PROPOSED RULEMAKING

ENVIRONMENTAL QUALITY BOARD

[25 PA. CODE CH. 250]

Administration of the Land Recycling Program

The Environmental Quality Board (Board) proposes to adopt Chapter 250 (relating to the administration of the land recycling program) to read as set forth in Annex A. The proposed regulations implement the Land Recycling and Environmental Remediation Standards Act (Act 2) (35 P. S. §§ 6026.101—6026.908) by creating subchapters to establish general provisions, cleanup standards, requirements for special industrial areas, risk assessment requirements and requirements for the attainment of cleanup standards.

This proposal was adopted by the Board at its meeting of July 16, 1996.

A. *Effective Date*

These proposed regulations will go into effect upon publication in the *Pennsylvania Bulletin* as final rulemaking.

B. *Contact Persons*

For further information, contact Thomas K. Fidler, Chief, Land Recycling and Cleanup Program, P. O. Box 8471, Rachel Carson State Office Building, Harrisburg, PA 17105-8471, telephone (717) 783-7816; or Michelle M. Moses, Assistant Counsel, Bureau of Regulatory Counsel, P. O. Box 8464, Rachel Carson State Office Building, Harrisburg, PA 17105-8464, telephone (717) 787-7060. Information regarding submitting comments on this proposal appears in Section J of this Preamble. Persons with a disability may use the AT&T Relay Service by calling (800) 654-5984 (TDD users) or (800) 654-5988 (voice users) and request that they relay the call. This proposal is available electronically through the Department of Environmental Protection (Department) Web site (http://www.dep.state.pa.us). (Choose public participation center.)

C. *Statutory Authority*

This proposed rulemaking is being made under the authority of sections 104(a), 301(c) and 303(a) of Act 2 (35 P. S. §§ 6026.104(a), 6026.301(c) and 6026.303(a)). Section 104(a) of Act 2 authorizes the Board to adopt statewide health standards, appropriate mathematically valid statistical tests to define compliance with Act 2 and other regulations that may be needed to implement the provisions of Act 2. Section 301(c) of Act 2 authorizes the Department to establish by regulation procedures for determining attainment of remediation standards when practical quantitation limits set by the United States Environmental Protection Agency (EPA) have a health risk that is greater than the risk levels established in Act 2. Section 303(a) of Act 2 authorizes the Board to promulgate statewide health standards for regulated substances for each environmental medium and methods used to calculate the statewide health standards. This proposed rulemaking also is being made under the authority of section 105(a) of the Solid Waste Management Act (SWMA) (35 P. S. § 6018.105(a)). Section 105(a) of the SWMA grants the Board the power and duty to adopt the rules and regulations of the Department to carry out the provisions of the SWMA.

D. *Background and Purpose*

The proposed regulations were developed to implement Act 2, which became effective July 19, 1995. Act 2 establishes a framework for developing remediation standards that can be applied to any release of regulated substances. Regulated substances include hazardous substances and contaminants regulated under the SWMA, the Hazardous Sites Cleanup Act (HSCA) (35 P. S. §§ 6020.101—6020.1304), the Air Pollution Control Act (APCA) (35 P. S. §§ 4001—4015), The Clean Streams Law (CSL) (35 P. S. §§ 691.1—691.1001), the Storage Tank and Spill Prevention Act (STSPA) (35 P. S. §§ 6020.101—6020.2105) and the Infectious and Chemotherapeutic Waste Act (ICWA) (35 P. S. §§ 6019.1—6019.6). The environmental remediation standards established under Act 2 must be used whenever a site remediation is voluntarily conducted or is required to be conducted under one of the laws previously stated, in order to qualify for a release of liability. The proposed regulations will encourage the recycling and redevelopment of industrial sites, the preservation of existing uses of land and will encourage persons to perform cleanups by providing the opportunity for a release of liability. The Act 2 program is currently operating and 100 sites are participating.

A person who intends to perform a remediation in accordance with Act 2 should consult the statute, these proposed regulations and the *Land Recycling Technical Guidance Manual* (*Manual*) developed by the Department. In accordance with Governor Ridge's Executive Order 1996-1, the Department has taken a minimalist approach to developing these proposed regulations. Subjects that are clear and unambiguous in the statute are not repeated in these proposed regulations. In addition, when possible, the Department has chosen to use nonregulatory alternatives, such as the *Manual*, for points of clarification rather than building those into the proposed regulations. For example, procedural requirements such as deed notices or notices of intent to remediate (NIR) are addressed more directly in the statute or the *Manual*. The proposed regulations do address limited issues concerning procedures, such as what must be contained in plans and reports that are submitted to the Department. Compliance with procedural requirements in the statute and the proposed regulations is required in order to meet a remediation standard. Appropriate uses of engineering or institutional controls with regard to the specific remediation standards and permit waivers are addressed in the statute, not the proposed regulations.

Chapter 5 of Act 2 (35 P. S. §§ 6026.501—6026.506) affords liability protection from further cleanup obligations if a person demonstrates compliance with any, or a combination, of the three environmental remediation standards: the background standard; Statewide health standard; and site-specific standard. Act 2 also affords liability protection for the remediation of special industrial areas. In order to receive the liability protection, a person must comply with the requirements of Act 2 and the proposed regulations, including the administrative requirements, unless the site is placed on the Pennsylvania Priority List under HSCA or the release is subject to the corrective action regulations of the STSPA. In these two cases, persons shall comply with the cleanup levels as described in Act 2 and this chapter and the administrative requirements of HSCA or STSPA in order to qualify for liability protection. A person who is eligible for

cleanup liability protection will be relieved of further liability for remediation of the site for contamination identified in the required reports and will not be subject to citizen suits or contribution actions brought by responsible parties under Pennsylvania law.

An important element to any remediation is the site characterization or remedial investigation. A thorough investigation of the site is necessary to identify specific contaminant concentrations, the extent of contamination throughout soil and groundwater media, discharges to surface water and site conditions that may pose an unacceptable human health or environmental risk. It is important to perform a thorough investigation because the relief from liability only applies to contamination identified in reports submitted to and approved by the Department to demonstrate compliance with a standard. In the case of a special industrial area, the relief from liability applies to any contamination identified in the baseline environmental report, other than unabated immediate, direct and imminent threats to public health and the environment. The proposed regulations provide some performance criteria that must be met to properly characterize the site. A more detailed explanation of how to perform a remedial investigation, however, may be found in the *Manual*.

These proposed regulations address six major topics: the use of practical quantitation limits (PQLs); aquifer determinations; Statewide health cleanup standards, where no health advisory levels and no maximum contaminant levels exist; protection of ecological receptors; performance criteria for site characterizations and risk assessments; and attainment demonstrations.

Act 2 created the Cleanup Standards Scientific Advisory Board (SAB) for the purpose of assisting the Department in developing statewide health standards, determining the appropriate statistically and scientifically valid procedures to be used, determining the appropriate risk factors and providing other technical and scientific advice as needed to implement Act 2. Throughout the development of these proposed regulations, SAB and its subcommittees provided many significant technical recommendations. In addition, SAB reviewed drafts of the proposed regulations and provided comments to the Department on the drafts. The Department gratefully acknowledges the contributions of SAB to the development of these proposed regulations. Five members of SAB were selected by the Secretary of the Department and nine members were selected by the General Assembly. They are independent, outside experts in numerous scientific fields who provided their time and considerable expertise to the Department on a volunteer basis.

The Board has provided a qualified endorsement of the regulations, which is further detailed in a document entitled, "Cleanup Standards Scientific Advisory Board Qualified Endorsement of the Act 2 Proposed Regulations," which is available by contacting the Department. In this document, the Board commended the representatives of the Department on the manner in which they dealt with the Board and their willingness to maintain a high level of involvement on the part of SAB in developing these proposed standards. Elements of the proposed regulations that SAB strongly endorses include the following: the means used to develop the Statewide health-based standards; the development of minimum threshold Statewide standards for substances lacking toxicity data; the development of soil-to-groundwater standards; the attainment criteria and methods included in the proposed regulations; the selection and use of PQLs; and baseline remedial investigation procedures for special industrial areas.

Elements of the proposed regulations for which SAB has some continuing concerns include the following: the required attainment of secondary maximum contaminant levels (SMCLs); the definition of sustainable yield of a significant amount of water to a well or a spring, for purposes of defining an aquifer; the Statewide standards for addressing vapor intrusion into basements; the requirement to address ecological risks under statewide health standards; and the requirement that standards below reliable quantitation limits be attained. SAB is also concerned about the classification of nonaqueous phase liquids (NAPLs) as wastes, rather than as contaminated media subject to remediation.

The Department has had a limited time to propose these regulations. The issues are complex and the Department and SAB have used new and creative concepts to deal with difficult issues such as valid characterization methods that require less sampling and the use of minimum threshold values for regulated substances for which toxicity data is unavailable. For these reasons, the Department specifically encourages thoughtful analysis and comment by interested members of the public. The Department specifically invites comments on the following issues: the interface between the solid waste requirements and the Act 2 requirements; the use and efficacy of the 75/10x statistical test; the development and use of minimum threshold medium specific concentrations and the availability of a release of liability for meeting these standards; aquifer determinations; the screening procedure for volatile compounds in indoor air; the saturation limit provided on medium-specific concentrations in soil; and the use of the ecological screening procedure as part of the Statewide health standard.

E. *Summary of Regulatory Requirements*

A brief description of the proposed regulations is as follows:

Subchapter A. General Provisions

1. *Section 250.1. Definitions.*

This section includes definitions for terms that are not found in the statute but were needed to clarify language in the statute. These terms are: "ASTM," "anisotropy," "enterprise zone," "heterogeneity," "MCL," "MSC," "NIR," "NPDES," "PQL," "property," "risk assessment," "SIA—special industrial area," "site" and "TF." The term "volatile compound" is defined to limit the number of regulated substances that have to be evaluated for human exposure from inhalation and volatilization for the soil and groundwater pathways.

2. *Section 250.2. Application of remediation standards.*

This section explains the requirement that remediations performed under an enforcement action meet one of the three cleanup standards—background, Statewide health or site-specific. It also states that requirements and procedures under Act 2 and these regulations must be met in order to qualify for liability protection.

3. *Section 250.3. Management of contaminated media.*

This section explains that management of contaminated media that is removed during remediation conducted under Act 2 must be managed in accordance with the applicable waste, water quality and air laws and regulations. The Department has the discretion to waive applicable requirements for onsite remediation activities based

on a written demonstration of the criteria in section 902 of Act 2 (35 P. S. § 6026.902).

4. *Section 250.4. Groundwater determinations.*

This section explains when a regulated substance, that is in contact with groundwater, is considered contaminated media subject to the cleanup standards of Act 2, and when it is considered waste, subject to regulation under the applicable waste laws and regulations. Here again, the Department has the discretion to waive applicable requirements for onsite remediation activities based on a written demonstration of the criteria in section 902 of Act 2. This provision applies to groundwater remediations where LNAPLs (light nonaqueous phase liquids) and DNAPLs (dense nonaqueous phase liquids) exist in subsurface soils.

5. *Section 250.5. Aquifer determinations.*

This section explains elements of the statutory definition of the term "aquifer," such as "significant amount" and "sustainable yield," which were not defined by the statute. This section will be used to determine which pathways of exposure are relevant for consideration in developing Statewide health and site-specific standards for groundwater. Groundwater in an aquifer is afforded a higher level of protection under Act 2.

6. *Section 250.6. Current use and future use of aquifer groundwater.*

This section explains phrases in the statute, related to groundwater in aquifers, that were left undefined. These phrases are "currently planned for future use" and "probable future use." Under Act 2, current drinking or agricultural uses of groundwater and certain future uses of groundwater in an aquifer are afforded the same protection. This section describes which future uses are protected. Future uses of groundwater in an aquifer are protected if three requirements are met: public or private water supplies can be expected to rely on groundwater in the vicinity of the site where the contamination is expected to migrate; background water quality is such that it can be used for drinking water or agricultural purposes, or both, with reasonable treatment; and no other factors, such as local ordinance restrictions or deed restrictions, exist that would prevent the use of the groundwater in the vicinity of the site where the contamination is expected to migrate. As previously used, the phrase "where the contamination is expected to migrate" should also address situations involving geologic features present that would prevent the flow of groundwater.

7. *Section 250.7. Standards relating to PQLs*

This section establishes the source for identification of PQLs for regulated substances in soil and groundwater. Under Act 2, the PQL value may be used as a default value in lieu of a background value determined through a site investigation. Also, PQLs are considered threshold concentration levels for establishing Statewide health and site-specific standards. However, PQLs may not be used as cleanup standards in the following instances: (1) PQLs that fall outside the maximum allowable health risk levels identified in sections 303(c) and 304(b) and (c) of Act 2 (35 P. S. §§ 6026.303(c) and 6026.304(b) and (c)) may not be used; (2) if maximum contaminant level (MCL) has been promulgated under the Pennsylvania Safe Drinking Water Act (35 P. S. §§ 721.1—721.17) for the regulated substance; and (3) if a lifetime health advisory level (HAL) has been established under the safe drinking water program.

This section also clarifies that the selection of methods to analyze samples of environmental media is not restricted to the source methods of the PQLs.

8. *Section 250.8. Public notice by applicant.*

This section explains when the opportunity to request public participation is initiated. For cleanups under the site-specific standard and special industrial areas (SIAs), the notice of intent to remediate must include a 30-day period in which the municipality, where the remediation site is located, may request to be involved in the development of the remediation and reuse plans for the site. No plans and reports associated with the remediation may be submitted to the Department prior to the end of that 30-day period.

9. *Section 250.9. Public participation.*

This section establishes the starting date for the commencement of the 30-day public and municipal comment period during which a municipality may request to be involved in the development of the remediation and reuse plans. The comment period will begin on the publication date of the summary of the NIR in a newspaper of general circulation. This section also provides minimum contents for a public involvement plan and requires submission of the plan with the first report due to the Department for either a site-specific standard or special industrial area cleanup.

10. *Section 250.10. Fees.*

This section provides that resubmissions of reports and plans, except for a site-specific standard final report, require payments of the appropriate fee identified in Act 2. The section also states that the Department will disapprove a plan or report that is submitted without the appropriate fee.

11. *Section 250.11. Publication.*

This section creates the obligation for the Department to publish notice of its final actions on plans and reports in the *Pennsylvania Bulletin*. Appeals from Department actions are governed by the Environmental Hearing Board.

12. *Section 250.12. Applicability to solid waste facilities.*

This section explains how the Act 2 cleanup standards apply to solid waste facilities. Performance standards that exist in the solid waste regulations, such as how and where to monitor for contamination or how to demonstrate eligibility for a waiver or modification of liner and leachate treatment systems as part of a permit modification, will continue to apply to new and operating solid waste facilities.

A release at an old facility must be remediated to one of the three Act 2 standards, at the points of compliance identified in these proposed regulations.

A release at a new facility must be remediated to background at the points at which the facility must have monitoring wells under the pertinent solid waste regulations.

A release at a mixed facility, which received waste on or before, and after a trigger date, must be remediated to meet Act 2 standards, but must do so at the monitoring points identified in the pertinent solid waste regulations.

These proposed regulations only affect the levels in contaminated media that must be attained. It does not affect all the other requirements for facilities regulated under the SWMA.

The Department specifically invites comments on the interaction of Act 2 and the SWMA, and its effect on facilities presently operating under the hazardous, residual or municipal waste regulations.

13. *Section 250.13. Measurement of regulated substances in media.*

This section sets out procedures for sampling regulated substances. To eliminate differences based on moisture content, it provides that analyses of soils and sediments must be done on a dry weight basis.

It also requires total metals analysis for most substances in soil, and requires field filtering and field acidification of groundwater samples for metals analysis.

Subchapter B. Background Standard

The background standard is one of the three cleanup standards available under Act 2. "Background" is defined by Act 2 as the concentration of a regulated substance determined by appropriate statistical methods that is present at the site, but is not related to the release of regulated substances at the site. The determination of a background concentration can be based on levels of naturally occurring substances and concentrations of regulated substances originating from sources on other properties. Under Act 2, persons are not responsible for abating releases originating from other properties.

Institutional controls cannot be used to attain the background standard. Deed notices are not required if the background standard is attained and prior deed notices may be removed.

1. *Section 250.202. Establishing background concentrations.*

Background standards can be determined using two methods. First, a person can use practical quantitation limits as the default background standard. Second, a person can use a remedial investigation to establish background. If a person uses a remedial investigation to establish background, samples must be taken in an area unaffected by a release on the property. In some cases, this may require off-property sampling. Criteria is included in order to determine the number of samples necessary to determine background levels in groundwater.

2. *Section 250.203. Points of compliance.*

The point of compliance is the location in the environmental media where attainment of the standard must be met. The points of compliance for surface water and air quality are the same for all three cleanup standards. In surface water, the following points of compliance apply: (1) point source discharges must meet limits specified in a National Pollution Discharge Elimination System (NPDES) permit; (2) nonpoint source or diffuse groundwater discharges to surface water must meet surface water quality standards through the use of mass balance techniques; and (3) when groundwater discharges to the surface, thus creating a spring, the point of discharge to the surface is the point of compliance. For outdoor air quality, the point of compliance is what is specified in the air quality regulations. To attain the background standard for groundwater, the point of compliance is throughout the contaminant plume, including areas of the plume that are outside the property boundary. For soil, the point of compliance for the background standard is throughout the area of the soil that has become contaminated as a result of releases on the property.

3. *Section 250.204. Final report.*

Under the background standard, the final report is the only report that must be submitted to and approved by the Department. The final report must document the following: site investigation activities including all laboratory results; the means for establishing background concentrations; the remediation activities; the demonstration of attainment with the standard; and any post-remediation activities, such as engineering or institutional controls, that are necessary to maintain attainment.

Subchapter C. Statewide Health Standards

The Statewide health standard is one of the three cleanup standards available under Act 2. The statewide health standards were developed in consultation with SAB, established by Act 2. Act 2 mandates the use of HALs and other health-based standards, including MCLs, adopted by the Department and by the Federal government by regulation or statute for statewide health standards. This rulemaking introduces the health-based standards adopted by the Department. The medium-specific concentrations (MSCs) included in Appendix A, Tables 1 and 2 are the concentrations that must be met in order to demonstrate attainment of a Statewide health standard, along with a separate screening procedure for the volatilization of a subset of regulated substances into indoor air and the protection of ecological receptors.

The Department and SAB agreed that a saturation limit on MSCs for soil is needed. Although the ingestion and inhalation numeric values reflect the 1×10^{-5} cancer risk level, in some cases at these concentrations the soil could be more than 100% saturated with regulated substances. Therefore, a numerical cap of 190,000 ppm has been proposed as the saturation limit in soils.

In order to select the appropriate concentration from Appendix A, Tables 1 and 2, determinations must be made concerning the land use of the property, the background groundwater quality of the aquifer for total dissolved solids, saturation or unsaturation of the soils and depth of the soil contamination.

Based on SAB's recommendation and the Department's concurrence, the Department is proposing the use of a cancer risk factor of 1×10^{-5} for the development of soil and groundwater MSCs. The formula "1×10^{-5}" means there is an excess cancer risk of 1 in 100,000 in the human population. This risk factor was chosen because it falls midway within the risk range identified in Act 2, and it has been adopted by several other states, including California, Indiana, the Commonwealth of Massachusetts and Michigan, for use in the development of cleanup standards. Act 2 mandates that MSCs for carcinogens must be based on an upper bound lifetime cancer target risk of between 1 in 10,000 and 1 in 1 million.

Based on SAB's recommendation and the Department's concurrence, the Department is not proposing to develop soil and groundwater standards based on the dermal absorption route of exposure. Soils contaminated by regulated substances that meet ingestion and inhalation based standards would not pose a substantive risk because of low bioavailability, low moisture content of surface soils and short exposure periods for actual adherence of soil to the skin. For sediments, exposure is less frequent and of shorter duration than soils. For groundwater, the ingestion and inhalation standards provide adequate protection from the dermal contact route of exposure.

If the Statewide health standard is numerically less than the background standard for a regulated substance on a given site, then the background standard or the PQL must be used.

The proposed statewide health standards are protective of human health. SAB and the Department were unable to develop standards that are also protective of the environment. The complexity of how different substances interact with different species makes it very difficult to establish statewide health standards protective of ecosystems in general. Therefore, the Department is proposing a screening procedure to evaluate the effects of regulated substances on potential ecological receptors. The Department is specifically seeking comments on how these proposed regulations address ecological receptors.

SAB and the Department were unable to identify a generic method by which to adequately simulate the movement of vapors from soil and groundwater to indoor air. This is due to the varying construction methods and materials and integrity of subterranean structures. The proposed regulations contain a screening process which identifies chemicals and situations of concern that would trigger the remediator to evaluate and abate the risk under either the background standard or the site-specific standard. The Department is specifically seeking comments on how these proposed regulations address volatilization of regulated substances into indoor air.

1. *Section 250.301. Scope.*

This section explains that the statewide health standards are addressed in Subchapter C. References to the appropriate tables for choosing a Statewide health standard are included.

2. *Section 250.302. Point of compliance.*

The points of compliance for surface water and outdoor air quality are the same as those identified above under the background standard. For the ingestion and inhalation standards developed for groundwater, the point of compliance is at and beyond the property boundary that existed at the time the contamination is discovered or such point beyond the property boundary that the Department may determine to be appropriate under certain specific situations identified in this section. For instance, the Department may move a point of compliance where the contamination goes beyond a property boundary if those substances are secondary contaminants. The point of compliance for soil is the concentration of the medium specific value at the depth specified in § 250.304 (relating to MSCs for soil).

3. *Section 250.303. MSCs for groundwater.*

For groundwater in aquifers, the MSCs are developed on the basis of the following hierarchy: (1) the use of MCLs; (2) where no MCL has been established, the use of lifetime HALs; (3) where no MCL or HAL exists, the use of the lowest concentration calculated used in the equations in §§ 250.305 and 250.306 (relating to ingestion numeric values; and inhalation numeric values). Sites with groundwater that naturally exceeds 2,500 milligrams per liter for total dissolved solids may use an adjusted Statewide health standard. If this situation is occurring at a given site, the adjusted Statewide health standard shall be used as the basis for the development of a soil standard that is protective of groundwater.

SAB and the Department were unable to develop generic statewide health standards to address the volatilization of regulated substances from groundwater through soils to indoor air. SAB identified three substances (carbon tetrachloride, 1,1 dichloroethene and vinyl chloride) and the Department added three substances (1,2, dichloroethane, benzene and chloroform) for screening volatile compounds, on the basis of volatilization and toxicity to humans that may be of concern at the point of exposure in below grade structures on the property. In order to quantify and abate the risk posed through this pathway, a person must use the protocols and procedures under the site-specific standard.

4. *Section 250.304. MSCs for soil.*

Standards for soil are developed based on residential and nonresidential land uses. Along with changes in exposure factors, the depth to which the human health standards will apply varies based on land use. The residential standards and nonresidential standards to a depth of 2 feet are protective of human health through the ingestion, inhalation and volatilization and soil to groundwater routes of exposure. The nonresidential standards at a depth of 2 to 15 feet are protective of human health through the inhalation, volatilization and soil to groundwater routes of exposure. The standards are developed to ensure that future leaching of contaminants through soil will not exceed the groundwater standard as established in § 250.303.

This section states that soil remediation to secondary MCLs is not required. This is because any drinking water that might be impacted by the released substance would be abated prior to the point of use.

In order to determine the depth which the ingestion and inhalation standards apply, SAB recommended and the Department agreed that the depth should vary based on land use patterns and deed notice provisions. For the residential land uses, a person must remediate to the full depth of 15 feet from the existing ground surface. For nonresidential land uses, a person must remediate to a depth of 2 feet from the existing ground surface. Contamination below this 2-foot level will be documented in the deed notice.

This section establishes a soils saturation cap for MSCs for soil. The following saturation cap was adopted based on a SAB recommendation. A physical limitation on the concentration of a regulated substance that could occur in soil was calculated to serve as an upper limit for direct contact MSCs in soil. This physical limitation is based on an assumed porosity for the soil equal to 0.35, an assumed dry bulk density of soil equal to 1.8 kg/L and an assumed regulated substance density of 1.0 kg/L. This combination of assumptions yields a dry soil basis concentration limit of 190,000 mg/kg based on the equation in this section of the proposed regulations.

Other options were considered by the Department for development of a saturation cap. A Department proposal for capping the MSC was to base the cap on the organic carbon content of the soil. For example, the cap would limit each organic regulated substance in soil to the naturally-occurring organic carbon content of the soil. This approach is premised on the concept that a given mass of organic carbon in soil can not sorb a mass of organic contamination which is greater than the mass of naturally occurring organic carbon. An organic carbon content ranging from 0.25% to 4% could be used. This would yield a cap for organic regulated substances within the range of 2,500 mg/kg to 40,000 mg/kg. A second SAB proposal was to choose an arbitrary upper bound limit, between 10,000 and 50,000 ppm, based upon analytical precision for environmental testing methods. Above these levels, dilution errors and signal/noise levels cause large

relative imprecision. The Department is seeking comments on the method proposed and on other methods to develop a saturation cap.

5. *Sections 250.305 and 250.306. Ingestion Numeric Values and Inhalation Numeric Values.*

The algorithms or equations in these sections are based on those presented in EPA's risk assessment guidance for the Superfund program, under the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C.A. §§ 9601—9675). The equations attempt to replicate how the average person is expected to come into contact with regulated substances in soil or groundwater and how the contact will impact human health. The equations include consideration of assumptions as to body weight, exposure frequency and duration, inhalation and ingestion rates and toxicity data. The protection goals of section 303 of Act 2 are built into the equations.

Except in the following cases, EPA's generic exposure assumptions were used. Residential exposure to carcinogens is based on combined childhood and adult exposure. The EPA uses a residential exposure frequency of 350 days, accounting for time away from home. SAB recommended and the Department agreed, to reduce the exposure assumption to 250 days to reflect the number of days when the soil is frozen and volatilization is minimized. Similarly, SAB recommended, and the Department agreed, to calculate the nonresidential standards by assuming work weeks of 5 days, and multiplying 250 days by 5/7. The EPA uses an exposure frequency of 350 multiplied by 5/7. SAB recommended and the Department agreed to use the soil ingestion rate in its *Manual*, which had been based on EPA's Resource Conservation and Recovery Act of 1976 (RCRA) (42 U.S.C.A. §§ 6901—6986) corrective action proposal. The Department is using different nonresidential inhalation numbers than EPA, on SAB's recommendation, to reflect reduced activity and inhalation rates indoors. The proposed inhalation numbers are lower than the EPA's because SAB believes that the lower number is a more realistic breathing rate for a workplace setting. The EPA's number is too high for sustained activity over 8 hours.

The toxicity values, oral reference dose for systemic toxicants and the oral cancer slope factor for known human carcinogens, were selected based on the following hierarchy: current EPA Integrated Risk Information System (IRIS) files; current citations in the EPA's Health Effects Assessment Summary Tables (HEAST); EPA provisional values; the Federal Agency for Toxic Substances and Disease Registry (ATSDR) toxicity profiles; recommendations by California EPA; and the EPA Ambient Water Quality Criteria documents. Where toxicity values existed for either ingestion or inhalation, but not for both, the data available for one pathway was used for the other pathway. Input parameters such as body weight, the exposure duration, the exposure frequency and averaging times may vary based on land use.

Section 250.305(f) explains the methodology for developing the ingestion numeric value for lead.

The types of toxicological data which have been used to develop direct contact soil MSCs for all of the other regulated substances listed in Appendix A, Table 2 do not exist for lead. For example, although lead is classified as a carcinogen, it possesses no cancer slope factor so that a concentration in soil which represents an excess upper bound lifetime cancer target risk of one in 100,000 cannot be estimated. Similarly, even though lead is a systemic toxicant, there are no available oral reference doses from which to develop a threshold effect level for lead. This lack of data makes it necessary to develop direct contact soil MSCs for lead in an alternate manner.

The toxicological endpoints of concern for lead differ between children and adults. Because of this, two separate methods have been used to estimate direct contact soil MSCs for lead—one for residential exposures (based on effects on children) and one for nonresidential exposures (based on effects on adults). The following text describes the methodologies employed in developing both concentrations.

The direct contact soil MSC for lead for residential exposures has been estimated on the basis of protection of 95% of a population of children in the age range of 0 to 84 months. The Uptake Biokinetic (UBK) Model for Lead (version 0.4) was used to make this estimate. Although this model has been updated at least twice since version 0.4, this version was used because it was the version in use at the time the EPA developed its recommended residential lead-in-soil level of 500 mg/kg. Appendix A, Table 6 contains the input values that have been used in the model. The soil lead level from Appendix A, Table 6 (495 ug/g) has been rounded to 500 mg/kg which is the direct contact soil MSC for lead for residential exposures.

Because the UBK Model for Lead applies only to children, it could not be used for the nonresidential exposure scenario. Alternatively, a modeling equation applicable to adult exposures developed by the Society for Environmental Geochemistry and Health (SEGH) was obtained from Wixson (1991).

6. *Section 250.307. Soil to groundwater pathway numeric values.*

The statute provides three mechanisms for the development of soil to groundwater pathway numeric values. Values in Appendix A, Table 1, include concentrations developed using the following: (1) a concentration which is 100 times the MSC for groundwater; and (2) for organic compounds, a concentration developed using an equilibrium partitioning coefficient method which would be protective of the MSC for groundwater. SAB and the Department were unable to identify a valid, peer-reviewed scientific method to predict the leaching of inorganic compounds from soil to groundwater. As a third option, the person remediating may use the Synthetic Precipitation Leaching Procedure in order to determine a level which would not produce a leachate in excess of the MSC for groundwater.

When using an equilibrium partitioning coefficient method for organic compounds, the dilution factor may vary based on the organic carbon partition coefficient for that substance and based on whether the soils are saturated or unsaturated. The fraction of organic carbon in soil was selected to represent average values found in this Commonwealth.

7. *Section 250.308. Radionuclide numeric values.*

This section explains how the statewide health standards were developed for radionuclides. The Department determined, in consultation with SAB, that the radionuclides of concern are limited to those commonly found in soil and groundwater. Therefore, a short list of isotopes was chosen for developing statewide health standards. The screening process for developing the short list was as follows. First, a survey of the radioisotopes commonly found in soil and groundwater in recent cleanup projects was considered. Second, the list was augmented by the candidate lists prepared by the Federal Nuclear Regulatory Commission (NRC) (NRC 1500 1994)

and the EPA. Third, isotopes with half lives of 1 year or more were retained on the screened final list. The progeny with half lives of 6 months or more were assumed to coexist with the parent in secular equilibrium. Long-lived progeny were separately accounted for as ingrowths or, if initially present, assumed to start a chain of their own. For cases where ingrowths are significant, the year for maximum dose was selected for annual dose specification. For the pathways under consideration, the maximum dose was checked out to always occur initially, that is, at time zero. Thus, ingrowth of long-lived progeny did not introduce further complications in this project.

The exposure assumptions used for this section are essentially the same as those proposed for other sections of the statewide health standards. When new parameters were used, their basis and appropriate references are indicated in the proposed regulations.

The MSC for radionuclides was determined based on the annual effective dose equivalent of 4 millirem per year for each pathway. This is comparable to the basis of 4 millirem per year whole body dose used by the EPA for the determination of MCLs for drinking water (40 CFR 141). These levels are in general agreement with the cleanup standards recently proposed by the NRC at 59 FR 43200 (August 22, 1994) and the EPA.

8. *Section 250.309. Minimum threshold MSCs.*

This section provides cleanup standards for regulated substances where no toxicological data is available for the substances. The Department is seeking comments on the procedure for developing minimum threshold MSCs and on the proposed numbers for the substances identified in Appendix A, Table 4. It should be noted that these numbers are based solely on ingestion.

The standards identified for groundwater and for the soil ingestion numeric value were developed by a subcommittee of SAB. First, SAB considered the United States Food and Drug Administration's (FDA) final rule, Threshold of Regulation for Substances Used in Food-Contact Articles, 60 FR 36582 (July 17, 1995). The regulations establish threshold levels for exempting from regulation food additives that are derived from food-contact articles that migrate, or may be expected to migrate, into food (such as, food packaging and food processing equipment). In determining the threshold number, the FDA looked at a set of 477 rodent carcinogens by oral route compiled by L. S. Gold et al. By analyzing the probability density distribution of the 50% Toxic Doses (TD50) of these carcinogens, the FDA determined the concentration that represented an acceptable risk. The FDA threshold is 0.5 ppb of dietary concentration. The FDA stated that a dietary intake of 0.5 ppb of an indirect food additive would result in a risk of less than 1×10^{-6} with roughly 60% probability.

The threshold numbers have been established at a 1×10^{-5} risk level, consistent with the statewide health standards. The actual dietary intake of 0.5 ppb of the substance in food is multiplied by SAB's assumption of 2000 grams of food intake per person per day. The product of the multiplication is 1 microgram of a substance per person per day. Because the 0.5 ppb was based on a 1×10^{-6} risk level, SAB adjusted the 1 microgram (ug) to a 1×10^{-5} risk level. The result of that adjustment is 10 micrograms of a substance per person per day. To calculate the soil concentration, it is assumed that a person would ingest 100 milligrams (mg) of soil per day; therefore, the corresponding concentration in soil would be 10 ug/100 mg of soil, or 100 mg of a substance per kilogram of soil. This calculation resulted in the proposed soil ingestion numeric value of 100 mg/kg in soil. To calculate the groundwater concentration, it is assumed that a person would ingest 2 L of water per day; therefore, the corresponding concentration in water would be 10 ug/2 L, or 5 ug/L. This calculation resulted in the proposed minimum threshold MSC for water ingestion of 5 ug/L.

The minimum threshold MSC for soil is determined by selecting the lowest of the ingestion numeric value or the soil-to-groundwater numeric value as determined by the methodology in § 250.307.

The minimum threshold MSCs may be used only when no toxicological data is available for the regulated substance. If the minimum threshold MSC concentration is attained and impacts to ecological receptors are addressed in accordance with § 250.310, the Department will provide a release of liability. Under Act 2, the Department may require additional remediation for the regulated substances that meet a minimum threshold MSC if new chemical-specific toxicological information is obtained which revises the exposure assumptions beyond the acceptable risk. The Department is seeking comment on providing a release of liability for compliance with these standards.

9. *Section 250.310. Evaluation of ecological receptors.*

SAB and the Department were unable to identify a scientific method in the time available to develop generic statewide health standards that are protective of ecological receptors. SAB and the Department recommended a screening protocol for identification of receptors of concern, chemicals of concern and the size of sites of concern. If the screening process identifies impacts on ecological receptors that need to be addressed, the remediator must do one of the following: (1) demonstrate that attainment of the Statewide health standard is protective of the receptor; (2) demonstrate attainment with the background standard; or (3) follow the procedures in § 250.402(d) and demonstrate attainment with the site-specific standard.

If jet fuel, gasoline, kerosene, number two oil or diesel fuel is the only constituent detected onsite and is not an NAPL, the site will not require further evaluation of ecological receptors. SAB recommended this screen because it is believed that once the statewide health standards for the constituents found in the products identified above are met, the concern for ecological receptors will have been addressed. The substances listed in this screen are limited to a subset of petroleum products for which the chemical makeup and concentrations can be reliably predicted.

If, after the screening for the substances above, it is determined that 2 acres or more of surface soil or 1,000 or more square feet of sediments have been contaminated, then the screening procedure must be completed. Sites of less than 2 acres were eliminated due to the substantially greater feeding range of most ecological receptors. The size threshold for sediment areas of concern is smaller than for surface soils, based on the propensity for contaminants to concentrate as a result of differential particle size transport and sorting processes, the sedentary nature of the species making up the benthic community, and the generally greater sensitivity of many aquatic species to constituents.

If, after screening for the soils and sediments above, the contaminants at the site are constituents of potential

ecological concern, then further ecological evaluation is required. The list of chemicals of potential ecological concern, contained in Appendix A, Table 7, is largely based on 67 compounds identified by EPA as toxic to ecological receptors. In addition to the 67, SAB recommended and the Department adopted the addition of four pesticides either because of their toxicity or their potential to bioaccumulate in the food chain. Those four pesticides are aldrin, chlordane, kepone and mirex. If no constituents of potential ecological concern are present, then an environmental scientist must perform a preliminary site walk evaluation to determine if there are indications of ecological impacts.

If constituents of potential ecological concern exist or if indications of ecological impacts exist, then the site must be evaluated to determine whether features such as buildings, parking lots or graveled paved areas exist. The step will determine whether exposure pathways to the receptors are eliminated. If the pathways are not eliminated, a formal site walk evaluation must be conducted by a scientist who is qualified to perform risk assessments. The results of the site walk and of exposure pathway evaluation will determine which ecological impacts must be addressed.

Initially, the screening process is elementary to allow a person not thoroughly versed in ecological assessment protocols to determine whether there is a problem of concern. If such a problem is identified, then an expert in the field of ecological risk assessment must be utilized.

10. *Section 250.311. Final report.*

Under the Statewide health standard, the final report is the only report that must be submitted to and approved by the Department. The final report must document the site investigation activities including all laboratory results, the remediation activities, the demonstration of attainment with the standard and any post-remediation activities, such as engineering or institutional controls, that are necessary to maintain attainment. The final report must also include information supporting the use of residential or nonresidential standards.

Subchapter D. Site-Specific Standard

1. *Section 250.401. Scope.*

This section clarifies that the Department may approve or disapprove the plan and reports submitted under the site-specific standard based on the criteria listed in section 304 of Act 2.

2. *Section 250.402. Human health and environmental protection goals.*

This section defines the level of protection that is afforded to humans from threats posed by soil and groundwater contaminated with regulated substances which are known or suspected carcinogens or systemic toxicants. Remedies under the site-specific standard must also address cumulative risk.

Also included is the process by which risks to ecological receptors are assessed and addressed. This process requires use of the ecological screening protocol developed for the Statewide health standard and use of current EPA or American Society for Testing and Materials (ASTM) guidances to quantify the risk to ecological receptors.

3. *Section 250.403. Use of groundwater in an aquifer.*

Groundwater that has naturally occurring total dissolved solids above 2,500 ppm will not be considered a drinking water source in accordance with Act 2.

Current and future uses of groundwater in aquifers under the site-specific standard are to be determined in accordance with the definition of those uses in § 250.6.

This section requires compliance with MCLs, at a minimum, in order to protect the use of groundwater for drinking water purposes.

4. *Section 250.404. Pathway identification and elimination.*

This section requires the use of the most recent EPA or ASTM guidance in order to identify potential current and future exposure pathways to humans and ecological receptors. Future land use of the site and the effect of institutional and engineered controls should be taken into consideration in determining whether an exposure pathway is relevant. Exposure pathways include ingestion, inhalation of volatiles and particulates. The dermal contact route of exposure is not required to be evaluated because this risk is nominal compared to the risk posed by ingestion and inhalation and will be subsumed by the standards developed for these pathways.

5. *Section 250.405. When to perform a risk assessment.*

Persons who choose to develop a site-specific standard, or concentration level, must do so by conducting a risk assessment under Subchapter F.

Submission of a baseline risk assessment report is not required where it can be demonstrated in the remedial investigation report or cleanup plan that there are no current or future exposure pathways or where identified current or future pathways are eliminated through the implementation of a specific remediation measure. These remediation measures must be proposed to the Department in a cleanup plan prior to implementation.

6. *Section 250.406. Point of compliance.*

The points of compliance for the site-specific standard are identical to those used for the Statewide health standard for: releases to outdoor air, surface water and springs; ingestion and inhalation threats from contaminated groundwater; soil-to-groundwater soil standards; and soil standards developed to protect from threats posed by ingestion and inhalation in residential land use settings.

This section establishes the point of compliance for volatilization from soils and groundwater to indoor air as the point of exposure on the property in a below grade occupied space.

The depth to which the point of compliance for soil standards developed to protect from ingestion and inhalation from contaminated soil in nonresidential land use settings will be based on an approved risk assessment report.

