4 $m^3$ha (5.1 inches) of water annually through the application of the waste. This amount of water was included in the HELP model water balance calculation, resulting in an increased net infiltration as compared to ambient conditions. The waste application rate may or may not represent true field situations. As an alternative to the modeling procedure used for the base case of this proposal, the Agency evaluated the effect of using ambient recharge rates, i.e., the application of waste does not significantly alter the water balance, on the calculated leachate concentration limits. The comparison of this alternative with the procedure used for the base case shows that the regulatory leachate concentration limits for a non-degrading, non-sorbing constituent in land application units changes to 1.12 mg/L from 1.0 mg/L for the procedure used in the base case.

(6) Aggregate Effects of Alternative Groundwater Modeling Procedures and Data

The preceding sections have presented the effect of alternative modeling options and data sources that have been considered by the Agency. A consequence of the Monte Carlo exposure modeling approach is that the effects of changes in model parameters are not always linearly additive; rather the aggregate effect of changing multiple parameters or options may be to either magnify or reduce the effect of the individual changes. The Agency, therefore, has conducted modeling analyses of the aggregate effect of the alternatives discussed above for each of the four waste management scenarios. In addition to the alternatives presented in the preceding subsections, a modification was also made in the procedure for modeling waste sites for which the corresponding hydrogeological region was initially assigned as ''not classifiable''. Rather than ignoring the small fraction of sites involved, they were incorporated into the analysis by assigning them nationwide average values for the groundwater parameters. Table 5 presents the aggregate effect of all changes for each of the four waste management scenarios modeled. The modeling results correspond to a non-degrading, non-sorbing constituent. The leachate concentration limits are normalized with respect to a value of 1.0 mg/L for the landfill scenario, under the modeling procedure for the base case of this proposal. The results are presented for a 1,000 year time horizon; however for a non-sorbing constituent, these same results also hold for the 10,000 year time horizon.

TABLE 5.—AGGREGATE EFFECT OF MODELING ALTERNATIVES ON LEACHATE CONCENTRATION LIMITS FOR NON-DEGRADING, NON-SORBING CONSTITUENTS FOR FOUR WASTE MANAGEMENT SCENARIOS

| Waste management scenario | HWIR proposal | Alternative Options |
|---|---|---|
| Landfill | 1.0 | 0.71 |
| Surface Impoundment | 0.22 | 0.27 |
| Waste Pile | 0.29 | 484 |
| Land Application Unit | 0.08 | 0.22 |

Table 5 shows that, except for landfills, the aggregate effect of the combined alternative options is a less conservative (higher) leachate concentration limit. For landfills, adoption of the alternative modeling options would have resulted in a 30 % less stringent regulatory leachate limit for the groundwater pathway for non-sorbing and non-degrading constituents. For surface impoundments, there is little overall impact because the opposing effects of increasing the impeding layer hydraulic conductivity, and the alternative Monte Carlo procedure for handling parameter bound exceedances, nearly cancel out. For waste piles on the other hand, the procedure used for the base case, results in a significantly more conservative leachate concentration limit as compared to the alternative modeling options. This is due to the handling of parameter exceedances in the Monte Carlo simulation. Because many waste piles have very small sizes (surface areas), the alternative Monte Carlo procedure has a large impact. For land application units, the procedures used in the proposal for the base case also result in a more conservative regulatory limit as compared to the alternative modeling options. The contributing factors are much the same as for waste piles, but the overall impact is much smaller, primarily because there are only few land application units with very small areas.

*F. Additional Eco-Receptor Considerations*

EPA considered two different policy goals with respect to protection of terrestrial ecological receptors (i.e., soil fauna, birds, mammals, and plants). One goal protected terrestrial ecological receptors outside the boundaries of the waste management site, thus, the constituent had to travel off-site before exposures would be assessed. The alternative goal protected terrestrial ecological receptors on the closed land application site.

The Agency chose to propose exit levels based on off-site impacts for several reasons. One reason is that there are many land use decisions that significantly affect terrestrial ecological receptors on the property of a party making those decisions (e.g., a decision to pave a portion of land as a parking lot). EPA does not generally regulate those sort of decisions. However, many impacts are judged through local zoning regulations. Congress has typically asked EPA or other Federal entities to regulate activities on a property when there are significant off-site impacts, such as a groundwater plume that migrates, an air release that moves beyond the property, a wetland (located on the property) that is a significant resource for migratory birds and has broader ecological significance, or an endangered species with social values beyond the impact on a specific landowners purview.

EPA asks for comment, however, on the alternative of protecting terrestrial ecological receptors on-site. The rationale for this alternative approach would relate to protection from impacts on bird and mammal populations, and

other ecological receptors, and to the regulation of certain constituents that could potentially result in environmental consequences that go significantly beyond the bounds of a current waste management unit.

*G. Background Concentrations in Soils and Other Issues Relating to Results*

EPA has compared the exit levels for nonwastewaters to data on the variation in mean background concentrations found in soils. For some metals, the exit levels calculated based on risks at land application units are below [4] mean soil concentrations. One reason exit criteria may be below soil concentrations is that these metals bioaccumulate, causing greater exposure for higher trophic levels. Also, the acceptable levels for some of the metals that would be calculated for practices other than land application are significantly higher and not below mean soil concentrations.

If the final exit levels are below typical soil levels, EPA would consider promulgating levels based on concentrations that are either typical soil concentrations (national mean levels) or some percentile or portion of the naturally-occurring range such as the 10th percentile. If the effect of concern is an ecological impact, the rationale for using the 10th percentile (or similar figure if the data available does not allow that precision) would be that in 90 percent of locations, if the soil already contains those or greater levels, the ecological receptors existing in the area should already reflect the toxicity of the waste material; the rational for using the 10th percentile (or similar value) value is that human behavioral practices (e.g., treatment of groundwater prior to use) may already reflect protection from the potential toxicity of concern. EPA asks for comment on whether these are reasonable arguments.

EPA is concerned, however, that there are also issues of the chemical and physical form in which compound or chemicals exist, in both natural conditions and in the waste and that a simple comparison of total concentrations in soils and in wastes might be misleading about potential ecological or human impacts. EPA requests comment on these issues. EPA's first preference will be to reexamine the risk modeling to identify any inappropriate assumptions or modeling issues that may explain the low proposed exit level, and to look more carefully at those constituents where this issue only arises from the modeling of risks from land application units, to identify potential contingent management solutions to this problem.

Finally, EPA requests comment on whether these arguments could be extended to site-specific determinations where information on local background constituent concentrations and form in soil are available and have been reviewed by a State regulatory authority. EPA assumes that such an approach would only apply if the background concentrations were more than very localized and the concentrations were naturally-occurring rather than due to past contamination. If a site-specific determination were adopted, two approaches are available that have been used in other contexts. One statistical technique for determining whether background data conform to a normal distribution assumption includes combining the Student-t difference of means test, presented in the *Permit Guidance Manual on Unsaturated Zone Monitoring for Hazardous Waste Land Treatment Units,* (EPA, 1986) with the normal tolerance interval approach found in *Statistical Analysis of Ground Water at RCRA Facilities-Interim Final Guidance,* (EPA, April 1989). The Student-t test compares averaged waste/media concentrations to background concentrations, and is used to determine if the waste/media as a whole is within a specified criteria. However, even if the waste/media passes the Student-t test, individual sample concentrations may still exceed the tolerance interval limit. The normal tolerance interval approach is used to compare sample concentrations to an upper tolerance value based on the background mean, standard deviation, and sample size.

If such an approach is incorporated into the final rule, it would include criteria for defining and collecting adequate background samples. More specifically, the facility would be required to identify background locations, sample size, soil depth, etc. for at least four samples in a ''difference of means'' demonstration, and six to eight samples for a ''tolerance of means'' demonstration. The facility would also need to demonstrate the normalcy of the sample distribution. The Agency would require that this information be included as part of the facility's sampling and analysis plan and subject to review by the appropriate overseeing authority.

A more simplified approach would be to establish exit levels at 1/10 of the naturally occurring background level. The rationale for using 1/10 is that these levels would not appreciably contribute to the overall risk posed by elevated levels in the environmental media. EPA requests comment of this approach as well as the rationale.

Alternatively, the rule could defer any background level demonstrations to an omnibus authority for the overseeing agency. Under this concept, a claimant could submit information on naturally occurring background level and a request for modified exit levels to the agency overseeing the exemption process, which would have discretion to grant modifications where they are clearly justified. Comment is requested on the need for this authority.

The Agency solicits comments on other appropriate and generic ways (1) to identify background levels in soils, and (2) to incorporate the existing 40 CFR part 264, subpart F standards for establishing background levels for groundwater. Other suggestions that address the Agency's intent to promulgate a simplified exemption with little reliance on site-specific considerations but also allow for consideration of elevated background levels will be considered.

EPA also observed that some of the exit levels for organic chemicals appear relatively high (see, for example, the level for xylene). EPA believes that these results occurred primarily because these chemicals either are toxic only at relatively high concentrations or undergo high dilution during transport. EPA, however, requests comment on whether these chemicals are frequently co-disposed and, if so, whether they might pose cumulative risks not assessed by the risk analysis. EPA is interested in information on issues such as whether a waste containing one or more of these constituents at concentrations near exit levels would be ignitable or threaten the integrity of control measures such as liners.

*H. Constituents with Extrapolated Risk-based Levels*

EPA was unable to conduct the risk assessment for 187 of the 376 constituents on the exit list. In most of these cases, EPA was unable to find acceptable human health benchmarks to serve as the starting place for the assessment. In a few cases, EPA could not find values for critical physical or chemical properties, such as log $K_{ow}$s. Based on its past experience, EPA believes it would need at least a year to develop a new human health benchmark value for any constituent. EPA has less experience with the type of research and peer review needed to develop values for physical and chemical properties, but it believes that this process also would be time-consuming.

[4] When compared with mean soil background levels provided by the USGS, the exit levels are not more that 1 order of magnitude more restrictive.

Rather than not consider the 187 constituents for which EPA was unable to conduct the risk assessment as potential candidate constituents for exit criteria, EPA developed an approach for establishing exit criteria for these constituents. The Agency grouped the constituents on the exit list into classes, based on chemical structure. EPA selected the 50th percentile value from the range of modeled risk levels for each chemical class. This 50th percentile value serves as the extrapolated risk-based level for the un-modeled constituents in the corresponding chemical class. The constituents and their 50th percentile extrapolated risk-based levels are presented in a background document *Background Document to Support the Methodology used in Extrapolating Exit Levels to Constituents with no Health-Based Benchmarks.* EPA is proposing the 50th percentile level to avoid adding another conservative assumption to the derivation of exit levels for these constituents. EPA believes that the multipathway approach is already sufficiently conservative to protect human health and the environment even for these chemicals. EPA, however, requests comment on the alternative of using the 10th percentile or a different percentile from the modeled exit levels from each class. Such an approach would reduce the chances that the actual health benchmark for a particular level was lower than the extrapolated estimate. However, it would also increase the odds that the extrapolated level was higher than needed for many constituents. A complete list of extrapolated constituents and associated risk levels may be found in appendix C to today's preamble.

EPA recognizes that this approach to generating exit levels is much less sophisticated and precise than the multipathway analysis. Nonetheless, EPA prefers it to any of the available alternatives. If EPA set no exit levels and made wastes containing any of these constituents ineligible for exit, a significant number of waste streams would probably be ineligible, even though they may pose no significant threat to human health and the environment. EPA's RIA data shows that some of these constituents, such as Cyanide and Anthracene, are fairly prevalent. Although other constituents, such as those found in the commercial chemical products on the P and U lists of hazardous wastes, are not very prevalent, they may be significant for generators that manage multiple waste streams in centralized wastewater treatment plants. In the absence of extrapolated exit criteria, a generator would lose its opportunity to claim an exit for an entire combined stream if any of these constituents is found in the waste stream. Furthermore, it would take a long time to complete the work necessary to conduct exposure pathway assessments for any significant number of these 187 constituents.

Alternatively, EPA could propose to allow wastes to exit without testing for constituents lacking modeled exit levels. EPA, however, finds this approach insufficiently protective, especially when it can at least approximate likely risk levels as described above.

Finally, EPA considered the alternative of basing exit levels for these constituents on quantitation limits. As explained below, EPA is proposing to use EQCs as exit levels where they are higher than a constituent's multipathway or extrapolated exit level. (EPA is also proposing that wastes with such constituents meet the technology-based LDR standards for those constituents prior to exit.) EPA considered using this EQC and LDR approach for constituents lacking multipathway levels. Such an approach would actually produce more conservative exit levels, because EPA would not use extrapolated levels that are higher than EQCs. EQCs (and technology-based LDRs), however, are not based on risk. EPA prefers the extrapolated approach because it takes into account the toxicity and fate and transport of structurally similar chemicals. EPA believes it would be unreasonable to continue to regulate a chemical because chemistry can detect it, where the extrapolation described above suggests that the chemical poses no significant risks at the EQC level.

EPA finds the option of basing exit levels on the extrapolation procedure described above to strike a reasonable balance between the goals of protecting human health and the environment and eliminating regulation of low-risk wastes. EPA, however, requests comment on all of the alternatives described in this section.

*I. Analytical Considerations*

Some of the proposed exit levels established by the risk assessment and the extrapolation methodology are low. In some cases, existing analytical methods cannot routinely detect the constituents at those levels. EPA is proposing to cap these potential exit levels with reasonable analytical quantitation limits. The Agency is proposing quantitation limits that represent the lowest levels that can be reliably measured within acceptable limits of precision and accuracy during routine laboratory operating conditions using appropriate methods. These concentrations are referred to as ''exemption quantitation criteria,'' or EQCs. It is necessary to specify EQCs because a number of the constituents on the exemption list have either modeled or extrapolated risk-based levels that are not analytically achievable in all matrices. Appendix C to today's preamble lays out the comparison between the modeled or extrapolated risk level and the EQC for every constituent. Approximately one-quarter of the constituents have proposed modeled or extrapolated risk-based levels lower than EQC.

1. Development of Exemption Quantitation Criteria (EQC)

To develop the EQCs proposed in today's notice, EPA compiled a master list of the quantitation limits published for the identified constituents in the Third Edition of Test Methods for Evaluating Solid Waste, (SW–846), including the first and second updates (both of which are widely distributed throughout the regulated community). The Agency believes that the resultant EQCs present achievable quantitation limits for the proposed exemption constituents in most matrices. The Agency requests comment on the proposed quantitation limits as well as any data supporting those comments.

A regulatory action level (e.g., exit levels) must provide a clear distinction between those wastes subject to the regulation and those excluded. Action levels based on analytical determinations within a methods quantitative range can be used to determine regulatory status with a high degree of confidence. On the other hand, when an analyte is present at a concentration equal to the detection limit (DL) it will be detected only half the time. In other words there is a 50% risk of a false negative result when the analyte is present at the DL concentration. There is, however, a less than 1% risk of false positive results at this level. Therefore, regulations set at the detection limit would not identify non-compliance reliably.

The Agency is in the process of re-evaluating EQCs for some constituents. Preliminary updated EQCs could not be incorporated into today's proposed rule, but have been included in the docket for comment.

2. EQCs and LDR Requirements as Exit Levels

A comparison of the modeled or extrapolated risk-based levels with the EQCs reveals a number of cases where

quantitative measurement of analyte concentration at the modeled or extrapolated risk-based level cannot be reliably achieved, using standardized analytical methods. In today's proposed rule, for wastes containing constituents with a modeled or extrapolated risk-based level lower than the EQC, exit criteria include meeting the EQC along with an additional requirement that the waste meet Land Disposal Restrictions (LDR) treatment standards from part 268, regardless of whether or not the waste is to be land disposed. The exit table for constituents with EQCs as exit levels is proposed appendix X of 40 CFR part 261, Table B.

a. EQCs as exit levels

Only when the comparison between the modeled or extrapolated risk-based level with that constituent's EQC level reveals that the constituent cannot be quantitated at the modeled or extrapolated risk-based level, does the EQC become the exit level. For example, the modeled risk-based level for 2-nitropropane in wastewaters is 0.00019 µg/L. The EQC for 2-nitropropane in wastewaters is 0.0058 µg/L. 2-nitropropane is listed in appendix X, Table B, with an exemption level of 0.0058 µg/L. In other words, the exemption level for 2-nitropropane has been met if the claimant demonstrates that the method used can achieve the EQC of 0.0058 µg/L in the waste matrix, and the level detected by the method does not exceed 0.0058 µg/L.

The Agency believes that, for those constituents that have a modeled or extrapolated risk-based level lower than the achievable quantitation limit, demonstration that the constituent is not present above the EQC is the most reasonable approach to setting a national exemption level. The Agency is proposing that quantitation limits cap the modeled or extrapolated risk-based levels because a reliable, consistent measure of the constituent below the quantitation limit is not achievable. By establishing EQCs as benchmarks (or maximum allowable quantitation limits), the Agency is ensuring that all exemption demonstrations will achieve acceptable analytical sensitivity, and that wastes with high levels of contamination that tend to confound analytical protocols are not exempted.

The Agency requests comments on whether an exemption demonstration should be considered adequate if all proper method selection and QC procedures are followed and the constituents are not detected, even though the EQC level has not been analytically attained. This situation could arise even in relatively clean matrices if the constituents bind strongly to the matrix or if the constituents degrade rapidly during the analysis. However, the Agency would not want the exemption to be allowed if the EQC could not be achieved because of interference from other contaminants in the matrix, or if inappropriate methodology, i.e., sample preparation, cleanup (if necessary), or determinative, was used.

EPA is not proposing that any exit level based on an EQC can serve as a ''minimize threat'' level capping current 40 CFR part 268 treatment standards. Such levels are not sufficiently related to a constituent's risk.

b. LDR Requirements for Constituents With EQC Exit Levels

EPA considered the option of setting exit levels for all constituents at their modeled or extrapolated levels, regardless of analytical considerations. EPA also considered the alternative of making wastes containing constituents with analytical limitations ineligible for exit. Both of these options, however, are likely to constrain significantly the number of waste streams eligible for exit. Approximately one-quarter of the constituents on the exit list have EQCs above risk-based or extrapolated levels. Some of these constituents, such as Beryllium and Arsenic, are fairly prevalent. For less prevalent constituents, EPA has the same concerns about limiting exit for wastes managed in centralized wastewater treatment systems that it described above in the section on extrapolated risk levels. Further, this approach would overregulate wastes where constituents were in fact below risk levels. EPA prefers options which would not prohibit all wastes with these constituents from exiting.

The most promising alternative EPA found was setting exit levels for these constituents at EQC levels, and also requiring all wastes containing these constituents to comply with LDR treatment standards, even where such waste are not destined for land disposal. This alternative offers the possibility of additional risk reductions and, therefore, reduces the possibility that wastes posing significant threats will escape Subtitle C control.

EPA is unable to characterize the amount of additional risk reduction for a number of reasons. First, as explained in more detail in the Minimize Threat section of the preamble, compliance with LDRs already will be required after exit before land disposal for all wastes (except those that are below exit levels at their point of generation). The LDR requirement for constituents with EQC exit levels may provide additional risk reduction, even for those constituents that are not managed in land disposal units. EPA currently does not know how frequently nonhazardous wastes are burned as fuel, incinerated, or otherwise managed outside of land disposal.

Additionally, the Universal Treatment Standards (UTS) for nonwastewaters, were developed based on similar analytical chemistry considerations of detection limits. The majority of the UTS limits for nonwastewaters were based, however, on analysis of residuals from the treatment of what EPA determined to be the most difficult to treat wastes and, as a result, this often represented the most difficult to analyze treated matrix (i.e., higher detection limits than those represented by the EQCs). The majority of the UTS limits for wastewaters, on the other hand, were not developed based on limits of detection but rather they were based on analysis of treated effluents regulated under EPA's National Pollution Discharge Elimination System (NPDES).

LDR requirements for all wastes subject to the UTS would be equal to or higher than the EQC exit levels themselves. However, for wastes subject to treatment standards based on application of specified treatment methods under § 268.40, extending LDR requirements may provide additional risk reduction.

EPA believes that the combined approach of requiring non-detection at EQC levels and compliance with LDR standards for all waste streams, regardless of whether or not the waste will be land disposal, offers a reasonable balance between the goals of reducing overregulation and ensuring that wastes with significant risks remain subject to Subtitle C. EPA, however, requests comment on all of the alternatives described above. EPA also requests comment on the option of basing exit levels for these constituents on EQCs alone and relying on continued, independent applicability of LDR requirements for wastes that exit and are destined for land disposal.

3. Exemption for Constituents Without EQCs

There are several constituents covered in today's notice for which EQCs could not be developed. The universe of these constituents includes 78 constituents, most of which are not widely prevalent in wastes. Most are also found only in P and U listed wastes. These constituents are listed in table B to appendix X without associated exemption levels. The background document *Background Document to Support the Development of Exemption*

*Quantitation Criteria (EQCs) and Description of Analytical Methods under the Waste Exit Rule* explains why EQCs could not be created.

EPA is proposing that wastes containing these constituents (i.e., where an applicant has not documented that these constituents are not present—see section VIII.A.1.b.,) may remain eligible for an exemption under today's proposed rule by complying fully with LDR treatment standards applicable to the waste, as codified in 40 CFR part 268, regardless of whether the waste is to be land disposed. The Agency believes that any potential risks posed by these constituents are likely to be further reduced by applying LDR standards from part 268 to the waste, before the waste may be exempt, regardless of whether or not the waste is destined for land disposal. The Agency asks for comment on this approach.

An alternative approach would be to allow wastes with these constituents to exit without additional LDR obligations, but relying on continued, independent applicability of LDR treatment requirements to wastes destined for land disposal only. Another approach would be to prohibit wastes containing these constituents from being eligible for exemption under today's proposed rule. An additional approach would be that these constituents could be deleted from the exit table. The Agency requests comment on each of these alternatives.

EPA is not willing to propose to use LDR standards as exit levels for any other group of constituents. The technology-based LDR standards are not based on any risk assessment. A comparison of these standards with the multipathway risk levels that EPA produced shows that the LDR standards are sometimes more stringent and sometimes less stringent than risk-based levels. EPA believes that it is more prudent to base exit levels on risk assessment where possible because this better assures protection of human health and the environment. EPA views use of the LDR standards as the option of least preference, but necessary for exit for this group of constituents. EPA is willing to consider it only where there is no alternative to prohibiting a constituent from being eligible for exit.

## V. Presentation of Exit Levels

Today's proposed exemption criteria involves setting exemption levels for toxicants in listed waste, and in some cases requiring additional compliance with the requirements set forth at 40 CFR part 268. To exit Subtitle C regulation as a listed hazardous waste, all the hazardous constituents listed in appendix X of part 261 would be required to be in concentrations less than or equal to the numeric exit levels and when specified, the waste would have to meet the applicable requirements at 40 CFR part 268. Appendix C to the preamble presents constituents, distinguishes between modeled and extrapolated constituents, and includes EQCs for each constituent.

### *A. Constituents With Modeled or Extrapolated Risk-Based Exit Levels*

The Table A of proposed appendix X to part 261 presents exit levels for constituents with modeled or extrapolated risk-based levels which can be reliably quantified. See section IV.H. for a description of how this was determined. Listed hazardous waste would be required to contain concentrations at or below the specified exit levels to be eligible to be exempted from Subtitle C requirements other than LDR. In some cases we are proposing to change the land disposal restriction requirements at 40 CFR part 268 as well. A totals analysis would be required for both wastewaters and nonwastewaters to show that the constituent does not exist in the wastestream at levels above the exemption level.

For nonwastewaters, the Agency is also proposing that generators either use the TCLP test or a calculational screen to measure or calculate constituents' leachate from wastes. If the TCLP test shows leachate concentration in the waste is below the leach exit level, the waste would be considered to not pose a hazard to groundwater.

The Agency has in the past experienced difficulty in using the TCLP test for some types of waste. The Agency solicits comment on how to consider oily wastes and other wastes that are difficult to filter in the TCLP test or whose impact on groundwater is believed to be underestimated by the TCLP (such as materials subject to non-aqueous phase transport). Comment on alternative tests for these wastes, as well as comment on how to define such wastes for regulatory purposes is sought. A more complete discussion of oily waste can be found in VIII.A.1.a.iv.

Table A of appendix X of 40 CFR part 261 presents results of two alternatives for establishing the exit levels. These alternatives differ only in the benchmark used to calculate the modeled risk-based levels. For certain constituents there exists both a risk-based toxicity benchmark and a maximum concentration level (MCL) established under the Safe Drinking Water Act (SDWA). These numbers may differ because the MCLs are established using some non-risk considerations such as the cost of treatment and the availability of technology and consider exposure contributions from other sources for non-carcinogens. See section IV.D. of today's proposal for a complete discussion of toxicity benchmarks and MCLs.

### *B. Constituents With Quantitation-Based Exit Levels; Table B to Appendix X*

Table B of proposed appendix X to part 261 presents quantitation-based exit levels for constituents with methods that cannot reliably quantify the modeled or extrapolated risk-based levels. All exit levels on Table B of appendix X to 40 CFR part 261 are based on EQCs. (See section IV.I.) Wastes containing any of these constituents must *also* comply with the applicable treatment standards set forth at 40 CFR part 268, the Land Disposal Restrictions (LDR) in order to meet today's proposed exemption, regardless of whether or not the waste is to be land disposed.

Some constituents on Table B of appendix X of 40 CFR part 261 do not have associated exit levels. Waste with these constituents may exit only after complying with the LDR treatment standards for the waste. (See section IV.I.2.b.)

### *C. How To Read the Exit Level Tables*

For a waste to be eligible to exit Subtitle C under the exit proposed in today's rulemaking, every constituent in the waste must be below its exit level. Proposed appendix X of 40 CFR part 261, Tables A and B are the exit constituents and the exit levels. The following is a description of how to read the tables.

- The constituent list is derived from constituents listed in appendix VII, Basis for Listing Hazardous Waste; Appendix VIII, Hazardous Constituents; and appendix IX of part 264, the Ground-Water Monitoring List. (See section IV.C.)
- Table A represents constituents and their risk exit values—where the risk values can be measured analytically. (See sections IV.E., and IV.I.)
- Table B represents constituents with quantitation limits (EQCs) as exit levels—where the constituent cannot be measured at the modeled or extrapolated risk value. An additional condition of exit, compliance with treatment standards in 40 CFR part 268, exists for any waste becoming exempt under today's rulemaking by using a constituent exit level on Table B. (See section IV.I.2.b.)
- There will be overlap for some constituents between Tables A & B. For

example, the wastewater exit level for a constituent may be on Table A, whereas the nonwastewater exit level may be on Table B.

• Where an exit level does not exist on Table A or B for a particular constituent, the waste need not be tested for that constituent. For example, some constituents that are hydrolyzers have exit levels for nonwastewaters, but not for wastewaters. A complete discussion of deletions to the master constituent list can be found in section IV.C.

*The tables' columns:*

• Columns 1 and 2 are the CAS numbers & constituent names.

• There are two proposed options for the development of today's proposed exit levels. Option 1 is the option whereby Maximum Contaminant Levels (MCLs) from the Drinking Water program are used as an acceptable toxicity exposure for human drinking water exposure and toxicity benchmarks are used for other exposures. Option 2 is the option whereby toxicity benchmarks are used as acceptable exposure levels for all exposures. A more complete discussion of these two options is found in section IV.D. of today's proposed rule. The effect of co-proposing these two options is that there are two independent sets of proposed exit levels.

—Columns 3, 4, and 5 represent the exit levels that were derived by using an MCL benchmark for drinking water ingestion & using toxicity benchmarks for all other routes of exposure.

—Columns 6, 7, and 8 represent the exit levels that were derived by using toxicity benchmarks for all routes of exposure.

• The definitions of wastewater and nonwastewater are discussed in VIII.A.1.a.ii.

• Columns 3 & 6 represent wastewater exit values. If a generator determines he/she has a wastewater, if each constituent in the waste meets these wastewater exit levels, it is eligible for exemption.

—Values in columns 3 & 6 were derived from the most limiting of non-groundwater-ecological receptor, non-groundwater-human receptor, and groundwater pathway values from surface impoundments and tanks (the risk assessment's wastewater units).

• Columns (4 and 5) and (7 and 8) represent nonwastewater exit values. If a generator determines he/she has a non-wastewater, if each constituent in the waste meets both of these nonwastewater values, it is eligible for exemption. The totals level must be met by a totals analysis. The leach level must be met by a TCLP test or the calculational screen.

—Values in columns 4 & 7 were derived from the most limiting of the non-groundwater-ecological receptor and non-groundwater-human receptor pathway values from land application units, ash monofills, and waste piles (the risk assessment's nonwastewater units).

—Values in columns 5 & 8 were derived from the most limiting of the groundwater pathway values from land application units, landfills, and waste piles (the risk assessment's nonwastewater units).

## VI. Minimize Threat Levels

### A. *Background*

#### 1. Summary of the Hazardous and Solid Waste Amendments of 1984

The Hazardous and Solid Waste Amendments (HSWA), enacted on November 8, 1984, allow hazardous wastes to be land disposed of only if they satisfy either of two conditions: (1) They can either be treated or otherwise satisfy the requirements of section 3004(m), which requires EPA to set levels or methods of treatment, if any, which substantially diminish the toxicity of the water or substantially reduce the likelihood of migration of hazardous constituents from the water so that short term and long term threats to human health and the environment are minimized; or (2) they can be land disposed in units satisfying the so-called no migration standards in sections 3004(d)(1), (e)(1), and (g)(5). Land disposal includes any placement of hazardous waste in a landfill, surface impoundment, water pile, injection well, land treatment facility, salt dome formation, underground mine or cave. See RCRA section 3004(k).

EPA was required to promulgate land disposal prohibitions and treatments standards by May 8, 1990 for all wastes that were either listed or identified hazardous at the time of the 1984 amendments, a task EPA completed within the statutory time frames. See RCRA section 3004(d), (e), and (g). EPA is also required to promulgate prohibitions and treatment standards for wastes identified or listed after the date of the 1984 amendments within six months after the listing or identification takes effect. See RCRA section 3004(g)(4).

The land disposal restrictions are effective on promulgation. See RCRA section 3004(h)(1). However, the Administrator may grant a national capacity variance from the effective date and establish a later effective date (not to exceed two years) based on the earliest date on which adequate alternative treatment, recovery, or disposal capacity that protects human health and the environment will be available. (RCRA section 3004(h)(2).) The Administrator may also grant a case-by-case extension of the effective date for up to one year, renewable once for up to one additional year when an applicant(s) successfully makes certain demonstrations. (RCRA section 3004(h)(3).) See 55 FR 22526 (June 1, 1990) for a more detailed discussion on national capacity variances and case-by-case extensions.

As explained in the legislative history, the purpose of the land disposal restrictions is to reduce the risks associated with land disposal. Congress also intended the restrictions to reduce reliance on land disposal and promote waste minimization since land disposal was its least favored method of managing hazardous wastes.

#### 2. EPA's Interpretation of Standard for Treatment Requirements

The heart of the LDRs are the standards for treatment prior to land disposal, which must meet the statutory requirement to ''substantially diminish the toxicity of the water or substantially reduce the toxicity of the waste so that short term and long term threats to human health and the environment are minimized.'' RCRA Section 3004(m): EPA's interpretation of this ''minimize threat'' requirement has evolved through a long series of rulemakings.

When EPA proposed its first set of LDR treatment standards it took the position that the most effective way to minimize threats was to base standards on the capabilities of generally available treatment technologies. (51 FR 16011 (January 14, 1986).) To avoid unnecessary treatment, however, EPA also proposed to ''cap'' the technology based standards with risk-based screening levels based on human health toxicity thresholds for individual hazardous constituents and modeling of the groundwater route for exposure. (51 FR 16011–13.)

In the final rule EPA promulgated only the technology based standards. EPA explained that although it believed it had authority to promulgate risk-based standards, it was not promulgating the proposed risk-based caps because of extensive comments raising concerns about the scientific uncertainties of risk analysis. (52 FR 40578 (November 7, 1986).) Industry challenged the final standards, claiming that they required treatment to concentrations below ''minimize threat'' levels. On review, the Court held that section 3004(m) authorized both

technology based and risk-based standards, but remanded the rule to EPA for a fuller explanation of its decision to rely on technology-based standards alone. (*Hazardous Waste Treatment Council* v. *EPA*, 886 F. 2d 355 (D.C. Circ. 1989). (''HWTC III'').) The court also held that EPA was not obligated to adopt either the RCRA characteristic test levels or the Safe Drinking Water Act Maximum Contaminant levels (MCLs) as ''minimize threat'' levels because neither ''purports to establish a level at which safety is assured or 'threats to human health and the environment are minimized'.'' (886 F. 2d at 363.)

In its response to the remand, EPA stated that the best way to fulfill the requirements of section 3004(m) would be to ensure that no technology-based treatment standard required treatment of hazardous waste containing levels of hazardous constituents posing insignificant risks. (55 FR 6641 (Feb. 26, 1990).) EPA, however, explained that it was not yet able to promulgate such levels. EPA believed that it lacked a reliable predictive model for ground-water exposure, needed to assess exposure scenarios for air pathways, needed to consider impacts on ecological receptors, needed to develop additional analytic methods for hazardous constituents, and needed to develop an approach for constituents with threshold effect levels lower than detection limits. (Id. at 6642.)

In the same notice, EPA noted that the ''minimize threat'' language of section 3004(m) could reasonably be interpreted to require more protection than the ''normal subtitle C command that standards be those necessary to protect human health and the environment.'' (Id. at 6641.) EPA found that the many portions of the 1984 amendments stressing the inherent uncertainties of land disposal buttressed this interpretation. See, e.g., RCRA sections 1002(b)(7), 3004(d)(1)(A), 3004(e)(i)(A), 3004(g)(5). EPA also found support in the legislative history. For example, the Senate amendment containing the ''minimize threat'' standards replaced a committee bill that only would have required treatment to be ''protective of human health and the environment.'' See S. 757, section 3004(b)(7), printed at S. Pep. No. 284, 98th Cong., 2nd Session 86. Further, EPA noted that the ''no threat'' levels it had been using in site-specific and waste stream specific contexts, such as clean closures, delistings, and no-migration petitions, would not necessarily be appropriate for generally applicable standards required to minimize threats to health and the environment. (55 FR 6641, note 1.)

At the same time, EPA took the position that section 30004(m) does not require the elimination of every conceivable threat posed by land disposal of hazardous waste, citing a statement by Senator Chafee that ''[i]t is not intended that every waste receive repetitive levels of treatment, nor must all inorganic constituents be reclaimed.'' 130 Cong. Rec. S.9179 (daily ed., July 25, 1984). (55 FR 6641, note 1.) Clearly EPA did not interpret the minimize threat language to require the elimination of all threats.

Today, the Agency is proposing to re-evaluate the basis for some of the existing performance standards established for listed wastes. Since EPA's response to the HWTC III remand in 1990, the state-of-the-art in making quantitative determinations of risk has advanced and available methods have improved significantly. In addition, the increased sensitivity of analytical methods has lowered achievable detection limits, better bioassays exist than in the past, and more extensive biological data is available for extrapolation. As a result, the universe of available health-based and ecological data has grown significantly, and the reliability of this information has improved. The Agency now believes that these data can be used to establish levels that minimize threats to human health and the environment.

*B. Risk Assessment and Minimize Threat Levels*

1. Rationale

a. Overview

Today the Agency is proposing to establish risk-based LDR treatment requirements for some of the hazardous constituents for which exit levels are being proposed. These risk-based LDR requirements will minimize the short-term and long-term threats to human health and the environment posed by the hazardous waste constituents. The risk-based LDR levels (or ''minimize threat'' levels) would have the effect of capping, or limiting, treatment of those waste constituents where the current technology-based UTS standards require lower concentrations. EPA also hoped to propose most of these constituent-specific levels as ''minimize threat'' levels under section 3004(m) of RCRA that would cap current technology-based treatment standards under at these levels the LDR program. However, EPA is proposing ''minimize threat'' levels only for those constituents that were evaluated under the multipathway risk analysis and are not capped by quantitation (EQC) limitations. EPA is proposing to promulgate such levels as replacements for the constituent-specific treatment levels in the LDR Universal Treatment Standards (UTS). (As explained in more detail in Section VI, EPA is not proposing to cap any LDR standards requiring the use of specified technologies.) As shown on Table 1, § 268.60, EPA is proposing ''minimize threat'' levels to cap UTS treatment requirements for either the wastewater or nonwastewater (or both) for approximately 70 wastewater constituents and 90 nonwastewater constituents.

EPA, however, is not proposing that any extrapolated levels serve as ''minimize threat'' levels for LDR purposes. EPA does not have as much confidence that this alternative methodology provides enough information on risks to human health and the environment to enable EPA to determine that risks have been minimized. Similarly, EPA is not proposing that any levels based on quantitation limits serve as ''minimize threat'' levels. Such levels are not based on any analysis of risks to human health and the environment. In fact, as explained above, EPA is proposing to require compliance with technology-based LDR standards for all wastes which contain such constituents.

If a claimant finds that all constituents in a waste are below exit levels at the waste's point of generation and if the claimant meets all of the requirements for filing an exit claim, EPA will not require compliance with the LDR treatment standards for the waste. EPA will take the position that such as waste never became subject to subtitle C regulations, so that LDR standards never applied to the waste. EPA is proposing to take this position for all exit levels, regardless of whether they were generated by the multipathway analysis, the extrapolation method, or EQC limitations. For further explanation, see section VI.D.

EPA, however, is proposing that all listed wastes which as generated contain constituents exceeding exit levels must meet LDR requirements (current or as modified by this proposal), even if the waste subsequently becomes exempt from hazardous waste regulation under this rule. This requirement resembles EPA's current rules for ''de-characterized'' wastes, which must meet LDR requirements even after they cease to exhibit the hazardous characteristic that made them subject to Subtitle C in the first place.

b. ''Minimize Threat'' requirement of Section 3004(m)

EPA continues to believe that the minimize threat language of section 3004(m) does not require the elimination of every conceivable threat posed by land disposal of a hazardous waste. The legislative history of LDR indicates that Congress did not intend to require wastes to undergo repetitive or ultimate levels of treatment. Rather, Congress wanted to require use of effective, but widely available treatment technologies. See 130 Cong. Rec. S 9178 (daily ed. July 25, 1984) (statement of Senator Chafee introducing the amendment that became section 3004(m).)). Requiring elimination of all conceivable threats would almost certainly require use of the most effective treatment methods available, and this appears to conflict with Congresses' treatment goals. Moreover, although the DC Circuit has cited the dictionary definition of ''minimize'' to uphold technology-based treatment standards below EPA standards such as MCLs and TC levels, EPA does not believe that the court meant that EPA literally must reduce threats to the maximum extent possible. (See *Hazardous Waste Treatment Council III*, 886 F.2d at 361; *Chemical Waste Management II*, 976 F 2d. at 14.) EPA notes that the court indicated that risk-based treatment standards would satisfy section 30004(m). *Hazardous Waste Treatment Council III*, 866 F.2d at 364–65. Further, in his concurring opinion, Judge Silberman stated that Congress would allow EPA to exercise reasonable amounts of discretion in determining the level of risk reduction needed to meet the minimize threat requirement. Id. at 372.

The Agency believes that today's exit concentrations can serve as risk-based land disposal restriction levels for several reasons. First, the risk assessment, described in Section IV of today's proposal, significantly expands beyond the scope of past Agency risk assessment for wastes and waste constituents. Where adequate data are available, the analysis can evaluate the potential for waste constituent migration through almost all significant environmental fate and transport pathways leading to exposure for human and ecological receptors. As explained in more detail below, the Agency is also relying on reasonable conservative risk targets for both humans and ecological receptors in developing this risk assessment. The Agency believes that the proposed exit levels represent levels below which further treatment would not be needed to minimize threats to human health and the environment.

c. Scope of Risk Assessment

The broad scope of the risk analysis is a critical factor in the Agency's conclusion that proposed exit levels minimize both short term and long-term threats to human health and the environment, for those constituents where data are relatively complete.

The risk analysis evaluates all of the most common non-Subtitle C disposal options available to waste generators and treaters. These include disposal in landfills/monofills and by land farming, and management in surface impoundments, tanks and waste piles. The risk analysis assumes no minimum level of regulation of these facilities, and relies on available data to characterize them. As described in detail in Section IV and in the risk analysis report (EPA 1995), EPA modeled each disposal alternative using median values for most inputs, and high-end or conservative values for the two fate and transport and two exposure parameters for which the modeling outcome is most sensitive. The Agency believes that the modeling will also protect against exposures from similar disposal alternatives not specifically modeled.

The risk analysis evaluates the movement of waste constituents from each of these disposal options through numerous environmental fate and transport pathways. These include pathways involving volatiles and respirable (PM10) particulates, particulate deposition on soil and plant surfaces, vapor phase diffusion into surface water and plants, and surface run-off and soil erosion. Many of these pathways can result in waste constituent movement through the food-chains. Therefore, human exposures resulting from these fate and transport pathways include inhalation, soil or groundwater ingestion, and dermal contact, as well as exposure through consumption of contaminated foods such as fish, beef or vegetables.

EPA screened all multipathway constituents for potential to pose threats to ecological receptors. For 45 constituents, EPA quantitatively assessed likely risk to selected ecological receptors. Risks to both fresh water aquatic and terrestrial organisms were evaluated, representing different trophic levels and feeding habits of the ecosystem. Fish, daphnids, and benthic organisms, mammals, birds, plants, and soil organisms (nematodes, insects, etc.) were evaluated. The sustainability of the ecosystem and reproducing populations within the aquatic and terrestrial ecosystems was selected as an assessment endpoint, as described in Section IV of this Notice and in detail in Chapter 3 of the risk analysis support document (EPA 1995).

In addition, as part of this overall risk assessment effort, the Agency has reviewed and reevaluated its modeling of waste and waste constituent movement through groundwater. As described in Section IV above, this responds to comments by interested parties on the original HWIR proposal, as well as incorporates additional data submitted to the Agency (API data base), and updated modeling of leaching from wastes (new HELP model; get Cite).

In evaluating groundwater, the Agency examined both wells located on the landfill edge and closest wells anywhere down-gradient. Also, both finite source type and infinite-source type constituents (which behave as though there is an infinite supply of the constituent in the landfill, and will continue to leach forever) were evaluated. For finite source type constituents, the available constituent was not apportioned over the groundwater and other pathways, i.e., groundwater was modeled separately. Adsorption to soil and degradation of waste constituents (but not biodegradation) is modeled, and the toxicity of constituent daughter products (either more or less toxic than the parent compounds) is included. (There is a biodegradation module to the model; however, data to run that module for national conditions are not adequate at this time, although data were available for some sites. The Agency will continue to evaluate biodegradation data as they become available, and assess in the future whether national biodegradation estimates can be defensibly made). Leaching and groundwater migration from disposal in unregulated industrial landfills, surface impoundments, and waste piles have been modeled.

In evaluating the results of this series of groundwater modeling exercises, the Agency selected the approximate 90th percentile from a distribution of wells closest to modelled sites. This means that there is about a 90% probability that the drinking water well closest to the landfill would be protected at the target concentration (MCL or HBN). All wells more distant would be protected to a greater extent.

As described in section VI.E. above, the Agency then reviewed the risk assessment for groundwater and the pathways for each constituent, and selected as the exit level the concentration, back-calculated to the waste, from the most limiting (or highest risk) pathway. By using the most

limiting pathway as the basis for the risk criterion, the Agency believes it has accounted for all significant risks resulting from disposal and management of the waste outside of Subtitle C.

The agency believes it is also important to identify and discuss some of the limitations of the risk assessment, especially as they relate to determining whether short term and long-term threats to human health and the environment have been minimized.

The analysis does not account for additivity of risk for exposure to multiple constituents. Evaluation of risk additivity can be a complex analysis when even a few constituents are included. In the case of multiple waste constituents, potentially occurring in one or more waste streams that might be considered for exit, the complexity of conducting and analysis of additivity of risk quickly becomes overwhelming. However, EPA believes it will often be the case that one constituent typically drives determinations of whether waste streams exit and additivity would often make little difference with respect to the calculated exit levels.

Exposures to the same constituent from several pathways also are not added together, even though the risk analysis does apportion the available quantity of waste constituents over the different pathways evaluated. Again, EPA believes that often one result (in this case, one pathway) would contribute most of the risk and little would be gained from adding across pathways. EPA requests comment on this issue.

Data also were not available for all human exposure routes for all constituents, although data for high-risk pathways were usually available. Nonetheless, the Agency believes the exit levels can be considered to represent levels that minimize threats to human health and the environment because of the comprehensive evaluation of possible exposure routes, consideration of both human and ecologic risk, selection of the most restrictive pathway overall, and the relatively conservative risk target, $10^{-6}$, used in setting the exit levels derived from cancer risk estimates.

As mentioned above, EPA conducted a screening analysis to identify 47 high priority constituents for ecological assessment. EPA did not model the ecological impacts for 36 additional constituents that displayed one characteristic indicating potential ecological impacts. EPA is proposing to set minimize threat levels for 19 of these constituents.

EPA believes that it has adequately assured that the caps to BDAT treatment standards proposed today minimize threats to the environment. The specific ecological risk assessment conducted for 45 constituents (19 of which have minimize threat levels under this proposal) is the most extensive EPA has ever conducted under the RCRA program to date. EPA did not find threshold effects data for all seven groups of ecological receptors for any constituent evaluated for ecological risks. Rather, EPA typically had benchmarks for three to five groups. Nevertheless, its consideration of a broad range of species and use of reasonably conservative endpoints ensures that threats to ecological receptors are minimized.

With regard to chemicals that did not undergo this detailed assessment, EPA has conducted an extensive review of risks to human health, including a thorough review of risks posed by indirect pathways and risks posed by constituents that bioaccumulate in plants and animals consumed by humans. (Bioaccumulation is a key concern for protection of many ecological species.) EPA believes that it is reasonable to assume that the exit levels identified by this analysis also minimize threats to ecological receptors unless it has some definite data indicating that additional protection is warranted. Reliance on these levels is particularly appropriate for those chemicals that did not display one of EPA's ecological screening characteristics. EPA finds it also appropriate for the 15 ''minimize threat'' chemicals which exhibited one ecological screening characteristic. EPA acknowledges that conducting a specific assessment of ecological risks for these 15 constituents would have provided additional assurance that threat to ecological receptors were minimized. EPA solicits comment on the option of declining to set minimize threat levels for these 15 constituents until it can complete an ecological assessment for them.

d. Risk Targets Minimize Threats

The Agency believes that the risk targets used in the risk analysis to back calculate to waste concentrations minimize threats to human health and the environment. For cancer risks to human, a risk target of one in one million, over a lifetime is the risk target. For non-carcinogens, a hazard quotient (HQ) based on a reference dose or other comparable value from the literature could not exceed one (hazard quotient (HQ)=1). Reference doses or comparable values are based on studies of toxicity and no-effect levels in test animals and extrapolated, using safety factors, to humans. For ecological receptors, population effects inferred from individual effects and effects on a substantial number of both aquatic and terrestrial species were evaluated.

Other risk targets may be considered in establishing minimize threat levels. The Agency solicits comment on whether apportionment of the RfD ought to be used in establishing minimize threat levels (i.e., HQ<1). The Agency uses 20% of the Rfd in setting drinking water standards; a similar approach might be appropriate in establishing minimize threat levels and in establishing exit levels. EPA requests comment on this issue.

2. Public Policy Considerations

Finally, the Agency believes that it represents good public policy to reduce or eliminate unneeded or duplicative regulatory requirements. In this case, the Agency believes that for the initial list of constituents listed in Table 1 of 40 CFR 268.60, treatment to the UTS/LDR standard is no longer required beyond waste constituent concentrations where risks to human health and the environment are insignificant. Because there is no purpose in terms of protecting human health and the environment for retaining the more stringent LDR requirements, the Agency is proposing to revise them to the risk-based levels. This would reduce the overall number of different and distinct regulatory requirements on waste generators and treaters, would rationalize the RCRA regulations, and will provide significant pollution prevention opportunities and incentives. Waste generators would have only one target level to direct their pollution prevention effort toward. If generators met the LDR/exit levels, the waste would not be considered hazardous, and no additional treatment would be required before disposal in a subtitle D facility. Where waste continues to exceed one or more exit levels after LDR requirements are met, subtitle C disposal would be required.

*C. Risk-based LDR Levels*

1. List of Constituents and Minimize Threat Concentrations

As was mentioned earlier in this section, only modeled constituents' risk-level results are eligible to serve as risk-based LDR levels meeting the statutory requirement of minimize threat. In addition, minimize threat levels are only proposed for those constituents where the risk level is higher (less stringent) than the associated

technology-based treatment standard in § 268.40 or the UTS level in § 268.48.

First, the Agency repeats that it is not proposing to set any alternative risk-based LDR standards expressed as specified technologies (rather than constituent concentrations.) Consequently, the option of complying with minimize threat levels in lieu of levels specified in part 268 will be available only for wastes with treatment standards expressed as constituent concentrations. This includes both wastes subject to waste-specific treatment requirements under the table to § 268.40 and wastes subject to the Universal Treatment Standard levels in the table to § 268.48

The Agency proposes that for purposes of establishing nonwastewater and wastewater minimize threat values for wastes with BDAT treatment standards expressed as constituent concentrations, the levels proposed would utilize the LDR definitions of nonwastewater and wastewater from 40 CFR 268.2(d) and (f). Therefore, any exit levels that are considered nonwastewater for purposes of exit will also be considered nonwastewater for purposes of minimize threat. Likewise, wastewater exit levels will be considered wastewater LDR levels. The Agency believes that consistent definitions of nonwastewater and wastewater is the only practical means to establish minimize threat levels. The Agency realizes, however, that the modeling and subsequent development of exit levels for today's proposed exit did not use the part 268 definition of nonwastewater and wastewater. (A complete discussion of this may be found in section VIII.A.1.a.ii.) The effect of this would be that some wastes that would be defined as wastewaters under today's proposed exit scheme would be considered LDR non-wastewaters. The Agency requests comment on whether the definition in Part 268 should be adopted for purposes of establishing minimize threat levels.

The Agency compared the exit levels to the current LDR treatment levels to determine whether a constituent's risk level should be proposed as a minimize threat level. For wastewater values, the LDR wastewater value was directly compared to the wastewater exit value. Where the UTS nonwastewater level is a total level, the comparison was made to the nonwastewater totals exit level. Where the LDR nonwastewater level is a leach level, the comparison was made to the nonwastewater leach exit level. However, for the reasons explained below, the nonwastewater minimize threat level would contain both a leach level and a totals level. For both wastewater and nonwastewater, where the most comparable exit level is higher (less stringent) than the current LDR level, the constituent's risk level is proposed as an optional minimize threat level. The Agency requests comment on this approach to determining which exit levels are higher than current LDR levels.

The Agency is proposing that testing requirements when using minimize threat levels would be consistent with the current LDR testing requirements found in § 268.7. The Agency proposes that if a claimant wishes to meet LDR requirements by complying with a minimize threat level, the claimant must meet the minimize threat levels with a totals analysis, and where specified, the waste must meet the leach level with a leachate analysis. The Agency believes that a totals analysis is preferable to a leach analysis for establishing minimize threat levels, as it more directly pertains to all pathways, not only the groundwater pathway.

Today's proposed exit levels for nonwastewaters consist of two risk levels for each constituent. The totals (mg/kg) nonwastewater risk level is the result of the most limiting non-groundwater pathway. The leach (mg/L) nonwastewater risk level is the result of the most limiting groundwater pathway. The Agency believes it would be preferable to have one exit level, but the groundwater model results are a leach (mg/l), whereas the results from the multipathway analysis are a totals (mg/kg), and the science to extrapolate from a leach to totals is highly variable. Using only the leach or only the total risk level would reflect only a portion of the risks presented by the waste. A waste must meet both of these limits before it minimizes threats to human health and the environment. Consequently, EPA is proposing to include both levels in the minimize threat standards for nonwastewaters. The Agency proposes to allow generators to either use a calculational screen or perform the TCLP to make a determination that constituent concentrations do not exceed nonwastewater leach minimize threat levels. A full discussion and explanation of the calculational screen can be found in section VIII.A.1.a.iii. of today's proposal.

Because extrapolating from a leach to a total varies with each constituent and is not easily measured, EPA has not directly compared both of the minimize threat levels with the LDR standard. The Agency requests data on specific constituents where the second, less easily-compared nonwastewater minimize threat level may be harder to achieve than the current LDR standard. If such results occur, waste handlers will not be required to use the new minimize threat levels. The levels in the tables to § 268.40 and § 268.48 will continue to satisfy LDR requirements as they always have. The minimize threat levels will be located in Table 1 of § 268.60, are optional, and are intended to be used to provide treatment relief. The Agency believes that minimize threat levels will only be used where they are less stringent than current LDR levels. The Agency requests comment on the proposed revisions to part 268 with respect to minimize threat levels.

Table D–1 of appendix D to the preamble presents for comparison current LDR UTS standards and proposed minimize threat levels. The Agency is proposing that for the constituents listed below, the risk levels may substitute for current UTS treatment levels in 40 CFR 268.48 or for treatment standards for these constituents in 40 CFR 268.40. A table of the proposed minimize threat levels can be found at proposed 40 CFR 268.60 subpart F in the regulatory text following this preamble.

2. Constituents for Which Exit Levels Are Not Minimize Threat Levels

As an alternative to the approach described in C.1 above, the Agency solicits comment on the background data underlying the risk evaluations for these constituents. The Agency believes, in general, that the constituents evaluated in the risk analysis have relatively complete assessments of risk. The Agency recognizes, however, that data quality and completeness can vary among constituents, even for those for which risk can be assessed. The Agency solicits comment on both general criteria for assessing completeness of data, and also specific constituents for which use as minimize threat levels to cap LDR requirements may be inappropriate.

*D. Meeting LDR Requirements*

1. Wastes Below Exit Levels as Generated

EPA proposes that, if a generator samples a listed waste stream at its point of generation and analysis of the sample shows all constituents to be below exit levels, LDR requirements would not apply to the waste. EPA is proposing this result both for constituents with exit levels based on multipathway analysis (where, since exit levels can serve as LDR ''minimize threat'' levels that cap current treatment requirements, the LDR program will never require treatment to levels lower than exit levels) and constituents with

exit levels based on extrapolation from the multipath analysis or quantitation levels (where, since EPA has not proposed to make exit levels into LDR minimize threat levels,the LDR programs may require treatment to levels lower than exit levels).

To claim this relief generators would have to certify that they sampled their wastes at the point of generation. In the interim between sampling and receipt of analytical results, the generator would be required to manage the waste as hazardous. However, EPA would take the position that this brief period of Subtitle C regulation would not subject the waste to LDR requirements.

EPA believes that position is consistent with its prior interpretations of LDR provisions and the D.C. Circuit's opinion in *Chemical Waste Management II.* At issue in that case was EPA's determination that LDR treatment standards apply to wastes that are characteristically hazardous at the point of generation but that *subsequently* cease to exhibit characteristics and become nonhazardous wastes. EPA took that position to ensure that characteristic wastes receive effective treatment. Without this requirement, for example, it would be possible to dilute characteristic wastes and evade LDR treatment requirements. The Court held that EPA must apply this interpretation consistently to characteristic wastes.

It is not necessary, however, to follow this interpretation for wastes that are generated with all constituent concentrations below exit levels. EPA can reasonably distinguish between wastes that are below exit levels at the point of generation and wastes which achieved such levels at some subsequent time. Only wastes which exceed exit levels at the point of generation need continued LDR applicability to ensure that they reduce constituent concentration or constituent mobility by complying with LDR standards rather than using dilution or some other inferior form of treatment. A generator of wastes that meet exit levels as generated would not use waste treatment to evade LDR requirements. Rather, he or she might use waste minimization techniques to reduce concentration or mobility of constituents in the precursor to his waste.

EPA notes that it is proposing to require listed wastes which exceed exit levels at the point of generation to meet LDR treatment requirements, even if the waste later meets exit levels. EPA believes that this requirement carries out the LDR requirements set out in the Third Third rule and the *Chemical Waste* decision.

Finally, EPA notes that it would be possible to articulate alternative rationales for exempting from LDR requirements wastes which meet today's exit levels as generated. For exit levels based on extrapolations from the multipathway analysis, EPA could argue that extrapolated levels are LDR ''minimize threat'' levels. EPA, however, thinks protection of the environment is better served by refraining from such a step and requiring wastes which exceed such levels at the point of generation to meet current technology-based LDR standards. (As explained above, EPA is not entirely certain that these extrapolated levels actually minimize risks for all constituents.) For exit levels based on quantitation limits, imposing LDR requirements would not have any practical impact. LDR treatment standards are limited by the same quantitation limits proposed for this rule. Consequently, treatment standards for constituents limited by analytical capabilities are not lower than the exit levels.

2. Wastes Above Exit Levels as Generated

Listed wastes that are above exit levels as generated would be required to be treated to the LDR standards in force at the time if they are placed on the land.

## VII. Dilution

The 1984 RCRA Amendments (HSWA) established a vigorous national policy for minimizing the generation of hazardous wastes. Section 1003 of RCRA, as amended in 1984, established a national waste minimization policy stating that ''wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible''. The policy also cited the need to reduce the volume and toxicity of hazardous wastes which is nevertheless generated. Similarly, section 3005(h) prescribed that effective September 1, 1985, all RCRA permittees who generate waste disposed of, treated, or stored on-site certify, on an annual basis, that the facility has waste minimization programs in place. In addition, section 3002(b) mandates that hazardous waste generators include a certification with their hazardous waste manifests that the generator has a waste minimization program in place and that the proposed method of off-site management minimizes threats to human health and the environment. In concert with these HSWA mandates, it is the Agency's policy to encourage source reduction (*i.e.,* waste minimization) and waste treatment as preferable to disposal and dilution.

EPA has recognized that successful implementation of the land disposal restrictions requires that, in general, dilution be prohibited as a partial or complete substitute for adequate treatment of restricted wastes. The legislative history indicates that such a prohibition ''is particularly important where regulations are based on concentrations of hazardous constituents'' (H.R. Rep. no. 198, Part I, 98th Congress, 1st Session 38 (1983)).

The Agency also opposes the dilution of hazardous wastes for several technical reasons. Most importantly, dilution is an environmentally inappropriate means to reduce toxicant concentrations because it does not reduce toxicant loadings to the environment. The same mass of toxicant is released to the environment when a diluted waste is disposed as would be if that same waste, prior to dilution, were to be disposed. While mass loading of the environment is itself a serious concern, the potential for environmental damage is magnified when toxicants (for example, pesticides and metals) bioaccumulate in the food chain. In addition, diluted wastes can create an unnecessary demand for scarce solid waste disposal capacity.

For these reasons, dilution is generally prohibited as a means to achieve the exemption levels under today's proposal. Because today's rule proposes to amend the some of the current LDR levels by establishing minimize threat levels, allowing dilution as a means of achieving exemptions would be inconsistent with the ban on dilution included in the land disposal restrictions rule (40 CFR 268.3). In addition, dilution would be inconsistent with the Congressional purpose of encouraging waste minimization. Thus, today's proposed rule specifically prohibits dilution as a means of attaining the exemption levels except as provided under the LDR program under 40 CFR 268.3(b).

## VIII. Implementation

Today's proposed rulemaking would establish a generic set of constituent-specific exemption levels for listed hazardous wastes. Wastes with hazardous constituent concentrations below the generic exemption levels would be conditionally exempt from Subtitle C.[5] Today's proposed

[5] Exempted wastes would continue to be solid wastes, and as such would require proper management under subtitle D and other applicable state laws.

rulemaking would be self-implementing; that is, no prior governmental approval or review of documentation would be required before wastes are eligible to exit. Claimants of an exemption, however, would be required to meet certain prerequisites in addition to the generic constituent concentration levels before the wastes would be considered non-hazardous. These testing and notification requirements are necessary to ensure that only those hazardous wastes which truly meet the exemption criteria exit the subtitle C system. In addition, certain testing and record-keeping conditions would be imposed to maintain the exemption to ensure that the waste continued to be eligible for the exemption. Failure to satisfy the conditions would void the exemption.

*A. Implementation Requirements*

To make an effective claim, persons would need to comply with the following requirements:

—The waste must be sampled and tested in accordance with a comprehensive sampling and analysis plan prepared prior to conducting sampling and analysis (EPA recommends, as guidance, using the basic elements of sampling and analysis plans described in Chapters One and Nine of SW–846);

—Representative samples collected in support of an exemption proposed in today's notice must consist of a sufficient number of samples to represent the spatial and temporal variability of the waste characteristics;

—The waste must be tested for all hazardous constituents except those that should not be present in the waste as defined by this rule, with documentation supporting determination not to test any constituent available on-site at the time of the notification;

—If the claimant must test for any hazardous constituents on table B of appendix X of 40 CFR part 261, the waste must also meet treatment standards for those constituents listed on UTS table of 40 CFR 268.48;

—A notification must be submitted to the Regional Administrator (or authorized State) (hereafter referred to as the implementation authority), along with

—A certification signed by the claimant's authorized representative attesting to the completeness and accuracy of the notification, and

—Verification that a notice of the exemption claim has been placed in a major local newspaper of general circulation.

Any deficiencies in compliance with these requirements would prevent the exemption from being valid; that is, the waste would not exit the subtitle C system. Claimants would not be able to use their knowledge of the waste alone to make a determination. Furthermore, in order to defend a claim that a waste was exempt under today's proposed rule and thus exempt from hazardous waste regulation, claimants would bear the burden in an enforcement action of establishing that the waste in question met the exit levels and the other requirements for the exemption.

1. Testing Requirements

In today's notice, the Agency is proposing concentration-based exemption criteria below which a listed hazardous waste would be conditionally exempt from subtitle C compliance. To best ensure accurate characterizations of constituent concentrations in these wastes, the Agency is also proposing sampling and analysis requirements for the exemption determination proposed today. Adherence to these requirements, however, does not ensure that the characterization is accurate and representative of a waste on a continual basis. It is the generator's responsibility to ensure that a waste always meets the exemption requirements proposed today for *all* appendix X of 40 CFR part 261 constituents, regardless of which constituents the facility is required to test and how often testing is performed.

To be eligible for an exemption, EPA is proposing that facilities must (1) demonstrate that each constituent of concern is not present above the specified exemption level in the waste, (2) demonstrate that the analysis could have detected the presence of the constituent at or below the specified exemption level, and, (3) where specified, comply with the LDR standards applicable to the waste. Today's proposed rule allows that any reliable analytical method may be used to demonstrate that no constituent of concern is present at concentrations above the exemption levels. It is the responsibility of the generator to ensure that the sampling and analysis is unbiased, precise, and representative of the waste.

The Agency will consider that the exemption level was achieved in the waste matrix if an analysis in which the constituent is spiked at the exemption level indicates that the analyte is present at that level within analytical method performance limits (e.g., bias and precision). The Agency prefers this empirical demonstration of method performance through the successful analysis at the exemption level. The Agency requests comment on this and any other approaches to demonstrate method performance.

In general, the Agency is proposing testing requirements that would consist of an initial test to characterize the waste as exempt, followed by subsequent testing to ensure ongoing compliance with constituents of concern. A generator of a listed waste on a one-time basis will only be required to comply with initial testing requirements. Wastes produced on an infrequent (batch) or continuous basis will have to comply with initial testing requirements and subsequent testing requirements as appropriate based on the volume of the waste. The Agency asks for comment on this general approach to testing requirements.

a. Data Evaluation

i. Compliance With the Exit Levels

The Agency is requesting comment on three approaches of data evaluation.

First, the Agency is proposing that, for exemptions under today's proposed rule, generators would be required to evaluate their waste based on the maximum detected concentrations of the exemption constituents. If any constituent concentration is greater than its specified exit level, then the waste would be ineligible for exemption under today's proposed rule. One advantage of this approach is that facilities can use process and waste knowledge to determine the appropriate number of representative samples without relying on a complex, potentially costly statistical approach to determine an appropriate number of samples. However, generators will need to be sufficiently knowledgeable about their waste and process to make an unbiased determination regarding the appropriate number of samples. Actual sample representativeness might be difficult to verify or otherwise assess (on a statistical basis). Finally, the level of uncertainty associated with the results cannot be defined. Because of this, under this approach, a single composite sample that validly exceeds the HWIR exit levels would indicate that the waste is hazardous and must be handled in Subtitle C.

Second, the Agency requests comment on also allowing a second data evaluation method whereby the analytical results are evaluated in terms of an upper confidence limit around an average concentration. An example of one method for determining an upper confidence limit is presented in the statistical approach found in Chapter Nine of SW–846 (Third Edition, as amended by Updates I, II, IIA, and IIB),

where, for the purpose of evaluating solid wastes, the probability level (confidence interval) of 80 percent is used. Sample measurements for which the upper limit of the 80 percent confidence interval about the sample mean is below the regulatory level for the chemical contaminant are not considered to be present at levels of regulatory concern. One main advantage of this approach is that the number of samples is statistically determined and thus it eliminates any bias that might otherwise be introduced when using knowledge to determine the appropriate number of samples. In addition, the level of uncertainty associated with the results can be determined. However, the main disadvantage of this approach is that it could be more costly for some facilities than the proposed approach. For example, it might require multiple rounds of sampling to determine the mean and variance. Highly variable wastes may require the collection of many more additional samples than might otherwise be determined to be necessary using the first approach. However, this statistical approach allows occasional samples to be above exemption level, as long as the upper confidence limit of the data overall is below the exit level.

The Agency also requests comment on a third data evaluation method that would allow facilities to use long-term average data to demonstrate compliance without consideration of the upper confidence limit. A rolling average of samples would be taken over the course of a year on a schedule determined by the initial sampling and analysis plan. As long as the average of the samples was below the HWIR exit level, the waste stream would be considered non-hazardous. This approach would have the advantage of being simpler than the second option, while allowing occasional exceedences of the exit levels by single samples, as long as the average concentration is below exit levels.

EPA has modelled risk with the assumption that the constituents of concern are uniformly distributed within the waste at the exit concentrations. In discussion with the Hazardous Waste Identification Dialogue Group, some representatives noted that actual levels might need to average significantly below the exit levels if the exit criteria are to be consistently met. The second and third data evaluation methods discussed above help address this issue.

However, EPA and the States have noted that the only practical approach for enforcement purposes is to independently collect samples for analysis (which may represent a composite of materials spatially or over a short time span) and to set up the regulation so that an exceedence by any single composite sample during an inspection could constitute a violation. It would then be the responsibility of the generator to refute this, using historic sampling data and possibly additional samples to show that the sample exceedence does not constitute an overall violation of the HWIR levels.

EPA believes it is important to retain the practical approach whereby a single composite sample of a waste at some arbitrary point in time or space during a short visit is considered sufficient for enforcement purposes. However, because the exit numbers were modeled based on long-term average concentrations, the Agency requests comment on allowing occasional exceedences as long as the average concentration meets the exit level.

In addition to the concern about enforceability, however, EPA has identified two additional concerns about using average concentration to determine compliance. First, not all waste streams would be disposed of in the same place. Thus the wastes may on average be in compliance when they are generated, but the wastes arriving at the disposal site (possibly from multiple sources) may not be, on average, below the exit levels. Second, EPA has not modeled the constituents for acute risk. While the average concentration of constituents may be below the exit levels, the occasional ''high'' concentration may be of concern due to acute health or ecological effects.

One possible way to address some of these concerns is, in addition to requiring that the average meet the exit levels (as in the second and third data evaluation methods), EPA could require that all samples be below some ''peak'' concentration.

Under this approach, if the average concentrations are below the exit levels, and all individual samples are below the higher peak level, then the generator would be in compliance and need take no further action to support the exemption. EPA or a State would then be able to confirm waste status without total reliance on the generator's data and without the expense of periodic sampling by EPA or the State. EPA requests comment on this issue, including any information on setting peak levels.

For any of the three data evaluation approaches, representative samples must be collected in support of exemption under today's proposed rule, consisting of a sufficient number of samples to represent the spatial and temporal variability of the waste characteristics, regardless of how the sample number is determined.

For the identification and handling of ''outliers'', the Agency is recommending that testing for outliers should be done if an observation seems particularly high or low compared to the rest of the data set. If an outlier is identified, the result should not be treated as such until a specific reason for the abnormal measurement can be determined (e.g. contaminated sampling equipment, laboratory contamination, data transcription error). If a specific reason is documented, the result should be excluded from further data evaluation. If a plausible reason cannot be found, the observations should be treated as a true, albeit extreme, value and not excluded from the data evaluation, as waste composition can vary. The Agency solicits comments on implementable techniques for the identification of analytical outliers.