7. *Section 250.407. Remedial investigation report.*

Persons electing to remediate a site to the site-specific standard must submit a remedial investigation report to the Department for review and approval. The report must contain the information necessary to define the location, rate, extent and movement of regulated substances at the site and to select appropriate remedial technologies that will be evaluated in the cleanup plan.

Remedial investigations should be designed, to the extent known, based on knowledge of the site, historical activities at the site and chemicals used at the site. Performance standards are provided for those factors to be taken into account when investigating soil and groundwater contamination. These performance standards also address the data quality and reporting requirements for

sampling and analysis activities. Copies of all laboratory data are required to be included in the report, regardless of whether the data has been eliminated from consideration by the person performing the remediation. Further guidance on the information required in the remedial investigation can be found in the *Manual*.

If the municipality has requested the development of a community involvement plan, any public comments and the response to those comments must also be included in all plans and reports submitted under the site-specific standard.

8. *Section 250.408. Risk assessment report.*

The risk assessment report must describe the potential risks, or adverse affects, posed to humans and other ecological receptors under both current and planned future use of the site in the absence of any cleanup taking place and the methodologies and supporting documentation that are used to develop any site-specific cleanup levels and those levels will be proposed in a cleanup plan for the site.

9. *Section 250.409. Cleanup plan.*

The site-specific standard is the only one of the three standards which requires Department approval of the cleanup plan prior to implementation. The plan must describe those alternatives which were evaluated and the alternative which the remediator is proposing to implement, along with an analysis of how these alternatives were evaluated using the remedy selection criteria of section 304(j) of Act 2. The plan shall also include site maps, results of any treatability or small scale studies which were used to assist in the remedy evaluation process, a final design of the proposed remedy and a post-remediation care plan which addresses monitoring and maintenance of any continued treatment and any utilized engineered or institutional controls. Further technical guidance on the information needed in the cleanup plan can be found in the *Manual*.

When the cooperation of a third party is necessary in order for the remediator to implement the remedy, the plan must also include documentation that cooperation has been obtained. This provision would be relevant in cases including extension of water supplies, installation of home treatment units for water supply wells and water use restrictions on other properties.

10. *Section 250.410. Final Report.*

Final reports submitted under the site-specific standard must contain the information necessary to document that the remedy, as approved by the Department in the cleanup plan, was implemented. This information must also include confirmation sampling and analysis methods, and documentation of compliance with any necessary post-remediation care requirements required by the approved cleanup plan.

Subchapter E. Special Industrial Areas

Special incentives were provided by Act 2 to encourage the cleanup and reuse of orphan sites and sites located in an enterprise zone. These incentives include streamlined cleanup requirements that apply only to the portions of the property that would prevent the property from being occupied for its intended purpose. While off-property releases must be investigated, the threats posed from these off-property areas are not required to be addressed by persons entering into SIA agreements. These incentives are only available to persons who did not cause or contribute to the contamination at the site and are only available for certain sites that have been used for industrial purposes.

A baseline remedial investigation must be conducted prior to entering into a SIA agreement. The investigation will be the basis for establishing a person's liability protection for contamination at the property. Protection can only be given for contamination identified in this investigation; therefore, it would be in the remediator's best interest to conduct a thorough investigation.

Section 250.502. Eligibility determinations.

This section identifies what a person must demonstrate in order for a property to qualify as an SIA.

Section 250.503. Remediation requirements.

A person remediating an SIA must prepare a work plan that is reviewed and approved by the Department. Once approved, the work plan, which describes the baseline remedial investigation, is implemented. The baseline remedial investigation should be based on historical information and knowledge about the property, with environmental sampling on those areas of the property believed to be potentially contaminated. The investigation must identify existing contamination that poses an immediate, direct or imminent threat to public health or the environment which is inconsistent with the intended reuse of that portion of the property.

The results of the baseline remedial investigation must be reported in a baseline environmental report that is submitted to the Department for approval. The report must include a remediation plan that addresses all immediate, direct and imminent threats to public health and the environment which would prevent the property from being occupied for its intended purpose. Subsection (d)(4) describes, at a minimum, what constitutes an immediate, direct or imminent threat. For those areas not included in the reuse plans, the report must address how access will be limited for workers and trespassers.

Subsection (e) requires a person to enter into a Consent Order and Agreement with the Department, based on the baseline environmental report, in order to qualify for liability protection.

Subsection (f) requires a person to notify the Department about any change in the use of the property from the use identified in the cleanup plan. These changes may result in the need for further remediation of the site if there are any immediate, direct or imminent threats.

The municipality may request the development of a public involvement plan for properties going through the SIA process. If requested, public comments and the remediators' response to those comments must be included along with the baseline environmental report.

Subchapter F. Exposure and Risk Determinations

1. *Section 250.602. Risk assessment procedures.*

Risk assessments may be conducted using either the methodologies utilized in development of the statewide health standards or the most recent EPA or ASTM guidelines. The assessment must define unacceptable risks to both humans and ecological receptors. The risk assessment must include the following components: identification of contaminants of concern and their concentration levels; an exposure assessment to identify pathways of concern and to determine the appropriate exposure assumptions; a toxicity assessment which evaluates toxicity of contaminants based on the oral reference dose for systemic toxicants and cancer slope factor for carcinogens; and a risk characterization which quantifies risk and determines whether the current site conditions meet the protection goals of Act 2.

2. *Section 250.603. Exposure factors for site-specific standards.*

This section explains which exposure factors should be used to perform an exposure assessment. Based on a recommendation of a subcommittee to SAB, the proposed regulations state that site-specific exposure factors shall be used and shall be clearly justified by supporting data. If site-specific exposure factors are not used, the exposure assessment must be based on the standard exposure factors used to develop the statewide health standards.

3. *Section 250.604. Fate and transport modeling requirements for exposure assessments.*

This section explains which models may be used to estimate site-specific, soil-to-groundwater leaching potential for organic contaminants. The soil-to-groundwater model in the statewide health standards, § 250.307(a)(2), may be used in site-specific exposure assessment. Because the model was based on a number of assumptions, SAB recommended and the Department agreed that only the values of Koc, water-filled soil porosity, dry soil bulk density, fraction organic carbon and the dilution factor in the model may be varied based on site-specific measurements.

This section also recognizes that many fate and transport models and methods are available in EPA and ASTM guidelines. To ensure the proper application of groundwater models, the Department requires that EPA or ASTM quality assurance/quality control criteria, such as model verification, model calibration and model validation shall be followed.

4. *Section 250.605. Sources of toxicity information.*

When conducting the toxicity assessment, this section establishes sources of toxicology data that are acceptable for use and a hierarchy within these sources for selection of the most appropriate oral reference dose and cancer slope factor. This is the same protocol which was used to select the toxicity values used in generation of the statewide health standards.

If no toxicity data is available in any of these defined sources, a person may use the background standard or may meet one of the following: (1) develop chemical-specific toxicity values in accordance with EPA guidance and based on published, peer-reviewed scientific literature or develop toxicity values from appropriately justified surrogates for the Department's review in the risk assessment report; or (2) use the minimum threshold MSC as the site-specific standard, with an assumed risk of 1×10^{-5} for purposes of calculating cumulative risk for the regulated substances identified in Appendix A, Table 4.

5. *Section 250.606. Development of site-specific standards.*

If an unacceptable risk is identified through the risk assessment, a person may choose to eliminate the pathway or implement a remedy which abates the risks posed by that pathway to the protection levels established for site-specific standard remedies.

Specific factors are provided for the assessment of risks posed by contaminated soil, contaminated groundwater in an aquifer, nonaquifer groundwater and ecological receptors. These factors include consideration of the fate and transport of released regulated substances through the environment, natural conditions that may affect this fate and transport, specified exposure pathways, current and future land use and the effectiveness of institutional or legal controls placed on the use of the land.

6. *Section 250.607. Risk assessment of remediation alternatives.*

This section explains that a risk assessment of remedial alternatives must evaluate long-term risks remaining after completion of the remediation and short-term risks that may be posed to the community, workers or the environment during the implementation of the remediation. The degree of uncertainty associated with the risk must be discussed in the risk assessment.

Subchapter G. Demonstration of Attainment

1. *Section 250.701. Scope.*

This section describes the scope of the subchapter for demonstration of attainment. The subchapter clarifies what information and procedures are necessary to demonstrate attainment with the cleanup standards, where a release of a regulated substance has occurred.

The section clarifies that the concentration of a regulated substance is not required to be less than the standard relating to the PQL, in accordance with § 250.7(a)—(d), for purposes of demonstrating attainment. The section also clarifies that attainment must be demonstrated at the points of compliance indicated by each subchapter pertaining to a cleanup standard.

2. *Section 250.702. Attainment requirements.*

This section explains that attainment will apply to the horizontal and vertical extent of soil and water identified as contaminated. SAB recommended, and the Department agreed, that the areas defined as contaminated are those areas that exceed the cleanup standard selected. Where separate zones of contamination exist on a property from multiple releases, attainment applies to each individual separate zone.

This section also identifies what is required to be included in a final report to demonstrate attainment. The report must include a demonstration that the cleanup standard has been met, based on an analysis of data through the application of statistical tests and must include a demonstration of a statistical trend analysis, knowledge of the plume stability or other acceptable method that shows that the standard will not be exceeded at the point of compliance. For attainment of the site-specific standard, a demonstration of pathway elimination, if applicable, and a demonstration that the site does not exceed the least protective risk level provided for in Act 2 must be provided.

3. *Section 250.703. General attainment requirements for soil.*

This section explains that the data collected to demonstrate attainment of a cleanup standard for soil must be random, both horizontally and vertically, over the areal extent which was shown to be contaminated above the selected cleanup standard during the site characterization. This data varies spatially and is used to determine statistically whether or not attainment has been demonstrated. This data is not the same as the data used to characterize the site. The data is collected specifically for the determination of attainment. The number of samples needed is dependent on the site of the area.

SAB recommended a general distinction between sites which are less than and those equal to or greater than 125 cubic yards. This figure was determined by the size of a pit (15 feet by 15 feet by 15 feet deep). In order to correspond with statistical methods used to demonstrate attainment, a minimum of eight sampling points are required for soil volumes less than 125 cubic yards. A

minimum of 12 sampling points are required for soil volumes equal to or greater than 125 cubic yards.

4. *Section 250.704. General attainment requirements for groundwater.*

This section explains that a sufficient number of sampling points needed to demonstrate attainment with a cleanup standard must be installed, based on site-specific conditions, such as geologic characteristics, the size of the contaminated area, the number of aquifers impacted and whether contamination extends off the property. The data collection and statistical analysis for attainment must be performed for each individual well.

In order to represent a valid conclusion, the number of samples used for analysis is dependent on the statistical test chosen. SAB identified and recommended a statistical test which is not data intensive or restrictive. In general, a minimum of eight quarters of groundwater data is needed to account for variability over time. SAB recommended, and the Department agreed, that only four quarters of data may need to be collected for cleanups resulting from recent spills or other conditions in which enough information exists to make scientifically sound assumptions regarding the source and the extent of the plume. In cases where vertical migration of contamination is significant or where more than one aquifer has been impacted, clusters of wells will be required at each point of compliance. A cluster consists of wells drilled and open to a specific vertical interval of interest.

5. *Section 250.705. Demonstration of attainment of surface water and air quality standards.*

This section requires that applicable State and Federal laws and regulations related to surface water and air must be met to demonstrate attainment with surface water and air media.

6. *Section 250.706. Statistical tests.*

This section specifies the requirements for using and applying statistical tests to demonstrate attainment. The statistical tests may also be used to establish background concentrations at a site, as required by the background standard subchapter. The statistical test used to establish background must correspond with the statistical test used to demonstrate attainment.

The proposed regulations allow a person to choose between SAB's 75%/10x statistical test, a 95% UCL of the mean statistical test or other methods that meet specified performance standards for demonstrating attainment with the statewide health and site-specific standard. For the background standard in soil, a person may use a nonparametric UTL combined with the Wilcoxon rank-sum test or other methods that compare the population of analytical results of background samples with a population of the medium of concern and meet specified performance standards. For the background standard in groundwater, a person may use the nonparametric Tolerance Intervals, a retesting strategy using nonparametric Prediction Limits in accordance with EPA guidance or other statistical methods that meet specified performance standards. A nonparametric statistical test compares distributions rather than parameters and is intended to apply to a large class of distributions rather than a single distribution. A parametric statistical test estimates parameters, such as arithmetic average, and tests hypotheses concerning them. The assumptions generally specify the form of distribution.

Except for SAB's 75%/10x test, the other tests identified in the proposed regulations are well documented in Federal guidances. The 95% UCL of the mean test is a parametric statistical procedure for determining whether the mean (average) concentration in the area of concern attains the cleanup standard. If the 95% upper confidence limit of the mean value is below the cleanup standard, the area of concern would be considered clean.

The 75%/10x test was developed by SAB. This test requires that 75% of all samples collected for attainment purposes must be equal to or less than the standard with no individual sample exceeding ten times the standard. This test requires that a sufficient number of samples be collected in the field to provide an acceptable result in the test. Therefore, SAB recommended that a minimum of eight samples must be collected in order to reduce the false positive rate in the test. A false positive conclusion means that the statistical finding that the standard has been met is not representative of the overall field conditions at the site. To substantially reduce the false positive rate, SAB recommended the use of a minimum of eight samples in groundwater and a minimum of eight samples in soil equal to or less than 125 cubic yards.

The attainment subcommittee of SAB evaluated six different tests or decision rules using statistical simulation:

(1) SAB 75%/10x test.

(2) SAB 75% test without 10x cap.

(3) A PaDEP statistical procedure for determining with 95% confidence (alpha=0.05) whether 75% of the site is less than the cleanup standard (the 75th percentile test).

(4) The PaDEP 75th percentile test in paragraph (3) with 10x cap.

(5) Upper 95% confidence limit of the mean value must lie below the cleanup standard (95% UCL).

(6) Wilcoxon Signed Rank test (alpha=0.05) of null hypothesis that population median equals cleanup standard versus alternative hypothesis that population median is below the cleanup standard.

The tests were evaluated using log normal distributions with coefficients of variation (Cv) ranging from 0.5 to 4.0 and 5 to 40 samples.

After a series of computer simulations, the Attainment Subcommittee had the following basic conclusions:

(1) With 5 samples, the 75%/10x test has somewhat indeterminate behavior, including an unacceptable high false positive rate (evaluated where 50% of the site remains contaminated).

(2) Despite its method, the 75%/10x test is not a test of whether 75% of a site is truly below the cleanup standard. With 10 to 20 samples, the 75%/10x test behaves more like a test of whether the population mean or median is below a cleanup standard. That is, its power curves are similar to those of the 95% UCL and the Wilcoxon Signed Rank test, which are testing the location of the mean and median, respectively. The power curve shows the change of probability to declare that the site attains cleanup standards as a function of the extent of cleanup.

(3) For sample distributions with lower variance (Cv=1), the power of the 75%/10x test is relatively insensitive if more than 10 samples are taken. Higher sample sizes improve the power of traditional tests as expected, while the power of the 75%/10x test remains relatively constant.

(4) For sample distributions with higher variance (Cv>1), the power of the 75%/10x test decreases as more than 10 samples are taken. With higher variances, the 10x cap begin to limit the probability of concluding "clean" because the probability of encountering a large value above the 10x cap increase quickly with sample size. Higher numbers of samples then become a penalty. This is an undesirable characteristic, because it penalizes a more thorough effort to demonstrate verification.

(5) The 75th percentile test has typical lower power than the other rules, since it is a true test of whether 75% of the site is below the cleanup standard, then rises quickly.

(6) With five samples, the 75th percentile test is a "no exceedance" rule. The 95% UCL and the Wilcoxon are essentially the same, since even one exceedance in five samples is usually enough to prevent the upper confidence limit or rank test from concluding "clean." With 10 or more samples, the cleanup under the 75th percentile test would leave less of the site above the numeric standard than the cleanup would leave under the 95% UCL of the mean test or SAB 75%/10x test.

The attainment subcommittee of SAB concluded that for numbers of samples in the 10—12 range, SAB ad hoc decision test (75%/10x) performed the best of the six methods examined, in determining when actual attainment was reached at a site. An alternative considered was a parametric test—the 95% upper confidence limit (UCL) of the mean test used by EPA. Because the 95% method generally requires much more data to be as sensitive, and because the 75%/10x appeared to statistically determine when a site was "clean," the SAB recommended the use of the 75%/10x test with a 2x limit off property. The Department included both the 75%/10x and the 95% UCL of mean tests as options for the user. In addition, other methods can be proposed based on performance requirements of this section. The background determination was treated as comparison of range distributions between the background area and the area of attainment determination. The Department specifically requests comments on the use and efficacy of the 75%/10x statistical test.

7. *Section 250.707. Post-remediation attainment.*

This section applies to remediations that require the use of engineering or institutional controls to attain and maintain a cleanup standard beyond the time a final report is reviewed and approved by the Department. Implementation of a post-remediation care plan is required if engineering or institutional controls are needed to demonstrate attainment with a cleanup standard.

F. *Benefits and Costs*

Executive Order 1996-1 requires a cost/benefit analysis of the proposed regulations.

Benefits

The proposed regulations provide significant benefits to the public, local government and the private sector. The public and local government are notified of plans to remediate sites, by the person who intends to perform the remediation, prior to the initiation of the cleanup. In the past, this notice was not required. In addition, for cleanups that involve the site-specific standard or SIAs, a person who is remediating a site must publish the availability of the opportunity for a municipality to become involved in the remediation and reuse plans for the site.

These proposed regulations will encourage the voluntary cleanup and reuse of contaminated sites, restoring these sites to safe and productive uses, while promoting additional employment and tax revenues to distressed communities. The reuse of these sites will also reduce industrial development of greenfields sites.

Compliance Costs

The Department does not anticipate new compliance costs associated with the proposed regulations. Costs to remediate contaminated sites should be reduced based on the availability of a release of liability for compliance with the cleanup standards. Act 2, however, does impose fees for the submission of plans and reports that are reviewed by the Department. These fees will be collected by the Department and will be used to implement the provisions of Act 2, including implementation of these regulations.

Compliance Assistance Plan

Act 2 establishes an Industrial Sites Cleanup Fund, which is administered by the Department of Commerce. (*Editor's Note:* The Community and Economic Development Enhancement Act, Act 58 of 1996, created the Department of Community and Economic Development as the successor agency of the Department of Commerce.) The fund provides financial assistance to persons who did not cause or contribute to contamination on a property used for industrial activity and who propose to undertake a voluntary cleanup of the property.

The Department has developed a technical guidance manual for the land recycling program. The *Manual* provides detailed, technical information on how to comply with Act 2 and the proposed regulations.

Paperwork Requirements

The paperwork required by these proposed regulations is based on statutory requirements. Act 2 requires an NIR and final reports for all remediations. In addition, Act 2 requires the preparation of remedial investigation reports, risk assessment reports and cleanup plans for remediations that will attain the site-specific standard. For the remediation of special industrial areas, Act 2 requires the preparation of a work plan and a baseline remedial investigation report. Also, a person undertaking the reuse of a special industrial site is required to enter into an agreement with the Department based on the baseline remedial investigation report. The reports are an important aspect of the cleanup program because releases of liability will be based on the Department-approved reports that identify contamination and demonstrate compliance with a cleanup standard. The proposed regulations do not require additional paperwork.

G. *Pollution Prevention*

Pollution prevention approaches to environmental management often provide environmentally sound and longer-term solutions to environmental protection because pollution is prevented at the source. Generally speaking, pollution prevention refers to measures taken to avoid or reduce the generation of all types of pollution at their points of origin. These proposed regulations will be applied after the pollution has been generated and a person is remediating the property. It should be noted, however, that these proposed regulations are intended to encourage the reuse of contaminated sites and prevent the generation of pollution at a site that is not contaminated.

H. *Sunset Review*

These proposed regulations will be reviewed in accordance with the sunset review schedule published by the Department to determine whether the regulations effectively fulfill the goals for which it was intended.

I. *Regulatory Review*

Under section 5(a) of the Regulatory Review Act (71 P. S. § 745.5(a)), the Department submitted a copy of the proposed rulemaking on August 2, 1996, to the Independent Regulatory Review Commission (IRRC), and the Chairpersons of the Senate and House Environmental Resources and Energy Committees. In addition to submitting the proposed regulations, the Department has provided IRRC and the Committees with a copy of a detailed regulatory analysis form prepared by the Department in compliance with Executive Order 1996-1, "Improving Government Regulations." A copy of this material is available to the public upon request.

If IRRC has objections to any portion of the proposed regulations, it will notify the Department within 30 days of the close of the public comment period. The notification shall specify the regulatory review criteria which have not been met by that portion. The Regulatory Review Act specifies detailed procedures for the Department, the Governor and the General Assembly to review these objections before final publication of the regulations.

J. *Public Comments*

Written Comments—Interested persons are invited to submit comments, suggestions or objections regarding the proposed regulation to the Environmental Quality Board, P. O. Box 8477, Harrisburg, PA 17105-8477 (express mail: Rachel Carson State Office Building, 15th Floor, 400 Market Street, Harrisburg, PA 17105-2301). Comments received by facsimile will not be accepted. Comments, suggestions or objections must be received within 60 days of publication in the *Pennsylvania Bulletin*. Interested persons may also submit a summary of their comments to the Board. The summary shall not exceed one page in length and must also be received within 60 days following publication in the *Pennsylvania Bulletin*. The one-page summary will be provided to each member of the Board in the agenda packet distributed prior to the meeting at which the final regulations will be considered.

Electronic Comments—Comments may be submitted electronically to the Board at RegComments@A1.dep.state.pa.us. A subject heading of the proposal must be included in each transmission. Comments submitted electronically must also be received by the Board within 60 days following publication in the *Pennsylvania Bulletin*.

K. *Public Hearings*

The Board will hold three public hearings for the purpose of accepting comments on this proposal. They will be held at 1 p.m. on the following dates:

September 17, 1996	Ramada Inn—Allentown 1500 McArthur Road Whitehall, PA
September 23, 1996	Sheraton Inn—Pittsburgh North 910 Sheraton Drive Mars, PA
October 3, 1996	Holiday Inn 334 Arsenal Road (I-83, Exit 9E) York, PA

Persons wishing to present testimony at a hearing are requested to contact Sharon Freeman at the Environmental Quality Board, P. O. Box 8477, Harrisburg, PA 17105-8477, (717) 787-4526, at least 1 week in advance of the hearing to reserve a time to present testimony. Oral testimony is limited to 10 minutes for each witness. Witnesses are requested to submit three written copies of their oral testimony to the hearing chairperson at the hearing. Organizations are limited to designating one witness to present testimony on their behalf at each hearing.

Persons with a disability who wish to attend the hearing and require an auxiliary aid, service or other accommodation in order to participate should contact Sharon Freeman at (717) 787-4526, or through the Pennsylvania AT&T Relay Service at (800) 654-5984 (TDD) to discuss how the Department may accommodate their needs.

JAMES M. SEIF,
Chairperson

Fiscal Note: 7-300. No fiscal impact; (8) recommends adoption.

Annex A

TITLE 25. ENVIRONMENTAL PROTECTION

PART I. DEPARTMENT OF ENVIRONMENTAL PROTECTION

Subpart D. ENVIRONMENTAL HEALTH AND SAFETY

ARTICLE VI. GENERAL HEALTH AND SAFETY

CHAPTER 250. ADMINISTRATION OF LAND RECYCLING PROGRAM

Subch.

Subchapter A. GENERAL PROVISIONS

§ 250.1. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

ASTM—American Society for Testing and Materials.

Act—The Land Recycling and Environmental Remediation Standards Act (35 P. S. §§ 6026.101—6026.909).

Anisotropy—The variability of a physical property based on direction, for example, variation in permeability in relation to direction of groundwater flow.

Enterprise zone—An area specially designated as an enterprise zone under requirements determined by the Department of Community Affairs or its successor agency for this responsibility.

Heterogeneity—Nonhomogeneous structure, composition and physical properties.

MCL—Maximum contaminent level.

MSC—Medium-specific concentration.

NIR—Notice of Intent to Remediate.

NPDES—National Pollution Discharge Elimination System.

PQL—Practical quantitation limit.

Property—A parcel of land defined by the metes and bounds set forth in the deed for that land.

Risk assessment—A process to quantify the risk posed by exposure of a human or ecological receptor to regulated substances. The term includes baseline risk assessment, development of site-specific standards and risk assessment of the remedial alternatives.

SIA—special industrial area—A property where there is no financially viable responsible person to perform remediation on property located within an enterprise zone and where the property was used for industrial activity.

Site—The extent of contamination originating within the property boundaries and all areas in close proximity to the contamination necessary for the implementation of remediation activities to be conducted under the act.

TF—Transfer factor.

Volatile compound—A chemical compound with a Henry's Law constant $>1x10^{-5}$ atm-m^3/mol and a molecular weight <200 g/mol.

§ 250.2. Application of remediation standards.

(a) A person who is required to perform a site remediation under an enforcement action of the Department shall meet the following:

(1) Select one or a combination of the background standards contained in Subchapter B (relating to background standard), statewide health standards contained in Subchapter C (relating to statewide health standards) and site-specific standards, contained in Subchapter D (relating to site-specific standards).

(2) Demonstrate compliance with one of the standards in paragraph (1) by meeting the requirements of the act and this chapter.

(b) To qualify for liability protection under the act, a person conducting remediation shall comply with this chapter and the act. Administrative and procedural requirements for remediations listed in subsection (a)(1) and (2) shall be used in lieu of those requirements listed in this chapter to qualify for liability protection under the act.

(1) Persons remediating sites placed on the Pennsylvania Priority List shall comply with the Hazardous Sites Cleanup Act (35 P. S. §§ 6020.101—6020.1305), except for the cleanup levels which are set by the act.

(2) Persons remediating releases from storage tanks regulated under the Storage Tank and Spill Prevention Act (35 P. S. §§ 6021.101—6021.2104) shall comply with the requirements of the corrective action process, contained in Chapter 245, Subchapter D (relating to corrective action process for owners and operators of storage tanks and storage tank facilities and other responsible parties), except for the cleanup levels which are set by the act.

§ 250.3. Management of contaminated media.

(a) Contaminated media removed for reuse, treatment or disposal shall be managed in accordance with the Solid Waste Management Act (35 P. S. §§ 6018.101—6018.1003), The Clean Streams Law (35 P. S. §§ 691.1—691.1001), the act of July 13, 1988 (P. L. 525, No. 93) (35 P. S. §§ 6019.1—6019.6), known as the Infectious and Chemotherapeutic Waste Law, the Air Pollution Control Act (35 P. S. §§ 4001—4015) and the regulations promulgated thereunder.

(b) The Department may waive procedural and operating requirements for onsite remediation activities based on a written demonstration of the criteria in section 902 of the act (35 P. S. § 6026.902).

§ 250.4. Groundwater determinations.

For the purpose of meeting groundwater standards, water and substances contained within it in a suspended or aqueous phase are contaminated media and substances that are in a separate phase are waste. The Department may require removal of waste during a remediation conducted under the act. The Department may waive procedural and operating requirements for onsite remediation activities based on a written demonstration of the criteria in section 902 of the act (35 P. S. § 6026.902).

§ 250.5. Aquifer determinations.

To qualify as groundwater in an aquifer, the water shall be in a geological formation, a group of formations or part of formations that exist beneath the site and the formation shall meet one of the following conditions:

(1) The geological formation or part of a formation is capable of supplying a developed spring or typically constructed well drilled in the formation with a yield of water year round in an amount greater than 200 gallons/day.

(2) The geological formation or part of a formation is supplying an existing developed spring or typically constructed well, regardless of quantity or quality, for drinking water or agricultural use.

§ 250.6. Current use and future use of aquifer groundwater.

(a) Current drinking or agricultural use of groundwater in an aquifer, at the time contamination was discovered, shall be protected.

(b) Under the Statewide health standard, an aquifer under a site will be considered to be currently planned for future use and under the site-specific standard, an aquifer under a site will be considered to be available for probable future use if the following apply:

(1) The water for a present or future private water supply or public water supply system can be expected to rely on the groundwater in the vicinity of the site where contamination could reasonably migrate.

(2) The background quality of the water is of a quality that it could be used for drinking water or agricultural purposes, or both, with reasonable treatment—for example, point of use treatment.

(3) There are no other factors, such as local ordinances or deed restrictions, or similar prohibitions that exist on consumption, that reasonably would prevent the use of groundwater in the vicinity of the site where site contamination could reasonably migrate.

§ 250.7. Standards related to PQLs.

(a) The PQLs shall be selected from the PQLs specified by the EPA as estimated quantitation limits (EQLs) in the most current version of the EPA RCRA Manual SW-846 (U. S. EPA, 1990. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Third Edition. Office of Solid Waste and Emergency Response) for soil listed as "low level soil" and for groundwater listed as "groundwater" in accordance with the following:

(1) For inorganic compounds, the PQLs under this chapter shall be the values listed for methods associated with analysis by Inductively Coupled Plasma (ICP) with the following exceptions:

(i) For lead, cadmium, arsenic and selenium, values listed for the atomic absorption graphite furnace methods for water shall be used.

(ii) Mercury shall be the value listed for the cold vapor method.

(2) For organic compounds, the PQLs shall be the EQLs listed for the GC/Mass spec methods—for example, Method 8240 for volatile organic compounds.

(b) In cases where EQLs set by the EPA have a health risk that is greater (less protective) than the risk levels set in sections 303(c) and 304(b) and (c) of the act (35 P. S. §§ 6026.303(c) and 6026.304(b) and (c)), the MSC levels under the statewide health standards shall be used to demonstrate attainment.

(c) If an MCL or lifetime health advisory level (HAL) exists for a regulated substance, the MCL or lifetime HAL will be the standard regardless of whether it is higher or lower than the PQL.

(d) Nothing in this section restricts the selection of valid and generally accepted methods to be used to analyze samples of environmental media.

§ 250.8. Public notice by applicant.

(a) Public notice shall be initiated by the applicant through an NIR. For remediations proposing the use of a site-specific standard or, for remediations under an SIA agreement, the public and the municipality where the site is located shall be provided a 30-day period, in the NIR, in which the municipality may request to be involved in the development of the remediation and reuse plans for the site.

(b) The remedial investigation report, the risk assessment report and the cleanup plan, prepared under a site-specific remediation, may not be submitted to the Department until after the initial 30-day public and municipal comment period following the submission of the NIR has expired.

(c) The baseline remedial investigation report, prepared under an SIA remediation, shall be submitted after the initial 30-day public and municipal comment period has expired.

§ 250.9. Public participation.

(a) The publication date of the summary of the NIR in a newspaper of general circulation in the area of the site shall initiate the 30-day public and municipal comment period during which the municipality can request to be involved in the development of the remediation and reuse plans for a site being remediated to a site-specific standard or for remediation at an SIA.

(b) The person proposing remediation shall be responsible for developing and implementing a public involvement plan if the following circumstances exist:

(1) The remediation involves a site-specific standard or an SIA cleanup.

(2) A municipality, through its official representatives, has requested, in writing, to be involved in the development of the remediation and reuse plans within the 30-day public and municipal comment period identified in the notice to the municipality and the newspaper notice.

(c) If a public involvement plan has been initiated, the person proposing remediation shall, at a minimum, provide:

(1) Public access at convenient locations for document review.

(2) Designation of a single contact person to address questions from the community.

(3) A location near the remediation site for any public hearings and meetings that may be part of the public involvement plan.

(d) If a public involvement plan has been requested, it shall be submitted with one of the following:

(1) A remedial investigation report under a site-specific remediation.

(2) A baseline environmental report under an SIA cleanup.

§ 250.10. Fees.

(a) Except for the resubmission of a site-specific standard final report, resubmission of a cleanup plan, remedial investigation, risk assessment or final report will require payment of the appropriate fee identified in the act for each resubmission.

(b) The Department will disapprove a plan or report that is submitted without the appropriate fee.

§ 250.11. Publication.

The Department will publish a notice of its final actions on plans and reports in the *Pennsylvania Bulletin*.

§ 250.12. Applicability to solid waste facilities.

(a) A release of a regulated substance at a solid waste facility which did not receive waste after the applicable trigger date in subsection (d) shall be remediated in accordance with this chapter and the act. The standard shall be attained at the point of compliance as determined in accordance with this chapter and the act.

(b) A release of a regulated substance at a solid waste facility which did not receive waste prior to the applicable trigger date in subsection (d) shall be remediated to background, as that term is defined in the act. Background shall be attained at the appropriate monitoring points as determined under the applicable hazardous, residual or municipal waste regulations.

(c) A release of a regulated substance at a solid waste facility, including an expansion, which received waste on or before, and after, the applicable trigger date in subsection (d) shall be remediated to one or a combination of the remediation standards in the act. In regard to hazardous waste facilities, the remedy selected shall also comply with the Resource Conservation and Recovery Act (42 U.S.C.A. §§ 6091—6986). The standard shall be attained at appropriate monitoring points as determined under the applicable hazardous waste, residual waste or municipal waste regulations.

(d) As used in this section, "applicable trigger date" means:

(1) July 26, 1982, for hazardous waste facilities.

(2) July 4, 1992, for residual waste facilities.

(3) April 9, 1988, for municipal waste facilities.

(e) Nothing in this section affects any closure requirements in the applicable hazardous, residual and municipal waste regulations contained in Subpart D, Articles VII—IX (relating to hazardous waste management; municipal waste; and residual waste management) other

than those that set forth levels for releases of regulated substances that the facility shall achieve in contaminated media.

§ 250.13. Measurement of regulated substances in media.

(a) For measuring regulated substances in soil and sediments, analyses shall be performed on a dry weight basis.

(b) For metals in soil, analyses shall be performed on total metals, except for hexavalent and trivalent chromium, which analyses shall be performed individually.

(c) For groundwater, samples for metals analysis shall be field filtered and field acidified in accordance with the most current version of the EPA RCRA Manual SW-846.

Subchapter B. BACKGROUND STANDARD

Sec.
250.201. Scope.
250.202. Establishing background concentrations.
250.203. Points of compliance.
250.204. Final report.

§ 250.201. Scope.

This subchapter sets forth requirements and procedures for a person selecting the background standard, as provided in § 250.2 (relating to application of remediation standards).

§ 250.202. Establishing background concentrations.

(a) Background concentrations shall be established using one of the following:

(1) A person chooses the default background concentrations based on standards relating to the PQLs described in § 250.7 (relating to standards related to PQLs).

(2) A person establishes background concentrations based on a remedial investigation.

(b) The background concentrations will be determined using analysis of samples of regulated substances present at the property but not related to any release at the property. If all areas on the property are affected by a release, background shall be determined at points off the property in accordance with § 250.204(f)(6) and (7) (relating to final report).

(c) Background concentrations shall be determined by a methodology that is statistically valid and consistent with the methodology used to demonstrate attainment.

§ 250.203. Points of compliance.

(a) For attainment of a background groundwater standard, the point of compliance shall be throughout the contaminant plume, including areas of the plume that are outside the property boundary.

(b) For attainment of a background soil standard, the point of compliance shall be throughout the area of the soil that has become contaminated as a result of releases on the property.

(c) For attainment of a surface water quality standard, the following points of compliance shall be used:

(1) For point source discharges, compliance shall be measured at the point of discharge in accordance with limits specified in the NPDES permit.

(2) For purposes of determining compliance with surface water quality standards from a diffuse groundwater discharge, the person shall estimate the expected instream regulated substance concentrations, using mass balance techniques for groundwater/surface water mixing at design flow conditions. If the results indicate that surface water quality standards are being achieved, no action is required. If results indicate that surface water quality standards are not being achieved, further remedial action will be required. In the case of special protection waters, point source and diffuse discharges shall meet the applicable regulations and achieve water quality that does not preclude uses existing prior to the contamination from this source.

(3) For purposes of complying with surface water quality standards in a spring, the point of compliance is the point of discharge to the ground surface.

(d) For the emission of regulated substances to outdoor air, the point of compliance for any applicable air quality standard shall be as specified in the air quality regulations in Subpart C, Article III (relating to air resources).

§ 250.204. Final report.

(a) For sites remediated under the background standard, the person conducting the remediation shall submit a final report to the Department which documents attainment of the selected standard. The final report shall include site characterization information in subsections (b)—(e). The site characterization shall be conducted in accordance with scientifically recognized principles, standards and procedures. The level of detail in the investigation and the methods selected shall sufficiently define the rate, extent and movement of contaminants. Interpretations of geologic and hydrogeologic data shall be prepared by a professional geologist licensed in this Commonwealth.

(b) As derived from specific knowledge of the subject property, historic use of the subject property or regulated substance usage information regarding the subject property, an appropriate number of sample locations should be investigated from the identified media of concern to characterize the nature and composition of the contaminants including the following:

(1) Source characterization or development of a conceptual site model.

(2) The vertical and horizontal extent of contamination above the selected standard within each media of concern.

(3) The direction and rate of contaminant movement within each media of concern.

(4) A determination of the appropriate remedial technology for each media of concern.

(c) Descriptions of sampling and decontamination methodologies and analytical quality assurance/quality control procedures should be included within a Sampling and Analysis Plan and Quality Assurance Plan. Copies of soil and geologic boring descriptions and as-built construction drawings of wells used for site characterization should be included in the report. Copies of laboratory analytical results and applicable laboratory quality control results should be included within the report, including historical data and data eliminated from consideration based on data validation protocols. Analytical results should be presented within the report in table form.

(d) If soil is determined to be a media of concern, the site characterization shall determine the relative location of soil samples necessary to characterize the horizontal and vertical extent of contamination based on factors such as hydraulic conductivity of the soils, heterogeneity of the soils and the nature of the contaminants. The horizontal and vertical extent of soil with concentrations of a regulated substances above the selected standard

shall be defined by an appropriate number of samples inside and outside of the area that exceeds the standard. Soil samples from the area with the anticipated highest levels of contamination shall be obtained, as appropriate, to determine the applicability of the proposed remedial action or handling and disposal requirements, or both, for that soil during remediation.

(e) If groundwater is determined to be a media of concern, the site characterization shall characterize the effects of a release on groundwater to adequately determine how naturally occurring physical and geochemical characteristics define the movement of groundwater and contaminants beneath the surface, including the delineation of the position of aquifers, as well as geologic units which inhibit groundwater flow. The site characterization shall meet the following conditions:

(1) If appropriate, the characterization shall consider the heterogeneity and anisotropy of aquifer materials based on hydraulic conductivity values (measured or published), and the effect of local and regional groundwater flow directions and any influence from pumping wells.

(2) Defining the horizontal extent of concentrations of a regulated substances above the standard shall require more than one round of groundwater sampling from properly constructed and developed monitoring wells taken with a sufficient number of days apart to yield independently valid results.

(3) When characterizing the vertical extent of groundwater contamination, the person shall perform more than one round of groundwater sampling and shall consider the specific gravity of the regulated substances identified in the groundwater in the site, and the potential for naturally occurring or induced downward vertical hydraulic gradients.

(4) When characterizing the vertical extent of groundwater contamination, properly constructed monitoring wells or nested monitoring wells should be utilized to focus groundwater sampling in zones of potential contaminant accumulation—that is, directly above a confining layer—and sampling shall be taken with a sufficient number of days apart to yield independently valid results.

(f) Final reports for the background standard shall include the following additional information:

(1) Descriptions of treatment, removal or decontamination procedures performed in remediation.

(2) Descriptions of the sampling methodology and analytical results, including the appropriate statistical methodologies, which pertain to whether the remediation has attained the selected standard, following the requirements of Subchapter G (relating to demonstration of attainment).

(3) Documentation of compliance with postremediation care requirements, if they are needed to maintain the selected standard.

(4) All sampling data.

(5) If background was established based on a site characterization, a summary of sampling methodology and analytical results that relate to the determination of the background concentration. The summary shall contain the following:

(i) For soil, the final report shall identify the background region within which all background samples were collected.

(ii) For groundwater, the final report shall identify background wells.

(6) Documentation that background areas for soil meet the following criteria:

(i) The background region and background areas shall be free of contamination from any release at the site.

(ii) The statistical distribution and comparison parameters used to demonstrate background shall be the same in establishing background levels and in establishing distribution and parameters in the cleanup units. Sampling at the background area and the cleanup unit shall be comparable and random.

(iii) A background area selected for comparison with a given cleanup unit may not differ significantly from that cleanup unit in physical, chemical or biological characteristics that might cause measurements in the background area and the cleanup unit to differ.

(7) Documentation that background groundwater concentrations have been determined at hydrogeologically upgradient points that characterize the groundwater flow onto the site that are not affected by any release at the property.

(g) If engineering controls are needed to attain or maintain a standard or if institutional controls are needed to maintain a standard, a post remediation care plan shall be documented in the final report. The plan shall include the following:

(1) Reporting of any instance of nonattainment.

(2) Reporting of measures to correct nonattainment conditions.

(3) Periodic reporting of monitoring, sampling and analysis as required by the Department.

(4) Maintenance of records at the property where the remediation is being conducted for monitoring, sampling and analysis.

(5) A schedule for operation and maintenance of the controls and submission of proposed changes.

Subchapter C. STATEWIDE HEALTH STANDARDS

Sec.

§ 250.301. Scope.

(a) This subchapter sets forth generic statewide health standards as one of three remediation standards that a person may select. The statewide health standards are concentrations of regulated substances associated with a specific environmental medium, and are designated as the MSCs. The values used to determine the MSCs are contained in Appendix A, Tables 1, 2 and 5 and are the concentrations of regulated substances that shall be met to demonstrate attainment of a Statewide health standard. Appendix A, Table 3 presents the toxicological and physical parameters used to calculate the MSCs in Appendix A, Tables 1 and 2.

(b) This subchapter sets forth minimum threshold MSCs for soil and groundwater that shall be met to demonstrate attainment with regulated substances in Appendix A, Table 4. Minimum threshold MSCs are

standards developed for regulated substances for which no chemical-specific toxicological data exists.

§ 250.302. Point of compliance.

(a) For regulated substances in groundwater, the MSC as determined in § 250.303 (relating to MSCs for groundwater) is the Statewide health standard that shall be met at the point of compliance.

(b) For attainment of the Statewide health standard for ingestion and inhalation, the point of compliance is at and beyond the property boundary that existed at the time the contamination is discovered or a point beyond the property boundary that the Department may, in writing, determine to be appropriate under the following situations:

(1) The original contamination source was at the property boundary.

(2) Structures are located on the property boundary which prohibit internal or external access for a drill rig.

(3) The property is a small parcel of land with limited space for onsite monitoring wells.

(4) It is not physically possible to monitor groundwater quality at the property boundary.

(5) The downgradient property was owned by the same party at the time the contamination was discovered and the use of the groundwater on the downgradient property can be controlled to prevent unacceptable exposure.

(6) Where regulated substances are only secondary contaminants for which a secondary MCL exists.

(c) For attainment of the Statewide health standard for soil, the MSC as determined in § 250.304 (relating to MSCs for soil) shall be met at the specified depth.

(d) For the discharges of regulated substances to surface water:

(1) For point source discharges to surface water, the point of compliance is measured at the point of discharge in accordance with limits specified in the NPDES permit.

(2) For purposes of determining compliance with surface water quality standards from a diffuse groundwater discharge, the person shall estimate the expected instream regulated substance concentrations, using mass balance techniques for groundwater/surface water mixing at design flow conditions. If the results indicate that surface water quality standards are being achieved, no action is required. If results indicate that surface water quality standards are not being achieved, further remedial action will be required. In the case of special protection waters, point source and nonpoint discharges shall meet the applicable regulations and achieve water quality that does not preclude uses existing prior to the contamination from this source.

(3) For purposes of complying with surface water quality standards in a spring, the point of compliance is the point of discharge to the ground surface.

(e) For the emission of regulated substances to outdoor air, the point of compliance for any applicable air quality standard shall be as specified in the air quality regulations.

§ 250.303. MSCs for groundwater.

(a) A person shall implement a remedy under the Statewide health standard that is protective of human health and the environment.

(b) The MSCs for regulated substances in groundwater in aquifers used or currently planned to be used for drinking water or for agricultural purposes are presented in Appendix A, Tables 1 and 5. The methodology for calculating MSCs in groundwater is detailed in subsections (c) and (d).

(c) The MSCs for regulated substances contained in groundwater in aquifers used or currently planned to be used for drinking water or for agricultural purposes is the MCL as established by the Department or the EPA (U. S. EPA, 1996. Drinking Water Regulations and Health Advisories. Office of Water. EPA 822-R-96-001). For a regulated substance where no MCL has been established, the MSC is the lifetime health advisory level (HAL) for that compound. For a regulated substance where neither an MCL nor a lifetime HAL is established by the EPA, the MSC is the lowest concentration calculated using the appropriate residential and nonresidential exposure assumptions and the equations in §§ 250.305 and 250.306 (relating to ingestion numeric values; and inhalation numeric values).

(d) If the groundwater at the site has naturally occurring background total dissolved solids concentrations greater than 2,500 milligrams per liter, the Statewide health standard for a regulated substance dissolved in the groundwater may be adjusted by multiplying the MSC for groundwater in aquifers by 100. The adjusted Statewide health standard shall then be used in calculating the soil to groundwater pathway numeric value as specified in § 250.307 (relating to soil to groundwater pathway numeric values).

(e) Volatilization from groundwater through soils into indoor air shall be evaluated and abated through the use of the background standard or the site-specific standard if the following apply:

(i) Carbon tetrachloride, 1,1 dichloroethene, 1,2 dichloroethane, benzene, chloroform or vinyl chloride are present in the groundwater.

(ii) Groundwater is present at depths less than 15 feet from the ground surface.

§ 250.304. MSCs for soil.

(a) A person shall implement a remedy under the Statewide health standard that is protective of human health and the environment.

(b) The MSCs for regulated substances in soil are presented in Appendix A, Tables 2 and 5. The methodology for calculating MSCs in soil is detailed in subsections (c) and (d) and is further limited to not exceed the physical capacity of the soil to contain a regulated substance. This physical limitation is based on an assumed porosity of .35, an assumed dry bulk density of soil of 1.8 kilograms per liter and an assumed density of a regulated substance of 1.0 kilograms per liter and is calculated according to the following equation:

$$C_{PL} = \frac{\rho_{RS} n}{\rho_B}$$

where:
ρ_{RS} = density of the regulated substance = 1.0 kg/L
n = porosity of the soil = 0.35
ρ_B = dry bulk density of the soil = 1.8 kg/L

(c) For the residential standard, the MSC for regulated substances contained in soil is the lowest one of the following:

(1) The ingestion numeric value within a depth of up to 15 feet from the existing ground surface as determined by the methodology in § 250.305 (relating to ingestion numeric values), using the appropriate default residential exposure assumptions contained in § 250.305(e).

(2) The inhalation numeric value within a depth of up to 15 feet in soil from the existing ground surface, which considers volatilization into the outdoor air and inhalation of particulates, as determined by the methodology in § 250.306 (relating to inhalation numeric values), using the appropriate default residential exposure assumptions contained in § 250.306(d).

(3) The soil-to-groundwater pathway numeric value throughout the soil column as determined by the methodology in § 250.307 (relating to soil to groundwater pathway numeric values).

(d) For the nonresidential standard, the MSC for regulated substances contained in soil is one of the following:

(1) For soils within a depth of up to 2 feet from the existing ground surface, the MSC is the lowest one of the following:

(i) The ingestion numeric value as determined by the methodology in § 250.305, using the appropriate default nonresidential exposure assumptions contained in § 250.305(e).

(ii) The inhalation numeric value which is the lower of the values for volatilization into the outdoor air and the inhalation of particulates, as determined by the methodology in § 250.306, using the appropriate default nonresidential exposure assumptions contained in § 250.306(d).

(2) For soils at depths greater than 2 feet through 15 feet from the existing ground surface, the MSC is the lowest of one of the following:

(i) The inhalation numeric value which considers volatilization to the outdoor air, as determined by the methodology in § 250.306, using the appropriate default nonresidential exposure assumptions contained in § 250.306(d), and using a TF based upon the calculated emission rate from subsurface soil as specified in the method of Jury, et al. 1990. Water Resources Research, Vol. 26, No. 1, pp. 13-20.

(ii) The soil-to-groundwater pathway numeric value throughout the soil column as determined by the methodology in § 250.307.

(e) A person conducting a remediation of soils contaminated with a substance having only a secondary MCL will not be required to comply with the soil to groundwater standard for those substances to protect groundwater in aquifers for drinking water.

(f) For the residential standard, the MSC for regulated substances which are radionuclides is the lowest one of the following:

(1) The ingestion numeric value within a depth of up to 15 feet from the existing ground surface as determined by the methodology in § 250.308 (relating to radionuclide numeric values), using the appropriate default residential exposure assumptions contained in § 250.308(a).

(2) The inhalation numeric value within a depth of up to 15 feet from the existing ground surface, which considers volatilization into the outdoor air and inhalation of particulates, as determined by the methodology in § 250.308(b) and (c), using the appropriate default residential exposure assumptions contained in § 250.308(e).

(3) The direct exposure pathway numeric value as determined by the methodology in § 250.308(d).

(4) The soil-to-groundwater pathway numeric value throughout the soil column as determined by the methodology in § 250.307.

(g) For the nonresidential standard, the MSC for regulated substances which are radionuclides is the lowest one of the following:

(1) The ingestion numeric value within a depth of up to 15 feet from the existing ground surface as determined by the methodology in § 250.308(a), using the appropriate default nonresidential exposure assumptions contained in § 250.308(e).

(2) The inhalation numeric value within a depth of up to 15 feet from the existing ground surface, which considers volatilization into the outdoor air and inhalation of particulates, as determined by the methodology in § 250.308(b) and (c), using the appropriate default nonresidential exposure assumptions contained in § 250.308(e).

(3) The direct exposure pathway numeric value as determined by the methodology in § 250.308(d).

(4) The soil-to-groundwater pathway numeric value throughout the soil column as determined by the methodology in § 250.307.

§ 250.305. Ingestion numeric values.

(a) For a regulated substance which is a systemic toxicant, the ingestion numeric value for that substance was calculated using the appropriate residential or nonresidential exposure assumptions from subsection (e) according to the following equation:

$$MSC = \frac{THQ \times RfD_o \times BW \times AT_{nc} \times 365 \text{ days/year}}{Abs \times EF \times ED \times IngR \times CF}$$

(b) For a regulated substance which is a carcinogen, the ingestion numeric value for that substance was calculated using the appropriate residential or nonresidential exposure assumptions from subsection (e) according to the following equation:

$$MSC = \frac{TR \times AT_c \times 365 \text{ days/year}}{CSF_o \times Abs \times EF \times IF_{adj} \times CF}$$

(c) For a regulated substance that has both an oral reference dose and an oral cancer slope factor, the ingestion numeric value is the lower of the two numbers as calculated by the equations in subsections (a) and (b).

(d) The numeric values in subsections (a)—(c) can be used only if there is no nonaqueous phase liquid.

(e) The default exposure assumptions used to calculate the ingestion numeric values are as follows:

Term		Residential		Nonresidential (Onsite Worker)
		Systemic[1]	Carcinogens[2]	
THQ	Target Hazard Quotient	1	N/A	1
RfD_o	Oral Reference Dose (mg/kg-day)	Chemical-specific	N/A	Chemical-specific
BW	Body Weight (kg) Soil Groundwater	 15 70	N/A	 70 70
AT_{nc}	Averaging Time for systemic toxicants (yr) Soil Groundwater	 6 30	 N/A N/A	 25 25
Abs	Absorption (unitless)[3]	1	1	1
EF	Exposure Frequency (d/yr) Soil Groundwater	 250 350	 250 350	 180 250
ED	Exposure Duration (yr) Soil Groundwater	 6 30	 N/A N/A	 25 25
IngR	Ingestion Rate Soil (mg/day) GW (L/day)	 100 2	 N/A N/A	 50 1
CF	Conversion Factor Soil (kg/mg) GW (unitless)	 1×10^{-6} 1	 1×10^{-6} 1	 1×10^{-6} 1
TR	Target Risk	N/A	1×10^{-5}	1×10^{-5}
CSF_o	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	N/A	Chemical-specific	Chemical-specific
AT_c	Averaging Time for carcinogens (yr)	N/A	70	70
If_{adj}[4]	Ingestion Factor Soil (mg-yr/kg-day) GW (L-yr/kg-day)	N/A	 57.1 1.1	 17.9 0.4

Notes:

[1] Residential exposure to noncarcinogens is based on childhood (ages 1-6) exposure for soil, and adult exposure for groundwater, consistent with USEPA (1991).

[2] Residential exposure to carcinogens is based on combined childhood and adult exposure.

[3] The oral absorption factor takes into account absorption and bioavailability. In cases where the oral RfD or CSF is based on administered oral dose, the absorption factor would be limited to bioavailability. The default value is 1.

[4] The Ingestion Factor for the residential scenario is calculated using the equation $If_{adj} = ED_c \times IR_c / BW_c + ED_a \times IR_a / Bw_a$, where ED_c = 6 yr, IR_c =100 mg/day for soils and 1 L/day for groundwater, BW_c = 15 kg, ED_a = 24 yr, IR_a =50 mg/day for soils and 2 L/day for groundwater, and BW_a = 70 kg. The ingestion factor for the nonresidential scenario is calculated using the equation If_{adj} = EDxIR/BW, where ED = 25 yr, IR = 50 mg/day for soils and 1L/day for groundwater, and BW = 70 kg.

(f) The residential ingestion numeric value for lead in soil was developed using the Uptake Biokinetic (UBK) Model for Lead (version 0.4) developed by the EPA (U. S. Environmental Protection Agency. (1990). Uptake Biokinetic (UBK) Model for Lead (version 0.4). U. S. EPA/ECAO. August 1990), in lieu of the algorithms presented in subsections (a) and (b). Default input values are identified in Appendix A, Table 6. Because the UBK model is applicable only to children, the nonresidential ingestion numeric value was calculated according to the method developed by the Society for Environmental Geochemistry and Health (Wixson, B.G. (1991)). The Society for Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead

in Soil. *Trace Substances in Environmental Health*. 11-20), using the following equations:

$$S = \frac{1000\left[\left(T/G^{n}\right)\text{-}B\right]}{\delta}$$

Table 6 identifies each of the variables in this equation.

§ 250.306. Inhalation numeric values.

(a) For a regulated substance which is a systemic toxicant, the following applies:

(1) For a volatile compound, the numeric value for inhalation from soil shall be calculated using the appropriate residential or nonresidential exposure assumptions from subsection (d) according to the following equation using TF for volatiles:

$$MSC = \frac{THQ \times RfD_i \times BW \times AT_{nc} \times 365\ days/yr \times TF}{Abs \times ET \times EF \times ED \times IR}$$

(2) For a regulated substance attached to particulates, the numeric value for inhalation from soil was calculated using the appropriate residential or nonresidential exposure assumptions from subsection (d) according to the equation in paragraph (1) using TF for particulates.

(b) For a regulated substance which is a carcinogen, the following apply:

(1) For a volatile compound, the numeric value for inhalation from soil was calculated using the appropriate residential or nonresidential exposure assumptions from subsection (d) according to the following equation using TF for volatiles:

$$MSC = \frac{TR \times AT_c \times 365\ days/year \times TF}{CSF_i \times Abs \times ET \times EF \times IF_{adj}}$$

(2) For a regulated substance attached to particulates, the numeric value for inhalation from soil was calculated using the appropriate residential or nonresidential exposure assumptions from subsection (d) according to the equation in paragraph (1) using TF for particulates.

(c) For a regulated substance which is both a systemic toxicant and a carcinogen, the inhalation numeric value is the lower of the two numbers as calculated by the equations in subsections (a) and (b).

(d) The default exposure assumptions used to calculate the inhalation numeric values for soil are as follows:

Term		Residential		Nonresidential (Onsite Worker)
		Systemic[1]	Carcinogens[2]	
THQ	Target Hazard Quotient	1	N/A	1
RfD_i	Inhal. Reference Dose (mg/kg-day)	Chemical-specific	N/A	Chemical-specific
BW	Body Weight (kg)	70	N/A	70
AT_{nc}	Averaging Time for systemic toxicants (yr)	30	N/A	25
TF	Transport Factor (mg/kg)/(mg/m^3) Volatilization[3] Particulate[4]	Chemical-specific 1×10^{10}	Chemical-specific 1×10^{10}	Chemical-specific 1×10^{10}
Abs	Absorption (unitless)[5]	1	1	1
ET	Exposure Time (hr/day)	24	24	8
EF	Exposure Frequency[6] (d/yr)	250	250	180
ED	Exposure Duration (yr)	30	N/A	25
IR	Inhalation Rate (m^3/hr)	0.8[3]	N/A	1.25
TR	Target Risk	N/A	1×10^{-5}	1×10^{-5}
CSF_i	Inhalation Cancer Slope Factor (mg/kg-day)$^{-1}$	N/A	Chemical-specific	Chemical-specific
AT_c	Averaging Time for carcinogens (yr)	N/A	70	70
If_{adj}	Inhalation Factor[7] (m^3-yr / kg-hr)	N/A	0.5	0.4

Notes: Modified from USEPA Region III Risk-based Concentration Table, dated October 20, 1995.

N/A = Not Appplicable

[1] Residential exposure to systemic toxicants is based on adult exposure, consistent with USEPA (1991).

[2] Residential exposure to carcinogens is based on combined child and adult exposure.

[3] Volatilization TF is calculated using TF=(ER x DF)$^{-1}$, where DF =12 (mg/m^3) / (m^2-sec). See soil depth-specific algorithm for the calculation of ER.

[4] Particulate TF was calculated using TF=(ER x DF)$^{-1}$, where ER = 8.25 x 10^{-12} (mg/m^2-sec)/ (mg/kg) and DF = 12 (mg/m^3)/(mg/m^2-sec).

[5] In cases where the inhalation RfD or CSF is based on absorbed dose, this factor can be applied in the exposure algorithm. The default value is 1.

[6] Assumes approximately 100 days/yr with the ground being frozen. Exposure to surficial soils when the ground is frozen is considered de minimis. The nonresidential exposure frequency is defined as 5/7 x 250 days/yr.

[7] The inhalation factor for the residential scenario is calculated using the equation IF_{adj} = ED_c x IR_c /BW_c + ED_a x IR_a /Bw_a, where ED_c = 6 yr, IR_c =0.5 m^3/hr, BW_c = 15 kg, ED_a = 24 yr, IR_a =0.83 m^3/hr, and BW_a = 70 kg. The inhalation factor for the nonresidential scenario is calculated using the equation IF_{adj} = ED x IR / BW , where ED = 25 yr, IR =1.25 m^3/hr and BW = 70 kg.

(e) For the inhalation numeric values in subsections (a) and (b), the TF was calculated by the following equation:

$$TF = (ERxDF)^{-1}$$

The Dispersion Factor (DF) value of 12 (mg/m^3)/(mg/m^2/sec) is taken from the default value in the EPA Draft Soil Screening Guidance (U. S. EPA, 1994. Technical Background Document for Soil Screening Guidance. Review Draft. Office of Emergency and Remedial Response. EPA-540/R-94/106) and the Emission Rate (ER) is calculated by the following equations (from Jury et al. 1990. Water Resources Research, Vol. 26. No. 1. pp. 13-20):

(1) For surficial soils:

$$ER = \frac{1}{T}\int_0^T \left(\frac{C_O}{C_S}\right)\left(D_E/\pi t\right)^{0.5}\left[1-\exp^{(-L^2/4D_E t)}\right]\cdot(10^3)\,dt$$

$$D_E = \frac{D_G}{\frac{\rho_b K_d}{H}+\frac{\theta_m}{H}+\theta_a} + \frac{D_L}{\rho_b K_d + \theta_m + \theta_a H}$$

where:

$$D_G = \left(\frac{\theta_a^{10/3}}{\theta^2}\right) D_{ai}$$

$$D_L = \left(\frac{\theta_m^{10/3}}{\theta^2}\right) D_{Li}$$

(ii) For subsurface soils:

$$ER = \frac{1}{T}\int_0^T \left(\frac{C_O}{C_S}\right)\left(D_E/\pi t\right)^{0.5}\left[\exp^{(-1^2/4D_E t)}-\exp^{(-(1+W)^2/4D_E t)}\right]\cdot(10^3)\,dt$$

$$D_E = \frac{D_G}{\frac{\rho_b K_d}{H}+\frac{\theta_m}{H}+\theta_a} + \frac{D_L}{\rho_b K_d + \theta_m + \theta_a H}$$

where:

$$D_G = \left(\frac{\theta_a^{10/3}}{\theta^2}\right) D_{ai}$$

$$D_L = \left(\frac{\theta_m^{10/3}}{\theta^2}\right) D_{Li}$$

Parameter	Definition	Unit	Recommended Value (1)
ER	Chemical vapor emission rate from surface soil or subsurface soil	mg/m^2-sec per mg/kg	Chemical-specific
C_o	Chemical concentration in soil, $C_o = C_{\rho b}$	g/m^3	1.8
C_s	Chemical concentration in soil	mg/kg (ppm)	1
D_E	Effective diffusion coefficient	m^2/sec	Chemical-specific
D_{ai}	Air diffusivity for chemical i	m^2/sec	Chemical-specific
D_{Li}	Water diffusivity for chemical i	m^2/sec	Chemical-specific
t	Time	sec	N/A
T	Emission averaging time	sec	Equal to exposure duration
θ	Total soil porosity, $\theta = \theta_a + \theta_m$	cm^3/cm^3	0.32 (2)
θ_a	Air-filled soil porosity	cm^3/cm^3	0.12 (2)
θ_m	Moisture-filled soil porosity, $\theta_m = w\rho_b$	cm^3/cm^3	0.20 (2)
w	Moisture content for soil	g water/g soil	0.11
ρ_b	Dry bulk density of soil, $\rho_b = (1-\theta)\ \rho$	g/cm^3	1.8 (2)
ρ	Soil particle density	g/cm^3	2.65
K_d	Partition coefficient, $K_d = K_{oc}\ f_{oc}$	cm^3/g	Chemical-specific
H	Henry's Law constant	dimensionless	Chemical-specific
D_G	Effective gas-phase diffusion coefficient	m^2/sec	Chemical-specific
D_L	Effective liquid-phase diffusion coefficient	m^2/sec	Chemical-specific
L	Depth of the contaminated surface soil	m	0.6
l	Depth of the clean soil cover	m	0.6
W	Thickness of the contaminated subsurface soil	m	4.0 (3)
K_{oc}	Organic carbon partition coefficient for chemical i	cm^3/g	Chemical-specific
f_{oc}	Fraction of organic carbon in soil	dimensionless	0.005 (4)

(1) All default values from USEPA (1994) Draft Soil Screening Guidance, EPA-540/R-94/106, except as noted.

(2) Consistent with Standards Subcommittee recommendation.

(3) Based on Act 2 of 1995 SAB-agreed depths.

(4) The Risk Assessment Subcommittee selected a f_{oc} of 0.005, which falls between f_{oc}'s of 0.006

(f) For a regulated substance which is a systemic toxicant and is a volatile compound, the numeric value for the inhalation of volatiles from groundwater was calculated by using the appropriate residential or nonresidential exposure assumptions from subsection (h) according to the following equation:

$$MSC = \frac{THQ \times RfDi \times BW \times ATnc \times 365\ days/yr}{Abs \times ET \times EF \times ED \times IR \times TF}$$

(g) For a regulated substance which is a carcinogen and is a volatile compound, the numeric value for the inhalation of volatiles from groundwater shall be calculated by using the appropriate residential or nonresidential exposure assumptions from subsection (h) according to the following equation:

$$MSC = \frac{TR \times ATc \times 365\ days/yr}{CSFi \times ABs \times ET \times EF \times IFadj \times TF}$$

(h) The default exposure assumptions used to calculate the inhalation numeric values for the inhalation of volatiles from groundwater are as follows:

Term		Residential		Nonresidential
		Systemic[1]	Carcinogens[2]	(Onsite Worker)
THQ	Target Hazard Quotient	1	N/A	1
RfD_i	Inhal. Reference Dose (mg/kg-day)	Chemical-specific	N/A	Chemical-specific
BW	Body Weight (kg)	70	N/A	70
AT_{nc}	Averaging Time for systemic toxicants (yr)	30	N/A	25
Abs	Absorption (unitless)[3]	1	1	1
ET	Exposure Time (hr/day)	24	24	8
EF	Exposure Frequency[6] (d/yr)	350	350	250
ED	Exposure Duration (yr)	30	N/A	25
IR	Inhalation Rate (m^3/hr)	0.625	N/A	1.25
TF	Transfer Factor (L/m^3)[4]	0.5	0.5	0.5
TR	Target Risk	N/A	1×10^{-5}	1×10^{-5}
CSF_i	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	N/A	Chemical-specific	Chemical-specific
AT_c	Averaging Time for carcinogens (yr)	N/A	70	70
If_{adj}	Inhalation Factor[5] (m^3-yr / kg-hr)	N/A	0.4	0.4

Notes: Modified from USEPA Region III Risk-based Concentration Table, dated October 20, 1995.

N/A = Not Applicable

[1] Residential exposure to systemic toxicants is based on adult exposure, consistent with USEPA (1991).

[2] Residential exposure to carcinogens is based on combined child and adult exposure.

[3] In cases where the inhalation RfD or CSF is based on absorbed dose, this factor can be applied in the exposure algorithm.

[4] Default TF is as presented in USEPA's RAGS, Part B.

[5] The inhalation factor for the residential scenario is calculated using the equation $IF_{adj} = ED_c \times IR_c / BW_c + ED_a \times IR_a / Bw_a$, where ED_c = 6 yr, IR_c =0.5 m^3/hr, BW_c = 15 kg, ED_a = 24 yr, IR_a =0.625 m^3/hr, and BW_a = 70 kg. The inhalation factor for the nonresidential scenario is calculated using the equation IF_{adj} = ED x IR / BW , where ED = 25 yr, IR =1.25 m^3/hr and BW = 70 kg.

§ 250.307. Soil to groundwater pathway numeric values.

(a) A person may use the soil-to-groundwater pathway numeric values listed in Appendix A, Table 2, as developed using the methods contained in paragraph (1) or (2), or may use a concentration in soil at the site which does not produce a leachate in excess of the MSC for groundwater contained in Appendix A, Table 1, when subjected to the Synthetic Precipitation Leaching Procedure (Method 1312 of SW-846, Test Methods for Evaluating Solid Waste, promulgated by the U. S. EPA).

(1) A value which is 100 times the MSC for groundwater, expressed as milligrams per kilogram of soil.

(2) For organic compounds, a generic value determined not to produce a concentration in groundwater in the aquifer in excess of the MSC for groundwater as calculated by the equation in paragraph (3).

(i) For unsaturated soil, the generic value shall be calculated by the equation in paragraph (3).

(ii) For saturated soil, the standard is 1/10th of the generic value calculated by the equation in paragraph (3).

(3) The equation referenced in paragraph (2) is the following:

$$MSC_s = MSC_{GW} \left((K_{oc} * f_{oc}) + \frac{\theta_w}{\rho_b} \right) DF$$

where: MSC_s (mg/kg) = the generic value for a regulated substance in soil

MSC_{GW} (mg/L) = MSC of a regulated substance in groundwater

K_{oc} (L/kg) = organic carbon partition coefficient for a regulated substance

f_{oc} = fraction of organic carbon in soil (default value = 0.0025)

θ_w = water-filled porosity of soil (default value = 0.2)

ρ_b (kg/L) = dry bulk density of soil (default value = 1.8 kg/L)

DF = dilution factor

For compounds with a $k_{oc} \geq 1000$, the default value for DF in unsaturated soils is 100.

For compounds with a $k_{oc} < 1000$, the default value for DF in unsaturated soils is 10.

§ 250.308. Radionuclide numeric values.

(a) For a regulated substance which is a radionuclide, the soil ingestion numeric value was calculated using the appropriate residential or nonresidential exposure assumptions below according to the following equation:

$$MSC_{(pci/gm)} = \frac{AT_{(yr)} x\ 4_{(mrem/yr)}}{ED_{(yr)} \times INGR_{(mg/day)} \times (1\ gm/1000mg) \times EF_{(day/yr)} \times DCF_{ing}\ (mrem/pci)}$$

		Residential	Nonresidential
AT	Averaging Time (yr)	70	70
ED	Exposure Duration (yr)	30	25
INGR	Ingestion Rate (mg/day)	use AINGR[1]=133.33	50
EF	Exposure Frequency (day/yr)	250	180
DCF_{mg}	Ingestion Dose $\frac{(mrem)}{(pci)}$	Radioisotope specific	Radioisotope specific

(b) For a regulated substance which is a radionuclide, the inhalation numeric value for particulates was calculated using the appropriate residential or nonresidential exposure assumptions below according to the following equation:

$$MSC_{(pci/gm)} = \frac{AT_{(yr)} \times TF_{(pci/kg//pci/m^3)} \times 4_{(mrem/yr)}}{ED_{(yr)} \times (10^3 gm/kg) \times BR_{(m^3/hr)} \times ET_{(hr/day)} \times EF\ (day/yr) \times DCF_{inh\ (mrem/pci)}}$$

		Residential	*Nonresidential*
AT	Averaging Time (yr)	70	70
ED	Exposure Duration (yr)	30	25
TF	Transfer Factor $\frac{(pci/kg)}{(pci/m^3)}$	1×10^{10}	1×10^{10}
BR	Breathing Rate (m^3/hr)	use ABR[2]=1.13	1.25
ET	Exposure Time (hr/day)	24	8
EF	Exposure Frequency (day/yr)	250	180
DCF_{Inh}	Dose Conversion Factor $\frac{(mrem)}{(pci)}$	Radioisotope specific	Radioisotope specific

(c) Inhalation of volatile radionuclides is applicable only to carbon and tritium. The inhalation numeric values for volatiles was calculated using the appropriate exposure assumptions below according to the following equations:[3]

(1) For carbon, the residential and nonresidential numeric value is calculated by:

$$MSC_{(pci/gm)} = \frac{AT_{(yr)} \times 4_{(mrem/yr)} \times H_{mix}(m) \times V_{(m/sec)}}{ED_{(yr)} \times BR_{(m^3/hr)} \times ET_{(hr/day)} \times EF_{(day/yr)} \times DCF_{inh(mrem/pci)} \times d_{ref}(m)} \times$$

$$\frac{1}{(3.17 \times 10^{-8} sec/yr) \times FW \times (10^6 cm^3/m^3) \times (A(m^2))^{0.5} \times EC(yr^{-1}) \times \rho_b(gm/cc)}$$

		Residential	*Nonresidential*
AT	Averaging Time (yr)	70	70
ED	Exposure Duration (yr)	30	25
H_{mix}	Mixing Height for Vapor (m)	2	2
V	Annual Average Wind Speed (m/sec)	2	2
BR	Breathing Rate (m^3/hr)	Use ABR=1.13[4]	1.25
ET	Exposure Time (hr/day)	24	8
EF	Exposure Frequency (day/yr)	250	180
DCF_{inh}	Inhalation Dose $\frac{(mrem)}{(pci)}$ Conversion Factor	Radioisotope specific	Radioisotope specific
FW	Fraction of time wind blows towards receptor (dimensionless)	0.5	0.5
A	Area of Contaminated Zone (m^2)	10,000	10,000
EC	Evasion Loss Rate Constant (Yr^{-1})	22	22
ρ_b	Bulk density of contaminated soil (gm/cm^3)	1.8	1.8
d_{ref}	Reference soil depth (m)	0.3	0.3

(2) For tritium, the residential and nonresidential numeric value is calculated by:[5]

$$MSC_{(pci/gm)} = \frac{AT_{(yr)} \times 4_{(mrem/yr)} \times \rho_{w(gm/cc)} \times \theta}{ED_{(yr)} \times BR_{(m^3/hr)} \times ET_{(hr/day)} \times EF_{(day/yr)} \times DCF_{inh(mrem/pci)}} \times$$

$$\frac{1}{H_a(gm/m^3) \times \rho_b(gm/cc)}$$

		Residential	*Nonresidential*
AT	Averaging Time (yr)	70	70
ED	Exposure Duration (yr)	30	25
P_w	Density of water (gm/cm^3)	1	1
θ	Volumetric Water Content of Contaminated Zone (dimensionless)	0.2	0.2
BR	Breathing Rate (m^3/hr)	Use ABR=1.13[6]	1.25
ET	Exposure Time (hr/day)	24	8
EF	Exposure Frequency (day/yr)	250	180
DCF_{inh}	Inhalation Dose Conversion Factor $\frac{(mrem)}{(pci)}$	Radioisotope specific	Radioisotope specific
Ha	Average Absolute Humidity in Air (gm/m^3)	8	8
ρ_b	Bulk density of contaminated soil (gm/cm^3)	1.8	1.8

(d) For a regulated substance which is a radionuclide, the direct exposure numeric value was calculated for both the residential and nonresidential exposure scenarios using the assumptions below according to the following equation:

$$MSC_{(pci/gm)} = \frac{AT(yr) \times 4(mrem/yr) \times (24\ hr/day) \times (365\ day/yr)}{ED(yr) \times ET(hr/day) \times EF(day/yr) \times DCFdir(mrem/yr//pci/gm) \times (F_{in} \times SF + F_{out})}$$

		Residential	Nonresidential
AT	Averaging Time (yr)	70	70
DCF_{dir}	Direct Dose Conversion[7] Factor $\frac{(mrem/yr)}{(pci/gm)}$	Radioisotope specific	Radioisotope specific
ET	Exposure Time (hr/day)	24	8
EF	Exposure Frequency (day/yr)	350	250
ED	Exposure Duration (yr)	30	25
F_{in}	Fraction of Onsite Time Spent Indoor (Dimensionless)	0.666[8]	0
F_{out}	Fraction of Onsite Time Spent Outdoor (Dimensionless)	0.333[9]	1
SF	Outdoor/Indoor Shielding Factor (Dimensionless)	0.4[10]	0.4

(e) For a regulated substance which is a radionuclide, the groundwater ingestion numeric value shall be calculated for both the residential and nonresidential exposure scenarios using the assumptions below according to the following equation:

$$MSC(pci/L) = \frac{AT(yr) \times 4(mrem/yr)}{ED(yr) \times INGR(L/day) \times EF(day/yr) \times ABS \times DCFing(mrem/pci)}$$

		Residential	Nonresidential
AT	Averaging Time (yr)	70	70
INGR	Ingestion Rate (L/day)	use AINGR[11] = 2.533	1
ABS	Absorption Rate (Unitless)	1	1
EF	Exposure Frequency (day/yr)	350	250
ED	Exposure Duration (yr)	30	25
DCF_{ing}	Dose Conversion Factor for Ingestion $\frac{(mrem)}{(pci)}$	Radioisotope specific	Radioisotope specific

(f) For a regulated substance which is a radionuclide, the groundwater inhalation numeric value shall be calculated for both the residential and nonresidential exposure scenarios using the assumptions below according to the following equation:

$$MSC(pci/L) = \frac{AT(yr) \times 4(mrem/yr)}{ED(yr) \times TF\ (L/m^3) \times EF\ (day/yr) \times BR(m^3/hr) \times ABS \times DCFinh\ (mrem/pci)}$$

		Residential	*Nonresidential*
AT	Averaging Time (yr)	70	70
ABS	Absorption Rate (Unitless)	1	1
BR	Breathing Rate (m^3/hr)	use ABR[12]=0.967	1.25
TF	Transfer Factor (L/m^3)	0.5	0.5
EF	Exposure Frequency (day/yr)	350	250
ET	Exposure Time (hr/day)	24	8
DCF_{inh}	Inhalation Dose Conversion Factor $\frac{(mrem)}{(pci)}$	Radioisotope specific	Radioisotope specific
ED	Exposure Duration (yr)	30	25

§ 250.309. Minimum threshold MSCs.

(a) For regulated substances listed in Appendix A, Table 4 that are found in groundwater, the minimum threshold MSC of 5 micrograms per liter in groundwater, shall be used.

(b) For regulated substances listed in Appendix A, Table 4 that are found in soil, the lowest of one of the following values shall be used as the minimum threshold MSC:

(1) An ingestion numeric value of 100 milligrams per kilogram in soil.

(2) The soil-to-groundwater pathway numeric value throughout the soil column as determined by the methodology in § 250.307 (relating to soil to groundwater pathway numeric values), but substituting 5 micrograms per liter in groundwater for the groundwater MSC.

(c) The person shall assess and address substantial direct impacts to ecological receptors and any impact to an individual species of concern in § 250.310(a)(2) (evaluation of ecological receptors), rare, threatened and endangered species, and exceptional value wetlands from regulated substances in Appendix A, Table 4 in accordance with § 250.310 (relating to evaluation of ecological receptors).

(d) The minimum threshold MSC in subsection (a) and the ingestion numeric value in subsection (b)(1) are calculated according to the following exposure assumption and equation:

0.50 ppb dietary intake corresponds to a 1×10^{-6} risk (USFDA Threshold of Regulation Final Rule July 17, 1995) assuming the substance is a carcinogen. Correcting this value (or 5.0 ppb) to the 10^{-5} risk level, in statewide health standard formulation, the threshold of regulation concentrations are determined by the following:

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5 ug/kg (substance of concern) threshold level corresponding to 1×10^{-5} risk

dietary intake 2 kg/day × 5 ug/kg (substance - 10 ug/day (daily intake of substance of concern)

For soil ingestion: 10 ug/100 mg soil or 100 mg/kg = Threshold concentration for soils

For groundwater ingestion: 10 ug/2L water = 5 ug/L - Threshold concentration for water

The 100 mg soil and 2L water factors are the default ingestion rates from § 250.305(c) (relating to ingestion numeric values).

§ 250.310. Evaluation of ecological receptors.

(a) In addition to any protection afforded under other requirements for meeting surface water and air quality standards under this chapter, direct impacts, based on the screening process set forth in this section, from regulated substances to the following receptors shall be assessed and addressed to implement a remedy that is protective of the environment:

(1) Individuals of rare, threatened or endangered species.

(2) Individuals of species of special concern as identified by the Game Commission and the Fish and Boat Commission.

(3) Exceptional value wetlands.

(4) Habitats of concern.

(5) Species of concern.

(b) Procedures for determining any impact on the receptors identified in subsection (a) shall be as follows:

(1) Determine if jet fuel, gasoline, kerosene, number two fuel oil or diesel fuel, are the only constituents detected onsite and that no nonaqueous phase liquids are present. Under these conditions, the site will not require further evaluation of ecological receptors and the information that supports this determination shall be documented in the final report.

(2) Determine if one of the following exists:

(i) The area of the impacted surface soil at the site is equal to or greater than 2 acres.

(ii) The impacted sediment is equal to or greater than 1,000 square feet.

If the area meets either of these size limitations, then the site will require further evaluation of ecological receptors and the information that supports this determination shall be documented in the final report.

(3) Determine whether any of the constituents detected at the site are considered to be constituents of potential ecological concern (CPECs), as identified in Appendix A, Table 7.

(i) If no CPECs are detected at the site, then further ecological evaluation is required in accordance with paragraph (4).

(ii) If CPECs have been detected at the site, then further ecological evaluation is required in accordance with paragraph (5).

(4) Determine, based on the evaluation of an environmental scientist who is qualified to perform environmental assessments, whether indications of substantial ecological impacts or any individual species of special concern, rare, threatened or endangered species exist by performing a preliminary site walk evaluation.

(i) The preliminary site walk evaluation requires the following conditions to be met:

(A) Review of readily available site background information.

(B) A preliminary walk of the area of concern to identify evidence of ecological impacts, such as signs of stressed or dead vegetation, discolored soil, sediment or water, the presence of deformed organisms and the presence of nonnative materials in sediments resulting from seeps or other discharges from the site, and to identify nearby reference areas representing equivalent ecological areas without contamination, if available, that are outside the area of contamination on the site.