The results of the tests of all of the constituents on the exemption list would be required to show the constituent concentration to be at or below the exit level in order for the claimant to be eligible for an exemption. In the case where a constituent's exit level is based on the quantitation criteria (EQC, as described in section IV.E.), in addition to showing a non-detect at the exit level, the waste would be required to meet applicable requirements set forth at 40 CFR part 268. Certain facilities may have difficulty quantifying a constituent at the exit level due to matrix interference effects, but the Agency expects exempted wastes to have relatively clean matrices such that exit levels should be able to be achieved. The Agency believes that the exit level must be met in order for a waste to exit Subtitle C; therefore, waste streams that cannot meet exit levels would not exit under today's rule. The Agency asks for comment on this approach.

ii. Wastewater and Nonwastewater Categories

Throughout today's proposal and background documentation, all of the exit levels have been described as being applicable to two categories of wastes using the terms wastewater and non-wastewater[6]. EPA used these terms as an initial means of distinguishing two waste categories that are inherent to how the exit levels were developed, by taking into account how these wastes

[6] The terms ''wastewater'' and ''non-wastewater'' are used generically in today's preamble and rule, and do not represent the land disposal restriction definitions in 40 CFR 268.2(d) and (f), although one option EPA is requesting comment on in this section is the use of those definitions.

will be managed (i.e., stored, treated, and disposed), and also how the wastes would be expected to behave in the environment. In the development of the exit levels, several waste management units were evaluated in the underlying risk analysis. The units chosen for evaluation were those that are considered most likely to manage the types of wastes that would be expected to exit Subtitle C regulation under today's exemption. Although these units will likely receive to some degree both forms of waste, in general there are technical, physical, and sometimes legal constraints on what types of waste are managed in each. The Agency considered ash monofills, waste piles, and land application units as typically managing waste materials that can be considered ''solid'' or ''non-wastewater,'' while tanks and surface impoundments typically manage ''liquid'' or ''wastewater.'' Based on these assumptions, results from the analysis of risk from these specific waste management units were then used to generate the corresponding exit levels for non-wastewater and wastewater.

In considering how to develop final definitions and terms for these two waste categories, the Agency's goal is to establish definitions that are clear, concise, and easily distinguishable from other similar terms such that a generator can readily determine which set of exit levels to apply to the waste being evaluated for the exemption. EPA requests comment on three options for defining these two waste categories to determine which set of exit levels to apply to a listed waste eligible for today's proposed exemption. EPA emphasizes that these definitions will only apply in the context of today's exit rule.

The Agency also requests comment on whether it is reasonable in all three options to allow a generator the alternative options of separating in the laboratory the solid (or nonwastewater) portion of the waste from the liquid (or wastewater) portion of the waste, analyzing the resultant portions, comparing the results to the corresponding exit levels, and treating the waste as exempt if all exit levels are met in both portions.

*Option 1: Using Percent Solids*—EPA prefers the option of defining the two categories of exit levels as ''solid'' and ''liquid'' exit levels, where the distinction between solids and liquids is based upon the percent solids content of the waste, as determined using Section 7.1 of the Toxicity Characteristic Leach Procedure (TCLP) in SW–846. Specifically, the option would define wastes containing 15 percent solids by weight or greater as solids,[7], while wastes with less than 15 percent solids by weight be defined as liquids. EPA believes that the 15 percent cutoff is a reasonable distinction between the two categories of exit levels, for the following reasons. Because there are general prohibitions on liquids or wastes containing free liquids in non-hazardous waste landfills accepting municipal wastes, the Agency does not envision wastes containing less than 15 percent solids being managed in these units. Similarly, it is unlikely that waste containing less than 15 percent solids will be stored in waste piles due to obvious physical limitations. For land application units, EPA believes that 15 percent solids content by weight is a reasonable lower limit for the types of wastes typically managed in these units; indeed, this was the value used in the land application unit scenario in the groundwater modeling portion of the risk assessment underlying today's exit levels.

Because of these limitations, EPA believes that wastes containing less than 15 percent solids will more frequently be managed in the types of units associated with wastewater treatment, such as tanks and surface impoundments. In fact, EPA believes that many wastes falling into the liquid category under this definition, that can realistically exit under today's proposed exit rule, will likely be wastewaters that have undergone treatment and that contain much less than 15 percent solids. EPA presumes that in many cases the separation of water from solids will be occurring as part of routine wastewater treatment, and generators will be either be evaluating the solid residues (which would clearly meet our solid definition), or the treated water, much of which is currently discharged under the Clean Water Act and therefore likely has limits on the amount of solids present.

EPA also requests comment on alternative ways of determining percent solids content, including generator knowledge of the waste or results of previous analyses. The Agency believes that in many cases, particularly for fairly dry or fairly wet wastes, the generator can immediately ascertain from a visual inspection that the percent solids content is well above or well below the 15 percent solids value.

[7] EPA will avoid use of the term ''solid waste'' when describing the category of exit levels that are defined as solids under this option in today's proposal. This is to avoid confusion with the existing term ''solid waste'' in the RCRA program, which has specific statutory and regulatory definitions, which have no relationship to whether a waste is a physically a solid or a liquid.

*Option 2: Using LDR Definitions*—EPA also requests comment on the use of the same terms and definitions currently used under the land disposal restrictions. Wastewater is defined as waste containing less than 1 percent total suspended solids (TSS) and less than 1 percent total organic carbon, or TOC (40 CFR 268.2(f)). Non-wastewater is defined as any waste that is not a wastewater (40 CFR 268.2(d)). The principle advantage of this approach is it allows the use of consistent definitions for wastewater and nonwastewater in both today's exit system for listed wastes, and the LDR program. The advantage of this consistency is particularly apparent for those cases where LDR treatment standards are conditions of exit under today's rule. One disadvantage of this approach is that it defines wastes containing greater than 1 percent TSS as non-wastewater, even though these wastes will likely be managed in wastewater treatment systems using tanks and surface impoundments, which is inconsistent with the way in which the results from the risk analysis were used in developing exit levels. The Agency requests comment on this approach as an alternative to Option 1.

*Option 3: Using the Paint Filter Liquids Test*—The third option is to use the terms ''liquid'' and ''solid'' as in Option 1, but to use EPA Method 9095 from SW–846, the Paint Filter Liquids Test, to determine whether the waste being evaluated for exit is a liquid or a solid. Under this option, any waste determined to contain free liquids using Method 9095 would be considered a liquid, and the exit numbers currently in the wastewater category would apply to that waste. Conversely, a waste would be defined as a solid, and the nonwastewater exit levels would apply, if the waste does not contain free liquids using Method 9095. Under this option, EPA realizes that many wastes appearing like solid materials would actually be defined as liquids.

Method 9095 is presently used in defining the term ''liquid waste'' in the solid waste disposal facility criteria, for determining compliance with the prohibition on disposing of bulk or containerized liquid in municipal solid waste landfills (see 40 CFR 258.28). Method 9095 is also used in determining compliance with the prohibition on bulk or containerized liquids in hazardous waste landfills (264.314(c)).

iii. Totals and TCLP Analyses

Today's rule proposes that the claimant would be required to test the waste for which today's exemption is

being claimed to prove that constituent concentrations in the waste do not exceed the exit level(s) for each constituent that should be present in the waste.

The claimant would determine which category of exit levels would apply (e.g., wastewater or nonwastewater) to his waste. In a previous section of today's rule, the Agency requests comment on several options to define these two categories. For a wastewater waste to be eligible for exit, every constituent in the waste must comply with the wastewater total constituent exit concentration. For a nonwastewater waste to be eligible for exit, every constituent in the waste must comply with the nonwastewater total constituent exit level as well as the nonwastewater leach exit level.

A test for total concentration would be required for each constituent in the waste regardless of whether the waste is a wastewater or a nonwastewater to determine that the total constituent exit concentration has not been exceeded. For non-wastewaters, a claimant must also prove that the measurable leachate concentrations do not exceed the nonwastewater leach exit levels. The Agency proposes to allow claimants to either use a calculational screen or to use the Toxicity Characteristic Leaching Procedure (TCLP, Test Method 1311 in ''Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,'' EPA Publication SW–846) to make a determination that constituent concentrations do not exceed nonwastewater leach exit levels. Discussion concerning the methodology of a calculational screen is described below.

Section 1.2 of the TCLP allows for a compositional (total) analysis in lieu of the TCLP when the constituent of concern is absent from the waste, or if present, is at such a low concentration that the appropriate regulatory level could not be exceeded.

For wastes that are 100% solid as defined by the TCLP, the maximum theoretical leachate concentration can be calculated by dividing the total concentration of the constituent by 20. The dilution factor of 20 reflects the liquid to solid ratio employed in the extraction procedure. This value then can be compared to the appropriate regulatory concentration. If this value is below the regulatory concentration, the TCLP need not be performed. If the value is above the regulatory concentration, the waste may then be subjected to the TCLP to determine its regulatory status.

The same principal applies to wastes that are less than 100% solid. In this case, however, both the liquid and solid portion of the waste are analyzed for total constituency and the results are combined to determine the maximum leachable concentration of the waste. The following may be used to calculate the maximum theoretical concentration in the leachate.

$$\frac{[A \times B] + [C \times D]}{B + \left[20 \frac{L}{kg} \times D\right]} = E$$

where:

A = Concentration of the analyte in liquid portion of the sample (mg/L)

B = Volume of the liquid portion of the sample (L)

C = Concentration of the analyte in the solid portion of the sample (mg/kg)

D = Weight of the solid portion of the sample (kg)

E = Maximum theoretical concentration in leachate (mg/L)

If:

$E < exit_{leach}$

Then: A TCLP need not be performed for this constituent because, even if 100% of the constituent leaches, the TCLP results would be less than the regulatory leach standard. This calculation is adequate proof that this waste is at or below its leach exit level.

The above calculational screen may be used by a claimant in order not to perform the TCLP. The screen may be used to determine that a total analysis of the waste demonstrates that individual contaminants are at such low concentrations that the nonwastewater leach exit level could not possibly be exceeded, thus eliminating the need to run the TCLP.

*Example:* To illustrate the calculational screen, the following example is provided: An analyst wishes to determine if a leach processing sludge could fail the nonwastewater leach exit level for lead. The sludge is reported to have a low concentration of lead, and the analyst decides to perform a compositional analysis (totals test). A representative sample of waste is subjected to a preliminary percent solids determination as described in the TCLP. The percent solids is found to be 90%. Thus, for each 100 grams of this waste filtered, 10 grams of liquid and 90 grams of solid are obtained. It is assumed for the purpose of this calculation that the density of the filterable liquid is equal to one. The liquid and solid portion of the sample are then analyzed for total lead. The following data are generated:

Percent solids = 90%

Concentration of lead in the liquid phase = 0.023 mg/l

Volume of filtered liquid = 0.010 L

Concentration of lead in the solid phase = 85 mg/kg (wet weight)

Weight of the solid phase = 0.090 kg.

The calculated concentration is as follows:

$$\frac{[0.023 \frac{mg}{L} \times 0.010L] + [85 \frac{mg}{kg} \times 0.090kg]}{0.010L + [20 \frac{L}{kg} \times 0.090kg]} = 4.23 \frac{mg}{L}$$

In this case, the maximum leachable concentration is below the 10 mg/L regulatory concentration for lead, and the TCLP need not be performed.

iv. Oily Wastes

In this proposed rulemaking, the Agency has modelled the transport of solutes in groundwater as well as movement along other environmental pathways. This groundwater modeling involves predicting rates of constituent leaching from wastes in land-based waste disposal units. In using this fate and transport modeling to develop regulatory exit levels, the Agency is proposing to rely on the use of leach tests to ensure that groundwater is not contaminated. Among the test methods that have been developed and employed to identify wastes which might pose an unacceptable hazard are: Methods 1310 (Extraction Procedure), 1311 (Toxicity Characteristic Leaching Procedure, TCLP), 1320 (Multiple Extraction Procedure, MEP), and 1330 (Oily Waste Extraction Procedure, OWEP).

However, these leach test procedures all have deficiencies in predicting the mobility of toxic chemicals from oily

wastes. Method 1311 underestimates the mobility of constituents from many oily wastes due to filter clogging problems, can be imprecise for oily wastes, and has several operational problems. Conversely, Method 1330 is believed to overestimate mobility of constituents from oily wastes since it emulates a worst case scenario by using solvents to extract contaminants from the oil. None of the available laboratory procedures is fully satisfactory. Rather, they bracket the range of possible leaching for oily wastes.

In addition, EPA does not have a good definition for what constitutes an oily waste. EPA originally defined oily wastes as those materials that clogged the filter during Method 1311 (TCLP) extraction. EPA requests comment on how to better define what an oily waste is.

EPA also requests comment on which of the two tests methods (1311 or 1330) should be used and why should one test be chosen over the other for predicting the concentrations of contaminants in leachate from wastes being managed in landfills. EPA also requests comment on whether there are any alternative test methods or models that could be used for predicting the mobility of oily materials. Such procedures need to be both scientifically credible and environmentally protective. Methods need to identify material that might be released from the waste and enter the soil. Release is defined as movement of either the liquid phase of the waste or leached contaminants through the bottom of the waste unit to the subsurface soil immediately underlying the disposal point. Once contaminants pass this point their ultimate fate in terms of impact on down-gradient water supplies can be estimated by the ground-water fate and transport model (EPACMOW model).

EPA also requests comment on any additional problems with oily waste leachability not covered here, and whether the volatilization or other attributes of constituents should be considered in the development of a test.

Oily wastes also pose modeling challenges in groundwater because they do not disperse in the same pattern as aqueous liquids. This affects the movement of the constituents in the material. In the event of a release of waste at or near the soil surface, the waste will migrate downward until it reaches the water table. Light non-aqueous phase liquids (LNAPLs) will then tend to migrate laterally, forming a pancake on top of the water table. Dense non-aqueous phase liquids (DNAPLs) on the other hand will sink to the base of an aquifer and not show much lateral spreading until an impermeable layer is reached. EPA is requesting comment on what sort of wastes or what constituents exhibit these behaviors and how to define that set of wastes. Constituents that have been associated with DNAPLs include dichlorobenzenes, PCBs, napthalenes, chloroform, carbon tetrachloride pentachlorophenol, cresols, and several PAHs. However, trace amounts of these constituents are unlikely to pose a DNAPL problem. A DNAPL problem is likely to occur when there is sufficient concentration to flow as undissolved liquid that would then form the sort of complex reservoirs that subsequently slowly dissolve into groundwater. The Agency requests comment on concentrations of these or similar chemicals that are likely to pose DNAPL problems and whether the proposed exit levels in totals or, for nonwastewaters in leach levels, are sufficient to limit wastes exiting for which a DNAPL or LNAPL problem would need to be explicitly evaluated.

The Agency is continuing to work on developing tests and models for determining the leaching potential of oily materials and may propose them in future rulemaking. In the meantime, EPA is today proposing to apply the levels as proposed in this rule to oily wastes, but seeks comment on whether instead there is a definable class of wastes for which these levels cannot reasonably be concluded to be protective.

b. Initial Test

The Agency is proposing in today's rule that there would be an initial test before a facility would be eligible for an exemption. The initial test would be the primary tool to characterize the waste as exempt. Results from this initial test would be sent to the implementing agency. The public could request the implementing agency to make the results available.

EPA is proposing to require initial testing of all of the 386 constituents on appendix X of 40 CFR part 261 except those that the claimant determines should not be present in the waste. EPA would require the claimant to document the basis of each determination that a constituent should not be present. The claimant must submit the documentation to the implementing agency and retain a copy on site for three years. No claimant may determine that any of the following categories of constituents should not be present:

—Constituents set out in appendix VII to part 261 as the basis for listing the wastestream for which exemption is sought;

—Constituents listed in the table to 40 CFR 268.40 as regulated hazardous constituents for LDR treatment of the waste stream ;

—Constituents detected in any previous analysis of the same wastestream conducted by or on behalf of the claimant;

— Constituents introduced into the process which generates the wastestream; and

—Constituents which the claimant knows or has reason to believe are byproducts or side reactions to the process that generates the wastestream.

The Agency requests comment on whether these are the appropriate criteria to be used to determine what should not be present in the waste. The Agency also requests comment on requiring claimants who are not waste generators to consult the generator prior to determining that a constituent is not introduced into the process or that a constituent is not a byproduct or side product of the process. EPA believes that it is unlikely that a non-generator claimant would have sufficient knowledge of the production process to make adequate determinations on these issues. EPA requests comment on the type of documentation that it should require. The generator could co-sign the document that sets out the reasons for determining that the claimant need not test for a constituent, or the generator could prepare a separate supporting document that would be attached to the document for submission to the implementing agency and retention in the claimant's files.

The Agency is soliciting comment on whether the absence of constituents in the following documents could constitute sufficient justification for not analyzing all of the constituents listed in 40 CFR part 261 appendix X.

—40 CFR part 261 appendix VII highlighted to show which constituents are listed for each waste code applicable to that waste;

—40 CFR 268.40 highlighted to show which constituents are regulated under the land disposal restrictions for each waste code applicable to that waste;

—EPCRA Toxic Release Inventory reports highlighted to show which constituents are reported as being ''used'' in the manufacturing process from which that waste is generated (based on the EPCRA definition of ''use'');

—NPDES discharge permits highlighted to show which constituents are required to be monitored in wastewaters with which that waste is commingled or will be commingled;

—State or Local emissions monitoring permits or documents (e.g., stack emissions, fugitive emissions, groundwater monitoring, wastewater discharges, etc.,) highlighted to indicate which constituents are required to be monitored as potential emissions from units in which that waste is managed or will be managed;
—Responses to government and/or trade group data collection efforts (e.g., biennial reports, TSD surveys) that require submission of waste-specific constituent information;
—Published literature (e.g., journals, presentations, chemical and engineering reference documents, health and safety handbooks, material safety data sheets, etc.,) highlighted to indicate constituents that are formed or potentially formed from side reactions, degradation, or reactivity of the products, reactants, or solvents used in the manufacturing process generating that waste;
—Plant-specific process flow diagrams or process descriptions highlighted to indicate constituents that are formed or potentially formed from side reactions, degradation, or reactivity of the products, reactants, or solvents used in the manufacturing process generating that waste;
—Product specifications or constituent-specific labeling requirements under federal regulations, state regulations, or non-governmental standards (i.e, per product-grade) that identify constituents that are expected to be present in the products from which the waste was generated, highlighted to indicate those constituents identified as part of these specifications or standards (excluding chemical additives or preservatives that are placed in the products subsequent to the generation of the waste for which exit is claimed);
—Waste profile data sheets, such as those submitted to commercial waste handlers, highlighted to show the constituents that were found or expected to be present in that waste; and/or
—A certified, third party engineering analysis of the process generating that waste that provides qualitative verification of the theories behind the anticipated absence of certain chemical classes or groups of Appendix X of 40 CFR 261 constituents such as pesticides, pharmaceutical, halogenated solvents, carbamate, organo-sulfur compounds, known gases, cyanides, etc.;
—Any other available quantitative or qualitative constituent information specific to that waste

Relevant information includes not only those document sections that indicate which constituents are present, but also cover pages that indicate the source of the document segments and signature pages to verify authenticity of government-approved documents (where appropriate). For the verification purposes, page numbers should also be clearly identified for each document. EPA is also soliciting information on additional readily available documentation that could be added to this list that would not impose an unreasonable records burden on both the generator and enforcement officials (for example, the Agency believes that requiring highlighted copies of copious amounts of monitoring data would be redundant and would significantly impede enforcement review). EPA believes that requiring copies of only relevant portions of these documents, highlighted to indicate the chemicals present, should minimize the burden associated with this documentation requirement significantly.

Regardless of which constituents a facility tests, the facility is responsible for ensuring that each constituent in the waste meets its applicable exit level.

The Agency believes that the tailored initial test described above will ensure accurate waste characterizations of the waste streams while focusing testing requirements to those constituents that are of concern. A facility could determine whether a constituent would be present. A facility would *not* be authorized to determine that the constituents in the waste meet the exemption levels based on knowledge of the waste or material. This approach both reduces unnecessary testing costs and allows for more frequent monitoring of those constituents that are of concern.

The Agency is soliciting comment on whether this proposed approach to an initial test is appropriate.

The Agency asks for comment on taking the opposite approach: requiring each claimant to test only for those constituents that the claimant determines ''could be present'' for that waste. This would be a systematic way for facilities to focus the list of hazardous constituents to those that are mostly to be present in the waste. EPA requests comment on requiring at a minimum testing of the following categories of constituents:
—Constituents set out in appendix VII to part 261 as the basis for listing the wastestream for which exemption is sought;
—Constituents listed in the table to 40 CFR 268.40 as regulated hazardous constituents for LDR treatment of the waste stream ;
—Constituents detected in any previous analysis of the same wastestream conducted by or on behalf of the claimant;
—Constituents introduced into the process which generates the wastestream; and
—Constituents which the claimant knows or has reason to believe are byproducts or side reactions to the process that generates the wastestream.

The Agency asks for comment on the completeness of the proposed mandatory testing criteria. In addition, the Agency requests comment on whether testing should be required for those constituents that do not meet any of the criteria of ''could be present.'' The Agency also requests comment on whether documentation should be required to demonstrate that those constituents that were not tested did not meet any of the ''could be present'' criteria.

EPA requests comment on another approach to determining which constituents need to be analyzed by a claimant. The approach would be that the claimant needs to provide data on all additional constituents listed in appendix X of 40 CFR part 261 of today's rulemaking for which a method used by the generator to detect other constituents which the claimant is required to test can easily determine concentrations. Thus, for example, if a waste was listed for a constituent for which GC/MS is an appropriate method used by the claimant, the claimant would also be required to ask the laboratory to provide information on all other constituents listed in appendix X of 40 CFR part 261 of today's proposed rulemaking for which the GC/MS is also an appropriate method.

EPA did not use this in its primary proposal because the Agency realized that implementation of this concept become more complex than it appears. For example, even when using GC/MS, there may be sample preparation techniques, dilutions, and similar issues that determine which constituents can be measured in the appropriate concentration ranges using the method.

However, there is something intuitively reasonable and attractive in asking claimant to gather and provide information that is easily obtainable and would provide additional confidence and certainty. EPA solicits comments on this idea and ways to implement it.

The Agency requests comment on whether there is some other way to focus the scope of testing requirements or if the only way to ensure accurate waste characterizations would be to require testing for all 386 constituents.

The FACA suggested EPA should define, for major waste streams, a set of constituents that it believes would fairly characterize those waste streams. The Agency believes such an approach may be desirable. However, the Agency notes that this could require it to expend significant resources. The Agency requests comments on the feasibility or need for this approach in the long term.

EPA recognizes that some generators may wish to assert claims for protection of confidential business information (CBI) for some to the information that supports an exit claim. Material that is classified as CBI may be reviewed by EPA, but may not be released to the public. States may have similar provisions under state law. EPA requests comments on two options for addressing CBI information.

First, EPA requests comment on the option of prohibiting any person from asserting a claim of exit under this rule if that person wishes to claim CBI protection for any data or information used to support the exit claim, including all information submitted to the implementing agency in the notification package and all information required to be maintained by the claimant on site and furnished to the agency on request. A generator who wished to rely on CBI data to support an exemption claim for a listed hazardous waste would need to file a delisting petition with EPA or a state authorized for delisting.

EPA believes such an approach may be necessary because the exits proposed today are self-implementing. The public would not have the assurance of knowing that EPA or a state agency had reviewed the claimant's data and determined that it showed that the claimant's waste posed low risks to human health and the environment. Members of the public may not feel that they are adequately protected by the fact that EPA and authorized states could obtain the CBI data and use it (with appropriate precautions against disclosure) in an enforcement action if warranted. They may feel that the number of claims will strain agency inspection and enforcement resources, making it important for them to be able to bring their own citizen enforcement actions under section 7002 of RCRA.

At the same time EPA is sensitive to potentially legitimate business needs to protect information supporting an exit claim. Some firms may not wish to release detailed information about the chemical composition of their process waste streams. EPA also recognizes that the federal delisting process is considerably slower and imposes more procedural burdens than the self-implementing exit scheme. EPA requests comment on the alternative of creating a limited prior approval process for exit claims involving CBI claims. EPA anticipates that rulemaking would not be required. However, states that wish to obtain authorization for today's exit program might not be required to adopt this feature because they could argue that failure to provide a review process for CBI claims would not make their programs less stringent than the federal program.

EPA also notes that CBI protection is not absolute. EPA has authority under RCRA to release CBI information to the public as necessary to support rulemaking proceedings. (In fact, EPA could try to support the first option above by arguing that it was exercising in this proceeding its authority to waive protection for all of the individual exit claims that ''implement'' the rule.) Also, a citizen that has sufficient evidence of a violation to file a complaint in court may be able to persuade the court to order a limited release of the data for use in the enforcement proceedings.

2. Notification Requirements

The Agency is proposing that the required notification to the implementing authority would include the following information:

—The name, address, and RCRA ID number of the person claiming the exemption;
—The applicable EPA Hazardous Waste Codes;
—A brief description of the process that generated the waste;
—An estimate of the average and maximum monthly and annual quantities of each waste claimed to be exempt;
—Documentation for any claim that a constituent is not present;
—The results of all analyses and estimates of constituent concentrations and all quantitation limits achieved;
—Documentation that any constituents on Table B to appendix X of 40 CFR part 261 have met the applicable treatment standards in § 268.48, unless the claimant is claiming the exemption under § 261.36(e);
—Evidence that the public notification requirements have been satisfied; and
—A certification signed by the person claiming the exemption or his authorized representative.

The Agency is taking comment on whether the following additional information should also be sent to the implementing authority:

—The name and address of the laboratory which performed the analysis;
—A copy of the sampling and analysis plan used for making the exemption determination;
—A description of any chain-of-custody procedures;
—Whether the identity of the disposal facility should be included in the notification package;
—Dates of sampling and analysis; and
—A description of the (temporal and) spatial locations of the demonstration samples.

Also, the Agency is taking comment on whether, if the disposal facility is different than the claimant's facility, the claimant should also include as part of the notification package documentation that the claimant informed the disposal facility of the exempt status of the waste.

A complete notification package would include all required information in the notification and all required certifications signed by the appropriate individual, as identified in the regulations. Failure to submit a notification package if the exemption is being claimed or submission of an incomplete notification package would be a violation of RCRA requirements and thus subject to penalties and injunctive relief under section 3008(a) of RCRA and possible criminal liability under section 3008(d) of RCRA. As a necessary prerequisite to claiming an exemption, the burden would be on the claimant to establish that a complete notification package was submitted to the implementing authority to assert in an enforcement action that the waste is exempt.

It should be noted that, regardless of whether the sampling and analysis plan must be included with the notification to the implementing agency, a current sampling and analysis plan must be developed and used to establish the waste's eligibility for exemption, and must be available upon request to the implementing authority at the time the notification package is submitted and at least for three years. The sampling and analysis plan must demonstrate that the samples to be taken and analyzed will be representative of any spatial and temporal variations in the subject waste.

Furthermore, it should be noted that submission of sampling and analysis plans with the notification to the implementing authority does not change the self-implementing nature of the exemption. Submission of such plans would not be for review or approval of exemption claims prior to the exemption becoming effective. The implementing agency would be under no obligation to undertake such review or approval prior to the exemption

becoming effective, and failure to undertake such prior review would not preclude a subsequent enforcement action should the exemption claim later be determined to be inaccurate or otherwise invalid.

As proposed, the certification required to accompany the notification must attest that the waste in question meets all relevant constituent concentration exit levels and that the information in the notification package is true, accurate, and complete. The Agency is taking comment on whether this certification is sufficient assurance that the claimant has made best efforts to accurately characterize the waste or if additional certification language or additional certifications (*e.g.*, from an analytical laboratory) are necessary.

The notification package would be required to be submitted by certified mail with return receipt requested, or other commercial carrier that provided written confirmation of delivery. No claim would be effective until the claimant received the return notification indicating that the package had been delivered.

Submission of the notification package to the implementing authority, however, is not equivalent to approval or verification of the exemption claim. Submission of a notification package would not preclude or in any way limit the implementing authority's ability to take a subsequent enforcement action should it determine that the initial requirements of exemption were never met or that the conditions for maintaining the exemption are not satisfied.

The Agency is taking comment on whether, instead of the exemption becoming effective upon confirmation of delivery of the notification package, there should be some brief waiting period prior to the exemption becoming effective.

Such a period (*e.g.*, 30 or 60 days) could be used by the implementing authority to review notification packages for completeness or for indicia of concerns that would lead to prioritized enforcement, although the exemption would still become automatic after the period regardless of whether any action was taken by the implementing authority. As an alternative, the period could be designed to provide the implementing authority an opportunity to determine that a claimant should not be able to avail itself of the exemption without some further review and to notify the claimant of its views.

Under either approach, governmental review would be discretionary and the lack of such review would not be an indication of governmental approval of the exemption claim. To ensure that there would be no confusion on this point, the certification could include a statement of recognition that expiration of the delay period without comment by the overseeing agency is not the equivalent of agency approval that the claim is accurate. The Agency has not chosen to propose a delayed implementation approach because it believes a short time frame, particularly combined with an automatic effective date, would not provide an opportunity for thorough prior review and would, at best, provide only marginal benefits as a screening device for potentially problematic claims. The Agency, however, requests comment on whether such a delay would be beneficial to monitoring claims and if there are procedural or other concerns relating to such a delay.

*B. Implementation Conditions*

After the exit claim has become effective, the claimant would have to continue to meet certain conditions to maintain the exemption. Failure to satisfy any of the conditions would void the exemption and subject the waste to applicable subtitle C requirements.

Under this proposal, wastes must continue to meet the generic exemption levels established for exit to remain non-hazardous. Separate and distinct from any requirement or condition that might be established under this rulemaking, all generators—including claimants of today's proposed exemption—would have a continuing obligation to identify whether they are generating a hazardous waste and to notify the appropriate governmental official if they are generating a hazardous waste. Section 3010; 40 CFR 261.11. If wastes claimed as exempt under today's proposed rule test above exit levels at any time, that waste and subsequently generated waste would have to be managed as hazardous waste—including compliance with all notification requirements—until testing demonstrated that the waste was below exit levels.[8]

[8] Compliance with HWIR exemption levels will be measured from the last available test data or from the latest representative samples taken from the waste in question. Testing which shows constituent concentration levels above exemption levels will not affect wastes previously generated under a valid claim of exemption based upon representative samples. Similarly, testing, which shows that a waste which tested above exit levels once again tested below all relevant exit levels will exempt all waste generated on or after the date the samples were taken. Waste which exceeded the exit levels would not be able to requalify for the exemption.

1. Records Maintained on Site

In addition to the information described in the Notification Section above, the Agency is also proposing that the following information concerning the initial testing and retesting be maintained in the files on site at the facility making the exemption claim for at least three years:

—All information required to be submitted to the implementing authority as part of the notification of the claim;
—The dates and times waste samples were obtained, and the dates the samples were analyzed;
—The names and qualifications of the person(s) who obtained the samples;
—A description of the (temporal and) spatial locations of the samples;
—The name and address of the laboratory facility at which analyses of the samples were performed;
—A description of the analytical methods used, including any clean-up and extraction methods;
—All quantitation limits achieved and all other quality control results for the analyses (including method blanks, duplicate analyses, matrix spikes, etc.), laboratory quality assurance data, and a description of any deviations from published analytical methods or from the plan which occurred;
—All laboratory documentation that support the analytical results, unless a contract between the claimant and the laboratory provides for the documentation to be maintained by the laboratory for the period specified in § 261.36(b)(2) and also provides for the availability of the documentation to the claimant upon request;
—If the generator claims a waste is exempt from part 268 requirements pursuant to § 261.36(e), documentation to substantiate such a claim.

The Agency requests comment on the proposed information maintenance requirements and comment on additional information that may be necessary.

In addition, claimants will be required to retain certain information concerning retesting of wastes as described below and set out in the text of proposed 40 CFR 261.36(d)(6)(ii).

2. Testing Conditions

Claimants would continue to periodically test their wastes as a condition of the exemption.[9] Failure to test and maintain documentation of the

[9] Wastes generated on a one-time basis would not be subject to this requirement.

testing in accordance with the requirements of proposed 40 CFR 261.36(d) would void the exemption. The Agency believes that required subsequent testing is necessary to maintain accurate waste characterizations. Subsequent testing would be an ongoing exemption condition and would be the minimum testing required to maintain an exemption. A tailored constituent list setting out minimum requirements for testing purposes should not be confused with the facility's ongoing requirement to maintain constituent concentrations below exit levels for *all* constituents on appendix X of 40 CFR part 261. Results from subsequent testing would be required to be maintained on-site.

The scope of subsequent testing would focus primarily on those constituents from appendix X of 40 CFR part 261 that are of concern based on the initial test. The list of constituents for which a claimant would be required to test would, at a minimum, include each constituent that was detected in the initial test within an order of magnitude below the exit level for that constituent, and any constituent listed in Table B of appendix X of 40 CFR part 261 that is also identified as a basis for listing the waste or appendix VII to part 261 or listed as a regulated hazardous constituent for the waste in the table to 40 CFR 268.40. The claimant would also be required to test for any other constituent which the claimant had reason to believe was newly present in the waste since the most recent previous test.

The Agency proposes that the frequency with which a facility would be required to perform subsequent testing would be determined based on the volume of waste which the facility is declaring exempt. Those facilities with large-volume waste streams would perform subsequent testing more often than those facilities with low- or medium- volume waste streams. The claimant would be responsible for determining the volume of annual exempt waste. The Agency asks for ideas and comments on whether guidance should be made available for claimants on how to measure annual volumes. Justification of annual volumes would be sent to the Director in the notification package. The Agency believes that accurate waste characterizations are important for waste volumes of all sizes; however, inaccurately characterized large-volume wastes have greater potential to harm the environment than do smaller-volume wastes. In today's rule, the Agency is proposing the following requirements for the first three years of subsequent testing:

—Wastes generated at the time of exemption is initially claimed in volumes greater than 10,000 tons/year would be tested four times a year for the first three years of the exemption.

—Wastes generated at the time of exemption is initially claimed in volumes greater than 1000 tons/year but less than 10,000 tons/year would be tested twice a year for the first three years of the exemption.

—Wastes generated at the time of exemption is initially claimed in volumes less than 1000 tons/year would be tested once a year for the first three years of the exemption.

EPA requests comment on whether it should allow the Agency proposes that if a waste maintains exempt status for three years, the frequency of subsequent testing would then be reduced to once a year, regardless of the volume produced. The Agency believes that three years of subsequent testing should provide a facility with adequate data to assess the potential for variability in the waste. The Agency requests comment on the frequency of subsequent testing.

The Agency requests comment on an approach that the FACA suggested. The approach consisted of a comprehensive test, similar to an initial test, that is required every 3 or 5 years of an exemption because of the strong reliance on the initial test's results in determining the scope of subsequent testing.

The Agency also requests comment on whether follow-up testing should be eliminated entirely after the first three year period. In addition, the Agency asks if a certification of compliance with all relevant exit levels could suffice in lieu of testing at the end of three years.

3. Testing Frequency and Process Change

Under today's proposal, the claimant has a continuing obligation to verify that the waste continues to meet the exemption criteria, including meeting the exemption constituent concentration levels. Process changes that may either increase the number of hazardous constituents in the exempted waste or increase the concentration of hazardous constituents already present, should put a claimant on notice that there may be changes in the waste that may affect its continued eligibility for exemption. The Agency, however, is not proposing to require new sampling and analysis whenever there is a process change that may affect the exempt status of the waste.

The Agency is taking comment on whether it is necessary to require as a condition of maintaining the exemption that wastes be re-tested after a process change and, if so, what the scope of such re-testing should be. The Agency would like to know if the testing frequency proposed or more frequent testing would provide a clearer indicator of waste changes of concern than triggering re-testing through a narrative description of a process change. Another alternative is to require the claimant to notify the implementing authority that a process change has occurred and to certify that the exemption criteria continue to be met if the claimant determines that the waste still maintains its exempt status. The Agency is taking comment on how process change should be defined in the event one of the alternatives is chosen. It should be noted that if waste for which an exemption has been claimed at any time tests above exemption levels, that waste and all subsequently generated waste is hazardous. The claimant could not assert a new exit claim until a new batch of waste tests below the exit levels. The exemption proposed today would not relieve generators of their responsibility under § 262.11, nor would any test data previously obtained prevent a claimant from failing to satisfy the exemption criteria should an inspector conduct waste sampling that establishes hazardous constituents at concentrations above exit levels.

*C. Public Participation*

As a self-implementing exemption effective upon receipt of the notification by the implementing authority, there is no decision prior to exit being made by the implementing authority regarding the waste. The opportunity for public participation in an exemption claim is the opportunity that exists at all times for the public to bring to the implementing authority's attention any circumstance that might aid that authority in its monitoring and enforcement efforts. The public, furthermore, would have the ability to bring a citizen suit for a claimant's failure to comply with any requirement of the exemption.

The Agency is proposing to require that the public be notified by the claimant that an exemption claim is being asserted. This notification would be accomplished by publication of a notice in a major newspaper, local to the claimant and of general circulation, that contains the information required by the regulations. Evidence that the notice has been submitted for publication must be part of the notification package submitted to the implementing facility.

The Agency is requesting comment on whether such a notice should be placed in a newspaper local to the claimant's facility or to the disposal facility or both, should those facilities be located in different areas not served by the same newspaper.

Requiring notification of facilities receiving exiting wastes has also been raised to the Agency in discussions. The Agency solicits public comment on the need for and possible approaches to requiring that waste generators that are exiting their listed waste, notify receiving facilities that wastes are HWIR exited wastes. Additional discussion of this issue appears in the docket under ''Receiving Facility Notification Process.''

As discussed above, the Agency is also taking comment on whether providing a ''delay'' in the effective date when the exemption attaches (*e.g.*, 30 or 60 days) would provide a significant and meaningful opportunity for public comment prior to the waste having exited the subtitle C system. Possible benefits of a waiting period before effectiveness of the exit could include greater opportunity for State review or citizen comment before waste is actually disposed outside of Subtitle C. Under such an approach, the waiting period would begin with receipt by the State of a complete certification package, and would run for the designated time (30 or 60 calendar days).

The Agency is taking comment on whether access to claim documentation through the appropriate implementing agency will be sufficient to provide public access to documentation. One alternative would be to require the claimant to provide access to the information. If that option is selected, the Agency requests comment on how, and for how long, the claimant should be required to provide access to the documentation, and on what kind of protection for CBI would be appropriate.

## IX. Request for Comment on Options for Conditional Exemptions

The Agency has at different times considered contingent management approaches to disposal of hazardous wastes. Under such approaches, wastes that would be considered hazardous if managed in an uncontrolled manner, could be considered non-hazardous if managed in a sufficiently controlled manner. The following section discusses and requests public comment on several approaches to setting higher exit levels tied to meeting certain management requirements. These approaches would allow wastes with higher concentrations of hazardous constituents to be managed safely outside of Subtitle C.

Many Subtitle C requirements were written generically to address all hazardous wastes and, consequently, provide protection for those wastes that pose the greatest risks. Others are either explicitly or implicitly technology-based rather than risk-based. Some of these requirements are statutory and cannot easily be adjusted to take risk into account. Nevertheless, EPA generally believes that it would be desirable to tailor waste management requirements to more closely coincide with risks. The exit levels proposed today take an initial significant step in this process by allowing very low-risk hazardous wastes to be exempt from Subtitle C requirements, leaving them subject only to less prescriptive federal and state controls for nonhazardous wastes. They also take an initial step towards setting different exit levels for different situations by recognizing that wastewater and non-wastewaters are typically handled in different ways and pose different risks, hence today's notice proposes different exit levels for wastewaters and non-wastewaters.

Within the time constraints imposed by the court-ordered deadline for this proposal, EPA has begun exploring whether it would be possible to create additional exemptions to allow more flexible management of additional wastes now classified as hazardous without compromising protection of human health and the environment. These options are premised on the theory that a waste's risk is due not only to its chemical composition, but also the manner in which it is managed, which can greatly affect the amount of chemical constituents that ultimately reach a human or environmental receptor. The multipathway analysis prepared to support the exit levels shows that the concentration at which a hazardous constituent threatens human health or the environment varies significantly with the type of management that a waste receives—some forms of management appear to present greater risks than others. The following discussion presents the legal framework for management-based exemptions, and outlines in some detail the options which EPA finds to be most promising for rapid promulgation.

### *A. Legal Basis for Conditional Exemptions*

EPA originally interpreted RCRA's definition of hazardous waste to focus on the inherent chemical composition of the waste and to assume that mismanagement would occur so that people or organisms would come into contact with the waste's constituents. See 45 FR 33113 (May 19, 1980). However, EPA even in the past tried to consider ''reasonable'' mismanagement scenarios, scenarios that where reasonably likely or plausible even if not proven to necessarily have occurred or be typical for a specific waste. However, after more than a decade of experience with waste management, EPA believes that it may no longer be accurate or necessary to assume that worst-case mismanagement will occur. In recent hazardous waste listing decisions, for example, EPA has identified some likely ''mismanagement'' scenarios that are reasonable for almost all wastewaters or non-wastewaters, and looked hard at available data to then determine if any of these are for some reason very unlikely for the specific wastes being considered, or if other scenarios are likely given available information about current waste management practices. As a further extension of that logic, EPA now believes it may be appropriate to find that, where mismanagement is not likely or has been adequately addressed by other programs, EPA need not classify a waste as hazardous and that there may be ways to recognize situations where the limitations on likely ''mismanagement'' are specific to a State, a type of waste, or a facility-specific condition on how a waste is managed.

EPA believes that it can interpret the definition of ''hazardous waste'' in RCRA section 1004(5) to authorize this approach to classifying wastes as hazardous. Section 1004(5)(B) defines as ''hazardous'' any waste which may present a substantial present or potential hazard ''when mismanaged''. EPA reads this provision to allow it to determine the circumstances under which a waste may present a hazard and to regulate the waste only when those conditions occur. Support for this reading can be found by contrasting section 1004(5)(B) with section 1004(5)(A), which defines certain inherently dangerous wastes as ''hazardous'' no matter how they are managed. The legislative history of Subtitle C of RCRA also appears to support this interpretation, stating that ''the basic thrust of this hazardous waste title is to identify what wastes are hazardous in what quantities, qualities and concentrations, *and the methods of disposal which may make such wastes hazardous.*'' H.Rep. No. 94–1491, 94th Cong., 2d Sess.6 (1976), reprinted in *A Legislative History of the Solid Waste Disposal Act, as Amended,* Congressional Research Service, Vol.1, 567 (1991) (emphasis added).

EPA also believes that section 3001 provides it with flexibility to consider

the need to regulate wastes as hazardous. Section 3001 requires that EPA, in determining whether to list or otherwise identify a waste as hazardous waste, decide whether a waste ''should'' be subject to the requirements of Subtitle C. Hence, section 3001 authorizes EPA to determine that Subtitle C regulation is not appropriate where a waste is not likely to be managed in such a way that it will threaten human health or the environment. Moreover, regulation of such waste under Subtitle C would not appear ''necessary to protect human health or the environment'' under RCRA sections 3002(a), 3003(a) and 3004(a). As noted elsewhere in this proposal, EPA interprets these provisions to give it broad flexibility in fashioning criteria to allow hazardous wastes to exit the Subtitle C regulatory system. EPA's existing regulatory standards for listing hazardous wastes also allow consideration of a waste's potential for mismanagement. See § 261.11(a)(3) (incorporating the language of RCRA section 1004(5)(B)) and § 261.11(c)(3)(vii) (requiring EPA to consider plausible types of mismanagement). Where mismanagement of a waste is implausible, the listing regulations do not require EPA to classify a waste as hazardous.

Two decisions by the U.S. Court of Appeals for the District of Columbia Circuit provide potential support for this approach to defining hazardous waste. In *Edison Electric Institute v. EPA, 2 F.3d 438,* (D.C. Cir. 1993) the Court remanded EPA's RCRA Toxicity Characteristic (''TC'') as applied to certain mineral processing wastes because the TC was based on modeling of disposal in a municipal solid waste landfill, yet EPA provided no evidence that such wastes were ever placed in municipal landfills or similar units. This suggests that the Court might approve a decision to exempt a waste from Subtitle C regulation if EPA were to find that mismanagement was unlikely to occur. In the same decision the Court upheld a temporary exemption from Subtitle C for petroleum-contaminated media because such materials are also subject to Underground Storage Tanks regulations under RCRA Subtitle I. The court considered the fact that the Subtitle I standards could prevent threats to human health and the environment to be an important factor supporting the exemption. *Id.* at 466. In *NRDC v. EPA,* 25 F.3d 1063 (D.C. Cir. 1994) the Court upheld EPA's finding that alternative management standards for used oil promulgated under section 3014 of RCRA reduced the risks of mismanagement and eliminated the need to list used oil destined for recycling. (The Court, however, did not consider arguments that taking management standards into account violated the statute because petitioners failed to raise that issue during the comment period.)

*B. Improvements in Management of Non-Hazardous Waste and in Risk Assessment Methodology*

EPA's early regulations defining hazardous waste reached broadly to ensure that wastes presenting hazards were quickly brought into the system. When EPA promulgated its first listings and characteristic rules in 1980, its knowledge of toxic constituents, constituent transport pathways, and waste management options was more limited than it is today.

In addition, significant changes and improvements in waste management have occurred since the early 1980's. Many states have established or strengthened industrial nonhazardous waste programs since that time. For example, currently 26 states require liners and 28 states require ground-water monitoring for at least some surface impoundments. Up to 45 states require ground-water monitoring and 38 states require liners for at least some landfills. It is important to recognize however, that within a state, applicable requirements may vary according to a number of factors, including unit type, waste source, and location. See ''State Requirements for Industrial Non-Hazardous Waste Management Facilities'' EPA 1994. At the same time, industries have gained experience in managing wastes and many have improved waste management practices under incentives such as public access pursuant to the Emergency Preparedness and Community Right to Know Act, and avoiding liabilities under Superfund, RCRA corrective action and state cleanup programs.

EPA's ability to predict the risks that a waste may pose has also improved significantly. EPA has collected much more data on a variety of waste management units and other factors that impact the ability of waste constituents to reach a receptor. Models such as the EPACMTP and the models used in the multipathway analysis provide more sophisticated means of assessing the risks of a range of waste management options. As a result of all these changes, EPA is now in a position to begin to implement a more carefully tailored risk-based approach to regulating hazardous wastes.

*C. Overview of Options for Conditional Exemptions*

The Agency has identified several different approaches to providing conditional exemptions that would allow more wastes to exit the Subtitle C system. These options fall into two broad categories: (1) Establishing national conditional exemptions based on unit type either with or without assuming additional management controls; and (2) granting conditional exemptions to qualified state programs that ensure additional management controls.

1. National Approach: EPA Would Establish National Exit Levels for Contingently Managed Waste

The contingent management program could be adopted by any state that wants to implement it, without consideration of state programs for non-hazardous waste. The contingent exit levels would differ according to the degree of management/disposal restrictions imposed as a condition of exit. The possible options would include progressively more restrictive requirements, and allow progressively higher exit levels as disposal options are further restricted. The options under this approach are:

a. Distinguish Between Disposal in Land Application Units and Other Units

The multipathway risk assessment methodology used for this rulemaking takes into account management scenarios (such as land treatment of a waste), or exposure pathways (such as wind transport from an uncovered pile or volatilization from an open tank), resulting in calculated exit levels based on the riskiest scenario. In some cases this exit level may be significantly lower than the next most risky exposure pathway. The riskiest exposure pathway may not be applicable to some management situations. On review of the risk analysis results, the Agency determined that disposal in a land application unit is frequently the highest risk disposal option in both the multipath and groundwater modeling.

As described in detail in Section X. below, the Agency has developed for proposal an approach to contingent management relying on the multipathway exposure analysis, risk level of 10–6 and HQ of 1, and using the base case uncontrolled management scenarios, but with land application units removed from the analysis. Exit concentrations would still be protective across a wide variety of conditions nationally, for all non-land application unit disposal. The Agency is proposing

one national exit level for each constituent based on the next riskiest pathway, on condition that wastes are not disposed in land application units.

This option was considered by the Agency to be the simplest approach to contingent management. It would be somewhat easier to enforce than other options described below, since there would still be only one conditional exit level for each constituent. Implementation mechanisms to assure that the wastes go only to allowable unit types are described below.

b. Unit-Specific Exit Levels for Each Disposal

Another approach to contingent management considered by the Agency would be to establish a set of exit levels for each waste management unit evaluated based on risks at unregulated units of that type. Units that would be evaluated, at HQ 1 and 1 E–6 risk, would be land application units, waste piles, landfills, surface impoundments and tanks. Base case assumptions would be used to describe the units. The Agency has not included specific exit levels for this approach here, but solicits comment on its potential benefits, and potentially greater complexity of implementation and compliance assurance.

Under option 2 the Agency would set separate exit levels for each type of waste management unit. Generators would be allowed to choose the type of non-subtitle C waste management unit in which to manage their waste, and would be required to meet the unit-specific exit levels for all constituents in order to manage the waste in that unit. Testing and implementation would be similar to the requirements for exit based on the most limiting pathway. However, the Agency believes this option would increase the complexity of tracking wastes that met the varying concentration exit levels tied to specific allowable units.

The Agency believes allowing use of exit levels tailored to waste management can be a practical and appropriate way to allow greater volumes of waste to exit Subtitle C without increasing risks to above the toxicity benchmarks described in Section IV.D, providing that characteristics of various waste unit types can be clearly defined (such as the difference between surface impoundments, tanks, and perhaps covered tanks for the management of wastewaters), and providing the Agency can design a viable implementation scheme that does not rely primarily on statements of proposed future disposal. Tracking and monitoring of actual waste management could be one way to assure disposal in the appropriate facilities. Limiting disposal to on-site facilities could also better assure proper disposal, although this would limit the usefulness of contingent management approaches. The Agency requests comment on additional implementation requirements that might be needed to assure the waste is managed in the designated unit type only.

EPA has not developed this as a general approach in this rulemaking because the risk modelling that was done, while more multifaceted and comprehensive than many past analyses, was not designed for this purpose. For efficiency in modelling, EPA did not always model each pathway for each specific unit. EPA sometimes only modelled an exposure pathway of concern (such as air emissions) from certain types of units that EPA thought might be the limiting scenario, and risk from organic constituents in a landfill were not modeled. Therefore the modelling work to date may not identify the most limiting pathway if each unit is judged individually. To fully develop exit levels for a full range of unit types, EPA believes it would have to do supplemental risk analysis to fill in the gaps in modeling for each of the waste management units, or at least evaluate whether the risk analysis done to date is sufficiently representative. Tables 21–39 in the November 1995 Supplement to the multipath analysis present the modeled risk values for each constituent disposed in each of the five options modeled, and for each pathway. These tables can aid commenters in understanding what a unit-specific exit value for any particular constituent could be.

c. Consideration of Additional Management Unit Design or Management Practices

A third option is that EPA would use a somewhat modified multipathway exposure model to evaluate whether adding additional specific design or operating controls for particular unit types, would allow less conservative exit levels. These conditional exit concentrations would be promulgated on a unit-type specific basis, and could be used only by units employing the specified additional controls that would reduce the risk level to 10–6. Such an approach could be self-implementing for a facility owner/operator, and would not necessarily be tied into a permitting authority.

While such an approach could take into account the effects of a combination of added controls on each unit type (such as size of the unit, ground-water monitoring, liners, caps, etc.) the Agency believes that there are a number of significant implications associated with this approach. It could be interpreted by industries and states as an indirect way to define a broader set of management standards for industrial non-hazardous waste management units. Also, if the approach were self-implementing, it could be extremely difficult to ascertain that a particular unit meets a complex set of controls and therefore to assure compliance with the conditional exit levels. The more complex a judgement required to determine compliance with the conditions (such as whether a liner that is hard to inspect during operation is properly installed and protected from tears), the more appropriate it is likely to be that such determinations be made in the context of a permitting authority or prior approval rather than as a condition on a self-implementing exemption.

As a variation on this approach, The Agency could take into account certain regional, local, or site-specific factors in establishing exit levels. These could include the effect of local rainfall, regional hydrogeology, or size of facility on exit values. These issues are described in greater detail in section 3 below.

Because of the complexity of implementation, the Agency would attempt to define very limited additional control(s) to limit exposures and reduce risks to 10–6 level. EPA particularly asks for comments on unit design attributes that are easily ascertainable in a spot inspection versus those that require more detailed engineering review, or review or monitoring of operations. For this option, as with options one and two, the Agency would have to conduct additional risk modelling work to adequately evaluate additional parameters on a unit specific basis.

One issue common to all of the options discussed above is the legal status of wastes subject to such conditioned exemptions when there is a violation of the conditions. The Agency requests comments on how to make them enforceable in a practical way that is fair to those involved. If the waste concentration/unit requirements are conditions of an exemption, any violation of a condition means that the waste generator, or other individual managing the waste, has violated the full range of RCRA requirements and has been illegally managing a ''hazardous waste'' as a ''nonhazardous'' waste. Because the conditional requirements are not clearly tied to other non-hazardous waste authorities,

there would not be a remedy for the violations outside of the hazardous waste program. An alternative approach is discussed in the following options allowing conditional exit levels in states with qualified industrial non-hazardous waste programs. As long as the state has clear enforcement authority under its non-hazardous waste management program, these conditions could be crafted so that a violation of the condition was not illegal disposal of hazardous waste involving multiple RCRA counts. Rather it would be enforced as a violation of the relevant State authorities. The Agency requests comment on the advantages and disadvantages of these approaches, as well as whether there might be other approaches to ensure adequate legal remedies for violations of the conditional exit requirements, when the contingencies are not based on qualified state industrial non-hazardous waste programs.

2. State Program Approach

As noted earlier in this section, many state industrial non-hazardous waste programs have improved significantly since the early days of Subtitle C. State programs may offer the advantages both of requiring management controls which ensure protection of human health and the environment and ongoing oversight on a facility specific basis through permitting, inspection and enforcement activities. While every state program may not be operating at the same level, the Agency believes that a number of state programs may offer reasonable, protective systems to serve as the basis for less stringent exit levels. Qualified state programs would be allowed to manage listed waste in their non-hazardous waste management program under certain conditions. These qualified state programs would ensure that risks were reduced to protect human health and the environment.

There are three key factors the Agency believes would need to be considered in establishing state-based contingent management programs. These are (1) establishing a risk-based cap on waste constituent concentrations that can be managed contingently; (2) the type of program review of a state program that EPA would perform to identify qualified state programs, and (3) the breadth of state program controls.

For the risk cap, the Agency has considered using either a 1 E–4 cancer risk and HQ 1, or 1 E–3 cancer risk and HQ 10 as options. The caps would be modeled based on management in unregulated disposal facilities, as in the base-case exit level modeling.

Regarding program review, the Agency would either conduct a qualitative review of the State program, examining it to ensure it addresses key considerations, or would require states to conduct quantitative risk assessment of planned management practices to demonstrate their safety down to 1 E–6 cancer risk and HQ 1 or an alternative risk target.

For the qualitative review, EPA would specify environmental and administrative performance goals and the state would have to submit a narrative description demonstrating how the particular combination of technical standards and administrative requirements in their program protects human health and the environment and meets those performance goals, for example:

- Ground-water protection: A state program must address adequately contamination of groundwater from a facility.
- Surface water protection: A state program must address adequately prevention of contamination of surface water which may occur through the run-off of pollutants from the disposal facility to surface waters.
- Address other environmental and performance goals such as controlling air exposures, siting, ensuring long-term integrity of the site, etc.
- Permitting and enforcement authorities and public participation: A state program has appropriate authorities and a system for prior approval of waste management facilities, and public participation either on a site-specific basis or for input to development of class permits.
- Adequate resources: A state program has adequate resources for administration of the program including permitting, inspections and enforcement.

Under a quantitative risk review approach, a state would have to document their permitting and enforcement authorities and public participation requirements, as well as the adequacy of their program resources. The state would also have to demonstrate to EPA how the particular combination of technical management controls or design standards in its industrial non-hazardous waste program would ensure meeting 10–6 risk levels. In order to do this, EPA would have to refine or expand the multipathway exposure model. EPA would then either make its multipath model available to states or work with them to demonstrate that unit-specific state program controls would meet the 10–6 risk level for a particular class of facilities receiving conditionally exited wastes. The Agency solicits public comment on whether states can propose alternative risk targets for use in state contingent management programs.

Regarding program breadth, the Agency believes either broad, state-wide programs, or more narrowly focused contingent management programs could be developed. Under a broad-based state program approach, the Agency would approve as qualified only those state subtitle D programs that adequately regulate all state non-hazardous waste management and wastes. Under this approach, states with programs deficient in certain aspects would be required to upgrade before participating in the contingent management program. However, the Agency recognizes that state subtitle D programs vary widely in the particular units and waste types that are covered, among other factors. Therefore, as an alternative approach, EPA might determine that a program qualifies for conditional exit only for particular units (i.e. for landfills only, or for landfills and surface impoundments, etc.). In other cases, a state program might focus narrowly on developing appropriate contingent management for particular waste streams generated by key industries in the state.

In considering how to use these key factors in developing contingent management regulations, the Agency identified three options in addition to the three options described above under the national programs. These will be identified in this discussion as options four, five and six.

Under option four, the Agency would use the 1 E–4 and HQ 1 risk cap on waste and would conduct a qualitative review of the state program using the criteria described above. This could be done either on a narrow program basis, or based on a program that qualifies broadly.

Under option five, the Agency would also use the 1 E–4 and HQ 1 risk cap for waste being contingently managed, but would require that states conduct risk modeling of proposed disposal to demonstrate that risks from the waste as disposed would be not greater than the 1E–6 and HQ1 risk targets of the base case. This approach could be taken either with the entire state program, or only certain waste management practices. In particular, site-specific factors, as described below, could be considered under this approach. These could include facility size, local rainfall, or local hydrogeology, among others. Location of the nearest drinking water well might also be considered by the state in evaluating risks, if allowed under state regulations and regulatory policies. In this case, the state would be

required to demonstrate to EPA, using the multipathway analysis or another risk assessment model, how they would ensure on a site-specific basis that facilities disposing of conditionally exited wastes meet a 10–6 risk level. Development of this approach might also require quite different risk models, since the multipathway model as it currently exists incorporates a number of simplifying assumptions to capture a broad range of possible conditions. The Agency would have to ensure that a model used for this analysis can incorporate complex site-specific variables, or develop a set of simplified models that could be applied by states. However, this approach would provide maximum flexibility to states and generators to tailor exit levels to particular waste and site characteristics.

Under option six, the Agency would allow wastes posing up to 1 E–3 cancer risk and HQ 10 (in an unregulated management setting), and allow either a qualitative or quantitative review of the state program, but allow participation only by state programs that are broadly qualified, i.e., that are qualified in all aspects of the program, for currently managed industrial non-hazardous waste. The Agency would be more comfortable with this approach because it would be more assured of safe management of the waste regardless of where in the state it is disposed.

The Agency also solicits public comment on whether more than one of the options discussed above should be developed at the same time. For example, the Agency might establish both the option 1 proposal described below, and establish a state-based contingent management program based on any of options four, five or six. By doing so, the Agency would establish option 1 as a minimum national standard, but this approach would allow that states to go further they choose to do so.

3. Establish Exit Levels That Consider Regional or Site-Specific Factors That Might Affect Constituent Fate and Transport′

In addition to facility design factors, there are other location-specific factors that may substantially affect the risks and the appropriate exit levels for waste management units. Examples of such factors include: Rainfall and hydrogeology at the site and the distance to off-site receptors. The average amount of precipitation falling on these waste management units may affect both the amount of leachate to groundwater and soil run off to off-site receptors. Thus, the Agency could determine geographic regions based upon climatic zones, could require precipitation data from the most appropriate certified rain gauge, or could require site specific precipitation information. However, in order to do this the Agency would need to verify that the other model inputs are appropriate for each of the regions or else develop new region-specific inputs. Therefore, the Agency solicits data and comment on technically appropriate ways to establish exit levels based on rainfall levels.

Other site-specific factors that may significantly affect the groundwater pathway are the hydraulic conductivity of the soil surrounding the waste management unit and the distance to the nearest drinking water wells. If the hydraulic conductivity of surrounding soil is relatively low—such as in soils dominated by clays—then the flow of any potentially contaminated leachate to ground water could be effectively retarded for long periods of time (though flow to surface waters or other pathways might change, perhaps increasing). Landfills located in soils with low hydraulic conductivities (for example, 10–6 cm/sec or lower) could provide an extra level of environmental protectiveness for ground water that could be considered in developing this approach. For example, the Agency might address this effect by developing exit levels corresponding to different classes of hydraulic conductivity. Alternatively, differences in hydraulic conductivity could be considered through a site-specific process. This approach would not be relying on engineered controls, but on natural attributes of the location. EPA solicits comments on whether such attributes can be readily determined or in what circumstances they can be readily determined and relied upon.

The Agency did some limited sensitivity analysis with respect to ground water risk modelling to look at the concept of developing different exit levels depending on broad hydrogeological regions. The results of that analysis are in the docket. The Agency requests comment as to the value of investing in this approach and practical considerations the Agency should weigh in deciding whether to pursue this approach.

Finally, where the nearest drinking water wells are at an unusually great distance from the waste management unit, corresponding exit level concentrations associated with groundwater exposures that took that distance into account could be significantly lower if the Agency's goal were solely the prevention of current exposure to groundwater contamination. However, many states have policies to not degrade groundwater and EPA believes it is quite difficult to predict future needs for uncontaminated groundwater. EPA believes that the groundwater modelling done for this rule reflects a balanced view by using the distribution of nearest wells. However, EPA expects it will receive comments suggesting that it should consider allowing facilities with no moderately nearby drinking water wells to take that into account. The Agency seeks comment on the implementation issues associated with taking these factors into account and the related policy judgement as to whether the goal of more site-specific assessment should be prevention of risk based on current ground water use, reasonably foreseeable use, or based on distances that would be more protective of the potential future use of ground water.

The Agency also seeks comment on other location-specific factors or combinations of factors that may be particularly important in mitigating the risks associated with waste disposal. The Agency also requests comment on alternative approaches for taking these location-specific factors into consideration in developing exit levels for waste management. One option for doing so would be to develop additional tables of exit levels (in addition to Option 2) for waste management units that reflect the effect of some of the most important location-specific factors (e.g., exit levels for areas with low annual rainfall, or indexed to landfill size). As an alternative option, the Agency could develop ''reduced form'' equations that specifically relate the exit level concentration to critical location-specific factors (such as annual rainfall). The Agency requests comment on the merits of these approaches and on alternative options that might be used to better accommodate the effect of location-specific factors on exit levels.

*D. Land Disposal Restrictions for Contingent Management Options*

Any conditional exemption would offer much more significant relief if it eliminated or reduced the need to comply with more stringent LDR treatment requirements. As explained above in Section VI of today's proposed rulemaking, however, under *Chemical Manufacturers Association* v. *EPA* (the ''Third Third'' decision) LDR treatment standards generally continue to apply even if a waste ceases to be classified as a hazardous waste. If an LDR treatment standard were lower (more stringent) than a contingent management exit level, the waste would still need to meet the LDR standard.

EPA has proposed two approaches to integrating HWIR exit levels and LDR treatment requirements for the base option. First, EPA is proposing that LDR treatment requirements will never apply to wastes that meet all applicable exit levels at the point of generation. Second, for wastes which meet exit levels subsequent to the point of generation and, consequently, remain subject to the LDR regime, EPA is proposing to allow some exit levels to serve as alternative risk-based treatment standards meeting the ''minimize threat'' standard under RCRA section 3004(m). EPA expects these proposals to reduce the burden of complying with LDR requirements.

As explained more fully in the detailed presentation of option 1 below, EPA is proposing both of these approaches for contingent management option 1 (relaxed exit values for wastes that are not placed in land application units). EPA's rationales are set out in that discussion.

EPA anticipates that it might also be willing to propose to use exit levels developed under option 2 (separate exit levels for each major type of waste management unit) to serve as risk-based ''minimize threat'' standards. If EPA filled the gaps in its current multipathway risk assessment, it would feel fairly confident that the multipathway analysis plus the groundwater analysis identified constituent concentrations that minimize threats to human health and the environment for each class of waste management units. The modeling for both analyses would assume each type of unit was located in a ''reasonable worst case'' physical setting and was subject to minimal management controls. EPA, however, would expect some members of the public to argue that unit-specific exit levels should not be considered ''minimize threat'' levels because risks to human health and the environment would not be minimized if exempted waste ended up in the wrong type of management unit. EPA might try to address such concerns by imposing conditions such as tracking or reporting systems on persons claiming the exemptions.

EPA would expect similar objections to the option of allowing wastes that meet option 2 levels to exit if their constituent concentrations met unit-specific exit levels at the point of generation. Members of the public might again be concerned about the possibility that wastes could be placed in a unit type requiring lower (more restrictive) exit levels. As suggested above, however, EPA could impose conditions to help ensure that exempted waste goes only to a unit where the exit levels in fact minimize threats.

Providing LDR relief for the remaining options for conditional exemptions would raise additional legal and practical issues. All of the remaining national and state-based options rely on design or operating controls (such as liners) to help prevent dangerous concentrations of hazardous constituents from reaching human or environmental receptors. EPA, for example, would be reluctant to take into account control measures that would be difficult for inspectors to verify during site visits.

It might be somewhat easier to take into account factors—such as annual rainfall, depth to groundwater, and subsurface soil and rock formations—that relate to a unit's physical setting. EPA has already proposed to interpret section 3004(m) to allow consideration of a unit's physical setting in making site-specific minimize threat findings. See the proposed LDR standards for contaminated soil, 58 Fed. Reg. 48123 and 48155 (Sept. 14, 1993). EPA requests comments on all of these issues related to the integration of conditional exemption options to the LDR standards.

*E. Contingent Management of Mixed Waste*

The Department of Energy (DOE) has also expressed interest in EPA's contingent management approaches to managing waste that is mixed radiologic and RCRA hazardous waste (''mixed waste''). Mixed waste may be managed by DOE-regulated facilities or commercial facilities regulated by the Nuclear Regulatory Commission (NRC). EPA expects that the general approach in today's proposed regulation would be applicable to mixed wastes as well as listed-only hazardous wastes. DOE has suggested that because mixed wastes subject to RCRA are also subject to AEA disposal requirements which control releases of and exposure to radioactive hazards, these AEA requirements may address releases of chemically hazardous constituents as well, and it would be reasonable to allow more mixed wastes to exit Subtitle C because of the AEA requirements. DOE believes these AEA requirements would also provide adequate protection of human health and the environment from chemically-hazardous constituents. DOE has submitted several studies to EPA in support of their views, and the Agency has placed those documents in the public docket for review. The Agency will also undertake a review of these data to better understand the additional increment of protection provided by AEA low-level waste site performance standards. With that review ongoing, the Agency is proposing, and requesting public comment on, adaption of option four above to DOE's special circumstances. The Agency requests comment on allowing mixed waste meeting conditional exit levels for chemical toxicity estimated at 10–4 cancer risk and HQ 1 (modeled at an uncontrolled site), to exit Subtitle C if managed in AEA disposal facilities.

DOE has also urged the Agency to consider establishing a categorical exclusion from RCRA requirements for mixed waste debris that is immobilized. One of several macro- or microencapsulation methods could be used to immobilize the debris, including use of portland or other cement products, or various polymer products. Under such an exclusion, all immobilized mixed debris could be managed outside of Subtitle C, but would still be required to be disposed in AEA disposal facilities. No testing of the debris would be required to identify toxic constituents or the levels at which they might be present. DOE has conducted a study of leaching rates for certain toxic constituents from stabilized debris and submitted it to the Agency for review in support of DOE's conclusion that immobilized debris can be managed safely outside of subtitle C if disposed in an AEA facility. Because the Agency has only recently received this study, it has been unable to adequately review and evaluate the data presented. The Agency solicits public comment on this approach, the DOE study, and solicits any other available data that are relevant to this topic.

Finally, DOE has developed data on vitrified waste, and requested that the Agency consider the environmental protection conferred by this treatment process. Again, the Agency has not had adequate time to review and evaluate the DOE data, but has placed it in the public docket and solicits public comment on the data and DOE's preferred approach to mixed waste management.

In soliciting comment on these exit procedures for mixed waste, the Agency recognizes that a number of states hosting DOE facilities have expressed concern over the proposal's effect on their states ability to adequately regulate mixed waste under states and federal law as intended by RCRA and the Federal Facilities Compliance Act. These states also believe that significant details of the DOE proposal are lacking and additional analysis would need to occur before the procedures can receive adequate comment. Therefore, the Agency intends, to the extent consistent

with the schedule negotiated in the consent decree for this rulemaking, to publish a supplemental proposal on HWIR mixed waste exit criteria after initial comments have been received. The supplemental proposal would further describe the regulatory options being considered and will solicit additional comment on more specific options.

## X. Implementation of Conditional Exemption Option 1

### *A. Introduction*

Using the concept of contingent management, EPA is proposing to create a second, alternative set of exit levels for nonwastewaters that are managed in landfills or monofills, but not land treatment units. Persons wishing to utilize this alternative exit scheme would not only have to meet the recalculated concentration limits for all constituents in their wastes, but also comply with conditions prohibiting land treatment. Compliance with notification and tracking requirements described in more detail below will also be necessary. The exit levels for this alternative are set out in appendix XI of 40 CFR part 261; the requirements and conditions are set out in proposed § 261.37. Nonwastewaters that do not meet the exit levels in appendix X to 40 CFR part 261 will be eligible for exit only if they meet the more relaxed levels in appendix XI of 40 CFR part 261 and comply with all relevant conditions.