(C) Preparation of a summary of findings that documents whether differences of greater than 50% in the density of species of concern or in the diversity and extent of habitats of concern exist. If differences of greater than 50% exist, then indications of substantial ecological impacts exist. The summary of findings shall document the existence of any individual species of special concern in subsection (a)(2), rare, threatened or endangered species and any exceptional value wetlands.

(ii) If indications of substantial ecological impacts exist, or if any individual species of special concern in subsection (a)(2) exist, rare, threatened or endangered species exist, or any exceptional value wetlands exist, further evaluation of ecological receptors is required in accordance with paragraph (5).

(iii) If no indications of substantial ecological impacts exist under subparagraph (i)(C) and no other ecological receptors exist under subparagraph (i)(C), the site will not require further evaluation of ecological receptors and the information that supports this determination shall be documented in the final report.

(5) Determine whether the site has features, such as buildings, parking lots or graveled paved areas, which would obviously eliminate specific pathways, such as soils exposure.

(i) As long as all pathways are eliminated by the feature, the site will not require further evaluation of ecological receptors and the information that supports this determination shall be documented in the final report.

(ii) If pathways are not eliminated, then further ecological evaluation is required in accordance with paragraph (6).

(6) Determine, based on the evaluation of an environmental scientist who is qualified to perform detailed environmental risk assessments, whether species of concern or habitats of concern or exceptional value wetlands exist on the site or, for individual species of special concern in subsection (a)(2), or for individual rare, endangered and threatened species if those species exist on the site or within a 2,500-foot radius of the border of the site in its current and intended use by conducting a formal site walk evaluation.

(i) The formal site walk evaluation shall include the following:

(A) Review of readily available site background information.

(B) Identification of physical and habitat features of the area and nearby reference areas which are outside the area of contamination on the site.

(C) Qualitative evaluation of whether species of concern or habitats of concern are present at the site and in the reference area.

(D) Identification of evidence of ecological impacts as compared with the reference area. The identification shall include the following impacts: signs of stressed or dead vegetation, discolored soil, sediment or water; the presence of deformed organisms and the presence of nonnative materials in sediments resulting from seeps or other discharges from the site; community composition differences; the absence of biota compared with similar areas of the system; the presence of nonnative or exotic species; the presence of individual species of special concern in subsection (a)(2), rare, threatened or endangered species; the existence of exceptional value wetlands; and the potential for residual contamination to habitats of concern and areas utilized by species of concern.

(E) Identification of the existence of exposure pathways.

(F) Preparation of a summary of findings that documents whether differences of greater than 20% in the density of species of concern or greater than 50% in the diversity and extent of habitats of concern exist. If differences of greater than the 20% or 50% exist, then substantial ecological impacts exist. The summary of findings shall document the existence of any individual species of special concern in subsection (a)(2), rare, threatened or endangered species and exceptional value wetlands.

(ii) If no species of concern or habitats of concern or exceptional value wetlands exist on the site and no species of special concern in subsection (a)(2), no rare, threatened or endangered species exist within a 2,500-foot radius of the border of the site, the site will not require further evaluation of ecological receptors and the information that supports this determination shall be documented in the final report.

(iii) If substantial ecological impacts exist, as identified in subparagraph (i)(F), or if any individual species of special concern in subsection (a)(2), rare, threatened or endangered species exist, further ecological evaluation is required in accordance with paragraph (7). If exceptional value wetlands exist, the requirements of paragraph (7)(i) shall be met.

(7) Determine whether a complete exposure pathway to species of concern or habitats of concern substantially impacted exists or whether a complete exposure pathway to species of special concern in subsection (a)(2), rare, threatened or endangered species exist at the site in its current and intended use.

(i) If a complete exposure pathway, a regulated substance and either a substantial impact or any individual species of special concern in subsection (a)(2), rare, threatened or endangered species exist, one of the following shall be met:

(A) The person shall demonstrate in the final report that attainment of the Statewide health standard is protective of the ecological receptor.

(B) The person shall demonstrate attainment of the background standard.

(C) The person shall follow the procedures in § 250.402(d) (relating to human health and environmental protection goals) and demonstrate attainment of the site-specific standard.

(ii) If no complete exposure pathway exists, then the results of the screening procedure shall be reported in the final report for the statewide health standard or the risk assessment report for the site-specific standard. The final report shall include the basis for the conclusion that a substantial ecological impact is unlikely and that further ecological evaluation is not required.

§ 250.311. Final report.

(a) For sites remediated under the Statewide health standard, the person conducting the remediation shall submit a final report to the Department which documents attainment of the selected standard. This final report shall include site characterization information identified in § 250.204(b)—(e) (relating to final report). The site characterization shall be conducted in accordance with scientifically recognized principles, standards and procedures. The level of detail in the investigation and the methods selected shall sufficiently define the rate, extent and movement of contaminants. Interpretations of geologic and hydrogeologic data shall be prepared by a professional geologist licensed in this Commonwealth.

(b) The final report for the Statewide health standard shall include the results of the evaluation of ecological receptors.

(c) Final reports for the Statewide health standard shall include information on the basis for selecting residential or nonresidential standards and the additional information identified in § 250.204(f)(1)—(4).

(d) If engineering controls are needed to attain or maintain a standard, or if institutional controls are

needed to maintain a standard, a post remediation care plan shall be documented in the final report that includes the information identified in § 250.204(g).

Subchapter D. SITE-SPECIFIC STANDARD

Sec.
250.401. Scope.
250.402. Human health and environmental protection goals.
250.403. Use of groundwater in an aquifer.
250.404. Pathway identification and elimination.
250.405. When to perform a risk assessment.
250.406. Point of compliance.
250.407. Remedial investigation report.
250.408. Risk assessment report.
250.409. Cleanup plan.
250.410. Final report.

§ 250.401. Scope.

(a) This subchapter sets forth requirements and procedures for any person selecting the site-specific standards.

(b) The Department may approve or disapprove a remedial investigation report, a risk assessment report or cleanup plan based on consideration of all subsections in section 304 of the act (35 P. S. § 6026.304).

§ 250.402. Human health and environmental protection goals.

(a) Site-specific standards shall be developed that meet the human health and environmental protection goals specified in this section. The development of site-specific standards shall be based on a site-specific risk assessment, if required.

(b) The site-specific standard shall be a protective level that eliminates or reduces any risk to human health in accordance with the following:

(1) For known or suspected carcinogens, soil and groundwater cleanup standards shall be established at exposures which represent an excess upperbound lifetime risk of between 1 in 10,000 and 1 in 1 million. The cumulative excess risk to exposed populations, including sensitive subgroups, may not be greater than 1 in 10,000.

(2) For systemic toxicants, soil and groundwater cleanup standards shall represent the level to which the human population could be exposed on a daily basis without appreciable risk of deleterious effect to the exposed population. Where several systemic toxicants affect the same target organ or act by the same method of toxicity, the hazard index may not exceed one.

(c) In addition to any protection afforded under other requirements for meeting surface water and air quality standards under this chapter, direct impacts resulting from a release of regulated substances to the receptors identified in § 250.310(a) (relating to evaluation of ecological receptors) shall be assessed and addressed in the remedial investigation, risk assessment and cleanup plans in accordance with § 250.310(b).

(d) If the ecological screening procedure in § 250.310 indicates a complete exposure pathway, a regulated substance and either a substantial impact or any individual species of special concern in § 250.310(a)(2), rare, threatened or endangered species, then the following shall be performed:

(1) An ecological risk assessment to determine if an impact has occurred or will occur if the release of a regulated substance goes unabated.

(2) An ecological risk assessment conducted in accordance with the most recent EPA or ASTM guidance identified in subsection (e) to establish acceptable remediation levels or alternative remedies based on current and future use that are protective of the ecological receptors.

(3) Implementation of the selected remedy that is protective of the ecological receptors.

(e) The references identified in subsection (d)(2) are as follows:

(1) EPA/540/1-89/001 "Risk Assessment Guidance for Superfund, Volume 2: Environmental Evaluation Manual," March, 1989.

(2) EPA/600/3-89/013 "Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document." PB89205967. March, 1989.

(3) EPA/600/R-93/187A "Wildlife Exposure Factors Handbook." PB94-174778.

(4) ASTM ES38. "Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites."

§ 250.403. Use of groundwater in an aquifer.

(a) Groundwater will not be considered a current or potential source of drinking water where groundwater has a background of total dissolved solids greater than 2,500 milligrams per liter.

(b) Except as provided subsection (a), current use and future use of aquifer groundwater shall be determined in accordance with § 250.6 (relating to current use and future use of aquifer groundwater).

(c) Drinking water use of groundwater in an aquifer shall be made suitable by at least meeting the primary and secondary MCLs at all points of exposure identified in § 250.404 (relating to pathway identification and elimination).

§ 250.404. Pathway identification and elimination.

(a) The person shall consult the most recent EPA or ASTM guidance, referenced in subsection (d), to identify any potential current and future exposure pathways for both human receptors and environmental receptors identified in § 250.402 (relating to human health and environmental protection goals).

(b) The person shall summarize pathways for current land use and any probable future land use separately in the site-specific remedial investigation report. If no exposure pathway exists, the remedial investigation report shall contain information necessary to determine that no current or future exposure pathway exists.

(c) Prior to performing a risk assessment as required in § 250.405 (relating to when to perform a risk assessment), the person may take into account the effect of engineering and institutional controls in eliminating pathways identified in subsection (b) and include this evaluation in the remedial investigation report.

(d) The references identified in subsection (a) are as follows:

(1) ASTM E 1689, Standard Guide for Developing Conceptual Site Models for Contaminated Sites.

(2) ASTM E 978, Standard Practice for Evaluating Mathematical Models for the Environmental Fate of Chemicals.

(3) For petroleum release sites, risk assessment methodology in ASTM ES 38 (Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites) may be consulted for guidance.

(4) Interim Final Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A, Baseline Risk Assessment (RAGS Volume 1 Part A). EPA/540/1-89/002.

(5) Interim Final Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors," OSWER Directive 9285.6-03.

(6) Interim Final Guidance for Soil Ingestion Rates. OSWER Directive 9850.4.

(7) Exposure Factors Handbook. EPA/600/8-89/043.

(8) Interim Final Guidance for Data Usability in Risk Assessment. EPA/540/G-90/008.

(9) Superfund Exposure Assessment Manual. EPA/540/1-88/001, OSWER Directive 9285.5-1.

(10) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Chemical Concentration Data Near the Detection Limit. EPA/903/8-91/001.

(11) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Exposure Point Concentrations in Groundwater. EPA/903/8-91/002.

(12) U. S. EPA Region III Technical Guidance Manual, Use of Monte Carlo Simulation in Risk Assessments. EPA 903-F-94001.

(13) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening. EPA/903/R-93-001.

§ 250.405. When to perform a risk assessment.

(a) Except as specified in subsections (b) and (c), a person who remediates under this subchapter shall develop site-specific standards based on a risk assessment. The person shall conduct the risk assessment according to the procedures specified in Subchapter F (relating to exposure and risk determinations).

(b) The risk assessment report is not required if a fate and transport analysis which takes into account the effects of engineering and institutional controls demonstrates that neither present nor future exposure pathways exist. This demonstration shall follow the procedures described in § 250.404 (relating to pathway identification and elimination).

(c) The baseline risk assessment report is not required if the Department, in its remedial investigation report or cleanup plan approval, determines that a specific remediation measure that eliminates all pathways, other than a no-action remedial alternative, can be implemented to attain the site-specific standard in accordance with the requirements of attainment demonstration as specified in Subchapter G (relating to demonstration of attainment). A baseline risk assessment is that portion of a risk assessment that evaluates a risk in the absence of the proposed site-specific measure.

§ 250.406. Point of compliance.

(a) For point source discharges to surface water, the point of compliance is measured at the point of discharge in accordance with limits specified in the NPDES permit.

(b) For purposes of determining compliance with surface water quality standards from a diffuse groundwater discharge, the person shall estimate the expected instream regulated substance concentrations, using mass balance techniques for groundwater/surface water mixing at design flow conditions. If the results indicate that surface water quality standards are being achieved, no action is required. If results indicate that surface water quality standards are not being achieved, further remedial action will be required. In the case of special protection waters, point source and diffuse discharges shall meet the applicable regulations and shall achieve water quality that does not preclude uses existing prior to the contamination from this source.

(c) For purposes of complying with surface water quality standards in a spring, the point of compliance is the point of discharge to the ground surface.

(d) For attainment of a site-specific standard in groundwater for ingestion and inhalation exposures, the point of compliance is at and beyond the property boundary in the intervals specified in subsection (d) at the time the contamination is discovered or a point beyond the property boundary that the Department may determine to be otherwise appropriate under the following situations:

(1) The original contamination source was at the property boundary.

(2) Structures are located on the property boundary which prohibit internal or external access for a drill rig.

(3) The property is a small parcel of land with limited space for onsite monitoring wells.

(4) It is not physically possible to monitor groundwater quality at the property boundary.

(5) The downgradient property was owned by the same party at the time the contamination was discovered and the use of the groundwater on the downgradient property can be controlled to prevent unacceptable exposure.

(6) Where regulated substances are only secondary contaminants. A secondary contaminant is a substance for which a secondary MCL exists.

(e) For attainment of a site-specific standard for volatilization directly to indoor air, the point of compliance is the point of exposure where there is exposure on the site in a below-grade occupied space.

(f) For attainment of site-specific soil standards in residential areas, the point of compliance for ingestion and inhalation exposure is up to 15 feet below the existing surface unless bedrock or physical structures are encountered which prevent safe continued remediation.

(g) For attainment of site-specific soil standards in nonresidential areas, the point of compliance for ingestion, inhalation and volatilization is the point of exposure as identified in an approved risk assessment report, if required.

(h) For attainment of soil to groundwater soil standards in both residential and nonresidential areas, the point of compliance is throughout the soil column.

(i) For the emission of regulated substances to outdoor air, the point of compliance for the air quality standard shall be as specified in the air quality regulations.

§ 250.407. Remedial investigation report.

(a) Persons electing to remediate a site to the site-specific standard shall submit a remedial investigation report to the Department for review and approval. This report shall include documentation and a description of the procedures and conclusions from the site characterization conducted according to the requirements of subsections (b)—(e). The site characterization shall be conducted in accordance with scientifically recognized principles, standards and procedures. The level of detail in investigation and the methods selected shall sufficiently define the

rate, extent and movement of contaminants. Interpretations of geologic and hydrogeologic data shall be prepared by a professional geologist licensed in this Commonwealth.

(b) As directed from specific knowledge of the subject property, historic use of the subject property or regulated substance usage information regarding the subject property, an appropriate number of sample locations should be investigated from the identified media of concern to characterize the nature and composition of the contaminants including: source characterization or development of a conceptual site model, the vertical and horizontal extent of contamination above the selected standard within each media of concern, the direction and rate of contaminant movement within each media of concern and determination of the appropriate remedial technology for each media of concern.

(c) Descriptions of sampling and decontamination methodologies and analytical quality assurance/quality control procedures should be included within a sampling and analysis plan and quality assurance plan. Copies of soil and geologic boring descriptions and as-built construction drawings of wells used for site characterization should be included in the report. Copies of all laboratory analytical results and applicable laboratory quality control results should be included within the report, including all historical data and data eliminated from consideration based on data validation protocols. Analytical results should be presented within the report in table form.

(d) If soil is determined to be a media of concern, the site characterization shall determine the relative location of the soil samples necessary to characterize the horizontal and vertical extent of contamination, and factors which could relate to the movement of the contamination. The horizontal and vertical extent of soil with concentrations of a regulated substances above the selected standard shall be defined by an appropriate number of samples inside and outside of the area that exceeds the standard. Soil samples from the area with the anticipated highest levels of contamination shall be obtained, as appropriate, in order to determine the applicability of the proposed remedial action and handling and disposal requirements for that soil during remediation.

(e) If groundwater is determined to be a media of concern, the site characterization shall characterize the effects of a release on groundwater to adequately determine how naturally occurring physical and geochemical characteristics define the movement of groundwater and contaminants beneath the surface, including the delineation of the position of aquifers, as well as geologic units which inhibit groundwater flow. When appropriate, the characterization shall consider the heterogeneity and anisotropy of aquifer materials based on hydraulic conductivity values (measured or published), and the effect of local and regional groundwater flow directions and influence from pumping wells. Defining the horizontal extent of concentrations of a regulated substances above the standard shall require more than one round of groundwater sampling from properly constructed and developed monitoring wells taken with a sufficient number of days apart to yield independently valid results. When characterizing the vertical extent of groundwater contamination, the person shall perform more than one round of groundwater sampling and shall consider the specific gravity of the regulated substances identified in the groundwater in the site, and the potential for naturally occurring or induced downward vertical hydraulic gradients. When characterizing the vertical extent of groundwater contamination, properly constructed monitoring wells or nested monitoring wells should be utilized to focus groundwater sampling in zones of potential contaminant accumulation (that is, directly above a confining layer) and sampling shall be taken with a sufficient number of days apart to yield independently valid results.

(f) The comments obtained as a result of a public involvement plan, if any, and the responses to those public comments shall be included in a remedial investigation report.

§ 250.408. Risk assessment report.

The risk assessment report shall conform to this subchapter and Subchapter F (relating to exposure and risk determinations), and shall include the following unless not required under § 250.405 (relating to when to perform a risk assessment):

(1) A risk assessment report that describes the potential adverse effects, including the evaluation of ecological receptors, under both current and planned future conditions caused by the presence of regulated substances in the absence of any further control, remediation or mitigation measures.

(2) The development of the site-specific standards risk assessment report that describes the methods used to calculate a concentration level at which human health and the environment are protected.

(3) The comments obtained as a result of a public involvement plan, if any, and the responses to those public comments.

§ 250.409. Cleanup plan.

(a) A cleanup plan is required to be submitted to the Department for approval when the site-specific standard is selected as the remediation goal. The cleanup plan shall evaluate the relative abilities of the alternative remedies to achieve the site-specific standard and propose a remedial measure which shall achieve the standard established according to the procedures contained in this subchapter. The person submitting the plan shall evaluate additional alternative remedies that have been requested for evaluation by the Department in accordance with the act.

(b) The cleanup plan shall include remedial alternatives and a proposed remedy that document how each of the potential remedies relate to the factors identified in section 304(j) of the act (35 P. S. § 6026.304(j)).

(c) Other components of the cleanup plan include:

(1) Site maps.

(2) The results of treatability, bench scale or pilot scale studies or other data collected to support the remedial actions.

(3) A final design which consists of complete plans and specifications.

(4) The comments obtained as a result of a public involvement plan and the responses to those public comments.

(5) Documentation of proposed postremediation care requirements if they are needed to maintain the standard.

(d) When a person proposes a remedy that relies on the cooperation or agreement of third parties in order for the

remedy to be implemented, documentation of that cooperation or agreement shall be submitted as part of the cleanup plan.

(e) A cleanup plan is not required and no remedy is required to be proposed or completed if no current or future exposure pathways exist.

§ 250.410. Final report.

(a) For sites remediated under the site-specific standard, the person conducting the remediation shall submit a final report to the Department which documents attainment of the selected standard.

(b) Final reports shall demonstrate that the remedy has been completed in accordance with an approved cleanup plan.

(c) Final reports shall include the information identified in § 250.204(f)(1)—(4) (relating to final report).

(d) If engineering or institutional controls are needed to maintain a standard, a postremediation care plan shall be documented in the final report that includes the information identified in § 250.204(g).

(e) The comments obtained as a result of a public involvement plan and the responses to those public comments shall be included in a final report.

Subchapter E. SIA STANDARDS

Sec.
250.501. Scope.
250.502. Eligibility determinations.
250.503. Remediation requirements.

§ 250.501. Scope.

(a) This subchapter sets forth requirements and procedures for any person who conducts remediation activities for property located in an SIA.

(b) A person who conducts remediation activities in an SIA shall comply with the requirements for notifying municipalities, the public and the Department.

§ 250.502. Eligibility determinations.

The person proposing remediation shall demonstrate:

(1) The property was used for industrial activity.

(2) The person did not cause or contribute to contamination on the property.

(3) There is no financially viable responsible person to clean up the contamination; or the property is located within a designated enterprise zone.

§ 250.503. Remediation requirements.

(a) A person proposing remediation of an SIA shall perform a baseline remedial investigation that establishes a reference point for existing contamination.

(b) A work plan shall be prepared that will define the scope of the baseline remedial investigation and shall be submitted to the Department for approval prior to the initiation of the investigation.

(c) At a minimum, a baseline remedial investigation shall include the following:

(1) Identification of the historical regulated substance use, handling and disposal activities on the property and any known or suspected releases associated with these activities by conducting environmental site assessment research and interviews with any person who may have knowledge of the property.

(2) If indicated by the investigation, performance of environmental sampling, within all potential media of concern, to confirm that the releases have occurred.

(3) Identification of potential migration pathways off the property and associated potential receptors of any confirmed release on the property.

(4) If migration pathways and associated potential receptors have been identified, performance of environmental sampling of groundwater at the downgradient property boundary to determine if migration of regulated substances from the releases on the property have migrated off the property.

(5) Evaluation of exposure conditions within the portion of the property to be reused to identify existing contamination that poses an immediate, direct or imminent threat to public health or the environment which is inconsistent with the intended reuse of that portion of the property.

(d) The results of the baseline remedial investigation shall be included in a baseline environmental report. At a minimum, the baseline environmental report shall include the following:

(1) A description of the location and boundaries of the SIA.

(2) Identification of all areas of contamination.

(3) A description of the intended reuse of the property and exposure patterns.

(4) A remediation plan for the property that addresses all immediate, direct or imminent threats to public health and the environment which would prevent the property from being occupied for its intended purpose and delineates methods of compliance monitoring. At a minimum, immediate, direct or imminent threats will entail:

(i) Containerized wastes not intended in the property reuse, such as wastes in drums, above or below ground tanks and small containers.

(ii) Wastes not contained which present a direct threat to workers or other users or occupants of the property.

(iii) Contaminated soil presenting a direct threat to workers or other users or occupants of the property. The depth of consideration shall be the first 2 feet from the ground surface, unless reuse of the property presents exposure threats from depths greater than 2 feet.

(iv) Contaminated groundwater, if groundwater use will expose persons on the property to contaminants.

(v) Contaminated surface water and sediments, if use will expose persons on the property to contaminants.

(5) A remediation plan to prevent access to portions of the property containing contaminated media that is not being required to be remediated and that poses unacceptable health risks to trespassers or workers on the site.

(6) A description of the existing or potential public benefits of the reuse of the property, such as employment, housing, open space or recreation.

(7) The comments obtained as a result of a public involvement plan and the responses to these public comments.

(e) Protection from cleanup liability is available only to persons undertaking a reuse and who have entered into a consent order and agreement with the Department based on the baseline environmental report.

(f) A person that changes the use of the property from nonresidential to residential, or changes the use of the property to create substantial changes in exposure conditions to contamination that existed prior to the person's reuse shall notify the Department of the changes and may be required to implement a remediation plan to address any new imminent, direct or immediate threats to human health and the environment resulting from the changes.

(g) The baseline environmental report shall include and address any municipal and public comments and the response to those comments as developed by the public involvement plan.

(h) The baseline environmental report shall be submitted to the Department after the date of approval of the baseline remedial investigation work plan, and the public participation period.

Subchapter F. EXPOSURE AND RISK DETERMINATIONS

Sec.
250.601. Scope.
250.602. Risk assessment procedures.
250.603. Exposure factors for site-specific standards.
250.604. Fate and transport modeling requirements for exposure assessments.
250.605. Sources of toxicity information.
250.606. Development of site-specific standards.
250.607. Risk assessment of remediation alternatives.

§ 250.601 Scope.

(a) This subchapter specifies the information and procedures necessary to conduct a risk assessment.

(b) A risk assessment shall ensure adequate evaluation of the risks associated with human and ecological receptors exposed to regulated substances at contaminated sites.

(c) A risk assessment may include one or more of the following:

(1) A baseline risk assessment.

(2) A risk assessment to develop site-specific standards.

(3) A risk assessment of the remediation alternatives.

§ 250.602. Risk assessment procedures.

(a) Except as specified in § 250.405 (relating to when to perform a risk assessment), a person shall perform a risk assessment to determine if there are unacceptable exposures to humans or unacceptable exposures to ecological receptors, or both.

(b) A person who proposes to perform a risk assessment under the site-specific standard shall use the methodologies used to develop the statewide health standards contained in Subchapter C (relating to statewide health standards) to conduct the risk assessment. If methodologies are not specified in Subchapter C or this subchapter, the risk assessment shall be conducted in accordance with the methodology specified in the most recent EPA or ASTM guidelines identified in subsection (g).

(c) A risk assessment for human exposure shall include the following components:

(1) Data collection, including source characterization or development of a conceptual site model, and evaluation to identify contaminants of concern.

(2) Exposure assessment that considers ingestion, inhalation and volatilization pathways and exposure assumptions based on land use.

(3) Toxicity assessment that includes the use of toxicity information from sources identified in § 250.605 (relating to sources of toxicity information).

(4) Risk characterization that evaluates if the risks meet the human health protection goals and ecological receptor protection specified in § 250.402 (relating to human health and environmental protection goals).

(d) An exposure assessment that is based on sampling shall use a data handling methodology that is consistent with the statistical method used to demonstrate attainment.

(e) When performing an exposure assessment, a person shall use the appropriate exposure factors identified in § 250.603 (relating to exposure factors for site-specific standards) and meet the requirements of § 250.604 (relating to fate and transport modelling requirements for exposure assessments).

(f) The risk assessment report shall discuss the degree of uncertainty associated with the risk assessment.

(g) The references identified in subsection (b) are as follows:

(1) ASTM E 1689, Standard Guide for Developing Conceptual Site Models for Contaminated Sites.

(2) ASTM E 978, Standard Practice for Evaluating Mathematical Models for the Environmental Fate of Chemicals.

(3) For petroleum release sites, risk assessment methodology in ASTM ES 38 (Emergency Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites) may be consulted for guidance.

(4) Interim Final Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A, Baseline Risk Assessment (RAGS Volume 1 Part A). EPA/540/1-89/002.

(5) Interim Final Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors," OSWER Directive 9285.6-03.

(6) Interim Final Guidance for Soil Ingestion Rates. OSWER Directive 9850.4.

(7) Exposure Factors Handbook. EPA/600/8-89/043.

(8) Interim Final Guidance for Data Usability in Risk Assessment. EPA/540/G-90/008.

(9) Superfund Exposure Assessment Manual. EPA/540/1-88/001, OSWER Directive 9285.5-1.

(10) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Chemical Concentration Data Near the Detection Limit. EPA/903/8-91/001.

(11) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Exposure Point Concentrations in Groundwater. EPA/903/8-91/002.

(12) U. S. EPA Region III Technical Guidance Manual, Use of Monte Carlo Simulation in Risk Assessments. EPA 903-F-94001.

(13) U. S. EPA Region III Technical Guidance Manual, Risk Assessment, Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening. EPA/903/R-93-001.

§ 250.603. Exposure factors for site-specific standards.

(a) A risk assessment for the site-specific standard shall use site-specific exposure factors. If not generated on a site-specific basis, the person shall use exposure

factors used in the development of the statewide health standards identified in Subchapter C (relating to statewide health standards).

(b) The person may not use site-specific exposure factors that deviate from the standard exposure factors in Subchapter C unless site-specific exposure factors are clearly justified by supporting data. The person shall provide the supporting data in the site-specific risk assessment report.

(c) The exposure factors shall be selected based on the land use of the site with reference to current and currently planned future land use and the effectiveness of institutional or legal controls placed on the future use of the land.

(d) The person shall document in the site-specific risk assessment report the future use of the site.

§ 250.604. Fate and transport modelling requirements for exposure assessments.

(a) A person may use the soil-to-groundwater model in § 250.307(a)(2) (relating to soil to groundwater pathway numeric values) to estimate site-specific, soil-to-groundwater leaching potential for organic contaminants if the following conditions are met:

(1) Site-specific values of water-filled soil porosity, dry soil bulk density, dilution factors (DF) and fraction organic carbon in soil beneath the source of contamination (that is, not from top soil) are appropriately justified and the person provides supporting data to the Department.

(2) Koc values as provided in § 250.307(a)(2) are used or site-specific values which are appropriately justified are used and the person provides supporting data to the Department.

(3) There is no identified nonaqueous phase liquid (NAPL) contamination at the site.

(4) Other processes such as colloidal transport or transport via dissolved organic matter (DOM) are not significant at the site.

(5) The application of the soil-to-groundwater model shall meet the most current EPA or ASTM quality assurance/quality control criteria referenced in subsection (c)(1)—(3).

(b) Except for the soil-to-groundwater model in § 250.307(a)(2), a person planning to use other fate and transport models and methods to estimate exposure concentrations and to develop site-specific standards shall use appropriate models or methods identified in EPA or ASTM guidelines referenced in subsection (c)(4)—(6). The application of groundwater models shall meet the most current EPA or ASTM quality assurance/quality control criteria referenced in subsection (c)(1)—(3).

(c) The references referred to in this section are as follows:

(1) Chapter 6 (relating to Models and Computers in Ground-Water Investigation) of EPA's Handbook, Ground Water, Volume II: Methodology, EPA/625/6-90/016b, July, 1991.

(2) EPA. "Quality Assurance and Quality Control in the Development and Application of Ground-Water Models." EPA/600/R-93/011. September 1992. Office of Research and Development, Washington, D.C. 20460.

(3) ASTM E 978, Standard Practice for Evaluating Mathematical Models for the Environmental Fate of Chemicals.

(4) Groundwater models have been identified in the following documents:

(i) Section 3.5 of EPA's "Superfund Exposure Assessment Manual," EPA/540/1-88/001, OSWER Directive 9285.5-1, April, 1988.

(ii) EPA. "Selection Criteria for Mathematical Models Used in Exposure Assessments: Ground-Water Models," 600/8-88/075, 1988.

(iii) EPA. "Groundwater Modeling: An Overview and Status Report," EPA/600/2-89/028 (NTIS PB89-229497). (Also available from International Ground Water Modeling Center, Institute for Ground-Water Research and Education, Colorado School of Mines, Golden, Colorado 80401).

(iv) National Academy of Sciences (NAS). "Ground Water Models: Scientific and Regulatory Applications." National Academy Press, Washington, D.C. 1990.

(v) EPA. "Ground Water Modeling Compendium, Second Edition." EPA-500-B-94-003. 1994. Resource Management and Information Staff, Office of Solid Waste and Emergency Response, Washington, D.C.

(vi) van der Heijde, P.M. "Identification and Compilation of Unsaturated/Vadose Zone Models." EPA/600/R-94/028. 1994. R.S. Kerr Environmental Research Laboratory, Office of Research and Development, U. S. EPA, Ada, OK.

(vii) EPA. "Compilation of Ground-Water Models." EPA/600/R-93/118.1993. Office of Research and Development, Washington, D.C. 20460.

(5) Surface water models are identified in the following documents:

(i) Section 3.4 of EPA's "Superfund Exposure Assessment Manual," EPA/540/1-88/001, OSWER Directive 9285.5-1. April, 1988.

(ii) "Selection Criteria for Mathmematical Models Used in Exposure Assessments: Surface Water Models" Office of Health and Environmental Assessment. EPA/600/8-87/042. 1987.

(iii) "Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water-Part I." EPA/600/6-85/002a. September 1985. Environmental Research Laboratory, EPA, Athens, GA 30613.

(iv) "Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water-Part II." EPA/600/6-85/002b. September 1985. Environmental Research Laboratory, EPA, Athens, GA 30613.

(6) Air models are identified in the following documents:

(i) Section 3.3 of the EPA's "Superfund Exposure Assessment Manual," EPA/540/1-88/001, OSWER Directive 9285.5-1. April, 1988.

(ii) "Interim Final Air Superfund National Technical Guidance Series (NTGS). Volume IV: Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis." EPA/450/1-89/004. Office of Air Quality Planning and Standards, EPA, Research Triangle Park, NC.

(iii) "Compilation of Air Pollutant Emission Factors. Volume I. Stationary Point and Area Sources, and Supplements (AP-42)." Fourth Edition. Office of Air Quality Planning and Standards, EPA, Research Triangle Park, NC.

(iv) "Guideline for Air Quality Models (Revised)" (GAQM), EPA-450/2-78-027R, July, 1986. (40 CFR Part 51, Appendix W).

§ 250.605. Sources of toxicity information.

(a) For site-specific standards, the person shall use appropriate reference doses and cancer slope factors identified in Subchapter C (relating to Statewide health standard), unless the person can demonstrate that published data, available from one of the following sources, provides more current reference doses or cancer slope factors:

(1) Integrated Risk Information System (IRIS).

(2) Health Effects Assessment Summary Table (HEAST).

(3) United States Environmental Protection Agency, National Center for Environmental Assessment (NCEA) provisional values.

(4) Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles.

(5) California EPA, California Cancer Potency Factors.

(6) EPA criteria documents, including drinking water criteria documents, drinking water health advisory summaries, ambient water quality criteria documents and air quality criteria documents.

(b) If no toxicity values are available from sources identified in subsection (a), the person may use the background standard or meet one of the following:

(1) Develop for the Department's review in the risk assessment report one of the following:

(i) Chemical-specific toxicity values in accordance with the methods in the most current EPA guidelines or protocols, identified in subsection (c), using corroborated peer-reviewed data published in a scientific journal, if they exist.

(ii) Toxicity values developed from appropriately justified surrogates.

(2) Use the minimum threshold medium-specific concentration, as the site-specific standard, with an assumed risk of 1×10^{-5} for purposes of calculating cumulative risk for the regulated substances identified in Appendix A, Table 4.

(c) The references referred to in subsection (b)(1)(i) are as follows:

(1) 51 FR 33992 "Guidelines for Carcinogen Risk Assessment." September 24, 1986.

(2) 51 FR 34006 "Guidelines for Mutagenicity Risk Assessment." September 24, 1986.

(3) 51 FR 34014 "Guidelines for the Health Risk Assessment of Chemical Mixtures." September 24, 1986.

(4) 51 FR 34028 "Guidelines for the Health Assessment of Suspect Developmental Toxicants." September 24, 1986.

§ 250.606. Development of site-specific standards.

(a) If an unacceptable risk is identified by the assessments described in § 250.602 (relating to risk assessment procedure), then a person shall perform one of the following:

(1) A remediation that eliminates all current and future exposure pathways.

(2) A remediation utilizing a standard developed under a site-specific risk assessment that is protective of human health and the environment.

(b) A person who chooses to use a standard developed under a site-specific risk assessment shall meet the human health and environmental protection requirements identified in § 250.402 (relating to human health and environmental protection goals).

(c) The development of site-specific standards shall be based on the standard in § 250.605(b)(2) (relating to sources of toxicity information) or the components of risk assessment in § 250.602, the appropriate exposure factors identified in § 250.603 (relating to exposure factors for site-specific standards), the fate and transport modeling requirements of § 250.604 (relating to fate and transport modeling requirements for exposure assessments) and the toxicity values of § 250.605 (relating to source of toxicity information).

(d) The following factors shall be considered in the development of the risk assessment and in the development of site-specific standards:

(1) Groundwater in aquifers as identified in §§ 250.5 and 250.6 (relating to aquifer determinations; and current use and future use of aquifer groundwater).

(i) Natural environmental conditions that affect the fate and transport of contaminants, such as natural attenuation, shall be determined.

(ii) The person shall identify routes of exposure for aquifer groundwater such as human exposure to groundwater by ingestion, human inhalation of regulated substances from volatilization and migration of these substances into buildings or other areas where humans could be exposed, human ingestion of regulated substances in surface water or other site-specific surface water exposure pathways with respect to groundwater discharges or releases to surface water, human inhalation of regulated substances in air, or other site-specific air exposure pathways with respect to releases of regulated substances from groundwater to air.

(2) Nonaquifer groundwater as determined by § 250.5. The person shall consider current and probable future exposure scenarios, such as human exposure as described in paragraph (1)(ii).

(3) The person shall consider current and probable future exposure scenarios, such as human ingestion of soil when direct contact exposure to the soil may reasonably occur, exposure to groundwater by ingestion with respect to leaching of regulated substances from soils to aquifer groundwater, human inhalation of regulated substances from volatilization and migration of these substances into below grade occupied space, human ingestion of regulated substances in surface water or other site-specific surface water exposure pathways with respect to regulated substances migration from soil to surface water, human inhalation of regulated substances in air or other site-specific air exposure pathways with respect to the release of regulated substances from soil to air.

(4) If ecological receptors have been identified under § 250.310 (relating to evaluation of ecological receptors) or § 250.402, and are directly impacted, a remedial activity that eliminates current or future exposure pathways, or a standard, shall be developed to protect the receptors from the direct impacts.

(e) In determining soil and groundwater site-specific standards, the person shall identify the land use of the site with reference to current and currently planned future land use and the effectiveness of institutional or legal controls placed on the future use of the land.

(f) In determining soil and groundwater site-specific standards, the person shall use appropriate statistical techniques, including Monte Carlo simulations as appropriate, to establish statistically valid cleanup standards. The report for a risk assessment to develop site-specific standards shall discuss the degree of uncertainty associated with the risk assessment.

§ 250.607. Risk assessment of remediation alternatives.

(a) A risk assessment of the remedial alternatives shall include an evaluation of the magnitude of long-term risks remaining after completion of the remedial action and an evaluation of short-term risks that may be posed to the community, worker or the environment during the implementation of the remedy.

(b) The risk assessment of remediation alternatives shall discuss the degree of uncertainty associated with the risk assessment.

Subchapter G. DEMONSTRATION OF ATTAINMENT

Sec.
250.701. Scope.
250.702. Attainment requirements.
250.703. General attainment requirements for soil.
250.704. General attainment requirements for groundwater.
250.705. Demonstration of attainment of surface water and air quality standards.
250.706. Statistical tests.
250.707. Postremediation attainment.

§ 250.701. Scope.

(a) This subchapter specifies the information and procedures necessary to demonstrate attainment with one or a combination of the background standard, Statewide health standard, site-specific standard and the minimum threshold standard, when a release of a regulated substance has occurred.

(b) This subchapter applies to persons who undertake a remediation in accordance with the act and this chapter.

(c) For purposes of determining attainment of one or a combination of remediation standards, the concentration of a regulated substance is not required to be less than the standard relating to a PQL for a regulated substance in accordance with § 250.7 (relating to standards related to PQLs).

(d) Attainment of a standard shall be demonstrated at the point of compliance, as identified in § 250.203, § 250.302 (relating to points of compliance) or § 250.406, whichever is applicable.

§ 250.702. Attainment requirements.

(a) Attainment will apply to the vertical and horizontal extent of soil and water identified as contaminated from the release above the selected standard in a site characterization. If multiple releases occur on a property which produce distinctly separate zones of contamination, the characterization and subsequent attainment demonstrations apply individually to the separate zones.

(b) Demonstration of attainment in a final report shall include the following:

(1) A demonstration that the analysis of the data, through the application of statistical tests provided for in § 250.706 (relating to statistical tests), indicates that the standard has been met.

(2) A demonstration of a statistical trend analysis, knowledge of the plume stability or other acceptable method that shows contaminant concentration at the point of compliance will not exceed the selected standard.

(3) For the site-specific standard, the following apply:

(i) If pathway elimination is part of the remediation, it shall be demonstrated on the basis of either an engineering or hydrogeologic analysis, or both, which includes fate and transport analysis that some or all of the exposure pathways have been eliminated.

(ii) If pathway elimination is not part of the remediation or it cannot be demonstrated that all pathways have been eliminated, then it shall be demonstrated that the calculated numerical site-specific standards for the remaining pathways have been attained in accordance with paragraphs (1) and (2), using the procedures in this subchapter, or that the risk level remaining at a site does not exceed a risk level of 1 × 10-4 and a hazard index of 1, provided for in the act.

§ 250.703. General attainment requirements for soil.

(a) For any standard selected, the attainment demonstration for the soil media shall be made at the point of compliance as defined in Subchapters B—D (relating to background standard; statewide health standards; and site-specific standards).

(b) The volume of soil to which the attainment criteria is applied shall be determined by circumscribing with an irregular surface those concentrations detected during characterization which exceed the selected standard.

(c) Sampling points for demonstration of attainment of soils shall be selected randomly both horizontally and vertically.

(d) For statistical methods under § 250.706(b)(1)(i) (relating to statistical tests), the number of sample points required for each distinct area of contamination to demonstrate attainment shall be determined in the following way:

(1) For soil volumes equal to or less than 125 cubic yards, at least eight samples.

(2) For soil volumes over 125 cubic yards, at least twelve sample points.

(3) Additional sampling points may be required based on site-specific conditions.

(e) For statistical methods under § 250.706(b)(1)(ii) and (c), the minimum number of sample points required for demonstrating attainment shall be as specified by the documentation of the chosen method.

§ 250.704. General attainment requirements for groundwater.

(a) For any standard selected, the attainment demonstration for the groundwater media shall be made at the point of compliance as defined in Subchapters B—D (relating to background standard; statewide health standards; and site-specific standards).

(b) A sufficient number and location of monitoring wells necessary to demonstrate attainment shall be installed at the point of compliance for each aquifer, based on site-specific conditions.

(c) When two or more impacted aquifers underlie a property or site, attainment of the cleanup standard will be evaluated on each aquifer separately.

(d) For site plumes characterized with significant vertical migration within a single aquifer, one or more clusters of compliance points will be applied.

(e) In cases where the site characterization has determined the groundwater contamination extends beyond the property boundary (plume), and the concentration of

regulated substances beyond the property is above the cleanup levels of the standard selected, then the location and number of wells shall:

(1) Determine compliance at and beyond the property boundary.

(2) Determine compliance within the area off property shown, in the site investigation report, to be contaminated with regulated substances above the selected standard.

(f) For statistical methods under § 250.706(b)(2)(i) (relating to statistical tests), for groundwater subject to remediation, the demonstration of attainment shall be based on at least eight consecutive quarters of groundwater data. The Department may accept no fewer than four consecutive quarterly sampling events under the following conditions:

(1) There is more than adequate spatial monitoring of the plume upgradient of the property which indicates a decreasing concentration trend toward the downgradient property boundary.

(2) Parameters affecting the fate and transport of regulated substances within the plume have been fully evaluated.

(3) Concentrations of regulated substances in the plume at the point of compliance monitoring wells along the downgradient property boundary are all less than or equal to the groundwater standard or the standard relating to the PQL— whichever is higher—in all samples collected during the four quarters of monitoring.

(4) One of the following are met:

(i) The age of the plume is sufficiently well known to permit a judgment to be made regarding its stability.

(ii) The remediation includes source removal or containment actions which would reduce the chemical flux into the plume.

(g) For statistical methods under § 250.706(b)(2)(ii) and (c), the minimum number of sample points required for demonstrating attainment shall be as specified by the documentation of the chosen method.

§ 250.705. Demonstration of attainment of surface water and air quality standards.

A person shall demonstrate attainment with the surface water and the air by demonstrating compliance with the applicable State and Federal laws and regulations.

§ 250.706. Statistical tests.

(a) Application of statistical tests for the background standard shall be as follows:

(1) For regulated substances which are naturally occurring, or for non-naturally occurring substances for which a known background condition exists, the person shall compare the population of analytical results of background samples with a population of the medium of concern.

(i) *Soil.*

(A) The Department may require that the highest measurement from the area of concern is not greater than the highest measurement from the background area, that is, the nonparametric upper tolerance limit.

(B) In addition to clause (A), the Department may accept the use of the Wilcoxon rank-sum test (equivalent to the Mann-Whitney U test) for data from two populations, when less than 40% of the measurements in the background population as well as the sample population in the area of concern are nondetect data.

(C) The false-positive rate for a set of data applied to a statistical test may not be greater than 0.20. The minimum number of samples to be collected is ten from the background population and ten from each distinct area of contamination.

(D) The censoring level of nondetects (NDs) shall be the standard relating to the PQL.

(E) The application of a statistical method shall meet the criteria in subsection (c).

(ii) *Groundwater for known upgradient release of a regulated substance.*

(A) The Department may accept the use of the nonparametric tolerance intervals that are applied in accordance with the procedures in clauses (B)—(F) and (H)—(J).

(B) The upgradient concentration shall be determined by sampling in a background well shown on the basis of characterization to exhibit the highest concentration.

(C) The well shall be sampled over a period of eight quarters to provide eight samples.

(D) From these eight samples, the highest concentration for each regulated substance shall be selected as the upper tolerance limit.

(E) In each onsite well, eight samples shall also be collected during the same eight-quarter period.

(F) The upper tolerance limit shall be met in each onsite well. The maximum of data collected from each onsite well shall be at or below the upper tolerance limit.

(G) In lieu of clauses (D)—(F), the Department may accept a retesting strategy using nonparametric prediction limit in accordance with current EPA guidance (U. S. EPA, Office of Solid Waste Management Division. "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities; Addendum to Interim Final Guidance, EPA, Washington, D.C. June 1992). For each regulated substance, the highest concentration of the eight background samples shall be selected as the upper prediction limit, as determined by the most current EPA guidance.

(H) The application of a statistical method for groundwater background standard shall meet the criteria in subsection (c).

(I) The censoring level of NDs shall be the standard relating to the PQL.

(J) In lieu of eight-quarter sampling in clauses (C) and (E), the Department may allow the eight samples to be taken during a period of four quarters, if the following criteria can be met:

(I) There is more than adequate spatial monitoring of the plume upgradient of the property on which the release occurred which indicates a stable plume condition.

(II) Parameters affecting the fate and transport of regulated substances within the plume have been fully evaluated.

(III) Coefficient of variation for the eight samples collected over a four-quarter period may not exceed 1.0 for metals, 1.0 for some specific organic compounds and 2.0 for other organic compounds.

(IV) The age of the plume is sufficiently well known to permit a judgment to be made regarding its stability and

remediation of the source associated with the upgradient contamination is not currently or has not recently occurred.

(iii) *Background groundwater conditions due to naturally occurring or areawide contamination.*

(A) To use this subsection for areawide contamination, the person performing remediation shall demonstrate to the Department, in writing, that the site conditions are due to areawide contamination and shall obtain the Department's approval to use this subsection.

(B) A minimum of twelve samples shall be collected from any combination of monitoring wells, including upgradient locations, if all data collected is used in determination of background concentrations.

(C) The same number of samples shall be collected within and representative of the area of groundwater contamination (plume) onsite as were collected in the upgradient sampling for each sampling event.

(D) The samples from the upgradient wells and the wells in the plume onsite shall be collected at the same time.

(E) Sampling may be accelerated so that all samples are collected as quickly as possible so long as the frequency does not result in serial correlation in the data.

(F) The resulting values may be compared using nonparametric or parametric methods to test for the difference in the mean of the two data sets.

(G) The sampling results in the plume onsite may not have extreme values, when comparing with the sampling results in the background points.

(H) The application of a statistical method for groundwater background standard shall meet the criteria in subsection (c).

(I) The censoring level of NDs shall be the standard relating to the PQL.

(2) For non-naturally occurring substances for which there is no known background condition, the default background standard is the standard relating to the PQL as specified in § 250.7 (relating to standards related to PQLs). Attainment of standards relating to the PQLs shall be demonstrated using the statistical test specified in subsection (b) or other appropriate statistical method that the Department determines satisfies the criteria in subsection (c).

(b) The following statistical tests may be accepted by the Department to demonstrate attainment with standards relating to the PQLs, the statewide health and site-specific standards. The statistical test for soil shall apply to each distinct area of contamination. The statistical test for groundwater will apply to each well. Testing shall be performed individually for each regulated substance identified in the final report site investigation as being present at the site for which a person wants relief from liability under the act. The application of a statistical method shall meet the criteria in subsection (c).

(1) For soil attainment determination at each distinct area of contamination, subparagraph (i) or (ii) shall be met in addition to the attainment requirements in §§ 250.702 and 250.703 (relating to attainment requirements; and general attainment requirements for soil).

(i) Seventy-five percent of all samples collected for attainment purposes shall be equal to or less than the standard with no individual sample exceeding ten times the standard.

(ii) As applied in accordance with EPA approved methods on statistical analysis of environmental data, as identified in subsection (d), the 95% upper confidence level of the mean shall be at or below the standard.

(2) For groundwater attainment determination at each point of compliance, subparagraph (i) or (ii) shall be met in addition to the attainment requirements in § 250.702 and § 250.704 (relating to general attainment requirements for groundwater).

(i) Seventy-five percent of all samples collected for attainment purposes shall be equal to or less than the standard with no individual sample exceeding both of the following:

(A) Ten times the standard on the property.

(B) Two times the standard beyond the property boundary at the point of compliance.

(ii) As applied in accordance with EPA approved methods on statistical analysis of environmental data, as identified in subsection (d), the 95% upper confidence level of the mean shall be at or below the standard.

(c) Except for the statistical methods identified in subsection (b)(1)(i) and (2)(i), a demonstration of attainment with one or a combination of remediation standards shall comply with the following:

(1) When statistical methods are to be used for demonstration of attainment of standards relating to the PQLs, background standards after remediation, Statewide health or site-specific standards, the null hypothesis (Ho) shall be that the cleanup standard is not achieved, and the alternative hypothesis (Ha) shall be that the cleanup standard is achieved. When statistical methods are to be used to initially determine that the background standard other than standard relating to the PQL is exceeded, the null hypothesis (Ho) shall be that the background standard is achieved and the alternative hypothesis (Ha) shall be that the background standard is not achieved.

(2) A statistical method chosen shall comply with the following performance standards, as appropriate:

(i) The underlying assumptions of the statistical method shall be met, such as data distribution.

(ii) The statistical method shall be recommended for this use in a relevant Federal guidance or regulation and is generally recognized as appropriate for the particular remediation implemented at the site.

(iii) Compositing cannot be used with nonparametric methods.

(iv) Statistical parameters shall be protective of human health and the environment.

(v) Tests shall account for nondetects without assigning zero as the value.

(vi) Tests shall control for seasonal and spatial variability as well as temporal correlation of data.

(vii) Tests used to initially determine that the background standard is exceeded shall maintain adequate power (1-beta) to detect contamination in accordance with current EPA guidances, regulations or protocols.

(viii) For the standards relating to the PQLs, Statewide health and site-specific standards, the false-positive rate for a statistical test may not be greater than 0.20 for nonresidential and 0.05 for residential.

(ix) Testing shall be done individually for each regulated substance present at the site.

(3) The following information shall be documented in a final report when a statistical method is applied:

(i) A description of the statistical method.

(ii) A description of the underlying assumptions of the method.

(iii) Documentation showing that the sample data set meets the underlying assumptions of the method and explaining why the method is appropriate to apply to the data.

(iv) Specification of false positive rates.

(v) Documentation of input and output data for the statistical test, presented in tables, figures, or both, as appropriate.

(vi) An interpretation and conclusion of the statistical test.

(d) The references identified in subsection (b)(1)(ii) and (2)(ii) are as follows:

(1) U. S. EPA, Office of Policy, Planning and Evaluation, *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media*, EPA 230/02-89-042, Washington, D.C. 1989.

(2) U. S. EPA, Office of Solid Waste Management Division, *Test Methods for Evaluating Solid Waste*, SW-846 Volume II: Field Methods, U. S. EPA, November 1985, Third Edition.

(3) U. S. EPA, Office of Solid Waste Management Division, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities*, Interim Final Guidance, EPA, Washington, D.C., April, 1989.

(4) U. S. EPA, Office of Solid Waste Management Division, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities*, Addendum to Interim Final Guidance, EPA, Washington, D.C., June, 1992.

(5) 40 CFR Parts 264 and 265 (relating to standards for owners and operators of hazardous waste treatment, storage, and disposal facilities; and interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities).

§ 250.707. Postremediation attainment.

(a) After engineering controls are in place and the groundwater has reached a consistent concentration level, a statistical test shall be used to demonstrate that regulated substances in groundwater do not exceed the selected standard at the point of compliance. A statistical trend analysis, knowledge of the plume stability, or other acceptable method shall be used to demonstrate that contaminant concentration at the point of compliance will not exceed the selected standard in the future.

(b) If engineering or institutional controls are utilized at a site to maintain the nonresidential Statewide health standard or the site-specific standard, a post-remediation care program shall be implemented to protect human health and the environment.

(c) A person implementing engineering controls shall ensure the ongoing achievement of the performance standards in order to maintain attainment.

(d) A person shall implement a post-remediation care plan, as identified in an approved final report.

(e) A person may terminate post-remediation care as approved in the final report if he can demonstrate attainment under this chapter without the engineering controls in place.

APPENDIX A
TABLE 1—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR GROUNDWATER IN AQUIFERS*

		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
ACENAPHTHENE	83329	580	Inhalation - N	1200	Inhalation - N
ACENAPHTHYLENE	208968	580	Inhalation - N	1200	Inhalation - N
ACETALDEHYDE	75070	20	Inhalation - C	57	Inhalation - N
ACETIC ACID	64197	5	TR	5	TR
ACETIC ANHYDRIDE	108247	5	TR	5	TR
ACETONE	67641	3700	Ingestion - N	10000	Ingestion - N
ACETONITRILE	75058	58	Inhalation - N	122	Inhalation - N
ACETOPHENONE	98862	3700	Ingestion - N	10000	Ingestion - N
ACETYLAMINOFLUORENE, 2-(2AAF)	53963	0.17	Ingestion - C	0.67	Ingestion - C
ACROLEIN	107028	0.056	Inhalation - N	0.12	Inhalation - N
ACRYLAMIDE	79061	0.01	HAL	0.01	HAL
ACRYLIC ACID	79107	18000	Ingestion - N	51000	Ingestion - N
ACRYLONITRILE	107131	0.64	Inhalation - C	2.7	Inhalation - C
ALACHLOR	15972608	2	MCL	2	MCL
ALDICARB	116063	7	HAL	7	HAL
ALDRIN	309002	0.002	HAL	0.002	HAL
ALLYL ALCOHOL	107186	49	Inhalation - N	100	Inhalation - N
ALUMINUM	7429905	200	MCL	200	MCL
AMINOBIPHENYL, 4-	92671	0.03	Ingestion - C	0.12	Ingestion - C
AMITROLE	61825	0.028	Solubility	0.028	Solubility
AMMONIA	7664417	30000	HAL	30000	HAL
AMMONIUM CHLORIDE	12125092	7300	Ingestion - N	20000	Ingestion - N
AMMONIUM SULFAMATE	7773060	2000	HAL	2000	HAL
AMYL ACETATE, N-	628637	5	TR	5	TR
AMYL ACETATE, SEC-	626380	5	TR	5	TR
ANILINE	62533	10	Ingestion - N	29	Ingestion - N
ANTHRACENE	120127	1300	Solubility	1300	Solubility
ANTIMONY	7440360	6	MCL	6	MCL
ANTIMONY TRIOXIDE	1309644	15	Ingestion - N	41	Ingestion - N
ANTU	86884	5	TR	5	TR
ARAMITE	140578	27	Ingestion - C	100	Ingestion - C
ARSENIC	7440382	50	MCL	50	MCL
ASBESTOS	12001295	7,000,000 fibers/L	MCL	7,000,000 fibers/L	MCL
ATRAZINE	1912249	3	MCL	3	MCL
AZINPHOS-METHYL	86500	5	TR	5	TR
BARIUM AND COMPOUNDS	7440393	2000	MCL	2000	MCL
BAYGON (PROPOXUR)	114261	3	HAL	3	HAL
BENZENE	71432	5	MCL	5	MCL
BENZIDINE	92875	0.003	Ingestion - C	0.011	Ingestion - C
BENZO[A]ANTHRACENE	56553	0.91	Ingestion - C	3.5	Ingestion - C
BENZO[A]PYRENE	50328	0.2	MCL	0.2	MCL
BENZO[B]FLUORANTHENE	205992	0.91	Ingestion - C	3.5	Ingestion - C
BENZO[GHI]PERYLENE	191242	0.26	Solubility	0.26	Solubility
BENZO[K]FLUORANTHENE	207089	9.1	Ingestion - C	29	Solubility
BENZOIC ACID	65850	39000	Inhalation - N	82000	Inhalation - N
BENZYL ALCOHOL	100516	11000	Ingestion - N	31000	Ingestion - N
BENZYL CHLORIDE	100447	0.89	Inhalation - C	3.7	Inhalation - C
BERYLLIUM	7440417	4	MCL	4	MCL

All MSCs in ug/L (Except asbestos).
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TABLE 1—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR GROUNDWATER IN AQUIFERS*

		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
PROPIOLACTONE, BETA	57578	5	TR	5	TR
BHC, ALPHA-	319846	0.11	Ingestion - C	0.41	Ingestion - C
BHC, BETA-	319857	0.37	Ingestion - C	1.4	Ingestion - C
BHC, DELTA-	319868	11	Ingestion - N	31	Ingestion - N
BHC, GAMMA (LINDANE)	58899	0.2	MCL	0.2	MCL
BIPHENYL	92524	490	Inhalation - N	1000	Inhalation - N
BIS(2-CHLORO-1-METHYLETHYL)ETHER	108601	300	HAL	300	HAL
BIS(2-CHLORO-ISOPROPYL)ETHER	39638329	300	HAL	300	HAL
BIS(2-CHLOROETHOXY)METHANE	111911	5	TR	5	TR
BIS(2-CHLOROETHYL)ETHER	111444	0.13	Inhalation - C	0.55	Inhalation - C
BIS(CHLOROMETHYL)ETHER	542881	0.0007	Inhalation - C	0.0029	Inhalation - C
BIS[2-ETHYLHEXYL]PHTHALATE	117817	6	MCL	6	MCL
BORON AND COMPOUNDS	7440428	600	HAL	600	HAL
BROMODICHLOROMETHANE	75274	100	MCL	100	MCL
BROMOMETHANE	74839	10	HAL	10	HAL
BROMOPHENYL PHENYL ETHER, 4-	101553	5	TR	5	TR
BUTADIENE, 1,3-	106990	0.16	Inhalation - C	0.65	Inhalation - C
BUTYL ACETATE, N-	123864	5	TR	5	TR
BUTYL ACETATE, SEC-	105464	5	TR	5	TR
BUTYL ACETATE, TERT-	540885	5	TR	5	TR
BUTYL ALCOHOL, N-	71363	3700	Ingestion - N	10000	Ingestion - N
BUTYL PHTHALATE, DI-N-	84742	3700	Ingestion - N	10000	Ingestion - N
BUTYLAMINE, N-	109739	5	TR	5	TR
BUTYLBENZYL PHTHALATE	85687	2600	Solubility	2600	Solubility
CADMIUM	7440439	5	MCL	5	MCL
CADMIUM OXIDE	1306190	18	Ingestion - N	51	Ingestion - N
CALCIUM CHROMATE	13765190	5	TR	5	TR
CALCIUM CYANAMIDE	156627	5	TR	5	TR
CAPROLACTAM DUST	105602	18000	Ingestion - N	51000	Ingestion - N
CAPTAN	133062	190	Ingestion - C	730	Ingestion - C
CARBARYL	63252	700	HAL	700	HAL
CARBOFURAN	1563662	40	MCL	40	MCL
CARBON DISULFIDE	75150	1900	Inhalation - N	4100	Inhalation - N
CARBON TETRACHLORIDE	56235	5	MCL	5	MCL
CARBONYL FLUORIDE	353504	5	TR	5	TR
CATECHOL	120809	5	TR	5	TR
CHLORAL HYDRATE	75876	60	HAL	60	HAL
CHLORAMBEN	133904	100	HAL	100	HAL
CHLORDANE	57749	2	MCL	2	MCL
CHLORDANE, ALPHA-	5103719	0.51	Ingestion - C	2	Ingestion - C
CHLORDANE, GAMMA-	5103742	0.51	Ingestion - C	2	Ingestion - C
CHLORINE	7782505	3700	Ingestion - N	10000	Ingestion - N
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107051	2.8	Inhalation - N	5.8	Inhalation - N
CHLOROACETALDEHYDE	107200	5	TR	5	TR
CHLOROACETOPHENONE, ALPHA-	532274	0.083	Inhalation - N	0.18	Inhalation - N
CHLOROANILINE, P-	106478	39	Inhalation - N	82	Inhalation - N
CHLOROBENZENE	108907	100	MCL	100	MCL
CHLOROBENZILATE	510156	2.5	Ingestion - C	9.5	Ingestion - C

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		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
CHLORODIBROMOMETHANE	124481	100	MCL	100	MCL
CHLOROETHANE	75003	28000	Inhalation - N	58000	Inhalation - N
CHLOROETHYL VINYL ETHER, 2-	110758	240	Inhalation - N	510	Inhalation - N
CHLOROFORM	67663	100	MCL	100	MCL
CHLORONAPHTHALENE, 2-	91587	780	Inhalation - N	1600	Inhalation - N
CHLOROPHENOL, 2-	95578	40	HAL	40	HAL
CHLOROPHENYL PHENYL ETHER, 4-	7005723	5	TR	5	TR
CHLOROPRENE	126998	19	Inhalation - N	41	Inhalation - N
CHLORPYRIFOS	2921882	20	HAL	20	HAL
CHROMIUM III	7440473	100	MCL	100	MCL
CHROMIUM VI		180	Ingestion - N	510	Ingestion - N
CHRYSENE	218019	1.9	Solubility	1.9	Solubility
COBALT	7440484	2200	Ingestion - N	6100	Ingestion - N
COBALT CARBONYL	10210681	2200	Ingestion - N	6100	Ingestion - N
COPPER	7440508	1000	MCL	1000	MCL
CRESOL	1319773	180	Ingestion - N	510	Ingestion - N
CRESOL, P-CHLORO-M-	59507	180	Ingestion - N	510	Ingestion - N
CROTONALDEHYDE	4170303	0.35	Ingestion - C	1.3	Ingestion - C
CUMENE	98828	25	Inhalation - N	53	Inhalation - N
CYANIDE, TOTAL	57125	200	MCL	200	MCL
CYANOGEN	460195	390	Inhalation - N	820	Inhalation - N
CYANOGEN CHLORIDE	506774	390	Inhalation - N	820	Inhalation - N
CYCLOHEXANE	110827	5	TR	5	TR
CYCLOHEXANONE	108941	49000	Inhalation - N	102000	Inhalation - N
CYCLOHEXYLAMINE	108918	7300	Ingestion - N	20000	Ingestion - N
CYCLOPHOSPHAMIDE (ANHYDROUS)	50180	1.1	Ingestion - C	4.2	Ingestion - C
CYCLOPHOSPHAMIDE (HYDRATED)	6055192	1.2	Ingestion - C	4.5	Ingestion - C
DDD, 4,4'-	72548	2.8	Ingestion - C	11	Ingestion - C
DDE, 4,4'-	72559	2	Ingestion - C	7.5	Ingestion - C
DDT, 4,4'-	50293	2	Ingestion - C	3.4	Solubility
DECABORANE	17702419	5	TR	5	TR
DECACHLOROBIPHENYL	2051243	0.086	Ingestion - C	0.33	Ingestion - C
DEMETON	8065483	1.5	Ingestion - N	4.1	Ingestion - N
DIALLATE	2303164	11	Ingestion - C	42	Ingestion - C
DIAZINON	333415	0.6	HAL	0.6	HAL
DIBENZO[A,H]ANTHRACENE	53703	0.091	Ingestion - C	0.35	Ingestion - C
DIBENZOFURAN	132649	5	TR	5	TR
DIBROMO-3-CHLOROPROPANE, 1,2-	96128	0.2	MCL	0.2	MCL
DIBROMOETHANE, 1,2- (ETHYLENE DIBROMIDE)	106934	0.05	MCL	0.05	MCL
DIBROMOMETHANE	74953	97	Inhalation - N	200	Inhalation - N
DICAMBA	1918000	200	HAL	200	HAL
DICHLORO-2-BUTENE, TRANS-1,3-	110576	5	TR	5	TR
DICHLOROBENZENE, 1,2-	95501	600	MCL	600	MCL
DICHLOROBENZENE, 1,3-	541731	870	Inhalation - N	1800	Inhalation - N
DICHLOROBENZENE, P-	106467	75	MCL	75	MCL
DICHLOROBENZIDINE, 3,3'-	91941	1.5	Ingestion - C	5.7	Ingestion - C
DICHLOROBIPHENYL	2051607	0.086	Ingestion - C	0.33	Ingestion - C
DICHLORODIFLUOROMETHANE (FREON 12)	75718	1000	HAL	1000	HAL

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		Residential		Non-Residential	
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DICHLOROETHANE, 1,1-	75343	27	Inhalation - C	110	Inhalation - C
DICHLOROETHANE, 1,2-	107062	5	MCL	5	MCL
DICHLOROETHYLENE, 1,1-	75354	7	MCL	7	MCL
DICHLOROETHYLENE, CIS-1,2-	156592	70	MCL	70	MCL
DICHLOROETHYLENE, TRANS-1,2-	156605	100	MCL	100	MCL
DICHLOROMETHANE (METHYLENE CHLORIDE)	75092	5	MCL	5	MCL
DICHLOROPHENOL, 2,4-	120832	20	HAL	20	HAL
DICHLOROPHENOL, 2,6-	87650	110	Ingestion - N	310	Ingestion - N
DICHLOROPHENOXYACETIC ACID, 2,4-(2,4-D)	94757	70	MCL	70	MCL
DICHLOROPROPANE, 1,2-	78875	5	MCL	5	MCL
DICHLOROPROPANE, 1,3-	142289	2.4	Inhalation - C	10	Inhalation - C
DICHLOROPROPANE, 2,2-	590207	10	Ingestion - C	38	Ingestion - C
DICHLOROPROPENE, 1,1-	563586	3.7	Ingestion - C	14	Ingestion - C
DICHLOROPROPENE,1,3-	542756	1.2	Inhalation - C	4.9	Inhalation - C
DICHLOROPROPIONIC ACID, 2,2-(DALAPON)	75990	200	MCL	200	MCL
DICHLORVOS	62737	2.3	Ingestion - C	8.8	Ingestion - C
DICROTOPHOS	141662	3.6	Ingestion - N	10	Ingestion - N
DIELDRIN	60571	0.002	HAL	0.002	HAL
DIETHANOLAMINE	111422	5	TR	5	TR
DIETHYL PHTHALATE	84662	5000	HAL	5000	HAL
DIETHYLAMINE	109897	5	TR	5	TR
DIGLYCIDYL ETHER (DGE)	2238075	5	TR	5	TR
DIMETHOATE	60515	7.3	Ingestion - N	20	Ingestion - N
DIMETHYL PHTHALATE	131113	5	TR	5	TR
DIMETHYL SULFATE	77781	5	TR	5	TR
DIMETHYLAMINE	124403	21	Ingestion - N	58	Ingestion - N
DIMETHYLAMINOAZOBENZENE, P-	60117	0.14	Ingestion - C	0.56	Ingestion - C
DIMETHYLBENZ[A]ANTHRACENE, 7,12-	57976	0.051	Ingestion - C	0.2	Ingestion - C
DIMETHYLBENZIDINE, 3,3'-	119937	0.072	Ingestion - C	0.28	Ingestion - C
DIMETHYLHYDRAZINE, 1,1-	57147	0.089	Inhalation - C	0.37	Inhalation - C
DIMETHYLPHENETHYLAMINE, ALPHA, ALPHA-	122098	5	TR	5	TR
DIMETHYLPHENOL, 2,4-	105679	730	Ingestion - N	2000	Ingestion - N
DINITRO-O-CRESOL, 4,6-	534521	5	TR	5	TR
DINITROBENZENE	528290	15	Ingestion - N	41	Ingestion - N
DINITROBENZENE, 1,3-	99650	1	HAL	1	HAL
DINITROPHENOL, 2,4-	51285	73	Ingestion - N	200	Ingestion - N
DINITROTOLUENE	25321146	0.98	Ingestion - C	3.8	Ingestion - C
DINITROTOLUENE, 2,4-	121142	0.05	HAL	0.05	HAL
DINITROTOLUENE, 2,6- (2,6-DNT)	606202	0.05	HAL	0.05	HAL
DINOSEB	88857	7	MCL	7	MCL
DIOXANE, 1,4-	123911	7	HAL	7	HAL
DIOXATHION	78342	5	TR	5	TR
DIPHENYLAMINE	122394	200	HAL	200	HAL
DIPHENYLHYDRAZINE, 1,2-	122667	0.83	Ingestion - C	3.2	Ingestion - C
DIQUAT	85007	20	MCL	20	MCL
DISULFOTON	298044	0.3	HAL	0.3	HAL
DIURON	330541	10	HAL	10	HAL
ENDOSULFAN	115297	220	Ingestion - N	230	Solubility

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		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
ENDOSULFAN I (ALPHA)	959988	220	Ingestion - N	320	Solubility
ENDOSULFAN II (BETA)	33213659	220	Ingestion - N	330	Solubility
ENDOSULFAN SULFATE	1031078	220	Ingestion - N	220	Solubility
ENDOTHALL	145733	100	MCL	100	MCL
ENDRIN	72208	2	MCL	2	MCL
ENDRIN ALDEHYDE	7421934	11	Ingestion - N	31	Ingestion - N
ENDRIN KETONE	53494705	11	Ingestion - N	31	Ingestion - N
EPICHLOROHYDRIN	106898	4	HAL	4	HAL
ETHION	563122	0.001	Solubility	0.001	Solubility
ETHOXYETHANOL, 2- (EGEE)	110805	3900	Inhalation - N	8200	Inhalation - N
ETHYL ACETATE	141786	8800	Inhalation - N	18000	Inhalation - N
ETHYL ACRYLATE	140885	3.2	Inhalation - C	13	Inhalation - C
ETHYL BENZENE	100414	700	MCL	700	MCL
ETHYL ETHER	60297	1900	Inhalation - N	4100	Inhalation - N
ETHYL METHANESULFONATE	62500	5	TR	5	TR
ETHYLAMINE	75047	5	TR	5	TR
ETHYLENE CHLORHYDRIN	107073	5	TR	5	TR
ETHYLENE GLYCOL	107211	6000	HAL	6000	HAL
ETHYLENE OXIDE	75218	0.43	Inhalation - C	1.8	Inhalation - C
ETHYLENE THIOUREA	96457	0.3	HAL	0.3	HAL
ETHYLENEDIAMINE	107153	190	Inhalation - N	410	Inhalation - N
ETHYLENEIMINE	151564	0.01	Ingestion - C	0.039	Ingestion - C
ETHYLMETHACRYLATE	97632	880	Inhalation - N	1800	Inhalation - N
FAMPHUR	52857	5	TR	5	TR
FENAMIPHOS	22224926	2	HAL	2	HAL
FENSULFOTHION	115902	5	TR	5	TR
FLUORANTHENE	206440	230	Solubility	230	Solubility
FLUORENE	86737	390	Inhalation - N	820	Inhalation - N
FLUORINE	7782414	2200	Ingestion - N	6100	Ingestion - N
FLUOROTRICHLOROMETHANE (FREON 11)	75694	2000	HAL	2000	HAL
FONOFOS	944229	10	HAL	10	HAL
FORMALDEHYDE	50000	1000	HAL	1000	HAL
FORMIC ACID	64186	73000	Ingestion - N	200000	Ingestion - N
FURFURAL	98011	110	Ingestion - N	310	Ingestion - N
GLYPHOSATE	1071836	700	MCL	700	MCL
HEPTACHLOR	76448	0.4	MCL	0.4	MCL
HEPTACHLOR EPOXIDE	1024573	0.2	MCL	0.2	MCL
HEPTACHLOROBIPHENYL	28655712	0.086	Ingestion - C	0.33	Ingestion - C
HEXACHLOROBENZENE	118741	1	MCL	1	MCL
HEXACHLOROBIPHENYL	26601649	0.086	Ingestion - C	0.33	Ingestion - C
HEXACHLOROBUTADIENE	87683	1	HAL	1	HAL
HEXACHLOROCYCLOPENTADIENE	77474	50	MCL	50	MCL
HEXACHLORODIBENZO-P-DIOXINS		0.000044	Ingestion - C	0.00017	Ingestion - C
HEXACHLORODIBENZOFURANS		0.000044	Ingestion - C	0.00017	Ingestion - C
HEXACHLOROETHANE	67721	1	HAL	1	HAL
HEXACHLOROPHENE	70304	3	Solubility	3	Solubility
HEXACHLOROPROPENE	1888717	5	TR	5	TR
HEXAMETHYLENE DIISOCYANATE	822060	0.1	Ingestion - N	0.29	Ingestion - N

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HEXANE	110543	560	Inhalation - N	1200	Inhalation - N
HEXANONE, 2- (METHYL N-BUTYL KETONE)	591786	5	TR	5	TR
HYDRAZINE	302012	0.22	Ingestion - C	0.85	Ingestion - C
HYDROGEN CHLORIDE	7647010	56	Inhalation - N	120	Inhalation - N
HYDROGEN CYANIDE	74908	8.3	Inhalation - N	18	Inhalation - N
HYDROGEN FLUORIDE	7664393	16	Inhalation - N	34	Inhalation - N
HYDROGEN SULFIDE	7783064	2.8	Inhalation - N	5.8	Inhalation - N
HYDROQUINONE	123319	1500	Ingestion - N	4100	Ingestion - N
INDENO[1,2,3-CD]PYRENE	193395	0.022	Solubility	0.022	Solubility
IODOMETHANE	74884	5	TR	5	TR
IRON	7439896	11000	Ingestion - N	31000	Ingestion - N
IRON PENTACARBONYL	13463406	5	TR	5	TR
ISOAMYL ACETATE	123922	5	TR	5	TR
ISOBUTYL ACETATE	110190	5	TR	5	TR
ISOBUTYL ALCOHOL	78831	2900	Inhalation - N	6100	Inhalation - N
ISODRIN	465736	5	TR	5	TR
ISOPHORONE	78591	100	HAL	100	HAL
ISOPHORONE DIISOCYANATE	4098719	5	TR	5	TR
ISOSAFROLE	120581	5	TR	5	TR
KEPONE	143500	0.041	Ingestion - C	0.16	Ingestion - C
LEAD	7439921	5	MCL	5	MCL
LITHIUM	7439932	5	TR	5	TR
LITHIUM HYDRIDE	7580678	5	TR	5	TR
MALATHION	121755	200	HAL	200	HAL
MALEIC ANHYDRIDE	108316	3700	Ingestion - N	10000	Ingestion - N
MALEIC HYDRAZIDE	123331	4000	HAL	4000	HAL
MANGANESE	7439965	50	MCL	50	MCL
MANGANESE CYCLOPENTADIENYL TRICARBONYL	12079651	5	TR	5	TR
MELPHALAN	148823	0.005	Ingestion - C	0.02	Ingestion - C
MERCURY	7439976	2	MCL	2	MCL
METHACRYLONITRILE	126987	1.9	Inhalation - N	4.1	Inhalation - N
METHANOL	67561	4900	Inhalation - N	10000	Inhalation - N
METHOMYL	16752775	200	HAL	200	HAL
METHOXYCHLOR	72435	40	MCL	40	MCL
METHYL CHLORIDE	74873	3	HAL	3	HAL
METHYL ETHYL KETONE	78933	2800	Inhalation - N	5800	Inhalation - N
METHYL ETHYL KETONE PEROXIDE	1338234	22000	Ingestion - N	61000	Ingestion - N
METHYL HYDRAZINE	60344	5	TR	5	TR
METHYL ISOAMYL KETONE	110123	5	TR	5	TR
METHYL ISOBUTYL KETONE	108101	220	Inhalation - N	470	Inhalation - N
METHYL ISOCYANATE	624839	5	TR	5	TR
METHYL MERCAPTAN	74931	5	TR	5	TR
METHYL METHACRYLATE	80626	780	Inhalation - N	1600	Inhalation - N
METHYL METHANESULFONATE	66273	6.7	Ingestion - C	26	Ingestion - C
METHYL PARATHION	298000	2	HAL	2	HAL
METHYL TERT-BUTYL ETHER (MTBE)	1634044	20	HAL	20	HAL
METHYLAMINE	74895	5	TR	5	TR
METHYLCHLOROPHENOXYACETIC ACID (MCPA)	94749	10	HAL	10	HAL

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METHYLCHOLANTHRENE, 3-	56495	0.03	Ingestion - C	0.12	Ingestion - C
METHYLENE BIS (2-CHLOROANILINE), 4,4'- (MOCA)	101144	5.1	Ingestion - C	20	Ingestion - C
METHYLENE DIANILINE, 4,4-	101779	0.42	Ingestion - C	1.6	Ingestion - C
METHYLNAPHTHALENE, 2-	91576	28	Inhalation - N	58	Inhalation - N
MEVINPHOS	7786347	5	TR	5	TR
MITOMYCIN C	50077	0.000081	Ingestion - C	0.00031	Ingestion - C
MONOCROTOPHOS	6923224	5	TR	5	TR
NALED	300765	73	Ingestion - N	200	Ingestion - N
NAPHTHALENE	91203	20	HAL	20	HAL
NAPHTHOQUINONE, 1,4-	130154	5	TR	5	TR
NAPHTHYLAMINE, 1-	134327	0.084	Inhalation - C	0.35	Inhalation - C
NAPHTHYLAMINE, 2-	91598	0.37	Ingestion - C	1.4	Ingestion - C
NICKEL	7440020	100	MCL	100	MCL
NITRATE-NITROGEN (TOTAL)	14797558	10000	MCL	10000	MCL
NITRIC ACID	7697372	5	TR	5	TR
NITRITE-NITROGEN (TOTAL)	14797650	1000	MCL	1000	MCL
NITRO-O-TOLUIDINE, 5-	99558	20	Ingestion - C	78	Ingestion - C
NITROANILINE, M-	99092	0.56	Inhalation - N	1.2	Inhalation - N
NITROANILINE, O-	88744	0.56	Inhalation - N	1.2	Inhalation - N
NITROANILINE, P-	100016	2.1	Ingestion - N	5.8	Ingestion - N
NITROBENZENE	98953	5.6	Inhalation - N	12	Inhalation - N
NITROPHENOL, 2-	88755	600	Inhalation - N	1300	Inhalation - N
NITROPHENOL, 4-	100027	60	HAL	60	HAL
NITROPROPANE, 2-	79469	0.016	Inhalation - C	0.068	Inhalation - C
NITROQUINOLINE-1-OXIDE, 4-	56575	5	TR	5	TR
NITROSODI-N-BUTYLAMINE, N-	924163	0.027	Inhalation - C	0.11	Inhalation - C
NITROSODI-N-PROPYLAMINE, N-	621647	0.022	Inhalation - C	0.091	Inhalation - C
NITROSODIETHYLAMINE, N-	55185	0.0044	Ingestion - C	0.017	Ingestion - C
NITROSODIMETHYLAMINE, N-	62759	0.013	Ingestion - C	0.05	Ingestion - C
NITROSODIPHENYLAMINE, N-	86306	17	Inhalation - C	70	Inhalation - C
NITROSOMETHYLETHYLAMINE, N-	10595956	0.03	Ingestion - C	0.12	Ingestion - C
NITROSOMORPHOLINE, N-	59892	0.099	Ingestion - C	0.38	Ingestion - C
NITROSOPIPERIDINE, N-	100754	0.071	Ingestion - C	0.27	Ingestion - C
NITROSOPYRROLIDINE, N-	930552	0.32	Ingestion - C	1.2	Ingestion - C
NITROTOLUENE	88722	370	Ingestion - N	1000	Ingestion - N
NONACHLOROBIPHENYL	53742077	0.086	Ingestion - C	0.33	Ingestion - C
OCTACHLOROBIPHENYL	55722264	0.086	Ingestion - C	0.33	Ingestion - C
OCTYL PHTHALATE, DI-N-	117840	40	Solubility	40	Solubility
OSMIUM TETROXIDE	20816120	5	TR	5	TR
OXAMYL (VYDATE)	23135220	200	MCL	200	MCL
OZONE	10028156	1900	Ingestion - N	5300	Ingestion - N
PARATHION	56382	220	Ingestion - N	610	Ingestion - N
PCB-1016 (AROCLOR)	12674112	0.68	Inhalation - N	1.4	Inhalation - N
PCB-1221 (AROCLOR)	11104282	0.3	Inhalation - C	1.3	Inhalation - C
PCB-1232 (AROCLOR)	11141165	1.3	Ingestion - C	5.1	Ingestion - C
PCB-1242 (AROCLOR)	53469219	1.3	Ingestion - C	5.1	Ingestion - C
PCB-1248 (AROCLOR)	12672296	0.37	Ingestion - C	1.4	Ingestion - C
PCB-1254 (AROCLOR)	11097691	0.37	Ingestion - C	1.4	Ingestion - C