EPA derived the levels for this alternative by deleting all of the modeling results for the land treatment scenario from its risk assessment data base, and selecting the lowest remaining exit value from the remaining modeling results for other types of waste management units. The same approach used to establish exit levels presented in Section V. of today's proposed rulemaking was used to establish exit levels under this option. That is, where complete risk data was not available, surrogates were used to extrapolated exit levels (see Section IV.H) and where analytical limitations existed, EQCs were used as exit levels (see Section IV.I). As a practical matter, this approach affects only the exit levels for nonwastewaters. As explained above in section IV, EPA created the original exit levels for nonwastewaters by grouping the modeling results for the unit types typically used to manage solid materials (ash monofills, piles, and land treatment units) and selecting the lowest value from all pathways modeled for these scenarios. EPA created the separate wastewater exit levels by grouping the results from units typically used to manage liquid wastes (tanks and surface impoundments). Consequently, the wastewater exit levels are not based on the modeling of land treatment units, and these levels are not affected by the decision to exclude results from the land treatment scenario.

The Agency is proposing that the contingent management exemption be self-implementing. Therefore, the claimant would have the burden of demonstrating that all of the provisions for the contingent management exemption described herein have been met. In an enforcement action, a waste for which a contingent management exemption is claimed would be considered a Subtitle C hazardous waste unless the claimant was able to produce evidence that all of the conditions of the exemption have been met.

### *B. When Contingent Management Exemptions Become Effective*

The Agency is proposing two options for the point at which the contingent management exemption would become effective.

#### 1. Option 1A—Placement of the Waste in a Qualifying Unit

Under the first option, the conditional exemption for ''contingent management'' nonwastewaters would not become effective until the waste had been placed in a qualifying unit. Prior to actual disposal, the nonwastewater would be managed as a hazardous waste according to all applicable RCRA provisions, including 40 CFR parts 262 (for generators) and 263 (for transporters) and part 268 (regarding treatment prior to land disposal). These requirements include compliance with the waste manifest provisions of 40 CFR part 262, subpart B, and the pre-transport provisions of 40 CFR part 262, subpart C, which contains, among other provisions, the provisions governing hazardous waste accumulation. Treatment and storage prior to disposal would remain subject to parts 264, 265, and 270.

The Agency believes this approach makes it easier to ensure consistent implementation and safe management of the waste. It also decreases the potential implementation concerns that may arise if some states adopt this rule as part of their authorized programs and others do not. For example, this approach would reconcile transportation concerns that could arise if waste, conditionally-exempt in one state, were transported through a state that had not adopted the contingent management exemption as part of its authorized program.

Under this option, the Agency is considering and requesting comment on the applicability of amending 40 CFR 264.1 and 265.1 to allow off-site disposal facilities to store candidate contingent management exempt wastes for up to 10 days without becoming a subtitle C treatment, storage, and disposal facility, prior to ultimate disposal in a monofill or landfill. The Agency requests comment on whether 10 days is a sufficient or appropriate length of time, and if not, what time period may be appropriate.

Under the above approach, contingent management exempt nonwastewaters being disposed of on-site also would not become exempt until placed in a disposal unit meeting the requirements established under this rule. However, since the current waste accumulation provisions of 40 CFR 262.34, allow a generator to store hazardous waste on-site in tanks, containers or containment buildings for 90 days without becoming a Subtitle C storage facility, EPA believes that this approach should not place undue burdens on a generator. EPA requests comment on whether § 262.34 will in fact enable generators of exempt nonwastewaters to store wastes on-site in unpermitted units for a reasonable period of time prior to land disposal. EPA acknowledges that nonwastewaters are typically not stored in tanks.

#### 2. Option 1B—Effective Upon Meeting the Exit Levels

The second option that EPA is considering would allow a nonwastewater to become exempt from all hazardous waste requirements except part 268 as soon as it meets appendix XI of 40 CFR part 261 exit levels and the claimant has met all the requirements and conditions of the exemption, including certifying that the waste will be managed in a monofill or land disposal unit. The goal of this approach is to ensure nonwastewaters will not be managed in a land treatment unit, which was found to pose the greatest risk for many routes of exposure. Under this approach, storage, treatment and transportation of the nonwastewater could take place outside of Subtitle C control upon meeting the requirements and conditions for the exemption. If EPA were to adopt such an approach, it would impose conditions to ensure that the exempted nonwastewater reached the types of units for which the exemption was designed. Various options are suggested below in Section D.1.

Finally, EPA notes that the proposed approaches have different implications for LDR relief. These differences, which

principally concern the availability of LDR relief for nonwastewaters which meet the appendix XI of 40 CFR part 261 exit levels at their point of generation, are discussed in more detail in section H. below.

*C. Requirements for Obtaining an Exemption*

The following requirements would be applicable to both of the approaches discussed above. Requirements for meeting the contingent management exemption would include the sampling and testing requirements of § 261.37 (b)(1), the public notice requirements of § 261.37 (b)(3) and the notification to the implementing Agency requirements of § 261.37 (b)(4), similar to those respective requirements for the base exemption in §§ 261.36 (b) (1), (3) and (4). The Agency notes that these provisions would be directly enforceable Subtitle C requirements imposed prior to obtaining an exemption rather than conditions for maintaining the exemption.

1. Sampling and Testing Requirements for Contingent Management Exemptions

The Agency is proposing that the sampling and testing requirements for the contingent management exemption be the same as those proposed for the base exemption in Section 261.36 (b)(1). The Agency requests comment on whether the sampling and testing requirements for the base exemption would be appropriate for the contingent management exemption.

2. Requirements for Public Participation in Contingent Management Exemptions

To provide the public with access to information, the Agency is proposing to require compliance with the public notice requirements in proposed § 261.37(b)(3), similar to those in § 261.36(b)(3). The first time a claimant provides the Agency with notification of an exemption claim for contingent management wastes, he will be required to publish a notice of the claim in a major local newspaper general circulation. The notice must include the name and address of the facility, the description of the waste (as contained in the notification), a brief general description of the process producing the waste, an estimate of the quantities of waste claimed to be exempt, and information about the Agency where the claimant has sent the notification and supporting information. In addition, the public notice must include that the waste meets the contingent management exemption levels in appendix XI of 40 CFR part 261 and that the waste will be disposed of in a monofill or land disposal unit.

3. Notification Requirements for Contingent Management Exemptions

To qualify for a contingent management exemption, a claimant would need to submit to the authorized State Agency Director a formal notification of its claim that waste meets the contingent management exemption levels in Appendix XI of 40 CFR part 261 and will be managed in accordance with the management conditions. In addition to the requirements under § 261.36 (b)(4), the contingent management exemption notification to the implementing Agency must include an accompanying certification that the waste meets the contingent management exemption levels in appendix XI of 40 CFR part 261 and that the waste will be disposed of in a monofill or land disposal unit.

The Agency requests comment on whether these requirements, similar to § 261.36 (b)(1),(3) and (4), will provide adequate information to the implementing agency and the public on what exemption levels, i.e., appendix X to 40 CFR part 261 or appendix XI of 40 CFR part 261, are being claimed and on how the waste is being managed. These provisions would be requirements rather than conditions.

*D. Implementation Conditions*

As set out in § 261.37 (d) and explained in the base exemption implementation preamble (section VIII. B., Implementation Conditions) certain conditions have to be met to maintain the exemption after the claim has become effective. Under both option 1A and 1B, the following conditions would have to be met to maintain the contingent management option: Submitting changes in notification information to the Director within 10 days of the change, following the schedule for retesting, preparing and complying with a sampling and analysis plan for every retest, maintaining constituent concentrations in the nonwastewater at or below the exemption levels in appendix XI, meeting applicable treatment levels under § 268.40, and maintaining records on-site for three years. These conditions are very similar to those proposed for the base exit in Section VIII of today's proposed rulemaking. In addition to those conditions established for the base exemption, the claimant would also have to ensure that the waste was managed in a qualifying unit.

Claimants, under both options, always have the obligation to identify whether they are generating a hazardous waste and to notify the appropriate government official if they are generating a hazardous waste. (Section 3010; 40 CFR 261.11.) If any nonwastewater claimed as exempt under the contingent management proposal tested above the exit levels in appendix XI to 40 CFR part 261 at any time, that waste and any mixture or derived-from forms of that waste would have to be managed as hazardous waste, including compliance with all notification requirements, until testing demonstrated that the waste was below the exit levels.

1. Tracking Conditions

EPA is proposing to modify the manifest regulations to reflect the fact that wastes exiting under this exemption need not be disposed of in treatment, storage or disposal facilities that are subject to the requirements of § 264.71–264.72 or Section 265.71–264.72 requiring the facility that receives the waste to sign and return the manifest. EPA is not proposing to require the owners and operators of nonhazardous waste facilities that accept wastes exempted under this option to comply with these duties. As EPA concluded when it decided not to extend recordkeeping duties related to the LDR program to nonhazardous waste facilities accepting de-characterized hazardous wastes, it would probably be difficult to provide reasonable notice to all the members of this diverse universe, which has little or no other contact with the hazardous waste management regime, of these Subtitle C responsibilities.

EPA is proposing instead that the claimant of the exemption be responsible for ensuring that the manifest is returned and that it—or some other document—provides information showing that the facility designated on the manifest did in fact receive the waste and did place it in a landfill or monofill (and not a land treatment unit). Billing documents may already supply some of the needed information. Where they do not, EPA believes that claimants should generally be able to contract with the receiving facilities to obtain the necessary information. In some states, nonhazardous waste rules may also require disposers to furnish generators with some of the necessary information. EPA proposes to revise the manifest document as necessary to ensure that nonhazardous waste facilities can be designated as receiving facilities for listed wastes meeting all of the other requirements for obtaining an exemption under this option.

The alternative to this approach would be to require owners and operators of nonhazardous waste facilities to sign and return manifests as a condition of the exemption. Failure to satisfy this condition would void the exemption and return the waste to the hazardous waste management regime, even if it were in fact safely placed in an appropriate waste management unit. EPA requests comment on this alternative.

Under option 1A, where all Subtitle C regulations apply until placement of the nonwastewater in a monofill or landfill, EPA is proposing conditions that make the claimant responsible for obtaining a copy of the manifest to ensure the waste has reached its destination. The claimant would also have the burden of acquiring evidence from the receiving facility that the waste was placed in either a monofill or land disposal unit.

Under Option 1B, where the exemption becomes effective upon the waste meeting the appendix XI of 40 CFR part 261 exit levels, any tracking system established would be a condition that the claimant would have to meet to maintain the contingent management exemption. To ensure that listed wastes exempted under this option actually go to a landfill or monofill, EPA is proposing to require exemption claimants to comply with the requirements of part 262 (with the modification discussed above) relating to the uniform hazardous waste manifest.

Since this option allows wastes to go to facilities that are not subject to the duty to return the manifest under § 264.71–264.72 or § 265.71–264.72, EPA is proposing to require the claimant to ensure that the manifest is returned and that it—or some other document—provides information showing that the facility designated on the manifest did in fact receive the waste and did place it in a landfill or monofill (and not a land treatment unit). The duties would be identical to those proposed above for claimants under the first option. The rationale for imposing the duties on the claimant—and not the receiving facility—is also the same.

An alternative which EPA requests comment on is the concept of imposing conditions that require a uniform, national tracking document similar to the current uniform manifest to accompany the waste until it reaches its final destination. This document could inform transporters and other waste handlers that the waste is an exempt hazardous waste that must be managed in a monofill or land disposal facility and loses its exemption if it is managed in a land treatment unit. EPA could further require that the disposal facility certify that the nonwastewater was disposed in a monofill or land disposal unit and return the tracking document and certification to the original exemption claimant. EPA could also ensure that the implementing agency (EPA or an authorized state) received notice of any problems in waste disposal by imposing requirements similar to the current § 262.42 exception reporting provisions.

Another alternative would be to require, in lieu of a tracking document, a contractual agreement between the exemption claimant and the receiving facility specifying the type of waste the receiving facility will accept, the type of units it will use, and information on the volume and frequency of deliveries. EPA could require either the claimant or the receiving facility (or both) to maintain a copy of the agreement on-site and make it available to state or EPA inspectors. EPA also could require exemption claimants and transporters to create and keep similar contracts. EPA, however, requests comment on whether transporters would require claimants to provide information on the exempted waste's origin and the regulatory limits on its disposal options even without federal regulation.

EPA requests comment on whether any of these alternatives can adequately ensure that mismanagement will not occur so that these wastes managed under this option 1B approach would not need to be classified as hazardous.

2. Qualifying Unit

A ''qualifying unit'' for today's contingent management proposal is a landfill or monofill. For purposes of today's proposal, a landfill is defined in § 260.10 as being ''a disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground mine, a cave or a corrective action management unit.'' The Agency is proposing a definition for monofill in § 260.10 as a landfill where waste of only one kind or type is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground mine, a cave, or a corrective action management unit. Also, for today's proposal, a land treatment facility is defined in § 260.10 as being ''a facility or part of a facility at which hazardous waste is applied onto or incorporated into the soil surface; such facilities are disposal facilities if the waste will remain after closure.'' The Agency requests comment on whether other units could be considered ''qualifying units'' for contingent management exempt waste and whether additional modeling is needed to assess risks from management of nonwastewaters from other units.

The Agency modeled risks from waste piles in both its multipathway and groundwater analyses. It modeled only groundwater risks form landfills. As explained elsewhere in this preamble, EPA believes that the nongroundwater risks posed by piles generally are higher than the nongroundwater risks posed by landfills. EPA, however, is not proposing to allow wastes placed in piles to be exempt under the exit levels for contingent management option 1. Piles, as defined in Part 260, are temporary units. To ensure that exempted wastes removed form piles went only to landfills or monofills, EPA would have to impose additional tracking conditions. These could be difficult to craft and enforce effectively. EPA currently thinks that excluding piles from eligibility will provide much better assurance that exempted wastes will not be mismanaged.

EPA acknowledges that the exit levels for this option, which are based in many cases on the evaluation of waste piles, may, for some pathways, be more restrictive than levels for landfills. If EPA later completes a multipathway analysis of landfill units, it will be able to use the levels from that modeling in lieu of the modeling from piles to derive exit levels for this option.

The Agency requests comment on the proposal to exclude wastes placed in piles from being eligible for exemption under this option. The Agency also requests comment on the alternatives of allowing wastes to be exempt either permanently or temporarily (e.g., for one year) after they are placed in piles.

3. Claimant's Duty To Ensure Compliance With All Requirements and Conditions

Today's proposal requires that, in order to claim a contingent management exemption, the person submitting the claim must manage the waste for which the exemption is claimed in accordance with the requirements and conditions established by this rule. To satisfy this rule, the claimant must ensure that the waste is actually disposed of in a qualifying unit. The burden of satisfying all conditions for the exemption falls on the claimant as the person in the best position to determine eligibility of a waste for an exemption and to ensure informed waste management decisions. The claimant may enter into contractual

arrangements with receiving facilities to allocate responsibility for satisfaction of the conditions among themselves although such arrangements will not relieve the claimant of liability if the receiving facility manages the waste improperly. It should be noted, however, that facilities receiving contingent management exemption wastes could also become liable for violations of permitting, Subtitle C treatment, storage and disposal standards should they dispose of the nonwastewaters that do not qualify.

Under today's proposal, § 261.37(g), the burden of proof to establish conformance with the exemption criteria is on the claimant in the event of an enforcement action. One alternative for simplifying the claimant's burden of proving compliance with all conditions would be to set out in the rule certain documentation that, while not necessarily required of the claimant, presumptively would be sufficient evidence of satisfaction of the management condition. Of course, EPA could rebut this presumption regarding actual disposal through evidence that the claimant's documentation is deficient or inaccurate. For example, claimants might be able to develop rebuttable evidence of proper off-site disposal by keeping correspondence with the receiving facility, indicating that the waste went to a landfill or monofill, and by keeping a returned manifest which indicates that the waste reached that facility. The Agency is taking comment on whether establishing certain evidentiary standards would provide useful guidance to claimants on how to satisfy the management condition and provide helpful incentive for claimants to maintain proper documentation of their exemption claims.

Comment is also requested on whether any additional conditions or requirements, substantive or procedural, should be imposed on claimants to ensure that the contingent management exemption waste is actually managed in a qualifying unit.

### *E. Retesting and Recordkeeping Conditions for Contingent Management Exemptions*

Claimants continuing to generate or otherwise manage waste for which they continue to claim a contingent management exemption would be required, under § 261.37(d)(2), to retest the waste with the same frequency and under the same conditions as is being proposed for the base exemptions, § 261.36(d)(2). If a claimant finds that the exempted waste no longer meets the constituent concentration levels on Appendix XI of 40 CFR part 261 for the contingent management exemption, or that the waste has not been placed in a landfill or monofill, the claimant must comply with all applicable requirements for generators of listed wastes (including disposal of waste at a Subtitle C facility) and the disposal facility would have to comply with all of the requirements for owner/operators of treatment, storage, and disposal facilities under 40 CFR parts 262–270. The generator and disposal facility's obligations would also include renotifying the Agency of hazardous waste management activity using EPA form 8700–12.

Under § 261.37(d)(6), claimants also would be required to maintain on-site, for at least three years after Agency receipt of the notification and certification, all documentation required under this rule including, but not limited to, the sampling and analysis plan and test data and the accompanying notification and certification. These requirements are similar to those proposed for the ''base'' exemption in § 261.36.

The Agency requests comment on alternative record retention periods for claimants such as 5 years, which corresponds to the applicable statute of limitations period at 28 U.S.C. 2462. An extended record retention period may assist claimants in substantiating their conformance with the contingent management exemption criteria. The documentation must be available for review by the Agency or an authorized State at the time of site inspection. The three-year claimant record retention period will be automatically extended during the course of any unresolved enforcement action regarding the regulated activity.

### *F. Compliance Monitoring and Enforcement for Contingent Management Exemptions*

Since contingent management exemptions are self-implementing, the Agency needs to rely on its enforcement authorities to ensure that the exemptions are being applied in an appropriate manner and that only those wastes that are truly nonhazardous are relieved from Subtitle C disposal requirements. Compliance monitoring and enforcement of the contingent management program would be carried out under existing authorities and conditions with which the regulated community should already be familiar.

Claimants must comply with all of the previously described conditions of the exemptions to qualify for the exemptions. All persons who manage waste for which an exemption has been claimed must manage the waste as required under Subtitle C during periods when any of those conditions are not met. Claimants that fail to comply with the applicable conditions of the contingent management exemption risk enforcement action for violations of Subtitle C requirements, including administrative, civil and criminal penalties.

#### 1. Compliance Monitoring

The Agency is proposing that compliance monitoring of the contingent management exemption occur through EPA and State oversight, primarily through review of notifications and inspections.

The Agency has the authority, under section 3007 of RCRA, to require submission of information and to conduct inspections of facilities which EPA has reason to believe may be generating or managing a hazardous waste. EPA and States may do confirmatory sampling and analysis to determine whether a waste meets the exemption levels. Under this authority, the Agency would be able to inspect a non-Subtitle C facility receiving contingent management exemption waste.

Inspections of off-site laboratories may also be performed.

#### 2. Enforcement

The contingent management exemption criteria proposed today would create an exit from the Subtitle C system only so long as the requirements and conditions established for the exemption are met. Failure to comply with any of the conditions for the exemption would mean that the wastes would not be exempt from Subtitle C, and the claimant could be subject to immediate enforcement action for violation of Subtitle C requirements.

The Agency has the authority under this regulation and RCRA Section 3007 to require submission of information on the management of exempted wastes in a situation where the Agency suspects the claimant has not satisfactorily determined whether a waste meets the appropriate exemption levels. Alternatively, the Agency may require improved analysis using an administrative or civil action under section 3013. Failure to manage the contingent management exemption waste in accordance with the conditions would void the exemption and the conditionally exempt waste would be subject to full Subtitle C regulation. The receiving facility, therefore, would become a Subtitle C treatment, storage, and/or disposal facility requiring a permit.

In an enforcement action, compliance with the terms and conditions of the exemption may be raised as an affirmative defense, but the burden will be on the defendant to establish eligibility for the exemption and compliance with the conditions necessary to maintain the exemption. See 50 FR 642 (Jan. 4, 1985) for a discussion of EPA's authority to place such burdens on defendants.

Claimants may not use the contingent management exemption as a means of avoiding enforcement actions. For example, a generator who is the subject of an Agency enforcement action cannot claim that the waste in question is exempted from Subtitle C under the contingent management exemption unless a valid exemption notification for that waste has been previously submitted to the Agency and the required documentation to support the claim exists at the facility and satisfies the requirements of the regulations. The contingent management exemption cannot be used in a retroactive fashion to avoid enforcement actions. Similarly, these exemptions cannot be used as a legal defense prior to the effective date of promulgation of this rule.

*G. Exports of Wastes Eligible for Contingent Management Exemptions*

Under option 1A of today's proposal, contingent management exemption wastes would remain hazardous until actually disposed of in a qualifying unit. The waste would thus remain subject to all applicable requirements of 40 CFR parts 262 and 263, including export requirements.

Under option 1B where the waste becomes exempt upon meeting the contingent management exit levels, comment is requested on whether these exempt wastes should still remain subject to the export requirements of 40 CFR part 262. Comment is requested on whether these export requirements are necessary to ensure that the contingent management exemption waste will be properly managed in the receiving country.

*H. Land Disposal Restrictions*

As discussed above in section VI, EPA is proposing two approaches to integrating LDR requirements with the exit levels for the base option. First, EPA is proposing that LDR treatment requirements will never apply to wastes that meet exit levels for the base option at the point of generation. Second, for wastes which remain subject to LDR requirements, EPA is proposing to allow exit levels based solely on the combined multipathway and groundwater analyses to serve as alternative risk-based LDR standards meeting the ''minimize threat'' standard in section 3004(m) of RCRA. EPA believes that both approaches are appropriate for contingent management option 1.

To eliminate the duty to comply with the LDR rules for wastes that meet the base option exit level at the point of generation, EPA is taking the position that such wastes are defined as hazardous waste pursuant to their listing descriptions for such a brief period of time that they effectively never become subject to Subtitle C requirements, and LDR requirements never apply. It is relatively easy to apply this theory to option 1B presented above in section B.2. that allows nonwastewaters to exit as soon as they have met the appropriate concentration limits and to remain exempt so long as they are managed in landfills or monofills. Such wastes need only meet the exit levels to obtain their exemption. If they meet them at the point of generation, they would appear just as entitled to LDR relief as wastes meeting the exit levels for the base option.

Under option 1A, however, nonwastewaters will not exit until they both meet the exit levels and are placed in a landfill or monofill. Such wastes would not be eligible for exit at the point of generation even if their constituent concentrations were low enough. Rather, they would be subject to Subtitle C regulation for a significant portion of their ''cradle-to-grave'' management cycle. It would be difficult to argue that these wastes had never really been regulated as hazardous wastes, and that LDR treatment requirements did not apply. Consequently, EPA is not proposing to allow nonwastewaters to become exempt from LDR requirements at the point of generation under this sub-option. EPA requests comment on alternative legal theories that would provide a better basis for arguing that nonwastewaters subject to this sub-option could be exempt for the LDR rules if they meet exit levels at the point of generation.

Both options 1A and 1B have identical exit levels based on removing the predictions for land treatment units and using the next-highest concentration as the exit level. EPA is proposing to allow the exit levels that are based solely on the multipathway/groundwater risk analyses to serve as minimize threat levels for both options 1A and 1B. These levels represent concentrations posing minimal low threats for nonwastewater placed in landfills, monofills and waste piles. They are based on the same risk assessment used for the assessment for the base option. They make the same ''reasonable worst case'' assumptions about the units' physical setting and the same minimal assumptions about control measures. Hence, EPA believes that these exit levels sufficiently reduce threats to human health and the environment to meet section 3004(m)'s ''minimize threat'' standard.

EPA acknowledges that option 1B, allowing wastes to exit Subtitle C before they are placed in the right kind of land disposal unit, presents an additional type of risk. Under option 1B, it may be more difficult for EPA to ensure that exited wastes will not be placed in land treatment units. (Under the alternative option, option 1A, Subtitle C manifest and tracking requirements would apply.) As explained above in section B., however, EPA will create conditions for option 1B to help ensure that exempted wastes are not disposed of in land treatment units. EPA believes that these conditions will sufficiently reduce the risk of inappropriate disposal that the exit levels will continue to minimize threats. EPA requests comment on this aspect of the proposal.

## XI. Relationship to Other RCRA Regulatory Programs

Today's rule proposes specific conditions and exit criteria that would exempt listed hazardous wastes, including waste mixtures and derived-from wastes, from Subtitle C regulation. Below is a discussion of how this proposed rule would affect other relevant RCRA regulatory programs.

*A. Hazardous Waste Determination*

Under current RCRA regulations, any person who generates a solid waste must determine if that waste is a hazardous waste in accordance with the procedures outlined in 40 CFR 262.11. According to 262.11, generators must first determine if their waste is excluded from regulation under 40 CFR 261.4. Generators must then determine if the waste is listed in subpart D of part 261. If the waste was not listed, or for purposes of compliance with 40 CFR part 268, generators must then determine if the waste exhibits a characteristic defined in subpart C of part 261.

Today's proposed rule is an exemption for listed wastes meeting the exit criteria, and does not change the general requirements for generators making hazardous waste determinations under § 262.11 (see discussion of characteristic waste below).

*B. Characteristic Hazardous Waste*

Today's proposed rule establishes exemption criteria for hazardous

constituents in eligible listed wastes, waste mixtures, or derived-from wastes. If the waste satisfies the exemption criteria proposed today, the waste would not be considered listed hazardous waste. However, the generator must still determine whether the waste exhibits any characteristics of a hazardous waste as specified in 40 CFR 261.21 through 261.24 and continue to meet hazardous waste requirements if the waste does exhibit a characteristic.

*C. Toxicity Characteristic Level for Lead*

Toxicity characteristic constituents are among those evaluated for exit values in this proposal. In developing the risk assessment for all constituents, including the TC constituents, the Agency examined risks via groundwater and other pathways to humans, and also environmental receptors. In evaluating risks resulting from the groundwater pathway, the Agency used its newly developed CMTP model, and the MINTEQ metals speciation component. The CMTP model estimates groundwater transport using finite source assumptions, and accounting for hydrolysis and adsorption of chemicals to soils. The MINTEQ component estimates dissolution and speciation of metals in groundwater. Using these models, the Agency has developed and is proposing estimates of transport through groundwater specific to each constituent. These estimates are analogous to constituent-specific dilution and attenuation factors (DAFs). These constituent-specific DAFs were contemplated for several constituents proposed for regulation in the TC rulemaking, but not finalized, because the modeling work was not complete. TC levels were set using generic DAFs of 100.

In developing the constituent-specific DAFs, the Agency estimated that lead moves through groundwater much more slowly than predicted by the generic DAF of 100. While the modeling analyses supporting the TC rule and today's proposed rule are somewhat different from one another, the constituent-specific DAF for lead leaching from a landfill was estimated as 5000 rather than the 100 used in the TC rule. Higher leaching rates (giving lower DAF values) were estimated for some other disposal options evaluated in the updated modeling, such as land application and management in surface impoundments. This analysis raised the question of how the TC and today's proposed rules would relate to one another, and whether these results warranted consideration of a change to the TC level of 5 mg/l for lead (updated groundwater modeling of other TC constituents did not show the large disparity between the TC and exit level proposed in today's notice for lead).

In considering these issues, the Agency reviewed several factors. First, the human health risk evaluation for lead has changed since the TC rule was promulgated, resulting in the MCL (on which the TC is based) for lead being reduced from 50 ppb to 15 ppb. Using the new DAF from the landfill scenario plus the new drinking water standard could raise the TC level to 75 mg/l from the current 5 mg/l. However, when lead movement from a land treatment scenario was modeled, a DAF of approximately 770 resulted, and a TC level based on this and the new drinking water standard could be approximately 10 mg/l. Another relevant reference point for lead in the environment includes the current OSWER soil direct ingestion level for lead of 400 ppm (as a total concentration, not leachate).

The Agency considered several approaches to potentially proposing revisions to the TC level, including basing a new TC level on groundwater modeling only, basing it on the soil ingestion estimate, or basing it on the driving pathway value and exit level, which considers adverse ecologic effects.

After carefully considering the issue, the Agency concluded that the issue of lead toxicity and movement through the environment is very complex and changes to existing rules could have significant impacts on management of lead-bearing waste and public health. The agency believes regulation of lead-bearing wastes warrants careful consideration and full evaluation of and review of the policy issues associated with considering all potential exposure pathways and risk to human health and the environment. Questions include whether the TC level would be a leachate or totals value, and whether it would be based on groundwater only or other exposure routes and whether it would be human health based or based on ecological risk considerations. Such a comprehensive evaluation is not feasible in the context of the rulemaking proposed today, and so the agency has determined to defer any action on the lead TC level. The Agency recognizes that this is an issue of considerable interest to the public, and will consider review of management of lead-bearing waste at the soonest practical time. In the interim, the lead TC regulation and the exemption regulation proposed today (when finalized) would co-exist as independent regulations.

As described in Section IV.E.3, the Agency has developed groundwater modeling based on both 10,000 year and 1000 year time frames. Today's proposal is based on the 10,000 year modeling time horizon, and the Agency is soliciting public comment on the alternative of using 1000 years. One aspect of the 1000 year modeling results is that the groundwater-based exit levels for more constituents would be above current TC levels for those constituents. These constituents include, in addition to lead, chromium, cadmium, selenium, and mercury. The Agency seeks public comment on this aspect of using the 1000 year time horizon modeling for risk assessment in the HWIR rule.

*D. Hazardous Waste Listings*

The Agency evaluated the likelihood that untreated hazardous wastes would be able to meet the exemption criteria in an ''pure'' state (e.g., untreated and unmixed) and determined that it is unlikely that the constituent concentrations in many untreated hazardous wastes would be below today's proposed exemption levels or the applicable BDAT standards, particularly for nonwastewaters. Specifically, the Agency's hazardous waste characterization data indicate that the concentrations of toxicants of concern in untreated listed wastes are typically present at levels many times higher than health-based levels or BDAT values. Therefore, it is unlikely that the Agency's current criteria for listing wastes as hazardous will change as a result of the introduction of today's exit criteria into the RCRA regulations. However, EPA has been utilizing a more comprehensive risk analysis in the listing program, looking at multiple pathways for the movement of constituents through the environment, similar to the approach taken in today's proposal. Today's proposed approach may also provide the Agency with a means of assessing whether or not future listings might inadvertently bring into the RCRA system the types of low-concentration wastestreams that would subsequently be eligible for exit under today's proposal.

*E. Delisting*

The evaluation criteria used for delisting may vary from today's exemption criteria for various reasons. First, delisting is an interactive process that considerable oversight by EPA or authorized State agencies. In delisting, the overseeing agency evaluates the processes generating a specific wastestream in order to determine the constituents likely to be present, as well as the potential variability in the waste.

EPA (or the State) closely reviews sampling procedures, analytical test results, and the accompanying QA/QC data. This oversight increases the confidence in the quality and representativeness of the waste analysis.

Second, delisting is specific to one wastestream, which decreases uncertainties that arise in the more generic approach proposed today. For example, a delisting petition will typically provide the annual generation volume of the waste. Using a specific waste volume as an input to various models has allowed EPA to calculate exit levels that may be somewhat higher than the levels proposed in today's rule. EPA believes that it is reasonable to use higher exit levels for the smaller waste volumes in delisting petitions (see 56 FR 32993 (Reynolds Metals) for further description of volume impact).

The delisting process also allows more certainty in the plausible management scenarios that are modeled to generate exit levels. For example, the characteristics of the waste may dictate the likely disposal method (e.g., disposal in a landfill of de-watered process sludge). In some cases, special management standards may also be a factor (e.g., radioactive wastes are regulated under the Atomic Energy Act, therefore if such a hazardous waste were delisted, disposal options would be severely limited (see 60 FR 6054 (Hanford delisting)).

EPA also considers the applicability of available groundwater monitoring data from land-based waste management units that have received the petitioned waste. Such data are typically required under permitting regulations for hazardous waste facilities (see 40 CFR parts 264 and 265). If any contamination of groundwater appears to be due to constituents from the petitioned waste, EPA will consider this as a basis to deny the petition. The more generic waste identification rule proposed today does not incorporate this additional evaluation criterion.

EPA may also require special testing regimes to ensure waste consistently meets delisting criteria (e.g., see (cite Reynolds Metals, CSI, Hanford)). Because the overseeing agency reviews the petition in some detail, the testing frequency may be closely tied to the potential variability of the waste. A facility that accepts and treats waste from diverse sources would typically have frequent testing requirements (see 40 CFR part 261 appendix IX (Envirite)). In other cases, the testing requirements for some initial period will be extensive, but the subsequent testing may be reduced.

Delisting petitions for wastes that contain toxic constituents which exceed the exemption levels proposed today will continue to be accepted and reviewed by the Agency after promulgation of today's rule. With the exception of a potentially reduced petition review burden, the Agency does not anticipate any changes in the current review of delisting petitions as a result of the implementation of today's proposed exemption. EPA does request comment on which risk models should be used to evaluate future delisting petitions.

*F. Requirements for Treatment, Storage, and Disposal Facilities and Interim Status Facilities*

In order to implement the changes proposed today, owners or operators of RCRA permitted or interim status facilities may have to amend their waste analysis plans if required under 40 CFR 264.13 and 265.13. Such changes will most likely include the addition of the appropriate analysis methods and changes that may be required in the frequency of testing.

Permitted facilities, in unauthorized States, who elect to employ the exemption procedures and who subsequently prepare changes to their waste analysis plans should, following promulgation of this rule, submit a Class I permit modification to EPA. (EPA is aware that although most States have either become authorized for, or have adopted, the 3-class permit modification regulations, some states may still be operating under the older ''major/minor'' permit modification procedures. Under those procedures, changes to the waste analysis plan would be considered a major modification).

*G. Closure*

Under today's proposed rule, a hazardous waste management unit that receives wastes that are exempt under today's exit criteria would continue to be a regulated Subtitle C unit subject to the requirements of 40 CFR parts 264 or 265, including closure requirements, until the owner/operator completed clean closure of the unit or unless all of the waste in the unit were delisted. A unit receiving only waste that is exempt under today's proposal would no longer be receiving hazardous waste upon the effective date of the exemption; such a unit would normally become subject to Subtitle C closure requirements, which are triggered by the final receipt of hazardous waste by the unit. The facility owner or operator is required to complete closure activities within 180 days after receiving the final volume of hazardous waste. 40 CFR 264.113(b) and 265.113(b). However, RCRA closure requirements do allow certain waste management units to delay closure, while continuing to receive non-hazardous waste (such as waste exempt under today's proposed rule), provided certain conditions are met.

The RCRA delay-of-closure regulations, promulgated on August 14, 1989 (54 FR 33376), allow owners or operators to delay the closure of landfills, land treatment units, and surface impoundments in cases where the unit stops receiving hazardous waste but the owner or operator wishes to continue using the unit to manage only non-hazardous waste. These requirements are outlined in 40 CFR 264.113(d) and (e) and 265.113(d) and (e). Owners or operators wishing to delay closure must request a permit modification at least 120 days prior to final receipt of hazardous wastes, or, if the facility is in interim status, submit an amended part B application at least 180 days prior to the final receipt of hazardous wastes. The request for a permit modification or the amended part B application must include demonstrations that the unit has the existing design capacity to manage non-hazardous wastes, and that the non-hazardous wastes are not incompatible with any wastes in the unit. In addition, certain facility information including the waste analysis plan, groundwater monitoring plans, closure and post-closure plans, cost estimates, and financial assurance demonstrations must be updated as necessary to account for receipt of only non-hazardous waste. Sections 264.113(d) and 265.113(d). In addition, surface impoundments that do not meet the minimum technological requirements (MTRs) for liners and leachate collection of RCRA 3004(o) must comply with additional requirements in order to delay closure, including the removal of hazardous wastes to the extent practicable from the unit. Sections 264.113(e) and 265.113(e).

The delay of closure regulations apply only to landfills, land treatment units, and surface impoundments. In the case of other RCRA units such as tanks and waste piles, the Agency did not feel that the delay-of-closure regulations were necessary for these types of units in order to receive only non-hazardous wastes (54 FR 33383). The closure requirements in subpart G for these units include removal or decontamination of waste residues, containers, liners, bases and contaminated soils, equipment, and other containment system components; these closure requirements are not incompatible with the reuse of these

units for receipt of only non-hazardous waste. Once the unit has been emptied of all hazardous wastes and decontaminated, it could receive non-hazardous waste. However, the Agency also recognizes that some flexibility may be warranted in converting the use of a unit such as a tank from hazardous to non-hazardous waste management. EPA solicits comment on whether an owner or operator might demonstrate removal of hazardous waste residues from the tank by demonstrating that all waste in the tank is below exemption levels, without removing the waste from the tank. In cases where the owner or operator could not demonstrate that all wastes in the tank were below exemption levels, he or she would have to remove the hazardous waste in order to achieve closure of the unit. In some cases, the facility owner or operator may be able to demonstrate that a tank no longer managed hazardous waste (because the waste met today's proposed exemption criteria), but did not achieve clean closure because of soil and perhaps groundwater contamination. In this case, EPA solicits comment on whether the facility owner or operator should be required to remove the contamination to clean closure levels, or close the area as a landfill while using the tank to manage nonhazardous wastes, as long as this activity did not interfere with cleanup activities or control of the contaminated areas.

The Agency also believes that the availability of a delay-of-closure option provides much of the flexibility needed to allow for the uninterrupted management of exempt waste, while providing assurance that the protections afforded by the closure regulations for Subtitle C units (e.g., evaluation of soil and groundwater at closure) are not lost. This approach makes sense in light of the fact that today's proposed exemption is self-implementing, which the Agency feels is appropriate for waste identification purposes, but not necessarily so for determining whether a Subtitle C unit may become a Subtitle D unit without first undergoing closure.

*H. HWIR-Media Rule/Subtitle C Corrective Action*

The Agency is currently planning on proposing a rule (''HWIR Media'') addressing waste management issues relating to environmental media (e.g., soil, groundwater, and sediments). The goal of this rule is to allow more effective cleanups at contaminated sites. As currently drafted, the media proposal will supplement the regulatory system under RCRA for the management of RCRA hazardous contaminated media, applicable to sites that are undergoing cleanup overseen by EPA or authorized States. Such sites include cleanups at RCRA corrective action sites, State cleanups, and Superfund remedial actions. The media rule will propose a ''bright-line'' distinction between hazardous contaminated media (i.e., media containing hazardous waste that is therefore regulated as hazardous) subject to modified Subtitle C standards, and less contaminated media subject to more site-specific, flexible standards implemented by State agencies. This new system will supplement the current approach(es) to identifying RCRA applicability to the management of contaminated media. The rule will also propose streamlined permit requirements for cleanups. It will not specify cleanup standards.

Today's proposal applies to listed hazardous wastes (e.g. process wastes, sludges, discarded commercial chemical products, etc.), including mixtures of one or more listed wastes with other solid wastes, and residues derived from the treatment, storage, or disposal of one or more listed hazardous wastes. Media that contain listed hazardous wastes, mixtures, or derived-from wastes with constituent concentrations below today's proposed exemption levels will be eligible for exemption under the procedures proposed today. EPA or an authorized State may continue to assess contaminated media with concentrations higher or lower than the exit levels proposed today on a case-by-case basis by making site-specific determinations as to whether a media ''contains'' a RCRA hazardous waste.

*I. Land Disposal Restriction Program*

Today's rule contains several important areas of overlap with the RCRA Land Disposal Restrictions (LDR) program that are discussed elsewhere in today's rule. First, as described in more detail elsewhere in this notice, EPA is proposing that exit levels produced under the multipathway analysis for constituents with adequate analytical methods should ''cap'' existing technology-based LDR standards, where the exit levels are less stringent than the current LDR values. If a waste contains only constituent with ''capped'' LDR values, it should be able to satisfy LDR requirements and exit Subtitle C for all other purposes as soon as the waste achieved those levels.

Under today's proposal the uncapped LDR requirements for listed hazardous wastes continue to apply to a waste even after the waste becomes exempt from Subtitle C under the exemption criteria. Furthermore, for listed wastes containing certain constituents with analytical problems, compliance with the LDRs (either numerical levels, specified treatment, or both) is part of the criteria for exempting that waste under today's proposal. Specifically, for constituents where there are no adequate analytical methods for determining whether or not the exit levels have been met, a combination of meeting applicable LDR standards and a showing of non-detect estimated quantitation concentration is required to satisfy the exit criteria for these constituents. This is explained in more detail in Section IV.I of today's rule.

If, however, a listed waste is below the exit concentrations proposed today at the point where the waste is ''first'' generated, that is, the point where the waste first meets the listing description and is potentially subject to Subtitle C, then a hazardous waste is never really ''generated'' and the LDR requirements do not attach to the waste. The EPA does not expect many listed wastes to be at or below the exit criteria at the point of first generation, where waste characterization data indicate that this is where wastes contain higher concentrations of hazardous constituents. Nonetheless, where a particular process generates a waste that is perhaps inappropriately captured by a listing, or where pollution prevention efforts by the generator result in a waste of lower constituent concentrations, if the waste meets the exemption criteria at the moment it is first generated, the LDR requirements would not apply. In contrast, once a listed waste is generated and managed the LDR requirements attach, and remain even after the waste exits Subtitle C under today's exemption (unless, as stated, where the exit levels are considered equivalent to a minimize threat standard). This issue is discussed in more detail in Section VI in today's proposal.

It should be noted that the Agency is currently reviewing the definition of ''point-of-generation'' with respect to the application of the LDRs. Since November 1986 (51 FR 40620), EPA has required LDR determinations to be made at the point which hazardous wastes are generated. In the Phase III LDR rule (March 2, 1995, 60 FR 11702), EPA solicited comment on the issue of where the point of generation should be defined. EPA presented three options to narrowly redefine the point at which the land disposal prohibitions attach: (1) Similar wastestreams generated by similar processes, (2) wastestreams from a single process, and (3) ''battery limits.'' With Option 1 the point of generation would be defined at the point after which like wastestreams are generated from like processes and combined as a matter of routine

practice. Option 2 would consider the point of generation to occur when wastestreams from a single process are combined (e.g., residual wastestreams collected in a common unit such as a sump). In many cases, these wastestreams are similar in composition because they all come from a common unit process. The Option 3 ''battery limits,'' is similar to Option 2; however instead of limiting aggregation to that normally occurring within a single unit process, the facility would view an entire battery of processes (associated with making a single product or related group of products) as a single manufacturing step. In the Phase III LDR proposal, EPA identified listed hazardous wastes as situations where existing point of generation determinations may remain appropriate. This is because EPA has carefully reviewed the various waste streams and has defined the point of generation as part of the listing description. Therefore, it may be inappropriate to modify that description with a more generic ''point of prohibition'' rule. This is important because today's rule applies only to listed hazardous wastes.

Lastly, under today's proposal, mixtures containing listed hazardous waste and residues from the treatment, storage, or disposal of listed hazardous waste that contain some constituents with concentrations below exit levels and some constituents with concentrations above exit levels would continue to be managed as listed hazardous wastes. Today's notice does not allow for partial exemptions, because the Agency does not believe that a self-implemented exemption process is well suited to partial exemptions. It is not always clear what the origin of a hazardous constituent is, particularly for constituents that are formed as by-products of treatment or waste interactions. Further, the proposed exemption criteria are not waste-specific, and thus are not suited to waste-specific or partial exemptions. Thus, the determination that a waste that carries two listing numbers should no longer bear one of the listing numbers is not always a straight-forward decision. The Agency has designed the exemption process proposed today to remove as much subjective decision making from the process as possible.

However, while the Agency is not today proposing an alternative that would allow these wastes to use only the hazardous waste codes for those listed wastes that are the origin of the constituents above the exit levels, the Agency believes that there could be merit in the concept for a future proposed rulemaking should the implementation concerns stated above be overcome. Therefore, the Agency requests information on actual cases with waste characterization data where a waste bears more than one waste code which results in conflicting treatment standards under the land disposal restrictions rules. If the Agency finds that there is a serious compliance issue for multiple listing wastes, the Agency may reconsider this decision, as well as other potential solutions to any documented problems.

*J. RCRA Air Emission Standards*

Today's proposed rule, when promulgated, may have an impact on the effectiveness of two other RCRA rules developed by the Agency under HSWA authority. Section 3004(n) of HSWA directed the Agency to promulgate regulations controlling air emissions from hazardous waste TSDFs ''as necessary to protect human health and the environment.'' Subsequent Agency analysis demonstrated that air emissions from TSDFs do pose substantial risk in the absence of controls, and that controls were therefore required under the HSWA mandate. The Agency is fulfilling this mandate in phases; EPA completed the first phase when it promulgated RCRA air standards that control organic emissions vented from certain hazardous waste treatment processes, as well as from leaks in certain ancillary equipment used for hazardous waste management processes (55 FR 25454, June 21, 1990; 40 CFR part 264/265, subparts AA and BB). More recently, EPA completed the second phase when it promulgated RCRA air standards for tanks, surface impoundments, containers, and miscellaneous units operated at TSDFs (59 FR 62896, December 6, 1994; 40 CFR part 264/265, subpart CC). Together, these rules would reduce the risk from air emissions from the vast majority of these facilities to well within the risk range of other RCRA standards. After more thorough analysis, the Agency may issue a third phase of these regulations to address any residual risk. The emission reductions achieved by these rules would also significantly reduce the formation of ozone, which has adverse effects on human health and the environment.

Hazardous waste that satisfies the exemption criteria proposed today (including any constituent-specific exit concentrations for volatile organic chemicals, or VOCs), would be exempt from Subtitle C regulations, including regulations promulgated to date under RCRA 3004(n). In other words, once a waste is no longer regulated as hazardous, any unit in which the waste is managed (assuming no other hazardous wastes are being/have been managed in the unit) is not subject to Subtitle C regulations, including 40 CFR parts 264 and 265, subparts AA, BB, and CC. However, the Agency believes that it is important to ensure that the risks associated with air emissions both from hazardous wastes, and from wastes that would be eligible for exit under today's proposal, are adequately addressed. In the final rule establishing air emission controls for tanks, surface impoundments, containers, and miscellaneous units (the ''Subpart CC'' rule), the Agency established a threshold level of 100 ppmw (parts per million by weight) for total volatile organics in a waste, a concentration which if equaled or exceeded that would trigger the emission control requirements for these units. Because there are examples of exit levels proposed today for specific volatile organic constituents that exceed this 100 ppmw threshold, the Agency considered whether today's exit levels adequately addressed the air emission concerns of 3004(n) in allowing waste to exit Subtitle C. There are important differences in the underlying risk modeling between the two rules. However, the Agency believes that the constituent-specific risk evaluation done for this rulemaking results in proposed exit levels that for VOCs will not be less protective than the standards established to date under RCRA 3004(n). Despite these differences, the Agency requests comment on whether or not a total VOC concentration of 100 ppmw (parts per million weight), which is the concentration that triggers air emission controls under the Subpart CC rule, would be appropriate for use in the exit rule proposed today, and if so, how this level would be used.

*K. Hazardous Debris*

Hazardous debris that contains one or more listed hazardous wastes is eligible for exiting Subtitle C under today's proposed rule. The EPA notes, however, that certain exemptions already exist relating to hazardous debris. On August 18, 1992, the EPA published a final rule on the Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris (57 FR 37194). In that rule, EPA required that hazardous debris be treated prior to land disposal, using specified treatment technologies from the treatment categories of extraction, destruction, or immobilization. (See 40 CFR 268.45, Table 1.) EPA also added a conditional exemption at § 261.3(f) for non-characteristic hazardous debris (i.e.,

debris that is hazardous solely because it contains one or more listed hazardous wastes). Section 261.3(f)(1) exempts debris from Subtitle C regulation provided that the debris is treated using one of the extraction or destruction technologies specified in Table 1 of § 268.45. Alternatively, non-characteristic hazardous debris can be exempt under § 261.3(f)(2) if it is determined to be no longer hazardous by the Regional Administrator, after considering the extent of contamination of the debris, i.e., after a ''contained-in'' determination is made. However, non-characteristic hazardous debris contaminated with a listed waste, that is treated by a specified immobilization technology is *not* eligible for the conditional exemption in § 261.3(f)(1), and therefore remains subject to Subtitle C regulation after treatment.

In today's rule, EPA is not proposing to change the current exemption under § 261.3(f); therefore, non-characteristic hazardous debris that requires LDR treatment by extraction or destruction technologies will be exempt from Subtitle C regulation, once treated. As was explained more thoroughly in the final rule for hazardous debris, the Agency gave careful consideration to many factors before exempting certain treated debris, including whether each debris/contaminant type would be effectively treated by each BDAT technology to levels that would no longer pose a hazard to human health or the environment (57 FR 37240). However, hazardous debris that contains listed waste, and for which immobilization is the specified LDR treatment, may exit using today's proposed exit criteria. See also the discussion of a contingent management option above for a description of an alternative for encapsulated debris contaminated by radioactive ''mixed'' hazardous wastes. Finally, EPA is not proposing to change the contained-in exemption under § 261.3(f)(2) for hazardous debris; that is, the Regional Administrator may continue to determine on a case-by-case basis that hazardous debris no longer contains listed hazardous waste, and should therefore be exempt from RCRA Subtitle C.

### *L. Hazardous Wastes Used in a Manner Constituting Disposal*

Section 266.20 (b) of the regulations states that hazardous wastes and hazardous waste-derived products that are legitimately recycled by being applied to or placed on the land are largely exempt from subtitle C regulation provided they satisfy three conditions: the recyclable materials must have undergone a chemical reaction so as not to be separable by physical means, the product must be produced for the general public's use, and land disposal restriction treatment standards for every hazardous waste in the hazardous waste-derived product must be satisfied. (The shorthand for this type of recycling is ''use in a manner constituting disposal''. See § 261.2(c)(1).) EPA developed § 266.20(b) largely as a stop-gap to provide some modicum of safety while EPA studied further whether various disposal-like uses of hazardous waste-derived products in fact were safe or warranted control. 50 FR 614, 628–29, 647 (Jan,. 4, 1985). Since then, the Agency has studied particular use constituting disposal practices and determined, or proposed, that such uses either be prohibited or allowed based on more individualized determinations of risk. See 53 FR 31138, 31164 (August 17, 1988) (allowing use of fertilizers derived from waste K 061 because of similarity to other zinc-containing fertilizers); 59 FR 43496, 43500 (August 24, 1994) (prohibiting anti-skid uses of K 061-derived sags); 59 FR 67256 (Dec. 29, 1994) (proposing to allow certain uses of K 061 if risk-based criteria are satisfied); 60 FR 11702, 11732 (March 2, 1995) (proposing to prohibit hazardous waste use as fill material).

EPA solicits comment today on the relationship of today's proposed exit levels and the general use constituting disposal provisions in § 266.20(b) stating that such uses can occur if land disposal restriction treatment standards are satisfied. These land disposal restriction standards are not fully protective in all cases: the standards are technology-based rather than risk-based, and, for metal hazardous constituents, only control leachable amounts of the metal. Yet in many situations, *total* metal levels, rather than leachable levels, will be the critical factor because of the possibilities of direct contact through inhalation of abraded or wind-dispersed contaminants, or surface runoff. These exposure pathways are critical for uses constituting disposal because the hazardous waste are not placed in a confined unit. 60 FR at 11733, 59 FR at 43499.

The exit levels proposed today, on the other hand, are risk-based (although some are capped by quantitation limits), are expressed as both total and leachable concentrations, and consider exposure pathways in some cases similar to those relevant in analyzing uses constituting disposal. The Agency solicits comment as to the appropriateness of applying these levels to hazardous wastes used in a manner constituting disposal (or at least to those uses where the hazardous waste-derived products are not comparable to non-hazardous waste based products that would be used in their place). One approach would be to replace the requirement to meet LDR treatment standards with a requirement to meet the exit levels proposed today. This approach should assure that exit levels for unconfined hazardous wastes (i.e. hazardous wastes used in a manner constituting disposal) are never less stringent than exit levels for hazardous wastes placed in confined units. EPA believes that the risk assessment it conducted for the exit levels considered scenarios sufficiently similar to use constituting disposal scenarios to ensure that the exit levels would be reasonably protective for uses (and more protective than LDR levels, in many cases, because of the analysis of impacts from total concentrations of constituents). EPA, however, requests comment on the reasonableness of this approach.

Another option would be to require persons wishing to use hazardous wastes in a manner constituting disposal to meet the lower of the LDR treatment standards and the exit levels. Because EPA is today proposing setting exit levels for both total and leachable concentrations, and because LDR standards are expressed as either total or leachable levels, however, EPA is not certain how to meaningfully compare relative stringency.

With respect to the current requirement in § 266.20(b) that persons wishing to use waste in a manner constituting disposal meet the treatment standards from the LDR program, EPA notes that compliance with LDR tracking and recordkeeping rules is not required. EPA proposes today to require compliance only with the exit levels where they substitute for LDR treatment levels, although it requests comment on the option of requiring persons using wastes in this manner also to file the exit notification package proposed today. EPA does not intend that such persons be required to comply with conditions that continue to apply after exit, such as periodic retesting.

Finally, EPA proposes to eliminate the requirement that wastes to be used in a manner constituting disposal undergo a chemical reaction so as to be inseparable by physical means. EPA does not believe it is necessary to retain this requirement since wastes will be evaluated for total constituent concentrations. (EPA, however, will retain this requirement for wastes with treatment standards expressed as a specified technology, rather than concentration levels.)

Were EPA to proceed on this course, the Agency would adjust the timing of any regulatory action so that it does not supersede the separate rulemaking the Agency is now conducting on certain uses of residues derived from K 061 recovery facilities. 59 FR 67256. Thus, the Agency does not intend to take final action affecting these uses until the analysis begun in that rulemaking is completed on the schedule established in that rulemaking.

With respect to the other pending proposal, involving a prohibition on placement of hazardous waste as fill material, the Agency requests comment on whether it should substitute permission to use waste that has met the proposed exit levels for the proposed prohibition. The risk assessment underlying today's proposal addressed the major pathways that would arise from use as fill, but may not have used input values that fully reflect the fill scenario for some important parameters. For example, unit depths may be greater for fill sites than for land application units. At the same time, use of hazardous waste as fill is a proven cause of human health and environmental harm, contributing significantly to a number of Superfund sites. See Docket F–95–PH3P–FFFFF (record for the pending proposal). In light of this, the Agency questions whether to substitute today's proposed exit approach for the proposed prohibition.

## XII. CERCLA Impacts

All listed hazardous wastes are listed as hazardous substances under section 101(14)(C) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. Under section 103(a) of CERCLA, notification must be made to the Federal government of a release of any CERCLA hazardous substance in an amount equal to or greater than the reportable quantity (RQ) assigned to that substance within a 24 hour period. (See 40 CFR part 302 for a list of CERCLA hazardous substances and their Rqs.) If a specific waste from a particular facility meets the exemption criterion in this rule, the waste is not a listed hazardous waste and therefore not a hazardous substance by virtue of its hazardous waste listing. Thus, notification under CERCLA of a release of the exempted waste may not be necessary. In this situation, CERCLA notification of releases of the waste would only be required if the waste or any of the constituents of the waste are CERCLA hazardous substances by virtue of Section 101(14) (A), (B), (D), (E), or (F) of CERCLA or 40 CFR 302.4(b), and are released in amounts greater than or equal to their Rqs. The Agency requests comment on this approach.

Exit levels also may be applicable to the CERCLA program where it has been documented that RCRA listed hazardous waste has been disposed of at the site. Section 121(d) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, requires that CERCLA actions comply with, or justify a waiver of, applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws. The options proposed in this rule would determine the legal applicability of federal RCRA managements requirements to remediation wastes generated at Superfund sites. They may also be considered in determining whether RCRA is relevant and appropriate in cases where it is not applicable.

At sites undergoing CERCLA remedial activities where no listed hazardous wastes have been identified, the Agency will generally use a site-specific risk assessment for all chemicals for which there are no ARARs. In some cases, these health-based cleanup levels will be higher than the exemption levels, based on a reasonably conservative exposure scenario which does not include leachate ingestion. In other cases, the CERCLA health-based clean-up levels will be lower than exemption levels when additive effects are considered or when specialized analytical techniques are required in order to lower quantitation limits. The CERCLA health-based clean-up levels may also be different than exemption levels based on the consideration of site-specific factors.

## XIII. State Authority

### *A. Applicability of Rules in Authorized States*

Under section 3006 of RCRA, EPA may authorize qualified States to administer and enforce the RCRA program within the State. (See 40 CFR part 271 for the standards and requirements for authorization.) Following authorization, EPA retains enforcement authority under sections 3008, 7003, and 3013 of RCRA, although authorized States have primary enforcement responsibility.

Prior to the Hazardous and Solid Waste Amendments (HSWA) of 1984, a State with final authorization administered its hazardous waste program entirely in lieu of EPA administering the Federal program in that State. The Federal requirements no longer applied in the authorized State and EPA could not issue permits for any facility in the State that the State was authorized to permit. When new, more stringent Federal requirements were promulgated or enacted, the State was obliged to enact equivalent authority within specified time frames. New Federal requirements did not take effect in an authorized State until the State adopted the requirements as State law.

In contrast, under section 3006(g) of RCRA, 42 U.S.C. 6926(g), new requirements and prohibitions imposed by the HSWA take effect in authorized States at the same time that they take effect in non-authorized States. EPA is directed to implement HSWA requirements and prohibitions in an authorized State, including the issuance of permits, until the State is granted authorization to do so. While States must still adopt HSWA-related provisions as State law to retain final authorization, HSWA applies in authorized States in the interim.

### *B. Effect of State Authorizations*

Today's proposal, if finalized, will promulgate regulations that are not effective under HSWA in authorized States. Thus, the exemption will be applicable only in those States that do not have final authorization.

Authorized States are only required to modify their programs when EPA promulgates Federal regulations that are more stringent or broader in scope than the authorized State regulations. For those changes that are less stringent or reduce the scope of the Federal program, States are not required to modify their programs. This is a result of section 3009 of RCRA, which allows States to impose more stringent regulations than the Federal program. Today's proposal for exit levels is considered to be less stringent than, or a reduction in the scope of, the existing Federal regulations because it would exempt certain wastes now subject to RCRA Subtitle C. Therefore, authorized States are not required to modify their programs to adopt regulations consistent with and equivalent to today's proposal.

Even though States are not required to adopt most options in today's proposal, EPA strongly encourages States to do so as quickly as possible. As already explained in this preamble, today's proposal will reduce over-regulation of dilute wastes and will provide an alternative to delisting. States are therefore urged to consider the adoption of today's proposal (when promulgated); EPA will expedite review of authorized State program revision applications.

### *C. Streamlining Issues*

EPA is considering a new approach to state authorization for rules revising the

RCRA program. Under this new approach EPA would vary the requirements for state submissions and for EPA's review to reflect differences in the scope and complexity of various program revisions. This differential approach to authorization also would recognize the fact that many states now have more than a decade of experience in implementing large portions of the RCRA program and commensurate experience in obtaining authorization for program revisions. EPA believes that adjusting authorization requirements will strike an appropriate balance between recognizing state experience and ensuring environmental protection.

EPA recently proposed a greatly streamlined set of procedures for the least complex changes to the LDR program in the ''LDR Phase IV'' rulemaking. EPA, however, proposed to retain the current authorization process for other portions of the rule that presented more complex and novel regulations.

EPA is also developing a different approach to streamlining authorization for the ''HWIR media'' proposal scheduled for publication later in 1995. Although EPA expects some aspects of these state authorization procedures to be unique to the HWIR- media rulemaking, EPA will determine whether some of the concepts can be used to craft streamlined procedures for additional RCRA rules.

EPA was not able to develop a streamlined authorization process for this rule in time to include it in this proposal. EPA, however, intends to describe such a process in more detail in the preamble to the proposed HWIR-media rule. EPA anticipates that most elements of the basic waste exit scheme proposed in today's notice would be eligible for a greatly streamlined approach to authorization. For example, the new LDR standards based on ''minimize threat'' findings would be good candidates for streamlined authorization because states that are already authorized for significant portions of the LDR program are familiar with the type of rule changes needed, have adopted all or most of the underlying LDR program, and have experience in implementing and enforcing the rules. The exit levels, along with the self-implementing approach to exit determinations, are also likely to be eligible for a greatly streamlined approach. The scheme is very similar to the existing program for determining whether a waste exhibits any of the hazardous waste characteristics, particularly the 1980 EP Toxicity Characteristic and the expanded 1990 Toxicity Characteristic. Under both the characteristic rules and today's proposal, generators are responsible for determining whether or not a waste meets a numerical definition of ''hazard''. States must then enforce by reviewing records of determinations and/or conducting their own analysis of wastes determined not to be hazardous. Consequently, States which have been authorized for the base program already have experience in adopting and enforcing rules which resemble the exit scheme proposed today. EPA, however, notes that adopting the exit scheme proposed in today's notice will place additional demands on state inspection and enforcement resources. EPA will give careful consideration to balancing the need to ensure that a state has sufficient resources to implement an exit program with the goal of streamlining the authorization process.

Today's scheme does differ from the original characteristics and the 1990 Toxicity Characteristic by including some requirements which must be enforced as conditions of exit. These requirements, however, are requirements for testing, notification and recordkeeping that are relatively easy to meet and relatively easy to detect if violated. Accordingly, EPA does not at this time anticipate that these conditions would require it to retain the current authorization process.

EPA currently finds it unlikely that it will propose a greatly streamlined authorization process for any of the contingent management options presented for discussion in today's proposal. These options will raise novel legal, implementation and enforcement issues. A more conventional approach to the review of state authorities and capabilities may be warranted. If EPA proposes any of these options in the future, it will consider the possibility of adapting the approach to authorization that it is currently developing for the HWIR-media proposal.

## XIV. Regulatory Requirements

### *A. Analytical Requirements*

#### 1. Executive Order 12866

Under Executive Order 12866, (58 FR 51735 (October 4, 1993)) the Agency must determine whether this regulatory action is ''significant.'' A determination of significance will subject this action to full OMB review and compliance under Executive Order 12866 requirements. The order defines ''significant regulatory action'' as one that is likely to result in a rule that may:

(a) Have an annual effect on the economy of $100 million or more, adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;

(b) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(c) Materially alter the budgetary impact of entitlement, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or

(d) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the terms of the Executive Order.

The proposed rule is expected to have an annual effect on the economy greater than $100 million. Furthermore, although voluntary, the adoption of this action may burden state or tribal governments with increased regulatory review requirements. Today's action may also raise novel legal or policy issues as they relate to the President's priorities for environmental protection within a regulatory system facing resource limitations. The Agency, therefore, has determined that today's proposed rule is a ''significant regulatory action.'' As a result, this rulemaking action, and supporting analyses, are subject to full OMB review under the requirements of the Executive Order. The Agency has prepared an *Assessment of The Potential Costs and Benefits of The Hazardous Waste Identification Rule for Industrial Process Wastes, as Proposed,* in support of today's action. A summary of this Assessment and findings is presented in section D below.

#### 2. Regulatory Flexibility Analysis

Pursuant to the Regulatory Flexibility Act of 1980, 5 U.S.C. 601 et seq., when an agency publishes a notice of rulemaking, for a rule that will have a significant effect on a substantial number of small entities, the agency must prepare and make available for public comment a regulatory flexibility analysis. This analysis shall consider the effect of the rule on small entities (i.e.: Small business, small organizations, and small governmental jurisdictions).

Under the Agency's revised Guidelines for Implementing the Regulatory Flexibility Act, dated May 4, 1992, the Agency committed to considering regulatory alternatives in rulemakings when there were any economic impacts estimated on any small entities. Previous guidance required alternatives to be examined only when significant economic effects were estimated for a substantial number of small entities. The Agency has

prepared a Regulatory Flexibility Analysis in support of today's action. A summary of this analysis and findings is presented in section E below.

3. Environmental Justice

Executive Order 12898, ''Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,'' directs each Federal Agency to ''make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations * * *''

The Executive Order requires that where environmental justice concerns or the potential for concerns are identified, appropriate analysis of the issue(s) be evaluated. To the extent practicable, the ecological, human health (taking into account subsistence patterns and sensitive populations) and socio-economic impacts of the proposed decision-document in minority and low-income communities should also be evaluated.

The Agency has examined Environmental Justice concerns relevant to today's action. A summary of this analysis and findings is presented in section F below.

4. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the *Paperwork Reduction Act*, 44 U.S.C. 3501 *et seq.* An Information Collection Request (ICR) document has been prepared by EPA (ICR No. 1766.01) and a copy may be obtained from Sandy Farmer, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137); 401 M St., SW.; Washington, DC 20460 or by calling (202) 260–2740.

This information collection is required to provide documentation of solid waste exemptions from Subtitle C requirements, and will allow for certification and verification as the program evolves. Exemptions under today's action require no formal preapproval. As such, information collection, maintenance and reporting issues are especially important due to the self-implementing nature of this action. Successful implementation of today's proposal will depend upon the documentation, certification, and verification provided by the information collection.

The general authority for this proposal is sections 2002(a), 3001, 3002, 3004, and 3006 of the Solid Waste Disposal Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), 42 U.S.C. 6912(a), 6921, 6922, 6924, and 6926. The specific authority for the collection of information is 40 CFR 261.36, *Exemption for Listed Hazardous Wastes Containing Low Concentrations of Hazardous Constituents.*

The Agency has prepared a full Information Collection request (ICR) in support of today's action. A summary of the methodology and findings from this document is presented in section G below.

*B. Background*

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) to address problems associated with annual nationwide generation of large quantities of municipal and industrial solid waste. This Act was significantly amended in 1984 by the Hazardous and Solid Waste Amendments (HSWA). Under RCRA, the Agency regulates non-hazardous solid waste through the Subtitle D program, and hazardous solid waste under the Subtitle C program. Subtitle C regulations differ from Subtitle D in two important areas. First, Subtitle C regulations are developed and promulgated by EPA, while Subtitle D requirements have been largely delegated to the states. Second, non-hazardous wastes regulated under Subtitle D are generally subject to standards that are considerably less stringent and less costly than those under Subtitle C. All wastes addressed under this action are currently managed under Subtitle C regulations.

RCRA is divided into four programs: Underground storage, medical waste, nonhazardous solid waste, and hazardous solid waste. Under RCRA 3001(a), Congress has required EPA to identify those wastes that should be classified as hazardous. In accordance with this provision, the Agency has designated wastes as hazardous in two ways: ''characteristic,'' or ''listed.'' Hazardous waste is considered characteristic if it has any of the properties or characteristics that would present a potential hazard if managed improperly. The Agency has identified four characteristics which, if exhibited, lead to hazardous classification. These are: Ignitability, corrosivity, reactivity, and toxicity. Under the toxicity characteristic, specific health-based concentration standards have been developed for approximately forty (40) constituents. Wastes exhibiting any of these characteristics are subject to Subtitle C regulation. Hazardous wastes are identified as listed based on an extensive listing procedure. This procedure may identify a waste as hazardous under three broad categories: if it exhibits one of the characteristics identified above but has not been classified as characteristically hazardous, if it is determined to be acutely toxic or hazardous, or if the waste meets the statutory definition of a hazardous waste.

The Agency, however, was concerned that generators and managers of hazardous waste might avoid regulatory requirements in two major ways: (1) By mixing listed hazardous waste with non-hazardous solid waste, and, (2) by minimal processing and treatment of hazardous waste. These activities could result in a waste or residual material that was no longer legally defined as hazardous under Subtitle C. In many cases, the Agency believed these materials could continue to pose unacceptable hazards to human health and the environment. The Agency promulgated mixture and derived-from rules in May of 1980, in response to these potential loopholes.

*C. Need for Regulation*

The mixture and derived-from rules created what was perceived as being federal over-regulation, where listed hazardous waste continued to remain under Subtitle C jurisdiction regardless of constituent concentration or presence in the waste, either before or after treatment. This problem was exacerbated with the passage of HSWA in 1984. HSWA set Land Disposal Restrictions (LDR) requiring best demonstrated available technology (BDAT) treatment for all listed hazardous wastes prior to disposal. In cases where a specific listed wastestream contained relatively innocuous constituents, or very low concentrations, BDAT treatment requirements were felt to be overly protective, and unnecessarily expensive.

By requiring Subtitle C management for some low risk wastes, the current RCRA regulatory system may inhibit the efficient allocation of limited societal resources. From a social perspective, too many resources devoted to managing low risk wastes may reduce resource availability for managing higher risk wastes. Resource availability for general productivity investments and innovative technologies are also reduced. The Agency's delisting program has not provided an efficient solution to this problem. The delisting process has proven to be overly time

and resource intensive for both industry and EPA.

The Agency believes that a simpler exemption process is necessary to reduce the over-regulation of low risk hazardous waste while, at the same time, reducing the time and resource burden on industry and government. This revised exemption process would also reduce the burden on the delisting program which will continue under current regulations. To meet these goals, the Agency is proposing the current action that would establish a single set of exit levels for constituents found in listed hazardous waste. This action would cover wastes as-generated, derived-from wastes, including BDAT treatment residuals, mixtures with solid wastes, and environmental media that contain hazardous wastes.

*D. Assessment of Potential Costs and Benefits*

1. Introduction and Summary

The U.S. Environmental Protection Agency (EPA) has prepared an *Assessment of The Potential Costs and Benefits (Assessment)* to accompany today's proposed rulemaking action. This action will establish concentration-based exemption criteria for certain hazardous wastes, creating a mechanism to exclude from Subtitle C regulation those listed industrial process wastes that the Agency believes are clearly not of Federal regulatory concern. Today's proposed rule addresses low hazard wastes, mixtures, treatment residuals, and media that contain hazardous wastes.