All MSCs in ug/L (Except asbestos).
Basis: MCL = Maximum Contaminant Level; HAL = Lifetime Health Advisory Level; N = Systemic effect; C = Cancer effect (10^{-5} risk level); TR = Threshold of Regulation; Solubility = Aqueous solubility

APPENDIX A
TABLE 1—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR GROUNDWATER IN AQUIFERS*

		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
PCB-1260 (AROCLOR)	11096825	1.1	Ingestion - C	4.3	Ingestion - C
PENTABORANE	19624227	5	TR	5	TR
PENTACHLOROBENZENE	608935	29	Ingestion - N	82	Ingestion - N
PENTACHLORODIBENZO-P-DIOXINS		0.0000088	Ingestion - C	0.000034	Ingestion - C
PENTACHLORODIBENZOFURANS		0.0000088	Ingestion - C	0.000034	Ingestion - C
PENTACHLOROETHANE	76017	5	TR	5	TR
PENTACHLORONITROBENZENE	82688	2.6	Ingestion - C	9.8	Ingestion - C
PENTACHLOROPHENOL	87865	1	MCL	1	MCL
PERCHLOROMETHYL MERCAPTAN	594423	5	TR	5	TR
PHENACETIN	62442	300	Ingestion - C	1200	Ingestion - C
PHENANTHRENE	85018	2900	Inhalation - N	6100	Inhalation - N
PHENOL	108952	4000	HAL	4000	HAL
PHENYL MERCAPTAN	108985	5	TR	5	TR
PHENYLENEDIAMINE, M-	108452	220	Ingestion - N	610	Ingestion - N
PHENYLENEDIAMINE, O-	95545	14	Ingestion - C	54	Ingestion - C
PHENYLENEDIAMINE, P-	106503	6900	Ingestion - N	19000	Ingestion - N
PHORATE	298022	7.3	Ingestion - N	20	Ingestion - N
PHOSGENE	75445	33	Inhalation - N	70	Inhalation - N
PHOSPHINE	7803512	0.83	Inhalation - N	1.8	Inhalation - N
PHOSPHORIC ACID	7664382	100	Ingestion - N	290	Ingestion - N
PHOSPHORUS AND COMPOUNDS	7723140	0.73	Ingestion - N	2	Ingestion - N
PHTHALIC ANHYDRIDE	85449	330	Inhalation - N	700	Inhalation - N
PICOLINE, 2-	109068	5	TR	5	TR
POLYCHLORINATED BIPHENYLS (PCB)	1336363	0.5	MCL	0.5	MCL
PRONAMIDE	23950585	50	HAL	50	HAL
PROPANOL, 1-	71238	5	TR	5	TR
PROPANOL, 2- (ISOPROPYL ALCOHOL)	67630	5	TR	5	TR
PROPARGYL ALCOHOL	107197	73	Ingestion - N	200	Ingestion - N
PROPIONIC ACID	79094	5	TR	5	TR
PROPIONITRILE (ETHYL CYANIDE)	107120	5	TR	5	TR
PROPYLENE GLYCOL MONOMETHYL ETHER	107982	26000	Ingestion - N	72000	Ingestion - N
PROPYLENE IMINE	75558	5	TR	5	TR
PROPYLENE OXIDE	75569	2.8	Ingestion - C	11	Ingestion - C
PYRENE	129000	140	Solubility	140	Solubility
PYRETHRUM	8003347	5	TR	5	TR
PYRIDINE	110861	9.7	Inhalation - N	20	Inhalation - N
QUINONE (p-BENZOQUINONE)	106514	5	TR	5	TR
RESORCINOL	108463	5	TR	5	TR
SAFROLE	94597	0.69	Inhalation - C	2.9	Inhalation - C
SELENIUM	7782492	50	MCL	50	MCL
SELENIUM HEXAFLUORIDE	7783791	5	TR	5	TR
SILVER	7440224	100	MCL	100	MCL
SIMAZINE	122349	4	MCL	4	MCL
SODIUM AZIDE	26628228	150	Ingestion - N	410	Ingestion - N
SODIUM BISULFITE	7631905	5	TR	5	TR
SODIUM FLUOROACETATE	62748	0.73	Ingestion - N	2	Ingestion - N
SODIUM HYDROXIDE	1310732	50	Ingestion - N	140	Ingestion - N
STRONTIUM CHROMATE	7789062	11	Ingestion - N	31	Ingestion - N

All MSCs in ug/L (Except asbestos).
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APPENDIX A
TABLE 1—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR GROUNDWATER IN AQUIFERS*

		Residential		Non-Residential	
REGULATED SUBSTANCE	**CASRN**	**MSC**	**Basis for MSC**	**MSC**	**Basis for MSC**
STRYCHNINE	57249	11	Ingestion - N	31	Ingestion - N
STYRENE	100425	100	MCL	100	MCL
SULFATE	14808798	260	Ingestion - N	730	Ingestion - N
SULFIDE	18496258	5	TR	5	TR
SULFOTEP	3689245	18	Ingestion - N	51	Ingestion - N
SULFUR MONOCHLORIDE	10025679	5	TR	5	TR
SULFURIC ACID	7664939	5	TR	5	TR
TELLURIUM	13494809	5	TR	5	TR
TELLURIUM HEXAFLUORIDE	7783804	5	TR	5	TR
TEPP	107493	5	TR	5	TR
TERBUFOS	13071799	0.9	HAL	0.9	HAL
TETRACHLOROBENZENE, 1,2,4,5-	95943	11	Ingestion - N	31	Ingestion - N
TETRACHLOROBIPHENYL	2051629	0.086	Ingestion - C	0.33	Ingestion - C
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8- (TCDD)	1746016	0.00003	MCL	0.00003	MCL
TETRACHLORODIBENZOFURANS		0.000044	Ingestion - C	0.00017	Ingestion - C
TETRACHLOROETHANE, 1,1,1,2-	630206	70	HAL	70	HAL
TETRACHLOROETHANE, 1,1,2,2-	79345	0.7	Inhalation - C	3.1	Inhalation - C
TETRACHLOROETHYLENE (PCE)	127184	5	MCL	5	MCL
TETRACHLOROPHENOL, 2,3,4,6-	58902	1100	Ingestion - N	3100	Ingestion - N
TETRAETHYL LEAD	78002	0.0037	Ingestion - N	0.01	Ingestion - N
TETRAHYDROFURAN	109999	5	TR	5	TR
TETRAMETHYL LEAD	75741	0.0037	Ingestion - N	0.01	Ingestion - N
TETRANITROMETHANE	509148	5	TR	5	TR
THALLIUM	7440280	2	MCL	2	MCL
THIONAZIN	297972	5	TR	5	TR
THIRAM	137268	180	Ingestion - N	510	Ingestion - N
TIN	7440315	22000	Ingestion - N	61000	Ingestion - N
TOLUENE	108883	1000	MCL	1000	MCL
TOLUENE-2,4-DIISOCYANATE	584849	0.99	Ingestion - N	2.8	Ingestion - N
TOLUIDINE, M-	95534	2.8	Ingestion - C	11	Ingestion - C
TOLUIDINE, O	95534	3.7	Ingestion - C	14	Ingestion - C
TOLUIDINE, P-	106490	3.5	Ingestion - C	13	Ingestion - C
TOXAPHENE	8001352	3	MCL	3	MCL
TRIBROMOMETHANE (BROMOFORM)	75252	100	MCL	100	MCL
TRICHLOROBENZENE, 1,2,4-	120821	70	MCL	70	MCL
TRICHLOROBENZENE, 1,3,5-	180703	40	HAL	40	HAL
TRICHLOROBIPHENYL	2051618	0.086	Ingestion - C	0.33	Ingestion - C
TRICHLOROETHANE, 1,1,1-	71556	200	MCL	200	MCL
TRICHLOROETHANE, 1,1,2-	79005	5	MCL	5	MCL
TRICHLOROETHYLENE (TCE)	79016	5	MCL	5	MCL
TRICHLOROPHENOL, 2,4,5-	95954	3700	Ingestion - N	10000	Ingestion - N
TRICHLOROPHENOL, 2,4,6-	88062	60	Ingestion - C	230	Ingestion - C
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	93765	70	HAL	70	HAL
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	93721	50	MCL	50	MCL
TRICHLOROPROPANE, 1,2,3-	96184	5	HAL	5	HAL
TRIETHYLAMINE	121448	5	TR	5	TR
TRIETHYLPHOSPHOROTHIOATE, O,O,O-	126681	5	TR	5	TR
TRIFLURALIN	1582098	5	HAL	5	HAL

All MSCs in ug/L (Except asbestos).
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APPENDIX A
TABLE 1—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR GROUNDWATER IN AQUIFERS*

		Residential		Non-Residential	
REGULATED SUBSTANCE	CASRN	MSC	Basis for MSC	MSC	Basis for MSC
TRIMETHYLAMINE	75503	19	Inhalation - N	41	Inhalation - N
TRINITROBENZENE, 1,3,5-	99354	1.8	Ingestion - N	5.1	Ingestion - N
TRINITROGLYCEROL (NITROGLYCERIN)	55630	5	HAL	5	HAL
VANADIUM	7440622	2.1	Ingestion - N	5.8	Ingestion - N
VANADIUM PENTOXIDE	1314621	330	Ingestion - N	920	Ingestion - N
VINYL ACETATE	108054	560	Inhalation - N	1200	Inhalation - N
VINYL BROMIDE	593602	1.4	Inhalation - C	5.7	Inhalation - C
VINYL CHLORIDE	75014	2	MCL	2	MCL
WARFARIN	81812	9.2E-07	Solubility	9.2E-07	Solubility
XYLENES (TOTAL)	1330207	10000	MCL	10000	MCL
ZINC AND COMPOUNDS	7440666	5000	MCL	5000	MCL

*These MSCs apply to groundwater in aquifers. For groundwater which has a naturally occurring background total dissolved solids concentration greater than 2500 mg/L, the remediation standard for a regulated substance dissolved in the groundwater may be adjusted by multiplying the MSC in this table by 100.

All MSCs in ug/L (Except asbestos).
Basis: MCL = Maximum Contaminant Level; HAL = Lifetime Health Advisory Level; N = Systemic effect; C = Cancer effect (10^{-5} risk level); TR = Threshold of Regulation; Solubility = Aqueous solubility

APPENDIX A
TABLE 2—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR SOIL

		Residential		Non-Residential MSCs				Soil to Groundwater	
REGULATED SUBSTANCE	CASRN	MSC	Basis	Surface Soil	Basis	Subsurface Soil	Basis	100x GW MSC	Model - Unsaturated Zone Soil
ACENAPHTHENE	83329	13000	Ingestion	170000	Ingestion	190000	PL	58	720
ACENAPHTHYLENE	208968	13000	Ingestion	170000	Ingestion	190000	PL	58	650
ACETALDEHYDE	75070	610	Ingestion	8000	Ingestion	95000	Inhalation	2	0.024
ACETIC ACID	64197	100	TR	100	TR	190000	PL	0.5	0.0057
ACETIC ANHYDRIDE	108247	100	TR	100	TR	100	TR	0.5	0.0076
ACETONE	67641	22000	Ingestion	190000	PL	190000	PL	370	4.1
ACETONITRILE	75058	1300	Ingestion	17000	Ingestion	190000	PL	5.8	0.065
ACETOPHENONE	98862	22000	Ingestion	190000	PL	190000	PL	370	20
ACETYLAMINOFLUORENE, 2- (2AAF)	53963	4.7	Ingestion	21	Ingestion	190000	PL	0.017	0.069
ACROLEIN	107028	470	Inhalation	1300	Inhalation	190	Inhalation	0.0056	0.000063
ACRYLAMIDE	79061	4	Ingestion	18	Ingestion	190000	PL	0.001	0.000017
ACRYLIC ACID	79107	110000	Ingestion	190000	PL	190000	PL	1800	33
ACRYLONITRILE	107131	33	Ingestion	150	Ingestion	4400	Inhalation	0.064	0.00089
ALACHLOR	15972608	220	Ingestion	990	Ingestion	190000	PL	0.2	0.0077
ALDICARB	116063	220	Ingestion	2800	Ingestion	190000	PL	0.7	0.012
ALDRIN	309002	1.1	Ingestion	4.7	Ingestion	190000	PL	0.0002	0.024
ALLYL ALCOHOL	107186	1100	Ingestion	14000	Ingestion	170000	Inhalation	4.9	0.058
ALUMINUM	7429905	220000	Ingestion	NNL	NNL	NA	NA	20	NA
AMINOBIPHENYL, 4-	92671	0.85	Ingestion	3.8	Ingestion	190000	PL	0.003	0.00011
AMITROLE	61825	19	Ingestion	84	Ingestion	1100	Inhalation	0.0028	0.00011
AMMONIA	7664417	210000	Ingestion	NNL	NNL	NNL	NNL	3000	NA
AMMONIUM CHLORIDE	12125092	44000	Ingestion	570000	Ingestion	NA	NA	730	NA
AMMONIUM SULFAMATE	7773060	44000	Ingestion	570000	Ingestion	NA	NA	200	NA
AMYL ACETATE, N-	628637	100	TR	100	TR	100	TR	0.5	0.063
AMYL ACETATE, SEC-	626380	100	TR	100	TR	190000	PL	0.5	22
ANILINE	62533	350	Ingestion	4500	Ingestion	190000	PL	1	0.059
ANTHRACENE	120127	66000	Ingestion	190000	PL	190000	PL	130	7000
ANTIMONY	7440360	88	Ingestion	1100	Ingestion	NA	NA	0.6	NA
ANTIMONY TRIOXIDE	1309644	88	Ingestion	1100	Ingestion	NA	NA	1.5	NA
ANTU	86884	100	TR	100	TR	190000	PL	0.5	0.022
ARAMITE	140578	720	Ingestion	3200	Ingestion	190000	PL	2.7	NA
ARSENIC	7440382	12	Ingestion	53	Ingestion	NA	NA	5	NA
ASBESTOS	12001295	1100	Inhalation	5500	Inhalation	NA	NA	NA	NA
ATRAZINE	1912249	81	Ingestion	360	Ingestion	190000	PL	0.3	0.013
AZINPHOS-METHYL	86500	100	TR	100	TR	190000	PL	0.5	1.3
BARIUM AND COMPOUNDS	7440393	15000	Ingestion	200000	Ingestion	NA	NA	200	NA

All concentrations in mg/kg (dry weight).
Basis: TR = Threshold of Regulation; PL = Physical Limit of Soil
NNL = No Numeric Limit
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APPENDIX A
TABLE 2—MEDIUM-SPECIFIC CONCENTRATIONS (MSCs) FOR SOIL

		Residential		Non-Residential MSCs				Soil to Groundwater	
REGULATED SUBSTANCE	CASRN	MSC	Basis	Surface Soil	Basis	Subsurface Soil	Basis	100x GW MSC	Model - Unsaturated Zone Soil
BAYGON (PROPOXUR)	114261	880	Ingestion	11000	Ingestion	190000	PL	0.3	NA
BENZENE	71432	620	Ingestion	2700	Ingestion	36000	Inhalation	0.5	0.013
BENZIDINE	92875	0.078	Ingestion	0.34	Ingestion	190000	PL	0.0003	0.0022
BENZO[A]ANTHRACENE	56553	25	Ingestion	110	Ingestion	190000	PL	0.091	81
BENZO[A]PYRENE	50328	2.5	Ingestion	11	Ingestion	190000	PL	0.02	46
BENZO[B]FLUORANTHENE	205992	25	Ingestion	110	Ingestion	190000	PL	0.091	130
BENZO[GHI]PERYLENE	191242	13000	Ingestion	170000	Ingestion	190000	PL	0.026	180
BENZO[K]FLUORANTHENE	207089	250	Ingestion	1100	Ingestion	190000	PL	0.91	9900
BENZOIC ACID	65850	190000	PL	190000	PL	190000	PL	3900	75
BENZYL ALCOHOL	100516	66000	Ingestion	190000	PL	190000	PL	1100	400
BENZYL CHLORIDE	100447	110	Ingestion	470	Ingestion	6100	Inhalation	0.089	0.0052
BERYLLIUM	7440417	4.2	Ingestion	18	Ingestion	NA	NA	0.4	NA
PROPIOLACTONE, BETA	57578	100	TR	100	TR	190000	PL	0.5	0.006
BHC, ALPHA-	319846	2.8	Ingestion	13	Ingestion	190000	PL	0.011	0.05
BHC, BETA-	319857	9.9	Ingestion	44	Ingestion	190000	PL	0.037	0.22
BHC, DELTA-	319868	66	Ingestion	850	Ingestion	190000	PL	1.1	5.4
BHC, GAMMA (LINDANE)	58899	16	Ingestion	72	Ingestion	190000	PL	0.02	0.071
BIPHENYL	92524	11000	Ingestion	140000	Ingestion	190000	PL	49	NA
BIS(2-CHLORO-1-METHYLETHYL)ETHER	108601	100	TR	100	TR	100	TR	30	NA
BIS(2-CHLORO-ISOPROPYL) ETHER	39638329	8800	Ingestion	110000	Ingestion	190000	PL	30	0.8
BIS(2-CHLOROETHOXY) METHANE	111911	100	TR	100	TR	190000	PL	0.5	0.02
BIS(2-CHLOROETHYL)ETHER	111444	16	Ingestion	72	Ingestion	900	Inhalation	0.013	0.00039
BIS(CHLOROMETHYL)ETHER	542881	0.081	Ingestion	0.36	Ingestion	4.9	Inhalation	0.00007	0.0000011
BIS[2-ETHYLHEXYL]PHTHALATE	117817	1300	Ingestion	5700	Saturation	190000	PL	0.6	130
BORON AND COMPOUNDS	7440428	20000	Ingestion	260000	Ingestion	NA	NA	60	NA
BROMODICHLOROMETHANE	75274	290	Ingestion	1300	Ingestion	8100	Inhalation	10	0.34
BROMOMETHANE	74839	310	Ingestion	4000	Ingestion	48000	Inhalation	1	0.054
BROMOPHENYL PHENYL ETHER, 4-	101553	100	TR	100	TR	190000	PL	0.5	110
BUTADIENE, 1,3-	106990	5.3	Ingestion	23	Ingestion	1100	Inhalation	0.016	NA
BUTYL ACETATE, N-	123864	100	TR	100	TR	100	TR	0.5	0.035
BUTYL ACETATE, SEC-	105464	100	TR	100	TR	190000	PL	0.5	0.029
BUTYL ACETATE, TERT-	540885	100	TR	100	TR	190000	PL	0.5	0.02
BUTYL ALCOHOL, N-	71363	22000	Ingestion	190000	PL	190000	PL	370	4.4
BUTYL PHTHALATE, DI-N-	84742	22000	Ingestion	190000	PL	190000	PL	370	1500
BUTYLAMINE, N-	109739	100	TR	100	TR	100	TR	0.5	0.015
BUTYLBENZYL PHTHALATE	85687	44000	Ingestion	190000	PL	190000	PL	260	22000

All concentrations in mg/kg (dry weight).
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		Residential		Non-Residential MSCs				Soil to Groundwater	
REGULATED SUBSTANCE	CASRN	MSC	Basis	Surface Soil	Basis	Subsurface Soil	Basis	100x GW MSC	Model - Unsaturated Zone Soil
CADMIUM	7440439	110	Ingestion	1400	Ingestion	NA	NA	0.5	NA
CADMIUM OXIDE	1306190	110	Ingestion	1400	Ingestion	NA	NA	1.8	NA
CALCIUM CHROMATE	13765190	100	TR	100	TR	NA	NA	0.5	NA
CALCIUM CYANAMIDE	156627	100	TR	100	TR	NA	NA	0.5	NA
CAPROLACTAM DUST	105602	110000	Ingestion	190000	PL	190000	PL	1800	NA
CAPTAN	133062	5100	Ingestion	23000	Ingestion	190000	PL	19	1.2
CARBARYL	63252	22000	Ingestion	190000	PL	190000	PL	70	4.2
CARBOFURAN	1563662	1100	Ingestion	14000	Ingestion	190000	PL	4	0.087
CARBON DISULFIDE	75150	22000	Ingestion	190000	PL	190000	PL	190	16
CARBON TETRACHLORIDE	56235	140	Ingestion	610	Ingestion	19000	Inhalation	0.5	0.026
CARBONYL FLUORIDE	353504	100	TR	100	TR	190000	TR	0.5	NA
CATECHOL	120809	100	TR	100	TR	190000	PL	0.5	NA
CHLORAL HYDRATE	75876	440	Ingestion	5700	Ingestion	190000	PL	6	0.068
CHLORAMBEN	133904	3300	Ingestion	43000	Ingestion	190000	PL	10	NA
CHLORDANE	57749	13	Ingestion	61	Ingestion	190000	PL	0.2	49
CHLORDANE, ALPHA-	5103719	13	Ingestion	61	Ingestion	190000	PL	0.051	7.5
CHLORDANE, GAMMA-	5103742	13	Ingestion	61	Ingestion	190000	PL	0.051	58
CHLORINE	7782505	22000	Ingestion	280000	Ingestion	NA	NA	370	NA
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107051	63	Ingestion	810	Ingestion	9600	Inhalation	0.28	0.0065
CHLOROACETALDEHYDE	107200	100	TR	100	TR	100	TR	0.5	0.006
CHLOROACETOPHENONE, ALPHA-	532274	1.9	Ingestion	24	Ingestion	290	Inhalation	0.0083	NA
CHLOROANILINE, P-	106478	880	Ingestion	11000	Ingestion	130000	Inhalation	3.9	0.49
CHLOROBENZENE	108907	4400	Ingestion	57000	Ingestion	190000	PL	10	0.62
CHLOROBENZILATE	510156	66	Ingestion	290	Ingestion	190000	PL	0.25	1.7
CHLORODIBROMOMETHANE	124481	210	Ingestion	940	Ingestion	190000	PL	10	0.32
CHLOROETHANE	75003	190000	PL	190000	PL	190000	PL	2800	60
CHLOROETHYL VINYL ETHER, 2-	110758	5500	Ingestion	71000	Ingestion	190000	PL	24	0.31
CHLOROFORM	67663	2200	Ingestion	13000	Ingestion	13000	Inhalation	10	0.25
CHLORONAPHTHALENE, 2-	91587	18000	Ingestion	190000	PL	190000	PL	78	1700
CHLOROPHENOL, 2-	95578	1100	Ingestion	14000	Ingestion	170000	Inhalation	4	0.44
CHLOROPHENYL PHENYL ETHER, 4-	7005723	100	TR	100	TR	190000	PL	0.5	5
CHLOROPRENE	126998	4400	Ingestion	57000	Ingestion	67000	Inhalation	1.9	0.045
CHLORPYRIFOS	2921882	660	Ingestion	8500	Ingestion	190000	PL	2	23
CHROMIUM III	7440473	220000	Ingestion	810000	Inhalation	NA	NA	10	NA
CHROMIUM VI		1100	Ingestion	14000	Ingestion	NA	NA	18	NA
CHRYSENE	218019	2500	Ingestion	11000	Ingestion	190000	PL	0.19	230

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COBALT	7440484	13000	Ingestion	170000	Ingestion	NA	NA	220	NA
COBALT CARBONYL	10210681	13000	Ingestion	170000	Ingestion	NA	NA	220	NA
COPPER	7440508	8100	Ingestion	100000	Ingestion	NA	NA	100	NA
CRESOL	1319773	1100	Ingestion	14000	Ingestion	190000	PL	18	NA
CRESOL, P-CHLORO-M-	59507	1100	Ingestion	14000	Ingestion	190000	PL	18	3.7
CROTONALDEHYDE	4170303	9.4	Ingestion	42	Ingestion	190000	PL	0.035	0.00044
CUMENE	98828	8800	Ingestion	110000	Ingestion	87000	Inhalation	2.5	18
CYANIDE, TOTAL	57125	4400	Ingestion	57000	Ingestion	NA	NA	20	NA
CYANOGEN	460195	8800	Ingestion	110000	Ingestion	NNL	NNL	39	NA
CYANOGEN CHLORIDE	506774	8800	Ingestion	110000	Ingestion	NNL	NNL	39	NA
CYCLOHEXANE	110827	100	TR	100	TR	100	TR	0.5	0.065
CYCLOHEXANONE	108941	190000	PL	190000	PL	190000	PL	4900	140
CYCLOHEXYLAMINE	108918	44000	Ingestion	190000	PL	190000	PL	730	NA
CYCLOPHOSPHAMIDE (ANHYDROUS)	50180	29	Ingestion	130	Ingestion	NA	NA	0.11	NA
CYCLOPHOSPHAMIDE (HYDRATED)	6055192	31	Ingestion	140	Ingestion	NA	NA	0.12	NA
DDD, 4,4′-	72548	75	Ingestion	330	Ingestion	190000	PL	0.28	31
DDE, 4,4′-	72559	53	Ingestion	230	Ingestion	190000	PL	0.2	44
DDT, 4,4′-	50293	53	Ingestion	230	Ingestion	190000	PL	0.2	120
DECABORANE	17702419	100	TR	100	TR	NA	NA	0.5	NA
DECACHLOROBIPHENYL	2051243	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
DEMETON	8065483	8.8	Ingestion	110	Ingestion	190000	PL	0.15	0.0041
DIALLATE	2303164	290	Ingestion	1300	Ingestion	190000	PL	1.1	0.065
DIAZINON	333415	200	Ingestion	2600	Ingestion	190000	PL	0.06	0.0082
DIBENZO[A,H]ANTHRACENE	53703	2.5	Ingestion	11	Ingestion	190000	PL	0.0091	41
DIBENZOFURAN	132649	100	TR	100	TR	100	TR	0.5	13
DIBROMO-3-CHLOROPROPANE, 1,2-	96128	13	Ingestion	57	Ingestion	190000	PL	0.02	0.00091
DIBROMOETHANE, 1,2- (ETHYLENE DIBROMIDE)	106934	0.21	Ingestion	0.93	Ingestion	1400	Inhalation	0.005	0.00012
DIBROMOMETHANE	74953	2200	Ingestion	28000	Ingestion	190000	PL	9.7	0.37
DICAMBA	1918000	6600	Ingestion	85000	Ingestion	190000	PL	20	0.23
DICHLORO-2-BUTENE, TRANS-1,3-	110576	100	TR	100	TR	190000	PL	0.5	NA
DICHLOROBENZENE, 1,2-	95501	20000	Ingestion	190000	PL	190000	PL	60	6
DICHLOROBENZENE, 1,3-	541731	19000	Ingestion	190000	PL	190000	PL	87	8.9
DICHLOROBENZENE, P-	106467	750	Ingestion	3300	Ingestion	27000	Inhalation	7.5	1
DICHLOROBENZIDINE, 3,3′-	91941	40	Ingestion	180	Ingestion	190000	PL	0.15	8.4
DICHLOROBIPHENYL	2051607	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
DICHLORODIFLUOROMETHANE (FREON 12)	75718	44000	Ingestion	190000	PL	190000	PL	100	10

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DICHLOROETHANE, 1,1-	75343	3100	Ingestion	14000	Ingestion	190000	Inhalation	2.7	0.065
DICHLOROETHANE, 1,2-	107062	200	Ingestion	870	Ingestion	12000	Inhalation	0.5	0.01
DICHLOROETHYLENE, 1,1-	75354	30	Ingestion	130	Ingestion	6000	Inhalation	0.7	0.019
DICHLOROETHYLENE, CIS-1,2-	156592	2200	Ingestion	28000	Ingestion	190000	Inhalation	7	0.16
DICHLOROETHYLENE, TRANS-1,2-	156605	4400	Ingestion	57000	Ingestion	190000	PL	10	0.23
DICHLOROMETHANE (METHYLENE CHLORIDE)	75092	2400	Ingestion	11000	Ingestion	190000	PL	0.5	0.0075
DICHLOROPHENOL, 2,4-	120832	660	Ingestion	8500	Ingestion	190000	PL	2	0.1
DICHLOROPHENOL, 2,6-	87650	660	Ingestion	8500	Ingestion	190000	PL	11	NA
DICHLOROPHENOXYACETIC ACID, 2,4- (2,4-D)	94757	2200	Ingestion	28000	Ingestion	190000	PL	7	0.18
DICHLOROPROPANE, 1,2-	78875	260	Ingestion	1200	Ingestion	15000	Inhalation	0.5	0.01
DICHLOROPROPANE, 1,3-	142289	280	Ingestion	1300	Ingestion	17000	Inhalation	0.24	NA
DICHLOROPROPANE, 2,2-	590207	260	Ingestion	1200	Ingestion	15000	Inhalation	4.5	NA
DICHLOROPROPENE, 1,1-	563586	66	Ingestion	440	Ingestion	190000	PL	0.37	NA
DICHLOROPROPENE,1,3-	542756	66	Ingestion	440	Ingestion	190000	PL	0.12	NA
DICHLOROPROPIONIC ACID, 2,2- (DALAPON)	75990	6600	Ingestion	85000	Ingestion	190000	PL	20	0.53
DICHLORVOS	62737	62	Ingestion	270	Ingestion	190000	PL	0.23	0.0054
DICROTOPHOS	141662	22	Ingestion	280	Ingestion	190000	PL	0.36	0.0081
DIELDRIN	60571	1.1	Ingestion	5	Ingestion	190000	PL	0.0002	0.0055
DIETHANOLAMINE	111422	100	TR	100	TR	190000	PL	0.5	NA
DIETHYL PHTHALATE	84662	180000	Ingestion	190000	PL	190000	PL	500	16
DIETHYLAMINE	109897	100	TR	100	TR	190000	PL	0.5	0.012
DIGLYCIDYL ETHER (DGE)	2238075	100	TR	100	TR	190000	PL	0.5	NA
DIMETHOATE	60515	44	Ingestion	570	Ingestion	190000	PL	0.73	0.028
DIMETHYL PHTHALATE	131113	100	TR	100	TR	190000	PL	0.5	0.011
DIMETHYL SULFATE	77781	100	TR	100	TR	190000	PL	0.5	0.0061
DIMETHYLAMINE	124403	130	Ingestion	1600	Ingestion	190000	PL	2.1	0.058
DIMETHYLAMINOAZOBENZENE, P-	60117	3.9	Ingestion	17	Ingestion	190000	PL	0.014	0.037
DIMETHYLBENZ[A]ANTHRACENE, 7,12-	57976	1.4	Ingestion	6.1	Ingestion	190000	PL	0.0051	NA
DIMETHYLBENZIDINE, 3,3′-	119937	1.9	Ingestion	8.6	Ingestion	190000	PL	0.0072	NA
DIMETHYLHYDRAZINE, 1,1-	57147	10	Ingestion	46	Ingestion	610	Inhalation	0.0089	0.000099
DIMETHYLPHENETHYLAMINE, ALPHA, ALPHA-	122098	100	TR	100	TR	190000	PL	0.5	NA
DIMETHYLPHENOL, 2,4-	105679	4400	Ingestion	57000	Ingestion	190000	PL	73	3.1
DINITRO-O-CRESOL, 4,6-	534521	100	TR	100	TR	190000	PL	0.5	0.038
DINITROBENZENE	528290	88	Ingestion	1100	Ingestion	190000	PL	1.5	NA
DINITROBENZENE, 1,3-	99650	22	Ingestion	280	Ingestion	190000	PL	0.1	0.0049
DINITROPHENOL, 2,4-	51285	440	Ingestion	5700	Ingestion	190000	PL	7.3	0.083

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DINITROTOLUENE	25321146	26	Ingestion	120	Ingestion	190000	PL	0.098	NA
DINITROTOLUENE, 2,4-	121142	58	Ingestion	260	Ingestion	190000	PL	0.005	0.00012
DINITROTOLUENE, 2,6- (2,6-DNT)	606202	220	Ingestion	2800	Ingestion	190000	PL	0.005	0.00015
DINOSEB	88857	220	Ingestion	2800	Ingestion	190000	PL	0.7	0.029
DIOXANE, 1,4-	123911	1600	Ingestion	7200	Ingestion	190000	PL	0.7	0.0091
DIOXATHION	78342	100	TR	100	TR	190000	PL	0.5	NA
DIPHENYLAMINE	122394	5500	Ingestion	71000	Ingestion	190000	PL	20	1.2
DIPHENYLHYDRAZINE, 1,2-	122667	22	Ingestion	99	Ingestion	190000	PL	0.083	0.015
DIQUAT	85007	480	Ingestion	6200	Ingestion	190000	PL	2	0.024
DISULFOTON	298044	8.8	Ingestion	110	Ingestion	190000	PL	0.03	0.08
DIURON	330541	440	Ingestion	5700	Ingestion	190000	PL	1	0.087
ENDOSULFAN	115297	1300	Ingestion	17000	Ingestion	190000	PL	22	NA
ENDOSULFAN I (ALPHA)	959988	1300	Ingestion	17000	Ingestion	190000	PL	22	110
ENDOSULFAN II (BETA)	33213659	1300	Ingestion	17000	Ingestion	190000	PL	22	130
ENDOSULFAN SULFATE	1031078	1300	Ingestion	17000	Ingestion	190000	PL	22	130
ENDOTHALL	145733	4400	Ingestion	57000	Ingestion	190000	PL	10	0.42
ENDRIN	72208	66	Ingestion	850	Ingestion	190000	PL	0.2	5.4
ENDRIN ALDEHYDE	7421934	66	Ingestion	850	Ingestion	190000	PL	1.1	74
ENDRIN KETONE	53494705	66	Ingestion	850	Ingestion	190000	PL	1.1	NA
EPICHLOROHYDRIN	106898	440	Ingestion	5700	Ingestion	9600	Inhalation	0.4	0.008
ETHION	563122	110	Ingestion	1400	Ingestion	190000	PL	0.0001	0.0022
ETHOXYETHANOL, 2- (EGEE)	110805	88000	Ingestion	190000	PL	190000	PL	390	5.5
ETHYL ACETATE	141786	190000	PL	190000	PL	190000	PL	880	23
ETHYL ACRYLATE	140885	370	Ingestion	1700	Ingestion	22000	Inhalation	0.32	0.012
ETHYL BENZENE	100414	22000	Ingestion	190000	PL	190000	PL	70	4.6
ETHYL ETHER	60297	44000	Ingestion	190000	PL	190000	PL	190	5.3
ETHYL METHANESULFONATE	62500	100	TR	100	TR	190000	PL	0.5	NA
ETHYLAMINE	75047	100	TR	100	TR	190000	PL	0.5	0.0057
ETHYLENE CHLORHYDRIN	107073	100	TR	100	TR	190000	PL	0.5	NA
ETHYLENE GLYCOL	107211	190000	PL	190000	PL	190000	Inhalation	600	7.3
ETHYLENE OXIDE	75218	18	Ingestion	78	Ingestion	3000	PL	0.043	0.00065
ETHYLENE THIOUREA	96457	18	Ingestion	230	Ingestion	190000	PL	0.03	NA
ETHYLENEDIAMINE	107153	4400	Ingestion	57000	Ingestion	190000	PL	19	NA
ETHYLENEIMINE	151564	0.28	Ingestion	1.2	Ingestion	190000	PL	0.001	1.1
ETHYLMETHACRYLATE	97632	20000	Ingestion	190000	PL	190000	PL	88	NA
FAMPHUR	52857	100	TR	100	TR	190000	PL	0.5	NA

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FENAMIPHOS	22224926	55	Ingestion	710	Ingestion	190000	PL	0.2	0.017
FENSULFOTHION	115902	100	TR	100	TR	190000	PL	0.5	0.015
FLUORANTHENE	206440	8800	Ingestion	110000	Ingestion	190000	PL	23	2800
FLUORENE	86737	8800	Ingestion	110000	Ingestion	190000	PL	39	780
FLUORINE	7782414	13000	Ingestion	170000	Ingestion	190000	PL	220	NA
FLUOROTRICHLOROMETHANE (FREON 11)	75694	66000	Ingestion	190000	PL	190000	PL	200	9
FONOFOS	944229	440	Ingestion	5700	Ingestion	190000	PL	1	2.8
FORMALDEHYDE	50000	390	Ingestion	1700	Ingestion	23000	Inhalation	100	1.2
FORMIC ACID	64186	190000	PL	190000	PL	190000	PL	7300	82
FURFURAL	98011	660	Ingestion	8500	Ingestion	190000	PL	11	0.14
GLYPHOSATE	1071836	22000	Ingestion	190000	PL	190000	PL	70	630
HEPTACHLOR	76448	4	Ingestion	18	Ingestion	190000	PL	0.04	0.68
HEPTACHLOR EPOXIDE	1024573	2	Ingestion	8.7	Ingestion	190000	PL	0.02	1
HEPTACHLOROBIPHENYL	28655712	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
HEXACHLOROBENZENE	118741	11	Ingestion	50	Ingestion	190000	PL	0.1	0.96
HEXACHLOROBIPHENYL	26601649	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
HEXACHLOROBUTADIENE	87683	44	Ingestion	570	Ingestion	190000	PL	0.1	1.2
HEXACHLOROCYCLOPENTADIENE	77474	1500	Ingestion	20000	Ingestion	190000	PL	5	91
HEXACHLORODIBENZO-P-DIOXINS		0.0012	Ingestion	0.0053	Ingestion	190000	PL	0.0000044	NA
HEXACHLORODIBENZOFURANS		0.0012	Ingestion	0.0053	Ingestion	190000	PL	0.0000044	NA
HEXACHLOROETHANE	67721	220	Ingestion	2800	Ingestion	190000	PL	0.1	0.56
HEXACHLOROPHENE	70304	66	Ingestion	850	Ingestion	190000	PL	0.3	NA
HEXACHLOROPROPENE	1888717	100	TR	100	TR	190000	PL	0.5	NA
HEXAMETHYLENE DIISOCYANATE	822060	0.63	Ingestion	8.1	Ingestion	190000	PL	0.01	NA
HEXANE	110543	13000	Ingestion	170000	Ingestion	190000	PL	56	510
HEXANONE, 2- (METHYL N-BUTYL KETONE)	591786	100	TR	100	TR	190000	PL	0.5	0.012
HYDRAZINE	302012	6	Ingestion	26	Ingestion	190000	PL	0.022	NA
HYDROGEN CHLORIDE	7647010	1300	Ingestion	16000	Ingestion	190000	Inhalation	5.6	NA
HYDROGEN CYANIDE	74908	4400	Ingestion	57000	Ingestion	29000	Inhalation	0.83	NA
HYDROGEN FLUORIDE	7664393	370	Ingestion	4800	Ingestion	57000	Inhalation	1.6	NA
HYDROGEN SULFIDE	7783064	660	Ingestion	8500	Ingestion	190000	PL	0.28	NA
HYDROQUINONE	123319	8800	Ingestion	110000	Ingestion	190000	PL	150	NA
INDENO[1,2,3-CD]PYRENE	193395	25	Ingestion	110	Ingestion	190000	PL	0.0022	170
IODOMETHANE	74884	100	TR	100	TR	100	TR	0.5	0.0084
IRON	7439896	66000	Ingestion	850000	Ingestion	190000	PL	1100	NA
IRON PENTACARBONYL	13463406	100	Ingestion	100	Ingestion	190000	PL	0.5	NA

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ISOAMYL ACETATE	123922	100	TR	100	TR	190000	PL	0.5	0.017
ISOBUTYL ACETATE	110190	100	TR	100	TR	100	TR	0.5	0.032
ISOBUTYL ALCOHOL	78831	66000	Ingestion	190000	PL	190000	PL	290	7.6
ISODRIN	465736	100	TR	100	TR	190000	PL	0.5	4.3
ISOPHORONE	78591	19000	Ingestion	83000	Ingestion	190000	PL	10	0.19
ISOPHORONE DIISOCYANATE	4098719	100	TR	100	TR	190000	PL	0.5	NA
ISOSAFROLE	120581	100	TR	100	TR	190000	PL	0.5	NA
KEPONE	143500	1.1	Ingestion	5	Ingestion	190000	PL	0.0041	0.56
LEAD	7439921	500	UBKM	1000	SEGHM	NA	NA	0.5	NA
LITHIUM	7439932	100	TR	100	TR	NA	NA	0.5	NA
LITHIUM HYDRIDE	7580678	100	TR	100	TR	NA	NA	0.5	NA
MALATHION	121755	4400	Ingestion	57000	Ingestion	190000	PL	20	67
MALEIC ANHYDRIDE	108316	22000	Ingestion	190000	PL	190000	PL	370	NA
MALEIC HYDRAZIDE	123331	110000	Ingestion	190000	PL	190000	PL	400	4.7
MANGANESE	7439965	10000	Ingestion	130000	Ingestion	NA	NA	5	NA
MANGANESE CYCLOPENTADIENYL TRICARBONYL	12079651	100	TR	100	TR	NA	NA	0.5	NA
MELPHALAN	148823	0.14	Ingestion	0.61	Ingestion	190000	PL	0.0005	NA
MERCURY	7439976	19	Ingestion	240	Ingestion	NA	NA	0.2	NA
METHACRYLONITRILE	126987	22	Ingestion	280	Ingestion	6800	Inhalation	0.19	0.0031
METHANOL	67561	110000	Ingestion	190000	PL	190000	PL	490	5.8
METHOMYL	16752775	5500	Ingestion	71000	Ingestion	190000	PL	20	0.32
METHOXYCHLOR	72435	1100	Ingestion	14000	Ingestion	190000	PL	4	630
METHYL CHLORIDE	74873	1400	Ingestion	6100	Ingestion	170000	Inhalation	0.3	0.0038
METHYL ETHYL KETONE	78933	130000	Ingestion	190000	PL	190000	PL	280	5.3
METHYL ETHYL KETONE PEROXIDE	1338234	131000	Ingestion	190000	PL	190000	PL	2200	NA
METHYL HYDRAZINE	60344	100	TR	100	TR	190000	PL	0.5	NA
METHYL ISOAMYL KETONE	110123	100	TR	100	TR	100	TR	0.5	0.01
METHYL ISOBUTYL KETONE	108101	18000	Ingestion	190000	PL	190000	PL	22	0.34
METHYL ISOCYANATE	624839	100	TR	100	TR	100	TR	0.5	0.0068
METHYL MERCAPTAN	74931	100	TR	100	TR	100	TR	0.5	0.0077
METHYL METHACRYLATE	80626	18000	Ingestion	190000	PL	190000	PL	78	1.1
METHYL METHANESULFONATE	66273	180	Ingestion	800	Ingestion	190000	PL	0.67	0.0083
METHYL PARATHION	298000	55	Ingestion	710	Ingestion	190000	PL	0.2	0.042
METHYL TERT-BUTYL ETHER (MTBE)	1634044	190000	Ingestion	190000	PL	190000	PL	2	0.028
METHYLAMINE	74895	100	TR	100	TR	100	TR	0.5	0.007
METHYLCHLOROPHENOXYACETIC ACID (MCPA)	94749	100	TR	100	TR	190000	PL	1	0.039

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REGULATED SUBSTANCE	CASRN	MSC	Basis	Surface Soil	Basis	Subsurface Soil	Basis	100x GW MSC	Model - Unsaturated Zone Soil
METHYLCHOLANTHRENE, 3-	56495	0.81	Ingestion	3.6	Ingestion	190000	PL	0.003	NA
METHYLENE BIS (2-CHLOROANILINE), 4,4′- (MOCA)	101144	140	Ingestion	610	Ingestion	190000	PL	0.51	NA
METHYLENE DIANILINE, 4,4-	101779	11	Ingestion	50	Ingestion	190000	PL	0.042	NA
METHYLNAPHTHALENE, 2-	91576	8800	Ingestion	110000	Ingestion	97000	Inhalation	2.8	110
MEVINPHOS	7786347	100	TR	100	TR	100	TR	0.5	NA
MITOMYCIN C	50077	0.0022	Ingestion	0.0097	Ingestion	190000	PL	0.0000081	NA
MONOCROTOPHOS	6923224	100	TR	100	TR	190000	PL	0.5	0.0058
NALED	300765	440	Ingestion	5700	Ingestion	190000	PL	7.3	NA
NAPHTHALENE	91203	8800	Ingestion	110000	Ingestion	95000	Inhalation	2	0.5
NAPHTHOQUINONE, 1,4-	130154	100	TR	100	TR	100	TR	0.5	0.032
NAPHTHYLAMINE, 1-	134327	9.9	Ingestion	44	Ingestion	580	Inhalation	0.0084	0.069
NAPHTHYLAMINE, 2-	91598	9.9	Ingestion	44	Ingestion	190000	PL	0.037	0.0012
NICKEL	7440020	4400	Ingestion	57000	Ingestion	NA	NA	10	NA
NITRATE-NITROGEN (TOTAL)	14797558	350000	Ingestion	NNL	NNL	NA	NA	1000	NA
NITRIC ACID	7697372	100	TR	100	TR	NA	NA	0.5	NA
NITRITE-NITROGEN (TOTAL)	14797650	22000	Ingestion	280000	Ingestion	NA	NA	100	NA
NITRO-O-TOLUIDINE, 5-	99558	540	Ingestion	2400	Ingestion	190000	PL	2	NA
NITROANILINE, M-	99092	13	Ingestion	160	Ingestion	1900	Inhalation	0.056	0.00088
NITROANILINE, O-	88744	13	Ingestion	160	Ingestion	1900	Inhalation	0.056	0.001
NITROANILINE, P-	100016	13	Ingestion	160	Ingestion	190000	PL	0.21	0.0031
NITROBENZENE	98953	110	Ingestion	1400	Ingestion	19000	Inhalation	0.56	0.025
NITROPHENOL, 2-	88755	14000	Ingestion	180000	Ingestion	190000	PL	60	1.2
NITROPHENOL, 4-	100027	14000	Ingestion	180000	Ingestion	190000	PL	6	0.42
NITROPROPANE, 2-	79469	1.9	Ingestion	8.4	Ingestion	110	Inhalation	0.0016	0.000026
NITROQUINOLINE-1-OXIDE, 4-	56575	100	TR	100	TR	190000	PL	0.5	NA
NITROSODI-N-BUTYLAMINE, N-	924163	3.3	Ingestion	15	Ingestion	190	Inhalation	0.0027	NA
NITROSODI-N-PROPYLAMINE, N-	621647	2.6	Ingestion	11	Ingestion	150	Inhalation	0.0022	0.000031
NITROSODIETHYLAMINE, N-	55185	0.12	Ingestion	0.53	Ingestion	190000	PL	0.00044	0.0000077
NITROSODIMETHYLAMINE, N-	62759	0.35	Ingestion	1.6	Ingestion	190000	PL	0.0013	0.000017
NITROSODIPHENYLAMINE, N-	86306	3700	Ingestion	16000	Ingestion	120000	Inhalation	1.7	0.26
NITROSOMETHYLETHYLAMINE, N-	10595956	0.81	Ingestion	3.6	Ingestion	190000	PL	0.003	NA
NITROSOMORPHOLINE, N-	59892	2.7	Ingestion	12	Ingestion	190000	PL	0.0099	NA
NITROSOPIPERIDINE, N-	100754	1.9	Ingestion	8.4	Ingestion	190000	PL	0.0071	NA
NITROSOPYRROLIDINE, N-	930552	8.5	Ingestion	38	Ingestion	190000	PL	0.032	NA
NITROTOLUENE	88722	2200	Ingestion	28000	Ingestion	190000	PL	37	NA
NONACHLOROBIPHENYL	53742077	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA

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OCTACHLOROBIPHENYL	55722264	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
OCTYL PHTHALATE, DI-N-	117840	4400	Ingestion	57000	Ingestion	190000	PL	4	190000
OSMIUM TETROXIDE	20816120	100	TR	100	TR	NA	NA	0.5	NA
OXAMYL (VYDATE)	23135220	5500	Ingestion	71000	Ingestion	190000	PL	20	0.26
OZONE	10028156	11000	Ingestion	150000	Ingestion	NA	NA	190	NA
PARATHION	56382	1300	Ingestion	17000	Ingestion	190000	PL	22	130
PCB-1016 (AROCLOR)	12674112	15	Ingestion	200	Ingestion	3000	Inhalation	0.068	18
PCB-1221 (AROCLOR)	11104282	36	Ingestion	160	Ingestion	2700	Inhalation	0.03	0.14
PCB-1232 (AROCLOR)	11141165	36	Ingestion	160	Ingestion	190000	PL	0.13	0.52
PCB-1242 (AROCLOR)	53469219	36	Ingestion	160	Ingestion	190000	PL	0.13	16
PCB-1248 (AROCLOR)	12672296	9.9	Ingestion	44	Ingestion	190000	PL	0.037	18
PCB-1254 (AROCLOR)	11097691	4.4	Ingestion	44	Ingestion	190000	PL	0.037	75
PCB-1260 (AROCLOR)	11096825	30	Ingestion	130	Ingestion	190000	PL	0.11	500
PENTABORANE	19624227	100	TR	100	TR	NA	NA	0.5	NA
PENTACHLOROBENZENE	608935	180	Ingestion	2300	Ingestion	190000	PL	2.9	230
PENTACHLORODIBENZO-P-DIOXINS		0.00024	Ingestion	0.0011	Ingestion	190000	PL	0.00000088	NA
PENTACHLORODIBENZOFURANS		0.00024	Ingestion	0.0011	Ingestion	190000	PL	0.00000088	NA
PENTACHLOROETHANE	76017	100	TR	100	TR	190000	PL	0.5	2.4
PENTACHLORONITROBENZENE	82688	69	Ingestion	310	Ingestion	190000	PL	0.26	5.2
PENTACHLOROPHENOL	87865	6600	Ingestion	85000	Ingestion	190000	PL	0.1	5
PERCHLOROMETHYL MERCAPTAN	594423	100	TR	100	TR	100	TR	0.5	NA
PHENACETIN	62442	8100	Ingestion	36000	Ingestion	190000	PL	30	1.2
PHENANTHRENE	85018	66000	Ingestion	190000	PL	190000	PL	290	28000
PHENOL	108952	130000	Ingestion	190000	PL	190000	PL	400	6.6
PHENYL MERCAPTAN	108985	100	TR	100	TR	100	TR	0.5	0.076
PHENYLENEDIAMINE, M-	108452	1300	Ingestion	17000	Ingestion	190000	PL	22	0.31
PHENYLENEDIAMINE, O-	95545	380	Ingestion	1700	Ingestion	190000	PL	1.4	NA
PHENYLENEDIAMINE, P-	106503	42000	Ingestion	190000	PL	190000	PL	690	NA
PHORATE	298022	44	Ingestion	570	Ingestion	190000	PL	0.73	0.16
PHOSGENE	75445	750	Ingestion	9700	Ingestion	115000	Inhalation	3.3	NA
PHOSPHINE	7803512	66	Ingestion	850	Ingestion	2900	Inhalation	0.083	NA
PHOSPHORIC ACID	7664382	630	Ingestion	8100	Ingestion	NA	NA	10	NA
PHOSPHORUS AND COMPOUNDS	7723140	4.4	Ingestion	57	Ingestion	NA	NA	0.073	NA
PHTHALIC ANHYDRIDE	85449	190000	PL	190000	PL	190000	PL	33	1
PICOLINE, 2-	109068	100	TR	100	TR	100	TR	0.5	0.017
POLYCHLORINATED BIPHENYLS (PCB)	1336363	2.3	Ingestion	10	Ingestion	190000	PL	0.05	NA

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REGULATED SUBSTANCE	CASRN	MSC	Basis	Surface Soil	Basis	Subsurface Soil	Basis	100x GW MSC	Model - Unsaturated Zone Soil
PRONAMIDE	23950585	16000	Ingestion	190000	PL	190000	PL	5	0.3
PROPANOL, 1-	71238	100	TR	100	TR	190000	PL	0.5	0.0059
PROPANOL, 2- (ISOPROPYL ALCOHOL)	67630	100	TR	100	TR	190000	PL	0.5	0.0087
PROPARGYL ALCOHOL	107197	440	Ingestion	5700	Ingestion	190000	PL	7.3	NA
PROPIONIC ACID	79094	100	TR	100	TR	100	TR	0.5	NA
PROPIONITRILE (ETHYL CYANIDE)	107120	100	TR	100	TR	100	TR	0.5	0.0092
PROPYLENE GLYCOL MONOMETHYL ETHER	107982	150000	Ingestion	190000	PL	190000	PL	2600	NA
PROPYLENE IMINE	75558	100	TR	100	TR	100	TR	0.5	NA
PROPYLENE OXIDE	75569	75	Ingestion	330	Ingestion	80000	Inhalation	0.28	0.0048
PYRENE	129000	6600	Ingestion	85000	Ingestion	190000	PL	14	2400
PYRETHRUM	8003347	100	TR	100	TR	190000	PL	0.5	NA
PYRIDINE	110861	220	Ingestion	2800	Ingestion	34000	Inhalation	0.97	0.011
QUINONE (p-BENZOQUINONE)	106514	100	TR	100	TR	190000	PL	0.5	0.0093
RESORCINOL	108463	100	TR	100	TR	100	TR	0.5	0.0058
SAFROLE	94597	81	Ingestion	360	Ingestion	4800	Inhalation	0.069	NA
SELENIUM	7782492	1100	Ingestion	14000	Ingestion	NA	NA	5	NA
SELENIUM HEXAFLUORIDE	7783791	100	TR	100	TR	NA	NA	0.5	NA
SILVER	7440224	1100	Ingestion	14000	Ingestion	NA	NA	10	NA
SIMAZINE	122349	150	Ingestion	660	Ingestion	190000	PL	0.4	0.016
SODIUM AZIDE	26628228	880	Ingestion	11000	Ingestion	NA	NA	15	NA
SODIUM BISULFITE	7631905	100	TR	100	TR	NA	NA	0.5	NA
SODIUM FLUOROACETATE	62748	4.4	Ingestion	57	Ingestion	NA	NA	0.073	NA
SODIUM HYDROXIDE	1310732	300	Ingestion	3900	Ingestion	NA	NA	5	NA
STRONTIUM CHROMATE	7789062	66	Ingestion	850	Ingestion	NA	NA	1.1	NA
STRYCHNINE	57249	66	Ingestion	850	Ingestion	190000	PL	1.1	0.09
STYRENE	100425	44000	Ingestion	190000	PL	190000	PL	10	2.4
SULFATE	14808798	1600	Ingestion	20000	Ingestion	NA	NA	26	NA
SULFIDE	18496258	100	TR	100	TR	100	TR	0.5	NA
SULFOTEP	3689245	110	Ingestion	1400	Ingestion	190000	PL	1.8	0.27
SULFUR MONOCHLORIDE	10025679	100	TR	100	TR	NA	NA	0.5	NA
SULFURIC ACID	7664939	100	TR	100	TR	NA	NA	0.5	NA
TELLURIUM	13494809	100	TR	100	TR	NA	NA	0.5	NA
TELLURIUM HEXAFLUORIDE	7783804	100	TR	100	TR	NA	NA	0.5	NA
TEPP	107493	100	TR	100	TR	190000	PL	0.5	NA
TERBUFOS	13071799	5.5	Ingestion	71	Ingestion	190000	PL	0.09	0.013
TETRACHLOROBENZENE, 1,2,4,5-	95943	66	Ingestion	850	Ingestion	190000	PL	1.1	NA

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TETRACHLOROBIPHENYL	2051629	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8- (TCDD)	1746016	0.00012	Ingestion	0.00053	Ingestion	190000	PL	0.000003	0.032
TETRACHLORODIBENZOFURANS		0.0012	Ingestion	0.0053	Ingestion	190000	PL	0.0000044	NA
TETRACHLOROETHANE, 1,1,1,2-	630206	690	Ingestion	3100	Ingestion	41000	Inhalation	7	NA
TETRACHLOROETHANE, 1,1,2,2-	79345	66	Ingestion	290	Ingestion	5200	Inhalation	0.07	0.0022
TETRACHLOROETHYLENE (PCE)	127184	340	Ingestion	1500	Ingestion	190000	PL	0.5	0.043
TETRACHLOROPHENOL, 2,3,4,6-	58902	6600	Ingestion	85000	Ingestion	190000	PL	110	1700
TETRAETHYL LEAD	78002	0.022	Ingestion	0.28	Ingestion	190000	PL	0.00037	0.0046
TETRAHYDROFURAN	109999	100	TR	100	TR	100	TR	0.5	0.011
TETRAMETHYL LEAD	75741	0.022	Ingestion	0.28	Ingestion	190000	PL	0.00037	NA
TETRANITROMETHANE	509148	100	TR	100	TR	100	TR	0.5	NA
THALLIUM	7440280	18	Ingestion	230	Ingestion	NA	NA	0.2	NA
THIONAZIN	297972	100	TR	100	TR	190000	PL	0.5	NA
THIRAM	137268	1100	Ingestion	14000	Ingestion	190000	PL	18	47
TIN	7440315	130000	Ingestion	NNL	NNL	NA	NA	2200	NA
TOLUENE	108883	44000	Ingestion	190000	PL	190000	PL	100	4.4
TOLUENE-2,4-DIISOCYANATE	584849	5.9	Ingestion	77	Ingestion	190000	PL	0.099	NA
TOLUIDINE, M-	95534	75	Ingestion	330	Ingestion	190000	PL	0.28	0.013
TOLUIDINE, O	95534	99	Ingestion	440	Ingestion	190000	PL	0.37	0.042
TOLUIDINE, P-	106490	94	Ingestion	420	Ingestion	190000	PL	0.35	0.032
TOXAPHENE	8001352	16	Ingestion	72	Ingestion	190000	PL	0.3	1.2
TRIBROMOMETHANE (BROMOFORM)	75252	2300	Ingestion	10000	Ingestion	190000	PL	10	0.43
TRICHLOROBENZENE, 1,2,4-	120821	2200	Ingestion	28000	Ingestion	190000	PL	7	28
TRICHLOROBENZENE, 1,3,5-	180703	2200	Ingestion	28000	Ingestion	190000	PL	4	31
TRICHLOROBIPHENYL	2051618	2.3	Ingestion	10	Ingestion	190000	PL	0.0086	NA
TRICHLOROETHANE, 1,1,1-	71556	130000	Ingestion	190000	PL	190000	PL	20	0.72
TRICHLOROETHANE, 1,1,2-	79005	310	Ingestion	1400	Ingestion	19000	Inhalation	0.5	0.015
TRICHLOROETHYLENE (TCE)	79016	440	Ingestion	5700	Ingestion	180000	Inhalation	0.5	0.017
TRICHLOROPHENOL, 2,4,5-	95954	22000	Ingestion	190000	PL	190000	PL	370	2300
TRICHLOROPHENOL, 2,4,6-	88062	1600	Ingestion	7200	Ingestion	190000	PL	6	17
TRICHLOROPHENOXYACETIC ACID, 2,4,5- (2,4,5-T)	93765	2200	Ingestion	28000	Ingestion	190000	PL	7	0.15
TRICHLOROPHENOXYPROPIONIC ACID, 2,4,5- (2,4,5-TP)	93721	1800	Ingestion	23000	Ingestion	190000	PL	5	22
TRICHLOROPROPANE, 1,2,3-	96184	2.6	Ingestion	11	Ingestion	150	Inhalation	0.5	0.041
TRIETHYLAMINE	121448	100	TR	100	TR	100	TR	0.5	0.012
TRIETHYLPHOSPHOROTHIOATE, O,O,O-	126681	100	TR	100	TR	100	TR	0.5	NA
TRIFLURALIN	1582098	1600	Ingestion	10000	Ingestion	190000	PL	0.5	NA

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TRIMETHYLAMINE	75503	440	Ingestion	5700	Ingestion	67000	Inhalation	1.9	0.09
TRINITROBENZENE, 1,3,5-	99354	11	Ingestion	140	Ingestion	190000	PL	0.18	NA
TRINITROGLYCEROL (NITROGLYCERIN)	55630	100	TR	100	TR	190000	PL	0.5	NA
VANADIUM	7440622	13	Ingestion	160	Ingestion	NA	NA	0.21	NA
VANADIUM PENTOXIDE	1314621	2000	Ingestion	26000	Ingestion	NA	NA	33	NA
VINYL ACETATE	108054	190000	Ingestion	190000	PL	190000	PL	56	0.66
VINYL BROMIDE	593602	160	Ingestion	710	Ingestion	9400	Inhalation	0.14	NA
VINYL CHLORIDE	75014	9.4	Ingestion	42	Ingestion	3600	Inhalation	0.2	0.0027
WARFARIN	81812	66	Ingestion	850	Ingestion	190000	PL	0.000000092	0.000000022
XYLENES (TOTAL)	1330207	190000	PL	190000	PL	190000	PL	1000	85
ZINC AND COMPOUNDS	7440666	66000	Ingestion	850000	Ingestion	NA	NA	500	NA

UBKM = Uptake Biokinetic Model for Lead
SEGHM = Society for Environmental Geochemistry and Health Model

NNL designations apply to estimated MSCs for inorganic regulated substances which mathematically exceed unity (1,000,000 mg/kg).

The PL value of 190,000 mg/kg applies to organic regulated substances only and is based on the physical limitation of soil to hold the substance. This value has been calculated by assuming a soil bulk density of 1.8 g/cc, soil porosity of 35%, and a regulated substance density of 1.0 g/cc.

The soil-to-groundwater model values in this table are designed to be applied to unsaturated soils. The value to be used for saturated soils can be calculated by dividing the unsaturated soil value by 10.

All concentrations in mg/kg (dry weight).
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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
ACENAPHTHENE	83329	0.06		0.06		4897.7882	1.5E-04	154.21	X	4.1E+00	3.0E-06	15806230	2379138.29
ACENAPHTHYLENE	208968	0.06		0.06		4466.8359	1.1E-03	152.2	X	3.9E+00	2.9E-05	15893018	2351240.56
ACETALDEHYDE	75070	0.0022	14258.31	0.0028	0.0077	4.0738028	7.2E-05	44.1	X	6.0E+05	9.8E-01	15894943	2387187.56
ACETIC ACID	64197	TR	TR	TR	TR	1	4.0E-06	60.05		2.0E+05	1.3E-02	NA	NA
ACETIC ANHYDRIDE	108247	TR	TR	TR	TR	16.218101	1.0E-05	102.09	X	1.2E+05	1.2E-02	15873751	2362471.98
ACETONE	67641	0.1		8.86		0.3090295	2.1E-05	58.08	X	6.0E+05	3.0E-03	15888475	2371514.92
ACETONITRILE	75058	0.006		0.006		0.5011872	2.4E-05	41.05	X	2.0E+05	1.2E-01	15892074	2377716.3
ACETOPHENONE	98862	0.1		0.1		173.78008	1.0E-05	120.1		6.1E+03	5.2E+04	NA	NA
ACETYLAMINOFLUORENE, 2- (2AAF)	53963		3.8		4.55	1584.8932	3.7E-04	223.26		2.1E+05	3.5E-01	NA	NA
ACROLEIN	107028	0.02		5.714E-06		0.5623413	9.4E-05	56.1	X	1.1E+05	3.4E-01	15898202	2388619.46
ACRYLAMIDE	79061	0.0002	4.5	0.0002	4.55	24.547089	3.0E-10	71.08		2.2E+06	9.2E-06	NA	NA
ACRYLIC ACID	79107	0.5		0.0002857		28.840315	3.0E-06	72.06		1.0E+06	4.2E-02	NA	NA
ACRYLONITRILE	107131	0.001	0.54	0.0005714	0.238	11.481536	1.0E-04	53.06	X	7.5E+04	1.4E-01	15894840	2387063.11
ADJUSTED GROSS ALPHA PARTICLE		TR	TR	TR	TR							NA	NA
ALACHLOR	15972608	0.01	0.08	0.01	0.08	109.64782	3.2E-08	269.77		2.4E+02	2.9E-08	NA	NA
ALDICARB	116063	0.001		0.001		21.877616	4.2E-09	190.25		6.0E+03	1.3E-07	NA	NA
ALDRIN	309002	0.00003	17	0.00003	17.15	47863.009	1.0E-05	365		7.8E-02	2.2E-08	NA	NA
ALLYL ALCOHOL	107186	0.005		0.005		3.2359366	1.5E-05	58.1	X	9.9E+04	2.6E-02	15891438	2376140.63
ALUMINUM	7429905	1		1				27				NA	NA
AMINOBIPHENYL, 4-	92671		21		21	107.15193	3.1E-07	169.23		3.6E+02	6.4E-07	NA	NA
AMITROLE	61825		0.94		0.945	117.48976	4.0E+04	84.08	X	2.8E-05	1.3E-02	17143258	2377003.82
AMMONIA	7664417	0.971		0.0285714			3.3E-04	17.03	X	5.1E+05	9.3E+00	15938254	2382698.2
AMMONIUM CHLORIDE	12125092	0.2		0.2				53.5				NA	NA
AMMONIUM SULFAMATE	7773060	0.2		0.2				114.13				NA	NA
AMYL ACETATE, N-	628637	TR	TR	TR	TR	457.08819	2.0E-05	130.2	X	3.7E+04	5.5E-03	15818089	2372299.86
AMYL ACETATE, SEC-	626380	TR	TR	TR	TR	17378.008		130.2					
ANILINE	62533	0.0016	0.0057	0.0002857	0.0056	190.54607	2.3E-06	93.1		3.6E+04	8.8E-04	NA	NA
ANTHRACENE	120.127	0.3		0.3		21379.621	3.4E-05	178.23	X	1.3E+00	1.7E-09	15674770	3636690.49
ANTIMONY	7440360	0.0004		0.0004				121.75				NA	NA
ANTIMONY TRIOXIDE	1309644	0.0004		5.714E-05				291.52				NA	NA
ANTU (ALPHA-NAPHTHYLTHIOUREA)	86884	TR	TR	TR	TR	128.82496	0.0E+00	202.27		6.0E+02		NA	NA
ARAMITE	140578	0.05	0.025	0.05	0.02485		3.0E-04	334.87		1.8E+04	1.6E-02	NA	NA
ARSENIC	7440382	0.0003	1.5	0.0003	15.05			74.9				NA	NA
ASBESTOS	12001295				805							NA	NA
ATRAZINE	1912249	0.035	0.222	0.035	0.222	134.89629	1.2E-09	215.68		7.0E+01	3.9E-10	NA	NA
AZINPHOS-METHYL (GUTHION)	86500	TR	TR	TR	TR	1023.293	9.5E-08	317.3		3.3E+01	9.9E-09	NA	NA
BARIUM AND COMPOUNDS	7440393	0.07		0.0001429				137.3				NA	NA
BAYGON (PROPOXUR)	114261	0.004		0.004			2.7E-06	209.24		1.8E+03	2.3E-05	NA	NA
BENZENE	71432		0.029		0.02905	57.543994	5.5E-03	78.11	X	1.8E+03	1.2E-01	16119161	2375875.35
BENZIDINE	92875	0.003	230	0.003	234.5	2884.0315	3.9E-11	184.23		5.2E+02	1.1E-10	NA	NA
BENZO[A]ANTHRACENE	56553		0.73		0.385	354813.39	3.8E-06	228		1.3E-02	2.0E-10	NA	NA
BENZO[A]PYRENE	50328		7.3		3.85	912010.84	8.4E-07	252.3		1.9E-03	6.4E-12	NA	NA
BENZO[B]FLUORANTHENE	205992		0.73		0.385	549540.87	2.9E-05	252		4.3E-03	4.9E-10	NA	NA
BENZO[GHI]PERYLENE	191242	0.06		0.06		2818382.9	1.4E-07	272		2.6E-04	1.3E-13	NA	NA

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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
BENZO[K]FLUORANTHENE-THENE	207089		0.073		0.0385	4365158.3	1.1E-09	252		2.9E-02	1.3E-13	NA	NA
BENZOIC ACID	65850	4		4		32.359366	5.5E-04	122.1	X	2.9E+03	1.3E-02	15913856	2386722.73
BENZYL ALCOHOL	100516	0.3		0.3		101.19	3.9E-07	108.13		4.0E+04	1.4E-04	NA	NA
BENZYL CHLORIDE	100447		0.17		0.172	190.54607	4.0E-04	126.58	X	4.9E+02	1.6E-03	15884608	2367938.92
BERYLLIUM	7440417	0.005	4.3	0.005	8.4			9				NA	NA
BETA PARTICLE AND PHOTON		TR	TR	TR	TR							NA	NA
BETA PROPIOLACTONE	57578	TR	TR	TR	TR	3.801894	9.2E-07	72.06		3.5E+05	4.5E-03	NA	NA
BHC, ALPHA	319846	0.0003	6.3	0.0003	6.3	1778.2794	6.8E-06	290.85		2.4E+00	5.6E-08	NA	NA
BHC, BETA-	319857	0.0003	1.8	0.0003	1.855	2290.8677	3.5E-07	290.85		5.4E-01	6.5E-10	NA	NA
BHC, DELTA-	319868	0.0003		0.0003		1905.4607	3.4E-06	290.85		2.1E+01	2.6E-05	NA	NA
BHC, GAMMA (LINDANE)	58899	0.0003	1.1	0.0003	1.085	1380.3843	3.4E-06	290.85		4.2E+00	4.9E-08	NA	NA
BIPHENYL	92524	0.05		0.05			2.7E-02	154.2	X	7.5E+00	1.3E-03	16682857	2372395.7
BIS(2-CHLORO-1-METHYLETHYL)ETHER	108601	TR	TR	TR	TR		1.1E-04	171.07	X	1.7E+03	1.1E-03	15895910	2387972.45
BIS(2-CHLORO-ISOPROPYL)ETHER	39638329	0.04		0.04		61.6595	1.0E-04	171.07	X	1.7E+03	1.0E-03	15870625	2361468.41
BIS(2-CHLOROETH-OXY)METHANE	111911	TR	TR	TR	TR	114.81536	2.8E-07	173.05		8.1E+04	1.3E-04	NA	NA
BIS(2-CHLOROETHYL)-ETHER	111444		1.1		1.155	75.857758	2.1E-05	143.02	X	1.2E+04	1.8E-03	15882557	2353248.74
BIS(CHLOROMETHYL)-ETHER	542881		220		217	15.848932	2.1E-04	114.96	X	2.2E+04	3.9E-02	15896138	2388090.71
BIX[2-ETHYLHEXYL] PHTHALATE	117817	0.02	0.014	0.02	0.0084	87096.359	8.3E-06	390.54		4.0E-01	8.5E-09	NA	NA
BORON	7440428	0.09		0.005714				10.8				NA	NA
BROMODICHLORO-METHANE	75274	0.02	0.062	0.02	0.13	93.32543	3.2E-03	163.8	X	4.0E+03	7.7E-02	15992219	2377574.31
BROMOMETHANE	74839	0.0014		0.0014		169.82437	1.4E-02	94.95	X	1.4E+04	2.2E+00	16112601	2375835.15
BROMOPHENYL PHENYL ETHER, 4-	101553	TR	TR	TR	TR	87096.359	2.1E-02	249.11		2.1E+01	1.8E-03	NA	NA
BUTADIENE, 1-3,	106990		3.4		0.98		1.5E-01	54.09	X	7.4E+02	2.0E+00	16998716	2375462.39
BUTYL ACETATE, N-	123864	TR	TR	TR	TR	234.42288	3.0E-04	116.2	X	5.1E+03	1.3E-02	15874508	2362737.32
BUTYL ACETATE, SEC-	105464	TR	TR	TR	TR	190.54607		116.2					
BUTYL ACETATE, TERT-	540885	TR	TR	TR	TR	112.20185		116.2					
BUTYL ALCOHOL, N-	71363	0.1		0.1		3.1622777	5.3E-06	74.12		7.7E+04	5.5E-03	NA	NA
BUTYL PHTHALATE, DI-N-	84742	0.1		0.1		1584.8932	1.4E-06	278.34		1.1E+01	5.6E-08	NA	NA
BUTYLAMINE, N-	109739	TR	TR	TR	TR	75.857758	1.6E-05	73.1	X	4.2E+05	9.5E-02	15883872	2352981.14
BUTYLBENZYL PHTHALATE	85687	0.2		0.2		33884.416	1.9E-06	312.4		2.6E+00	1.6E-08	NA	NA
CADMIUM	7440439	0.0005		0.0005	6.3			112.4				NA	NA
CADMIUM OXIDE	1306190	0.0005		0.0005	6.3			128.41				NA	NA
CALCIUM CHROMATE	13765190	TR	TR	TR	TR			156.09				NA	NA
CALCIUM CYANAMIDE	156627	TR	TR	TR	TR			80.11				NA	NA
CAPROLACTAM DUST	105602	0.5		0.5			4.3E-09	113.16		2.6E+05	9.6E-06	NA	NA
CAPTAN	133062	0.13	0.0035	0.13	0.00231	199.52623	1.2E-06	300.57		3.3E+00	1.3E-08	NA	NA
CARBARYL	63252	0.1		0.1		194.98446	8.8E-08	201.32		1.2E+02	5.3E-08	NA	NA
CARBOFURAN	1563662	0.005		0.005		42.657952	8.3E-09	221.3		7.0E+02	2.6E-08	NA	NA
CARBON DISULFIDE	75150	0.1		0.2		295.12092	1.3E-02	76.14	X	2.7E+03	4.5E-01	15894803	2387015.29
CARBON TETRACHLORIDE	56235	0.0007	0.13	0.00057	0.0525	162.18101	2.9E-02	153.82	X	7.9E+02	1.5E-01	16230357	2375998.05

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Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
CARBONYL FLUORIDE	353504	TR	TR	TR	TR			66.01		HYDROL			
CATECHOL	120809	TR	TR	TR	TR		3.4E-06	110.11		4.3E+05	1.3E-02	NA	NA
CHLORAL HYDRATE	75876	0.002		0.002		0.676083		147.4		0.0E+00	4.6E-02		
CHLORAMBEN	144904	0.015		0.015			3.5E-05	171.58	X	2.2E+04	4.5E-03	15888072	2371058.76
CHLORDANE	57749	0.00006	1.3	0.00006	1.3	97723.722	5.7E-05	409.8		2.2E-01	3.5E-08	NA	NA
CHLORDANE, ALPHA-	5103719	0.00006	1.3	0.00006	1.3	58884.366		409.8					
CHLORDANE, GAMMA-	5103742	0.00006	1.3	0.00006	1.3	457088.19		409.8					
CHLORINE	7782505	0.1		0.1				35.5				NA	NA
CHLORO-1-PROPENE, 3- (ALLYL CHLORIDE)	107051	0.000286		0.0002857		47.863009	1.1E-02	76.53	X	3.4E+03	4.8E-01	16235019	2375956.38
CHLOROACETALDE-HYDE	107200	TR	TR	TR	TR	3.2359366	4.8E-05	78.5	X	2.1E+05	1.3E-01	15889867	2373336.05
CHLOROACETOPHE-NONE, ALPHA	532274	8.57E-06		8.571E-06			3.9E-05	154.59	X	2.3E+02	5.8E-05	15889413	2372693.65
CHLOROANILINE, P-	106478	0.004		0.004		457.08819	1.1E-04	127.57	X	3.4E+03	2.8E-03	15892111	2351406.59
CHLOROBENZENE	108907	0.02		0.00571		204.17379	4.4E-03	113	X	4.1E+02	1.6E-02	15949776	2381186.89
CHLOROBENZILATE	510156	0.02	0.27	0.02	0.273	2630.268	1.2E-07	325.2		1.3E+01	4.8E-09	NA	NA
CHLORODIBROMO-METHANE	124481	0.02	0.084	0.02	0.0945	83.176377	2.5E-03	208.3		3.4E+03	4.1E-02	NA	NA
CHLOROETHANE	75003	2.86		2.86		41.686938	4.0E-02	65	X	5.7E+03	3.5E+00	16521640	2372096.02
CHLOROETHYL VINYL ETHER, 2-	110758	0.025		0.025		6.6069345	6.3E-04	106.55	X	6.0E+03	3.5E-02	15969426	2379173.62
CHLOROFORM	67663	0.01	0.0061	0.01	0.0805	56.234133	4.0E-03	119	X	8.0E+03	2.7E-01	16095019	2379173.62
CHLORONAPHTHA-LENE, 2-	91587	0.08		0.08		8511.3804	5.4E-04	162.61	X	6.7E+00	2.2E-05	15886770	2350124.27
CHLOROPHENOL, 2-	95578	0.005		0.005		398.10717	1.7E-05	128.56	X	2.1E+04	2.8E-03	15897009	2348248.56
CHLOROPHENYL PHENYL ETHER, 4-	7005723	TR	TR	TR	TR	3981.0717	2.2E-04	204.65		3.3E+00	3.6E-06	NA	NA
CHLOROPRENE	126998	0.02		0.0019999		50.118723	3.9E-02	88.5	X	6.3E+02	2.8E-01	16560815	2372004.81
CHLORPYRIFOS	2921882	0.003		0.003		4570.8819	4.3E-06	350.59		2.0E+00	2.5E-08	NA	NA
CHROMIUM (III)	16065831	1		5.714E-06				52				NA	NA
CHROMIUM (VI)	18540299	0.005		0.005	42			52				NA	NA
CHRYSENE	218019		0.0073		0.00385	489778.82	1.2E-06	228.2		1.9E-03	1.0E-11	NA	NA
COBALT	7440484	0.06		8.571E-06				58.9				NA	NA
COBALT CARBONYL	10210681	0.06		8.571E-06				341.95				NA	NA
COPPER	7440508	0.0371		0.0371				63.5				NA	NA
CRESOLS	1319773	0.005		0.005			8.8E-07	108.13		1.3E+05	3.6E-04	NA	NA
CRESOL, P-CHLORO-M-	59507	0.005		0.005		776.24712	1.7E-07	142.6		3.9E+03	4.6E-06	NA	NA
CROTONALDEHYDE	4170303		1.9		1.9	5.6234133	9.7E-06	70		1.8E+05	2.5E-02	NA	NA
CUMENE	98828	0.04		0.0025713		2818.3829	1.3E-02	120	X	5.6E+01	6.0E-03	15893281	2382402.33
CYANIDE, TOTAL	57125	0.02		0.02				26				NA	NA
CYANOGEN	460195	0.04		0.04			2.9E-02	52.04	X	9.3E+03	5.2E+00	16701653	2372522.77
CYANOGEN CHLORIDE	506774	0.04		0.04			2.7E-03	61.48	X	3.0E+04	1.3E+00	16191859	2376178.88
CYCLOHEXANE	110827	TR	TR	TR	TR	478.63009	1.1E-01	84.16	X	1.0E+02	1.3E-01	16294218	2375136.71
CYCLOHEXANONE	108941	5		5		66.069345	2.3E-05	99.17	X	2.3E+04	5.3E-03	15872327	2375136.71
CYCLOHEXYLAMINE	108918	0.2		0.2			0.0E+00	98.2		2.6E+04		NA	NA
CYCLOPHOSPHAMIDE (anhydrous)	50180		0.61		0.595		0.0E+00	261.1		4.0E+04		NA	NA
CYCLOPHOSPHAMIDE (hydrated)	6055192		0.57		0.56		0.0E+00	261.1		4.0E+04		NA	NA
DDD, 4,4′-	72548		0.24		0.242	43651.583	5.0E-06	320.1		7.3E-02	1.1E-09	NA	NA
DDE, 4,4′-	72559		0.34		0.34	87096.359	1.2E-04	318.03		1.9E-02	7.5E-09	NA	NA
DDT, 4,4′-	50293	0.0005	0.34	0.0005	0.34	239883.29	5.4E-05	354.5		3.4E-03	5.2E-10	NA	NA
DECABORANE	17702419	TR	TR	TR	TR			122.21					