The Agency anticipates that the proposed rule will provide cost savings to selected generators and managers of low hazard wastes. Under the preferred option, annual nationwide treatment and disposal cost savings for exempted wastes may be as high as $75 million. Annual cost savings for a single facility may be as high as $5.03 million. Potential cost reductions beyond treatment and disposal savings may be associated with waste minimization incentives, avoided treatment costs for wastes remaining within Subtitle C, and administrative cost savings.

Exemption of eligible wastes from Subtitle C management requirements is projected to have negligible effects on human health and the environment. The proposed exemption levels are based on detailed analysis of numerous possible routes of exposure. These exemption levels are designed to be protective of both human health and ecological systems when exempted wastes are managed under Subtitle D, including state regulated waste disposal systems.

The Agency has also evaluated other impacts of the proposed rule. These include: Environmental justice, unfunded mandates, regulatory takings, and waste minimization incentives. Environmental justice concerns associated with today's proposed action may be in the form of economic benefits and/or human health effects. Today's proposal implements no enforceable requirements on states. Federal unfunded mandates, therefore, are not relevant to today's proposed rulemaking. Regulatory takings under today's proposed rulemaking will not approach land or productive value impacts discussed in past House and Senate Bills presented on this issue. This rulemaking provides opportunities for generators to implement waste minimization procedures to gain additional savings.

The complete document, *Assessment of The Potential Costs and Benefits of The Hazardous Waste Identification Rule for Industrial Process Wastes, as Proposed (Assessment),* is available in the docket established for this proposed rule. This document details the data, methodology, findings, regulatory issues, and analytical limitations associated this *Assessment*. The rapid evolution of this action resulted in continuous technical modifications throughout the development of this proposal. An Addendum to the *Assessment* document that details final quantity and cost savings estimates is included in the docket materials. Findings presented in this preamble present final estimates.

A summary of the *Assessment* methodology and findings is presented below. The analysis conducted for this Notice of Proposed Rulemaking is to be considered preliminary. The Agency welcomes review and comment of this document and urges the submission of data in support of any comment or response.

2. Regulatory Options

The Agency's Assessment, conducted in support of today's action, addresses the costs, benefits, and other potential impacts of the preferred option. The Assessment also examines various other regulatory options based on exit levels that are both more and less stringent. Findings presented in this preamble discuss the preferred option and one primary alternative. A full discussion of findings associated with various alternative regulatory options is presented in the Assessment and Addendum.

a. Preferred (Proposed) Option

Under the preferred option, exit criteria are established for approximately 400 constituents, allowing hazardous wastes (including waste mixed with or derived-from listed wastes) to exit Subtitle C if the concentration of all constituents is less than or equal to the exemption criteria. The exit levels apply to all listed wastes, regardless of origin.

Exit levels for most constituents are based on risks posed to human health and the environment. The Agency's goal is to ensure, through Federal or State management requirements, that humans are not exposed to carcinogens in concentrations that will increase the statistical risk of cancer by more that one-in-one-million ($1 \times 10^{-6}$). For non-carcinogens, the Agency's goal is to ensure that humans are not exposed to concentrations where the hazard quotient exceeds one (1). The Agency feels that, above this level, selected populations may experience carcinogenic effects at a $10^{-6}$ risk level and non-carcinogenic effects at a hazard quotient greater than one (1).

To determine the concentrations at which exempt wastes would not pose human health risks in excess of these target levels, EPA conducted a ''Multipathway'' Analysis that included ecological exposure pathways. In addition, EPA considered the effects of direct exposure to contaminants in groundwater. The analyses consider several types of waste management units. For non-wastewaters these unit types include landfills, land application units, waste piles, and ash monofills. For wastewaters management units included tanks and surface impoundments.

The concentrations from all other pathways were compared to the groundwater concentrations in determining the exit level. The more stringent of the multipathway or groundwater numbers was chosen as the exit level. Exit levels for some constituents are based on surrogates, or Exemption Quantitation Criteria (EQCs). MCLs were not used in the development of exit levels analyzed for this option. The Agency believes that levels established under this process will ensure protection of human health and the environment. These exit levels are presented in the regulatory language for this proposed rulemaking.

b. Other Options

In developing the preferred option, the Agency compared the proposed rule to several alternative regulatory options. These are discussed in the full

document, *Assessment of The Potential Costs and Benefits of The Hazardous Waste Identification Rule for Industrial Process Wastes, as Proposed*. Additional options are discussed in the supporting Addendum to the Assessment document. These options consider alternative waste management requirements, target risk levels, dilution and attenuation factors (DAFs), and exposure pathways. This Preamble discusses one primary alternative to the preferred option. This alternative is the same as the preferred option but drops land application units from consideration as a management source. Exempt nonwastewater wastestreams could not be land applied. There would be no change for wastewaters.

3. Implementation Requirements

Implementation requirements include the steps that generators (or waste managers) must take to achieve exemption of their wastes, regardless of the exit levels selected. These requirements include waste sampling and analysis, and related recordkeeping and reporting. Under the proposed rule, the facility must first perform a comprehensive analysis of the waste, testing for all constituents identified in appendix X to 40 CFR part 261. Reduced initial testing may be possible only if a facility is able to document that such constituents are not present in the waste. The generator must then prepare a notification/certification package and submit it to the EPA Regional Administrator or authorized state agency. The generator must repeat a comprehensive analysis periodically according to the schedule established in the proposed rule, along with more frequent tailored scans that focus on the constituents of concern. Related documentation must be maintained on-site and be available for review.

The Agency has estimated annual sampling, analysis, recordkeeping, and reporting costs (collectively referred to as ''implementation costs'') that may be required under this rule. These estimates range from approximately $21,000 for a less complex, solvent wastestream with testing every 12 months, to $169,000 for a complex high quantity F039 wastestream with testing every three months.

4. Analysis and Findings

Under the proposed rule, listed wastes from industrial processes may be eligible for exemption from Subtitle C hazardous waste requirements if they contain low concentrations of contaminants. This exemption may allow generators and waste managers to avoid some or all costs associated with Subtitle C requirements. The most significant cost savings relate to waste treatment and disposal; this rule will allow generators to avoid the costs of treatment required for compliance with the Land Disposal Restrictions as well as the costs of disposing wastes in highly protective Subtitle C facilities.

In addition to assessing these cost savings, the Assessment addresses a number of other potential effects of the regulations. It analyzes the relative effects of the regulatory options on human health and the environment and considers issues related to ensuring environmental justice, eliminating federal mandates, encouraging waste minimization, and providing flexibility for small businesses.

a. Eligible Waste

The universe of annual listed waste generation, both wastewaters and nonwastewaters, potentially affected by today's proposed rulemaking is estimated to total 303.6 million tons. The universe of potentially affected wastes includes approximately 25,300 wastestreams from 10,700 facilities. Wastewaters account for the vast majority of total waste quantity (99 percent).

To determine whether these wastes are likely to be eligible for exemption, EPA developed the Process Waste Model. This model uses data on the characteristics of individual listed waste-streams first collected in 1986 for EPA's *National Survey of Hazardous Waste Generators,* which has since been updated, refined, and in some cases, corrected. The model first compares the reported concentrations of constituents in each wastestream to the proposed rule exit levels to determine whether the waste is likely to be eligible for exemption without further treatment. If the waste is not eligible as-reported, the model then considers whether it may be eligible after treatment. In this comparison, the concentration standards established under EPA's Land Disposal Restrictions (which are based on the use of the best demonstrated and available technology) are used as a proxy for the lowest concentrations achievable by treatment. If the waste is not eligible for exemption as-reported or after treatment, EPA assesses whether waste minimization or pollution prevention methods could be used to cost-effectively achieve the exit levels. This model does not address contaminated media.

The analysis indicates that:

- Under the preferred option, total nonwastewater quantity exempted, including BDAT treatment residuals and sludge from wastewater, is estimated at 0.40 million tons. Total wastewater (liquid) quantity exempted is approximately 64 million tons.
- Under the primary alternative option (no land application), approximately 65 million tons of wastewaters, and 0.60 million tons of nonwastewaters, including BDAT treatment residuals and sludge from wastewaters, may be eligible for exemption.

b. Cost Savings

The proposed rule will allow waste generators and managers to avoid costs associated with Subtitle C requirements. Specifically, this exemption will allow them to avoid treatment costs and/or costs of disposing wastes in Subtitle C facilities. Wastes which meet exit levels at the point of generation may accrue treatment cost savings because the wastes will not require any treatment that would have been needed to comply with the Subtitle C Land Disposal Restrictions prior to disposal. All exempt wastes are likely to accrue disposal cost savings because the costs of disposing wastes in non-Subtitle C facilities are generally lower than the cost of more protective Subtitle C facilities.

The analysis indicates that:

- Under the preferred option, the high-end estimate of annual treatment and disposal cost savings is approximately $75 million.

—A large portion of these savings are attributable to avoided treatment costs.

- Under the primary alternative, the high-end estimate of cost savings is $99 million.

The above estimates for quantities exempted and cost savings assume zero implementation costs. The incorporation of implementation costs into the analytical model will have a significant impact on facilities and wastestreams affected, while having only a marginal impact on total quantities exempted.

c. Affected Wastestreams and Facilities

Under the preferred option (unconditional exemption), as high as 41 percent (10,300) of the potentially affected wastestreams may be eligible for exemption. These eligible wastestreams are generated by 56 percent (6000) of the facilities producing listed waste. Total wastestreams and facilities potentially eligible for exemption under the primary alternative option (no land application) are estimated at 12,200 (48 percent), and 7,000 (65 percent), respectively.

The majority of the wastestreams eligible for exemption under the preferred option are very small in quantity. The median annual generation size of an eligible wastewater wastestream is 20 tons. The median for eligible nonwastewaters is 2.0 tons. For small wastestreams, the costs accrued due to the exemption are likely to be counterbalanced by the costs associated with gaining the exemption.

While a relatively large number of wastestreams and facilities meet the eligibility criteria for exemption, many may not gain exemption because the costs of exemption may outweigh the estimated cost savings from exemption. For example, if implementation costs average $35,000 annually per wastestream, the estimate of facilities generating an exempted wastestream may be overstated by as much as 90 percent. However, small generators may choose to aggregate their wastes to avoid this problem.

d. Relative Impacts on Human Health and the Environment

Today's proposed rule will allow low concentration hazardous wastes to exit RCRA Subtitle C regulation and be disposed of in Subtitle D nonhazardous waste units. The Agency believes that today's proposed rule will have little effect on human health for the following reasons:

- The acceptable daily exposure levels used to set the exit levels are based on maximum risk levels for carcinogens of $10^{-6}$ and on acceptable daily doses for non-carcinogens at which no adverse effects are likely to occur.
- The waste management units modeled in the *Multipathway Analysis* provide high potential release rates for the various groups of constituents being considered in the analysis based on their physical and chemical properties.
- The pathways included in the *Multipathway Analysis* are generally considered to be the most critical.
- The *Multipathway Analysis* includes populations that are likely to be exposed more than the average adult due to proximity to a contaminant source, behavior patterns, activities, and body size.
- High-end values were used for selected parameters in the *Multipathway Analysis* to calculate acceptable waste concentrations.
- Exit levels represent acceptable constituent concentration levels for Subtitle D waste management based on all of the potential combinations of management units, and receptors in the Multipathway Analysis.
- Exit levels for several constituents are below the acceptable waste concentrations for human health due to the inclusion of ecological receptors.

Ecological risks were also evaluated for selected key constituents. The inclusion of such risk in solid waste regulation at a national level is an important step, and is preferable to establishing exit criteria based only on human health risks.

5. Other Regulatory Issues

a. Environmental Justice

Economic benefits may occur to selected communities as affected local facilities reinvest cost savings derived from reduced treatment and/or disposal costs. Human health effects are expected to be negligible due to the stringency of the exit levels. Included in these exit levels are pathways of particular concern for selected low income populations such as subsistence fishing and farming.

b. Other Issues

Today's proposal is expected to have no impact in the area of Unfunded Federal Mandates or Regulatory Takings. Waste minimization procedures are likely to be stimulated under this proposal.

6. Implications and Conclusions

The analysis indicates that approximately 11 percent of the quantity of all nonwastewaters containing listed codes, and 21 percent of all such wastewaters may be eligible for exemption under the proposed rule. This exempt quantity is dominated by a small number of very large wastestreams, and includes a large number of very small wastestreams. For some small wastestreams, exemption may not be cost effective unless generators aggregate their wastes or otherwise work cooperatively to minimize the costs of gaining the exemptions.

Today's proposal could also provide incentives for industry to implement process changes and increased recycling in an effort to gain additional savings. Preliminary estimates indicate that savings from these activities, when combined with treatment and disposal savings from the preferred option, are likely to result in total annual cost savings greater than $100 million. However, limitations of our analysis suggest that the cost savings estimates from such activities are highly uncertain. Additional savings related to administrative requirements and reduced treatment for hazardous wastes may also accrue. These potential additional cost savings are discussed in greater detail in the *Assessment* document.

The Agency believes that today's proposal will result in a net benefit to society. Wastes gaining exemption under the preferred option will not pose unacceptable incremental risks to human health and the environment because the exit levels are based on extensive analysis of possible human and ecological risks associated with exempt wastes.

EPA's analysis of the impact of today's proposal on industry groups indicates that a limited number of industries are likely to benefit from exemption. Under the preferred option (unconditional exemption), three industries account for 51 percent of eligible nonwastewater and wastewater sludge quantity and 53 percent of total treatment and disposal cost savings. These industries are: Chemicals and allied products (SIC 28); fabricated metals (SIC 34); and primary metals (SIC 33).

The Agency also compared benefits gained from exemption to key industry data such as national pollution abatement expenditures and considered facility level impacts of the proposal. To evaluate the relative magnitude of cost savings that would accrue under the proposed rule, EPA compared cost savings estimates to total pollution abatement expenditures and the total value of industry shipments. Total treatment and disposal cost savings under the preferred option account for approximately 3.5 percent of annual operating costs for hazardous waste pollution abatement activities, and less than 0.002 percent of the total value of industry shipments. The facility-level impacts of the proposal vary greatly.

*E. Regulatory Flexibility Analysis.*

The Regulatory Flexibility Act requires analysis of the impact of regulations on small entities. Because today's proposal is deregulatory, it is not expected to have adverse impacts on small businesses. In general, generators of large quantity wastestreams posing low hazards will benefit substantially from the regulations. The impacts on small quantity generators is less certain and depends on the degree to which they aggregate their wastes and work cooperatively to cost-effectively gain exemption.

*F. Environmental Justice*

It is the Agency's policy that environmental justice be considered as an integral part in the development of all policies, guidance and regulations. Further, Executive Order 12898, ''Federal Actions to Address

Environmental Justice in Minority Populations and Low-Income Populations'', directs each Federal Agency to ''make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations * * *''

The Executive Order requires that where environmental justice concerns or the potential for concerns are identified, appropriate analysis of the issue(s) be evaluated. To the extent practicable, the ecological, human health (taking into account subsistence patterns and sensitive populations) and socio-economic impacts of the proposed decision-document in minority and low-income communities should also be evaluated. Examples include how a policy on future land use would impact minority or low-income communities versus non-minority, affluent communities, or how subsistence farming or fishing patterns relate to risk-assessment policies.

For the purposes of today's proposed rulemaking, the Agency has taken an approach for proposal consistent with Executive Order 12898. As currently drafted, the multipathway analysis which was used to develop the exit levels takes into account subsistence farmers and subsistence fishers; however, subsistence fishers were evaluated using a recreational fisher database (one does not exist for subsistence fishers). Sensitive populations are accounted for in the RfDs, RfCs, and slope factors and ecological receptors were also evaluated.

*G. Paperwork Reduction Act*

As stated earlier, the level of implementation costs (i.e. sampling, analysis, recordkeeping, and reporting) will have a significant impact on the number of wastestreams and facilities affected by this proposal. Assuming annual implementation costs of $35,000 per wastestream, as many as 269 facilities, generating up to 285 different wastestreams may seek exemptions, and therefore be affected by the recordkeeping and reporting requirements. The actual number of facilities and wastestreams affected will depend upon the level of implementation costs. The higher the implementation cost to the facility, the fewer the number of facilities expected to participate in the HWIR program.

The estimated hour burden ranges from 382 hours to 573 hours per wastestream in the first year, and from 31 hours to 146 hours per wastestream in years two and three. The variation in burden estimates results from different assumptions in (1) the complexity of the waste (and therefore of the test methods required), and (2) the frequency of reporting. The estimated total hour burden over the first three years ranges from 206,900 to 293,465 hours, averaging 68,967 to 97,821 hours per year.

The estimated total start-up cost of recordkeeping and reporting in the first year ranges from $55,000 to $235,000 per wastestream. The annual cost in the second and third years is estimated to be $9,000 to $209,000 per wastestream (of which $8,000 to $203,000 is the cost of shipping samples to a laboratory and paying to have them tested). In years four and five the high-end cost drops to $53,000. The estimated annual recordkeeping and reporting cost per wastestream, annualized at seven percent over five years, is $21,000 to $170,000. The total recordkeeping and reporting cost burden over the first three years is $28,000,000 to $32,000,000.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR chapter 15.

Comments are requested on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, OPPE Regulatory Information Division; U.S. Environmental Protection Agency (2137); 401 M St., SW.; Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th St., NW., Washington, DC 20503, marked ''Attention: Desk Officer for EPA.'' Include the ICR number in any correspondence. Since OMB is required to make a decision concerning the ICR between 30 and 60 days after December 21, 1995, a comment to OMB is best assured of having its full effect if OMB receives it by January 22, 1996. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

List of Subjects in 40 CFR 261 and 268

Identification and listing of hazardous waste. Land disposal restrictions.

Dated: November 13, 1995.

Carol Browner,

*Administrator.*

XV. References

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## Appendix A

### TABLE A–1.—HUMAN EXPOSURE PATHWAYS

| Exposure medium | Route of exposure | Type of fate and transport | Pathway [a] |
|---|---|---|---|
| Groundwater | Ingestion | Groundwater | **1**<br>WMU ‰ groundwater ‰ humans<br>*Ingestion of contaminated groundwater as a drinking water source.* |
| Air | Inhalation | Direct air | **2a (on site or off site)**<br>WMU ‰ air ‰ humans<br>*Inhalation of volatiles* |
| Air | Inhalation | Direct air | **2b (on site or off site)**<br>WMU ‰ air ‰ humans<br>*Inhalation of suspended particulates* |
| Soil | Ingestion | Direct soil | **3 (on site)**<br>WMU ‰ humans<br>*Ingestion of contaminated soil* |
| Soil | Ingestion | Overland | **3 (off site)**<br>WMU ‰ overland ‰ humans<br>*Ingestion of contaminated soil* |
| Soil | Ingestion | Air deposition | **4**<br>WMU ‰ air ‰ deposition to soil ‰ humans<br>*Ingestion of contaminated soil* |
| Soil | Dermal | Direct soil | **5 (on site)**<br>WMU ‰ humans<br>*Dermal contact with contaminated soil* |
| Soil | Dermal | Overland | **5 (off site)**<br>WMU ‰ overland ‰ humans<br>*Dermal contact with contaminated soil* |
| Soil | Dermal | Air deposition | **6**<br>WMU ‰ air ‰ deposition to surface soil ‰ humans<br>*Dermal contact with contaminated soil* |
| Plant (veg/root) | Ingestion | Air deposition | **8**<br>WMU ‰ air ‰ deposition to soil/gard crops ‰ garen crops ‰ humans<br>*Consumption of contaminated crops grown in home gardens* |
| Plant (veg) | Ingestion | Air diffusion | **8a**<br>WMU ‰ air ‰ garden crops ‰ humans<br>*Consumption of contaminated crops grown in home gardens* |
| Plant (veg/root) | Ingestion | Direct soil | **9 (on site)**<br>WMU ‰ garden crops ‰ humans<br>*Consumption of contaminated crops grown in home gardens* |
| Plant (veg/root) | Ingestion | Overland | **9 (off site)**<br>WMU ‰ overland ‰ garden crops ‰ humans<br>*Consumption of contaminated crops grown in home gardens* |
| Animal (beef/milk) | Ingestion | Air deposition | **10**<br>WMU ‰ air ‰ deposition to soil/feed crops ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by eating contaminated feed crops and soil* |
| Animal (beef/milk) | Ingestion | Air diffusion | **10a**<br>WMU ‰ air ‰ feed crops ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by eating contaminated feed crops* |
| Animal (beef/milk) | Ingestion | Direct soil | **11 (on site)**<br>WMU ‰ feed crops ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by eating contaminated feed crops and soil* |
| Animal (bedf/milk) | Ingestion | Overland | **11 (off site)**<br>WMU ‰ overland ‰ feed crops/soil ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by eating contaminated feed crops and soil* |
| Groundwater | Dermal (bathing) | Groundwater | **14**<br>WMU ‰ groundwater ‰ humans<br>*Ingestion of contaminated surface water as a drinking water source* |
| Surface water | Ingestion | Air diffusion | **17**<br>WMU ‰ groundwater ‰ humans<br>*Dermal bathing contact with contaminated groundwater* |

TABLE A–1.—HUMAN EXPOSURE PATHWAYS—Continued

| Exposure medium | Route of exposure | Type of fate and transport | Pathway [a] |
|---|---|---|---|
| Surface water | Ingestion | Overland | **19**<br>WMU ‰ overland flow ‰ surface water ‰ humans<br>*Ingestion of contaminated surface water as a drinking water source* |
| Surface water | Ingestion | Air deposition | **20**<br>WMU ‰ air ‰ deposition to soil ‰ overland flow ‰ surface water ‰ humans<br>*Ingestion of contaminated surface water as a drinking water source* |
| Fish | Ingestion | Air diffusion | 21<br>WMU ‰ air ‰ surface water ‰ fish ‰ humans<br>Consumption f fish contaminated by toxicants in surface water |
| Fish | Ingestion | Overland | 23<br>WMU ‰ overland ‰ surface water ‰ fish ‰ humans<br>Consumption f fish contaminated by toxicants in surface water |
| Fish | Ingestion | Air deposition | 24<br>WMU ‰ air ‰ deposition to surface soil ‰ overland flow ‰ surface water ‰ fish ‰ humans<br>Consumption f fish contaminated by toxicants in surface water |
| Animal (beef/milk) | Ingestion | Air diffusion | **33**<br>WMU ‰ air ‰ suface water ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by drinking contaminated surface water* |
| Animal (beef/milk) | Ingestion | Overland | **35**<br>WMU ‰ overland flwo ‰ surface water ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by drinking contaminated surface water* |
| Animal (beef/milk) | Ingestion | Air deposition | **36**<br>WMU ‰ air ‰ deposition to soil ‰ overland flow ‰ surface water ‰ cattle ‰ humans<br>*Consumption of animal products with elevated levels of toxicant caused by drinking contaminated surface water* |
| Surface water | Dermal (bathing) | Air diffusion | **37**<br>WMU ‰ air ‰ surface water ‰ humans<br>*Dermal bathing contact with contaminated surface water* |
| Surface water | Dermal (bathing) | Air deposition | **38**<br>WMU ‰ air deposition to soil ‰ overland flow ‰ surface water ‰ humans<br>*Dermal bathing contact with contaminated surface water* |
| Surface water | Dermal (bathing) | Overland | **42**<br>WMU ‰ overland flow ‰ surface water ‰ humans<br>*Dermal bathing contact with contaminated surface water* |

Overland = Soil erosion; Overland flow = Both runoff and sold erosion; or, for surface impoundments, a spill directly to surface water. Veg = Aboveground fruits and vegetables. Root = Belowground (or root) vegetables.

[a] Some pathway numbers are missing, reflecting pathways that have been eliminated from the analysis or combined with other pathways.

TABLE A–2.—ECOLOGICAL EXPOSURE PATHWAYS

| | Exposure medium | Route of exposure | Type of fate and transport | Pathways [a] |
|---|---|---|---|---|
| Terr I | Soil | Ingestion | Direct soil | 3 (on site)<br>WMU ‰ mammals, birds, soil fauna<br>*Ingestion of contaminated soil* |
| | Soil | Direct contact | Direct soil | 5 (on site)<br>WMU ‰ plants, soil fauna<br>*Direct contact with contaminated soil* |
| | Plant | Ingestion | Direct soil | 9 (on site)<br>WMU ‰ vegetation ‰ mammals, birds<br>*Consumption of contaminated vegetation (e.g., forage grasses)* |
| | Soil fauna | Ingestion | Direct soil | 11a (on site)<br>WMU ‰ soil fauna ‰ mammals, birds<br>*Consumption of soil fauna (e.g., earthworms, insects) with elevated levels of toxicant* |
| | Animals | Ingestion | Direct soil | 11b (on site)<br>WMU ‰ soil fauna/vegetation ‰ animals ‰ predatory mammals, birds<br>*Consumption of animals with elevated levels of toxicant* |
| Terr II | Soil | Ingestion | Overland | 3 (off site)<br>WMU ‰ overland ‰ mammals, birds, soil fauna<br>*Ingestion of contaminated soil* |

TABLE A–2.—ECOLOGICAL EXPOSURE PATHWAYS—Continued

| | Exposure medium | Route of exposure | Type of fate and transport | Pathways [a] |
|---|---|---|---|---|
| | Soil | Direct contact | Overland | 5 (off site)<br>WMU ‰ overland ‰ plants, soil fauna<br>*Direct contact with contaminated soil* |
| | Plant | Ingestion | Overland | 9 (off site)<br>WMU ‰ overland ‰ vegetation ‰ mammals, birds<br>*Consumption of contaminated vegetation (e.g., forage grasses)* |
| | Soil fauna | Ingestion | Overland | 11c (off site)<br>WMU ‰ overland ‰ soil fauna ‰ mammals, birds<br>*Consumption of soil fauna (e.g., earthworms, insects) with elevated levels of toxicant* |
| | Animals | Ingestion | Overland | 11d (off site)<br>WMU ‰ soil fauna/vegetation ‰ animals ‰ predatory mammals, birds<br>*Consumption of animals with elevated levels of toxicant* |
| Terr III | Soil | Ingestion | Air deposition | 4<br>WMU ‰ air ‰ deposition to soil ‰ mammals, birds, soil fauna<br>*Ingestion of contaminated soil* |
| | Soil | Direct contact | Air deposition | 6<br>WMU ‰ air ‰ deposition to surface soil ‰ plants, soil fauna<br>*Direct contact with contaminated soil* |
| Terr IV | Plant | Ingestion | Air deposition | 8<br>WMU ‰ air ‰ deposition to soil ‰ vegetation ‰ mammals, birds<br>*Consumption of contaminated vegetation (e.g., forage grasses)* |
| Terr V | Plant | Ingestion | Air diffusion | 8<br>WMU ‰ air ‰ vegetation ‰ mammals, birds<br>*Consumption of contaminated vegetation (e.g., forage grasses)* |
| Aq I | Surface water | Ingestion | Air diffusion | 17<br>WMU ‰ air ‰ surface water ‰ mammals, birds<br>*Ingestion of contaminated surface water as a drinking water source* |
| | Fish | Ingestion | Air diffusion | 21<br>WMU ‰ air ‰ surface water ‰ fish ‰ mammals, birds, fish<br>*Consumption of fish contaminated by toxicants in surface water* |
| | Surface water | Direct contact | Air diffusion | 37<br>WMU ‰ air ‰ surface water ‰ fish, daphnids, benthos<br>*Direct contact with contaminated surface water, sediments* |
| Aq II | Surface water | Ingestion | Air deposition | 37<br>WMU ‰ air ‰ deposition to soil ‰ overland flow ‰ surface water ‰ mammals, birds<br>*Ingestion of contaminated surface water as a drinking water source* |
| | Fish | Ingestion | Air deposition | 24<br>WMU ‰ air ‰ deposition to surface soil ‰ overland flow ‰ surface water ‰ fish ‰ mammals, birds, fish<br>*Consumption of fish contaminated by toxicants in surface water* |
| | Surface water | Direct contact | Air deposition | 38<br>WMU ‰ air ‰ deposition to soil ‰ overland flow ‰ surface water ‰ fish, daphnids, benthos<br>*Direct contact with contaminated surface water, sediments* |
| Aq III | Surface water | Ingestion | Overland | 19<br>WMU ‰ overland flow ‰ surface water ‰ mammals, birds<br>*Ingestion of contaminated surface water as a drinking water source* |
| | Fish | Ingestion | Overland | 23<br>WMU ‰ overland flow ‰ surface water ‰ fish ‰ mammals, birds, fish<br>*Consumption of fish contaminated by toxicants in surface water* |
| | Surface water | Direct contact | Overland | 42<br>WMU ‰ overland flow ‰ surface water ‰ fish, daphnids, benthos<br>*Direct contact with contaminated surface water, sediments* |

Overland=Soil erosion. Overland flow=Both runoff and soil erosion; or, for surface impoundments, a spill directly to surface water.

[a] Some pathway numbers are missing, reflecting pathways that have been eliminated from the analysis.

TABLE A–3.—SUMMARY OF HUMAN RECEPTORS FOR EXPOSURES PATHWAYS

| Pathway | Receptor | | | | | | |
|---|---|---|---|---|---|---|---|
| | Adult | Child | Subs. farmer | Home gardener | Subs. fisher | Fish consumer | Worker |
| 1: Groundwater-ingestion | √ [a] | | | | | | |
| 2a: Direct air-inhalation of violates (on site) | √ [a] | | | | | | √ |
| 2a: Direct air-inhalation of volatiles (off site) | √ | | | | | | |
| 2b: Direct air-inhalation of particles (on site) | √ [a] | | | | | | √ |
| 2b: Direct air-inhalation of particles (off site) | √ | | | | | | |
| 3: Direct soil-soil ingestion (on site) | √ [a] | √ [a] | | | | | |
| 3: Overland-soil ingestion (off site) | √ | √ | | | | | |
| 4: Air deposition-soil ingestion | √ | √ | | | | | |
| 5: Direct soil-dermal (soil) (on site) | √ [a] | √ [a] | | | | | √ |
| 5: Direct Soil-dermal (off site) | √ | √ | | | | | |
| 6: Air deposition-dermal (soil) | √ | √ | | | | | |
| 8: Air deposition-veg/root ingestion | | | √ | √ | √ | | |
| 8a: Air diffusion-veg/root ingestion | | | √ | √ | | | |
| 9: Direct soil-veg/root ingestion (on site) | | | √ [a] | √ [a] | | | |
| 9: Overland-veg/root ingestion (on site) | | | √ | √ | | | |
| 10: Air deposition-beef/milk ingestion | | | √ | | | | |
| 10a: Air diffusion-beef/milk ingestion | | | √ | | | | |
| 11: Direct soil-bee/milk ingestion (on site) | | | √ [a] | | | | |
| 11: Overland-beef/milk ingestion (off site) | | | √ | | | | |
| 14: Groundwater-dermal (bathing) | √ | √ | | | | | |
| 17: Air diffusion-drinking water ingestion | √ | | | | | | |
| 19: Overland-drinking water ingestion | √ | | | | | | |
| 20: Air deposition-drinking water ingestion | √ | | | | | | |
| 21: Air diffusion-fish ingestion | √ | | | | √ | √ | |
| 23: Overland-fish ingestion | √ | | | | √ | √ | |
| 24: Air deposition-fish ingestion | √ | | | | √ | √ | |
| 33: Air diffusion (SW)-beef/milk ingestion | | | √ | | | | |
| 35: Overland (SW)-beef/milk ingestion | | | √ | | | | |
| 36: Air deposition (OF/SW)-beef/milk ingestion | | | √ | | | | |
| 37: Air diffusion (SW)-dermal (bathing) | √ | √ | | | | | |
| 38: Air deposition (OF/SW)-dermal (bathing | √ | √ | | | | | |
| 42: Overland (SW)-dermal (bathing) | √ | √ | | | | | |

[a] On-site pathways for receptors other than workers are modeled only for the land application unit after closure.

TABLE A–4.—SUMMARY OF ECOLOGICAL RECEPTORS BY EXPOSURE PATHWAYS

| Pathway | Receptor | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mammals | Birds | Plants | Soil fauna | Fish | Daphnids | Benthos |
| 3: Direct soil-soil ingestion (on site) | √ [a] | √ [a] | | √ | | | |
| 3: Direct soil-soil ingestion (off site) | √ | √ | | √ | | | |
| 4: Air deposition-soil ingestion | √ | √ | | √ | | | |
| 5: Direct soil-dermal soil (on site) | | | √ | √ | | | |
| 5: Direct soil-dermal soil (off site) | | | √ | √ | | | |
| 6: Air deposition-dermal soil | | | √ | √ | | | |
| 8: Air deposition-veg/root ingestion | √ | √ | | | | | |
| 8a: Air diffusion-veg ingestion | √ | √ | | | | | |
| 9: Direct soil-veg/root ingestion (on site) | √ | √ | | | | | |
| 9: Overland-veg/root ingestion (off site) | √ | √ | | | | | |
| 11a: Direct soil-soil fauna ingestion (on site) | √ | √ | | | | | |
| 11b: Direct soil-animals ingestion (on site) | √ | √ | | | | | |
| 11c: Overland-soil fauna ingestion (off site) | √ | √ | | | | | |
| 11d: Overland-animals ingestion (off site) | √ | √ | | | | | |
| 17: Air diffusion-drinking water ingestion | √ | √ | | | | | |
| 18: Groundwater (SW)-drinking water ingestion | √ | √ | | | | | |
| 19: Overland-drinking water ingestion | √ | √ | | | | | |
| 20: Air deposition-drinking water ingestion | √ | √ | | | | | |
| 21: Air diffusion-fish ingestion | √ | √ | | | √ | | |
| 22: Groundwater (SW)-fish ingestion | √ | √ | | | √ | | |
| 23: Overland-fish ingestion | √ | √ | | | √ | | |
| 24: Air deposition-fish ingestion | √ | √ | | | √ | | |
| 37: Air diffusion (SW)-direct contact | | | | | √ | √ | √ |
| 38: Air deposition (OF/SW)-direct contact | | | | | √ | √ | √ |
| 40: Groundwater (SW)-direct contact | | | | | √ | √ | √ |

TABLE A–4.—SUMMARY OF ECOLOGICAL RECEPTORS BY EXPOSURE PATHWAYS—Continued

| Pathway | Receptor | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mammals | Birds | Plants | Soil fauna | Fish | Daphnids | Benthos |
| 42: Overland (SW)-direct contact | ..... | ..... | ..... | ..... | √ | √ | √ |

[a] On-site pathways are modeled only for the land application unit after closure.

TABLE A–5.—PATHWAYS MODELED FOR EACH WASTE MANAGEMENT UNIT

| Pathway | Waste management unit | | | | | |
|---|---|---|---|---|---|---|
| | Ash monofill | Land appl. unit | Wastepile | Surface impound. | Tank | Water use |
| 1: Groundwater-ingestion | ..... | √ | √ | √ | ..... | ..... |
| 2a: Direct air-inhalation volatiles | ..... | √ | √ | √ | √ | ..... |
| 2b: Direct air-inhalation particles | √ | √ | √ | ..... | ..... | ..... |
| 3: Direct soil-soil ingestion | ..... | √ | √ | ..... | ..... | ..... |
| 4: Air deposition-soil ingestion | √ | √ | √ | ..... | ..... | ..... |
| 5: Direct soil-dermal (soil) | ..... | √ | √ | ..... | ..... | ..... |
| 6: Air deposition-dermal (soil) | √ | √ | √ | ..... | ..... | ..... |
| 8: Air deposition-veg/root ingestion | √ | √ | √ | ..... | ..... | ..... |
| 8a: Air diffusion-veg/root ingestion | ..... | √ | √ | √ | √ | ..... |
| 9: Direct soil or overland-veg/root ingestion | ..... | √ | √ | ..... | ..... | ..... |
| 10: Air deposition-beef/milk ingestion | √ | √ | √ | ..... | ..... | ..... |
| 10a: Air diffusion-beef/milk ingestion | ..... | √ | √ | √ | √ | ..... |
| 11: Direct soil or overland-beef/milk ingestion | ..... | √ | √ | ..... | ..... | ..... |
| 14: Groundwater-dermal (bathing) | ..... | ..... | ..... | ..... | ..... | √ |
| 17: Air diffusion-drinking water ingestion | ..... | √ | √ | √ | √ | ..... |
| 19: Overland-drinking water ingestion | ..... | √ | √ | √ | ..... | ..... |
| 20: Air deposition-drinking water ingestion | √ | √ | √ | ..... | ..... | ..... |
| 21: Air diffusion-fish ingestion | ..... | √ | √ | √ | √ | ..... |
| 23: Overland-fish ingestion | ..... | √ | √ | √ | ..... | ..... |
| 24: Air deposition-fish ingestion | √ | √ | √ | ..... | ..... | ..... |
| 33: Air diffusion (SW)-beef/milk ingestion | ..... | √ | √ | √ | √ | ..... |
| 35: Overland (SW)-beef/milk ingestion | ..... | √ | √ | √ | ..... | ..... |
| 36: Air deposition (OF/SW)-beef/milk ingestion | √ | √ | √ | ..... | ..... | ..... |
| 37: Air diffusion (SW)-dermal (bathing) | ..... | √ | √ | √ | √ | ..... |
| 38: Air deposition (OF/SW)-dermal (bathing) | √ | √ | √ | ..... | ..... | ..... |
| 42: Overland (SW)-dermal (bathing) | ..... | √ | √ | √ | ..... | ..... |

OF=Overland flow. SW=Surface water.

Appendix B

TABLE B–1.—COMPARISON OF GROUNDWATER MODELING RESULTS FOR 1000 VS. 10,000 YEARS TIME HORIZON (HQ=1 AND RISK=10–6)

[Threshold Chemical Concentrations for 1000 and 10,000 years Groundwater Modeling]

| No. | CAS No. | Name of Chemical | 1000 yrs time horizon | | 10,000 yrs time horizon | |
|---|---|---|---|---|---|---|
| | | | Nonwastewater* leach mg/l | Wastewater** leach mg/l | Nonwastewater* leach mg/l | Wastewater** leach mg/l |
| 1 | 83329 | Acenaphthene | 6.30E+00 | 3.60E+02 | 4.90E+00 | 3.10E+01 |
| 2 | 67641 | Acetone (2-propanone) | 6.00E+00 | 1.56E+01 | 6.00E+00 | 1.56E+01 |
| 3 | 75058 | Acetonitrile (methyl cyanide) | 3.00E−01 | 7.80E−01 | 3.00E−01 | 7.80E−01 |
| 4 | 98862 | Acetophenone | 6.40E+00 | 1.68E+01 | 6.40E+00 | 1.68E+01 |
| 5 | 107028 | Acrolein | 1.00E+06 | 1.00E+06 | 1.00E+06 | 1.00E+06 |
| 6 | 79061 | Acrylamide # | 3.80E−05 | 2.80E−04 | 3.80E−05 | 2.60E−04 |
| 7 | 107131 | Acrylonitrile # | 3.40E−04 | 1.10E−03 | 3.40E−04 | 1.10E−03 |
| 8 | 309002 | Aldrin # | 6.70E−04 | 6.50E−02 | 3.70E−06 | 4.70E−03 |
| 9 | 107051 | Allyl Chloride | ..... | ..... | ..... | ..... |
| 10 | 62533 | Aniline # | 1.70E−02 | 5.30E−02 | 1.70E−02 | 5.30E−02 |
| 176 | 7440360 | Antimony | 4.57E+01 | 1.18E+02 | 5.30E−02 | 1.36E−01 |
| 177 | 7440382 | Arsenic # | 3.08E−02 | 7.92E−02 | 1.48E−04 | 3.84E−04 |
| 178 | 7440393 | Barium | 1.67E+01 | 4.29E+01 | 1.55E+01 | 3.32E+01 |
| 12 | 71432 | Benzene # | 5.40E−03 | 1.80E−02 | 5.40E−03 | 1.77E−02 |
| 13 | 92875 | Benzidine # | 6.80E−07 | 2.24E−06 | 6.80E−07 | 2.24E−06 |
| 14 | 50328 | Benzo[a]pyrene # | 5.50E−04 | 5.50E−02 | 7.00E−06 | 3.60E−03 |
| 15 | 205992 | Benzo[b]fluoranthene # | 1.10E−02 | 4.90E−01 | 6.60E−05 | 1.60E−02 |
| 16 | 100516 | Benzyl alcohol | 1.50E+01 | 4.00E+01 | 1.50E+01 | 3.90E+01 |
| 17 | 100447 | Benzyl chloride # | 1.00E+06 | 1.00E+06 | 1.00E+06 | 1.00E+06 |
| 11 | 56553 | Benz[a]anthracene # | 1.10E−04 | 1.10E−02 | 4.30E−06 | 7.20E−04 |
| 179 | 7440417 | Beryllium # | 1.06E−03 | 2.72E−03 | 3.20E−04 | 8.27E−04 |
| 18 | 111444 | Bis(2-chloroethyl)ether # | 3.68E−04 | 1.92E−02 | 3.60E−04 | 6.48E−04 |
| 19 | 4E+07 | Bis(2-chloroisopropyl)ether # | 1.90E−03 | 7.90E−03 | 1.90E−03 | 7.00E−03 |
| 20 | 117817 | Bis(2-ethylhexyl)phthalate # | 1.80E+00 | 1.80E+02 | 1.10E−03 | 1.20E+01 |
| 21 | 75274 | Bromodichloromethane # | 2.52E−03 | 1.05E−02 | 2.52E−03 | 8.54E−03 |
| 22 | 74839 | Bromomethane | 2.87E+03 | 5.63E+04 | 2.87E+03 | 4.13E+04 |
| 23 | 71363 | Butanol | 6.00E+00 | 1.56E+01 | 6.00E+00 | 1.56E+01 |
| 24 | 85687 | Butyl benzyl phthalate | 1.10E+02 | 1.10E+04 | 6.40E+01 | 4.40E+02 |
| 25 | 88857 | Butyl-4,6-dinitrophenol,2-sec- | 6.40E−02 | 1.92E−01 | 6.40E−02 | 1.92E−01 |
| 180 | 7440439 | Cadmium | 1.18E+01 | 3.05E+01 | 1.10E−01 | 2.40E−01 |
| 26 | 75150 | Carbon disulfide | 6.40E+00 | 2.08E+01 | 6.40E+00 | 1.84E+01 |
| 27 | 56235 | Carbon tetrachloride # | 1.61E−03 | 1.40E−02 | 1.61E−03 | 1.40E−02 |
| 28 | 57749 | Chlordane # | 1.50E−02 | 1.50E+00 | 1.60E−04 | 1.00E−01 |
| 29 | 126998 | Chloro-1,3-butadiene 2-(Chloroprene) | ..... | ..... | ..... | ..... |
| 30 | 106478 | Chloroaniline p- | 1.60E−01 | 4.20E−01 | 1.60E−01 | 4.20E−01 |
| 31 | 108907 | Chlorobenzene | 1.33E+00 | 4.83E+00 | 1.33E+00 | 4.76E+00 |
| 32 | 510156 | Chlorobenzilate # | 7.50E−03 | 1.02E+00 | 5.70E−03 | 5.40E−02 |
| 33 | 124481 | Chlorodibromomethane # | 1.80E−03 | 6.90E−03 | 1.80E−03 | 6.60E−03 |
| 34 | 67663 | Chloroform # | 1.70E−02 | 5.80E−02 | 1.70E−02 | 5.70E−02 |
| 35 | 74873 | Chloromethane | ..... | ..... | ..... | ..... |
| 36 | 95578 | Chlorophenol 2- | 3.20E−01 | 9.00E−01 | 3.20E−01 | 9.00E−01 |
| 181 | 16065381 | Chromium (+3) | 1.32E+05 | 3.40E+05 | 2.37E+04 | 6.12E+04 |
| 182 | 7440473 | Chromium (+6) | 1.88E+01 | 4.85E+01 | 4.76E−01 | 1.24E+00 |
| 37 | 218019 | Chrysene | 2.70E−02 | 2.90E+00 | 1.20E−03 | 1.00E−01 |
| 183 | 7440508 | Copper | 1.32E+05 | 3.40E+05 | 1.08E+03 | 2.79E+03 |
| 38 | 108394 | Cresol m- | 3.20E+00 | 8.80E+00 | 3.20E+00 | 8.40E+00 |
| 39 | 95487 | Cresol o- | 3.20E+00 | 8.80E+00 | 3.20E+00 | 8.40E+00 |
| 40 | 106445 | Cresol p- | 3.20E−01 | 8.80E−01 | 3.20E−01 | 8.40E−01 |
| 41 | 98828 | Cumene | 2.50E+00 | 1.50E+01 | 2.50E+00 | 1.50E+01 |
| 42 | 72548 | DDD # | 2.80E+03 | 1.00E+06 | 2.80E+03 | 9.10E+05 |

TABLE B–1.—COMPARISON OF GROUNDWATER MODELING RESULTS FOR 1000 VS. 10,000 YEARS TIME HORIZON (HQ=1 AND RISK=10–6)—Continued

[Threshold Chemical Concentrations for 1000 and 10,000 years Groundwater Modeling]

| No. | CAS No. | Name of Chemical | 1000 yrs time horizon | | 10,000 yrs time horizon | |
|---|---|---|---|---|---|---|
| | | | Nonwastewater* leach mg/l | Wastewater** leach mg/l | Nonwastewater* leach mg/l | Wastewater** leach mg/l |
| 43 | 72559 | DDE # | 3.30E−02 | 3.30E+00 | 1.70E−04 | 2.30E−01 |
| 44 | 50293 | DDT, p,p′- # | 8.40E+03 | 1.00E+06 | 5.40E−03 | 2.04E+01 |
| 47 | 2303164 | Diallate # | 4.60E−01 | 2.80E+03 | 4.60E−01 | 9.00E+01 |
| 48 | 53703 | Dibenz[a,h]- anthracene # | 2.50E−04 | 2.50E−02 | 6.30E−07 | 1.80E−03 |
| 49 | 96128 | Dibromo-3-chloropropane1,2- # | 1.14E−04 | 7.20E−04 | 1.14E−04 | 6.60E−04 |
| 50 | 95501 | Dichlorobenzene1,2- | 6.10E+00 | 3.00E+01 | 6.10E+00 | 3.00E+01 |
| 51 | 106467 | Dichlorobenzene1,4- # | 1.16E−02 | 6.80E−02 | 1.08E−02 | 5.60E−02 |
| 52 | 91941 | Dichloro- benzidine3,3 # | 7.80E−04 | 5.40E−03 | 7.20E−04 | 4.20E−03 |
| 53 | 75718 | Dichlorodifluoromethane | 1.19E+01 | 3.57E+01 | 1.19E+01 | 3.57E+01 |
| 54 | 75343 | Dichloroethane 1,1- # | 1.71E−03 | 9.90E−03 | 6.00E−05 | 1.60E−04 |
| 55 | 107062 | Dichloroethane1,2- # | 1.62E−03 | 9.00E−03 | 6.00E−05 | 1.60E−04 |
| 56 | 166592 | Dichloroethylene cis-1,2 | 6.40E−01 | 1.72E+00 | 6.40E−01 | 1.68E+00 |
| 57 | 156605 | Dichloroethylene trans-1,2 | 1.12E+00 | 2.94E+00 | 1.12E+00 | 2.94E+00 |
| 58 | 75354 | Dichloroethylene1,1-(Vinylidene chloride:) # | 1.80E−04 | 5.90E−04 | 1.80E−04 | 5.90E−04 |
| 59 | 120832 | Dichlorophenol 2,4- | 1.80E−01 | 6.30E−01 | 1.80E−01 | 6.20E−01 |
| 60 | 94757 | Dichlorophenoxyacetic acid, 2,4- | 6.00E−01 | 1.56E+00 | 6.00E−01 | 1.56E+00 |
| 61 | 78875 | Dichloropropane 1,2- # | 2.30E−03 | 2.60E−02 | 2.30E−03 | 2.30E−02 |
| 62 | 1E+07 | Dichloropropene trans-1,3- # | 1.15E+03 | 9.00E+04 | 1.15E+03 | 9.00E+04 |
| 63 | 542756 | Dichloropropene 1,3-(mixture of isomers) # | 8.50E−04 | 2.80E−03 | 8.50E−04 | 2.80E−03 |
| 64 | 1E+07 | Dichloropropene cis-1,3- # | 1.15E+03 | 9.00E+04 | 1.15E+03 | 9.00E+04 |
| 65 | 60571 | Dieldrin # | 5.40E−01 | 2.90E+04 | 5.40E−01 | 6.80E+02 |
| 66 | 84662 | Diethyl phthalate | 6.00E+01 | 4.50E+02 | 5.40E+01 | 1.86E+02 |
| 67 | 56531 | Diethylstilbestrol # | 1.20E−07 | 9.20E−06 | 6.50E−08 | 4.30E−07 |
| 68 | 60515 | Dimethoate | 7.70E−01 | 2.94E+01 | 7.70E−01 | 2.94E+01 |
| 69 | 119904 | Dimethoxybenzidine 3,3′- # | 1.20E−02 | 3.36E−02 | 1.02E−02 | 3.36E−02 |
| 70 | 131113 | Dimethyl phthalate | 1.04E+03 | 1.1.12E+04 | 3.00E+01 | 7.80E+01 |
| 72 | 119937 | Dimethylbenzidine 3,3′- # | 1.89E−05 | 8.10E−05 | 1.80E−05 | 7.02E−05 |
| 71 | 57976 | Dimethylbenz[a]anthracene 7,12- | 1.20E−03 | 1.40E−01 | 2.80E−06 | 1.30E−02 |
| 73 | 105679 | Dimethylphenol 2,4- | 1.19E+00 | 3.78E+00 | 1.19E+00 | 3.78E+00 |
| 45 | 84742 | Di-n-butyl phthalate | 5.70E+01 | 6.30E+03 | 2.50E+01 | 2.30E+02 |
| 74 | 99650 | Dinitrobenzene 1,3- | 6.40E−03 | 1.68E−02 | 6.40E−03 | 1.68E—02 |
| 75 | 51285 | Dinitrophenol 2,4- | 1.05E−01 | 2.73E−01 | 1.05E−01 | 2.73E−01 |
| 76 | 121142 | Dinitrotoluene 2,4- | 1.12E−01 | 3.01E−01 | 1.12E−01 | 2.94E−01 |
| 77 | 606202 | Dinitrotoluene 2,6- | 6.40E−02 | 1.68E−01 | 6.40E−02 | 1.68E−01 |
| 46 | 117840 | Di-n-octyl phthalate | 3.10E+02 | 5.20E+04 | 1.00E−01 | 1.30E+03 |
| 78 | 123911 | Dioxane 1,4- # | 1.36E−02 | 4.24E−02 | 1.36E−02 | 4.24E−02 |
| 79 | 122394 | Diphenylamine | 2.60E+00 | 1.50E+01 | 2.60E+00 | 1.50E+01 |
| 80 | 298044 | Disulfoton | 1.30E+01 | 5.80E+02 | 1.30E+01 | 4.60E+02 |
| 81 | 115297 | Endosulfan(Endosulfan I and II, mixture) | 1.00E+00 | 1.26E+01 | 9.40E−01 | 6.00E+00 |
| 82 | 72208 | Endrin | 3.20E+01 | 2.70E+05 | 3.20E+00 | 6.60E+03 |
| 83 | 106898 | Epichlorohydrin # | 5.40E+03 | 4.14E+05 | 5.40E+03 | 4.14E+05 |
| 84 | 110805 | Ethoxyethanol 2- | 1.50E+01 | 3.90E+01 | 1.50E+01 | 3.90E+01 |
| 85 | 141786 | Ethyl acetate | 1.14E+02 | 6.00E+02 | 1.14E+02 | 3.90E+02 |
| 86 | 60297 | Ethyl ether | 1.05E+01 | 2.73E+01 | 1.05E+01 | 2.73E+01 |
| 87 | 97632 | Ethyl methacrylate | 6.60E+00 | 6.90E+01 | 6.60E+00 | 2.40E+01 |
| 88 | 62500 | Ethyl methanesulfonate # | 1.17E+04 | 9.30E+05 | 1.17E+04 | 9.30E+05 |
| 89 | 100414 | Ethylbenzene | 8.10E+00 | 3.90E+01 | 8.10E+00 | 3.90E+01 |
| 90 | 106934 | Ethylene dibromide (1,2-Dibromoethane) # | 1.50E−05 | 4.20E−04 | 1.50E−05 | 3.60E−04 |
| 91 | 96457 | Ethylene thiourea # | 1.70E−04 | 5.30E−04 | 1.70E−04 | 5.30E−04 |
| 92 | 206440 | Fluoranthene | 7.50E+00 | 7.80E+02 | 1.70E+00 | 2.70E+01 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 93 | 86737 | Fluorene | 5.00E+00 | 3.90E+02 | 3.40E+00 | 2.20E+01 |
| 94 | 50000 | Formaldehyde | 1.05E+01 | 2.73E+01 | 1.05E+01 | 2.73E+01 |
| 95 | 61486 | Formic acid | 1.05E+02 | 2.73E+02 | 1.05E+02 | 2.73E+02 |
| 96 | 110009 | Furan | 6.00E−02 | 1.60E−01 | 6.00E−02 | 1.56E−01 |
| 97 | 319857 | HCH beta- # | 2.10E−04 | 1.30E−03 | 2.10E−04 | 1.30E−03 |
| 99 | 319846 | HCH alpha- # | 1.10E−01 | 2.10E+01 | 1.10E−01 | 2.10E+01 |
| 98 | 58899 | HCH (Lindane) gamma- # | 6.93E+01 | 1.19E+02 | 6.93E−01 | 1.19E+02 |
| 100 | 76448 | Heptachlor # | 1.00E+06 | 1.00E+06 | 1.00E−06 | 1.00E+06 |
| 101 | 1024573 | Heptachlor epoxide # | 4.50E+01 | 3.15E+04 | 4.50E−01 | 7.83E+02 |
| 102 | 87683 | Hexachloro-1,3-butadene # | 2.30E+02 | 2.10E+00 | 6.90E−03 | 8.10E+02 |
| 103 | 118741 | Hexachlorobenzene # | 3.50E+03 | 3.50E+01 | 1.10E−04 | 2.23E+02 |
| 104 | 77474 | Hexachlorocyclopentadiene | 1.00E+06 | 1.00E+06 | 1.00E−06 | 1.00E+06 |
| 105 | 67721 | Hexachloroethane # | 4.02E−02 | 110E+00 | 3.30E−02 | 2.16E−01 |
| 106 | 70304 | Hexachlorophene | 1.40E−02 | 1.50E+00 | 1.40E−03 | 5.20E−01 |
| 107 | 193395 | Indeno[1,2,3-cd]pyrene | 4.60E−03 | 5.00E−01 | 2.40E−05 | 1.70E−02 |
| 108 | 78831 | Isobutyl alcohol | 1.50E+01 | 3.90E+01 | 1.50E+01 | 3.90E+01 |
| 109 | 78591 | Isophorone # | 1.62E−01 | 5.49E−01 | 1.62E−01 | 5.31E−01 |
| 110 | 143500 | Kepone # | 5.80E−05 | 4.80E−03 | 3.20E−05 | 2.20E−04 |
| 184 | 7439921 | Lead | 1.32E+05 | 3.40E+05 | 1.16E+01 | 3.00E+01 |
| 185 | 7439976 | Mercury | 1.81E+01 | 4.67E+01 | 1.38E−01 | 2.96E−01 |
| 111 | 126987 | Methacrylonitrile | 6.00E−03 | 1.64E−02 | 6.00E−03 | 1.56E−02 |
| 112 | 67561 | Methanol | 3.00E+01 | 7.80E+01 | 3.00E+01 | 7.80E+01 |
| 113 | 72435 | Methoxychlor | 1.00E+06 | 1.00E+06 | 1.00E+06 | 1.00E+06 |
| 114 | 78933 | Methyl ethyl ketone | 3.00E+01 | 7.80E+01 | 3.00E+01 | 7.80E+01 |
| 115 | 108101 | Methyl isobutyl ketone | 3.00E+00 | 8.00E+00 | 3.00E+00 | 7.80E+00 |
| 116 | 80626 | Methyl methacrylate | 8.10E+00 | 8.40E+01 | 8.10E+00 | 2.82E+01 |
| 117 | 298000 | Methyl parathion | 2.34E+01 | 9.90E+02 | 2.34E+01 | 7.80E+01 |
| 118 | 56495 | Methylcholanthrene 3- # | 1.70E−03 | 1.70E−01 | 1.40E−06 | 1.20E−02 |
| 119 | 74953 | Methylene bromide | 6.80E−01 | 2.32E+00 | 1.90E−01 | 2.32E+00 |
| 120 | 75092 | Methylene Chloride # | 6.80E−01 | 2.36E+00 | 1.50E−02 | 3.90E−02 |
| 186 | 7439987 | Molybdenum | ..... | ..... | ..... | ..... |
| 129 | 91203 | Naphthalene | 2.70E+00 | 1.40E+01 | 2.70E+00 | 1.40E+01 |
| 187 | 7440020 | Nickel | 9.95E+00 | 2.56E+01 | 4.89E+00 | 1.05E+01 |
| 130 | 98953 | Nitrobenzene | 3.20E−02 | 8.40E−02 | 3.20E−02 | 8.40E−02 |
| 131 | 79469 | Nitropropane 2- | ..... | ..... | ..... | ..... |
| 123 | 55185 | N–Nitrosodiethylamine # | 1.02E−06 | 3.18E−06 | 1.02E−06 | 3.18E−06 |
| 124 | 62759 | N–Nitrosodimethylamine # | 3.40E−06 | 1.06E−05 | 3.40E−06 | 1.06E−05 |
| 121 | 924163 | N–Nitroso-di-n-butylamine # | 3.60E−05 | 1.32E−04 | 3.60E−05 | 1.22E−04 |
| 122 | 621647 | N–Nitroso-di-n-propylamine # | 1.70E−05 | 5.40E−05 | 1.70E−05 | 5.30E−05 |
| 125 | 86306 | N–Nitrosodiphenylamine # | 4.80E–02 | 2.60E−01 | 4.60E−02 | 2.00E−01 |
| 126 | 1E+07 | N–Nitrosomethylethylamine # | 6.80E−06 | 2.16E−05 | 6.80E−06 | 2.12E−05 |
| 127 | 100754 | N–Nitrosopiperidine # | 3.40E−06 | 1.06E−05 | 3.40E−06 | 1.06E−05 |
| 128 | 930552 | N–Nitrosopyrrolidine # | 6.80E−05 | 2.12E−04 | 6.80E−05 | 2.12E−04 |
| 132 | 152169 | Octamethyl pyrophosphoramide | 1.05E−01 | 2.80E−01 | 1.05E−01 | 2.73E−01 |
| 133 | 56382 | Parathion (ethyl) | 1.16E+04 | 5.60E+05 | 1.16E+04 | 4.40E+05 |
| 134 | 608935 | Pentachlorobenzene | 1.44E+01 | 1.56E+03 | 5.70E−01 | 5.10E+00 |
| 135 | 82688 | Pentachloronitrobenzene (PCNB) # | 2.37E−02 | 2.19E+00 | 5.40E−03 | 8.10E−02 |
| 136 | 87865 | Pentachlorophenol # | 4.20E−04 | 2.50E−03 | 4.10E−04 | 2.00E−03 |
| 137 | 108952 | Phenol | 3.20E+01 | 8.40E+01 | 3.20E+01 | 8.40E−01 |
| 138 | 62384 | Phenyl mercuric acetate | 4.50E−03 | 1.17E−02 | 4.50E−03 | 1.17E−02 |
| 139 | 108452 | Phenylenediamine, 1,3- | 3.00E−01 | 7.80E−01 | 3.00E−01 | 7.80E−01 |
| 140 | 298022 | Phorate | 1.00E+06 | 1.00E+06 | 1.00E+06 | 1.00E+06 |
| 141 | 1336363 | Polychlorinated biphenyls (Aroclors) # | 9.10E−04 | 8.80E−02 | 4.80E−06 | 6.10E−03 |
| 142 | 2E+07 | Pronamide | 5.70E+00 | 2.19E+01 | 5.70E+00 | 2.13E+01 |
| 143 | 129000 | Pyrene | 1.40E+01 | 1.50E+03 | 1.70E+00 | 5.40E+01 |
| 144 | 110861 | Pyridine | 6.00E−02 | 1.56E−01 | 6.00E−02 | 1.56E−01 |
| 145 | 94597 | Safrole # | 9.50E−04 | 3.80E−03 | 9.50E−04 | 3.50E−03 |
| 188 | 7782492 | Selenium | 1.38E+00 | 3.57E+00 | 3.57E−01 | 9.27E−01 |
| 189 | 7440224 | Silver | 1.32E+00 | 3.40E+00 | 8.90E−02 | 1.91E−01 |

TABLE B–1.—COMPARISON OF GROUNDWATER MODELING RESULTS FOR 1000 VS. 10,000 YEARS TIME HORIZON (HQ=1 AND RISK=10–6)—Continued

[Threshold Chemical Concentrations for 1000 and 10,000 years Groundwater Modeling]

| No. | CAS No. | Name of Chemical | 1000 yrs time horizon | | 10,000 yrs time horizon | |
|---|---|---|---|---|---|---|
| | | | Nonwastewater* leach mg/l | Wastewater** leach mg/l | Nonwastewater* leach mg/l | Wastewater** leach mg/l |
| 146 | 57249 | Strychnine and salts | 1.60E−02 | 4.50E−02 | 1.60E−02 | 4.50E−02 |
| 147 | 100425 | Styrene | 1.54E+01 | 6.51E+01 | 1.54E+01 | 6.37E+01 |
| 148 | 1746016 | TCDDioxin 2,3,7,8, # | 2.70E−08 | 2.70E−06 | 1.80E−10 | 1.90E−07 |
| 149 | 95943 | Tetrachlorobenzene 1,2,4,5- # | 6.00E−02 | 5.70E+00 | 3.20E−02 | 2.30E−01150 |
| | 630206 | Tetrachloroethane 1,1,1,2- # | 7.80E−03 | 7.50E−02 | 7.80E−03 | 7.50E−02 |
| 151 | 79345 | Tetrachloroethane 1,1,2,2- # | 9.60E−03 | 2.92E−01 | 8.00E−03 | 2.40E−02 |
| 152 | 127184 | Tetrachloroethylene | 6.80E−01 | 2.08E+00 | 6.80E−01 | 2.04E+00 |
| 153 | 58902 | Tetrachlorophenol 2,3,4,6- | 5.80E−01 | 1.90E+00 | 5.80E−01 | 1.90E+00 |
| 154 | 3689245 | Tetraethyl dithiopyrophosphate | 1.00E+06 | 1.00E+06 | 1.00E+06 | 1.00+06 |
| 190 | 7440280 | Thallium | 3.96E+02 | 1.02E+03 | 1.92E−02 | 5.00E−02 |
| 155 | 108883 | Toluene | 1.26E+01 | 4.20E+01 | 1.26E+01 | 4.13E+01 |
| 156 | 95807 | Toluenediamine 2,4- # | 5.10E−05 | 1.59E−04 | 5.10E−05 | 1.59E−04 |
| 158 | 95534 | Toluidine o- # | 6.80E−04 | 2.24E−03 | 6.80E−04 | 2.24E−03 |
| 157 | 106490 | Toluidine p- # | 6.80E−04 | 2.24E−03 | 2.24E−03 | 2.24E−03 |
| 159 | 8001352 | Toxaphene (chlorinated camphenes) # | 1.10E−01 | 6.70E+02 | 1.10E−01 | 2.20E+01 |
| 160 | 75252 | Tribromomethane # | 1.80E−02 | 6.80E−02 | 1.80E−02 | 6.40E−02 |
| 161 | 76131 | Trichloro-1,2,2-trifluoro- ethane 1,1,2- | 2.40E+03 | 1.40E04 | 2.40E+03 | 1.10E+04 |
| 162 | 120821 | Trichlorobenzene 1,2,4- | 2.10E+00 | 1.70E+02 | 1.30E+00 | 9.30E+00 |
| 163 | 71556 | Trichloroethane 1,1,1- | 5.00E+00 | 1.20E+02 | 4.60E+00 | 1.20E+02 |
| 164 | 79005 | Trichloroethane 1,1,2- # | 1.80E−03 | 7.40E−03 | 1.80E−03 | 7.00E−03 |
| 165 | 79016 | Trichloroethylene (1,1,2-Trichloroethylene) # | 1.44E−02 | 5.28E−02 | 1.28E−02 | 3.84E−02 |
| 166 | 75694 | Trichlorofluoromethane | 1.60E+01 | 4.90+01 | 1.60E+01 | 4.80E+01 |
| 168 | 95954 | Trichlorophenol 2,4,5- | 4.20E+00 | 2.00E+01 | 4.20E+00 | 4.40E+01 |
| 167 | 88062 | Trichlorophenol 2,4,6- # | 1.52E−02 | 5.76E−02 | 1.52E−02 | 5.36E−02 |
| 170 | 93765 | Trichlorophenoxyacetic acid 2,4,5- | 6.40E−01 | 1.68E+00 | 6.40E−01 | 1.68E+00 |
| 169 | 93721 | Trichlorophenoxypropionic acid | 4.80E−00 | 1.32E+00 | 4.80E−01 | 1.26E+00 |
| 171 | 96184 | Trichloropropane 1,2,3- | 3.40E−01 | 2.20E+00 | 3.40E−01 | 1.10E+00 |
| 172 | 99354 | Trinitrobenzene (1,3,5-Trinitrobenzene) sym- | 3.00E−03 | 8.00E−03 | 3.00E−03 | 7.80E−03 |
| 173 | 126727 | Tris (2,3-dibromoprophyl) phosphate B19 # | 9.90E−05 | 2.52E−03 | 9.90E−05 | 2.52E−03 |
| 191 | 7440622 | Vanadium | 8.82E+00 | 2.27E+01 | 3.71E+00 | 9.58E+00 |
| 174 | 75014 | Vinyl chloride # | 6.80E−05 | 2.16E−04 | 6.00E−05 | 1.56E−04 |
| 175 | 1330297 | Xylenes (total) | 1.47E+02 | 9.10E+02 | 1.47E+02 | 8.60E+02 |
| 192 | 7440666 | Zinc | 1.08E+02 | 2.79E+02 | 3.84E+01 | 9.90E+01 |

For Trichloroethane 1,1,1 the MCL, 0.20 mg/L was used in conic. calculation.

*Represents the lowest results from either landfills, waste piles, or land application units waste management scenarios.

**Represents results from surface impoundments.

# Carcinogen.

Appendix C

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 83–32–9 | Acenaphthene | 49.5 | 31.2 | | 0.0018 | 9480 | | 0.0742 | 4.9 | | 0.0018 |
| 208–96–8 | Acenaphthylene | | | 0.00285 | 0.02 | | 3.9 | 0.7 | | 0.0000661 | 0.02 |
| 67–64–1 | Acetone | 232000 | 15.6 | | 0.2 | 17400 | | 0.027 | 6 | | 0.2 |
| 75–05–8 | Acetonitrile | 6.58 | 0.78 | | 0.015 | 923 | | 0.014 | 0.3 | | 0.015 |
| 98–86–2 | Acetophenone | 5960 | 16.8 | | 0.00158 | 1210 | | 0.03 | 6.4 | | 0.00158 |
| 75–36–5 | Acetyl chloride | | | 0.023 | | | 30.85 | | | 0.015 | |
| 591–08–2 | Acetyl-2-thiourea,1- | | | 0.11775 | 1 | | 1.66 | 70 | | 6.4 | 1 |
| 53–96–3 | Acetylaminofluorene, 2- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 107–02–8 | Acrolein | 0.00248 | | | 0.013 | 2.63 | | 0.075 | | | 0.013 |
| 79–06–1 | Acrylamide | 3.67 | 0.00026 | | 0.01 | 0.00436 | | 0.1 | 0.000038 | | 0.01 |
| 107–13–1 | Acrylonitrile | 0.00428 | 0.0011 | | 0.008 | 0.961 | | 0.7 | 0.00034 | | 0.008 |
| 1402–68–2 | Aflatoxins | | | 14.7 | | | 6900 | | | 10.5 | |
| 116–06–3 | Aldicarb | | | 0.0069415 | 0.05 | | 0.194 | 1 | | 0.48 | 0.05 |
| 309–00–2 | Aldrin | 5.640E–07 | 0.00469 | | 0.000034 | 0.000444 | | 0.0006 | 3.670E–06 | | 0.000034 |
| 107–18–6 | Allyl alcohol | | | 39 | | | 36700 | | | 15 | |
| 107–05–1 | Allyl chloride | 0.0742 | | | 0.002 | 258 | | 0.002 | | | 0.002 |
| 92–67–1 | Aminobiphenyl, 4- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 2763–96–4 | Aminomethyl-3-isoxazolol, 5- | | | 0.159 | | | 19.955 | | | 0.105 | |
| 504–24–5 | Aminopyridine, 4- | | | 0.02762 | | | 3.28 | | | 0.00884 | |
| 61–82–5 | Amitrole | | | 0.0069415 | | | 0.194 | | | 0.48 | |
| 62–53–3 | Aniline | 0.444 | 0.053 | | 0.00023 | 4.21 | | 0.0132 | 0.017 | | 0.00023 |
| 120–12–7 | Anthracene | | | 0.00285 | 0.007 | | 3.9 | 0.5 | | 0.0000661 | 0.007 |
| 7440–36–0 | Antimony | 8210 | 0.136 | | 0.0008 | 8.72 | | 2 | 0.053 | | 0.0008 |
| 140–57–8 | Aramite | | | 14.7 | 0.02 | | 6900 | 1 | | 10.5 | 0.02 |
| 7440–38–2 | Arsenic | 40.5 | 0.000384 | | 0.0005 | 0.17 | | 0.3031 | 0.000148 | | 0.0005 |
| 2465–27–2 | Auramine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 115–02–6 | Azaserine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7440–39–3 | Barium | | 33.2 | | 0.001 | 2080 | | 0.2 | 15.5 | | 0.001 |
| 71–43–2 | Benzene | 0.0209 | 0.0177 | | 0.00004 | 109 | | 0.0001 | 0.0054 | | 0.00004 |
| 92–87–5 | Benzidine | 0.00015 | 2.240E–06 | | 0.0025 | 0.0000298 | | 0.042 | 6.800E–07 | | 0.0025 |
| 106–51–4 | Benzoquinone, p- | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 98–07–7 | Benzotrichloride | | | 0.081 | | | 142 | 0.004 | | 0.0317 | |
| 50–32–8 | Benzo(a)pyrene | 0.00231 | 0.00364 | | 0.000023 | 0.227 | | 0.0621 | 7.040E–06 | | 0.000023 |
| 205–99–2 | Benzo(b)fluoranthene | 0.000805 | 0.0164 | | 0.000018 | 3.7 | | 0.0699 | 0.0000661 | | 0.000018 |
| 205–82–3 | Benzo(j)fluoranthene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.0000661 | 0.0002 |
| 207–08–9 | Benzo(k)fluoranthene | | | 0.00285 | 0.0002 | | 3.9 | 0.7 | | 0.0000661 | 0.0002 |
| 191–24–2 | Benzo[g,h,i,]perylene | | | 0.00285 | 0.0008 | | 3.9 | 0.7 | | 0.0000661 | 0.0008 |
| 100–51–6 | Benzyl alcohol | 22500 | 39 | | 0.00074 | 2740 | | 0.034 | 15 | | 0.00074 |
| 100–44–7 | Benzyl chloride | 1.13 | 3.9 | | 5.000E–06 | 37.5 | | 0.00276 | 15 | | 5.000E–06 |
| 56–55–3 | Benz(a)anthracene | 0.0138 | 0.000717 | | 0.000013 | 0.1 | | 0.0826 | 4.300E–06 | | 0.000013 |
| 225–51–4 | Benz[c]acridine | | | 0.00285 | 0.0005 | | 3.9 | 0.03 | | 0.0000661 | 0.0005 |
| 7440–41–7 | Beryllium | 10.1 | 0.000827 | | 0.00003 | 0.0591 | | 0.1 | 0.00032 | | 0.0003 |
| 39638–32–9 | Bis (2-chloroisopropyl) ether | 0.569 | 0.007 | | 0.00145 | 0.944 | | 0.0586 | 0.0019 | | 0.00145 |
| 111–44–4 | Bis(2-chlorethyl)ether | 0.00141 | 0.000648 | | 0.0003 | 0.115 | | 0.0651 | 0.00036 | | 0.0003 |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | 0.00044 | 12.4 | | 0.00027 | 225 | | 0.143 | 0.00112 | | 0.00027 |
| 542–88–1 | Bis(chloromethyl)either | | | 0.023 | | | 30.85 | | | 0.015 | |
| 598–31–2 | Bromoacetone | | | 0.023 | 0.005 | | 30.85 | 0.03 | | 0.015 | 0.005 |
| 75–27–4 | Bromodichloromethane | 33.3 | 0.00854 | | 0.00008 | 19 | | 0.0012 | 0.00252 | | 0.00008 |
| 75–25–2 | Bromoform (Tribromomethane). | 0.178 | 0.064 | | 0.0002 | 173 | | 0.02 | 0.018 | | 0.0002 |
| 101–55–3 | Bromophenyl phenyl ether, 4- | | | 0.023 | 0.01 | | 30.85 | 0.7 | | 0.015 | 0.01 |
| 357–57–3 | Brucine | | | 0.159 | 20 | | 19.955 | | | 0.105 | 20 |
| 71–36–3 | Butanol | 38600 | 15.6 | | 0.014 | 18200 | | 0.23 | 6 | | 0.014 |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2- sec- (Dinoseb). | 15.4 | 0.192 | | 0.00029 | 772 | | 0.042 | 0.064 | | 0.00029 |
| 85–68–7 | Butylbenzylphthalate | 235 | 437 | | 0.000042 | 87 | | 0.049 | 64 | | 0.000042 |
| 7440–43–9 | Cadmium | 1600 | 0.24 | | 0.00005 | 14.1 | | 0.2 | 0.11 | | 0.00005 |
| 86–74–8 | Carbazole | | | 0.159 | | | 19.955 | | | 0.105 | |
| 75–15–0 | Carbon disulfide | 0.738 | 18.4 | | 0.00121 | 330 | | 0.0002 | 6.4 | | 0.00121 |
| 353–50–4 | Carbon oxyfluoride | | | 0.023 | | | 30.85 | | | 0.015 | |
| 56–23–5 | Carbon tetrachloride | 0.0115 | 0.014 | | 0.00021 | 8.54 | | 0.02 | 0.00161 | | 0.00021 |
| 75–87–6 | Chloral | | | 0.081 | | | 142 | | | 0.0317 | |
| 305–03–3 | Chlorambucil | | | 0.081 | | | 142 | | | 0.0317 | |
| 57–74–9 | Chlordane | 0.000014 | 0.0998 | | 0.00004 | 0.00976 | | 0.0015 | 0.000163 | | 0.00004 |
| 494–03–1 | Chlomaphazin | | | 0.081 | | | 142 | | | 0.0317 | |
| 126–99–8 | Chloro-1, 3-butadiene, 2- (Chloroprene). | 0.515 | | | 0.002 | 288 | | 0.00099 | | | 0.002 |
| 107–20–0 | Chloroacetaldehyde | | | 0.023 | | | 30.85 | | | 0.015 | |
| 106–47–8 | Chloroaniline, p- | 517 | 0.42 | | 0.00066 | 142 | | 0.0592 | 0.16 | | 0.00066 |
| 108–90–7 | Chlorobenzene | 1.5 | 4.76 | | 0.00004 | 2470 | | 0.0002 | 1.33 | | 0.00004 |
| 510–15–6 | Chlorobenzilate | 0.0731 | 0.054 | | 0.00504 | 6.82 | | 0.069 | 0.0057 | | 0.00504 |
| 124–48–1 | Chlorodibromomethane | 16.3 | 0.0066 | | 0.00007 | 27.5 | | 0.00085 | 0.0018 | | 0.00007 |
| 75–00–3 | Chloroethane (ethyl chloride) | | | 0.023 | 0.005 | | 30.85 | 0.005 | | 0.015 | 0.005 |
| 110–75–8 | Chloroethyl vinyl ether, 2- | | | 0.081 | | | 142 | 0.005 | | 0.0317 | |
| 67–66–3 | Chloroform | 0.00759 | 0.057 | | 0.00003 | 6.74 | | 0.002 | 0.017 | | 0.00003 |

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 59–50–7 | Chloro-m-cresol, p- | | | 0.081 | 0.02 | | 142 | 1 | | 0.0317 | 0.02 |
| 107–30–2 | Chloromethyl methyl ether | | | 0.023 | | | 30.85 | 0.005 | | 0.015 | |
| 91–58–7 | Chloronaphthalene, 2- | | | 0.081 | 0.01 | | 142 | 0.7 | | 0.0317 | 0.01 |
| 95–57–8 | Chlorophenol, 2- | 134 | 0.9 | | 0.00058 | 104 | | 0.0758 | 0.32 | | 0.00058 |
| 7005–72–3 | Clorophenyl phenyl ether, 4- | | | 0.023 | 0.01 | | 30.85 | 0.7 | | 0.015 | 0.01 |
| 5344–82–1 | Chlorophenyl thiourea, 1-o- | | | 0.023 | | | 30.85 | | | 0.015 | |
| 542–76–7 | Chloropropionitrile, 3- | | | 0.081 | 0.1 | | 142 | 0.5 | | 0.0317 | 0.1 |
| 7440–47–3 | Chromium | 1300 | 1.24 | | 0.002 | 9.76 | | 0.003 | 0.476 | | 0.002 |
| 218–01–9 | Chrysene | 1.32 | 0.1 | | 0.00015 | 34.6 | | 0.084 | 0.00119 | | 0.00015 |
| 6358–53–8 | Citrus red No. 2 | | | 14.7 | | | 6900 | | | 10.5 | |
| 7440–48–4 | Cobalt | | | 1.24 | 0.5 | | 8.72 | 5 | | 0.4165 | 0.5 |
| 7440–50–8 | Copper | 674 | 2790 | | 0.0007 | 5.91 | | 0.5 | 1080 | | 0.0007 |
| 108–39–4 | Cresol, m- | 615 | 8.4 | | 0.00046 | 21500 | | 0.035 | 3.2 | | 0.00046 |
| 95–48–7 | Cresol, o- | 656 | 8.4 | | 0.00055 | 27400 | | 0.027 | 3.2 | | 0.00055 |
| 106–44–5 | Cresol, p- | 63.5 | 0.84 | | 0.00046 | 2550 | | 0.035 | 0.32 | | 0.00046 |
| 4170–30–3 | Crotonaldehyde | | | 7.8 | 0.06 | | 1210 | 4 | | 6.2 | 0.06 |
| 57–12–5 | Cyanide | | | 0.159 | 0.2 | | 19.955 | 0.2 | | 0.105 | 0.2 |
| 14901–08–7 | Cycasin | | | 14.7 | | | 6900 | | | 10.5 | |
| 108–94–1 | Cyclohexanone | | | 7.8 | 10 | | 1210 | 10 | | 6.2 | 10 |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2-. | | | 0.0252 | 0.1 | | 2.991 | 7 | | 0.0083 | 0.1 |
| 50–18–0 | Cyclophosphamide | | | 0.159 | | | 19.955 | | | 0.105 | |
| 20830–81–3 | Daunomycin | | | 14.7 | | | 6900 | | | 10.5 | |
| 72–54–8 | DDD | 0.000126 | 913000 | | 0.00005 | 0.00648 | | 0.0012 | 2800 | | 0.00005 |
| 53–19–0 | DDD (o,p[1]) | | | 0.0069415 | | | 0.194 | | | 0.48 | |
| 72–55–9 | DDE | 9.110E–06 | 0.228 | | 0.000058 | 0.000936 | | 0.0006 | 0.0000623 | | 0.000058 |
| 3424–82–6 | DDE (o,p[1]) | | | 0.0069415 | | | 0.194 | | | 0.48 | |
| 50–29–3 | DDT | 0.0000181 | 20.4 | | 0.000081 | 0.00315 | | 0.0006 | 0.0054 | | 0.000081 |
| 789–02–6 | DDT (o.p[1]) | | | 0.0069415 | | | 0.194 | | | 0.48 | |
| 2303–16–4 | Diallate | 0.26 | 90.1 | | 0.00063 | 1.26 | | 0.023 | 0.46 | | 0.00063 |
| 132–64–9 | Dibenzofuran | | | 8.4 | 0.01 | | 27400 | 0.7 | | 3.2 | 0.01 |
| 192–65–4 | Dibenzo[a,e]pyrene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.0000661 | 0.001 |
| 189–64–0 | Dibenzo[a,h]pyrene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.0000661 | 0.0002 |
| 189–55–9 | Dibenzo[a,i]pyrene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.0000661 | 0.0002 |
| 194–59–2 | Dibenzo[c,g]carbazole, 7H- | | | 0.00285 | 0.01 | | 3.9 | 0.7 | | 0.0000661 | 0.01 |
| 226–36–8 | Dibenz(a,h)acridine | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.0000661 | 0.0002 |
| 53–70–3 | Dibenz(a,h)anthracene | 8.440E–06 | 0.00176 | | 0.00003 | 0.000155 | | 0.084 | 6.340E–07 | | 0.00003 |
| 224–42–0 | Dibenz[a,j]acridine | | | 0.00285 | 0.001 | | 3.9 | 0.7 | | 0.0000661 | 0.001 |
| 96–12–8 | Dibromo-3-chloropropane, 1,2-. | 0.0723 | 0.00066 | | 0.00026 | 0.663 | | 0.0003 | 0.000114 | | 0.00026 |
| 764–41–0 | Dichloro-2-butene, 1,4- | | | 0.023 | 0.005 | | 30.85 | 0.005 | | 0.015 | 0.005 |
| 110–57–6 | Dichloro-2-butene, trans-1,4- | | | 0.023 | 0.005 | | 30.85 | 0.005 | | 0.015 | 0.005 |
| 96–23–1 | Dichloro-2-propanol, 1,3- | | | 0.081 | 0.01 | | 142 | 0.05 | | 0.0317 | 0.01 |
| 95–50–1 | Dichlorobenzene, 1,2- | 15.4 | 29.5 | | 0.00003 | 50000 | | 0.0002 | 6.1 | | 0.00003 |
| 541–73–1 | Dichlorobenzene, 1,3- | | | 0.023 | 0.005 | | 30.85 | 0.7 | | 0.015 | 0.005 |
| 106–46–7 | Dichlorobenzene, 1,4- | 3.01 | 0.056 | | 0.00004 | 63.9 | | 0.0001 | 0.0108 | | 0.00004 |
| 91–94–1 | Dichlorobenzidine, 3,3[1]- | 0.0037 | 0.0042 | | 0.0024 | 0.0524 | | 0.116 | 0.00072 | | 0.0024 |
| 75–71–8 | Dichlorodifluoromethane | 14.7 | 35.7 | | 0.0001 | 8070 | | 0.0052 | 11.9 | | 0.0001 |
| 75–34–3 | Dichloroethane, 1,1- | 37.4 | 0.00016 | | 0.00004 | 24.2 | | 0.0002 | 0.00006 | | 0.00004 |
| 107–06–2 | Dichloroethane, 1,2- | 0.00698 | 0.00016 | | 0.00006 | 6.1 | | 0.0001 | 0.00006 | | 0.00006 |
| 75–35–4 | Dichloroethylene, 1,1- | 0.00345 | 0.00059 | | 0.00012 | 2.55 | | 0.0014 | 0.00018 | | 0.00012 |
| 156–59–2 | Dichloroethylene, cis-1,2- | 30000 | 1.68 | | 0.00012 | 5400 | | 0.02 | 0.64 | | 0.00012 |
| 156–60–5 | Dichloroethylene, trans-1,2- | 44200 | 2.94 | | 0.00006 | 13800 | | 0.0006 | 1.12 | | 0.00006 |
| 111–91–1 | Dichloromethoxy ethane | | | 0.023 | 0.01 | | 30.85 | 0.7 | | 0.015 | 0.01 |
| 98–87–3 | Dichloromethylbenzene (benzal chloride). | | | 0.023 | 0.005 | | 30.85 | 0.3 | | 0.015 | 0.005 |
| 120–83–2 | Dichlorophenol, 2,4- | 6.94 | 0.62 | | 0.00041 | 769 | | 0.0788 | 0.18 | | 0.00041 |
| 87–65–0 | Dichlorophenol, 2,6- | | | 0.023 | 0.01 | | 30.85 | 0.7 | | 0.015 | 0.01 |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D). | 58.5 | 1.56 | | 0.00029 | 3140 | | 0.00011 | 0.6 | | 0.00029 |
| 78–87–5 | Dichloropropane, 1,2- | 0.303 | 0.023 | | 0.00004 | 16.9 | | 0.0001 | 0.0023 | | 0.00004 |
| 542–75–6 | Dichloropropene, 1,3- | 0.00476 | 0.0028 | | 0.0009 | 32.4 | | 0.0003 | 0.00085 | | 0.0009 |
| 10061–01–5 | Dichloropropene, cis-1,3- | 0.00485 | 90000 | | 0.00069 | 2.64 | | 0.0003 | 1150 | | 0.00069 |
| 10061–02–6 | Dichloropropene, trans-1,3- | 0.0049 | 90000 | | 0.00094 | 2.67 | | 0.0003 | 1150 | | 0.00094 |
| 60–57–1 | Dieldrin | 0.000059 | 682 | | 0.000044 | 0.00176 | | 0.0006 | 0.54 | | 0.000044 |
| 1464–53–5 | Diepoxybutane, 1,2,3,4-(2,2[1]-bioxirane). | | | 14.7 | 0.005 | | 6900 | 0.005 | | 10.5 | 0.005 |
| 84–66–2 | Diethyl phthalate | 3560 | 186 | | 0.00025 | 4490 | | 0.022 | 54 | | 0.00025 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–53–1 | Diethylstibestrol | 7.720E–07 | 4.290E–07 | | 0.0078 | 2.470E–11 | | 1 | 6.500E–08 | | 0.0078 |
| 94–58–6 | Dihydrosafrole | | | 14.7 | 0.05 | | 6900 | 3 | | 10.5 | 0.05 |
| 60–51–5 | Dimethoate | 38.1 | 29.4 | | 0.00029 | 1.6 | | 0.0691 | 0.77 | | 0.00029 |
| 131–11–3 | Dimethyl phthalate | 200000 | 78 | | 0.00064 | 3 | | 0.013 | 30 | | 0.00064 |
| 77–78–1 | Dimethyl sulfate | | | 0.11775 | | | 1.66 | | | 6.4 | |

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 60–11–7 | Dimethylaminoazobenzene, p-. | | | 0.02762 | 0.01 | | 3.28 | 0.7 | | 0.00884 | 0.01 |
| 119–93–7 | Dimethylbenzidine, 3,3[1]- | 0.000625 | 0.0000702 | | 0.0033 | 0.00062 | | 0.7 | 0.000018 | | 0.0033 |
| 57–97–6 | Dimethylbenz(a)anthracene, 7,12-. | 3.820E–06 | 0.00464 | | 0.00037 | 0.00263 | | 0.039 | 2.760E–06 | | 0.00037 |
| 79–44–7 | Dimethylcarbamoyl chloride | | | 0.081 | | | 142 | | | 0.0317 | |
| 122–09–8 | Dimethylphenethylamine, alpha, alpha-. | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 105–67–9 | Dimethylphenol, 2,4- | 151 | 3.78 | | 0.00047 | 11300 | | 0.052 | 1.19 | | 0.00047 |
| 119–90–4 | Dimethyoxybenzidine, 3,3[1]- | 1.78 | 0.0336 | | 0.0077 | 0.236 | | 7 | 0.0102 | | 0.0077 |
| 84–74–2 | Di-n-butyl phthalate | 883 | 227 | | 0.00033 | 90000 | | 0.249 | 25.2 | | 0.00033 |
| 99–65–0 | Dinitrobenzene, l,3– | 1.28 | 0.0168 | | 0.00011 | 5.54 | | 0.25 | 0.0064 | | 0.00011 |
| 100–25–4 | Dinitrobenzene, l,4– | | | 0.0252 | 0.04 | | 2.991 | 3 | | 0.0083 | 0.04 |
| 534–52–1 | Dinitro-o-cresol, 4,6– | | | 0.0252 | 0.05 | | 2.991 | 3 | | 0.0083 | 0.05 |
| 51–28–5 | Dinitrophenol, 2,4– | 50.2 | 0.273 | | 0.00042 | 56.1 | | 0.03 | 0.105 | | 0.00042 |
| 121–14–2 | Dinitrotoluene, 2,4– | 10.7 | 0.294 | | 0.00002 | 213 | | 0.26 | 0.112 | | 0.00002 |
| 606–20–2 | Dinitrotoluene, 2,6– | 12.9 | 0.168 | | 0.00031 | 86.3 | | 0.25 | 0.064 | | 0.00031 |
| 117–84–0 | Di-n-octyl phthalate | 0.002 | 1260 | | 0.000042 | 4480 | | 0.139 | 0.1 | | 0.000042 |
| 123–91–1 | Dioxane, 1,4– | 558 | 0.0424 | | 0.012 | 13.2 | | 0.0005 | 0.0136 | | 0.012 |
| 122–39–4 | Diphenylamine | 29 | 14.7 | | 0.00151 | 11800 | | 0.041 | 2.6 | | 0.00151 |
| 122–66–7 | Diphenylhydrazine, 1,2– | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 298–04–4 | Disulfoton | 0.0131 | 458 | | 0.00007 | 42.6 | | 0.0035 | 13 | | 0.00007 |
| 541–53–7 | Dithiobiuret | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 115–29–7 | Endosulfan | 6.62 | 6 | | 0.00004 | 73.1 | | 0.0005 | 0.94 | | 0.00004 |
| 959–98–8 | Endosulfan I | | | 0.0069415 | 0.0003 | | 0.194 | 0.009 | | 0.48 | 0.0003 |
| 332–13–65–9. | Endosulfan II | | | 0.0069415 | 0.0004 | | 0.194 | 0.003 | | 0.48 | 0.0004 |
| 1031–07–8 | Endosulfan sulfate | | | 0.0069415 | 0.0004 | | 0.194 | 0.04 | | 0.48 | 0.0004 |
| 145–73–3 | Endothall | | | 0.0069415 | 0.1 | | 0.194 | | | 0.48 | 0.1 |
| 72–20–8 | Endrin | 0.0729 | 6550 | | 0.00039 | 026 | | 0.0036 | 32 | | 0.00039 |
| 7421–93–4 | Endrin aldehyde | | | 0.0069415 | 0.0005 | | 0.194 | 0.02 | | 0.48 | 0.0005 |
| 53494–70–5 | Endrin ketone | | | 0.0069415 | 0.0005 | | 0.194 | 0.03 | | 0.48 | 0.0005 |
| 106–89–8 | Epichlorohydrin | 0.335 | 414000 | | 0.06519 | 44 | | 0.0714 | 5400 | | 0.06519 |
| 51–43–4 | Epinephrine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 110–80–5 | Ethoxyethanol, 2– | 14.7 | 39 | | 1.16 | 6900 | | 2.03 | 15 | | 1.16 |
| 141–78–6 | Ethyl acetate | | 390 | | 0.009 | 272000 | | 0.18 | 114 | | 0.0009 |
| 51–79–6 | Ethyl carbamate | | | 14.7 | 0.05 | | 6900 | 3 | | 10.5 | 0.05 |
| 107–12–0 | Ethyl cyanide (propionitrile) | | | 0.159 | 0.1 | | 19.955 | 0.1 | | 0.105 | 0.1 |
| 60–29–7 | Ethyl ether | | 27.3 | | 0.00153 | 41200 | | 0.00319 | 10.5 | | 0.00153 |
| 97–63–2 | Ethyl methacrylate | 25500 | 24 | | 0.00345 | 3420 | | 0.0011 | 6.6 | | 0.00345 |
| 62–50–0 | Ethyl methanesulfonate | 0.0055 | 930000 | | 0.00106 | 00133 | | 0.018 | 11700 | | 0.00106 |
| 100–41–4 | Ethylbenzene | 74.5 | 39 | | 0.00006 | 550000 | | 0.0002 | 8.1 | | 0.00006 |
| 106–93–4 | Ethylene Dibromide | 0.000928 | 0.00036 | | 0.00006 | 0.00745 | | 0.0001 | 0.000015 | | 0.00006 |
| 75–21–8 | Ethylene oxide | | | 14.7 | 0.001 | | 6900 | 0.07 | | 10.5 | 0.001 |
| 96–45–7 | Ethylene thiourea | 17.7 | 0.00053 | | | 0.51 | | | 0.00017 | | |
| 151–56–4 | Ethyleneimine (aziridine) | | | 0.159 | | | 19.955 | | | 0.105 | |
| 52–56–4 | Famphur | | | 0.0069415 | 0.02 | | 0.194 | 1 | | 0.48 | 0.02 |
| 640–19–7 | Fluoracetamide, 2– | | | 0.023 | | | 30.85 | | | 0.015 | |
| 62–74–8 | Flouracetic acid, sodium salt | | | 0.0069415 | | | 0.194 | | | 0.48 | |
| 206–44–0 | Fluoranthene | 1580 | 27.5 | | 0.00021 | 5970 | | 0.084 | 1.74 | | 0.00021 |
| 86–73–7 | Fluorene | 1310 | 22.4 | | 0.00021 | 89800 | | 0.08 | 3.4 | | 0.00021 |
| 16984–48–8 | Fluoride | | | 0 | 0.05 | | 0 | | | 0 | 0.05 |
| 50–00–0 | Formaldehyde | 0.0158 | 27.3 | | 0.0232 | 48.8 | | 4 | 10.5 | | 0.0232 |
| 64–18–6 | Formic Acid | | 273 | | 0.2 | 301000 | | 10 | 105 | | 0.2 |
| 765–34–4 | Glycidylaldehyde | | 7.8 | | | 1210 | | | 6.2 | | |
| 319–86–8 | HCH, delta- | | | 0.0069415 | 0.0002 | | 0.194 | 0.0006 | | 0.48 | 0.0002 |
| 76–44–8 | Heptachlor | 0.0000237 | | | 0.00004 | 7.79 | | 0.0008 | | | 0.00004 |
| 1024–57–3 | Heptachlor epoxide | 0.000528 | 783 | | 0.000032 | 0.0264 | | 0.0006 | 0.45 | | 0.000032 |
| 87–68–3 | Hexachloro-1,3-butadiene | 0.00788 | 0.0806 | | 0.0001 | 36.4 | | 0.046 | 0.00691 | | 0.0001 |
| 118–74–1 | Hexachlorobenzene | 0.000424 | 0.0226 | | 0.00161 | 0.0116 | | 0.0723 | 0.000113 | | 0.00161 |
| 319–84–6 | Hexachlorocyclohexane, alpha-(alpha-BHC). | 0.000142 | 21 | | 0.000035 | 0.0333 | | 0.0008 | 0.11 | | 0.000035 |
| 319–85–7 | Hexachlorocyclohexane, beta-(beta-BHC). | 0.000445 | 0.0013 | | 0.000023 | 0.12 | | 0.0006 | 0.00021 | | 0.000023 |
| 58–89–9 | Hexachlorocyclohexane, gamma-(Lindane). | 0.000783 | 119 | | 0.000025 | 0.102 | | 0.002 | 0.693 | | 0.000025 |
| 77–47–4 | Hexachlorocyclopentadiene | 0.00521 | | | 0.00018 | 1450 | | 0.092 | | | 0.00018 |
| 67–72–1 | Hexachloroethane | 0.049 | 0.212 | | 1.600E–06 | 80.6 | | 0.0206 | 0.033 | | 1.600E–06 |
| 70–30–4 | Hexachlorophene | 5.150E–06 | 0.0521 | | 0.207 | 0.0000241 | | 1.87 | 0.00136 | | 0.207 |
| 1888–71–7 | Hexachloropropene | | | 0.081 | 0.01 | | 142 | 0.7 | | 0.0317 | 0.01 |
| 757–58–4 | Hexaethyl tetraphosphate | | | 14.7 | | | 6900 | | | 10.5 | |
| 591–78–6 | Hexanone, 2- | | | 7.8 | 0.005 | | 1210 | 0.005 | | 6.2 | 0.005 |
| 302–01–2 | Hydrazine | | | 0.159 | | | 19.955 | 0.3 | | 0.105 | |
| 193–39–5 | Indeno (1,2,3-cd) pyrene | 0.00285 | 0.0165 | | 0.000043 | 3.9 | | 0.0748 | 0.0000241 | | 0.000043 |

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 74–88–4 | Iodomethane | | | 0.023 | 0.005 | | 30.85 | 0.005 | | 0.015 | 0.005 |
| 78–83–1 | Isobutyl alcohol | 180000 | 39 | | 0.011 | 55200 | | 0.0035 | 15 | | 0.011 |
| 465–73–6 | Isodrin | | | 0.0069415 | 0.02 | | 0.194 | 1 | | 0.48 | 0.02 |
| 78–59–1 | Isophorone | 78.6 | 0.531 | | 0.01 | 743 | | 0.0719 | 0.162 | | 0.01 |
| 120–58–1 | Isosafrole | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 143–50–0 | Kepone | 0.0000264 | 0.00022 | | 0.016 | 0.000277 | | 0.097 | 0.000032 | | 0.016 |
| 303–43–4 | Lasiocarpine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7439–92–1 | Lead | 907000 | 30 | | 0.01 | 568 | | 2 | 11.6 | | 0.01 |
| 108–31–6 | Maleic anhydride | | | 14.7 | | | 6900 | 0.07 | | 10.5 | |
| 123–33–1 | Maleic hydrazide | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 109–77–3 | Malononitrile | | | 0.159 | 0.1 | | 19.955 | 0.5 | | 0.105 | 0.1 |
| 148–82–3 | Melphalan | | | 14.7 | | | 6900 | | | 10.5 | |
| 7439–97–6 | Mercury | 125 | 0.296 | | 0.00009 | 0.598 | | 0.1 | 0.138 | | 0.00009 |
| 126–98–7 | Methacrylonitrile | 0.0708 | 0.0156 | | 0.009 | 8.91 | | 0.0005 | 0.006 | | 0.009 |
| 74–93–1 | Methanethiol | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 67–56–1 | Methanol | | 78 | | 0.021 | 138000 | | 0.46 | 30 | | 0.021 |
| 91–80–5 | Methapyrilene | | | 0.159 | 0.1 | | 19.955 | 7 | | 0.105 | 0.1 |
| 16752–77–5 | Methomyl | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.48 | 0.05 |
| 72–43–5 | Methoxychlor | 6.73 | | | 0.000086 | 19.4 | | 0.0057 | | | 0.000086 |
| 74–83–9 | Methyl bromide (Bromomethane). | 0.37 | 3.12 | | 0.00011 | 504 | | 0.02 | 0.92 | | 0.00011 |
| 74–87–3 | Methyl chloride (Chloromethane). | 0.0959 | | | 0.00013 | 90.8 | | 0.02 | | | 0.00013 |
| 78–93–3 | Methyl ethyle ketone | 141 | 78 | | 0.01 | 112000 | | 0.00834 | 30 | | 0.01 |
| 1338–23–4 | Mehtyl ethyl ketone peroxide | | | 7.8 | | | 1210 | | | 6.2 | |
| 60–34–4 | Mehty hydrazine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 108–10–1 | Methyl isobutyl ketone | 10.3 | 7.8 | | 0.00083 | 17000 | | 0.00315 | 3 | | 0.00083 |
| 80–62–6 | Methyl methacrylate | 69900 | 28.2 | | 0.005 | 39500 | | 0.0027 | 8.1 | | 0.005 |
| 66–27–3 | Methyl methanesulfonate | | | 0.11775 | 0.01 | | 1.66 | 0.7 | | 6.4 | 0.01 |
| 91–57–6 | Methyl naphthalene, 2- | | | 0.00285 | 0.01 | | 3.9 | 0.7 | | 0.0000661 | 0.01 |
| 298–00–0 | Methyl paratyhion | 0.662 | 78 | | 0.01 | 1.43 | | 0.0691 | 23.4 | | 0.01 |
| 75–55–8 | Methylaziridine, 2- | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–49–5 | Methylcholanthrene, 3- | 9.880E–06 | 0.0117 | | 0.01 | 0.000128 | | 0.046 | 1.410E–06 | | 0.01 |
| 74–95–3 | Methylene bromide | 11700 | 2.32 | | 0.00024 | 8400 | | 0.0001 | 0.19 | | 0.00024 |
| 75–09–2 | Methylene chloride | 0.376 | 0.039 | | 0.00026 | 306 | | 0.02 | 0.015 | | 0.00026 |
| 101–14–4 | Methylenebis, 4,4′-(2-chloroaniline). | | | 0.02762 | | | 3.28 | | | 0.00884 | |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG). | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–04–2 | Methylthiouracil | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 50–07–7 | Mitomycin C | | | 14.7 | | | 6900 | | | 10.5 | |
| 7439–98–7 | Molybdenum | 121000 | 1.83 | | 0.001 | 114 | | 0.3 | 1.83 | | 0.001 |
| 91–20–3 | Naphthalene | 385 | 14 | | 0.0018 | 120000 | | 0.0665 | 2.7 | | 0.0018 |
| 130–15–4 | Naphthoquinone, 1,4- | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 86–88–4 | Naphthyl-2-thiourea, 1- | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 134–32–7 | Naphthylamine, 1- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 91–59–8 | Naphthylamine, 2- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 7440–02–0 | Nickel | 5040 | 10.5 | | 0.005 | 106 | | 1 | 4.89 | | 0.005 |
| 54–11–5 | Nicotine and salts | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |
| 88–74–4 | Nitroaniline, 2- | | | 0.02762 | 0.05 | | 3.28 | 3 | | 0.00884 | 0.05 |
| 99–09–2 | Nitroaniline, 3- | | | 0.02762 | 0.05 | | 3.28 | 3 | | 0.00884 | 0.05 |
| 100–01–6 | Nitroaniline, 4- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 99–95–3 | Nitrobenzene | 0.345 | 0.084 | | 0.0064 | 44.8 | | 0.0544 | 0.032 | | 0.0064 |
| 55–86–7 | Nitrogen mustard | | | 0.159 | | | 19.955 | | | 0.105 | |
| 51–75–2 | Nitrogen mustard hydro-chloride salt. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 126–85–2 | Nitrogen mustard N-Oxide | | | 0.159 | | | 19.955 | | | 0.105 | |
| 302–70–5 | Nitrogen mustard N-Oxide, HCl salt. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 55–63–0 | Nitroglycerine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 99–55–8 | Nitro-o-toluidine, 5- | | | 0.02762 | 0.01 | | 3.28 | 0.7 | | 0.00884 | 0.01 |
| 88–75–5 | Nitrophenol, 2- | | | 0.0252 | 0.01 | | 2.991 | 0.7 | | 0.0083 | 0.01 |
| 100–02–7 | Nitrophenol, 4- | | | 0.0252 | 0.05 | | 2.991 | 3 | | 0.0083 | 0.05 |
| 79–46–9 | Nitropropane, 2- | 0.00019 | | | 0.00577 | 0.128 | | 0.0022 | | | 0.00577 |
| 56–57–5 | Nitroquinoline-1-oxide, 4- | | | 0.159 | 0.04 | | 19.955 | 3 | | 0.105 | 0.04 |
| 55–18–5 | Nitrosodiethylamine | 0.0000406 | 3.180E–06 | | 0.002 | 0.00064 | | 1 | 1.020E–06 | | 0.002 |
| 62–75–9 | Nitrosodimethylamine | 0.000268 | 0.0000106 | | 0.0006 | 0.00245 | | 0.074 | 3.400E–06 | | 0.0006 |
| 924–16–3 | Nitrosodi-n-butylamine | 0.000279 | 0.000122 | | 0.06 | 0.094 | | 0.03 | 0.000036 | | 0.06 |
| 10595–95–6 | Nitrosomethylethylamine | 0.129 | 0.0000212 | | 0.028 | 0.00244 | | 0.016 | 6.800E–06 | | 0.028 |
| 1116–54–7 | M-Nitrosodiethanolamine | | | 0.0000371 | 0.01 | | 0.012875 | 0.7 | | 0.0000119 | 0.01 |
| 621–64–7 | N-Nitrosodi-n-propylamine | 0.0644 | 0.000053 | | 0.026 | 0.0233 | | 0.0144 | 0.000017 | | 0.026 |
| 86–30–6 | N-Nitrosodiphenylamine | 7.54 | 0.2 | | 0.05 | 1270 | | 0.0846 | 0.046 | | 0.05 |
| 4549–40–0 | N-Nitrosomethyl vinyl amine | | | 0.0000371 | | | 0.012875 | | | 0.0000119 | |
| 59–89–2 | N-Nitrosomorpholine | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 759–73–9 | N-Nitroso-N-ethylurea | | | 0.159 | | | 19.955 | | | 0.105 | |
| 684–93–5 | N-Nitroso-N-methylurea | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 615–53–2 | N-Nitroso-N-methylurethane | | | 0.159 | | | 19.955 | | | 0.105 | |
| 16543–55–8 | N-Nitrosonomicotine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 100–75–4 | N-Nitrosopiperidine | 0.0106 | 0.0000106 | | 0.00135 | 0.00247 | | 0.033 | 3.400E–06 | | 0.00135 |
| 930–55–2 | N-Nitrosopyrrolidine | 0.101 | 0.000212 | | 0.0047 | 0.0534 | | 0.042 | 0.000068 | | 0.0047 |
| 13256–22–9 | N-Nitrososarcosine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 103–85–5 | N-Phenylthiourea | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 1615–80–1 | N,N-Diethylihydrazine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 152–16–9 | Octamethyl- pyro-phosphoramide. | 7310 | 0.273 | | 0.0053 | 31 | | 0.146 | 0.105 | | 0.0053 |
| 20816–12–0 | Osmium tetroxide | | | 1.24 | 3 | | 8.72 | 200 | | 0.4165 | 3 |
| 297–97–2 | O,O-Diethyl O-pyrazinyl phosphorothioate. | | | 0.11775 | 0.02 | | 1.66 | 1 | | 6.4 | 0.02 |
| 126–68–1 | O,O,O-Triethyl phosphorothioate. | | | 0.11775 | 0.05 | | 1.66 | 3 | | 6.4 | 0.05 |
| 123–63–7 | Paraldehyde | | | 7.8 | 1 | | 1210 | 70 | | 6.2 | 1 |
| 56–38–2 | Parathion | 2.63 | 440000 | | 0.0005 | 0.128 | | 0.025 | 11600 | | 0.0005 |
| 608–93–5 | Pentachlorobenzene | 7.86 | 5.15 | | 0.000038 | 205 | | 0.02 | 0.0543 | | 0.000038 |
| 76–01–7 | Pentachloroethane | | | 0.023 | 0.005 | | 30.85 | 0.01 | | 0.015 | 0.005 |
| 82–68–8 | Pentachloronitrobenzene (PCNB). | 13.9 | 0.081 | | 0.02 | 11.4 | | 0.052 | 0.0054 | | 0.02 |
| 87–86–5 | Pentachlorophenol | 0.301 | 0.00204 | | 0.00008 | 2.92 | | 0.1222 | 0.00041 | | 0.00008 |
| 62–44–2 | Phenacetin | | | 14.7 | 0.02 | | 6900 | 1 | | 10.5 | 0.02 |
| 85–01–8 | Phenanthrene | | | 0.00285 | 0.006 | | 3.9 | 0.7 | | 0.0000661 | 0.006 |
| 108–95–2 | Phenol | 19300 | 84 | | 0.00028 | 163000 | | 0.2185 | 32 | | 0.00028 |
| 62–38–4 | Phenyl mercuric acetate | 0.506 | 0.0117 | | | 0.00932 | | | 0.0045 | | |
| 25265–76–3 | Phenylenediamines (N.O.S.) | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 108–45–2 | Phenylenediamine, m- | 5440 | 0.78 | | 0.0174 | 784 | | 0.7 | 0.3 | | 0.0174 |
| 106–50–3 | Phenylenediamine, p- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 298–02–2 | Phorate | 0.106 | | | 0.00004 | 157 | | 0.002 | | | 0.00004 |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methyl. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 2953–29–9 | Phosphorodithioic acid, trimethyl ester. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 85–44–9 | Phthalic anhydride | | | 132 | | | 2352.5 | 7 | | 27.6 | |
| 109–06–8 | Picoline, 2- | | | 0.159 | 0.001 | | 19.955 | 0.07 | | 0.105 | 0.001 |
| 1336–36–3 | Polychlorinated biphenyls | 0.000286 | 0.00614 | | 0.0005 | 0.00596 | | 0.04 | 4.810E–06 | | 0.0005 |
| 23950–58–5 | Pronamide | 80.3 | 21.3 | | 0.00145 | 438 | | 0.097 | 5.7 | | 0.00145 |
| 1120–71–4 | Propane sultone, 1,3- | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 107–10–8 | Propylamine, n- | | | 0.159 | 0.005 | | 19.955 | 0.005 | | 0.105 | 0.005 |
| 51–52–5 | Propylthiouracil | | | 0.11775 | 0.1 | | 1.66 | 7 | | 6.4 | 0.1 |
| 107–19–7 | Propyn-1-ol, 2- | | | 39 | 0.01 | | 36700 | 0.05 | | 15 | 0.01 |
| 129–00–0 | Pyrene | 3040 | 54.1 | | 0.00027 | 15800 | | 0.0726 | 1.69 | | 0.00027 |
| 110–86–1 | Pyridine | 0.522 | 0.156 | | 0.011 | 814 | | 0.2 | 0.06 | | 0.011 |
| 50–55–5 | Reserpine | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 108–46–3 | Resorcinol | | | 0.0069415 | 0.1 | | 0.194 | 7 | | 0.48 | 0.1 |
| 81–07–2 | Saccharin and salts | | | 0.159 | | | 19.955 | | | 0.105 | |
| 94–59–7 | Safrole | 0.0829 | 0.0035 | | 0.0021 | 10.5 | | 0.015 | 0.00095 | | 0.0021 |
| 7782–49–2 | Selenium | 822 | 0.927 | | 0.0006 | 1.94 | | 5 | 0.357 | | 0.0006 |
| 7440–22–4 | Silver | 199 | | | 0.0005 | 0.134 | | 0.3 | | | 0.0005 |
| 18883–66–4 | Streptozotocin | | | 14.7 | | | 6900 | | | 10.5 | |
| 57–24–9 | Strychnine | 3.34 | 0.045 | | 0.0084 | 0.0041 | | 3 | 0.016 | | 0.0084 |
| 100–42–5 | Styrene | 75.7 | 63.7 | | 0.00004 | 629000 | | 0.004 | 15.4 | | 0.00004 |
| 18496–25–8 | Sulfide | | | 0 | 2 | | 0 | 2 | | 0 | 2 |
| 1746–01–6 | TCDD, 2,3,7,8- | 1.050E–09 | 1.880E–07 | | 1.000E–08 | 7.980E–06 | | 1.000E–06 | 1.780E–10 | | 1.000E–08 |
| 95–94–3 | Tetrachlorobenzene, 1,2,4,5- | 14.8 | 0.234 | | 0.00141 | 168 | | 0.034 | 0.0317 | | 0.00141 |
| 630–20–6 | Tetrachloroethane, 1,1,1,2- | 0.0241 | 0.075 | | 0.00005 | 133 | | 0.0001 | 0.0078 | | 0.00005 |
| 79–34–5 | Tetrachloroethane, 1,1,2,2- | 0.0037 | 0.024 | | 0.0002 | 29.3 | | 0.0002 | 0.0077 | | 0.0002 |
| 127–18–4 | Tetrachloroethylene | 15600 | 2.04 | | 0.00014 | 13300 | | 0.0007 | 0.68 | | 0.00014 |
| 58–90–2 | Tetrachlorophenol, 2,3,4,6- | 2720 | 1.89 | | 0.00062 | 6150 | | 0.04 | 0.58 | | 0.00062 |
| 107–49–3 | Tetraethyl pyrophosphate | | | 14.7 | | | 6900 | 3 | | 10.5 | |
| 3689–24–5 | Tetraethyldithiopyrophosphate. | 0.23 | | | 0.000058 | 2.81 | | 0.0039 | | | 0.000058 |
| 7440–28–0 | Thallium (I) | 646 | 0.05 | | 0.0007 | 5.12 | | 3 | 0.0192 | | 0.0007 |
| 62–55–5 | Thioacetamide | | | 0.159 | 1 | | 19.955 | | | 0.105 | 1 |
| 39196–18–4 | Thiofanox | | | 0.11775 | 0.05 | | 1.66 | 3 | | 6.4 | 0.05 |
| 108–98–5 | Thiophenol | | | 0.11775 | 0.02 | | 1.66 | 1 | | 6.4 | 0.02 |
| 79–19–6 | Thiosemicarbazide | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 62–56–6 | Thiourea | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 137–26–8 | Thiram | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.48 | 0.05 |
| 7440–31–5 | Tin | | | 1.24 | 8 | | 8.72 | 500 | | 0.4165 | 8 |
| 108–88–3 | Toluene | 29.8 | 41.3 | | 0.00011 | 176000 | | 0.0002 | 12.6 | | 0.00011 |
| 584–84–9 | Toluene diisocyanate | | | 0.159 | | | 19,955 | 7 | | 0.105 | |
| 95–80–7 | Toluenediamine, 2,4- | 0.211 | 0.000159 | | 0.0134 | 0.0101 | | 1 | 0.000051 | | 0.0134 |
| 823–40–5 | Toluenediamine, 2,6- | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |

TABLE C–1.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING TOXICITY BENCHMARKS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled leach level | Extrapo-lated leach level | NWW EQC | Ground-water modeled each level | Extrapo-lated each level | WW EQC |
| 496–72–0 | Toluenediamine, 3,4- | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |
| 636–21–5 | Toluidine hydrochloride, o- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 95–53–4 | Toluidine, o- | 0.441 | 0.00224 | | 0.0121 | 2.35 | | 0.029 | 0.00068 | | 0.0121 |
| 106–49–0 | Toluidine, p- | 0.703 | 0.00224 | | 0.0168 | 0.128 | | 0.043 | 0.00068 | | 0.0168 |
| 8001–35–2 | Toxaphene | 0.000364 | 21.5 | | 0.00127 | 0.000176 | | 0.0295 | 0.11 | | 0.00127 |
| 76–13–1 | Trichloro-1,2,2-trifluoroethane, 1,1,2-. | 2210 | 11000 | | 0.00108 | | | 0.00114 | 2400 | | 0.00108 |
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.685 | 9.31 | | 0.0002 | 3450 | | 0.574 | 1.3 | | 0.0002 |
| 71–55–6 | Trichloroethane, 1,1,1- | 73.9 | 120 | | 0.00008 | 48200 | | 0.0002 | 0.0539 | | 0.00008 |
| 79–00–5 | Trichloroethane, 1,1,2- | 0.0117 | 0.007 | | 0.0001 | 11.3 | | 0.004 | 0.0018 | | 0.0001 |
| 79–01–6 | Trichloroethylene | 138 | 0.0384 | | 0.00019 | 567 | | 0.0001 | 0.0128 | | 0.00019 |
| 75–69–4 | Trichlorofluoromethane | 51.4 | 48 | | 0.00008 | 25800 | | 0.001 | 16 | | 0.00008 |
| 75–70–7 | Trichloromethanethiol | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 95–95–4 | Trichlorophenol, 2,4,5- | 38.8 | 18.1 | | 0.00049 | 11500 | | 0.0672 | 4.2 | | 0.00049 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.1 | 0.0536 | | 0.0004 | 124 | | 0.0785 | 0.0152 | | 0.0004 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5- (245-T). | 15.5 | 1.68 | | 0.00008 | 63.2 | | 0.0063 | 0.64 | | 0.00008 |
| 93–72–1 | Trichlorophenoxypropionic acid, 2,4,5- (Silvex). | 9.72 | 1.26 | | 0.00008 | 6.36 | | 0.00028 | 0.48 | | 0.00008 |
| 96–18–4 | Trichloropropane, 1,2,3- | 707 | 1.1 | | 0.00032 | 872 | | 0.0009 | 0.34 | | 0.00032 |
| 99–35–4 | Trinitrobenzene, sym- | 3 | 0.0078 | | 0.00026 | 0.442 | | 0.25 | 0.003 | | 0.00026 |
| 126–72–7 | Tris (2,3-dibromopropyl) phosphate. | 0.000237 | 0.00252 | | 0.0245 | 0.357 | | 0.061 | 0.000099 | | 0.0245 |
| 52–24–4 | Tris (1-azridinyl) phosphine sulfide. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 72–57–1 | Trypan blue | | | 14.7 | | | 6900 | | | 10.5 | |
| 66–75–1 | Uracil mustard | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7440–62–2 | Vanadium | 15800 | 9.58 | | 0.003 | 250 | | 1 | 3.71 | | 0.003 |
| 108–05–4 | Vinyl acetate | | | 14.7 | 0.005 | | 6900 | 0.005 | | 10.5 | 0.005 |
| 75–01–4 | Vinyl chloride | 0.00199 | 0.000156 | | 0.00017 | 1.23 | | 0.0017 | 0.00006 | | 0.00017 |
| 81–81–2 | Warfarin | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.48 | 0.05 |
| 1330–20–7 | Xylenes (total) | 22.4 | 859 | | 0.002 | 172000 | | 0.0002 | 147 | | 0.002 |
| 7440–66–6 | Zinc | 23200 | 99 | | 0.002 | 316 | | 0.3 | 38.4 | | 0.002 |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water mod-eled exit level | Extrapo-lated exit level | WW EQC | Multipath modeled exit level | Extrapo-lated exit level | NWW EQC | Ground-water modeled Leach level | Extrapo-lated Leach level | WW EQC |
| 83–32–9 | Acenaphthene | 49.5 | 31.2 | | 0.0018 | 9480 | | 0.0742 | 4.9 | | 0.0018 |
| 208–96–8 | Acenaphthylene | | | 0.00285 | 0.02 | | 3.9 | 0.7 | | 0.00119 | 0.02 |
| 67–64–1 | Acetone | 232000 | 15.6 | | 0.2 | 17400 | | 0.027 | 6 | | 0.2 |
| 75–05–8 | Acetonitrile | 6.58 | 0.78 | | 0.015 | 923 | | 0.014 | 0.3 | | 0.015 |
| 98–86–2 | Acetophenone | 5960 | 16.8 | | 0.00158 | 1210 | | 0.03 | 6.4 | | 0.00158 |
| 75–36–5 | Acetyl chloride | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 591–08–2 | Acetyl-2-thiourea, 1- | | | 0.11775 | 1 | | 1.66 | 70 | | 6.4 | 1 |
| 53–96–3 | Acetylaminofluorene, 2- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 107–02–8 | Acrolein | 0.00248 | | | 0.013 | 2.63 | | 0.075 | | | 0.013 |
| 79–06–1 | Acrylamide | 3.67 | 0.00026 | | 0.01 | 0.00436 | | 0.1 | 0.000038 | | 0.01 |
| 107–13–1 | Acrylonitrile | 0.00428 | 0.0011 | | 0.008 | 0.961 | | 0.7 | 0.00034 | | 0.008 |
| 1402–68–2 | Aflatoxins | | | 14.7 | | | 6900 | | | 10.5 | |
| 116–06–3 | Aldicarb | | | 0.0069415 | 0.05 | | 0.194 | 1 | | 0.54 | 0.05 |
| 309–00–2 | Aldrin | 5.640E–07 | 0.00469 | | 0.000034 | 0.000444 | | 0.0006 | 3.670E–06 | | 0.000034 |
| 107–18–6 | Allyl alcohol | | | 39 | | | 36700 | | | 15 | |
| 107–05–1 | Allyl chloride | 0.0742 | | | 0.002 | 258 | | 0.002 | | | 0.002 |
| 92–67–1 | Aminobiphenyl, 4- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 2763–96–4 | Aminomethyl-3–isoxazolol, 5-. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 504–24–5 | Aminopyridine, 4- | | | 0.02762 | | | 3.28 | | | 0.00884 | |
| 61–82–5 | Amitrole | | | 0.0069415 | | | 0.194 | | | 0.54 | |
| 62–53–3 | Aniline | 0.444 | 0.053 | | 0.00023 | 4.21 | | 0.0132 | 0.017 | | 0.00023 |
| 120–12–7 | Anthracene | | | 0.00285 | 0.007 | | 3.9 | 0.5 | | 0.00119 | 0.007 |
| 7440–36–0 | Antimony | 8210 | 0.136 | | 0.0008 | 8.72 | | 2 | 0.053 | | 0.0008 |
| 140–57–8 | Aramite | | | 14.7 | 0.02 | | 6900 | 1 | | 10.5 | 0.02 |
| 7440–38–2 | Arsenic | 40.5 | 0.384 | | 0.0005 | 0.17 | | 0.3031 | 0.15 | | 0.0005 |
| 2465–27–2 | Auramine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 115–02–6 | Azaserine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7440–39–3 | Barium | | 28 | | 0.001 | 2080 | | 0.2 | 10.8 | | 0.001 |
| 71–43–2 | Benzene | 0.0209 | 0.0295 | | 0.00004 | .109 | | 0.0001 | 0.009 | | 0.00004 |
| 92–87–5 | Benzidine | 0.00015 | 2.2400E–06 | | 0.0025 | 0.0000298 | | 0.042 | 6.800E–07 | | 0.0025 |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 106–51–4 | Benzoquinone, p- | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 98–07–7 | Benzotrichloride | | | 0.27 | | | 142 | 0.004 | | 0.033 | |
| 50–32–8 | Benzo(a)pyrene | 0.00231 | 1.88 | | 0.000023 | 0.227 | | 0.0621 | 0.0036 | | 0.000023 |
| 205–99–2 | Benzo(b)fluoranthene | 0.000805 | 0.0164 | | 0.000018 | 3.7 | | 0.0699 | 0.0000661 | | 0.000018 |
| 205–82–3 | Benzo(j)fluoranthene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.00119 | 0.0002 |
| 207–08–9 | Benzo(k)fluoranthene | | | 0.00285 | 0.0002 | | 3.9 | 0.7 | | 0.00119 | 0.0002 |
| 191–24–2 | Benzo[g,h,i]perylene | | | 0.00285 | 0.0008 | | 3.9 | 0.7 | | 0.00119 | 0.0008 |
| 100–51–6 | Benzyl alochol | 22500 | 39 | | 0.00074 | 2740 | | 0.034 | 15 | | 0.00074 |
| 100–44–7 | Benzyl chloride | 1.13 | 3.9 | | 5.000E–06 | 37.5 | | 0.00276 | 15 | | 5.000E–06 |
| 56–55–3 | Benz(a)anthracene | 0.0138 | 0.000717 | | 0.000013 | 0.1 | | 0.0826 | 4.300E–06 | | 0.000013 |
| 225–51–4 | Benz(c)acridine | | | 0.00285 | 0.0005 | | 3.9 | 0.03 | | 0.00119 | 0.0005 |
| 7440–41–7 | Beryllium | 10.1 | 0.000827 | | 0.0003 | 0.0591 | | 0.1 | 0.00032 | | 0.0003 |
| 39638–32–9 | Bis (2-chloroisoproply) ether | 0.569 | 0.007 | | 0.00145 | 0.944 | | 0.0586 | 0.0019 | | 0.00145 |
| 111–44–4 | Bis(2-chlorethyl)ether | 0.00141 | 0.000648 | | 0.0003 | 0.115 | | 0.0651 | 0.00036 | | 0.0003 |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | 0.00044 | 1260 | | 0.00027 | 225 | | 0.143 | 0.108 | | 0.00027 |
| 542–88–1 | Bis(chloromethyl) ether | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 598–31–2 | Bromoacetone | | | 0.0241 | 0.005 | | 30.85 | 0.03 | | 0.0115 | 0.005 |
| 75–27–4 | Bromodichloromethane | 33.3 | 0.00854 | | 0.00008 | 19 | | 0.0012 | 0.00252 | | 0.00008 |
| 75–25–2 | Bromoform (Tribromomethane). | 0.178 | 0.064 | | 0.0002 | 173 | | 0.02 | 0.018 | | 0.0002 |
| 101–55–3 | Bromopheynl phenyl ether, 4-. | | | 0.0241 | 0.01 | | 30.85 | 0.7 | | 0.0115 | 0.01 |
| 357–57–3 | Brucine | | | 0.159 | 20 | | 19.955 | | | 0.105 | 20 |
| 71–36–3 | Butanol | 38600 | 15.6 | | 0.014 | 18200 | | 0.23 | 6 | | 0.014 |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinoseb). | 15.4 | 0.0336 | | 0.00029 | 772 | | 0.042 | 0.0112 | | 0.00029 |
| 85–68–7 | Butylbenzylphthalate | 235 | 437 | | 0.000042 | 87 | | 0.049 | 64 | | 0.000042 |
| 7440–43–9 | Cadmium | 1600 | 0.038 | | 0.00005 | 14.1 | | 0.2 | 0.015 | | 0.00005 |
| 86–74–8 | Carbazole | | | 0.159 | | | 19.955 | | | 0.105 | |
| 75–15–0 | Carbon disulfide | 0.738 | 18.4 | | 0.00121 | 330 | | 0.0002 | 6.4 | | 0.00121 |
| 353–50–4 | Carbon oxyfluoride | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 56–23–5 | Carbon tetrachloride | 0.0115 | 0.1 | | 0.00021 | 8.54 | | 0.02 | 0.0115 | | 0.00021 |
| 75–87–6 | Chloral | | | 0.27 | | | 142 | | | 0.033 | |
| 305–03–3 | Chlorambucil | | | 0.27 | | | 142 | | | 0.033 | |
| 57–74–9 | Chlordane | 0.000014 | 24 | | 0.00004 | 0.00976 | | 0.0015 | 0.036 | | 0.00004 |
| 494–03–1 | Chlomaphazin | | | 0.27 | | | 142 | | | 0.033 | |
| 126–99–8 | Chloro-1,3-butadiene, 2- (Chloroprene). | 0.515 | | | 0.002 | 288 | | 0.00099 | | | 0.002 |
| 107–20–0 | Chloroacetaldehyde | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 106–47–8 | Chloroaniline, p- | 517 | 0.42 | | 0.00066 | 142 | | 0.0592 | 0.16 | | 0.00066 |
| 108–90–7 | Chlorobenzene | 1.5 | 0.68 | | 0.00004 | 2470 | | 0.0002 | 0.19 | | 0.00004 |
| 510–15–6 | Chlorobenzilate | 0.0731 | 0.054 | | 0.00504 | 6.82 | | 0.069 | 0.0057 | | 0.00504 |
| 124–48–1 | Chlorodibromomethane | 16.3 | 0.0066 | | 0.00007 | 27.5 | | 0.00085 | 0.0018 | | 0.00007 |
| 75–00–3 | Chloroethane (ethyl chloride). | | | 0.0241 | 0.005 | | 30.85 | 0.005 | | 0.0115 | 0.005 |
| 110–75–8 | Chloroethyl vinyl ether, 2- | | | 0.27 | | | 142 | 0.005 | | 0.033 | |
| 67–66–3 | Chloroform | 0.00759 | 0.057 | | 0.00003 | 6.74 | | 0.002 | 0.017 | | 0.00003 |
| 59–50–7 | Chloro-m-cresol, p- | | | 0.27 | 0.02 | | 142 | 1 | | 0.033 | 0.02 |
| 107–30–2 | Chloromethyl methyl ether | | | 0.0241 | | | 30.85 | 0.005 | | 0.0115 | |
| 91–58–7 | Chloronaphthalene, 2- | | | 0.27 | 0.01 | | 142 | 0.7 | | 0.033 | 0.01 |
| 95–57–8 | Chlorophenol, 2- | 134 | 0.9 | | 0.00058 | 104 | | 0.0758 | 0.32 | | 0.00058 |
| 7005–72–3 | Chlorophenyl phenyl ether, 4-. | | | 0.0241 | 0.01 | | 30.85 | 0.7 | | 0.0115 | 0.01 |
| 5344–82–1 | Chlorophenyl thiourea, 1-o- | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 542–76–7 | Chloropropionitrile, 3- | | | 0.27 | 0.1 | | 142 | 0.5 | | 0.033 | 0.1 |
| 7440–47–3 | Chromium | 1300 | 0.618 | | 0.002 | 9.76 | | 0.003 | 0.238 | | 0.002 |
| 218–01–9 | Chrysene | 1.32 | 0.1 | | 0.00015 | 34.6 | | 0.084 | 0.00119 | | 0.00015 |
| 6358–53–8 | Citrus red No. 2 | | | 14.7 | | | 6900 | | | 10.5 | |
| 7440–48–4 | Cobalt | | | 0.618 | 0.5 | | 8.72 | 5 | | 0.194 | 0.5 |
| 7440–50–8 | Copper | 674 | 2790 | | 0.0007 | 5.91 | | 0.5 | 1080 | | 0.0007 |
| 108–39–4 | Cresol, m- | 615 | 8.4 | | 0.00046 | 21500 | | 0.035 | 3.2 | | 0.00046 |
| 95–48–7 | Cresol, o- | 656 | 8.4 | | 0.00055 | 27400 | | 0.027 | 3.2 | | 0.00055 |
| 106–44–5 | Cresol, p- | 63.5 | 0.84 | | 0.00046 | 2550 | | 0.035 | 0.32 | | 0.00046 |
| 4170–30–3 | Crotonaldehyde | | | 7.8 | 0.06 | | 1210 | 4 | | 6.2 | 0.06 |
| 57–12–5 | Cyanide | | | 0.159 | 0.2 | | 19.955 | 0.2 | | 0.105 | 0.2 |
| 14901–08–7 | Cycasin | | | 14.7 | | | 6900 | | | 10.5 | |
| 108–94–1 | Cyclohexanone | | | 7.8 | 10 | | 1210 | 10 | | 6.2 | 10 |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2-. | | | 0.0252 | 0.1 | | 2.991 | 7 | | 0.0083 | 0.1 |
| 50–18–0 | Cyclophosphamide | | | 0.159 | | | 19.955 | | | 0.105 | |
| 20830–81–3 | Daunomycin | | | 14.7 | | | 6900 | | | 10.5 | |
| 72–54–8 | DDD | 0.000126 | 913000 | | 0.00005 | 0.00648 | | 0.0012 | 2800 | | 0.00005 |
| 53–19–0 | DDD (o,p′) | | | 0.0069415 | | | 0.194 | | | 0.54 | |
| 72–55–9 | DDE | 9.110E–06 | 0.228 | | 0.000058 | 0.000936 | | 0.0006 | 0.0000623 | | 0.000058 |
| 3424–82–6 | DDE (o,p′) | | | 0.0069415 | | | 0.194 | | | 0.54 | |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 50–29–3 | DDT | 0.0000181 | 20.4 | | 0.000081 | 0.00315 | | 0.0006 | 0.0054 | | 0.000081 |
| 789–02–6 | DDT (o,p′) | | | 0.0069415 | | | 0.194 | | | 0.54 | |
| 2303–16–4 | Diallate | 0.26 | 90.1 | | 0.00063 | 1.26 | | 0.023 | 0.46 | | 0.00063 |
| 132–64–9 | Dibenzofuran | | | 8.4 | 0.01 | | 27400 | 0.7 | | 1.8 | 0.01 |
| 192–65–4 | Dibenzo[a,e]pyrene | | | 0.00285 | 0.001 | | 3.9 | 0.7 | | 0.00119 | 0.001 |
| 189–64–0 | Dibenzo[a,h]pyrene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.00119 | 0.0002 |
| 189–55–9 | Dibenzo[a,i]pyrene | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.00119 | 0.0002 |
| 194–59–2 | Dibenzo[c,g]carbazole, 7H- | | | 0.00285 | 0.01 | | 3.9 | 0.7 | | 0.00119 | 0.01 |
| 226–36–8 | Dibenz(a,h)acridine | | | 0.00285 | 0.0002 | | 3.9 | 0.01 | | 0.00119 | 0.0002 |
| 53–70–3 | Dibenz(a,h)anthracene | 8.440E–06 | 0.00176 | | 0.00003 | 0.000155 | | 0.084 | 6.340E–07 | | 0.00003 |
| 224–42–0 | Dibenz[a,j]acridine | | | 0.00285 | 0.001 | | 3.9 | 0.7 | | 0.00119 | 0.001 |
| 96–12–8 | Dibromo-3-chloropropane, 1,2-. | 0.0723 | 0.0022 | | 0.00026 | 0.663 | | 0.0003 | 0.00038 | | 0.00026 |
| 864–41–0 | Dichloro-2-butene, 1,4- | | | 0.0241 | 0.005 | | 30.85 | 0.005 | | 0.0115 | 0.005 |
| 110–57–6 | Dichloro-2-butene, trans-1,4-. | | | 0.0241 | 0.005 | | 30.85 | 0.005 | | 0.0115 | 0.005 |
| 96–23–1 | Dichloro-2-propanol, 1,3- | | | 0.27 | 0.01 | | 142 | 0.05 | | 0.033 | 0.01 |
| 95–50–1 | Dichlorobenzene, 1,2- | 15.4 | 7.8 | | 0.00003 | 50000 | | 0.0002 | 1.62 | | 0.00003 |
| 541–73–1 | Dichlorobenzene, 1,3- | | | 0.0241 | 0.005 | | 30.85 | 0.7 | | 0.0115 | 0.005 |
| 106–46–7 | Dichlorobenzene, 1,4- | 3.01 | 1.12 | | 0.00004 | 63.9 | | 0.0001 | 0.216 | | 0.00004 |
| 91–94–1 | Dichlorobenzidine, 3,3′- | 0.0037 | 0.0042 | | 0.0024 | 0.0524 | | 0.116 | 0.00072 | | 0.0024 |
| 75–71–8 | Dichlorodiflouromethane | 14.7 | 35.7 | | 0.0001 | 8070 | | 0.0052 | 11.9 | | 0.0001 |
| 75–34–3 | Dichloroethane, 1,1- | 37.4 | 0.00016 | | 0.00004 | 24.2 | | 0.0002 | 0.00006 | | 0.00004 |
| 107–06–2 | Dichloroethane, 1,2- | 0.00698 | 0.0475 | | 0.00006 | 6.1 | | 0.0001 | 0.009 | | 0.00006 |
| 75–35–4 | Dichloroethylene, 1,1- | 0.00345 | 0.0413 | | 0.00012 | 2.55 | | 0.0014 | 0.0216 | | 0.00012 |
| 156–59–2 | Dichloroethylene, cis-1,2- | 30000 | 0.294 | | 000012 | 5400 | | 0.02 | 0.112 | | 0.00012 |
| 156–60–5 | Dichloroethylene, trans-1,2- | 44200 | 0.42 | | 0.00006 | 13800 | | 0.0006 | 0.16 | | 0.00006 |
| 111–91–1 | Dichloromethoxyethane | | | 0.0241 | 0.01 | | 30.85 | 0.7 | | 0.0115 | 0.01 |
| 98–87–3 | Dichloromethylbenezene (benzal chloride). | | | 0.0241 | 0.005 | | 30.85 | 0.3 | | 0.0115 | 0.005 |
| 120–83–2 | Dichlorophenol, 2,4- | 6.94 | 0.62 | | 0.00041 | 769 | | 0.0788 | 0.18 | | 0.00041 |
| 87–65–0 | Dichlorophenol, 2,6- | | | 0.0241 | 0.01 | | 30.85 | 0.7 | | 0.0115 | 0.01 |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D). | 58.5 | 0.273 | | 0.00029 | 3140 | | 0.00011 | 0.105 | | 0.00029 |
| 78–87–5 | Dichloropropane, 1,2- | 0.303 | 0.115 | | 0.00004 | 16.9 | | 0.0001 | 0.0115 | | 0.00004 |
| 542–75–6 | Dichloropropene, 1,3- | 0.00476 | 0.0028 | | 0.0009 | 32.4 | | 0.0003 | 0.00085 | | 0.0009 |
| 10061–91–5 | Dichloropropene, cis-1,3- | 0.00485 | 90000 | | 0.00069 | 2.64 | | 0.0003 | 1150 | | 0.00069 |
| 10061–02–6 | Dichloropropene, trans-1,3- | 0.0049 | 90000 | | 0.00094 | 2.67 | | 0.0003 | 1150 | | 0.00094 |
| 60–57–1 | Dieldrin | 0.000059 | 682 | | 0.000044 | 0.00176 | | 0.0006 | 0.54 | | 0.000044 |
| 1464–53–5 | Diepoxybutane, 1,2,3,4-(2,2′-bioxirane. | | | 14.7 | 0.005 | | 6900 | 0.005 | | 10.5 | 0.005 |
| 84–66–2 | Diethl phthalate | 3560 | 186 | | 0.00025 | 4490 | | 0.022 | 54 | | 0.00025 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–53–1 | Diethylstillbestrol | 7.710E–07 | 4.2900E–07 | | 0.0078 | 2.470E–11 | | 1 | 6.500E–08 | | 0.0078 |
| 94–58–6 | Dihydrosafrole | | | 14.7 | 0.05 | | 6900 | 3 | | 10.5 | 0.05 |
| 60–51–5 | Dimethoate | 38.1 | 29.4 | | 0.00029 | 1.6 | | 0.0691 | 0.77 | | 0.00029 |
| 131–11–3 | Dimethyl phthalate | 200000 | 78 | | 0.00064 | 3 | | 0.013 | 30 | | 0.00064 |
| 77–78–1 | Dimethyl sulfate | | | 0.11775 | | | 1.66 | | | 6.4 | 60 |
| 60–11–7 | Dimethylaminoazobenzene, p-. | | | 0.02762 | 0.01 | | 3.28 | 0.7 | | 0.00884 | 0.01 |
| 119–93–7 | Dimethylbenzidine, 3,3′- | 0.000625 | 0.0000702 | | 0.0033 | 0.00062 | | 0.7 | 0.000018 | | 0.0033 |
| 57–97–6 | Dimethylbenz(a)anthracene, 7,12-. | 3.820E–06 | 0.00464 | | 0.00037 | 0.00263 | | 0.039 | 2.760E–06 | | 0.00037 |
| 79–44–7 | Dimethylcarbamoyl chloride | | | 0.27 | | | 142 | | | 0.033 | |
| 122–09–8 | Dimethylphenethylamine, alpha, alpha-. | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 105–67–9 | Dimethylphenol,2,4- | 151 | 3.78 | | 0.00047 | 11300 | | 0.052 | 1.19 | | 0.00047 |
| 119–90–4 | Dimethyloxybenzidine,3,3'- | 1.78 | 0.0336 | | 0.0077 | 0.236 | | 7 | 0.0102 | | 0.0077 |
| 84–74–2 | Di-n-butyl phthalate | 883 | 900 | | 0.00033 | 90000 | | 0.249 | 100 | | 0.00033 |
| 99–65–0 | Dinitrobenzene,1,3- | 1.28 | 0.0168 | | 0.00011 | 5.54 | | 0.25 | 0.0064 | | 0.00011 |
| 100–25–4 | Dinitrobenzene,1,4- | | | 0.0252 | 0.04 | | 2.991 | 3 | | 0.0083 | 0.04 |
| 534–52–1 | Dinitro-o-cresol,4,6- | | | 0.0252 | 0.05 | | 2.991 | 3 | | 0.0083 | 0.05 |
| 51–28–5 | Dinitrophenol,2,4- | 50.2 | 0.273 | | 0.00042 | 56.1 | | 0.03 | 0.105 | | 0.00042 |
| 121–14–2 | Dinitrotoluene,2,4- | 10.7 | 0.294 | | 0.00002 | 213 | | 0.26 | 0.112 | | 0.00002 |
| 606–20–2 | Dinitrotoluene,2,6- | 12.9 | 0.168 | | 0.00031 | 86.3 | | 0.25 | 0.064 | | 0.00031 |
| 117–84–0 | Di-n-octyl phthalate | 0.002 | 1260 | | 0.000042 | 4480 | | 0.139 | 0.1 | | 0.000042 |
| 123–91–1 | Dioxane,1,4- | 558 | 0.0424 | | 0.012 | 13.2 | | 0.0005 | 0.0136 | | 0.012 |
| 122–39–4 | Diphenylamine | 29 | 14.7 | | 0.00151 | 11800 | | 0.041 | 2.6 | | 0.00151 |
| 122–66–7 | Diphenylhydrazine,1,2- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 298–04–4 | Disulfoton | 0.0131 | 458 | | 0.00007 | 42.6 | | 0.0035 | 13 | | 0.00007 |
| 541–53–7 | Dithiobiuret | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 115–29–7 | Endosulfan | 6.62 | 6 | | 0.00004 | 73.1 | | 0.0005 | 0.94 | | 0.00004 |
| 959–98–8 | Endosulfan I | | | 0.0069415 | 0.0003 | | 0.194 | 0.009 | | 0.54 | 0.0003 |
| 33213–65–9 | Endosulfan II | | | 0.0069415 | 0.0004 | | 0.194 | 0.003 | | 0.54 | 0.0004 |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 1031–07–8 | Endosulfan sulfate | | | 0.0069415 | 0.0004 | | 0.194 | 0.04 | | 0.54 | 0.0004 |
| 145–73–3 | Endothall | | | 0.0069415 | 0.1 | | 0.194 | | | 0.54 | 0.1 |
| 72–20–8 | Endrin | 0.0729 | 4800 | | 0.00039 | 0.26 | | 0.0036 | 24 | | 0.00039 |
| 7421–93–4 | Endrin aldehyde | | | 0.0069415 | 0.0005 | | 0.194 | 0.02 | | 0.54 | 0.0005 |
| 53494–70–5 | Endrin ketone | | | 0.0069415 | 0.0005 | | 0.194 | 0.03 | | 0.54 | 0.0005 |
| 106–89–8 | Epichlorohydrin | 0.335 | 414000 | | 0.06519 | 44 | | 0.0714 | 5400 | | 0.06519 |
| 51–43–4 | Epinephrine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 110–80–5 | Ethoxyethanol,2- | 14.7 | 39 | | 1.16 | 6900 | | 2.03 | 15 | | 1.16 |
| 141–78–6 | Ethyl acetate | | 390 | | 0.009 | 272000 | | 0.18 | 114 | | 0.009 |
| 51–79–6 | Ethyl carbamate | | 390 | 14.7 | 0.05 | | 6900 | 3 | | 10.5 | 0.05 |
| 107–12–0 | Ethyl cyanide (propionitrile) | | | 0.159 | 0.1 | | 19.955 | 0.1 | | 0.105 | 0.1 |
| 60–29–7 | Ethyl ether | | 27.3 | | 0.00153 | 41200 | | 0.00319 | 10.5 | | 0.00153 |
| 97–63–2 | Ethyl methacrylate | 25500 | 24 | | 0.00345 | 3420 | | 0.0011 | 6.6 | | 0.00345 |
| 62–50–0 | Ethyl methanesulfonate | 0.0055 | 930000 | | 0.00106 | 0.00133 | | 0.018 | 11700 | | 0.00106 |
| 100–41–4 | Ethylbenzene | 74.5 | 8.4 | | 0.00006 | 550000 | | 0.0002 | 1.75 | | 0.00006 |
| 106–93–4 | Ethylene Dibromide | 0.000928 | 0.018 | | 0.00006 | 0.00745 | | 0.0001 | 0.00075 | | 0.00006 |
| 75–21–8 | Ethylene oxide | | | 14.7 | 0.001 | | 6900 | 0.07 | | 10.5 | 0.001 |
| 96–45–7 | Ethylene thiourea | 17.7 | 0.00053 | | | 0.51 | | | 0.00017 | | |
| 151–56–4 | Ethyleneimine (azirindine) | | | 0.159 | | | 19.955 | | | 0.105 | |
| 52–85–7 | Famphur | | | 0.0069415 | 0.02 | | 0.194 | 1 | | 0.54 | 0.02 |
| 640–19–7 | Fluoracetamide, 2- | | | 0.0241 | | | 30.85 | | | 0.0115 | |
| 62–74–8 | Fluoracetic acid, sodium salt. | | | 0.0069415 | | | 0.194 | | | 0.54 | |
| 206–44–0 | Fluoranthene | 1580 | 27.5 | | 0.00021 | 5970 | | 0.084 | 1.74 | | 0.00021 |
| 86–73–7 | Fluorene | 1310 | 22.4 | | 0.00021 | 89800 | | 0.08 | 3.4 | | 0.00021 |
| 16984–48–8 | Fluoride | | | 0 | 0.05 | | 0 | | | 0 | 0.05 |
| 50–00–0 | Formaldehyde | 0.0158 | 27.3 | | 0.0232 | 48.8 | | 4 | 10.5 | | 0.0232 |
| 64–18–6 | Formic Acid | | 273 | | 0.2 | 301000 | | 10 | 105 | | 0.2 |
| 765–34–4 | Glycidylaldehyde | | | 7.8 | | | 1210 | | | 6.2 | |
| 319–86–8 | HCH, delta- | | | 0.0069415 | 0.0002 | | 0.194 | 0.0006 | | 0.54 | 0.0002 |
| 76–44–8 | Heptachlor | 0.0000237 | | | 0.00004 | 7.79 | | 0.0008 | | | 0.00004 |
| 1024–57–3 | Heptachlor epoxide | 0.000528 | 17400 | | 0.000032 | 0.0264 | | 0.0006 | 66 | | 0.000032 |
| 87–68–3 | Hexachloro-1,3-butadiene | 0.00788 | 0.0806 | | 0.0001 | 36.4 | | 0.046 | 0.00691 | | 0.0001 |
| 118–74–1 | Hexachlorobenzene | 0.000424 | 3.6 | | 0.00161 | 0.0116 | | 0.0723 | 0.018 | | 0.00161 |
| 319–84–6 | Hexachlorocyclohexane, alpha- (alpha-BHC). | 0.000142 | 21 | | 0.000035 | 0.0333 | | 0.0008 | 0.11 | | 0.000035 |
| 319–85–7 | Hexachlorocyclohexane, beta- (beta-BHC). | 0.000445 | 0.0013 | | 0.000023 | 0.12 | | 0.0006 | 0.00021 | | 0.000023 |
| 58–89–9 | Hexachlorocyclohexane, gamma- (Lindane). | 0.000783 | 340 | | 0.000025 | 0.102 | | 0.002 | 1.98 | | 0.000025 |
| 77–47–4 | Hexachlorocyclopentadiene | 0.00521 | | | 0.00018 | 1450 | | 0.092 | | | 0.00018 |
| 67–72–1 | Hexachloroethane | 0.049 | 0.212 | | 1.600E-06 | 80.6 | | 0.0206 | 0.033 | | 1.600E-06 |
| 70–30–4 | Hexachlorophene | 5.150E-06 | 0.0521 | | 0.207 | 0.0000241 | | 1.87 | 0.00136 | | 0.207 |
| 1888–71–7 | Hexachloropropene | | | 0.27 | 0.01 | | 142 | 0.7 | | 0.033 | 0.01 |
| 757–58–4 | Hexaethyl tetraphosphate | | | 14.7 | | | 6900 | | | 10.5 | |
| 591–78–6 | Hexanone, 2- | | | 7.8 | 0.005 | | 1210 | 0.005 | | 6.2 | 0.005 |
| 302–01–2 | Hydrazine | | | 0.159 | | | 19.955 | 0.3 | | 0.105 | |
| 193–39–5 | Indeno(1,2,3-cd) pyrene | 0.00285 | 0.0165 | | 0.000043 | 3.9 | | 0.0748 | 0.0000241 | | 0.000043 |
| 74–88–4 | Iodomethane | | | 0.0241 | 0.005 | | 30.85 | 0.005 | | 0.0115 | 0.005 |
| 78–83–1 | Isobutyl alcohol | 180000 | 39 | | 0.011 | 55200 | | 0.0035 | 15 | | 0.011 |
| 465–73–6 | Isodrin | | | 0.0069415 | 0.02 | | 0.194 | 1 | | 0.54 | 0.02 |
| 78–59–1 | Isophorone | 78.6 | 0.531 | | 0.01 | 743 | | 0.0719 | 0.162 | | 0.01 |
| 120–58–1 | Isosafrole | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 143–50–0 | Kepone | 0.0000264 | 0.00022 | | 0.016 | 0.000277 | | 0.097 | 0.000032 | | 0.016 |
| 303–43–4 | Lasiocarpine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7439–92–1 | Lead | 907000 | 30 | | 0.01 | 568 | | 2 | 12 | | 0.01 |
| 108–31–6 | Maleic anhydride | | | 14.7 | | | 6900 | 0.07 | | 10.5 | |
| 123–33–1 | Maleic hydrazide | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 109–77–3 | Malononitrile | | | 0.159 | 0.1 | | 19.955 | 0.5 | | 0.105 | 0.1 |
| 148–82–3 | Melphalan | | | 14.7 | | | 6900 | | | 10.5 | |
| 7439–97–6 | Mercury | 125 | 0.0596 | | 0.00009 | 0.598 | | 0.1 | 0.023 | | 0.00009 |
| 126–98–7 | Methacrylonitrile | 0.0708 | 0.1056 | | 0.009 | 8.91 | | 0.0005 | 0.006 | | 0.009 |
| 74–93–1 | Methanethiol | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 67–56–1 | Methanol | | 78 | | 0.021 | 138000 | | 0.46 | 30 | | 0.021 |
| 91–80–5 | Methapyrilene | | | 0.159 | 0.1 | | 19.955 | 7 | | 0.105 | 0.1 |
| 16752–77–5 | Methomyl | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.54 | 0.05 |
| 72–43–5 | Methoxychlor | 6.73 | | | 0.000086 | 19.4 | | 0.0057 | | | 0.000086 |
| 74–83–9 | Methyl bromide (Bromomethane). | 0.37 | 3.12 | | 0.00011 | 504 | | 0.02 | 0.92 | | 0.00011 |
| 74–87–3 | Methyl chloride (Chloromethane). | 0.0959 | | | 0.00013 | 90.8 | | 0.02 | | | 0.00013 |
| 78–93–3 | Methyl ethyl ketone | 141 | 78 | | 0.01 | 112000 | | 0.00834 | 30 | | 0.01 |
| 1338–23–4 | Methyl ethyl ketone peroxide. | | | 7.8 | | | 1210 | | | 6.2 | |
| 60–34–4 | Methyl hydrazine | | | 0.159 | | | 19.955 | | | 0.105 | |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 108–10–1 | Methyl isobutyl ketone | 10.3 | 7.8 | | 0.00083 | 17000 | | 0.00315 | 3 | | 0.00083 |
| 80–62–6 | Methyl methacrylate | 69900 | 28.2 | | 0.005 | 39500 | | 0.0027 | 8.1 | | 0.005 |
| 66–27–3 | Methyl methanesulfonate | | | 0.11775 | 0.01 | | 1.66 | 0.7 | | 6.4 | 0.01 |
| 91–57–6 | Methyl naphthalene, 2- | | | 0.00285 | 0.01 | | 3.9 | 0.7 | | 0.00119 | 0.01 |
| 298–00–0 | Methyl parathion | 0.662 | 78 | | 0.01 | 1.43 | | 0.691 | 23.4 | | 0.01 |
| 75–55–8 | Methylazinidine, 2- | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–49–5 | Methylcholanthrene, 3- | 9.880E–06 | 0.0117 | | 0.01 | 0.000128 | | 0.046 | 1.410E–06 | | 0.01 |
| 74–95–3 | Methylene bromide | 11700 | 0.029 | | 0.00024 | 8400 | | 0.0001 | 0.0085 | | 0.00024 |
| 75–09–2 | Methylene chloride | 0.376 | 0.039 | | 0.00026 | 306 | | 0.02 | 0.09 | | 0.00026 |
| 101–14–4 | Methylenegbis, 4,4'-(2-chloraoniline). | | | 0.02762 | | | 3.28 | | | 0.00884 | |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG). | | | 0.159 | | | 19.955 | | | 0.105 | |
| 56–04–2 | Methylthiouracil | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 50–07–7 | Mitomycin C | | | 14.7 | | | 6900 | | | 10.5 | |
| 7439–98–7 | Molybdenum | 121000 | 1.83 | | 0.001 | 114 | | 0.3 | 1.83 | | 0.001 |
| 91–20–3 | Naphthalene | 385 | 14 | | 0.0018 | 120000 | | 0.0665 | 2.7 | | 0.0018 |
| 130–15–4 | Naphthoquinone, 1,4- | | | 14.7 | 0.01 | | 6900 | 0.7 | | 10.5 | 0.01 |
| 86–88–4 | Naphthyl-2-thiourea, 1- | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 134–32–7 | Naphthylamine, 1- | | | 0.159 | 0.01 | | 19.995 | 0.7 | | 0.105 | 0.01 |
| 91–59–8 | Naphthylamine, 2- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 7440–02–0 | Nickel | 5040 | 4.38 | | 0.005 | 106 | | 1 | 2.04 | | 0.005 |
| 54–11–5 | Nicotine and salts | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |
| 88–74–4 | Nitroaniline, 2- | | | 0.02762 | 0.05 | | 3.28 | 3 | | 0.00884 | 0.05 |
| 99–09–2 | Nitroaniline, 3- | | | 0.02762 | 0.05 | | 3.28 | 3 | | 0.00884 | 0.05 |
| 100–01–6 | Nitroaniline, 4- | | | 0.02762 | 0.02 | | 3.28 | 1 | | 0.00884 | 0.02 |
| 98–95–3 | Nitrobenzene | 0.345 | 0.084 | | 0.0064 | 44.8 | | 0.0544 | 0.032 | | 0.0064 |
| 55–86–7 | Nitrogen mustard | | | 0.159 | | | 19.955 | | | 0.105 | |
| 51–75–2 | Nitrogen mustard hydrochloride salt. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 126–85–2 | Nitrogen mustard N-Oxide | | | 0.159 | | | 19.955 | | | 0.105 | |
| 302–70–5 | Nitrogen mustard N-Oxide, HCl salt. | | | 0.159 | | | 19.955 | | | 0.105 | |
| 55–63–0 | Nitroglycerine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 99–55–8 | Nitro-o-toluidine, 5- | | | 0.02762 | 0.01 | | 3.28 | 0.7 | | 0.00884 | 0.01 |
| 88–75–5 | Nitrophenol, 2- | | | 0.0252 | 0.01 | | 2.991 | 0.7 | | 0.0083 | 0.01 |
| 100–02–7 | Nitrophenol, 4- | | | 0.0252 | 0.05 | | 2.991 | 3 | | 0.0083 | 0.05 |
| 79–46–9 | Nitropropane, 2- | 0.00019 | | | 0.00577 | 0.128 | | 0.0022 | | | 0.00577 |
| 56–57–5 | Nitroquinoline-1-oxide, 4- | | | 0.159 | 0.04 | | 19.955 | 3 | | 0.105 | 0.04 |
| 55–18–5 | Nitrosodiethylamine | 0.0000406 | 3,1800E–06 | | 0.002 | 0.00064 | | 1 | 1.020E–06 | | 0.00262 |
| 62–75–9 | Nitrosodimethylamine | 0.000268 | 0.0000106 | | 0.0006 | 0.00245 | | 0.074 | 3.400E–06 | | 0.0006 |
| 924–16–3 | Nitrosodi-n-butylamine | 0.000279 | 0.000122 | | 0.06 | 0.094 | | 0.03 | 0.000036 | | 0.06 |
| 10595–95–6 | Nitrosomethylethylamine | 0.129 | 0.000212 | | 0.028 | 0.00244 | | 0.016 | 6.800E–06 | | 0.028 |
| 1116–54–7 | N-Nirtrosodiethanolamine | | | 0.0000371 | 0.01 | | 0.012875 | 0.7 | | 0.0000119 | 0.01 |
| 621–64–7 | N-Nitrosodi-n-propylamine | 0.0644 | 0.000053 | | 0.026 | 0.0233 | | 0.0144 | 0.000017 | | 0.026 |
| 86–30–6 | N-Nitrosodiphenylamine | 7.54 | 0.2 | | 0.05 | 1270 | | 0.0846 | 0.046 | | 0.05 |
| 4549–40–0 | N-Nitrosomethyl vinyl amine | | | 0.0000371 | | | 0.012875 | | | 0.0000119 | |
| 59–89–2 | N-Nitrosomorpholine | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 759–73–9 | N-Nitroso-N-ethylurea | | | 0.159 | | | 19.955 | | | 0.105 | |
| 684–93–5 | N-Nitroso-N-methylurea | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 615–53–2 | N-Nitroso-N-methylurethane | | | 0.159 | | | 19.955 | | | 0.105 | |
| 16543–55–8 | N-Nitrosonornicotine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 100–75–4 | N-Nitrosopiperidine | 0.0106 | 0.0000106 | | 0.00135 | 0.00247 | | 0.033 | 3.400E–06 | | 0.00135 |
| 930–55–2 | N-Nitrosopyrrolidine | 0.101 | 0.000212 | | 0.0047 | 0.0534 | | 0.042 | 0.000068 | | 0.0047 |
| 13256–22–9 | N-Nitrososarcosine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 103–85–5 | N-Phenylthiourea | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 1615–80–1 | N,N-Diethylhydrazine | | | 0.159 | | | 19.955 | | | 0.105 | |
| 152–16–9 | Octamethylpyrophosphoramide. | 7310 | 0.273 | | 0.0053 | 31 | | 0.146 | 0.105 | | 0.0053 |
| 20816–12–0 | Osmium tetroxide | | | 0.618 | 3 | | 8.72 | 200 | | 0.194 | 3 |
| 297–97–2 | O,O-Diethyl O-pyrazinyl phosphorothioate. | | | 0.1175 | 0.02 | | 1.66 | 1 | | 64 | 002 |
| 126–68–1 | O,O,O-Triethyl phosphorothioate. | | | 0.11775 | 0.05 | | 1.66 | 3 | | 6.4 | 0.05 |
| 123–63–7 | Paraldehyde | | | 7.8 | 1 | | 1210 | 70 | | 6.2 | 1 |
| 56–38–2 | Parathion | 2.63 | 440000 | | 0.0005 | 0.128 | | 0.025 | 11600 | | 0.0005 |
| 608–93–5 | Pentachlorobenzene | 7.86 | 5.15 | | 0.000038 | 205 | | 0.02 | 0.0543 | | 0.000038 |
| 76–01–7 | Pentachloroethane | | | 0.0241 | 0.005 | | 30.85 | 0.01 | | 0.0115 | 0.005 |
| 82–68–8 | Pentachloronitrobenzene (PCNB). | 13.9 | 0.27 | | 0.02 | 11.4 | | 0.052 | 0.018 | | 0.02 |
| 87–86–5 | Pentachlorophenol | 0.301 | 0.00204 | | 0.00008 | 2.92 | | 0.1222 | 0.00041 | | 0.00008 |
| 62–44–2 | Phenacetin | | | 14.7 | 0.02 | | 6900 | 1 | | 10.5 | 0.02 |
| 85–01–8 | Phenanthrene | | | 0.00285 | 0.006 | | 3.9 | 0.7 | | 0.00119 | 0.006 |
| 108–95–2 | Phenol | 19300 | 84 | | 0.00028 | 163000 | | 0.2185 | 32 | | 0.00028 |
| 62–38–4 | Phenyl mercuric acetate | 0.506 | 0.0117 | | | 0.00932 | | | 0.0045 | | |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 25265–76–3 | Phenylenediamines (N.O.S.) | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 108–45–2 | Phenylenediamine, m- | 5440 | 0.78 | | 0.0174 | 784 | | 0.7 | 0.3 | | 0.0174 |
| 106–50–3 | Phenylenediamine, p- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 298–02–2 | Phorate | 0.106 | | | 0.00004 | 157 | | 0.002 | | | 0.00004 |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methyl. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 2953–29–9 | Phosphorodithioic acid, trimethyl ester. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 85–44–9 | Phthalic anhydride | | | 132 | | | 2352.5 | 7 | | 42 | |
| 109–06–8 | Picoline, 2- | | | 0.159 | 0.001 | | 19.955 | 0.07 | | 0.105 | 0.001 |
| 1336–36–3 | Polychlorinated biphenyls | 0.000286 | 11.5 | | 0.0005 | 0.00596 | | 0.04 | 0.009 | | 0.0005 |
| 23950–58–5 | Pronamide | 80.3 | 21.3 | | 0.00145 | 438 | | 0.097 | 5.7 | | 0.00145 |
| 1120–71–4 | Propane sultone, 1,3- | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 107–10–8 | Propylamine, n- | | | 0.159 | 0.005 | | 19.955 | 0.005 | | 0.105 | 0.005 |
| 51–52–5 | Propylthiouracil | | | 0.11775 | 0.1 | | 1.66 | 7 | | 6.4 | 0.1 |
| 107–19–7 | Propyn-1-ol, 2- | | | 39 | 0.01 | | 36700 | 0.05 | | 15 | 0.01 |
| 129–00–0 | Pyrene | 3040 | 54.1 | | 0.00027 | 15800 | | 0.0726 | 1.69 | | 0.00027 |
| 110–86–1 | Pyridine | 0.522 | 0.156 | | 0.011 | 814 | | 0.2 | 0.06 | | 0.011 |
| 50–55–5 | Reserpine | | | 0.159 | 0.05 | | 19.955 | 3 | | 0.105 | 0.05 |
| 108–46–3 | Resorcinol | | | 0.0069415 | 0.1 | | 0.194 | 7 | | 0.54 | 0.1 |
| 81–07–2 | Saccharin and salts | | | 0.159 | | | 19.955 | | | 0.105 | |
| 94–59–7 | Safrole | 0.0829 | 0.0035 | | 0.0021 | 10.5 | | 0.015 | 0.00095 | | 0.0021 |
| 7782–49–2 | Selenium | 822 | 0.232 | | 0.0006 | 1.94 | | 5 | 0.0892 | | 0.0006 |
| 7440–22–4 | Silver | 199 | | | 0.0005 | 1.134 | | 0.3 | | | 0.0005 |
| 18883–66–4 | Streptozotocin | | | 14.7 | | | 6900 | | | 10.5 | |
| 57–24–9 | Strychnine | 3.34 | 0.045 | | 0.0084 | 0.0041 | | 3 | 0.016 | | 0.0084 |
| 100–42–5 | Stryene | 75.7 | 0.91 | | 0.00004 | 629000 | | 0.004 | 0.22 | | 0.00004 |
| 18496–25–8 | Sulfide | | | 0 | 2 | | 0 | 2 | | 0 | 2 |
| 1746–01–6 | TCDD, 2,3,7,8- | 1.050E–09 | 0.00057 | | 1.000E–08 | 7.80E–06 | | 1.000E–06 | 5.400E–07 | | 1.000E–08 |
| 95–94–3 | Tetrachlorobenzene, 1,2,4,5-. | 14.8 | 0.234 | | 0.00141 | 168 | | 0.034 | 0.0317 | | 0.00141 |
| 630–20–6 | Tetrachloroethane, 1,1,1,2- | 0.0241 | 0.075 | | 0.00005 | 133 | | 0.0001 | 0.0078 | | 0.00005 |
| 79–34–5 | Tetrachloroethane, 1,1,2,2- | 0.0037 | 0.024 | | 0.0002 | 29.3 | | 0.0002 | 0.0077 | | 0.0002 |
| 127–18–4 | Tetrachloroethylene | 15600 | 0.0255 | | 0.00014 | 13300 | | 0.0007 | 0.0085 | | 0.00014 |
| 58–90–2 | Tetrachlorophenol, 2,3,4,6- | 2720 | 1.89 | | 0.00062 | 6150 | | 0.04 | 0.58 | | 0.00062 |
| 107–49–3 | Tetraethyl pyrophosphate | | | 14.7 | | | 6900 | 3 | | 10.5 | |
| 3689–24–5 | Tetraethyldithiopyrophosphate. | 0.23 | | | 0.000058 | 2.81 | | 0.0039 | | | 0.000058 |
| 7440–28–0 | Thallium (I) | 646 | 0.0353 | | 0.0007 | 5.12 | | 3 | 0.014 | | 0.0007 |
| 62–55–5 | Thioacetamide | | | 0.159 | 1 | | 19.955 | | | 0.105 | 1 |
| 39196–18–4 | Thiofanox | | | 0.11775 | 0.05 | | 1.66 | 3 | | 6.4 | 0.05 |
| 108–98–5 | Thiophenol | | | 0.11775 | 0.02 | | 1.66 | 1 | | 6.4 | 0.02 |
| 79–19–6 | Thiosemicarbazide | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 62–56–6 | Thiourea | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 137–26–8 | Thiram | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.54 | 0.05 |
| 7440–31–5 | Tin | | | 0.618 | 8 | | 8.72 | 500 | | 0.194 | 8 |
| 108–88–3 | Toluene | 29.8 | 5.9 | | 0.00011 | 176000 | | 0.0002 | 1.8 | | 0.00011 |
| 584–84–9 | Toluene diisocyanate | | | 0.159 | | | 19.955 | 7 | | 0.105 | |
| 95–80–7 | Toluenediamine, 2,4- | 0.211 | 0.000159 | | 0.0134 | 0.0101 | | 1 | 0.000051 | | 0.0134 |
| 823–40–5 | Toluenediamine, 2,6- | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |
| 496–72–0 | Toluenediamine, 3,4- | | | 0.159 | 0.02 | | 19.955 | 1 | | 0.105 | 0.02 |
| 636–21–5 | Toluidine hydrochloride, o- | | | 0.159 | 0.01 | | 19.955 | 0.7 | | 0.105 | 0.01 |
| 95–53–4 | Toluidine, o- | 0.441 | 0.00224 | | 0.0121 | 2.35 | | 0.029 | 0.00068 | | 0.0121 |
| 106–49–0 | Toluidine, p- | 0.703 | 0.00224 | | 0.0168 | 0.128 | | 0.043 | 0.00068 | | 0.0168 |
| 8001–35–2 | Toxaphene | 0.000364 | 1170 | | 0.00127 | 0.000176 | | 0.0295 | 6.3 | | 0.00127 |
| 76–13–1 | Trichloro-1,2,2-trifluoroethane, 1,1,2-. | 2210 | 0.77 | | 0.00108 | | | 0.00114 | 0.168 | | 0.00108 |
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.685 | 9.31 | | 0.0002 | 3450 | | 0.0574 | 1.3 | | 0.0002 |
| 71–55–6 | Trichloroethane, 1,1,1- | 73.9 | 120 | | 0.00008 | 48200 | | 0.0002 | 0.0539 | | 0.00008 |
| 79–00–5 | Trichloroethane, 1,1,2- | 0.0117 | 0.035 | | 0.0001 | 11.3 | | 0.004 | 0.009 | | 0.0001 |
| 79–01–6 | Trichloroethylene | 138 | 0.024 | | 0.00019 | 567 | | 0.0001 | 0.008 | | 0.00019 |
| 75–69–4 | Trichlorofluoromethane | 51.4 | 48 | | 0.00008 | 25800 | | 0.001 | 16 | | 0.00008 |
| 75–70–7 | Trichloromethanethiol | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 95–95–4 | Trichlorophenol, 2,4,5- | 38.8 | 18.1 | | 0.00049 | 11500 | | 0.0672 | 4.2 | | 0.00049 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.1 | 0.0536 | | 0.0004 | 124 | | 0.0785 | 0.0152 | | 0.0004 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5- (245–T). | 15.5 | 1.68 | | 0.00008 | 63.2 | | 0.0063 | 0.64 | | 0.00008 |
| 93–72–1 | Trichlorophenoxypropionic acid, 2,4,5- (Silvex). | 9.72 | 0.21 | | 0.00008 | 6.36 | | 0.00028 | 0.08 | | 0.00008 |
| 96–18–4 | Trichloropropane, 1,2,3- | 707 | 1.1 | | 0.00032 | 872 | | 0.0009 | 0.34 | | 0.00032 |
| 99–35–4 | Trinitrobenzene, sym- | 3 | 0.0078 | | 0.00026 | 0.442 | | 0.25 | 0.003 | | 0.00026 |
| 126–72–7 | Tris (2,3-dibromopropyl) phosphate. | 0.000237 | 0.00252 | | 0.0245 | 0.357 | | 0.061 | 0.000099 | | 0.0245 |

TABLE C–2.—SUMMARY OF CONSTITUENT-SPECIFIC EXIT LEVEL DEVELOPMENT USING MCL-BASED NUMBERS—Continued

| CAS No. | Name | WW totals (mg/l) | | | | NWW totals (mg/kg) | | | NWW leach (mg/l) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Multipath modeled exit level | Ground-water modeled exit level | Extrapolated exit level | WW EQC | Multipath modeled exit level | Extrapolated exit level | NWW EQC | Ground-water modeled Leach level | Extrapolated Leach level | WW EQC |
| 52–24–4 | Tris(1-azridinyl) phosphine sulfide. | | | 0.11775 | | | 1.66 | | | 6.4 | |
| 72–57–1 | Trypan blue | | | 14.7 | | | 6900 | | | 10.5 | |
| 66–75–1 | Uracil mustard | | | 0.159 | | | 19.955 | | | 0.105 | |
| 7440–62–2 | Vanadium | 15800 | 9.58 | | 0.003 | 250 | | 1 | 3.71 | | 0.003 |
| 108–05–4 | Vinyl acetate | | | 14.7 | 0.005 | | 6900 | 0.005 | | 10.5 | 0.005 |
| 75–01–4 | Vinyl chloride | 0.00199 | 0.0078 | | 0.00017 | 1.23 | | 0.0017 | 0.003 | | 0.00017 |
| 81–81–2 | Warfarin | | | 0.0069415 | 0.05 | | 0.194 | 3 | | 0.54 | 0.05 |
| 1330–20–7 | Xylenes (total) | 22.4 | 88 | | 0.002 | 172000 | | 0.0002 | 21 | | 0.002 |
| 7440–66–6 | Zinc | 23200 | 99 | | 0.002 | 316 | | 0.3 | 38.4 | | 0.002 |

Appendix D

TABLE D–1.—COMPARISON BETWEEN MODELED EXIT LEVELS AND UNIVERSAL TREATMENT STANDARDS

| CAS | Name | Wastewater | | Nonwastewater | | | |
|---|---|---|---|---|---|---|---|
| | | Exit level (mg/l) | UTS (mg/l) | Exit level (mg/kg) | UTS (mg/kg) | Exit level (mg/l) | UTS (mg/l) |
| 83–32–9 | Acenaphthene | 31 | 0.059 | 9500 | 3.4 | 5 | |
| 67–64–1 | Acetone | 16 | 0.28 | 17000 | 160 | 6 | |
| 75–05–8 | Acetonitrile | 0.78 | 5.6 | 920 | *1.8 | 0.3 | |
| 98–86–2 | Acetophenone | 17 | 0.01 | 1200 | 9.7 | 6 | |
| 107–02–8 | Acrolein | eqc | 0.29 | | | | |
| 107–13–1 | Acrylonitrile | eqc | 0.24 | 0.96 | 84 | eqc | |
| 107–05–1 | Allyl chloride | 0.074 | 0.36 | 260 | 30 | | |
| 62–53–3 | Aniline | 0.053 | 0.81 | 4 | 14 | 0.017 | |
| 7440–36–0 | Antimony | 0.14 | 1.9 | 9 | | 0.053 | 2.1 |
| 7440–38–2 | Arsenic | eqc | 1.4 | eqc | | eqc | 5 |
| 7440–39–3 | Barium | 33 | 1.2 | 2100 | | 16 | 7.6 |
| 56–55–3 | Benz(a)anthracene | 0.00072 | 0.059 | 0.1 | 3.4 | eqc | |
| 71–43–2 | Benzene | 0.018 | 0.14 | 110 | 10 | 0.0054 | |
| 50–32–8 | Benzo(a)pyrene | 0.0023 | 0.061 | 0.23 | 3.4 | eqc | |
| 205–99–2 | Benzo(b)fluoranthene | 0.00081 | 0.11 | 4 | 6.8 | 0.000066 | |
| 7440–41–7 | Beryllium | 0.00083 | 0.82 | eqc | | 0.00032 | 0.014 |
| 39638–32–9 | Bis (2-chloroisopropyl) ether | 0.007 | 0.055 | 0.94 | 7.2 | 0.0019 | |
| 111–44–4 | Bis(2-chlorethyl)ether | 0.00065 | 0.033 | 0.12 | 6 | 0.00036 | |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | 0.00044 | 0.28 | 230 | 28 | 0.0011 | |
| 75–27–4 | Bromodichloromethane | 0.0085 | 0.35 | 19 | 15 | 0.0025 | |
| 75–25–2 | Bromoform (Tribromomethane) | 0.064 | 0.63 | 170 | 15 | 0.018 | |
| 71–36–3 | Butanol | 16 | 5.6 | 18000 | 2.6 | 6 | |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinoseb) | 0.19 | 0.066 | 770 | 2.5 | 0.064 | |
| 85–68–7 | Butylbenzylphthalate | 240 | 0.017 | 87 | 28 | 64 | |
| 7440–43–9 | Cadmium | 0.24 | 0.69 | 14 | | 0.11 | 0.19 |
| 75–15–0 | Carbon disulfide | 0.74 | 3.8 | 330 | | 6 | 4.8 |
| 56–23–5 | Carbon tetrachloride | 0.012 | 0.057 | 9 | 6 | 0.0016 | |
| 57–74–9 | Chlordane | eqc | 0.0033 | 0.0098 | 0.26 | 0.00016 | |
| 126–99–8 | Chloro-1,3-butadiene, 2-(Chloroprene) | 0.52 | 0.057 | 290 | 0.28 | | |
| 106–47–8 | Chloroaniline, p- | 0.42 | 0.46 | 140 | 16 | 0.16 | |
| 108–90–7 | Chlorobenzene | 2 | 0.057 | 2500 | 6 | 1 | |
| 510–15–6 | Chlorobenzilate | 0.054 | 0.1 | | | | |
| 124–48–1 | Chlorodibromomethane | 0.0066 | 0.057 | 28 | 15 | 0.0018 | |
| 67–66–3 | Chloroform | 0.0076 | 0.046 | 7 | 6 | 0.017 | |
| 95–57–8 | Chlorophenol, 2- | 0.9 | 0.044 | 100 | 5.7 | 0.32 | |
| 7440–47–3 | Chromium | 1 | 2.77 | 10 | | 0.48 | 0.86 |
| 218–01–9 | Chrysene | 0.1 | 0.059 | 35 | 3.4 | 0.0012 | |
| 108–39–4 | Cresol, m- | 8 | 0.77 | 22000 | 5.6 | 3 | |
| 95–48–7 | Cresol, o- | 8 | 0.11 | 27000 | 5.6 | 3 | |
| 106–44–5 | Cresol, p- | 0.84 | 0.77 | 2600 | 5.6 | 0.32 | |
| 72–54–8 | DDD | 0.00013 | 0.023 | 0.0065 | 0.087 | 2800 | |
| 72–55–9 | DDE | eqc | 0.031 | 0.00094 | 0.087 | 0.000062 | |
| 50–29–3 | DDT | eqc | 0.0039 | 0.0032 | 0.087 | 0.0054 | |
| 84–74–2 | Di-n-butyl phthalate | 230 | 0.057 | 90000 | 28 | 25 | |
| 117–84–0 | Di-n-octyl phthalate | 0.002 | 0.017 | 4500 | 28 | 0.1 | |
| 96–12–8 | Dibromo-3-choloropropane, 1,2- | 0.00066 | 0.11 | 0.66 | 15 | eqc | |
| 95–50–1 | Dichlorobenzene, 1,2- | 15 | 0.088 | 50000 | 6 | 6 | |
| 106–46–7 | Dichlorobenzene, 1,4- | 0.056 | 0.09 | 64 | 6 | 0.011 | |
| 75–71–8 | Dichlorodifluoromethane | 15 | 0.23 | 8100 | 7.2 | 12 | |
| 75–34–3 | Dichloroethane, 1,1- | 0.00016 | 0.059 | 24 | 6 | 0.00006 | |
| 107–06–2 | Dichloroethane, 1,2- | 0.00016 | 0.21 | 6 | 6 | 0.00006 | |
| 75–35–4 | Dichloroethylene, 1,1- | 0.00059 | 0.025 | 3 | 6 | 0.00018 | |
| 156–60–5 | Dichloroethylene, trans-1,2- | 3 | 0.054 | 14000 | 30 | 1 | |
| 120–83–2 | Dichlorophenol, 2,4- | 0.62 | 0.044 | 770 | 14 | 0.18 | |

TABLE D–1.—COMPARISON BETWEEN MODELED EXIT LEVELS AND UNIVERSAL TREATMENT STANDARDS—Continued

| CAS | Name | Wastewater | | Nonwastewater | | | |
|---|---|---|---|---|---|---|---|
| | | Exit level (mg/l) | UTS (mg/l) | Exit level (mg/kg) | UTS (mg/kg) | Exit level (mg/l) | UTS (mg/l) |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D) | 2 | 0.72 | 3100 | 10 | 0.6 | ..... |
| 78–87–5 | Dichloropropane, 1,2- | 0.023 | 0.85 | 17 | 18 | 0.0023 | ..... |
| 10061–01–5 | Dichloropropene, cis-1,3- | 0.0049 | 0.036 | 3 | 18 | 1200 | ..... |
| 10061–02–6 | Dichloropropene, trans-1,3- | 0.0049 | 0.036 | 3 | 18 | 1200 | ..... |
| 60–57–1 | Dieldrin | 0.000059 | 0.017 | 0.0018 | 0.13 | 0.54 | ..... |
| 84–66–2 | Diethyl phthalate | 190 | 0.2 | 4500 | 28 | 54 | ..... |
| 131–11–3 | Dimethyl phthalate | 78 | 0.047 | 3 | 28 | 30 | ..... |
| 105–67–9 | Dimethylphenol,2,4- | 4 | 0.036 | 11000 | 14 | 1 | ..... |
| 51–28–5 | Dinitrophenol,2,4- | 0.27 | 0.12 | 56 | 160 | 0.11 | ..... |
| 121–14–2 | Dinitrotoluene,2,4- | 0.29 | 0.32 | 210 | 140 | 0.11 | ..... |
| 606–20–2 | Dinitrotoluene,2,6- | 0.17 | 0.55 | 86 | 28 | 0.064 | ..... |
| 123–91–1 | Dioxane,1,4- | 0.042 | *NA | 13 | 170 | 0.014 | ..... |
| 122–39–4 | Diphenylamine | 15 | 0.92 | 12000 | 13 | 3 | ..... |
| 298–04–4 | Disulfoton | 0.013 | 0.017 | 43 | 6.2 | 13 | ..... |
| 72–20–8 | Enndrin | 0.073 | 0.0028 | 0.26 | 0.13 | 32 | ..... |
| 141–78–6 | Ethyl acetate | 390 | 0.34 | 270000 | 33 | 110 | ..... |
| 60–29–7 | Ethyl ether | 27 | 0.12 | 41000 | 160 | 11 | ..... |
| 97–63–2 | Ethyl methacrylate | 24 | 0.14 | 3400 | 160 | 7 | ..... |
| 100–41–4 | Ethylbenzene | 39 | 0.057 | 550000 | 10 | 8 | ..... |
| 206–44–0 | Flouranthene | 28 | 0.068 | 6000 | 3.4 | 2 | ..... |
| 86–73–7 | Flourene | 22 | 0.059 | 90000 | 3.4 | 3 | ..... |
| 76–44–8– | Heptachlor | eqc | 0.0012 | 8 | 0.066 | ..... | ..... |
| 1024–57–3 | Heptachlor epoxide | 0.00053 | 0.016 | 0.026 | 0.066 | 0.45 | ..... |
| 87–68–3 | Hexachloro-1,3-butadiene | 0.0079 | 0.055 | 36 | 5.6 | 0.0069 | ..... |
| 118–74–1 | Hexachlorobenzene | eqc | 0.055 | eqc | 10 | eqc | ..... |
| 319–84–6 | Hexachlorocyclohexane, alpha-(alpha-BHC) | 0.00014 | 0.00014 | 0.033 | 0.066 | 0.11 | ..... |
| 319–85–7 | Hexachlorocyclohexane, beta-(beta-BHC) | 0.00044 | 0.00014 | 0.12 | 0.066 | 0.00021 | ..... |
| 58–89–9 | Hexachlorocyclohexane, gamma-(Lindane) | 0.00078 | 0.0017 | 0.1 | 0.066 | 0.69 | ..... |
| 77–47–4 | Hexachlorocyclopentadiene | 0.0052 | 0.057 | 1500 | 2.4 | ..... | ..... |
| 67–72–1 | Hexachloroethane | 0.049 | 0.055 | 81 | 30 | 0.033 | ..... |
| 193–39–5 | Indeno(1,2,3-cd) pyrene | 0.0029 | 0.0055 | 4 | 3.4 | eqc | ..... |
| 78–83–1 | Isobutyl alcohol | 39 | 5.6 | 55000 | 170 | 15 | ..... |
| 7439–92–1 | Lead | 30 | 0.69 | 570 | ..... | 12 | 0.37 |
| 7439–97–6 | Mercury | 0.3 | 0.15 | 0.6 | ..... | 0.14 | 0.025 |
| 126–98–7 | Methacrylonitrile | 0.016 | 0.24 | ..... | ..... | ..... | ..... |
| 67–56–1 | Methanol | 78 | 5.6 | 140000 | ..... | 30 | 0.75 |
| 72–43–5 | Methoxychlor | 7 | 0.25 | 19 | 0.18 | ..... | ..... |
| 74–83–9 | Methyl bromide (Bromomethane) | 0.37 | 0.11 | 500 | 15 | 0.92 | ..... |
| 74–87–3 | Methyl chloride (Chloromethane) | 0.096 | 0.19 | 91 | 30 | ..... | ..... |
| 78–93–3 | Methyl ethyl ketone | 78 | 0.28 | 110000 | 36 | 30 | ..... |
| 108–10–1 | Methyl isobutyl ketone | 8 | 0.14 | 17000 | 33 | 3 | ..... |
| 80–62–6 | Methyl methacrylate | 28 | 0.14 | 40000 | 160 | 8 | ..... |
| 298–00–0 | Methyl parathion | 0.66 | 0.014 | 1 | 4.6 | 23 | ..... |
| 74–95–3 | Methylene bromide | 2 | 0.11 | 8400 | 15 | 0.19 | ..... |
| 75–09–2 | Methylene chloride | 0.039 | 0.089 | 310 | 30 | 0.015 | ..... |
| 86–30–6 | N-Nitrosodiphenylamine | 0.2 | 0.92 | 1300 | 13 | eqc | ..... |
| 930–55–2 | N-Nitrosopyrrolidine | eqc | 0.013 | 0.053 | 35 | eqc | ..... |
| 91–20–3 | Naphthalene | 14 | 0.059 | 120000 | 5.6 | 3 | ..... |
| 7440–02–0 | Nickel | 11 | 3.98 | 110 | ..... | 5 | 5 |
| 98–95–3 | Nitrobenzene | 0.084 | 0.068 | 45 | 14 | 0.032 | ..... |
| 924–16–3 | Nitrosodi-n-butylamine | ..... | ..... | 0.094 | 17 | eqc | ..... |
| 56–38–2 | Parathion | 3 | 0.014 | 0.13 | 4.6 | 12000 | ..... |
| 608–93–5 | Pentachlorobenzene | 5 | 0.055 | 210 | 10 | eqc | ..... |
| 82–68–8 | Pentachloronitrobenzene (PCNB) | 0.081 | 0.055 | 11 | 4.8 | eqc | ..... |
| 87–86–5 | Pentachlorophenol | 0.002 | 0.089 | 3 | 7.4 | 0.00041 | ..... |
| 108–95–2 | Phenol | 84 | 0.039 | 160000 | 6.2 | 32 | ..... |
| 298–02–2 | Phorate | 0.11 | 0.021 | 160 | 4.6 | ..... | ..... |
| 1336–36–3 | Polychlorinated biphenyls | eqc | 0.1 | eqc | 10 | eqc | ..... |
| 23950–58–5 | Pronamide | 21 | 0.093 | 440 | 1.5 | 6 | ..... |
| 129–00–0 | Pyrene | 54 | 0.067 | 16000 | 8.2 | 2 | ..... |
| 110–86–1 | Pyridine | 0.16 | 0.014 | 810 | 16 | 0.06 | ..... |
| 94–59–7 | Safrole | 0.0035 | 0.081 | 11 | 0.16 | eqc | ..... |
| 7782-49-2 | Selenium | 0.93 | 0.82 | eqc | ..... | 0.36 | 0.16 |
| 7440-22-4 | Silver | 200 | 0.43 | eqc | ..... | ..... | 0.3 |
| 1746-01-6 | TCDD,2,3,7,8 | eqc | 0.000063 | 8.000E-06 | 0.001 | eqc | ..... |
| 95-94-3 | Tetrachlorobenzene, 1,2,4,5- | 0.23 | 0.055 | 170 | 14 | 0.032 | ..... |
| 630-20-6 | Tetrachloroethane, 1,1,1,2- | 0.024 | 0.057 | 130 | 6 | 0.0078 | ..... |
| 79-34-5 | Tetrachloroethane, 1,1,2,2- | 0.0037 | 0.057 | 29 | 6 | 0.0077 | ..... |
| 127-18-4 | Tetrachloroethylene | 2 | 0.056 | 13000 | 6 | 0.68 | ..... |
| 58-90-2 | Tetrachlorophenol, 2,3,4,6- | 2 | 0.03 | 6200 | 7.4 | 0.58 | ..... |
| 7440-28-0 | Thallium (I) | 0.05 | 1.4 | 5 | 0.078 | 0.019 | ..... |
| 108-88-3 | Toluene | 30 | 0.08 | 180000 | 10 | 13 | ..... |
| 8001-35-2 | Toxaphene | eqc | 0.0095 | eqc | 2.6 | 0.11 | ..... |
| 76-13-1 | Trichloro-1,2,2-trifluoroethane, 1,1,2- | 2200 | 0.057 | ..... | 30 | 2400 | ..... |
| 120-82-1 | Trichlorobenzene, 1,2,4- | 0.69 | 0.055 | 3500 | 19 | 1 | ..... |
| 71-55-6 | Trichloroethane, 1,1,1- | 74 | 0.054 | 48000 | 6 | 0.054 | ..... |
| 79-00-5 | Trichloroethane, 1,1,2- | 0.007 | 0.054 | 11 | 6 | 0.0018 | ..... |
| 79-01-6 | Trichloroethylene | 0.038 | 0.054 | 570 | 6 | 0.013 | ..... |
| 75-69-4 | Trichlorofluoromethane | 48 | 0.02 | 26000 | 30 | 16 | ..... |

TABLE D–1.—COMPARISON BETWEEN MODELED EXIT LEVELS AND UNIVERSAL TREATMENT STANDARDS—Continued

| CAS | Name | Wastewater | | Nonwastewater | | | |
|---|---|---|---|---|---|---|---|
| | | Exit level (mg/l) | UTS (mg/l) | Exit level (mg/kg) | UTS (mg/kg) | Exit level (mg/l) | UTS (mg/l) |
| 95-95-4 | Trichlorophenol, 2,4,5- | 18 | 0.18 | 12000 | 7.4 | 4 | ..... |
| 88-06-2 | Trichlorophenol, 2,4,6- | 0.054 | 0.035 | 120 | 7.4 | 0.015 | ..... |
| 93-76-5 | Trichlorophenoxyacetic acid, 2,4,5- (245-T) | 2 | 0.72 | 63 | 7.9 | 0.64 | ..... |
| 93-72-1 | Trichlorophenoxypropionic acid, 2,4,5- (Silvex) | 1 | 0.72 | 6 | 7.9 | 0.48 | ..... |
| 96-18-4 | Trichloropropane, 1,2,3- | 1 | 0.85 | 870 | 30 | 0.34 | ..... |
| 126-72-7 | Tris (2,3-dibromopropyl) phosphate | eqc | 0.11 | 0.36 | 0.1 | eqc | ..... |
| 7440-62-2 | Vanadium | 10 | 4.3 | 250 | ..... | 4 | 0.23 |
| 75-01-4 | Vinyl chloride | eqc | 0.27 | 1 | 6 | eqc | ..... |
| 1330-20-7 | Xylenes (total | 22 | 0.32 | 170000 | 30 | 150 | ..... |
| 7440-66-6 | Zinc | 99 | 2.61 | 320 | ..... | 38 | 5.3 |

For the reasons set out in the preamble, Chapter I of Title 40 of the Code of Federal Regulations is amended as follows:

## PART 260—HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

1. The authority citation for part 260 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921–6927, 6930, 6934, 6935, 6937, 6938, 6939, and 6974.

2. In § 260.10, add the following definitions in alphabetical order:

* * * * *

*Director* means the Regional Administrator or the State Director, as the context requires, or an authorized representative. When there is no approved State program, and there is an EPA administered program, Director means the Regional Administrator. When there is an approved State program, Director normally means the State Director. In some circumstances, however, EPA retains the authority to take certain actions even when there is an approved State program. In such cases, the term Director means the Regional Administrator and not the State Director.

* * * * *

*Monofill* means a landfill where waste of only one kind or type is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground mine, a cave, or a corrective action management unit.

## PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

3. The authority citation for part 261 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6921, and 6922.

4. Section 261.3 is amended by revising the first sentence of paragraph (a)(2)(iv) and the first sentence of paragraph (c)(2)(i) to read as follows:

### § 261.3 Definition of hazardous waste.

* * * * *

(a) * * *

(2) * * *

(iv) It is a mixture of solid waste and one or more hazardous wastes listed in subpart D of this part and has not been excluded from paragraph (a)(2) of this section under either §§ 260.20 and 260.22, § 261.36, or § 261.37 of this chapter; however, the following mixtures of solid wastes and hazardous wastes listed in subpart D of this part are not hazardous wastes (except by application of paragraph (a)(2) (i) or (ii) of this section) if the generator can demonstrate that the mixture consists of wastewater the discharge of which is subject to regulation under either section 402 or section 307(b) of the clean water act (including wastewater at facilities which have eliminated the discharge of wastewater) and:

* * * * *

(c) * * *

(2) * * *

(i) Except as otherwise provided in paragraph (c)(2)(ii) of this section, § 261.36, or § 261.37 of this chapter, any solid waste generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust, or leachate (but not including precipitation run-off) is a hazardous waste. * * *

* * * * *

5. A new § 261.36 is added to subpart D to read as follows:

### § 261.36 Exemption for listed hazardous wastes containing low concentrations of hazardous constituents.

(a) Any hazardous waste listed under this subpart, any mixture of such a listed waste with a solid waste, or any waste derived from the treatment, storage, or disposal of a listed hazardous waste that does not exhibit any of the characteristics of hazardous waste in subpart C of this part 261 and that meets all of the requirements in § 261.36(b)–(d) is exempt from all requirements of parts 262–266 and part 270 of this chapter. Any such waste which also meets the requirements of § 261.36(e) is also exempt from the requirements of part 268 of this chapter.

(b) *Requirements for qualifying for an exemption.*—(1) *Testing.* (i) For each waste for which an exemption is claimed, the claimant must test for all of the constituents on appendix X to this part 261 except those that the claimant determines should not be present in the waste. The claimant is required to document the basis of each determination that a constituent should not be present. No claimant may determine that any of the following categories of constituents should not be present:

(A) Constituents identified in appendix VII to this part 261 as the basis for listing the waste for which exemption is sought;

(B) Constituents listed in the table to § 268.40 of this chapter as regulated hazardous constituents for LDR treatment of the waste;

(C) Constituents detected in any previous analysis of the same waste conducted by or on behalf of the claimant;

(D) Constituents introduced into the process which generates the waste; and

(E) Constituents which the claimant knows or has reason to believe are byproducts or side reactions to the process that generates the waste.

Note: Any claim under this section must be valid and accurate for all hazardous constituents; a determination not to test for a hazardous constituent will not shield a claimant from liability should that constituent later be found in the waste.

(ii) The claimant must develop a sampling and analysis plan for each waste for which an exemption is sought. The plan must identify:

(A) Sampling procedures and locations sufficient to characterize the entire waste for which the exemption is

claimed. Grab sampling is acceptable for this purpose.

(B) Analytical methods that the claimant will use to determine, for wastewaters and nonwastewaters, the total concentration of each constituent on appendix X to this part except for those constituents which the claimant has determined should not be present under § 261.36(b)(1)(i).

(iii) The claimant must conduct sampling and analysis in accordance with the plan.

(iv) The results of the sampling and analysis must show, for both wastewaters and nonwastewaters, that all total constituent concentrations in the waste are at or below the exemption levels in appendix X to this part 261 and, for nonwastewaters, that all leachable constituent concentrations are either:

(A) At or below exemption levels in Appendix X to this part 261, as determined by testing an extract using test method 1311 (the Toxicity Characteristic Leaching Procedure, set out in ''Test Methods for Evaluating Solid Waste, Physical/Chemical Methods'' (SW–846)), or

(B) Estimated to be at or below exemption levels using the equation {[(A×B)+(C×D)]/[B+(20×D)]} leach exit level, where A=concentration of the analyte in the liquid portion of the sample; B=Volume of the liquid portion of the sample; C=Concentration of the analyte in the solid portion of the sample; D=Weight of the solid portion of the sample.

(2) *Treatment requirements.* Any waste that exits using an exit level on Table B to appendix X to this part 261 must meet the treatment standard for such a constituent under § 268.40 of this chapter, regardless of whether or not the waste is intended for land disposal, unless the claimant meets the exemption requirements in § 261.36(e).

(3) *Public Notice.* The claimant must submit for publication in a major newspaper of general circulation, local to the claimant, a notice entitled ''Notification of Exemption Claim for Listed Hazardous Wastes Containing Low Concentrations of Hazardous Constituents Under the Resource Conservation and Recovery Act'' containing the following information:

(i) The name, address, and RCRA ID number of the claimant's facility;

(ii) The applicable EPA Hazardous Waste Code of the waste for which the exemption is claimed and the narrative description associated with the listing from this part 261 subpart D;

(iii) A brief, general description of the manufacturing, treatment, or other process or operation producing the waste;

(iv) An estimate of the average and maximum monthly and annual quantities of the waste claimed to be exempt;

(v) The name and mailing address of the agency to which the claimant is submitting the notification required under § 261.36(b)(4).

(4) *Notification to implementing agency.* Prior to managing any waste as exempt under this section, the claimant must send to the Director via certified mail or other mail service that provides written confirmation of delivery a notification of the exemption claim meeting the following requirements:

(i) The name, address, and RCRA ID number of the person claiming the exemption;

(ii) The applicable EPA Hazardous Waste Codes;

(iii) A brief description of the process that generated the waste;

(iv) An estimate of the average and maximum monthly and annual quantities of each waste claimed to be exempt;

(v) Documentation for any claim that a constituent is not present as described under § 261.36 (b)(1)(i);

(vi) The results of all analyses and estimates of constituent concentrations required under § 261.36(b)(1)(iv) and all quantitation limits achieved;

(vii) Documentation that any waste that exits using a constituent exit level from Table B to Appendix X to this part has met the applicable treatment standards in § 268.40 of this chapter, unless the claimant is also claiming the exemption under § 261.36(e);

(viii) Evidence that the public notification requirements of § 261.36(b)(3) have been satisfied; and

(ix) The following statement signed by the person claiming the exemption or his authorized representative:

''Under penalty of criminal and civil prosecution for making or submitting false statements, representations, or omissions, I certify that the requirements of 40 CFR 261.36(b) have been met for all waste identified in this notification. Copies of the records and information required at 40 CFR 261.36(d)(7) are available at the claimant's facility. Based upon my inquiry of the individuals immediately responsible for obtaining the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.''

(c) *Effectiveness of exemption.* No claim shall take effect until the claimant receives confirmation of delivery for the notification required under § 261.36 (b)(4).

(d) *Conditions for maintaining the exemption.* To maintain any exemption claimed pursuant to this section, the claimant must satisfy the following conditions:

(1) *Changes in information.* The claimant must submit to the Director any change in any information submitted under § 261.36(b)(4) within ten business days of the claimant's first knowledge of the change.

(2) *Schedule for retesting.* The claimant must retest the waste for which the exemption was claimed on the following schedule:

(i) For the first three years of the exemption, the claimant must:

(A) Test wastes generated at the time the exemption is claimed in volumes greater than 10,000 tons/year on a quarterly basis;

(B) Test wastes generated at the time the exemption is claimed in volumes greater than 1000 tons/year but less than 10,000 tons/year must on a semi-annual basis;

(C) Test wastes generated at the time the volume is claimed in volumes less than 1000 tons/year on an annual basis.

(ii) After the first three years of an exemption, the claimant must retest the waste for which the exemption was claimed on an annual basis.

(3) For every retest the claimant must prepare and comply with a sampling and analysis plan meeting the requirements of § 261.36(b)(1)(ii) and determine the concentration of:

(i) Each constituent from Table A to appendix X to this part that was detected in the initial test within an order of magnitude below either its total or leachable exemption level and each constituent from Table B to appendix X of this part that is identified as a basis for listing the waste on appendix VII to this part or is listed as a regulated hazardous constituent for the waste in the table of ''Treatment Standards for Hazardous Wastes'' in § 268.40 of this chapter; and

(ii) Any other constituent that the claimant has reason to believe may be newly present in the waste since the most recent test.

(4) *Exemption levels.* The concentrations of all constituents tested must meet the criteria set out in § 261.36(b)(1)(iv).

(5) *Treatment requirements.* Any waste exiting by using an exit level for a hazardous constituent from Table B to appendix X to this part must meet the treatment requirements for such a constituent under § 268.40 of this chapter prior to exit regardless of whether or not the waste is intended for land disposal, unless the claimant meets

the exemption requirements in § 261.36(e).

(6) *Records.* The claimant must maintain records of the following information in files on-site for three years after the date of the relevant test:

(i) For initial testing, all information submitted under § 261.36(b)(4), all revisions to such material submitted under § 261.36(d)(1) and all information required to be maintained under § 261.36(d)(6)(iii);

(ii) For retests:

(A) All volume determinations made for the purpose of determining testing frequency under § 261.36(d)(2);

(B) All sampling and analysis plans required under § 261.36(d)(3);

(C) All analytical results and estimates of leachable concentrations (if any) for constituents required to be assessed under § 261.35(d)(3);

(D) Documentation showing that a waste exiting using any constituent exit level from Table B to appendix X to this part and is required to be reassessed under § 261.36(d)(3) has met applicable treatment standards under § 268.40 of this chapter, unless the claimant also claims the exemption under § 261.36(e); and

(iii) For both initial tests and retests, the claimant must also retain records of:

(A) The dates and times waste samples were obtained, and, for total concentrations and leachable concentrations that were analyzed, the dates of the analyses;

(B) The names and qualifications of the person(s) who obtained the samples;

(C) A description of the temporal and spatial locations of the samples;

(D) The name and address of the laboratory facility at which analyses of the samples were performed;

(E) A description of the analytical methods used, including any clean-up and extraction methods;

(F) All quantitation limits achieved and all other quality control results (including any method blanks, duplicate analyses, and matrix spikes), laboratory quality assurance data, and a description of any deviations from published analytical methods or from the plan which occurred; and

(G) All laboratory documentation that supports the analytical results, unless a contract between the claimant and the laboratory provides for the documentation to be maintained by the laboratory for the period specified in § 261.36 (b)(2) and also provides for the availability of the documentation to the claimant upon request.

Note: Failure to satisfy any of these conditions voids the exemption and requires management of the waste for which the exemption has been claimed as hazardous waste. Submission of notification to the Director that all waste conditions have been satisfied re-establishes the exemption for all waste generated after that date.

(e) Exemption from part 268 requirements.—If all hazardous constituent levels in a waste qualifying for exemption are at or below the appendix X to this part concentration levels at the waste's point of generation, prior to any mixing with other solid or hazardous wastes and prior to any treatment, the waste is exempt from all requirements of part 268 of this chapter. The claimant also must meet the following documentation requirements:

(1) For initial tests, in place of the certification required at § 261.36 (b)(4)(ix), the claimant must submit the following statement signed by the person claiming the exemption or his authorized representative and, if the claimant is not the generator of the waste, also signed by the generator or his authorized representative:

Under penalty of criminal and civil prosecution for making or submitting false statements, representations, or omissions, I certify that, for the waste identified in this notification, the concentration of all constituents assessed as required under § 261.36 (b)(1)(iv) met the applicable levels in appendix X to this part 261 at the point of generation and that all other requirements of 40 CFR § 261.36 (b) have been met. Copies of the records and information required at 40 CFR § 261.36 (d)(4) are available at the claimant's facility. Based upon my inquiry of the individuals immediately responsible for obtaining the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.''; or

(2) For every retest required under § 261.36(d)(2), the claimant must document that the concentrations of all constituents retested as required under § 261.36(d)(3) met the applicable levels in appendix X to this part 261 at the waste's point of generation, must include information supporting this claim from the waste's generator if the generator is not the person asserting the claim, and must retain such documentation in files on-site for three years after the date of the relevant test.

(f) Nothing in this paragraph preempts, overrides, or otherwise negates the provision in § 262.11 of this chapter, which requires any person who generates a solid waste to determine if that waste is a hazardous waste.

(g) In an enforcement action, the burden of proof to establish conformance with the exemption criteria shall be on the claimant.

6. A new § 261.37 is added to read as follows:

**§ 261.37 Exemption for listed hazardous wastes containing low concentrations of hazardous constituents and managed in landfills and monofills.**

(a) Any hazardous waste listed under this subpart, any mixture of such a listed waste with a solid waste, or any waste derived from the treatment, storage or disposal of such a listed waste is exempt from regulation as a hazardous waste under parts 262–266 and 270 of this chapter if it meets the requirements in § 261.37(b) and (d) (including the requirement that all hazardous constituents present in the waste be at or below the levels listed in appendix XI to this part and that the waste be disposed in a landfill or monofill, but not a land application unit). To maintain the exemption, the waste must satisfy the conditions in § 261.37(e). Any such waste which also meets the requirements of 261.37(f) is also exempt from the requirements of part 268 of this chapter.

(b) *Requirements for qualifying for an exemption*—(1) *Testing.* (i) For each waste for which an exemption is claimed, the claimant must test for all of the constituents on appendix XI to this part 261 except those that the claimant determines should not be present in the waste. The claimant is required to document the basis of each determination that a constituent should not be present. No claimant may determine that any of the following categories of constituents should not be present:

(A) Constituents identified in appendix VII to this part 261 as the basis for listing the waste for which exemption is sought;

(B) Constituents listed in the table to § 268.40 as regulated hazardous constituents for LDR treatment of the waste;

(C) Constituents detected in any previous analysis of the same waste conducted by or on behalf of the claimant;

(D) Constituents introduced into the process which generates the waste; and

(E) Constituents which the claimant knows or has reason to believe are byproducts or side reactions to the process that generates the waste.

Note: Any claim under this section must be valid and accurate for all hazardous constituents; a determination not to test for a hazardous constituent will not shield a claimant from liability should that constituent later be found in the waste.

(ii) The claimant must develop a sampling and analysis plan for each

waste for which an exemption is sought. The plan must identify:

(A) Sampling procedures and locations sufficient to characterize the entire waste for which the exemption is claimed. Grab sampling is acceptable for this purpose.

(B) Analytical methods that the claimant will use to determine, for wastewaters and nonwastewaters, the total concentration of each constituent on appendix XI to this part except for those constituents which the claimant has determined should not be present under § 261.37(b)(1)(i).

(iii) The claimant must conduct sampling and analysis in accordance with the plan.

(iv) The results of the sampling and analysis must show, for both wastewaters and nonwastewaters, that all total constituent concentrations in the waste are at or below the exemption levels in appendix XI to this part 261 and, for nonwastewaters, that all leachable constituent concentrations are either:

(A) At or below exemption levels in appendix XI to this Part 261, as determined by testing an extract using test method 1311 (the Toxicity Characteristic Leaching Procedure, set out in ''Test Methods for Evaluating Solid Waste, Physical/Chemical Methods'' (SW–846)), or

(B) Estimated to be at or below exemption levels using the equation {(AxB)+(CxD)}/{B+(20xD)} < leach exit level, where A=concentration of the analyte in the liquid portion of the sample; B = Volume of the liquid portion of the sample; C=Concentration of the analyte in the solid portion of the sample; D = Weight of the solid portion of the sample.

(2) *Treatment requirements.* Any waste that exits using an exit level on Table B to appendix XI to this Part 261 must meet the treatment standard for such a constituent under § 268.40 of this chapter, regardless of whether or not the waste is intended for land disposal, unless the claimant meets the exemption requirements in § 261.37(f).

(3) *Public Notice.* The claimant must submit for publication in a major newspaper of general circulation, local to the claimant, a notice entitled ''Notification of Exemption Claim for Listed Hazardous Wastes Containing Low Concentrations of Hazardous Constituents and Managed in Landfills and Monofills Under the Resource Conservation and Recovery Act'' containing the following information:

(i) The name, address, and RCRA ID number of the claimant's facility;

(ii) The applicable EPA Hazardous Waste Code of the waste for which the exemption is claimed and the narrative description associated with the listing from this part 261 subpart D;

(iii) A brief, general description of the manufacturing, treatment, or other process or operation producing the waste;

(iv) An estimate of the average and maximum monthly and annual quantities of the waste claimed to be exempt;

(v) The name and mailing address of the agency to which the claimant is submitting the notification required under § 261.37(b)(4);

(vi) The following statement:

The exemption for this waste from the hazardous waste regulatory scheme is conditioned disposing of the waste in a landfill or monofill (and not a land application unit.)

(4) *Notification to implementing agency.* Prior to managing any waste as exempt under this section, the claimant must send to the Director via certified mail or other mail service that provides written confirmation of delivery a notification of the exemption claim meeting the following requirements:

(i) The name, address, and RCRA ID number of the person claiming the exemption;

(ii) The applicable EPA Hazardous Waste Codes;

(iii) A brief description of the process that generated the waste;

(iv) An estimate of the average and maximum monthly and annual quantities of each waste claimed to be exempt;

(v) Documentation for any claim that a constituent is not present as described under § 261.37(b)(1)(i);

(vi) The results of all analyses and estimates of constituent concentrations required under § 261.37(b)(1)(iv) and all quantitation limits achieved;

(vii) Documentation that any waste that exits using a constituent exit level from Table B to appendix XI to this part have met the applicable treatment standards in § 268.40, of this chapter, unless the claimant is also claiming the exemption under § 261.37(f);

(viii) Evidence that the public notification requirements of § 261.37(b)(3) have been satisfied; and

(ix) The following statement signed by the person claiming the exemption or his authorized representative:

Under penalty of criminal and civil prosecution for making or submitting false statements, representations, or omissions, I certify that the requirements of § 261.37(b) have been met, including the requirement that all hazardous constituents present in the waste are at or below the levels listed on appendix XI to this part, for all listed wastes identified in this notification. I also certify that arrangements have been made to dispose of the waste in a landfill or monofill (and not a land application unit). Copies of the records and information required at § 261.37 (e)(7) are available) at the claimant's facility. Based upon my inquiry of the individuals immediately responsible for obtaining the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(5) The claimant must receive confirmation of delivery for the notification required under § 261.37 (b)(4).

(c) *Tracking, storage, treatment and other management prior to disposal.* Until a listed hazardous waste meeting the requirements of § 261.37(b) is placed in a landfill or monofill, it remains subject to all requirements of parts 262–266 and 270 of this chapter. The waste is also subject to the requirements of part 268 of this chapter unless it qualifies for an exemption under § 261.37(f).

(d) *Disposal in a landfill or monofill.* The claimant must ensure that any listed waste meeting the requirements of § 261.37(b) for which an exemption is sought is disposed of in either a landfill or monofill (and not a land application unit). The landfill or monofill need not be subject to regulation as a hazardous waste management unit. The waste becomes exempt as soon as it is placed in a landfill or monofill unit.

(e) *Conditions for maintaining the exemption.* To maintain any exemption claimed pursuant to this section, the claimant must satisfy the following conditions:

(1) *Compliance with modified hazardous waste manifest system.* If the landfill or monofill in which the waste is disposed is not a hazardous waste disposal unit subject to part § 264.71–264.72 or § 265.71–265.72 of this chapter, the claimant must:

(i) Ensure that the manifest form is returned from the disposal facility, and

(ii) Obtain information showing that the disposal facility designated on the manifest received the waste for which the exemption is sought and placed it in either a landfill or monofill (and not a land treatment unit).

(2) *Changes in information.* The claimant must submit to the Director any change in any information submitted under § 261.37(b)(4) within ten business days of the claimant's first knowledge of the change.

(3) *Schedule for retesting.* The claimant must retest the waste for which the exemption was claimed on the following schedule:

(i) For the first three years of the exemption, the claimant must:

(A) Test wastes generated at the time the exemption is claimed in volumes greater than 10,000 tons/year on a quarterly basis;

(B) Test wastes generated at the time the exemption is claimed in volumes greater than 1000 tons/year but less than 10,000 tons/year must on a semi-annual basis;

(C) Test wastes generated at the time the volume is claimed in volumes less than 1000 tons/year on an annual basis.

(ii) After the first three years of an exemption, the claimant must retest the waste for which the exemption was claimed on an annual basis.

(4) For every retest the claimant must prepare and comply with a sampling and analysis plan meeting the requirements of § 261.37(b)(1)(ii) and determine the concentration of:

(i) Each constituent from Table A to appendix XI to this part that was detected in the initial test within an order of magnitude below either its total or leachable exemption level and each constituent from Table B to appendix XI to this part that is identified as a basis for listing the waste on appendix VII to this part or is listed as a regulated hazardous constituent for the waste in the table of ''Treatment Standards for Hazardous Wastes'' in § 268.40 of this chapter; and

(ii) Any other constituent that the claimant has reason to believe may be newly present in the waste since the most recent test.

(5) Exemption levels.—The concentrations of all constituents tested must meet the criteria set out in § 261.37(b)(1)(iv).

(6) Treatment requirements.—Any waste exiting by using an exit level for a hazardous constituent from Table B to Appendix XI to this part must meet the treatment requirements for such a constituent under § 268.40 of this chapter prior to exit regardless of whether or not the waste is intended for land disposal, unless the claimant meets the exemption requirements in § 261.37(f).

(7) Records.—The claimant must maintain records of the following information in files on-site for three years after the date of the relevant test:

(i) For initial testing, all information submitted under § 261.37(b)(4) and all revisions to such material submitted under § 261.37(e)(2), all information obtained under § 261.37(e)(1), and all information required to be maintained under § 261.37(e)(7)(iii);

(ii) For retests:

(A) All volume determinations made for the purpose of determining testing frequency under § 261.37(e)(3);

(B) All sampling and analysis plans required under § 261.37(e)(4);

(C) All analytical results and estimates of leachable concentrations (if any) for constituents required to be assessed under § 261.37 (e)(5);

(D) Documentation showing that a waste exiting using any constituent exit level from Table B to Appendix XI to this part has met applicable treatment standards under § 268.40 of this chapter, unless the claimant also claims the exemption under § 261.37(f); and

(iii) For both initial tests and retests, the claimant must also retain records of:

(A) The dates and times waste samples were obtained, and, for total concentrations and leachable concentrations that were analyzed, the dates of the analyses;

(B) The names and qualifications of the person(s) who obtained the samples;

(C) A description of the temporal and spatial locations of the samples;

(D) The name and address of the laboratory facility at which analyses of the samples were performed;

(E) A description of the analytical methods used, including any clean-up and extraction methods;

(F) All quantitation limits achieved and all other quality control results (including any method blanks, duplicate analyses, and matrix spikes), laboratory quality assurance data, and a description of any deviations from published analytical methods or from the plan which occurred; and

(G) All laboratory documentation that supports the analytical results, unless a contract between the claimant and the laboratory provides for the documentation to be maintained by the laboratory for the period specified in § 261.37 (b)(2) and also provides for the availability of the documentation to the claimant upon request. Failure to satisfy any of these conditions voids the exemption and requires management of the waste for which the exemption has been claimed as hazardous waste. Submission of notification to the Director that all waste conditions have been satisfied re-establishes the exemption for all waste generated after that date.

(f) Exemption from part 268 requirements.—If all hazardous constituent levels in a waste qualifying for exemption are at or below the appendix XI to this part concentration levels at the waste's point of generation, prior to any mixing with other solid or hazardous wastes and prior to any treatment, the waste is exempt from all requirements of part 268 of this chapter. The claimant also must meet the following documentation requirements:

(1) For initial tests, in place of the certification required at § 261.37 (b)(4)(ix), the claimant must submit the following statement signed by the person claiming the exemption or his authorized representative and, if the claimant is not the generator of the waste, also signed by the generator or his authorized representative:

Under penalty of criminal and civil prosecution for making or submitting false statements, representations, or omissions, I certify that, for the waste identified in this notification, the concentration of all constituents assessed as required under § 261.37 (b)(1)(iv) met the applicable levels in appendix XI to this part 261 at the point of generation and that all other requirements of 40 CFR 261.37 (b) have been met. I also certify that arrangements have been made to dispose of the waste in a landfill or monofill (and not a land application unit). Copies of the records and information required at 40 CFR 261.37 (e)(7) are available at the claimant's facility. Based upon my inquiry of the individuals immediately responsible for obtaining the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.''; and

(2) For every retest required under § 261.37(e)(3), the claimant must document that the concentrations of all constituents retested as required under § 261.37(e)(4) met the applicable levels in appendix XI to this part 261 at the waste's point of generation, must include information supporting this claim from the waste's generator if the generator is not the person asserting the claim, and must retain such documentation in files on-site for three years after the date of the relevant test.

(g) Nothing in this paragraph preempts, overrides, or otherwise negates the provision in § 262.11 of this chapter, which requires any person who generates a solid waste to determine if that waste is a hazardous waste.

(h) In an enforcement action, the burden of proof to establish conformance with the exemption criteria shall be on the claimant.

7. Appendix X is added to read as follows:

# Appendix X

## TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 83–32–9 | Acenaphthene | 31 | 9500 | 5 | 31 | 9500 | 5 |
| 208–96–8 | Acenaphthylene | (1) | 4 | (1) | (1) | 4 | (1) |
| 67–64–1 | Acetone | 16 | 17000 | 6 | 16 | 17000 | 6 |
| 75–05–8 | Acetonitrile | 0.78 | 920 | 0.3 | 0.78 | 920 | 0.3 |
| 98–86–2 | Acetophenone | 17 | 1200 | 6 | 17 | 1200 | 6 |
| 75–36–5 | Acetyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–08–2 | Acetyl-2-thiourea, 1- | (1) | (1) | 6 | (1) | (1) | 6 |
| 53–96–3 | Acetylaminofluorene, 2- | 0.028 | 3 | (1) | 0.028 | 3 | (1) |
| 107–02–8 | Acrolein | (1) | 3 | ..... | (1) | 3 | ..... |
| 79–06–1 | Acrylamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–13–1 | Acrylonitrile | (1) | 0.96 | (1) | (1) | 0.96 | (1) |
| 1402–68–2 | Aflatoxins | (1) | (1) | (1) | (1) | (1) | (1) |
| 116–06–3 | Aldicarb | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 309–00–2 | Aldrin | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–18–6 | Allyl Alcohol | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–05–1 | Allyl chloride | 0.074 | 260 | ..... | 0.074 | 260 | ..... |
| 92–67–1 | Aminobiphenyl, 4- | 0.028 | 3 | (1) | 0.028 | 3 | (1) |
| 2763–96–4 | Aminomethyl-3-isoxazolol, 5- | (1) | (1) | (1) | (1) | (1) | (1) |
| 504–24–5 | Aminophyridine, 4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 61–82–5 | Amitrole | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–53–3 | Aniline | 0.053 | 4 | 0.017 | 0.053 | 4 | 0.017 |
| 120–12–7 | Anthracene | (1) | 4 | (1) | (1) | 4 | (1) |
| 7440–36–0 | Antimony | 0.14 | 9 | 0.053 | 0.14 | 9 | 0.053 |
| 140–57–8 | Aramite | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 7440–38–2 | Arsenic | 0.38 | (1) | 0.15 | (1) | (1) | (1) |
| 2465–27–2 | Auramine | (1) | (1) | (1) | (1) | (1) | (1) |
| 115–02–6 | Azaserine | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–39–3 | Barium | 28 | 2100 | 11 | 33 | 2100 | 16 |
| 71–43–2 | Benzene | 0.021 | 110 | 0.009 | 0.018 | 110 | 0.0054 |
| 92–87–5 | Benzidine | (1) | (1) | (1) | (1) | (1) | (1) |
| 106–51–4 | Benzoquinone, p- | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 98–07–7 | Benzotrichloride | (1) | 140 | (1) | (1) | 140 | (1) |
| 50–32–8 | Benzo(a)pyrene | 0.0023 | 0.23 | 0.0036 | 0.0023 | 0.23 | (1) |
| 205–99–2 | Benzo(b)- fluoranthene | 0.00081 | 4 | 0.000066 | 0.00081 | 4 | 0.000066 |
| 205–82–3 | Benzo(j)- fluoranthene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 207–08–9 | Benzo(k)- fluoranthene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 191–24–2 | Benzo[g,h,i]- perylene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 100–51–6 | Benzyl alcohol | 39 | 2700 | 15 | 39 | 2700 | 15 |
| 100–44–7 | Benzyl chloride | 1 | 38 | 15 | 1 | 38 | 15 |
| 56–55–3 | Benz(a) anthracene | 0.00072 | 0.1 | (1) | 0.00072 | 0.1 | (1) |
| 225–51–4 | Benz[c]acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 7440–41–7 | Beryllim | 0.00083 | (1) | o.00032 | 0.00083 | (1) | 0.00032 |
| 39638–32–9 | Bis (2-chloroisopropyl) ether | 0.007 | 0.94 | 0.0019 | 0.007 | 0.94 | 0.0019 |
| 111–44–4 | Bis(2-chlorethyl)ether | 0.00065 | 0.12 | 0.00036 | 0.00065 | 0.12 | 0.00036 |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | 0.00044 | 230 | 0.11 | 0.00044 | 230 | 0.0011 |
| 542–88–1 | Bis(chloromethyl) ether | (1) | (1) | (1) | (1) | (1) | (1) |
| 598–31–2 | Bromoacetone | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 75–27–4 | Bromodichloromethane | 0.0085 | 19 | 0.0025 | 0.0085 | 19 | 0.0025 |
| 75–25–2 | Bromoform (Tribromomethane) | 0.064 | 170 | 0.018 | 0.064 | 170 | 0.018 |
| 101–55–3 | Bromophyenyl ether, 4- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 357–57–3 | Brucine | (1) | (1) | (1) | (1) | (1) | (1) |
| 71–36–3 | Butanol | 16 | 1800 | 6 | 16 | 18000 | 6 |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinoseb) | 0.034 | 770 | 0.011 | 0.19 | 770 | 0.064 |
| 85–68–7 | Butylbenzylphthalate | 240 | 87 | 64 | 240 | 87 | 64 |
| 7440–43–9 | Cadmium | 0.038 | 14 | 0.015 | 0.24 | 14 | 0.11 |
| 86–74–8 | Carbazole | (1) | (1) | (1) | (1) | (1) | (1) |

**Appendix X**—Continued

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 75–15–0 | Carbon disulfide | 0.74 | 330 | 6 | 0.74 | 330 | 6 |
| 353–50–4 | Carbon oxyfluoride | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–23–5 | Carbon tetrachloride | 0.012 | 9 | 0.012 | 0.012 | 9 | 0.0016 |
| 75–87–6 | Chloral | (1) | (1) | (1) | (1) | (1) | (1) |
| 305–03–3 | Chlorambucil | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–74–9 | Chlordane | (1) | 0.0098 | 0.036 | (1) | 0.0098 | 0.00016 |
| 494–03–1 | Chlornaphazin | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–99–8 | Chloro-1,3-butadiene, 2-(Chloroprene) | 0.52 | 290 | ..... | 0.52 | 290 | ..... |
| 107–20–0 | Chloroacetaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 106–47–8 | Chloroaniline, p- | 0.42 | 140 | 0.16 | 0.42 | 140 | 0.16 |
| 108–90–7 | Chlorobenzene | 0.68 | 2500 | 0.19 | 2 | 2500 | 1 |
| 510–15–6 | Chlorobenzilate | 0.054 | 7 | 0.0057 | 0.054 | 7 | 0.0057 |
| 124–48–1 | Chlorodibromomethane | 0.0066 | 28 | 0.0018 | 0.0066 | 28 | 0.0018 |
| 75–00–3 | Chloroethane (ethyl chloride) | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 110–75–8 | Chloroethyl vinyl ether, 2- | (1) | 140 | (1) | (1) | 140 | (1) |
| 67–66–3 | Chloroform | 0.0076 | 7 | 0.017 | 0.0076 | 7 | 0.017 |
| 59–50–7 | Chloro-m-cresol, p- | 0.27 | 140 | 0.033 | 0.081 | 140 | 0.032 |
| 107–30–2 | Chloromethyl methyl ether | (1) | 31 | (1) | (1) | 31 | (1) |
| 91–58–7 | Chloronaphthalene, 2- | 0.27 | 140 | 0.033 | 0.081 | 140 | 0.032 |
| 95–57–9 | Chlorophenol, 2- | 0.9 | 100 | 0.32 | 0.9 | 100 | 0.32 |
| 7005–72–3 | Chlorophenyl phenyl ether, 4- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 5344–82–1 | Chlorophenyl thiourea, 1-0- | (1) | (1) | (1) | (1) | (1) | (1) |
| 542–76–7 | Chloropropionitrile, 3- | 0.27 | 140 | (1) | (1) | 140 | (1) |
| 7440–47–3 | Chromium | 0.62 | 10 | 0.24 | 1 | 10 | 0.48 |
| 218–01–9 | Chrysene | 0.1 | 35 | 0.0012 | 0.1 | 35 | 0.0012 |
| 6358–53–8 | Citrus red No. 2 | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–48–4 | Cobalt | 0.62 | 9 | (1) | 1 | 9 | (1) |
| 7440–50–8 | Copper | 670 | 6 | 1100 | 670 | 6 | 1100 |
| 108–39–4 | Cresol, m- | 8 | 22000 | 3 | 8 | 22000 | 3 |
| 95–48–7 | Cresol, o- | 8 | 27000 | 3 | 8 | 27000 | 3 |
| 106–44–5 | Cresol, p- | 0.84 | 2600 | 0.32 | 0.84 | 2600 | 0.32 |
| 4170–30–3 | Crotonaldehyde | 8 | 1200 | 6 | 8 | 1200 | 6 |
| 57–12–5 | Cyanide | (1) | 20 | (1) | (1) | 20 | (1) |
| 14901–08–7 | Cycasin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–94–1 | Cyclohexanone | (1) | (1) | (1) | (1) | (1) | (1) |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–18–0 | Cyclophosphamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 20830–81–3 | Daunomycin | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–54–8 | DDD | 0.00013 | 0.0065 | 2800 | 0.00013 | 0.0065 | 2800 |
| 53–19–0 | DDD (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–55–9 | DDE | (1) | 0.00094 | 0.000062 | (1) | 0.00094 | 0.00062 |
| 3424–82–6 | DDE (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–29–3 | DDT | (1) | 0.0032 | 0.0054 | (1) | 0.0032 | 0.0054 |
| 789–02–6 | DDT (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 2303–16–4 | Diallate | 0.26 | 1 | 0.46 | 0.26 | 1 | 0.46 |
| 132–64–9 | Dibenzofuran | 8 | 27000 | 2 | 8 | 27000 | 3 |
| 192–64–9 | Dibenzo[a,e]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 189–64–0 | Dibenzo[a,h]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 189–55–9 | Dibenzo[a,i]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 194–59–2 | Dibenzo[c,g]carbazole, 7H- | (1) | 4 | (1) | (1) | 4 | (1) |
| 226–36–8 | Dibenz(a,h)acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 53–70–3 | Dibenz(a,h)anthracene | (1) | (1) | (1) | (1) | (1) | (1) |
| 224–42–0 | Dibenz[a,j]acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 96–12–8 | Dibromo-3-chloropropane, 1,2- | 0.0022 | 0.66 | 0.00038 | 0.00066 | 0.66 | (1) |
| 764–41–0 | Dichloro-2-butene, 1,4- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.016 |
| 110–57–6 | Dichloro-2-butene, trans-1,4- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 96–23–1 | Dichloro-2-propanol, 1,3- | 0.27 | 140 | 0.033 | 0.081 | 140 | 0.032 |
| 95–50–1 | Dichlorobenzene, 1,2- | 8 | 50000 | 2 | 15 | 50000 | 6 |
| 541–73–1 | Dichlorobenzene, 1,3- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 106–46–7 | Dichlorobenzene, 1,4- | 1 | 64 | 0.22 | 0.056 | 64 | 0.011 |
| 91–94–1 | Dichlorobenzidine, 3,3′) | 0.0037 | (1) | (1) | 0.0037 | (1) | (1) |
| 75–71–8 | Dichlorodifluoromethane | 15 | 8100 | 12 | 15 | 8100 | 12 |
| 75–34–3 | Dichloroethane, 1,1- | 0.00016 | 24 | 0.0006 | 0.00016 | 24 | 0.00006 |
| 107–06–2 | Dichloroethane, 1,2- | 0.007 | 6 | 0.009 | 0.00016 | 6 | 0.00006 |
| 75–35–4 | Dichloroethylene, 1,1- | 0.0035 | 3 | 0.013 | 0.00059 | 3 | 0.00018 |
| 156–59–2 | Dichloroethylene, cis-1,2- | 0.29 | 5400 | 0.11 | 2 | 5400 | 0.64 |
| 156–60–5 | Dichloroethylene, trans-1,2- | 0.42 | 14000 | 0.16 | 3 | 14000 | 1 |
| 111–91–1 | Dichloromethoxy ethane | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 98–87–3 | Dichloromethylbenzene (benzal chloride) | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 120–83–2 | Dichlorophenol, 2,4- | 0.62 | 770 | 0.18 | 0.62 | 770 | 0.18 |
| 87–65–0 | Dichlorophenol, 2,6- | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D) | 0.27 | 3100 | 0.11 | 2 | 3100 | 0.6 |
| 78–87–5 | Dichloropropane, 1,2- | 0.12 | 17 | 0.012 | 0.023 | 17 | 0.0023 |
| 542–75–6 | Dichloropropene, 1,3- | 0.0028 | 32 | (1) | 0.0028 | 32 | (1) |
| 10061–01–5 | Dichloropropene, cis-1,3- | 0.0049 | 3 | 1200 | 0.0049 | 3 | 1200 |
| 10061–02–6 | Dichloropropene, trans-1,3- | 0.0049 | 3 | 1200 | 0.0049 | 3 | 1200 |
| 60–57–1 | Dieldrin | 0.000059 | 0.0018 | 0.54 | 0.000059 | 0.0018 | 0.54 |
| 1464–53–5 | Diepoxybutane, 1,2,3,4- (2,2'-bioxirane) | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 84–66–2 | Diethyl phthalate | 190 | 4500 | 54 | 190 | 4500 | 54 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–53–1 | Diethylstilbestrol | (1) | (1) | (1) | (1) | (1) | (1) |
| 94–58–6 | Dihydrosafrole | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 60–51–5 | Dimethoate | 29 | 2 | 0.77 | 29 | 2 | 0.77 |
| 131–11–3 | Dimethyl phthalate | 78 | 3 | 30 | 78 | 3 | 30 |
| 77–78–1 | Dimethyl sulfate | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–11–7 | Dimethylaminoazobenzene, p- | 0.028 | 3 | (1) | 0.028 | 3 | (1) |
| 119–93–7 | Dimethylbenzidine, 3,3' | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–97–6 | Dimethylbenz(a)anthracene, 7,12 | (1) | (1) | (1) | (1) | (1) | (1) |
| 79–44–7 | Dimethylcarbamoyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 122–09–8 | Dimethylphenethylamine, alpha, alpha- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 105–67–9 | Dimethylphenol, 2,4- | 4 | 11000 | 1 | 4 | 11000 | 1 |
| 119–90–4 | Dimethyoxybenzidine, 3,3- | 0.034 | (1) | 0.01 | 0.034 | (1) | 0.01 |
| 84–74–2 | Di-n-butyl phthalate | 880 | 90000 | 100 | 230 | 90000 | 25 |
| 99–65–0 | Dinitrobenzene, 1,3- | 0.017 | 6 | 0.0064 | 0.017 | 6 | 0.0064 |
| 100–25–4 | Dinitrobenzene, 1,4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 534–52–1 | Dinitro-o-cresol, 4,6- | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–28–5 | Dinitrophenol, 2,4- | 0.27 | 56 | 0.11 | 0.27 | 56 | 0.11 |
| 121–14–2 | Dinitrotoluene, 2,4- | 0.29 | 210 | 0.11 | 0.29 | 210 | 0.11 |
| 606–20–2 | Dinitrotoluene, 2,6- | 0.17 | 86 | 0.064 | 0.17 | 86 | 0.064 |
| 117–84–0 | Di-n-octyl phthalate | 0.002 | 4500 | 0.1 | 0.002 | 4500 | 0.1 |
| 123–91–1 | Dioxane, 1,4- | 0.042 | 13 | 0.014 | 0.042 | 13 | 0.014 |
| 122–39–4 | Diphenylamine | 15 | 1200 | 3 | 15 | 12000 | 3 |
| 122–66–7 | Diphenylhydrazine, 1,2- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 298–04–4 | Disulfoton | 0.013 | 43 | 13 | 0.013 | 43 | 13 |
| 541–53–7 | Dithiobiuret | (1) | (1) | (1) | (1) | (1) | (1) |
| | D, salts, esters, 2,4- | 0.0069 | (1) | 0.54 | 0.0069 | (1) | 0.48 |
| 115–29–7 | Endosulfan | 6 | 73 | 0.94 | 6 | 73 | 0.94 |
| 959–98–8 | Endosulfan I | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 33213–65–9 | Endosulfan II | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 1031–07–8 | Endosulfan sulfate | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 145–73–3 | Endothall | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 72–20–8 | Endrin | 0.073 | 0.26 | 24 | 0.073 | 0.26 | 32 |
| 7421–93–4 | Endrin aldehyde | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 53494–70–5 | Endrin ketone | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 106–89–8 | Epichlorohydrin | 0.34 | 44 | 5400 | 0.34 | 44 | 5400 |
| 51–43–4 | Epinephrine | (1) | (1) | (1) | (1) | (1) | (1) |
| 110–80–5 | Ethoxyethanol, 2- | 15 | 6900 | 15 | 15 | 6900 | 15 |
| 141–78–6 | Ethyl acetate | 390 | 270000 | 110 | 390 | 270000 | 110 |
| 51–79–6 | Ethyl carbamate | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 107–12–0 | Ethyl cyanide (propionitrile) | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 60–29–7 | Ethyl ether | 27 | 41000 | 11 | 27 | 41000 | 11 |
| 97–63–2 | Ethl methacrylate | 24 | 3400 | 7 | 24 | 3400 | 7 |

**Appendix X**—Continued

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 62–50–0 | Ethyl methanesulfonate | 0.0055 | (1) | 12000 | 0.0055 | (1) | 12000 |
| 100–41–4 | Ethylbenzene | 8 | 550000 | 2 | 39 | 550000 | 8 |
| 106–93–4 | Ethylene Dibromide | 0.00093 | 0.0075 | 0.00075 | 0.00036 | 0.0075 | (1) |
| 75–21–8 | Ethylene oxide | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 96–45–7 | Ethylene thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 151–56–4 | Ethyleneimine (aziridine) | (1) | (1) | (1) | (1) | (1) | (1) |
| 52–85–7 | Famphur | (1) | (1) | 0.54 B | (1) | (1) | 0.48 |
| 640–19–7 | Fluoracetamide, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–74–8 | Fluoracetic acid, sodium salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 206–44–0 | Fluoranthene | 28 | 6000 | 2 | 28 | 6000 | 2 |
| 86–73–7 | Fluorene | 22 | 90000 | 3 | 22 | 90000 | 3 |
| 16984–48–8 | Fluoride | ..... | ..... | ..... | ..... | ..... | ..... |
| 50–00–0 | Formaldehyde | (1) | 49 | 11 | (1) | 49 | 11 |
| 64–18–6 | Formia Acid | 270 | 300000 | 110 | 270 | 300000 | 110 |
| 765–34–4 | Glycidylaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 319–86–8 | HCH, delta- | 0.0069 | 0.19 | 0.54 | 0.0069 | 0.19 | 0.48 |
| 76–44–8 | Heptachlor | (1) | 8 | ..... | (1) | 8 | ..... |
| 1024–57–3 | Heptachlor epoxide | 0.00053 | 0.026 | 66 | 0.00053 | 0.026 | 0.45 |
| 87–68–3 | Hexachloro-1,3-butadiene | 0.0079 | 36 | 0.0069 | 0.0079 | 36 | 0.0069 |
| 118–74–1 | Hexachlorobenzene | (1) | (1) | 0.018 | (1) | (1) | (1) |
| 319–84–6 | Hexachloro- cyclohexane, alpha- (alpha-BHC) | 0.00014 | 0.0033 | 0.11 | 0.00014 | 0.033 | 0.11 |
| 319–85–7 | Hexach- lorocyclo- hexane, beta- (beta-BHC) | 0.00044 | 0.12 | 0.00021 | 0.00044 | 0.12 | 0.00021 |
| 58–89–9 | Hexach- lorocyc- lohexane, gamma- (Lindane) | 0.00078 | 0.1 | 2 | 0.00078 | 0.1 | 0.69 |
| 77–47–4 | Hexach- lorocyc- lopentadiene | 0.0052 | 1500 | ..... | 0.0052 | 1500 | ..... |
| 67–72–1 | Hexachloroethane | 0.049 | 81 | 0.033 | 0.049 | 81 | 0.033 |
| 70–30–4 | Hexachlorophene | (1) | (1) | (1) | (1) | (1) | (1) |
| 1888–71–7 | Hexachloropropene | 0.27 | 140 | 0.033 | 0.081 | 140 | 0.032 |
| 757–58–4 | Hexae- thylte- traphosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–75–6 | Hexanone, 2- | 8 | 1200 | 6 | 8 | 1200 | 6 |
| 302–01–2 | Hydrazine | (1) | 20 | (1) | (1) | 20 | (1) |
| 193–39–5 | Indeno(1,2,3-cd) pyrene | 0.0029 | 4 | (1) | 0.0029 | 4 | (1) |
| 74–88–4 | Iodomethane | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 78–83–1 | Isobutyl alcohol | 39 | 55000 | 15 | 39 | 55000 | 15 |
| 465–73–6 | Isodrin | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 78–59–1 | Isophorone | 0.53 | 740 | 0.16 | 0.53 | 740 | 0.16 |
| 120–58–1 | Isosafrole | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 143–50–0 | Kepone | (1) | (1) | (1) | (1) | (1) | (1) |
| 303–43–4 | Lasiocarpine | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–92–1 | Lead | 30 | 570 | 12 | 30 | 570 | 12 |
| 108–31–6 | Maleic anhydride | (1) | 6900 | (1) | (1) | 6900 | (1) |
| 123–33–1 | Maleic hydrazide | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 109–77–3 | Malononitrile | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 148–82–3 | Melphalan | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–97–6 | Mercury | 0.06 | 0.6 | 0.023 | 0.3 | 0.6 | 0.14 |
| 126–98–7 | Methacrylonitrile | 0.016 | 9 | (1) | 0.016 | 9 | (1) |
| 74–93–1 | Methanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 67–56–1 | Methanol | 78 | 140000 | 30 | 78 | 140000 | 30 |
| 91–80–5 | Methapyrilene | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 16752–77–5 | Methomyl | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 72–43–5 | Methoxychlor | 7 | 19 | ..... | 7 | 19 | ..... |
| 74–83–9 | Methyl bromide (Bromomethane) | 0.37 | 500 | 0.92 | 0.37 | 500 | 0.92 |
| 74–87–3 | Methyl chloride (Chloromethane) | 0.096 | 91 | ..... | 0.096 | 91 | ..... |
| 78–93–3 | Methyl ethyl ketone | 78 | 110000 | 30 | 78 | 110000 | 30 |
| 1338–23–4 | Methyl ethyl ketone peroxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–34–4 | Methyl hydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–10–1 | Methyl isobutyl ketone | 8 | 17000 | 3 | 8 | 17000 | 3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 80–62–6 | Methyl methacrylate | 28 | 40000 | 8 | 28 | 40000 | 8 |
| 66–27–3 | Methyl methanesulfonate | 0.12 | 2 | 6 | 0.12 | 2 | 6 |
| 91–57–6 | Methyl naphthalene, 2- | (1) | 4 | (1) | (1) | 4 | (1) |
| 298–00–0 | Methyl parathion | 0.66 | 1 | 23 | 0.66 | 1 | 23 |
| 75–55–8 | Methylaziridine, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–49–5 | Methylcholanthrene, 3- | (1) | (1) | (1) | (1) | (1) | (1) |
| 74–95–3 | Methylene bromide | 0.029 | 8400 | 0.0085 | 2 | 8400 | 0.19 |
| 75–09–2 | Methylene chloride | 0.039 | 310 | 0.09 | 0.039 | 310 | 0.015 |
| 101–14–4 | Methylenebis, 4,4′-(2-chloroaniline) | (1) | (1) | (1) | (1) | (1) | (1) |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG) | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–04–2 | Methylthiouracil | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–07–7 | Mitomycin C | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–98–7 | Molybdenum | 2 | 110 | 2 | 2 | 110 | 2 |
| 91–20–3 | Naphthalene | 14 | 120000 | 3 | 14 | 120000 | 3 |
| 130–15–4 | Naphthoquinone, 1,4- | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 86–88–4 | Naphthyl-2-thiourea, 1- | (1) | (1) | (1) | (1) | (1) | (1) |
| 134–32–7 | Naphthylamine, 1- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 91–59–8 | Naphthylamine, 2- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 7440–02–0 | Nickel | 4 | 110 | 2 | 11 | 110 | 5 |
| 54–11–5 | Nicotine and salts | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 88–74–4 | Nitroaniline, 2- | (1) | 3 | (1) | (1) | 3 | (1) |
| 99–09–2 | Nitroaniline, 3- | (1) | 3 | (1) | (1) | 3 | (1) |
| 100–01–6 | Nitroaniline, 4- | 0.028 | 3 | (1) | 0.028 | 3 | (1) |
| 98–95–3- | Nitrobenzene | 0.084 | 45 | 0.032 | 0.084 | 45 | 0.032 |
| 55–86–7 | Nitrogen mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–75–2 | Nitrogen mustard Hydrochloride salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–85–2 | Nitrogen mustard N-Oxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–70–5 | Nitrogen mustard N-Oxide, HCl salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 55–63–0 | Nitroglycerine | (1) | (1) | (1) | (1) | (1) | (1) |
| 99–55–8 | Nitro-o-toluidine, 5- | 0.028 | 3 | (1) | 0.028 | 3 | (1) |
| 88–75–5 | Nitrophenol, 2- | 0.025 | 3 | (1) | 0.0.25 | 3 | (1) |
| 100–02–7 | Nitrophenol, 4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 79–46–9 | Nitropropane, 2- | (1) | 0.13 | ..... | (1) | 0.13 | ..... |
| 56–57–5 | Nitroquinoline-1-oxide, 4- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 55–18–5 | Nitrosodiethylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–75–9 | Nitrosodimethylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 924–16–3 | Nitrosodi-n-butylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 10595–95–6 | Nitro- somethyle thylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 1116–54–7 | N-Nitro- sodietha- nolamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 621–64–7 | N-Nitrosodi-n-propylamine | (1) | 0.023 | (1) | (1) | 0.023 | (1) |
| 86–30–6 | N-Nitro- sodiphe- nylamine | 0.2 | 1300 | (1) | 0.2 | 1300 | (1) |
| 4549–40–0 | N-Nitrosomethyl vinyl amine | (1) | (1) | (1) | (1) | (1) | (1) |
| 59–89–2 | N-Nitrosomorpholine | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 759–73–9 | N-Nitroso-N-ethylurea | (1) | (1) | (1) | (1) | (1) | (1) |
| 684–93–5 | N-Nitroso-N-methylurea | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 615–53–2 | N-Nitroso-N-methylurethane | (1) | (1) | (1) | (1) | (1) | (1) |
| 16543–55–8 | N-Nitrosonornicotine | (1) | (1) | (1) | (1) | (1) | (1) |
| 100–75–4 | N-Nitrosopiperidine | (1) | (1) | (1) | (1) | (1) | (1) |
| 930–55–2 | N-Nitroopyrrolidine | (1) | 0.053 | (1) | (1) | 0.053 | (1) |
| 13256–22–9 | N-Nitrososarcosine | (1) | (1) | (1) | (1) | (1) | (1) |
| 103–85–5 | N-Phenylthiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 1615–80–1 | N,N-Diethylhydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 152–16–9 | Octame- thylpyro- phospho- ramide | 0.27 | 31 | 0.11 | 0.27 | 31 | 0.11 |
| 20816–12–0 | Osmium Tetroxice | (1) | (1) | (1) | (1) | (1) | (1) |
| 297–97–2 | O,O-Diethyl O-pyrazinyl phosphorothioate | 0.12 | 2 | 6 | 0.12 | 2 | 6 |
| 126–68–1 | O,O,O-Triethyl phosphorothioate | 0.12 | (1) | 6 | 0.12 | (1) | 6 |
| 123–63–7 | Paraldehyde | 8 | 1200 | 6 | 8 | 1200 | 6 |
| 56–38–2 | Parathion | 3 | 0.13 | 12000 | 3 | 0.13 | 12000 |
| 608–93–5 | Pentachlorobenzene | 5 | 210 | 0.054 | 5 | 210 | 0.054 |
| 76–01–7 | Pentachloroethane | 0.024 | 31 | 0.012 | 0.023 | 31 | 0.015 |
| 82–68–8 | Penta- chloro- nitro-benzene (PCNB) | 0.27 | 11 | (1) | 0.081 | 11 | (1) |
| 87–86–5 | Pentachlorophenol | 0.002 | 3 | 0.00041 | 0.002 | 3 | 0.00041 |
| 62–44–2 | Phenacetin | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 85–01–8 | Phenanthrene | (1) | 4 | (1) | (1) | 4 | (1) |
| 108–95–2 | Phenol | 84 | 160000 | 32 | 84 | 160000 | 32 |
| 62–38–4 | Phenyl mercuric acetate | (1) | (1) | (1) | (1) | (1) | (1) |

**Appendix X**—Continued

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 25265–76–3 | Phenylenediamines (N.O.S.) | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 108–45–2 | Phenylenediamine, m- | 0.78 | 780 | 0.3 | 0.78 | 780 | 0.3 |
| 106–50–3 | Phenylenediamine, p- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 298–02–2 | Phorate | 0.11 | 160 | ..... | 0.11 | 160 | ..... |
| | Phosphorodithioic acid, dimethylethylester | (1) | (1) | (1) | (1) | (1) | (1) |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methyl | (1) | (1) | (1) | (1) | (1) | (1) |
| 2953–29–9 | Phosphorodithioic acid, trimethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 85–44–9 | Phthalic anhydride | (1) | 2400 | (1) | (1) | 2400 | (1) |
| 109–06–8 | Picoline, 2- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 1336–36–3 | Polychlorinated biphenyls | (1) | (1) | 0.009 | (1) | (1) | (1) |
| 23950–58–5 | Pronamide | 21 | 440 | 6 | 21 | 440 | 6 |
| 1120–71–4 | Propane sultone, 1,3- | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–10–8 | Propylamine, n- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 51–52–5 | Propylthiouracil | 0.12 | (1) | 6 | 0.12 | (1) | 6 |
| 107–19–7 | Propyn-1-ol,2- | 39 | 37000 | 15 | 39 | 37000 | 15 |
| 129–00–0 | Pyrene | 54 | 16000 | 2 | 54 | 16000 | 2 |
| 110–86–1 | Pyridine | 0.16 | 810 | 0.06 | 0.16 | 810 | 0.06 |
| 50–55–5 | Reserpine | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 108–46–3 | Resorcinol | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 81–07–2 | Saccharin and salts | (1) | (1) | (1) | (1) | (1) | (1) |
| 94–59–7 | Safrole | 0.0035 | 11 | (1) | 0.0035 | 11 | (1) |
| 7782–49–2 | Selenium | 0.23 | (1) | 0.089 | 0.93 | (1) | 0.36 |
| 7440–22–4 | Silver | 200 | (1) | ..... | 200 | (1) | ..... |
| 18883–66–4 | Streptozotocin | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–24–9 | Strychnine | 0.045 | (1) | 0.016 | 0.045 | (1) | 0.016 |
| 100–42–5 | Stryene | 0.91 | 630000 | 0.22 | 64 | 630000 | 15 |
| 18496–25–8 | Sulfide | ..... | ..... | ..... | ..... | ..... | ..... |
| 1746–01–6 | TCDD,2,3,7,8- | (1) | 8.000E-06 | 5.400E-07 | (1) | 8.000E-06 | (1) |
| 95–94–3 | Tetrachlorobenzene, 1,2,4,5- | 0.23 | 170 | 0.032 | 0.23 | 170 | 0.032 |
| 630–20–6 | Tetrachloroethane, 1,1,1,2- | 0.024 | 130 | 0.0078 | 0.024 | 130 | 0.0078 |
| 79–34–5 | Tetrachloroethane, 1,1,2,2- | 0.0037 | 29 | 0.0077 | 0.0037 | 29 | 0.0077 |
| 127–18–4 | Tetrachloroethylene | 0.026 | 13000 | 0.0085 | 2 | 13000 | 0.68 |
| 58–90–2 | Tetrachlorophenol, 2,3,4,6- | 2 | 6200 | 0.58 | 2 | 6200 | 0.58 |
| 107–49–3 | Tetraethylpyrophosphate | (1) | 6900 | (1) | (1) | 6900 | (1) |
| 3689–24–5 | Tetraethyldithiopyrophosphate | 0.23 | 3 | ..... | 0.23 | 3 | ..... |
| 7440–28–0 | Thallium (I) | 0.035 | 5 | 0.014 | 0.05 | 5 | 0.019 |
| 62–55–5 | Thioacetamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 39196–18–4 | Thiofanox | 0.12 | (1) | 6 | 0.12 | (1) | 6 |
| 108–98–5 | Thiophenol | 0.12 | 2 | 6 | 0.12 | 2 | 6 |
| 79–19–6 | Thiosemicarbazide | (1) | (1) | (1)(1) | (1) | (1) | (1) |
| 62–56–6 | Thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 137–26–8 | Thiram | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 7440–31–5 | Tin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–88–3 | Toluene | 6 | 180000 | 2 | 30 | 180000 | 13 |
| 584–84–9 | Toluene diisocyanate | (1) | 20 | (1) | (1) | 20 | (1) |
| 95–80–7 | Toluenediamine,2,4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 823–40–5 | Toluenediamine,2,6- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 496–72–0 | Toluenediamine,3,4- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 636–21–5 | Toluidine hydrochloride, o- | 0.16 | 20 | 0.11 | 0.16 | 20 | 0.11 |
| 95–53–4 | Toluidine, o- | (1) | 2 | (1) | (1) | 2 | (1) |
| 106–49–0 | Toluidine, p- | (1) | 0.13 | (1) | (1) | 0.13 | (1) |
| 8001–35–2 | Toxaphene | (1) | (1) | 6 | (1) | (1) | 0.11 |
| 76–13–1 | Trichloro-1,2,2-trifluoroethane,1,1,2- | 0.77 | ..... | 0.17 | 2200 | ..... | 2400 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.69 | 3500 | 1 | 0.69 | 3500 | 1 |
| 72–55–6 | Trichloroethane, 1,1,1- | 74 | 48000 | 0.054 | 74 | 48000 | 0.054 |
| 79–00–5 | Trichloroethane, 1,1,2- | 0.012 | 11 | 0.009 | 0.007 | 11 | 0.0018 |
| 79–01–6 | Trichloroethylene | 0.024 | 570 | 0.008 | 0.038 | 570 | 0.013 |
| 75–69–4 | Trichlorofluoromethane | 48 | 26000 | 16 | 48 | 26000 | 16 |
| 75–70–7 | Trichloromethanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 95–95–4 | Trichlorophenol, 2,4,5- | 18 | 12000 | 4 | 18 | 12000 | 4 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.054 | 120 | 0.015 | 0.054 | 120 | 0.015 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5- (245–T) | 2 | 63 | 0.64 | 2 | 63 | 0.64 |
| 93–72–1 | Trichlorophenoxypropionic acid, 2,4,5-(Silvex) | 0.21 | 6 | 0.08 | 1 | 6 | 0.48 |
| 96–18–4 | Trichloropropane, 1,2,3- | 1 | 870 | 0.34 | 1 | 870 | 0.34 |
| 99–35–4 | Trinitrobenzene, sym- | 0.0078 | 0.44 | 0.003 | 0.0078 | 0.44 | 0.003 |
| 126–72–7 | Tris (2,3-dibromopropyl) phosphate | (1) | 0.36 | (1) | (1) | 0.36 | (1) |
| 52–24–4 | Tris(1-azridinyl)phosphine sulfide | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–57–1 | Trypan blue | (1) | (1) | (1) | (1) | (1) | (1) |
| 66–75–1 | Uracil mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–62–2 | Vanadium | 10 | 250 | 4 | 10 | 250 | 4 |
| 108–05–4 | Vinyl acetate | 15 | 6900 | 11 | 15 | 6900 | 11 |
| 75–01–4 | Vinyl chloride | 0.002 | 1 | 0.003 | (1) | 1 | (1) |
| 81–81–2 | Warfarin | (1) | (1) | 0.54 | (1) | (1) | 0.48 |
| 1330–20–7 | Xylenes (total) | 22 | 170000 | 21 | 22 | 170000 | 150 |
| 7440–66–6 | Zinc | 99 | 320 | 38 | 99 | 320 | 38 |

[1] See Table B.

## TABLE B.—QUANTITATION-BASED EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 208–96–8 | Acenaphthylene | 0.02 | | 0.02 | 0.02 | | 0.02 |
| 75–36–5 | Acetyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–08–2 | Acetyl-2-thiourea, 1- | 1 | 70 | | 1 | 70 | |
| 53–96–3 | Acetylaminofluorene, 2- | | | 0.02 | | | 0.02 |
| 107–02–8 | Acrolein | 0.013 | | | 0.013 | | |
| 79–06–1 | Acrylamide | 0.01 | 0.1 | 0.01 | 0.01 | 0.1 | 0.01 |
| 107–13–1 | Acrylonitrile | 0.008 | | 0.008 | 0.008 | | 0.008 |
| 1402–68–2 | Aflatoxins | (1) | (1) | (1) | (1) | (1) | (1) |
| 116–06–3 | Aldicarb | 0.05 | 1 | | 0.05 | 1 | |
| 309–00–2 | Aldrin | 0.000034 | 0.0006 | 0.000034 | 0.000034 | 0.0006 | 0.000034 |
| 107–18–6 | Allyl alcohol | (1) | (1) | (1) | (1) | (1) | (1) |
| 92–67–1 | Aminobiphenyl, 4- | | | 0.02 | | | 0.02 |
| 2763–96–4 | Aminomethyl-3-isoxazolol, 5- | (1) | (1) | (1) | (1) | (1) | (1) |
| 504–24–5 | Aminopyridine, 4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 61–82–5 | Amitrole | (1) | (1) | (1) | (1) | (1) | (1) |
| 120–12–7 | Anthracene | 0.007 | | 0.007 | 0.007 | | 0.007 |
| 7440–38–2 | Arsenic | | 0.3 | | 0.0005 | 0.3 | 0.0005 |
| 2465–27–2 | Auramine | (1) | (1) | (1) | (1) | (1) | (1) |
| 115–02–6 | Azaserine | (1) | (1) | (1) | (1) | (1) | (1) |
| 92–87–5 | Benzidine | 0.0025 | 0.042 | 0.0025 | 0.0025 | 0.042 | 0.0025 |
| 98–07–7 | Benzotrichloride | (1) | | (1) | (1) | | (1) |
| 50–32–8 | Benzo(a)pyrene | | | | | | 0.000023 |
| 205–82–3 | Benzo(j)fluor- anthene | | | | | | 0.0002 |
| 207–08–9 | Benzo(k)- fluoranthene | | | | | | 0.0002 |
| 191–24–2 | Benzo[g,h,i]- perylene | | | | | | 0.0008 |
| 56–55–3 | Benz(a)anth- racene | | | 0.000013 | | | 0.000013 |
| 225–51–4 | Benz[c]acri- dine | | | | | | 0.0005 |
| 7440–41–7 | Beryllium | | 0.1 | | | 0.1 | |
| 542–88–1 | Bis(chloro- methyl) ether | (1) | (1) | (1) | (1) | (1) | (1) |
| 357–57–3 | Brucine | 20 | (1) | 20 | 20 | (1) | 20 |
| 86–74–8 | Carbazole | (1 | (1) | (1) | (1) | (1) | (1) |
| 353–50–4 | Carbon oxyfluoride | (1) | (1) | (1) | (1) | (1) | (1) |

TABLE B.—QUANTITATION-BASED EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 75–87–6 | Chloral | (1) | (1) | (1) | (1) | (1) | (1) |
| 305–03–3 | Chlorambucil | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–74–9 | Chlordane | 0.00004 | | | 0.00004 | | |
| 494–03–1 | Chlornaphazin | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–20–0 | Chloroacetaldehyde | (1 | (1) | (1) | (1) | (1) | (1) |
| 110–75–8 | Chloroethyl vinyl ether, 2- | (1) | | (1) | (1) | | (1) |
| 107–30–2 | Chloromethyl methyl ether | (1) | | (1) | (1) | | (1) |
| 5344–82–1 | Chlorophenyl thiourea, 1-o- | (1) | (1) | (1) | (1) | (1) | (1) |
| 542–76–7 | Chloropropionitrile, 3- | | | 0.1 | 0.1 | | 0.1 |
| 6358–53–8 | Citrus red No. 2 | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–48–4 | Cobalt | | | 0.5 | | | 0.5 |
| 57–12–5 | Cyanide | 0.2 | | 0.2 | 0.2 | | 0.2 |
| 14901–08–7 | Cycasin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–94–1 | Cyclohexanone | 10 | | 10 | 10 | | 10 |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2- | 0.1 | 7 | 0.1 | 0.1 | 7 | 0.1 |
| 50–18–0 | Cyclophosphamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 20830–81–3 | Daunomycin | (1) | (1) | (1) | (1) | (1) | (1) |
| 53–19–0 | DDD (o,p[1]) | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–55–9 | DDE | 0.000058 | | | 0.000058 | | |
| 3424–82–6 | DDE (o,p[1]) | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–29–3 | DDT | 0.000081 | | | 0.000081 | | |
| 789–02–6 | DDT (o,p[1]) | (1) | (1) | (1) | (1) | (1) | (1) |
| 192–65–4 | Dibenzo[a,e]- pyrene | | | | | | 0.001 |
| 189–64–0 | Dibenzo[a,h]- pyrene | | | | | | 0.0002 |
| 189–55–9 | Dibenzo(a,i)pyrene | | | | | | 0.0002 |
| 194–59–2 | Dibenzo(c,g)car- bazole, 7H- | 0.01 | | 0.01 | 0.01 | | 0.01 |
| 226–36–8 | Dibenz(a,h)acri- dine | | | | | | 0.0002 |
| 53–70–3 | Dibenz(a,h)ant- hracene | 0.00003 | 0.084 | 0.00003 | 0.00003 | 0.084 | 0.00003 |
| 224–42–0 | Dibenz(a,j)acridine | | | | | | 0.001 |
| 96–12–8 | Dibromo-3-chloropropane, 1,2- | | | | | | 0.00026 |
| 91–94–1 | Dichlorobenzidine, 3,3[1]- | | 0.12 | 0.0024 | | 0.012 | 0.0024 |
| 542–75–6 | Dichloropropene, 1,3- | | | 0.0009 | | | 0.0009 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–53–1 | Diethylstilbestrol | 0.0078 | 1 | 0.0078 | 0.0078 | 1 | 0.0078 |
| 77–78–1 | Dimethyl sulfate | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–11–7 | Dimethylaminoazobenzene, p- | | | 0.01 | | | 0.01 |
| 119–93–7 | Dimethylbenzidine, 3,3[1]- | 0.0033 | 0.7 | 0.0033 | 0.0033 | 0.7 | 0.0033 |
| 57–97–6 | Dimethylbenz- (a)anthracene, 7,12- | 0.00037 | 0.039 | 0.00037 | 0.00037 | 0.039 | 0.00037 |
| 79–44–7 | Dimethylcarbamoyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 119–90–4 | Dimethyoxybenzidine, 3,3[1]- | | 7 | | | 7 | |
| 100–25–4 | Dinitrobenzene, 1,4- | 0.04 | 3 | 0.04 | 0.04 | 3 | 0.4 |
| 534–52–1 | Dinitro-o-cresol, 4,6- | 0.05 | 3 | 0.05 | 0.05 | 3 | 0.05 |
| 541–53–7 | Dithiobiuret | (1) | (1) | (1) | (1) | (1) | (1) |
| | D, salts, esters, 2,4- | | 0.2 | | | 0.2 | |
| 145–73–3 | Endothall | 0.1 | (1) | | 0.1 | (1) | |
| 51–43–4 | Epinephrine | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–50–0 | Ethyl methanesulfonate | | 0.018 | | | 0.018 | |
| 106–93–4 | Ethylene Dibromide | | | | | | 0.00006 |
| 96–45–7 | Ethylene thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 151–56–4 | Ethyleneimine (aziridine) | (1) | (1) | (1) | (1) | (1) | (1) |
| 52–85–7 | Famphur | 0.02 | 1 | | 0.02 | 1 | |
| 640–19–7 | Fluoracetamide, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–74–8 | Fluoracetic acid, sodium salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 16984–48–8 | Fluoride | | | | | | |
| 50–00–0 | Formaldehyde | 0.023 | | | 0.023 | | |
| 765–34–4 | Glycidylaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 76–44–8 | Heptachlor | 0.00004 | | | 0.00004 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 118–74–1 | Hexachlorobenzene | 0.0016 | 0.072 | | 0.0016 | 0.072 | 0.0016 |
| 70–30–4 | Hexachlorophene | 0.21 | 2 | 0.21 | 0.21 | 2 | 0.21 |
| 757–58–4 | Hexaethyl tetraphosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–01–2 | Hydrazine | (1) | | (1) | (1) | | (1) |
| 193–39–5 | Indeno(1,2,3-cd) pyrene | | | 0.000043 | | | 0.000043 |
| 465–73–6 | Isodrin | 0.02 | 1 | | 0.02 | 1 | |
| 143–50–0 | Kepone | 0.016 | 0.097 | 0.016 | 0.016 | 0.097 | 0.016 |
| 303–43–4 | Lasiocarpine | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–31–6 | Maleic anhydride | (1) | | (1) | (1) | | (1) |
| 148–82–3 | Melphalan | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–98–7 | Methacrylonitrile | | | 0.009 | | | 0.009 |
| 74–93–1 | Methanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 16752–77–5 | Methomyl | 0.05 | 3 | | 0.05 | 3 | |
| 1338–23–4 | Methyl ethyl ketone peroxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–34–4 | Methyl hydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 91–57–6 | Methyl naphthalene, 2- | 0.01 | | 0.01 | 0.01 | | 0.01 |
| 75–55–8 | Methylaziridine, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–49–5 | Methylcholanthrene, 3- | 0.01 | 0.046 | 0.01 | 0.01 | 0.046 | 0.01 |
| 101–14–4 | Methylenebis, 4,4[1]-(2-chloroaniline) | (1) | (1) | (1) | (1) | (1) | (1) |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG) | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–04–2 | Methylthiouracil | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–07–7 | Mitomycin C | (1) | (1) | (1) | (1) | (1) | (1) |
| 86–88–4 | Naphthyl-2-thiourea, 1- | (1) | (1) | (1) | (1) | (1) | (1) |
| 88–74–4 | Nitroaniline, 2- | 0.05 | | 0.05 | 0.05 | | 0.05 |
| 99–09–2 | Nitroaniline, 3- | 0.05 | | 0.05 | 0.05 | | 0.05 |
| 100–01–6 | Nitroaniline, 4- | | | 0.02 | | | 0.02 |
| 55–86–7 | Nitrogen mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–75–2 | Nitrogen mustard hydrochloride salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–85–2 | Nitrogen mustard N-Oxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–70–5 | Nitrogen mustard N-Oxide, HCl salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 55–63–0 | Nitroglycerine | (1) | (1) | (1) | (1) | (1) | (1) |
| 99–55–8 | Nitro-o-toluidine, 5- | | | 0.01 | | | 0.01 |
| 88–75–5 | Nitrophenol, 2- | | | 0.01 | | | 0.01 |
| 100–02–7 | Nitrophenol, 4- | 0.05 | 3 | 0.05 | 0.05 | 3 | 0.05 |
| 79–46–9 | Nitropropane, 2- | 0.0058 | | | 0.0058 | | |
| 55–18–5 | Nitrosodiethylamine | 0.002 | 1 | 0.002 | 0.002 | 1 | 0.002 |
| 62–75–9 | Nitrosodimethylamine | 0.0006 | 0.074 | 0.0006 | 0.0006 | 0.074 | 0.0006 |
| 924–16–3 | Nitrosodi-n-butylamine | 0.06 | | 0.06 | 0.06 | | 0.06 |
| 10595–95–6 | Nitrosomethylethylamine | 0.028 | 0.016 | 0.028 | 0.028 | 0.016 | 0.028 |
| 1116–54–7 | N-Nitrosodiethanolamine | 0.01 | 0.7 | 0.01 | 0.01 | 0.7 | 0.01 |
| 621–64–7 | N-Nitrosodi-n-propylamine | 0.026 | | 0.026 | 0.026 | | 0.026 |
| 86–30–6 | N-Nitrosodiphenylamine | | | 0.05 | | | 0.05 |
| 4549–40–0 | N-Nitrosomethyl vinyl amine | (1) | (1) | (1) | (1) | (1) | (1) |
| 759–73–9 | N-Nitroso-N-ethylurea | (1) | (1) | (1) | (1) | (1) | (1) |
| 615–53–2 | N-Nitroso-N-methylurethane | (1) | (1) | (1) | (1) | (1) | (1) |
| 16543–55–8 | N-Nitrosonornicotine | (1) | (1) | (1) | (1) | (1) | (1) |
| 100–75–4 | N-Nitrosopiperidine | 0.0014 | 0.033 | 0.0014 | 0.0014 | 0.033 | 0.0014 |
| 930–55–2 | N-Nitrosopyrrolidine | 0.0047 | | 0.0047 | 0.0047 | | 0.0047 |
| 13256–22–9 | N-Nitrososarcosine | (1) | (1) | (1) | (1) | (1) | (1) |
| 103–85–5 | N-Phenylthiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 1615–80–1 | N,N-Diethylhydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 20816–12–0 | Osmium tetroxide | 3 | 200 | 3 | 3 | 200 | 3 |
| 126–68–1 | O,O,O-Triethyl phosphorothioate | | 3 | | | 3 | |
| 82–68–8 | Pentachloronitrobenzene (PCNB) | | | 0.02 | | | 0.02 |
| 85–01–8 | Phenanthrene | 0.006 | | 0.006 | 0.006 | | 0.006 |
| 62–38–4 | Phenyl mercuric acetate | (1) | (1) | (1) | (1) | (1) | (1) |
| | Phosphorodithiolic acid, dimethylethylester | (1) | (1) | (1) | (1) | (1) | (1) |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methyl | (1) | (1) | (1) | (1) | (1) | (1) |
| 2953–29–9 | Phosphorodithioic acid, trimethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 85–44–9 | Phthalic anhydride | (1) | (1) | (1) | (1) | (1) | (1) |
| 1336–36–3 | Polychlorinated biphenyls | 0.0005 | 0.04 | | 0.0005 | 0.04 | 0.0005 |
| 1120–71–4 | Propane sultone, 1,3- | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–52–5 | Propylthiouracil | | 7 | | 7 | | |
| 108–46–3 | Resorcinol | 0.1 | 7 | | 0.1 | 7 | |
| 81–07–2 | Saccharin and salts | (1) | (1) | (1) | (1) | (1) | (1) |

TABLE B.—QUANTITATION-BASED EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 94–59–7 | Safrole | | | 0.0021 | | | 0.0021 |
| 94–59–7 | Safrole | | | 0.0021 | | | 0.0021 |
| 7782–49–2 | Selenium | | 5 | | | 5 | |
| 7440–22–4 | Silver | | 0.3 | | | 0.3 | |
| 18883–66–4 | Streptozotocin | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–24–9 | Strychnine | | 3 | | | 3 | |
| 1746–01–6 | TCDD, 2,3,7,8- | 1.000E-08 | | | 1.000E-08 | | 1.000E-08 |
| 107–49–3 | Tetraethyl pyrophosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–55–5 | Thioacetamide | 1 | (1) | 1 | 1 | (1) | 1 |
| 39196–18–4 | Thiofanox | | 3 | | | 3 | |
| 79–19–6 | Thiosemicarbazide | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–56–6 | Thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 137–26–8 | Thiram | 0.05 | 3 | | 0.05 | 3 | |
| 7440–31–5 | Tin | 8 | 500 | 8 | 8 | 500 | 8 |
| 584–84–9 | Toluene diisocyanate | (1) | | (1) | (1) | | |
| 95–80–7 | Toluenediamine, 2,4- | 0.013 | 1 | 0.013 | 0.013 | 1 | 0.013 |
| 95–53–4 | Toluidine, o- | 0.012 | | 0.012 | 0.012 | | 0.012 |
| 106–49–0 | Toluidine, p- | 0.017 | | 0.017 | 0.017 | | 0.017 |
| 8001–35–2 | Toxaphene | 0.0013 | 0.03 | | 0.0013 | 0.03 | |
| 75–70–7 | Trichloromethanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–72–7 | Tris (2,3-dibromopropyl) phosphate | 0.025 | | 0.025 | 0.025 | | 0.025 |
| 52–24–4 | Tris(1-azridinyl) phosphine sulfide | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–57–1 | Trypan blue | (1) | (1) | (1) | (1) | (1) | (1) |
| 66–75–1 | Uracil mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 75–01–4 | Vinyl chloride | | | | 0.00017 | | 0.00017 |
| 81–81–2 | Warfarin | 0.05 | 3 | | 0.05 | 3 | |

8. Appendix XI is added to read as follows:

Appendix XI

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED CONDITIONAL EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 83–32–9 | Acenaphthene | 31 | 63000 | 13 | 31 | 63000 | 13 |
| 208–96–8 | Acenaphthylene | (1) | 4 | (1) | (1) | 4 | (1) |
| 67–64–1 | Acetone | 16 | 39000 | 21 | 16 | 39000 | 21 |
| 75–05–8 | Acetonitrile | 0.78 | 2200 | 1 | 0.78 | 2200 | 1 |
| 98–86–2 | Acetophenone | 17 | 75000 | 22 | 17 | 75000 | 22 |
| 75–36–5 | Acetyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–08–2 | Acetyl-2-thiourea, 1- | (1) | 590 | 24 | (1) | 590 | 24 |
| 53–96–3 | Acetylaminofluorne, 2- | 0.028 | 88 | 0.038 | 0.028 | 88 | 0.038 |
| 107–02–8 | Acrolein | (1) | 11 | ..... | (1) | 11 | ..... |
| 79–06–1 | Acrylamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–13–1 | Acrylonitrile | (1) | 2 | (1) | (1) | 2 | (1) |
| 1402–68–2 | Aflatoxins | (1) | (1) | (1) | (1) | (1) | (1) |
| 116–06–3 | Aldicarb | (1) | 6 | 4 | (1) | 6 | 3 |
| 309–00–2 | Aldrin | (1) | 0.0045 | (1) | (1) | 0.0045 | (1) |
| 107–18–6 | Allyl alcohol | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–05–1 | Allyl chloride | 0.074 | 260 | ..... | 0.074 | 260 | ..... |
| 92–67–1 | Aminobiphenyl, 4- | 0.028 | 88 | 0.038 | 0.028 | 88 | 0.038 |
| 2763–96–4 | Aminomethyl-3-isoxazolol, 5- | (1) | (1) | (1) | (1) | (1) | (1) |
| 504–24–5 | Aminopyridine, 4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 61–82–5 | Amitrole | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–53–3 | Aniline | 0.053 | 170 | 0.072 | 0.053 | 170 | 0.072 |
| 120–12–7 | Anthracene | (1) | 4 | (1) | (1) | 4 | (1) |
| 7440–36–0 | Antimony | 0.14 | 85 | 0.18 | 0.14 | 85 | 0.18 |
| 140–57–8 | Aramite | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 7440–38–2 | Arsenic | 0.38 | 0.53 | 0.52 | (1) | 0.53 | 0.00052 |
| 2465–27–2 | Auramine | (1) | (1) | (1) | (1) | (1) | (1) |
| 115–02–6 | Azaserine | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–39–3 | Barium | 28 | 34000 | 38 | 33 | 34000 | 45 |
| 71–43–2 | Benzene | 0.021 | 250 | 0.039 | 0.018 | 250 | 0.023 |
| 92–87–5 | Benzidine | (1) | (1) | (1) | (1) | (1) | (1) |
| 106–51–4 | Benzoquinone, p- | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 98–07–7 | Benzotrichloride | (1) | 1200 | (1) | (1) | 1200 | (1) |
| 50–32–8 | Benzo(a)pyrene | 0.0023 | 0.23 | 0.0036 | 0.0023 | 0.23 | (1) |
| 205–99–2 | Benzo(b) fluoranthene | 0.00081 | 4 | 0.000066 | 0.00081 | 4 | 0.000066 |
| 205–82–3 | Benzo(j) fluoranthene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 207–08–9 | Benzo(k) fluoranthene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 191–24–2 | Benzo[g, h, i]perylene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 100–51–6 | Benzyl alcohol | 39 | 130000 | 53 | 39 | 130000 | 53 |
| 100–44–7 | Benzyl chloride | 1 | 81 | 50 | 1 | 81 | 50 |
| 56–55–3 | Benz(a) anthracene | 0.00072 | 0.1 | (1) | 0.00072 | 0.1 | (1) |
| 225–51–4 | Benz[c] acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 7440–41–7 | Beryllium | 0.00083 | 0.22 | 0.0011 | 0.00083 | 0.22 | 0.0011 |
| 39638–32–9 | Bis (2-chloroisopropyl) ether | 0.007 | 97 | 0.0088 | 0.007 | 97 | 0.0088 |
| 111–44–4 | Bis(2-chlore- thyl)ether | 0.00065 | 1 | 0.002 | 0.00065 | 1 | 0.002 |
| 117–81–7 | Bis(2-ethy- lexyl)phthalate | 0.00044 | 740 | 0.11 | 0.00044 | 740 | 0.0011 |
| 542–88–1 | Bis(chlor- omethyl)ether | (1) | (1) | (1) | (1) | (1) | (1) |
| 598–31–2 | Bromoacetone | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 75–27–4 | Bromodich- loromethane | 0.0085 | 240 | 0.011 | 0.0085 | 240 | 0.011 |
| 75–25–2 | Bromoform (Tribromomethane) | 0.064 | 1600 | 0.081 | 0.064 | 1600 | 0.081 |
| 101–55–3 | Bromophenyl phenyl ether, 4- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 357–57–3 | Brucine | (1) | (1) | (1) | (1) | (1) | (1) |
| 71–36–3 | Butanol | 16 | 41000 | 21 | 16 | 41000 | 21 |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinoseb) | 0.034 | 6000 | 0.043 | 0.19 | 6000 | 0.24 |
| 85–68–7 | Butylbenzyl- phthalate | 240 | 87 | 67 | 240 | 87 | 67 |

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED CONDITIONAL EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 7440–43–9 | Cadmium | 0.038 | 110 | 0.051 | 0.24 | 110 | 0.32 |
| 86–74–8 | Carbazole | (1) | (1) | (1) | (1) | (1) | (1) |
| 75–15–0 | Carbon disulfide | 0.74 | 3800 | 24 | 0.74 | 3800 | 24 |
| 353–50–4 | Carbon oxyfluoride | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–23–5 | Carbon tetrachloride | 0.012 | 130 | 0.055 | 0.012 | 130 | 0.0077 |
| 75–87–6 | Chloral | (1) | (1) | (1) | (1) | (1) | (1) |
| 305–03–3 | Chlorambucil | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–74–9 | Chlordane | (1) | 0.19 | 0.036 | (1) | 0.19 | 0.00016 |
| 494–03–1 | Chlornaphazin | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–99–8 | Chloro-1,3-butabiene, 2-(Chloroprene) | 0.52 | 1700 | ..... | 0.52 | 1700 | ..... |
| 107–20–0 | Chloroacetaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 106–47–8 | Chlororoaniline, p- | 0.42 | 5800 | 0.56 | 0.42 | 5800 | 0.56 |
| 108–90–7 | Chlorobenzene | 0.68 | 41000 | 0.81 | 2 | 41000 | 6 |
| 510–15–6 | Chlorobenzilate | 0.054 | 14 | 0.029 | 0.054 | 14 | 0.029 |
| 124–48–1 | Chlorodibromomethane | 0.0066 | 200 | 0.0079 | 0.0066 | 200 | 0.0079 |
| 75–00–3 | Chloroethane (ethyl chloride) | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 110–75–8 | Chloroethyl vinyl ether, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 67–66–3 | Chloroform | 0.0076 | 76 | 0.075 | 0.0076 | 76 | 0.075 |
| 59–50–7 | Chloro-m-cresol, p- | 0.27 | 1200 | 0.068 | 0.081 | 1200 | 0.06 |
| 107–30–2 | Chloromethyl methyl ether | (1) | 140 | (1) | (1) | 140 | (1) |
| 91–58–7 | Chloronaphthalene, 2- | 0.27 | 1200 | 0.068 | 0.081 | 1200 | 0.06 |
| 95–57–8 | Chlorophenol, 2- | 0.9 | 8500 | 1 | 0.9 | 8500 | 1 |
| 7005–72–3 | Chlorophenyl phenyl ether, 4- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 5344–82–1 | Chlorophenyl thiourea, 1-o- | (1) | (1) | (1) | (1) | (1) | (1) |
| 542–76–7 | Chloropropionitrile, 3- | 0.27 | 1200 | (1) | (1) | 1200 | (1) |
| 7440–47–3 | Chromium | 0.62 | 16 | 0.31 | 1 | 16 | 2 |
| 218–01–9 | Chrysene | 0.1 | 35 | 0.0012 | 0.1 | 35 | 0.0012 |
| 6358–53–8 | Citrus red No. 2 | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–48–4 | Cobalt | 0.62 | 110 | (1) | 1 | 110 | 1 |
| 7440–50–8 | Copper | 670 | 950 | 3800 | 670 | 950 | 3800 |
| 108–39–4 | Cresol, m- | 8 | 30000 | 11 | 8 | 30000 | 11 |
| 95–48–7 | Cresol, o- | 8 | 46000 | 11 | 8 | 46000 | 11 |
| 106–44–5 | Cresol, p- | 0.84 | 2900 | 1 | 0.84 | 2900 | 1 |
| 4170–30–3 | Crotonaldehyde | 8 | 38000 | 22 | 8 | 38000 | 22 |
| 57–12–5 | Cyanide | (1) | 51 | 0.37 | (1) | 51 | 0.37 |
| 14901–08–7 | Cycasin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–94–1 | Cyclohexanone | (1) | 38000 | 22 | (1) | 38000 | 22 |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2- | (1) | 42 | (1) | (1) | 42 | (1) |
| 50–18–0 | Cyclophosphamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 20830–81–3 | Daunomycin | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–54–8 | DDD | 0.00013 | 0.26 | 6800 | 0.00013 | 0.26 | 6800 |
| 53–19–0 | DDD (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–55–9 | DDE | (1) | 0.033 | 0.000062 | (1) | 0.033 | 0.000062 |
| 3424–82–6 | DDE (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–29–3 | DDT | (1) | 0.11 | 0.0054 | (1) | 0.11 | 0.0054 |
| 789–02–6 | DDT (o,p′) | (1) | (1) | (1) | (1) | (1) | (1) |
| 2303–16–4 | Diallate | 0.26 | 7 | 11 | 0.26 | 7 | 11 |
| 132–64–9 | Dibenzofuran | 8 | 38000 | 9 | 8 | 38000 | 11 |
| 192–65–4 | Dibenzo- [a,e]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 189–64–0 | Dibenzo- [a,h]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 189–55–9 | Dibenzo- [a,i]pyrene | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 194–59–2 | Dibenzo- [c,g]carbazole, 7H- | (1) | 4 | (1) | (1) | 4 | (1) |
| 226–36–8 | Dibenz- (a,h)acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 53–70–3 | Dibenz- (a,h)anth- racene | (1) | (1) | (1) | (1) | (1) | (1) |
| 244–42–0 | Dibenz- [a,j]acridine | 0.0029 | 4 | 0.0012 | 0.0029 | 4 | (1) |
| 96–12–8 | Dibromo-3-chloropro- pane, 1,2- | 0.0022 | 7 | 0.0017 | 0.00066 | 7 | 0.00052 |
| 764–41–0 | Dichloro-2-butene, 1,4- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 110–57–6 | Dichloro-2-butene, trans-1,4- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 96–23–1 | Dichloro-2-propanol, 1,3- | 0.27 | 1200 | 0.068 | 0.081 | 1200 | 0.06 |
| 95–50–1 | Dichlorobenzene, 1,2- | 8 | 530000 | 8 | 15 | 530000 | 32 |
| 541–73–1 | Dichlorobenzene, 1,3- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 106–46–7 | Dichlorobenzene, 1,4- | 1 | 650 | 1 | 0.056 | 650 | 0.06 |
| 91–94–1 | Dichlorobenzidine, 3,3′- | 0.0037 | 1 | 0.0036 | 0.0037 | 1 | 0.0036 |
| 75–71–8 | Dichloro- difluoromethane | 15 | 8400 | 45 | 15 | 8400 | 45 |
| 75–34–3 | Dichloroethane, 1,1- | 0.00016 | 110 | 0.00021 | 0.00016 | 110 | 0.00021 |
| 107–06–2 | Dichloroethane, 1,2- | 0.007 | 59 | 0.011 | 0.00016 | 59 | 0.00021 |
| 75–35–4 | Dichloroethy lene, 1,1- | 0.0035 | 20 | 0.054 | 0.00059 | 20 | 0.00077 |
| 156–59–2 | Dichlorethylene, cis-1,2- | 0.29 | 46000 | 0.39 | 2 | 46000 | 2 |
| 150–60–5 | Dichlorethylene, trans-1,2- | 0.42 | 130000 | 0.56 | 3 | 130000 | 4 |
| 111–91–1 | Dichloromethoxy ethane | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 98–87–3 | Dichloromethylbenzene (benzal chloride) | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 120–83–2 | Dichlorophenol, 2,4- | 0.62 | 770 | 0.76 | 0.62 | 770 | 0.76 |
| 87–65–0 | Dichlorophenol, 2,6- | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D) | 0.27 | 12000 | 0.37 | 2 | 12000 | 2 |
| 78–87–5 | Dichloropropane, 1,2- | 0.12 | 180 | 0.055 | 0.023 | 180 | 0.011 |
| 542–75–6 | Dichloropropene, 1,3- | 0.0028 | 68 | 0.0038 | 0.0028 | 68 | 0.0038 |
| 10061–01–5 | Dichloropropene, cis-1,3- | 0.0049 | 65 | 10000 | 0.0049 | 65 | 10000 |
| 10061–02–6 | Dichloropropene, trans-1,3- | 0.0049 | 62 | 10000 | 0.0049 | 62 | 10000 |
| 60–57–1 | Dieldrin | 0.000059 | 0.048 | 36 | 0.000059 | 0.048 | 36 |
| 1464–53–5 | Diepoxybutane, 1,2,3,4- (2,2′-bioxirane) | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 84–66–2 | Diethyl phthalate | 190 | 19000 | 220 | 190 | 19000 | 220 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–53–1 | Diethylstilbestrol | (1) | (1) | (1) | (1) | (1) | (1) |
| 94–58–6 | Dihydrosafrole | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 60–51–5 | Dimethoate | 29 | 7 | 4 | 29 | 7 | 4 |
| 131–11–3 | Dimethyl phthalate | 78 | 3 | 110 | 78 | 3 | 110 |
| 77–78–1 | Dimethyl sulfate | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–11–7 | Dimethyl- aminoazo- benzene, p- | 0.028 | 88 | 0.038 | 0.028 | 88 | 0.038 |
| 119–93–7 | Dimethylbenzidine, 3,3′- | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–97–6 | Dimethyl- benz(a)- anthracene, 7,12- | (1) | (1) | (1) | (1) | (1) | (1) |
| 79–44–7 | Dimethylcarbamoyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 122–09–8 | Dimethyl- phenethyl- amine, alpha, alpha- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 105–67–9 | Dimethylphenol, 2,4- | 4 | 24000 | 5 | 4 | 24000 | 5 |
| 119–90–4 | Dimethyoxy- benzidine, 3,3′- | 0.034 | (1) | 0.045 | 0.034 | (1) | 0.045 |
| 84–74–2 | Di-n-butyl phthalate | 880 | 90000 | 100 | 230 | 90000 | 25 |
| 99–65–0 | Dinitrobenzene, 1,3- | 0.017 | 60 | 0.022 | 0.017 | 60 | 0.022 |
| 100–25–4 | Dinitrobenzene, 1,4- | (1) | 42 | (1) | (1) | 42 | (1) |
| 534–52–1 | Dinitro-o-cresol, 4,6- | (1) | 42 | (1) | (1) | 42 | (1) |
| 51–28–5 | Dinitrophenol, 2,4- | 0.27 | 450 | 0.37 | 0.27 | 450 | 0.37 |
| 121–14–2 | Dinitrotoluene, 2,4- | 0.29 | 1400 | 0.39 | 0.29 | 1400 | 0.39 |
| 606–20–2 | Dinitrotoluene, 2,6- | 0.17 | 420 | 0.22 | 0.17 | 420 | 0.22 |
| 117–84–0 | Di-n-octyl phthalate | 0.002 | 21000 | 0.1 | 0.002 | 21000 | 0.1 |
| 123–91–1 | Dioxane, 1,4- | 0.042 | 71 | 0.058 | 0.042 | 71 | 0.058 |
| 122–39–4 | Diphenylamine | 15 | 12000 | 15 | 15 | 12000 | 15 |
| 122–66–7 | Diphenylhydrazine, 1,2- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 298–04–4 | Disulfoton | 0.013 | 58 | 120 | 0.013 | 58 | 120 |
| 541–53–7 | Dithiobiuret | (1) | (1) | (1) | (1) | (1) | (1) |
| | D, salts, esters, 2,4- | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 115–29–7 | Endosulfan | 6 | 150 | 4 | 6 | 150 | 4 |
| 959–98–8 | Endosulfan I | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 33213–65–9 | Endosulfan II | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 1031–07–8 | Endosulfan sulfate | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 145–73–3 | Endothall | (1) | (1) | 4 | (1) | (1) | 3 |
| 72–20–8 | Endrin | 0.073 | 27 | 880 | 0.073 | 27 | 770 |
| 7421–93–4 | Endrin Aldehyde | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 53494–70–5 | Endrin ketone | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 106–89–8 | Epichlorohydrin | 0.34 | 96 | 47000 | 0.34 | 96 | 47000 |
| 51–43–4 | Epinephrine | (1) | (1) | (1) | (1) | (1) | (1) |
| 110–80–5 | Ethoxyethanol, 2- | 15 | 6900 | 53 | 15 | 6900 | 53 |
| 141–78–6 | Ethyl acetate | 390 | 600000 | 510 | 390 | 600000 | 510 |
| 51–79–6 | Ethyl carbamate | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 107–12–0 | Ethyl cyanide (propionitrile) | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 60–29–7 | Ethyl ether | 27 | 260000 | 37 | 27 | 260000 | 37 |

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED CONDITIONAL EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 97–63–2 | Ethyl methacrylate | 24 | 100000 | 27 | 24 | 100000 | 27 |
| 62–50–0 | Ethyl methanesulfonate | 0.0055 | (1) | 99000 | 0.0055 | (1) | 99000 |
| 100–41–4 | Ethylbenzene | 8 | ..... | 9 | 39 | ..... | 42 |
| 106–93–4 | Ethylene Dibromide | 0.00093 | 0.06 | 0.0049 | 0.00036 | 0.06 | 0.000098 |
| 75–21–8 | Ethylene oxide | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 96–45–7 | Ethylene thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 151–56–4 | Ethyleneimine (aziridine) | (1) | (1) | (1) | (1) | (1) | (1) |
| 52–85–7 | Famphur | (1) | 6 | 4 | (1) | 6 | 3 |
| 640–19–7 | Fluoracetamide, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–74–8 | Fluoracetic acid, sodium salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 206–44–0 | Fluoranthene | 28 | 21000 | 2 | 28 | 21000 | 2 |
| 86–73–7 | Fluorene | 22 | 90000 | 7 | 22 | 90000 | 7 |
| 16984–48–8 | Fluoride | ..... | ..... | ..... | ..... | ..... | |
| 50–00–0 | Formaldehyde | (1) | 54 | 37 | (1) | 54 | 37 |
| 64–18–6 | Formic Acid | 270 | 680000 | 370 | 270 | 680000 | 370 |
| 765–34–4 | Glycidylaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 319–86–8 | HCH, delta- | 0.0069 | 6 | 4 | 0.0069 | 6 | 3 |
| 76–44–8 | Heptachlor | (1) | 8 | ..... | (1) | 8 | ..... |
| 1024–57–3 | Heptachlor epoxide | 0.00053 | 0.56 | 1900 | 0.00053 | 0.56 | 10 |
| 87–68–3 | Hexachloro-1,3-butadiene | 0.0079 | 290 | 0.0069 | 0.0079 | 290 | 0.0069 |
| 118–74–1 | Hexachlorobenzene | (1) | 0.27 | 0.018 | (1) | 0.27 | (1) |
| 319–84–6 | Hexachlorocyclohexane, alpha- (alpha-BHC) | 0.00014 | 0.18 | 2 | 0.00014 | 0.18 | 2 |
| 319–85–7 | Hexachlorocyclohexane, beta- (beta-BHC) | 0.00044 | 0.64 | 0.0009 | 0.00044 | 0.64 | 0.0009 |
| 58–89–9 | Hexachlorocyclohexane, gamma- (Lindane) | 0.00078 | 0.75 | 26 | 0.00078 | 0.75 | 9 |
| 77–47–4 | Hexachlorocyclopentadiene | 0.0052 | 1500 | ..... | 0.0052 | 1500 | ..... |
| 67–72–1 | Hexachloroethane | 0.049 | 890 | 0.11 | 0.049 | 890 | 0.11 |
| 70–30–4 | Hexachlorophene | (1) | (1) | (1) | (1) | (1) | (1) |
| 1888–71–7 | Hexachloropropene | 0.27 | 1200 | 0.068 | 0.081 | 1200 | 0.06 |
| 757–58–4 | Hexaethyl tetraphosphate | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–78–6 | Hexanone, 2- | 8 | 38000 | 22 | 8 | 38000 | 22 |
| 302–01–2 | Hydrazine | (1) | 51 | (1) | (1) | 51 | (1) |
| 193–39–5 | Indeno(1,2,3-cd) pyrene | 0.0029 | 4 | (1) | 0.0029 | 4 | (1) |
| 74–88–4 | Iodomethane | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 78–83–1 | Isobutyl alcohol | 39 | 120000 | 53 | 39 | 120000 | 53 |
| 465–73–6 | Isodrin | (1) | 6 | 4 | (1) | 6 | 3 |
| 78–59–1 | Isophorone | 0.53 | 2000 | 0.69 | 0.53 | 2000 | 0.69 |
| 120–58–1 | Isosafrole | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 143–50–0 | Kepone | (1) | (1) | (1) | (1) | (1) | (1) |
| 303–43–4 | Lasiocarpine | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–92–1 | Lead | 30 | 1600 | 41 | 30 | 1600 | 41 |
| 108–31–6 | Maleic anhydride | (1) | 6900 | (1) | (1) | 6900 | (1) |
| 123–33–1 | Maleic hydrazide | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 109–77–3 | Malononitrile | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 148–82–3 | Melphalan | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–97–6 | Mercury | 0.06 | 39 | 0.081 | 0.3 | 39 | 0.4 |
| 126–98–7 | Methacrylonitrile | 0.016 | 72 | 0.021 | 0.016 | 72 | 0.021 |
| 74–93–1 | Methanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 67–561 | Methanol | 78 | 310000 | 110 | 78 | 310000 | 110 |
| 91–80–5 | Methapyrilene | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 16752–77–5 | Methomyl | (1) | 6 | 4 | (1) | 6 | 3 |
| 72–43–5 | Methoxychlor | 7 | 280 | ..... | 7 | 280 | ..... |
| 74–83–9 | Methy bromide (Bromomethane) | 0.37 | 850 | 4 | 0.37 | 850 | 4 |
| 74–87–3 | Methyl chloride (Chloromethane) | 0.096 | 91 | ..... | 0.096 | 91 | ..... |
| 78–93–3 | Methyl ethyl ketone | 78 | 250000 | 110 | 78 | 250000 | 110 |
| 1338–23–4 | Methyl ethyl ketone peroxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–34–4 | Methyl hydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–10–1 | Methyl isobutyl ketone | 8 | 38000 | 11 | 8 | 38000 | 11 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 80–62–6 | Methyl methacrylate | 28 | 100000 | 33 | 28 | 100000 | 33 |
| 66–27–3 | Methyl methanesulfonate | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 91–57–6 | Methyl naphthalene, 2- | (1) | 4 | (1) | (1) | 4 | (1) |
| 298–00–0 | Methyl parathion | 0.66 | 6 | 110 | 0.66 | 6 | 110 |
| 75–55–8 | Methylaziridine, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–49–5 | Methylcholanthrene, 3- | (1) | (1) | (1) | (1) | (1) | (1) |
| 74–95–3 | Methylene bromide | 0.029 | 21000 | 0.037 | 2 | 21000 | 0.19 |
| 75–09–2 | Methylene chloride | 0.039 | 720 | 0.09 | 0.039 | 720 | 0.053 |
| 101–14–4 | Methylenebis, 4,4'- (2-chloroaniline) | (1) | (1) | (1) | (1) | (1) | (1) |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG) | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–04–2 | Methylthiouracil | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–07–7 | Mitomycin C | (1) | (1) | (1) | (1) | (1) | (1) |
| 7439–98–7 | Molybdenum | 2 | 1200 | 2 | 2 | 1200 | 2 |
| 91–20–3 | Naphthalene | 14 | 430000 | 15 | 14 | 430000 | 15 |
| 130–15–4 | Naphthoquinone, 1,4- | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 86–88–4 | Naphthyl-2-thiourea, 1- | (1) | (1) | (1) | (1) | (1) | (1) |
| 134–32–7 | Naphthylamine, 1- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 91–59–8 | Naphthylamine, 2- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 7440–02–0 | Nickel | 4 | 8600 | 6 | 11 | 8600 | 14 |
| 54–11–5 | Nicotine and salts | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 88–74–4 | Nitroaniline, 2- | (1) | 88 | (1) | (1) | 88 | (1) |
| 99–09–2 | Nitroaniline, 3- | (1) | 88 | (1) | (1) | 88 | (1) |
| 100–01–6 | Nitroaniline, 4- | 0.028 | 88 | 0.038 | 0.028 | 88 | 0.038 |
| 98–95–3 | Nitrobenzene | 0.084 | 520 | 0.11 | 0.084 | 520 | 0.11 |
| 55–86–7 | Nitrogen mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–75–2 | Nitrogen mustard hydrochloride salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–85–2 | Nitrogen mustard N-Oxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–70–5 | Nitrogen mustard N-Oxide, HCl salt | (1) | (1) | (1) | (1) | (1) | (1) |
| 55–63–0 | Nitroglycerine | (1) | (1) | (1) | (1) | (1) | (1) |
| 99–55–8 | Nitro-o-toluidine, 5- | 0.028 | 88 | 0.038 | 0.028 | 88 | 0.038 |
| 88–75–5 | Nitrophenol, 2- | 0.025 | 42 | 0.034 | 0.025 | 42 | 0.034 |
| 100–02–7 | Nitrophenol, 4- | (1) | 42 | (1) | (1) | 42 | (1) |
| 79–46–9 | Nitropropane, 2- | (1) | 3 | ..... | (1) | 3 | ..... |
| 56–57–5 | Nitroquinoline-1-oxide, 4- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 55–18–5 | Nitrosodiethylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–75–9 | Nitrosodimethylamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 924–16–3 | Nitrosodi-n-butylamine | (1) | 1 | (1) | (1) | 1 | (1) |
| 10595–95–6 | Nitrosomethylethylamine | (1) | 0.035 | (1) | (1) | 0.035 | (1) |
| 1116–54–7 | N-Nitrosodiethanolamine | (1) | (1) | (1) | (1) | (1) | (1) |
| 621–64–7 | N-Nitrosodi-n-propylamine | (1) | 0.22 | (1) | (1) | 0.22 | (1) |
| 86–30–6 | N-Nitrosodiphenylamine | 0.2 | 3600 | 0.24 | 0.2 | 3600 | 0.24 |
| 45490–40–0 | N-Nitrosomethyl vinyl amine | (1) | (1) | (1) | (1) | (1) | (1) |
| 59–89–2 | N-Nitrosomorpholine | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 759–73–9 | N-Nitroso-N-ethylurea | (1) | (1) | (1) | (1) | (1) | (1) |
| 684–93–5 | N-Nitroso-N-methylurea | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 100–75–4 | N-Nitrosopiperidine | (1) | (1) | (1) | (1) | (1) | (1) |
| 930–55–2 | N-Nitrosopyrrolidine | (1) | 0.36 | (1) | (1) | 0.36 | (1) |
| 13256–22–9 | N-Nitrososarcosine | (1) | (1) | (1) | (1) | (1) | (1) |
| 103–85–5 | N-Phenylthiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 1615–80–1 | N,N-Diethylhydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 152–16–9 | Octamethylpyrophosphoramide | 0.27 | 31 | 0.37 | 0.27 | 31 | 0.37 |
| 20816–12–0 | Osmium tetroxide | (1) | (1) | (1) | (1) | (1) | (1) |
| 297–97–2 | O,O-Diethyl O-pyrazinyl phosphorothioate | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 126–68–1 | O,O,O-Triethyl phosphorothioate | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 123–63–7 | Paraldehyde | 8 | 38000 | 22 | 8 | 38000 | 22 |
| 56–38–2 | Parathion | 3 | 19 | 160000 | 3 | 19 | 160000 |
| 608–93–5 | Pentachlorobenzene | 5 | 2300 | 0.054 | 5 | 2300 | 0.054 |
| 76–01–7 | Pentachloroethane | 0.024 | 140 | 0.054 | 0.023 | 140 | 0.053 |
| 82–68–8 | Pentachloro- nitrobenzene (PCNB) | 0.27 | 140 | (1) | 0.081 | 140 | (1) |
| 87–86–5 | Pentachlorophenol | 0.002 | 22 | 0.0022 | 0.002 | 22 | 0.0022 |
| 62–44–2 | Phenacetin | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 85–01–8 | Phenanthrene | (1) | 4 | (1) | (1) | 4 | (1) |
| 108–95–2 | Phenol | 84 | 390000 | 110 | 84 | 390000 | 110 |
| 62–38–4 | Phenyl mercuric acetate | (1) | (1) | (1) | (1) | (1) | (1) |
| 25265–76–3 | Phenylenediamines (N.O.S.) | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 108–45–2 | Phenylenediamine, m- | 0.78 | 1700 | 1 | 0.78 | 1700 | 1 |

TABLE A.—MODELED OR EXTRAPOLATED RISK-BASED CONDITIONAL EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 106–50–3 | Phenylenediamine, p- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 298–06–2 | Phorate | 0.11 | 510 | ..... | 0.11 | 510 | ..... |
| | Phosphorodithioic acid, dimethylethylester | (1) | (1) | (1) | (1) | (1) | (1) |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methyl | (1) | (1) | (1) | (1) | (1) | (1) |
| 2953–29–9 | Phosphorodithioic acid, trimethyl ester | (1) | (1) | (1) | (1) | (1) | (1) |
| 85–44–9 | Phthalic anhydride | (1) | 9600 | (1) | (1) | 9600 | (1) |
| 109–06–8 | Picoline, 2- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 1336–36–3 | Polychlorinated biphenyls | See Table B | 0.25 | 0.009 | See Table B | 0.25 | (1) |
| 12305–58–5 | Pronamide | 21 | 230000 | 25 | 21 | 230000 | 25 |
| 1120–71–4 | Propane sultone, 1,3- | (1) | (1) | (1) | (1) | (1) | (1) |
| 107-10-8 | Propylamine, n- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 51–52–5 | Propylthiouracil | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 107–19–7 | Propyn-1ol, 2- | 39 | 130000 | 53 | 39 | 130000 | 53 |
| 129–00–0 | Pyrene | 54 | 16000 | 2 | 54 | 16000 | 2 |
| 110–86–1 | Pyridine | 0.16 | 930 | 0.21 | 0.16 | 930 | 0.21 |
| 50–55–5 | Reserpine | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 108–46–3 | Resorcinol | (1) | (1) | 4 | (1) | (1) | (1) |
| 81–07–2 | Saccharin and salts | (1) | (1) | (1) | (1) | (1) | |
| 94–59–7 | Safrole | 0.0035 | 28 | 0.0044 | 0.0035 | 28 | 0.0044 |
| 7782–49–2 | Selenium | 0.23 | 280 | 0.12 | 0.93 | 280 | 1 |
| 7440–22–4 | Silver | 200 | 9 | ..... | 200 | 9 | ..... |
| 18883–66–4 | Streptozotocin | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–24–9 | Strychnine | 0.045 | (1) | 0.059 | 0.045 | (1) | 0.059 |
| 10–42–5 | Stryene | 0.91 | ..... | 1 | 64 | ..... | 70 |
| 18496–25–8 | Sulfide | ..... | ..... | ..... | ..... | ..... | ..... |
| 1746–01–6 | TCDD, 2,3,7,8- | (1) | (1) | (1) | (1) | (1) | (1) |
| 95–94–3 | Tetrachlorobenzene, 1,2,4,5- | 0.23 | 1600 | 0.032 | 0.23 | 1600 | 0.032 |
| 630–20–6 | Tetrachloroethane 1,1,1,2- | 0.024 | 370 | 0.042 | 0.024 | 370 | 0.042 |
| 79–34–5 | Tetrachloroethane, 1,1,2,2- | 0.0037 | 70 | 0.0077 | 0.0037 | 70 | 0.0077 |
| 127–18–4 | Tetrachloroethylene | 0.026 | 100000 | 0.032 | 2 | 100000 | 3 |
| 58–90–2 | Tetrachlorophenol, 2,3,4,6- | 2 | 35000 | 2 | 2 | 35000 | 2 |
| 107–49–3 | Tetraethyl pyrophosphate | (1) | 6900 | (1) | (1) | 6900 | (1) |
| 107–49–3 | Tetraethyl pyrophosphate | (1) | 6900 | (1) | (1) | 6900 | (1) |
| 3689–24–5 | Tetraethyldithiopyrophosphate | 0.23 | 1200 | ..... | 0.23 | 1200 | ..... |
| 7440–28–0 | Thallium (I) | 0.035 | 33 | 0.048 | 0.05 | 33 | 0.071 |
| 62–55–5 | Thioacetamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 39196–18–4 | Thiofanox | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 108–98–5 | Thiophenol | 0.12 | 590 | 24 | 0.12 | 590 | 24 |
| 79–19–6 | Thiosemicarbazide | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–566 | Thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 137–26–8 | Thiram | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–31–5 | Tin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–88–3 | Toluene | 6 | 560000 | 7 | 30 | 560000 | 51 |
| 584–84–9 | Toluene diisocyanate | (1) | (1) | (1) | ..... | ..... | |
| 95–80–7 | Toluenediamine, 2,4— | (1) | (1) | (1) | (1) | (1) | (1) |
| 823–40–5 | Toluenediamine, 2,6- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 496–72–0 | Toluenediamine, 3,4- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 636–21–5 | Toulidene,3,4- | 0.16 | 51 | 0.37 | 0.16 | 51 | 0.37 |
| 95–53–4 | Toluidine, o- | (1) | (1) | (1) | (1) | (1) | (1) |
| 106–49–0 | Toluidine, p- | (1) | (1) | (1) | (1) | (1) | (1) |
| 8001–35–2 | Toxaphene | (1) | (1) | 160 | (1) | (1) | 3 |
| 76–13–1 | Trichloro-1,2,2-trifuoroethane, 1,1,2 | 0.77 | ..... | 0.84 | 2200 | ..... | 12000 |
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.69 | 62000 | 3 | 0.69 | 62000 | 3 |
| 71–55–6 | Trichloroethane, 1,1,1- | 74 | 630000 | 0.054 | 74 | 630000 | 0.054 |
| 79–00–5 | Trichloroethane, 1,1,2- | 0.012 | 190 | 0.039 | 0.007 | 190 | 0.0077 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 79–01–6 | Trichloroethylene | 0.024 | 3200 | 0.031 | 0.038 | 3200 | 0.049 |
| 79–69–4 | Trichlorofluoromethane | 48 | 170000 | 61 | 48 | 170000 | 61 |
| 75–70–7 | Trichloromethanethiol | (1) | (1) | (1) | (1) | (1) | 22 |
| 95–95–4 | Trichlorophenol, 2,4,5- | 18 | 55000 | 22 | 18 | 55000 | 22 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.054 | 160 | 0.068 | 0.054 | 160 | 0.068 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5- (245-T) | 2 | 150 | 2 | 2 | 150 | 2 |
| 93–72–1 | Trichlorophenoxypropionic acid, 2,4,5- (Silvex) | 0.21 | 520 | 0.28 | 1 | 520 | 2 |
| 96–18–4 | Trichloropropane, 1,2,3- | 1 | 14000 | 1 | 1 | 14000 | 1 |
| 99–35–4 | Trintrobenzene, sym- | 0.0078 | 23 | 0.011 | 0.0078 | 23 | 0.011 |
| 126–72–7 | Tris (2,3-dibromopropyl) phosphate | (1) | 0.76 | (1) | (1) | 0.76 | (1) |
| 52–24–4 | Tris (1-azridinyl) phosphine sulfide | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–57–1 | Trypan blue | (1) | (1) | (1) | (1) | (1) | (1) |
| 66–75–1 | Uracil mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–62–2 | Vanadium | 10 | 2700 | 13 | 10 | 2700 | 13 |
| 108–05–4 | Vinyl acetate | 15 | 6900 | 37 | 15 | 6900 | 37 |
| 75–01–4 | Vinyl chloride | 0.002 | 3 | 0.011 | (1) | 3 | 0.00021 |
| 81–81–2 | Warfarin | (1) | 6 | 4 | (1) | 6 | 3 |
| 1330–20–7 | Xylenes (total) | 22 | 710000 | 100 | 22 | 710000 | 700 |
| 7440–66–6 | Zinc | 99 | 51000 | 130 | 99 | 51000 | 130 |

[1] See table B.

TABLE B.—QUANTITATION-BASED CONDITIONAL EXIT LEVELS

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 208–96–8 | Acenaphthylene | 0.02 | ..... | 0.02 | 0.02 | ..... | ..... |
| 75–36–5 | Acetyl chloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 591–08–2 | Acetyl-2-thiourea, | 1 | ..... | ..... | 1 | ..... | ..... |
| 107–02–8 | Acrolein | 0.013 | ..... | ..... | 0.013 | ..... | ..... |
| 79–06–1 | Acrylamide | 0.01 | 0.1 | 0.01 | 0.01 | 0.1 | 0.01 |
| 107–13–1 | Acrylonitrile | 0.008 | ..... | 0.008 | ..... | 0.008 | |
| 1402–68–2 | Aflatoxins | (1) | (1) | (1) | (1) | (1) | (1) |
| 116–06–3 | Aldicarb | 0.05 | ..... | ..... | 0.05 | ..... | ..... |
| 309–00–2 | Aldrin | 0.000034 | ..... | 0.000034 | 0.000034 | ..... | 0.000034 |
| 107–18–6 | Allyl alcohol | (1) | (1) | (1) | (1) | (1) | (1) |
| 2763–96–4 | Aminomethyl-3-isoxazolol, 5-. | (1) | (1) | (1) | (1) | (1) | (1) |
| 504–24–5 | Aminopyridine, 4- | (1) | (1) | (1) | (1) | (1) | (1) |
| 61–82–5 | Amitrole | (1) | (1) | (1) | (1) | (1) | (1) |
| 120–12–7 | Anthracene | 0.007 | ..... | 0.007 | 0.007 | ..... | 0.007 |
| 7440–38–2 | Arsenic | ..... | ..... | ..... | 0.0005 | ..... | ..... |
| 2465–27–2 | Auramine | (1) | (1) | (1) | (1) | (1) | (1) |
| 115–02–6 | Azaserine | (1) | (1) | (1) | (1) | (1) | (1) |
| 92–87–5 | Benzidine | 0.0025 | 0.042 | 0.0025 | 0.0025 | 0.042 | 0.0025 |
| 98–07–7 | Benzotrichloride | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–32–8 | Benzo(a)pyrene | ..... | ..... | ..... | ..... | ..... | 0.000023 |
| 205–82–3 | Benzo(j)fluoranthene | ..... | ..... | ..... | ..... | ..... | 0.0002 |
| 207–08–9 | Benzo(k)fluoranthene | ..... | ..... | ..... | ..... | ..... | 0.0002 |
| 191–24–2 | Benzo[g,h,i]perylene | ..... | ..... | ..... | ..... | ..... | 0.0008 |
| 56–55–3 | Benz(a)anthracene | ..... | ..... | 0.000013 | ..... | ..... | 0.000013 |
| 225–51–4 | Benz[c]acridine | ..... | ..... | ..... | ..... | ..... | 0.0005 |
| 542–88–1 | Bis(chloromethyl) ether. | (1) | (1) | (1) | (1) | (1) | (1) |
| 357–57–3 | Brucine | 20 | (1) | 20 | 20 | (1) | 20 |
| 86–74–8 | Carbazole | (1) | (1) | (1) | (1) | (1) | (1) |
| 353–50–4 | Carbon oxyfluoride | (1) | (1) | (1) | (1) | (1) | (1) |
| 75–87–6 | Chloral | (1) | (1) | (1) | (1) | (1) | (1) |
| 305–03–3 | Chlorambucil | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–74–9 | Chlordane | 0.00004 | ..... | ..... | 0.00004 | ..... | ..... |
| 494–03–1 | Chlornaphazin | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–20–0 | Chloroacetaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 110–75–8 | Chloroethyl vinyle ether, 2–. | (1) | (1) | (1) | (1) | (1) | (1) |
| 107–30–2 | Chloromethyl methyl ether. | (1) | (1) | (1) | (1) | (1) | (1) |
| 5344–82–1 | Chlorophenyl thiourea, 1-o-. | (1) | (1) | (1) | (1) | (1) | (1) |
| 542–76–7 | Chloropropionitrile, 3–. | ..... | ..... | 0.1 | 0.1 | ..... | 0.1 |
| 6358–53–8 | Citrus red No. 2 | (1) | (1) | (1) | (1) | (1) | (1) |
| 7440–48–4 | Cobalt | ..... | ..... | 0.5 | ..... | ..... | ..... |
| 57–12–5 | Cyanida | 0.2 | ..... | ..... | 0.2 | ..... | ..... |
| 14901–08–7 | Cycasin | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–94–1 | Cyclohexanone | 10 | ..... | ..... | 10 | (1) | (1) |
| 131–89–5 | Cyclohexyl-4,6-dinitrophenol, 2–. | 0.1 | (1) | 0.1 | 0.1 | (1) | 0.1 |
| 50–18–0 | Cyclophosphamide | (1) | (1) | (1) | (1) | (1) | (1) |
| 20830–81–3 | Daunomycin | (1) | (1) | (1) | (1) | (1) | (1) |
| 53–19–0 | DDD (o,p') | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–55–9 | DDE | 0.000058 | ..... | ..... | 0.000058 | ..... | ..... |
| 3424–82–6 | DDE (o,p') | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–29–3 | DDT | 0.000081 | ..... | ..... | 0.000081 | ..... | ..... |
| 789–02–6 | DDT (o,p') | (1) | (1) | (1) | (1) | (1) | (1) |
| 192–65–4 | Dibenzo-[a,e]ypyrene. | ..... | ..... | ..... | ..... | ..... | 0.001 |
| 189–64–0 | Dibenzo- [a,h]pyrene | ..... | ..... | ..... | ..... | ..... | 0.0002 |
| 189–64–9 | Dibenzo- [a,i]pyrene | ..... | ..... | ..... | ..... | ..... | 0.0002 |
| 194–59–2 | Dibenzo-[c,g]carbazole, 7H–. | (0.01 | ..... | 0.01 | 0.01 | ..... | 0.01 |
| 226–36–8 | Dibenz- (a,h)acridine | ..... | ..... | ..... | ..... | ..... | 0.0002 |
| 53–70–3 | Dibenz- (a,h)anthracene. | 0.00003 | 0.084 | 0.00003 | 0.00003 | 0.084 | 0.00003 |
| 224–42–0 | Dibenz[a,j] acridine | ..... | ..... | ..... | ..... | ..... | 0.001 |
| 311–45–5 | Diethyl-p-nitrophenyl phosphate. | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–53–1 | Diethylstibestrol | 0.0078 | 1 | 0.0078 | 0.0078 | 1 | 0.0078 |
| 77–78–1 | Dimethyl sulfate | (1) | (1) | (1) | (1) | (1) | (1) |
| 119–93–7 | Dimethybenzidine, 3,3′-. | 0.0033 | 0.7 | 0.0033 | 0.0033 | 0.7 | 0.0033 |
| 57–97–6 | Dimethyl- benz(a)-anthracene, 7,12-. | 0.00037 | 0.039 | 0.00037 | 0.00037 | 0.039 | 0.00037 |

TABLE B.—QUANTITATION-BASED CONDITIONAL EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 79–44–7 | Dimethylcarbamoyl chloride. | (1) | (1) | (1) | (1) | (1) | (1) |
| 119–90–4 | Dimethy- oxybenzidine, 3,3′-. | ..... | 7 | ..... | ..... | 7 | ..... |
| 100–25–4 | Dinitrobenzene, 1,4- | 0.04 | ..... | 0.04 | 0.04 | ..... | 0.04 |
| 534–52–1 | Dinitro-o-cresol, 4,6- | 0.05 | ..... | 0.05 | 0.05 | ..... | 0.05 |
| 541–53–7 | Dithiobiuret | (1) | (1) | (1) | (1) | (1) | (1) |
| 145–73–3 | Endothall | 0.1 | (1) | ..... | 0.1 | (1) | ..... |
| 51–43–4 | Epinephrine | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–50–0 | Ethyl methanesulfonate. | ..... | 0.018 | ..... | ..... | 0.018 | ..... |
| 96–45–7 | Ethylene thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 151–56–4 | Ethyleneimine (aziridine). | (1) | (1) | (1) | (1) | (1) | (1) |
| 52–85–7 | Famphur | 0.02 | ..... | ..... | 0.02 | ..... | ..... |
| 640–19–7 | Fluoracetamide, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–74–8 | Fluoracetic acid, sodium salt. | (1) | (1) | (1) | (1) | (1) | (1) |
| 16984–48–8 | Fluoride | ..... | ..... | ..... | ..... | ..... | ..... |
| 50–00–0 | Formaldehyde | 0.023 | ..... | ..... | 0.023 | ..... | ..... |
| 765–34–4 | Glycidylaldehyde | (1) | (1) | (1) | (1) | (1) | (1) |
| 76–44–8 | Heptachlor | 0.00004 | ..... | ..... | 0.00004 | ..... | ..... |
| 118–74–1 | Hexachlorobenzene | 0.0016 | ..... | ..... | 0.0016 | ..... | 0.0016 |
| 70–30–4 | Hexachlorophene | 0.21 | 2 | 0.21 | 0.21 | 2 | 0.21 |
| 757–58–4 | Hexaethyl tetraphosphate. | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–01–2 | Hydrazine | (1) | ..... | (1) | (1) | ..... | (1) |
| 193–39–5 | indeno(1,2,3-cde)pyrene. | ..... | ..... | 0.000043 | ..... | ..... | 0.000043 |
| 465–73–6 | Isodrin | 0.02 | ..... | ..... | 0.02 | ..... | ..... |
| 143–50–0 | Kepone | 0.016 | 0.097 | 0.016 | 0.016 | 0.097 | 0.016 |
| 303–43–4 | Lasiocarpine | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–31–6 | Maleic anhydride | (1) | ..... | (1) | (1) | ..... | (1) |
| 148–82–3 | Melphalan | (1) | (1) | (1) | (1) | (1) | (1) |
| 74–93–1 | Methanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 16752–77–5 | Methomyl | 0.05 | ..... | ..... | 0.05 | ..... | ..... |
| 1338–23–4 | Methyl ethyl ketone peroxide. | (1) | (1) | (1) | (1) | (1) | (1) |
| 60–34–4 | Methyl hydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 91–57–6 | Methyl naphthalene, 2-. | 0.01 | ..... | 0.01 | 0.01 | ..... | 0.01 |
| 75–55–8 | Methylaziridine, 2- | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–49–5 | Methylcholanthrene, 3-. | 0.01 | 0.046 | 0.01 | 0.01 | 0.046 | 0.01 |
| 101–14–4 | Methylenebis, 4,4′-(2-chloroaniline). | (1) | (1) | (1) | (1) | (1) | (1) |
| 70–25–7 | Methyl-nitro-nitrosoguanidine (MNNG). | (1) | (1) | (1) | (1) | (1) | (1) |
| 56–04–2 | Methylthiouracil | (1) | (1) | (1) | (1) | (1) | (1) |
| 50–07–7 | Mitomycin C | (1) | (1) | (1) | (1) | (1) | (1) |
| 86–88–4 | Naphthyl-2-thiourea, 1-. | (1) | (1) | (1) | (1) | (1) | (1) |
| 88–74–4 | Nitroaniline, 2- | 0.05 | ..... | 0.05 | 0.05 | ..... | 0.05 |
| 99–09–2 | Nitroaniline, 3- | 0.05 | ..... | 0.05 | 0.05 | ..... | 0.05 |
| 55–86–7 | Nitrogen mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 51–75–2 | Nitrogen mustard hydrochloride salt. | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–85–2 | Nitrogen mustard N–Oxide. | (1) | (1) | (1) | (1) | (1) | (1) |
| 302–70–5 | Nitrogen mustard N-Oxide, HCI salt. | (1) | (1) | (1) | (1) | (1) | (1) |
| 55–63–0 | Nitroglycerine | (1) | (1) | (1) | (1) | (1) | (1) |
| 110–02–7 | Nitrophenol, 4- | 0.05 | ..... | 0.05 | 0.05 | ..... | 0.05 |
| 79–46–9 | Nitropropane, 2- | 0.0058 | ..... | ..... | 0.0058 | ..... | ..... |
| 55–18–5 | Nitrosodiethylamine | 0.002 | (1) | 0.002 | 0.002 | 1 | 0.002 |
| 62–75–9 | Nitrosodimethylamine | 0.0006 | 0.074 | 0.0006 | 0.0006 | 0.074 | 0.0006 |
| 924–16–3 | Nitrosodi-n-butylamine. | 0.06 | ..... | 0.06 | 0.06 | ..... | 0.06 |
| 10595–95–6 | Nitrosomethylethylamine. | 0.028 | ..... | 0.028 | 0.028 | ..... | 0.028 |
| 1116–54–7 | N-Nitrosodiethanolamine. | 0.01 | 0.7 | 0.01 | 0.01 | 0.7 | 0.01 |
| 621–64–7 | N-Nitrosodi-n-propyamine. | 0.026 | ..... | 0.026 | 0.026 | ..... | 0.026 |

TABLE B.—QUANTITATION-BASED CONDITIONAL EXIT LEVELS—Continued

| CAS No. | Name | MCL benchmark option | | | Toxicity benchmark option | | |
|---|---|---|---|---|---|---|---|
| | | Wastewater | Nonwastewater | | Wastewater | Nonwastewater | |
| | | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) | Totals (mg/l) | Totals (mg/kg) | Leach (mg/l) |
| 4549–40–0 | N-Nitrosomethy vinyl amine. | (1) | (1) | (1) | (1) | (1) D(1) | |
| 759–73–9 | N-Nitroso-N-ethylurea. | (1) | (1) | (1) | (1) | (1) | (1) |
| 615–53–2 | N-Nitroso-N-methylurethane. | (1) | (1) | (1) | (1) | (1) | (1) |
| 16543–55–8 | N-Nitrosonornicotine | (1) | (1) | (1) | (1) | (1) | (1) |
| 100–75–4 | N-Nitrosopiperidine | 0.0014 | 0.033 | 0.0014 | 0.0014 | 0.033 | 0.0014 |
| 930–55–2 | N-Nitrosopyrrolidine | 0.0047 | ..... | 0.0047 | 0.0047 | ..... | 0.0047 |
| 13256–22–9 | N-Nitrososarcosine | (1) | (1) | (1) | (1) | (1) | (1) |
| 103–85–5 | N-Phenylthiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 1615–80–1 | N,N-Diethylhydrazine | (1) | (1) | (1) | (1) | (1) | (1) |
| 20816–12–0 | Osmium tetroxide | 3 | 200 | 3 | 3 | 200 | 3 |
| 82–68–8 | Pentachloronitrobenzene (PCNB). | ..... | ..... | 0.02 | ..... | ..... | 0.02 |
| 85–01–8 | Phenanthrene | 0.006 | ..... | 0.006 | 0. 006 | ..... | 0.006 |
| 62–38–4 | Phenyl mercuric acetate. | (1) | (1) | (1) | (1) | (1) | (1) |
| | Phosphorodithioic acid, dimethylethylester. | (1) | (1) | (1) | (1) | (1) | (1) |
| 298–06–6 | Phosphorodithioic acid, o-o-diethyl ester. | (1) | (1) | (1) | (1) | (1) | (1) |
| 3288–58–2 | Phosphorodithioic acid, o-o-diethyl-s-methlyl. | (1) | (1) | (1) | (1) | (1) | (1) |
| 2953–29–9 | Pyhosphorodithioic acid, trimethyl ester. | (1) | (1) | (1) | (1) | (1) | (1) |
| 85–44–9 | Phthalic anhydride | (1) | ..... | (1) | (1) | ..... | (1) |
| 1336–36–3 | Polychlorinated biphenyls. | 0.0005 | ..... | ..... | 0.0005 | ..... | 0.0005 |
| 1120–71–4 | Propane sultone, 1,3-. | (1) | (1) | (1) | (1) | (1) | (1) |
| 108–46–3 | Resorcinol | 0.1 | 7 | ..... | 0.1 | 7 | ..... |
| 81–07–2 | Saccharin and salts | (1) | (1) | (1) | (1) | (1) | (1) |
| 18883–66–4 | Streptozotocin | (1) | (1) | (1) | (1) | (1) | (1) |
| 57–24–9 | Strychnine | ..... | 3 | ..... | ..... | 3 | ..... |
| 1746–01–6 | TCDD, 2, 3, 7.8- | 1.000E-08 | ..... | ..... | 1.000E-08 | ..... | 1.000E-08 |
| 107–49–3 | Tetraethyl pyrophosphate. | (1) | ..... | (1) | (1) | ..... | (1) |
| 62–55–5 | Thioacetamide | 1 | (1) | 1 | 1 | (1) | 1 |
| 79–19–6 | Thiosemicarbazide | (1) | (1) | (1) | (1) | (1) | (1) |
| 62–56–6 | Thiourea | (1) | (1) | (1) | (1) | (1) | (1) |
| 137–26–8 | Thiram | 0.05 | ..... | ..... | 0.05 | ..... | ..... |
| 7440–31–5 | Tin | 8 | 500 | 8 | 8 | 500 | 8 |
| 584–84–9 | Toluene diisocyanate | (1) | ..... | (1) | (1) | ..... | (1) |
| 95–80–7 | Toluenediamine, 2,4- | 0.013 | 1 | 0.013 | 0.013 | 1 | 0.013 |
| 95–53–4 | Toluidine, 0- | 0.012 | ..... | 0.012 | 0.012 | ..... | 0.012 |
| 106–49–0 | Toluidine, p- | 0.017 | ..... | 0.017 | 0.017 | ..... | 0.017 |
| 8001–35–2 | Toxaphene | 0.0013 | 0.03 | ..... | 0.0013 | 0.03 | ..... |
| 75–70–7 | Trichloromethanethiol | (1) | (1) | (1) | (1) | (1) | (1) |
| 126–72–7 | Tris (2, 3-dibromopropyl) phosphate. | 0.025 | ..... | 0.025 | 0.025 | ..... | 0.025 |
| 52–24–4 | Tris (1-azridinyl) phosphine sulfide. | (1) | (1) | (1) | (1) | (1) | (1) |
| 72–57–1 | Trypan blue | (1) | (1) | (1) | (1) | (1) | (1) |
| 66–75–1 | Uracil mustard | (1) | (1) | (1) | (1) | (1) | (1) |
| 75–01–4 | Vinyl chloride | ..... | ..... | ..... | 0.00017 | ..... | ..... |
| 81–81–2 | Warfarin | 0.05 | ..... | ..... | 0.05 | ..... | ..... |

[1] No testing required; additional LDR requirements apply.

## PART 266—STANDARDS FOR THE MANAGEMENT OF SPECIFIC HAZARDOUS WASTES AND SPECIFIC TYPES OF HAZARDOUS WASTE FACILITIES

9. The authority citation for part 266 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a), 6924, and 6934.

10. Section 266.20 is amended by revising the first sentence of paragraph (b) to read as follows:

* * * * *

(b) Products produced for the general public's use that are used in a manner that constitutes disposal and that contain recyclable materials are not presently subject to regulation if, for each hazardous constituent in each recyclable material (i.e., hazardous waste) that they contain, they meet the

applicable exit levels in appendix X to Part 261 of this chapter. * * *

## PART 268—LAND DISPOSAL RESTRICTIONS

11. The authority citation for part 268 continues to read as follows:

Authority: 42 U.S.C. 6905, 6912(a) 6921, and 6924.

12. Section 268.2 is amended by adding paragraph (j) to read as follows:

* * * * *

(j) *Land treatment* means waste is applied onto or incorporated into the soil surface.

13. Section 268.40 is amended by revising the first sentence of paragraph (a), revising paragraph (e), and adding paragraph (g) to read as follows:

### § 268.41 Applicability of treatment standards

(a) Except as provided in paragraph (g) of this section, a waste identified in the table ''Treatment Standards for Hazardous Wastes'' may be land disposed only if it meets the requirements found in the table. * * *

* * * * *

(e) Except as provided in paragraph (g) of this section, for all characteristic wastes (D001, D002, and D012–D043) that are subject to treatment standards in the following table ''Treatment Standards for Hazardous Wastes,'' all underlying constituents (as defined in § 268.20(i)) must meet Universal Treatment Standards, found in § 268.48, Table UTS, prior to land disposal.

* * * * *

(g) Wastes subject to either the treatment standards described in paragraph (a)(1) or (a)(2) of this section or the Universal Treatment Standards described in paragraph (e) of this section may be land disposed if they meet either of the alternative, risk-based standards found in subpart F and G of this part and representing levels at which threats to human health or the environment are minimized.

14. Part 268 is amended by adding Subpart F consisting of § 268.60 to read as follows:

## Subpart F—Minimize Threat Levels Without Management Requirements

### § 268.60 Minimize threat levels.

(a) Table ''Minimize Threat Levels'' identifies risk-based standards representing levels at which threats to human health and the environment are minimized. These levels may be used as alternatives to waste-specific treatment standards in the table to § 268.40 and to the Universal Treatment Standards in the table to § 268.48. Nonwastewaters must meet both the total and waste extract levels contained in the table of ''Minimize Threat Levels''.

(b) Wastes identified in the Table to § 268.40 may be land disposed if they meet either the requirements in that Table or the standards in the Minimize Threat Table for all constituents. Characteristic wastes that are subject to the requirement for meeting Universal Treatment Standards under § 268.40(e) must also meet the requirements of Table UTS or the Minimize Threat Table for all underlying hazardous constituents as defined in § 268.2(i).

(c) Wastes containing either regulated hazardous constituents under the Table to § 268.40 or UTS constituents which do not have treatment standards listed in the Minimize Threat Table must continue to comply with treatment standards for these constituents in the tables to § 268.40 or § 268.48 prior to land disposal.

268.60 TABLE 1.—MINIMIZE THREAT LEVELS

| CAS | Constituent name | WW standard (mg/l) | NWW standard (mg/kg) | NWW standard (mg/l) |
|---|---|---|---|---|
| 83–32–9 | Acenaphthene | 31 | 9500 | 5 |
| 67–64–1 | Acetone | 16 | 17000 | 6 |
| 75–05–8 | Acetonitrile | | 920 | 0.3 |
| 98–86–2 | Acetophenone | 17 | 1200 | 6 |
| 107–05–1 | Allyl chloride | | 260 | |
| 7440–39–3 | Barium | 33 | 2100 | 16 |
| 71–43–2 | Benzene | | 110 | 0.0054 |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | | 230 | 0.0011 |
| 75–27–4 | Bromodichloromethane | | 19 | 0.0025 |
| 75–25–2 | Bromoform (Tribromomethane) | | 170 | 0.018 |
| 71–36–3 | Butanol | 16 | 18000 | 6 |
| 88–85–7 | Butyl-4,6-dinitrophenol, 2-sec- (Dinoseb) | 0.19 | 770 | 0.064 |
| 85–68–7 | Butylbenzylphthalate | 240 | 87 | 64 |
| 75–15–0 | Carbon disulfide | | 330 | 6 |
| 56–23–5 | Carbon tetrachloride | | 9 | 0.0016 |
| 126–99–8 | Chloro-1,3-butadiene, 2- (Chloroprene) | 0.52 | 290 | |
| 106–47–8 | Chloroaniline, p- | | 140 | 0.16 |
| 108–90–7 | Chlorobenzene | 2 | 2500 | 1 |
| 124–48–1 | Chlorodibromomethane | | 28 | 0.0018 |
| 67–66–3 | Chloroform | | 7 | 0.017 |
| 95–57–8 | Chlorophenol, 2- | 0.9 | 100 | 0.32 |
| 218–01–9 | Chrysene | 0.1 | 35 | 0.0012 |
| 108–39–4 | Cresol, m- | 8 | 22000 | 3 |
| 95–48–7 | Cresol, o- | 8 | 27000 | 3 |
| 106–44–5 | Cresol, p- | 0.84 | 2600 | 0.32 |
| 84–74–2 | Di-n-butyl phthalate | 230 | 90000 | 25 |
| 117–84–0 | Di-n-octyl phthalate | | 4500 | 0.1 |
| 95–50–1 | Dichlorobenzene, 1,2- | 15 | 50000 | 6 |
| 106–46–7 | Dichlorobenzene, 1,4- | | 64 | 0.011 |
| 75–71–8 | Dichlorodifluoromethane | 15 | 8100 | 12 |
| 75–34–3 | Dichloroethane, 1,1- | | 24 | 0.00006 |
| 156–60–5 | Dichloroethylene, trans-1,2- | 3 | 14000 | 1 |
| 120–83–2 | Dichlorophenol, 2,4- | 0.62 | 770 | 0.18 |
| 94–75–7 | Dichlorophenoxyacetic acid, 2,4- (2,4-D) | 2 | 3100 | 0.6 |
| 84–66–2 | Diethyl phthalate | 190 | 4500 | 54 |
| 131–11–3 | Dimethyl phthalate | 78 | | |

268.60 TABLE 1.—MINIMIZE THREAT LEVELS—Continued

| CAS | Constituent name | WW standard (mg/l) | NWW standard (mg/kg) | NWW standard (mg/l) |
|---|---|---|---|---|
| 105–67–9 | Dimethylphenol, 2,4- | 4 | 11000 | 1 |
| 51–28–5 | Dinitrophenol, 2,4- | 0.27 | | |
| 121–14–2 | Dinitrotoluene, 2,4- | | 210 | 0.11 |
| 606–20–2 | Dinitrotoluene, 2,6- | | 86 | 0.064 |
| 122–39–4 | Diphenylamine | 15 | 12000 | 3 |
| 298–04–4 | Disulfoton | | 43 | 13 |
| 72–20–8 | Endrin | 0.073 | 0.26 | 32 |
| 141–78–6 | Ethyl acetate | 390 | 270000 | 110 |
| 60–29–7 | Ethyl ether | 27 | 41000 | 11 |
| 97–63–2 | Ethyl methacrylate | 24 | 3400 | 7 |
| 100–41–4 | Ethylbenzene | 39 | 550000 | 8 |
| 206–44–0 | Fluoranthene | 28 | 6000 | 2 |
| 86–73–7 | Fluorene | 22 | 90000 | 3 |
| 76–44–8 | Heptachlor | | 8 | |
| 87–68–3 | Hexachloro-1,3-butadiene | | 36 | 0.0069 |
| 319–85–7 | Hexachlorocyclohexane, beta- (beta-BHC) | 0.00044 | 0.12 | 0.00021 |
| 58–89–9 | Hexachlorocyclohexane, gamma- (Lindane) | | 0.1 | 0.69 |
| 77–47–4 | Hexachlorocyclopentadiene | | 1500 | |
| 67–72–1 | Hexachloroethane | | 81 | 0.033 |
| 78–83–1 | Isobutyl alcohol | 39 | 55000 | 15 |
| 7439–92–1 | Lead | 30 | 570 | 12 |
| 7439–97–6 | Mercury | 0.3 | 0.6 | 0.14 |
| 67–56–1 | Methanol | 78 | 140000 | 30 |
| 72–43–5 | Methoxychlor | 7 | 19 | |
| 74–83–9 | Methyl bromide (Bromomethane) | 0.37 | 500 | 0.92 |
| 74–87–3 | Methyl chloride (Chloromethane) | | 91 | |
| 78–93–3 | Methyl ethyl ketone | 78 | 110000 | 30 |
| 108–10–1 | Methyl isobutyl ketone | 8 | 17000 | 3 |
| 80–62–6 | Methyl methacrylate | 28 | 40000 | 8 |
| 298–00–0 | Methyl parathion | 0.66 | | |
| 74–95–3 | Methylene bromide | 2 | 8400 | 0.19 |
| 75–09–2 | Methylene chloride | | 310 | 0.015 |
| 91–20–3 | Naphthalene | 14 | 120000 | 3 |
| 7440–02–0 | Nickel | 11 | 110 | 5 |
| 98–95–3 | Nitrobenzene | 0.084 | 45 | 0.032 |
| 56–38–2 | Parathion | 3 | | |
| 608–93–5 | Pentachlorobenzene | 5 | | |
| 82–68–8 | Pentachloronitrobenzene (PCNB) | 0.081 | | |
| 108–95–2 | Phenol | 84 | 160000 | 32 |
| 298–02–2 | Phorate | 0.11 | 160 | |
| 23950–58–5 | Pronamide | 21 | 440 | 6 |
| 129–00–0 | Pyrene | 54 | 16000 | 2 |
| 110–86–1 | Pyridine | 0.16 | 810 | 0.06 |
| 7782–49–2 | Selenium | 0.93 | | |
| 7440–22–4 | Silver | 200 | | |
| 95–94–3 | Tetrachlorobenzene, 1,2,4,5- | 0;23 | 170 | 0.032 |
| 630–20–6 | Tetrachloroethane, 1,1,1,2- | | 130 | 0.0078 |
| 79–34–5 | Tetrachloroethane, 1,1,2,2- | | 29 | 0.0077 |
| 127–18–4 | Tetrachloroethylene | 2 | 13000 | 0.68 |
| 58–90–2 | Tetrachlorophenol, 2,3,4,6- | 2 | 6200 | 0.58 |
| 7440–28–0 | Thallium (I) | | 5 | 0.019 |
| 108–88–3 | Toluene | 30 | 180000 | 13 |
| 76–13–1 | Trichloro-1,2,2,-trifluoroethane, 1,1,2- | 2200 | | |
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.69 | 3500 | 1 |
| 71–55–6 | Trichloroethane, 1,1,1- | 74 | 48000 | 0.054 |
| 79–00–5 | Trichloroethane, 1,1,2- | | 11 | 0.0018 |
| 79–01–6 | Trichloroethylene | | 570 | 0.013 |
| 75–69–4 | Trichlorofluoromethane | 48 | 26000 | 16 |
| 95–95–4 | Trichlorophenol, 2,4,5- | 18 | 12000 | 4 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.054 | 120 | 0.015 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5- (245-T) | 2 | 63 | 0.64 |
| 93–72–1 | Trichlorophenoxypropionic acid, 2,4,5- (Silvex) | 1 | | |
| 96–18–4 | Trichloropropane, 1,2,3- | 1 | 870 | 0.34 |
| 7440–62–2 | Vanadium | 10 | 250 | 4 |
| 1330–20–7 | Xylenes (total) | 22 | 170000 | 150 |
| 7440–66–6 | Zinc | 99 | 320 | 38 |

15. Part 268 is amended by adding subpart G consisting of §§ 268.70 and 268.71 to read as follows:

## Subpart G—Conditioned Minimize Threat Levels with Management Requirements

### § 268.70 Conditioned Minimize Threat Levels.

(a) Table ''Conditioned Minimize Threat Levels'' identifies risk-based standards representing levels at which threats to human health and the environment are minimized for wastes which are placed in landfills or monofills (but not land application units). These levels may be used as alternatives to waste-specific treatment standards in the table to § 268.40 and to the Universal Treatment Standards in the table to § 268.48 for wastes which comply with the requirements of § 268.71. Nonwastewaters must meet both the total and waste extract levels contained in the table of ''Minimize Threat Levels''.

(b) Wastes identified in the Table to § 268.40 may be land disposed if they meet, for all hazardous constituents identified in the table to § 268.40, either the requirements in that table, the standards in the Minimize Threat Table in subpart F, or, if they meet the requirements in § 268.71, the standards in the Conditioned Minimize Threat Table. Characteristic wastes that are subject to the requirement for meeting Universal Treatment Standards under § 268.40(e) must also meet the requirements of Table UTS, the Minimize Threat Table, or, if they meet the requirements of § 268.71, the Conditioned Minimize Threat Table, for all underlying hazardous constituents as defined in § 268.2(i).

(c) Wastes containing either regulated hazardous constituents under the Table to § 268.40 or UTS constituents which do not have treatment standards listed in the Minimize Threat Table must continue to comply with treatment standards for these constituents in the tables to § 268.40, § 268.48, or the Minimize Threat Table to Subpart F prior to land disposal.

268.70 TABLE 1.—CONDITIONAL MINIMIZE THREAT LEVELS

| CAS | Constituent name | WW standard (mg/l) | NWW standard (mg/kg) | NWW standard (mg/l) |
|---|---|---|---|---|
| 83–32–9 | Acenaphthene | 31 | 63000 | 13 |
| 67–64–1 | Acetone | 16 | 39000 | 21 |
| 75–05–8 | Acetonitrile | | 2200 | 1 |
| 98–86–2 | Acetophenone | 17 | 75000 | 22 |
| 107–05–1 | Allyl chloride | | 260 | |
| 62–53–3 | Aniline | | 170 | 0.072 |
| 7440–39–3 | Barium | 33 | 34000 | 45 |
| 71–43–2 | Benzene | | 250 | 0.023 |
| 39638–32–9 | Bis (2-chloroisopropyl) ether | | 97 | 0.0088 |
| 117–81–7 | Bis(2-ethylhexyl)phthalate | | 740 | 0.0011 |
| 75–27–4 | Bromodichloromethane | | 240 | 0.011 |
| 75–25–2 | Bromoform (Tribromomethane) | | 1600 | 0.081 |
| 71–36–3 | Butanol | 16 | 41000 | 21 |
| 88–85–7 | Buthl-4,6-dinitrophenol, 2-sec- (Dinoseb) | 0.19 | 6000 | 0.24 |
| 85–68–7 | Butylbenzylphthalate | 240 | 87 | 67 |
| 7440–43–9 | Cadmium | | 110 | 0.32 |
| 75–15–0 | Carbon disulfide | | 3800 | 24 |
| 56–23–5 | Carbon tetrachloride | | 130 | 0.0077 |
| 126–99–8 | Chloro-1,3-butadiene, 2-(Chloroprene) | 0.52 | 1700 | |
| 106–47–8 | Chloroaniline, p- | | 5800 | 0.56 |
| 108–90–7 | Chlorobenzene | 2 | 41000 | 6 |
| 124–48–1 | Chlorodi- bromo- methane | | 200 | 0.0079 |
| 67–66–3 | Chloroform | | 76 | 0.075 |
| 95–57–8 | Chlorophenol, 2- | 0.9 | 8500 | 1 |
| 7440–47–3 | Chromium | | 16 | 2 |
| 218–01–9 | Chrysene | 0.1 | 35 | 0.0012 |
| 108–39–4 | Cresol, m- | 8 | 30000 | 11 |
| 95–48–7 | Cresol, o- | 8 | 46000 | 11 |
| 106–44–5 | Cresol, p- | 0.84 | 2900 | 1 |
| 72–54–8 | DDD | | 0.26 | 6800 |
| 50–29–3 | DDT | | 0.11 | 0.0054 |
| 84–74–2 | Di-n-butyl phthalate | 230 | 90000 | 25 |
| 117–84–0 | Di-n-octyl phthalate | | 21000 | 0.1 |
| 95–50–1 | Dichlorobenzene, 1,2- | 15 | 530000 | 32 |
| 106–46–7 | Dichlorobenzene, 1,4- | | 650 | 0.06 |
| 75–71–8 | Dichloro- difluoro- methane | 15 | 8400 | 45 |
| 75–34–3 | Dichloroethane, 1,1- | | 110 | 0.00021 |
| 107–06–2 | Dichloroethane, 1,2- | | 59 | 0.00021 |
| 156–60–5 | Dichloro- ethylene, trans-1,2- | 3 | 130000 | 4 |
| 120–83–2 | Dichlorophenol, 2,4- | 0.62 | 770 | 0.76 |
| 94–75–7 | Dichlorophen- oxyacetic acid, 2,4- (2,4-D) | 2 | 12000 | 2 |
| 78–87–5 | Dichloropropane, 1,2- | | 180 | 0.011 |
| 10061–01–5 | Dichloropropene, cis-1,3- | | 65 | 10000 |
| 10061–02–6 | Dichloropro- pene, trans-1,3- | | 62 | 10000 |
| 84–66–2 | Diethyl phthalate | 190 | 19000 | 220 |
| 131–11–3 | Dimethyl phthalate | 78 | | |
| 105–67–9 | Dimethylphenol, 2,4- | 4 | 24000 | 5 |
| 51–28–5 | Dinitrophenol, 2,4- | 0.27 | 450 | 0.37 |
| 121–14–2 | Dinitrotoluene, 2,4- | | 1400 | 0.39 |

268.70 TABLE 1.—CONDITIONAL MINIMIZE THREAT LEVELS—Continued

| CAS | Constituent name | WW standard (mg/l) | NWW standard (mg/kg) | NWW standard (mg/l) |
|---|---|---|---|---|
| 606–20–2 | Dinitrotoluene, 2,6- | ..... | 420 | 0.22 |
| 122–39–4 | Diphenyla- mine | 15 | 12000 | 15 |
| 298–04–4 | Disulfoton | ..... | 58 | 120 |
| 72–20–8 | Endrin | 0.073 | 27 | 770 |
| 141–78–6 | Ethyl acetate | 390 | 600000 | 510 |
| 60–29–7 | Ethyl ether | 27 | 260000 | 37 |
| 97–63–2 | Ethyl methacrylate | 24 | 100000 | 27 |
| 100–41–4 | Ethylbenzene | 39 | ..... | 42 |
| 206–44–0 | Fluoranthene | 28 | 21000 | 2 |
| 86–73–7 | Fluorene | 22 | 90000 | 7 |
| 76–44–8 | Heptachlor | ..... | 8 | ..... |
| 1024–57–3 | Heptachlor epoxide | ..... | 0.56 | 10 |
| 87–68–3 | Hexachloro-1,3-butadiene | ..... | 290 | 0.0069 |
| 319–84–6 | Hexachloro- cyclohex- ane, alpha- (alpha-BHC) | ..... | 0.18 | 2 |
| 319–85–7 | Hexachloro- cyclohex- ane, beta- (beta-BHC) | 0.00044 | 0.64 | 0.0009 |
| 58–89–9 | Hexachloro- cyclohex- ane, gamma- (Lindane) | ..... | 0.75 | 9 |
| 77–47–4 | Hexachloro- cyclopent- adiene | ..... | 1500 | ..... |
| 67–72–1 | Hexachloroethane | ..... | 890 | 0.11 |
| 78–83–1 | Isobutyl alcohol | 39 | 120000 | 53 |
| 7439–92–1 | Lead | 30 | 1600 | 41 |
| 7439–97–6 | Mercury | 0.3 | 39 | 0.4 |
| 67–56–1 | Methanol | 78 | 310000 | 110 |
| 72–43–5 | Methoxychlor | 7 | 280 | ..... |
| 74–83–9 | Methyl bromide (Bromo- methane) | 0.37 | 850 | 4 |
| 74–87–3 | Methyl chloride (Chloro- methane) | ..... | 91 | ..... |
| 78–93–3 | Methyl ethyl ketone | 78 | 250000 | 110 |
| 108–10–1 | Methyl isobutyl ketone | 8 | 38000 | 11 |
| 80–62–6 | Methyl methacrylate | 28 | 100000 | 33 |
| 298–00–0 | Methyl parathion | 0.66 | 6 | 110 |
| 74–95–3 | Methylene bromide | 2 | 21000 | 0.19 |
| 75–09–2 | Methylene chloride | ..... | 720 | 0.053 |
| 86–30–6 | N-Nitrosodi- phenylamine | ..... | 3600 | 0.24 |
| 91–20–3 | Naphthalene | 14 | 430000 | 15 |
| 7440–02–0 | Nickel | 11 | 8600 | 14 |
| 98–95–3 | Nitrobenzene | 0.084 | 520 | 0.11 |
| 152–16–9 | Octamethyl- pyrophos- phoramide | ..... | 31 | 0.37 |
| 56–38–2 | Parathion | 3 | 19 | 160000 |
| 608–93–5 | Pentachlorobenzene | 5 | ..... | ..... |
| 82–68–8 | Pentachloro- nitrobenzene (PCNB) | 0.081 | ..... | ..... |
| 87–86–5 | Pentachlorophenol | ..... | 22 | 0.0022 |
| 108–95–2 | Phenol | 84 | 390000 | 110 |
| 298–02–2 | Phorate | 0.11 | 510 | ..... |
| 23959–58–5 | Pronamide | 21 | 230000 | 25 |
| 129–00–0 | Pyrene | 54 | 16000 | 2 |
| 110–86–1 | Pyridine | 0.16 | 930 | 0.21 |
| 94–59–7 | Safrole | ..... | 28 | 0.0044 |
| 7782–49–2 | Selenium | 0.93 | ..... | ..... |
| 7440–22–4 | Silver | 200 | ..... | ..... |
| 95–94–3 | Tetrachloro- benzene, 1,2,4,5- | 0.23 | 1600 | 0.032 |
| 630.20–6 | Tetrachloro- ethane, 1,1,1,2- | ..... | 370 | 0.042 |
| 79–34–5 | Tetrachloro- ethane, 1,1,2,2,- | ..... | 70 | 0.0077 |
| 127–18–4 | Tetrachloro- ethylene | 2 | 100000 | 3 |
| 53–90–2 | Tetrachloro- phenol, 2,3,4,6- | 2 | 35000 | 2 |
| 7440–28–0 | Thallium (I) | ..... | 33 | 0.071 |
| 108–88–3 | Toluene | 30 | 560000 | 51 |
| 76–13–1 | Trichloro-1,2,2,-trifluoroethane, 1,1,2- | 2200 | ..... | 12000 |
| 120–82–1 | Trichlorobenzene, 1,2,4- | 0.69 | 62000 | 3 |
| 71–55–6 | Trichloroeth- ane, 1,1,1- | ..... | 190 | 0.0077 |
| 79–01–6 | Trichloroeth- ylene | ..... | 3200 | 0.049 |
| 75–69–4 | Trichlorofluo- romethane | 48 | 170000 | 61 |
| 95–95–4 | Trichlorophenol, 2,4,5- | 18 | 55000 | 22 |
| 88–06–2 | Trichlorophenol, 2,4,6- | 0.054 | 160 | 0.068 |
| 93–76–5 | Trichlorophenoxyacetic acid, 2,4,5-(245-T) | 2 | 150 | 2 |
| 93–72–1 | Triclorophen- oxypropionic acid, 2,4,5- (Silvex) | 1 | 520 | 2 |
| 96–18–4 | Trichloropro- pane, 1,2,3- | 1 | 14000 | 1 |
| 7440–62–2 | Vanadium | 10 | 2700 | 13 |
| 1330–20–7 | Xylenes (total) | 22 | 710000 | 700 |
| 7440–66–6 | Zinc | 99 | 51000 | 130 |

**§ 268.71 Associated Management Requirements.**

Waste may meet the standards set out in the Conditional Minimize Threat Table as an alternative to the treatment standards in the tables to Subpart D of this part or the Minimize Threat Table to subpart F of this part only if they are placed in a landfill or a monofill as defined in 40 CFR 260.10. Waste that is placed in land application units must comply with the minimize threat levels set forth in subpart F of this part or the treatment standards set forth in subpart D of this part.

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