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DECACHLOROBIPHENYL	2051243		7.7		7.7								
DEMETON	8065483	0.00004		0.00004		66.069345							
DIALLATE	2303164		0.061		0.061	190.54607	3.0E-06	270.24		1.4E+01	2.0E-07	NA	NA
DIAZINON	333415	0.0009		0.0009		501.18723	1.4E-06	304.36		4.0E+01	1.8E-07	NA	NA
DIBENZO[A,H]ANTHRACENE	53703		7.3		4.2	1819700.9	1.1E-08	278.35		6.7E-04	2.7E-14	NA	NA
DIBENZOFURAN	132649	TR	TR	TR	TR	10232.93	1.5E-04	168.19	X	1.0E+01	8.8E-06	15756048	2466779.96
DIBROMO-3-CHLOROPROPANE, 1,2-	96128	0.0000571	1.4	0.0000571	0.00242	138.03843	2.0E-04	236.3		1.2E+03	1.0E-03	NA	NA
DIBROMOETHANE, 1,2-(ETHYLENE DIBROM	106934	0.0000571	85	0.0000571	0.77	53.70318	4.6E-04	190	X	4.2E+03	1.0E-02	15897292	2388475.44
DIBROMOMETHANE	74953	0.01		0.01		109.64782	7.8E-04	173.86	X	1.2E+04	5.3E-02	15896766	2388336.06
DICAMBA	1918000	0.03		0.03		1.8620871		221.04					
DICHLORO-2-BUTENE, TRANS-1,3-	110576	TR	TR	TR	TR					INSOL			
DICHLOROBENZENE, 1,2-	95501	0.09		0.0571		354.81339	2.1E-03	147.01	X	1.3E+02	1.8E-03	15894456	2386483.13
DICHLOROBENZENE, 1,3-	541731	0.089		0.089		363.07805	1.6E-03	147.01	X	1.2E+02	1.3E-03	15893653	2384179.63
DICHLOROBENZENE, P-	106467	0.229	0.024	0.229	0.0385	512.86138	2.8E-03	147.01	X	7.3E+01	1.4E-03	15894352	2386285.29
DICHLOROBENZIDINE, 3,3′-	91941		0.45		1.19	22387.211	2.1E-08	253.13		3.5E+00	2.9E-10	NA	NA
DICHLOROBIPHENYL	2051607		7.7		7.7		0.0E+00			5.8E+00	1.3E-03	NA	NA
DICHLORODIFLUOROMETHANE (FREON 12)	75718	0.2		0.0571		363.07805	2.8E+00	120.92	X	3.0E+02	1.3E-03	17009360	2375578.1
DICHLOROETHANE, 1,1-	75343	0.1	0.0057	0.143	0.0056	52.480746	5.8E-03	98.96	X	5.2E+03	3.0E-01	16121950	2375893.1
DICHLOROETHANE, 1,2-	107062		0.091		0.091	38.01894	1.3E-03	98.96	X	8.3E+03	1.1E-01	15994581	2377446.08
DICHLOROETHYLENE, 1,1-	75354	0.009	0.6	0.009	0.175	64.565423	2.5E-02	96.95	X	3.0E+03	7.9E-01	16351093	2374105.23
DICHLOROETHYLENE, CIS-1,2-	156592	0.01		0.01		48.977882	4.5E-03	96.95	X	4.9E+03	2.3E-01	16092840	2375740.27
DICHLOROETHYLENE, TRANS-1,2-	156605	0.02		0.02		46.773514	5.6E-03	96.95	X	8.0E+03	4.6E-01	16128486	2375935.43
DICHLOROMETHANE (METHYLENE CHLORI	75092	0.06	0.0075	0.857	0.00165	15.848932	2.4E-03	84.93	X	1.7E+04	4.9E-01	16132116	2375959
DICHLOROPHENOL, 2,4-	120832	0.003		0.003		158.48932	2.4E-07	163.01		4.9E+03	7.2E-06	NA	NA
DICHLOROPHENOL, 2,6-	87650	0.003		0.003			9.5E-07	163.01		1.5E+04	8.8E-05	NA	NA
DICHLOROPHENOXY-ACETIC ACID, 2,4- (2,4-	94757	0.01		0.01		58.884366	4.5E-06	221.04		6.8E+02	1.4E-05	NA	NA
DICHLOROPROPANE, 1,2-	78875	0.00123	0.068	0.00123	0.068	46.773514	2.8E-03	112.99	X	2.7E+03	6.7E-02	16032937	2376106.3
DICHLOROPROPANE, 1,3-	142289		0.063		0.063		2.9E-03	112.99	X	1.5E+03	4.1E-02		2376154.09
DICHLOROPROPANE, 2,2-	590207	0.00123	0.068	0.00123	0.068			112.99					
DICHLOROPROPENE, 1,1-	563586	0.0003	0.18	0.00571	0.13			110.97					
DICHLOROPROPENE, 1,3-	542756	0.0003	0.18	0.00571	0.13		1.5E-03	110.97	X	2.8E+03	3.8E-02		
DICHLOROPROPIONIC ACID (DALAPON), 2,2	75990	0.03		0.03		61.6595		142.97					
DICHLORVOS	62737	0.0005	0.29	0.0001429	0.291	50.118723	3.5E-07	220.98		1.0E+04	1.6E-05	NA	NA
DICROTOPHOS	141662	0.0001		0.0001		45.708819		237.21		MISC	1.3E-07		
DIELDRIN	60571	0.00005	16	0.00005	16.1	10964.782	2.7E-06	381		1.9E-01	1.3E-09	NA	NA
DIETHANOLAMINE	111422	TR	TR	TR	TR		7.6E-11	105.14		1.0E+06	7.2E-07	NA	NA
DIETHYL PHTHALATE	84662	0.8		0.8		81.283052	5.5E-07	222.2		8.8E+02	2.2E-06	NA	NA
DIETHYLAMINE	109897	TR	TR	TR	TR	50.118723	0.0E+00	73.14		2.4E+05		NA	NA
DIGLYCIDYL ETHER (DGE)	2238075	TR	TR	TR	TR		130.16						

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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
DIMETHOATE	60515	0.0002		0.0002		109.64782	6.2E-11	229.28		2.5E+04	6.7E-09	NA	NA
DIMETHYL PHTHALATE	131113	TR	TR	TR	TR	45.708819	5.8E-07	194.18		4.2E+03	1.2E-05	NA	NA
DIMETHYL SULFATE	77781	TR	TR	TR	TR	4.0738028	5.9E-06	126.13		2.8E+04	1.3E-03	NA	NA
DIMETHYLAMINE	124403	0.000571		0.0005714		66.069345		45.08		0.0E+00	2.0E+00		
DIMETHYLAMINOAZO-BENZENE, P-	60117		4.6		4.55	1000	7.8E-08	225.3		2.4E+03	8.4E-07	NA	NA
DIMETHYLBENZ[A]AN-THRACENE, 7,12-	57976		13		13		1.9E-08	256.35		5.0E-02	3.8E-12	NA	NA
DIMETHYLBENZIDINE, 3,3′-	119937		9.2		9.2		5.6E-11	107.15		1.2E+03	4.9E-10	NA	NA
DIMETHYLHYDRAZINE, 1,1-	57147		1.72		1.72	0.1995262	1.2E-05	60.1	X	1.0E+06	2.1E-01	15880441	2365319.72
DIMETHYLPHENETHYL-AMINE, ALPHA, ALPH	122098	TR	TR	TR	TR			149.23					
DIMETHYLPHENOL, 2,4-	105679	0.02		0.02		125.89254	3.3E-06	122.16		6.2E+03	1.7E-04	NA	NA
DINITRO-O-CRESOL, 4,6-	534521	TR	TR	TR	TR	257.03958	2.0E-07	198.13		1.3E+02	1.3E-07	NA	NA
DINITROBENZENE	528290	0.0004		0.0004				168.11					
DINITROBENZENE, 1,3-	99650	0.0001		0.0001		151.35612	1.2E-07	168.11		5.4E+02	4.0E-07	NA	NA
DINITROPHENOL, 2,4-	51285	0.002		0.002		0.7943282	4.8E-09	184.11		5.8E+03	1.5E-07	NA	NA
DINITROTOLUENE	25321146		0.68		0.68			182.14					
DINITROTOLUENE, 2,4-	121142	0.002	0.31	0.002	0.31	51.286138	1.5E-07	182.14		2.8E+02	2.3E-07	NA	NA
DINITROTOLUENE, 2,6-(2,6-DNT)	606202	0.001		0.001		74.131024	1.3E-07	182.14		1.1E+03	7.5E-07	NA	NA
DINOSEB	88857	0.001		0.001		123.02688	4.6E-04	240.2		5.2E+01	9.9E-05	NA	NA
DIOXANE, 1,4-	123911		0.011		0.027	7.7624712	4.9E-06	88.2		9.0E+05	5.0E-02	NA	NA
DIOXATHION	78342	TR	TR	TR	TR			456.54		INSOL			
DIPHENYLAMINE	122394	0.025		0.025		190.54607	3.2E-06	169.23		3.0E+02	5.6E-06	NA	NA
DIPHENYLHYDRAZINE, 1,2,-	122667		0.8		0.8	660.69345	5.7E-08	184.23		2.2E+02	6.8E-08	NA	NA
DIQUAT	85007	0.0022		0.0022		2.630268	0.0E+00	344.07		7.0E+05		NA	NA
DISULFOTON	298044	0.00004		0.00004		1023.293	6.2E-06	274.38		1.6E+01	3.7E-07	NA	NA
DIURON	330541	0.002		0.002		301.99517	2.3E-08	233.1		4.2E+01	4.1E-09	NA	NA
ENDOSULFAN	115297	0.006		0.006			2.3E-05	406.95		2.3E-01	1.3E-08	NA	NA
ENDOSULFAN I (ALPHA)	959988	0.006		0.006		2041.7379	1.7E-05	406.95		3.2E-01	1.3E-08	NA	NA
ENDOSULFAN II (BETA)	33213659	0.006		0.006		2344.2288	1.6E-05	406.95		3.3E-01	1.3E-08	NA	NA
ENDOSULFAN SULFATE	1031078	0.006		0.006		2344.2288	2.5E+01	422.95		2.2E-01	1.3E-02	NA	NA
ENDOTHALL	145733	0.02		0.02		123.02688	0.0E+00	186.18		1.0E+05		NA	NA
ENDRIN	72208	0.0003		0.0003		10715.193	1.2E-06	380.93		2.5E-01	7.7E-10	NA	NA
ENDRIN ALDEHYDE	7421934	0.0003		0.0003		26915.348		380.89					
ENDRIN KETONE	53494705	0.0003		0.0003									
EPICHLOROHYDRIN	106898	0.002	0.0099	0.0002857	0.0042	35.481339	3.0E-05	92.5	X	6.6E+04	2.2E-02	15867275	2360383.87
ETHION	563122	0.0005		0.0005		8709.6359	7.6E-01	384.48		1.0E-06	2.0E-09	NA	NA
ETHOXYETHANOL, 2-(EGEE)	110805	0.4		0.4		12.022644	5.1E-02	90.1	X	2.7E+05	7.0E-03	16729731	2372735.94
ETHYL ACETATE	141786	0.9		0.9		58.884366	1.7E-04	88.1	X	6.4E+04	1.2E-01	15887501	2370454.62
ETHYL ACRYLATE	140885		0.048		0.048	107.15193	4.5E-04	100	X	1.4E+04	6.1E-02	16893101	2381515.23
ETHYL BENZENE	100414	0.1		0.286		218.77616	7.7E-03	106	X	1.7E+02	1.3E-02	16000238	2377163.97
ETHYL ETHER	60297	0.2		0.2		67.608298	8.7E-04	74	X	6.1E+04	7.1E-01	16908012	2387741.58
ETHYL METHANESUL-FONATE	62500	TR	TR	TR	TR		8.8E-08	124.15		4.9E+05	3.5E-04	NA	NA
ETHYLAMINE	75047	TR	TR	TR	TR	0.7762471	5.5E-05	45.08	X	9.9E+05	1.2E+00	15892069	2377703.3
ETHYLENE CHLORHYDRIN	107073	TR	TR	TR	TR			80.52		MISC	6.6E-05		
ETHYLENE GLYCOL	107211	2		2		4.3651583	1.0E-04	62.1	X	1.0E+05	1.7E-01	15893904	2385129.12
ETHYLENE OXIDE	75218		1.02	0.171	0.35	16.218101	2.1E-04	44	X	3.0E+05	1.4E+00	15896149	2388095.73

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Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
ETHYLENE THIOUREA	96457	0.00008	0.11	0.00008	0.0455		9.1E-07	102.2		1.2E+04	1.1E-04	NA	NA
ETHYLENEDIAMINE	107153	0.02		0.02			2.2E-05	78.12	X	1.0E+05	2.8E-02	15881296	2365788.7
ETHYLENEIMINE	151564		65		66.5	1.2882496		43.07		MISC	1.6E+02		
ETHYLMETHACRYLATE	97632	0.09		0.09			1.4E-04	114.14	X	1.9E+04	7.6E+02	15899281	2388684.2
FAMPHUR	52857	TR	TR	TR	TR			325.36		SLIGHT			
FENAMIPHOS	22224926	0.00025		0.00025		295.12092	0.0E+00			7.0E+02	1.3E-09	NA	NA
FENSULFOTHION	115902	TR	TR	TR	TR	77.624712	0.0E+00	308.35		1.5E+03		NA	NA
FLUORANTHENE	206440	0.04		0.04		48977.882	9.3E-06	202		2.3E-01	1.1E-08	NA	NA
FLUORENE	86737	0.04		0.04		7943.2823	7.3E-05	170	X	1.9E+00	8.2E-07	15744223	2549723.83
FLUORINE	7782414	0.06	1.09E-13	0.06	2.289E-10			19		HYDROL	6.6E+02		
FLUOROTRICHLORO-METHANE (FREON 11)	75694	0.3		0.2		134.89629	1.3E-01	137	X	1.1E+03	1.1E+00	16620152	2372086.24
FONOFOS	944229	0.002		0.002		1071.5193	5.2E-06	246.32		1.3E+01	2.8E-07	NA	NA
FORMALDEHYDE	50000	0.2	0.0455	0.2	0.0455	3.6307805	2.8E-04	30	X	5.5E+05	5.1E+00	15984672	2378028.12
FORMIC ACID	64186	2		2		0.5370318	2.5E-06	46.03		1.0E+06	5.4E-02	NA	NA
FURFURAL	98011	0.003		0.0143		6.3095734	1.5E-06	96.08		8.3E+04	1.3E-03	NA	NA
GLYPHOSATE	1071836	0.1		0.1		3548.1339	2.5E-06	169.07		1.2E+04	1.8E-04	NA	NA
HEPTACHLOR	76448	0.0005	4.5	0.0005	4.55	6760.8298	5.8E-04	373.35		2.7E-01	4.3E-07	NA	NA
HEPTACHLOR EPOXIDE	1024573	0.000013	9.1	0.000013	9.1	20892.961	8.3E-06	389.2		2.7E-01	5.7E-09	NA	NA
HEPTACHLOROBI-PHENYL	28655712		7.7		7.7								
HEXACHLOROBENZENE	118741	0.0008	1.6	0.0008	1.61	3801.894	7.5E-04	284.8		8.6E-03	2.3E-08	NA	NA
HEXACHLOROBI-PHENYL	26601649		7.7		7.7								
HEXACHLOROBUTA-DIENE	87683	0.0002	0.078	0.0002	0.077	4677.3514	2.4E-02	260.76		2.5E+00	2.3E-04	NA	NA
HEXACHLOROCYCLO-PENTADIENE	77474	0.007		0.00002		7244.3596	1.7E-02	273		1.5E+00	9.6E-05	NA	NA
HEXACHLORODIBENZO-P-DIOXINS			15000		11600								
HEXACHLORODIBENZO-FURANS			15000		11600								
HEXACHLOROETHANE	67721	0.001	0.014	0.001	0.014	2187.7616	3.6E-03	236.76		4.1E+01	6.2E-04	NA	NA
HEXACHLOROPHENE	70304	0.0003		0.0003			4.9E-10	406.91		3.0E-03	3.6E-15	NA	NA
HEXACHLOROPROPENE	1888717	TR	TR	TR	TR			248.73					
HEXAMETHYLENE DIISOCYANATE	822060	2.86E-06		2.857E-06			2.7E-07	168.22		3.1E+04	5.0E-05	NA	NA
HEXANE	110543	0.06		0.0571		3630.7805	1.0E+00	86.17	X	1.3E+01	1.6E-01	16349797	2374128.74
HEXANONE, 2-(METHYL N-BUTYL KETONE)	591786	TR	TR	TR	TR	53.70318	7.5E-06	100.2		3.5E+04	2.6E-03	NA	NA
HYDRAZINE	302012		3		17.2		6.7E-07	32.05		1.0E+06	2.1E-02	NA	NA
HYDROGEN CHLORIDE	7647010	0.00571		0.00571			3.0E-02	36.5	X	4.8E+05	4.0E+02	16710840	2372589.63
HYDROGEN CYANIDE	74908	0.02		0.0008571			2.2E-05	27.03	X	1.0E+06	8.1E-01	15881057	2365654.44
HYDROGEN FLUORIDE	7664393	0.00169		0.0016856			1.7E-05	20	X	1.0E+06	8.5E-01	15877267	2363812.48
HYDROGEN SULFIDE	7783064	0.003		0.0002857			1.8E-01	34.08	X	3.8E+03	2.0E+01	17019677	
HYDROQUINONE	123319	0.04		0.04			0.0E+00	110.1		7.0E+04		NA	NA
INDENO[1,2,3-CD]PY-RENE	193395		0.73		0.385	30902954	2.4E-06	276.34		2.2E-05	1.9E-13	NA	NA
IODOMETHANE	74884	TR	TR	TR	TR	22.908677	5.3E-03	141.95	X	1.4E+04	5.3E-01	16187093	2376180.85
IRON	7439896	0.3		0.3				55.8				NA	NA
IRON PENTACARBONYL	13463406	0.3		0.3				195.9				NA	NA
ISOAMYL ACETATE	123922	TR	TR	TR	TR	89.125094		130.18					
ISOBUTYL ACETATE	110190	TR	TR	TR	TR	213.79621	4.9E-04	116.2	X	6.3E+03	2.6E-02	15887695	2370654.62
ISOBUTYL ALCOHOL	78831	0.3		0.3		60.255959	1.3E-05	74.1	X	7.6E+04	1.4E-02	15881653	2353436.54
ISODRIN	465736	TR	TR	TR	TR	3388.4416	1.6E-05	364.9		1.2E+04	5.4E-04	NA	

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Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil NA
ISOPHORONE	78591	0.2	0.00095	0.2	0.00095	30.902954	6.2E-06	138.2		1.2E+04	1.4E+02	NA	NA
ISOPHORONE DIISOCYANATE	4098719	TR	TR	TR	TR			222.32			5.0E-04		
ISOSAFROLE	120581	TR	TR	TR	TR			162.18					
KEPONE	143500		16		16.1	54954.087	2.5E-08	490.68		7.6E+00	3.9E-10	NA	NA
LEAD	7439921							207.2				NA	NA
LITHIUM	7439932	TR	TR	TR	TR			6.9				NA	NA
LITHIUM HYDRIDE	7580678	TR	TR	TR	TR		0.0E+00			1.5E+02		NA	NA
MALATHION	121755	0.02	0.00095	0.02	0.00095	1288.2496	1.2E-07	330.36		1.5E+02	5.3E-08	NA	NA
MALEIC ANHYDRIDE	108316	0.1		0.1			8.2E-09	98.06		7.9E+02	6.6E-08	NA	NA
MALEIC HYDRAZIDE	123331	0.5		0.5		2.8183829	0.0E+00	112.09		6.0E-03		NA	NA
MANGANESE	7439965	0.047		1.429E-05				54.9				NA	NA
MANGANESE CYCLO-PENTADIENYL TRICAR	12079651	TR	TR	TR	TR							NA	NA
MELPHALAN	148823		130		130			305.2					
MERCURY	7439976	0.0000857		8.571E-05			7.1E-10	201		5.6E-02	2.6E-06	NA	NA
METHACRYLONITRILE	126987	0.0001		0.0002		20.892961	2.3E-04	93	X	2.5E+04	8.9E-02	15895865	2387946.73
METHANOL	67561	0.5		0.5		2.7542287	1.7E-04	32.04	X	2.9E+04	1.6E-01	15931073	2383774.81
METHOMYL	16752775	0.025		0.025		19.952623	1.8E-10	162.2		5.8E+04	6.6E-08	NA	NA
METHOXYCHLOR	72435	0.005	0.00095	0.005	0.00095	63095.734	6.3E-06	345.65		8.8E-02	2.1E-12	NA	NA
METHYL CHLORIDE	74873		0.013		0.0063	6.0255959	4.5E-02	50.5	X	6.3E+03	5.7E+00	16952413	2374958.28
METHYL ETHYL KETONE	78933	0.6		0.286		31.622777	3.6E-05	72	X	2.4E+05	1.2E-01	15893244	2382216.41
METHYL ETHYL KETONE PEROXIDE	1338234	0.6		0.286				176.24					
METHYL HYDRAZINE	60344	TR	TR	TR	TR		3.2E-08	46.07		1.0E+06	6.8E-04	NA	NA
METHYL ISOAMYL KETONE	110123	TR	TR	TR	TR	38.904514	2.1E-04	114.2	X	5.4E+03	9.9E-03	15893213	2382064.07
METHYL ISOBUTYL KETONE	108101	0.08		0.0229		17.378008	1.2E-04	100.2	X	2.0E+04	2.5E-02	15892543	2379193.18
METHYL ISOCYANATE	624839	TR	TR	TR	TR	9.7723722	1.1E-02	57.06	X	3.3E+03	6.1E-01	16380819	2373585.4
METHYL MERCAPTAN	74931	TR	TR	TR	TR	16.982437	4.7E-03	48.11	X	2.3E+04	2.3E+00	16189240	2376180.5
METHYL METHACRYLATE	80626	0.08		0.08		10	3.2E-04	100.11	X	1.6E+04	5.1E-02	15912013	2387051.26
METHYL METHANESULFONATE	66273		0.099		0.098	5.2480746	3.8E-07	110.13		2.0E+05	6.8E-04	NA	NA
METHYL PARATHION	298000	0.00025		0.00025		794.32823	1.1E-07	263.23		5.0E+01	2.0E-08	NA	NA
METHYL TERT-BUTYL ETHER (MTBE)	1634044	0.857		0.857		11.748976	5.9E-04	88.14	X	4.8E+04	3.2E-01	15950002	2381159.86
METHYLAMINE	74895	TR	TR	TR	TR	11.748976	6.2E-05	31.06	X	1.0E+06	2.0E+00	15888573	2371630.61
METHYLCHLOROPHEN-OXYACETIC ACID (M	94749	TR	TR	TR	TR	112.20185							
METHYLCHOLATHRENE, 3-	56495		22		22.1		1.4E-05	268.4		1.9E-03	1.0E-11	NA	NA
METHYLENE BIS (2-CHLOROANILINE), 4,4′-[	101144	0.0007	0.13	0.0007	0.13		3.4E-07	267.15		7.2E+01	9.1E-08	NA	NA
METHYLENE DIANILINE, 4-4,	101779		1.6		1.61		5.6E-09	172		1.6E+04	5.3E-07	NA	NA
METHYLNAPHTHALENE, 2-	91576	0.04		0.00286		15848.932	7.2E-02	142.19	X	2.6E+01	1.3E-02	15894079	2385650.6
MEVINPHOS	7786347	TR	TR	TR	TR			224.1		MISC	1.3E+00		
MITOMYCIN C	50077		8200		8050		3.1E+00	334.37		4.3E+02	4.0E+00	NA	NA
MONOCROTOPHOS	6923224	TR	TR	TR	TR	2.0417379		223.16					
NALED	300765	0.002		0.002				380.79		INSOL	2.0E-03		
NAPHTHALENE	91203	0.04		0.00286		954.99259	4.8E-04	128	X	3.1E+01	1.2E-04	15874974	2354958.25

TR = Threshold of Regulation

Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
NAPHTHOQUINONE, 1,4-	130154	TR	TR	TR	TR	213.79621	9.7E-03	158.15	X	1.0E+03	6.1E-02	16036473	2376039.55
NAPHTHYLAMINE, 1-	134327		1.8		1.8	3235.9366	1.1E-04	143.18	X	1.7E+03	1.3E-03	15822108	2370299.57
NAPHTYLAMINE, 2-	91598		1.8		1.8	87.096359	3.1E-06	143.18		1.3E+03	2.8E-05	NA	NA
NICKEL	7440020	0.02		0.00286	0.84			58.7					
NITRATE-NITROGEN (TOTAL)	14797558	1.6		1.6								NA	NA
NITRIC ACID	7697372	TR	TR	TR	TR			63					
NITRITE-NITROGEN (TOTAL)	14797650	0.1		0.1								NA	NA
NITRO-O-TOLUIDINE, 5-	99558		0.033		0.033			152.16					
NITROANILINE, M-	99092	0.0000571		5.714E-05		18.197009	1.7E-04	138.12	X	1.1E+03	1.3E-03	15893950	2385276.52
NITROANILINE, O-	88744	0.0000571		5.714E-05		26.915348	1.4E-05	138.12	X	1.3E+03	1.3E-04	15866567	2357837.31
NITROANILINE, P-	100016	0.0000571		5.714E-05		14.791084	3.5E-07	138.12		8.0E+02	2.0E-06	NA	NA
NITROBENZENE	98953	0.0005		0.0005714		131.82567	2.1E-05	123	X	1.9E+03	3.2E-04	15900098	2349967.7
NITROPHENOL, 2-	88755	0.062		0.062		37.153523	8.7E-05	139.11	X	2.1E+03	1.3E-03	15882828	2366709.48
NITROPHENOL, 4-	100027	0.062		0.062		234.42288	2.5E-05	139.11	X	1.6E+04	2.9E-03	15918000	2346582.58
NITROPROPANE, 2-	79469	0.00571	9.45	0.00571	9.45	20.417379	1.2E-05	89.09	X	1.7E+05	2.4E-02	15865748	2358480.56
NITROQUINOLINE-1-OXIDE, 4-	56575	TR	TR	TR	TR								
NITROSODI-N-BUTYL-AMINE, N-	924163		5.4		5.6		5.4E-05	158.2	X	1.1E+03	3.8E-04	15892251	2378234.86
NITROSODI-N-PROPYL-AMINE, N-	621647	0.095	7	0.095	7	11.220185	4.1E-05	130.19	X	1.5E+04	4.6E-03	15881796	2366076.92
NITROSODIETHYL-AMINE, N-	55185		150		151	25.703958	1.3E-06	102.14		2.0E+05	2.6E-03	NA	NA
NITROSODIMETHYL-AMINE, N-	62759		51		49	8.5113804	5.3E-07	74.08		1.0E+06	7.1E-03	NA	NA
NITROSODIPHENYL-AMINE, N-	86306		0.0049		0.0091	575.43994	7.0E-04	198.23	X	3.7E+01	1.3E-04	15874058	2362578.35
NITROSOMETHYL-ETHYLAMINE, N-	10595956		22		22.1		8.9E-07	88.11		3.0E+05	3.0E-03	NA	NA
NITROSOMORPHOLINE, N-	59892		6.7		6.65		9.5E-09	116.11		1.6E+06	1.3E-04	NA	NA
NITROSOPIPERIDINE, N-	100754		9.4		9.45		1.4E-07	114.5		1.5E+05	1.9E-04	NA	NA
NITROSOPYRROLIDINE, N-	930552		2.1		2.14		2.9E-08	100.11		7.9E+05	2.3E-04	NA	NA
NITROTOLUENE	88722	0.01		0.01				137.13					
NONACHLOROBIPHE-NYL	53742077		7.7		7.7								
OCTACHLOROBIPHE-NYL	55722264		7.7		7.7								
OCTYL PHTHALATE, DI-N-	117840	0.02		0.02		977237221	5.7E-05	390.56		4.0E-02	5.9E-09	NA	NA
OSMIUM TETROXIDE	20816120	TR	TR	TR	TR		5.4E-05	254.2		6.2E+04	1.3E-02	NA	NA
OXAMYL (VYDATE)	23135220	0.025		0.025		7.0794578	0.0E+00	219.25		7.8E+05		NA	NA
OZONE	10028156	0.0514		0.0514				48				NA	NA
PARATHION	56382	0.006		0.006		2344.2288	5.7E-07	291.3		6.5E+00	1.3E-08	NA	NA
PCB-1016 (AROCLOR)	12674112	0.00007	0.09	0.00007	0.09	107151.93	4.1E-04		X	8.0E-02	1.0E-07	15699214	3030388.92
PCB-1221 (AROCLOR)	11104282		0.5		0.5	1862.0871	4.1E-04	192	X	8.0E-02	1.0E-07	15898948	3030388.92
PCB-1232 (AROCLOR)	11141165		0.5		0.5	1548.8166	4.1E-04	221		8.0E-02	1.0E-07	NA	NA
PCB-1242 (AROCLOR)	53469219		0.5		0.5	47963.009	4.1E-04	254		8.0E-02	1.0E-07	NA	NA
PCB-1248 (AROCLOR)	12672296		1.8		1.8	190546.07	4.1E-04	292		8.0E-02	1.0E-07	NA	NA
PCB-1254 (AROCLOR)	11097691	0.00002	1.8	0.00002	1.8	812830.52	4.1E-04	326		8.0E-02	1.0E-07	NA	NA
PCB-1260 (AROCLOR)	11096825		0.6		0.6	1819700.9	4.1E-04	361		8.0E-02	1.0E-07	NA	NA
PENTABORANE	19624227	TR	TR	TR	TR			63.14					

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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
PENTACHLOROBEN-ZENE	608935	0.0008		0.0008		32359.366	8.4E-04	250.34		6.5E-01	2.2E-06	NA	NA
PENTACHLORODIBEN-ZO-P-DIOXINS			75000		58000								
PENTACHLORODIBEN-ZOFURANS			75000		58000								
PENTACHLOROETHANE	76017	TR	TR	TR	TR	1905.4607	1.8E-03	202.3		5.0E+02	4.5E-03	NA	NA
PENTACHLORONITRO-BENEZNE	82688	0.003	0.26	0.003	0.26	7943.2823	2.9E-02	295.34		3.2E-02	3.1E-06	NA	NA
PENTACHLOROPHENOL	87865	0.03		0.03		19952.623	1.4E-05	266		1.3E+01	7.1E-07	NA	NA
PERCHLOROMETHYL MERCAPTAN	594423	TR	TR	TR	TR		1.0E-01	188.85	X	1.6E+01	8.7E-03	16949905	2374931.01
PHENACETIN	62442		0.0022		0.0022	112.20185	1.4E-06	179.21		7.6E+02	2.8E-05	NA	NA
PHENANTHRENE	85018	0.3		0.3		38018.94	3.9E-05	178	X	8.1E+00	3.8E-07	15678659	4451687.58
PHENOL	108952	0.6		0.6		21.877616	6.0E-07	94.11		9.1E+04	5.7E-04	NA	NA
PHENYL MERCAPTAN	108985	TR	TR	TR	TR	562.34133	3.5E-04	110.17	X			15865552	2358788.47
PHENYLENEDIAMINE, M-	108452	0.006		0.006		11.748976	9.2E-09	108.14		3.5E+05	3.0E-05	NA	NA
PHENYLENEDIAMINE, O-	95545		0.047		0.047		2.7E-08	108.14		4.2E+04	1.1E-05	NA	NA
PHENYLENEDIAMINE, P-	106503	0.19		0.19			1.5E-09	108.14		4.5E+05	6.1E-06	NA	NA
PHORATE	298022	0.0002		0.0002		812.83052	1.2E-05	260.4		3.8E+01	1.7E-06	NA	NA
PHOSGENE	75445	0.00343		0.00343			1.2E-02	98.92	X	1.3E+04	1.6E+00	16494879	2372235.54
PHOSPHINE	7803512	0.0003		8.571E-05			3.2E+00	34	X	4.0E+02	3.7E+01	17135297	2376921.26
PHOSPHORIC ACID	7664382	0.00286		0.00286				98		SLIGHT		NA	NA
PHOSPHORUS AND COMPOUNDS	7723140	0.00002		0.00002				153.33				NA	NA
PHTHALIC ANHYDRIDE	85449	2		0.0343		79.432823	3.1E-04	148.11	X	6.2E+03	1.3E-02	15892642	2379553.55
PICOLINE, 2-	109068	TR	TR	TR	TR	89.125094	1.2E-05	93.12	X	1.0E+05	1.3E-02	15898428	2350265.63
POLYCHLORINATED BIPHENYLS (PCB)	1336363		7.7		7.7								
PRONAMIDE	23950585	0.075		0.075		199.52623	9.0E-06	256.13		1.5E+01	5.3E-07	NA	NA
PROPANOL, 1-	71238	TR	TR	TR	TR	3.0199517	1.9E-06	60.09		8.9E+05	2.8E-02	NA	NA
PROPANOL, 2- (ISOPROPYL ALCOHOL)	67630	TR	TR	TR	TR	25.118864	1.5E-06	60.09		1.0E+06	2.5E-02	NA	NA
PROPARGYL ALCOHOL	107197	0.002		0.002			2.1E-07	56.06		1.0E+06	3.8E-03	NA	NA
PROPIONIC ACID	79094	TR	TR	TR	TR		3.0E-03	74.1	X	1.0E+06	4.0E+01	16207597	2376140.79
PROPIONITRILE (ETHYL CYANIDE)	107120	TR	TR	TR	TR	28.840315	2.8E-05	55.08	X	1.0E+05	4.3E-02	15866837	2360205.35
PROPYLENE GLYCOL MONOMETHYL ETHE	107982	0.7		0.571				90.12					
PROPYLENE IMINE	75558	TR	TR	TR	TR		1.2E-05	57.11	X	1.0E+06	2.0E-01	15872425	2362031.29
PROPYLENE OXIDE	75569	0.00857	0.24	0.008571	0.0132	24.547089	1.3E-03	58	X	3.0E+04	6.9E-01	15996126	2377365.6
PYRENE	12900	0.03		0.03		67608.298	8.3E-06	202.26		1.4E-01	5.6E-09	NA	NA
PYRETHRUM	8003347	TR	TR	TR	TR					SPARINGLY			
PYRIDINE	110861	0.001		0.001		0.0066069	7.0E-03	79.1	X	3.0E+02	3.4E-05	16402870	2373234.67
QUINONE (p-BENZO-QUINONE)	106514	TR	TR	TR	TR	30.199517	9.7E-08	108.09		1.3E+05	1.2E-04	NA	NA
RESORCINOL	108463	TR	TR	TR	TR	2.0892961	2.2E-04	110.11	X	5.2E+05	1.0E+00	15910193	2387370.99
SAFROLE	94597		0.22		0.22		1.2E-05	162.19	X	1.5E+04	1.4E-04	15872867	2362175.27
SELENIUM	7782492	0.005		0.005				79				NA	NA
SELENIUM HEXAFLUO-RIDE	7783791	TR	TR	TR	TR			192.95				NA	NA

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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
SILVER	7440224	0.005		0.005				107.9				NA	NA
SIMAZINE	122349	0.005	0.12	0.005	0.12	112.20185	3.2E-10	201.67		5.0E+00	7.9E-12	NA	NA
SODIUM AZIDE	26628228	0.004		0.004				65.02				NA	NA
SODIUM BISULFITE	7631905	TR	TR	TR	TR			104.07				NA	NA
SODIUM FLUOROACETATE	62748	0.00002		0.00002				100.62				NA	NA
SODIUM HYDROXIDE	1310732	0.00137		0.00137				40.01				NA	NA
STRONTIUM CHROMATE	7789062	0.0003		0.0003				203.64				NA	NA
STRYCHNINE	57249	0.0003		0.0003		281.83829	4.9E-13	334.43		1.5E+02	2.2E-13	NA	NA
STYRENE	100425	0.2		0.286		912.01084	3.3E-03	100	X	2.6E+02	8.2E-03	15893095	2381486.48
SULFATE	14808798	0.00714		0.00714				96				NA	NA
SULFIDE	18496258	TR	TR	TR	TR		2.1E-03	34	X	4.1E+03	2.5E-01	16150633	
SULFOTEP	3689245	0.0005		0.0005		549.54087		322.32			2.2E-07		
SULFUR MONOCHLORIDE	10025679	TR	TR	TR	TR			135.03					
SULFURIC ACID	7664939	TR	TR	TR	TR			98					
TELLURIUM	13494809	TR	TR	TR	TR								
TELLURIUM HEXAFLUORIDE	7783804	TR	TR	TR	TR			241.61					
TEPP (TETRAETHYL PYROPHOSPHATE)	107493	TR	TR	TR				290.2		HYDROL	2.0E-07		
TERBUFOS	13071799	0.000025		0.000025		512.86138	9.9E-06	288.41		1.0E+01	3.4E-07	NA	NA
TETRACHLOROBENZENE, 1,2,4,5-	95943	0.0003		0.0003			1.2E-03	215.9		1.3E+00	7.1E-06	NA	NA
TETRACHLOROBIPHENYL	2051629		7.7		7.7								
TETRACHLORODIBENZO-P-DIOZIN, 2,3,7,8-	1746016		150000		116000	4265795.2	9.2E-06	322		1.9E-05	9.7E-13	NA	NA
TETRACHLORODIBENZOFURANS			15000		11600								
TETRACHLOROETHANE, 1,1,1,2-	630206	0.03	0.026	0.03	0.0259		2.3E-03	167.86	X	1.1E+03	1.6E-02	16149464	2376064.79
TETRACHLOROETHANE, 1,1,2,2-	79345		0.27		0.203	79.432823	3.7E-04	167.86	X	3.1E+03	6.8E-03	15892854	2380402.13
TETRACHLOROETHYLENE (PCE)	127184	0.01	0.052	0.0857	0.00203	301.99517	1.7E-02	166	X	2.3E+02	2.4E-02	16053495	2375815.9
TETRACHLOROPHENOL, 2,3,4,6-	58902	0.03		0.03		6165.95	1.5E-05	231.9		1.0E+02	6.6E-06	NA	NA
TETRAETHYL LEAD	78002	0.0000001		0.0000001		4897.7882	8.0E-02	323.44		8.0E-01	2.0E-04	NA	NA
TETRAHYDROFURAN	109999	TR	TR	TR	TR	42.657952	1.1E-04	72	X	4.8E+05	2.1E-01	15885528	2368657.7
TETRAMETHYL LEAD	75741	0.0000001		0.0000001				267.33					
TETRANITROMETHANE	509148	TR	TR	TR	TR		2.6E-05	196.04	X	1.1E+01	1.1E-02		
THALLIUM AND COMPOUNDS	7440280	0.00008		0.00008				232				NA	NA
THIONAZIN	297972	TR	TR	TR	TR			248.26		SLIGHT	3.9E-06		
THIRAM	137268	0.005		0.005		1000	2.1E-01	240.44		3.0E+01	2.6E-02	NA	NA
TIN	7440315	0.6		0.6				118.7				NA	NA
TOLUENE	108883	0.2		0.114		131.82567	6.1E-03	92	X	5.6E+02	3.7E-02	16042827	2375938.16
TOLUENE-2,4-DIISOCYANATE	584849	0.0000271	0.0385	0.0000271	0.0385		2.1E-08	174.16		1.1E+05	1.3E-05	NA	NA
TOLUIDINE,M-	95534		0.24		0.24	138.03843	1.7E-06	107.15		1.6E+04	2.5E-04	NA	NA
TOLUIDINE, O-	95534		0.18		0.1785	407.38028	2.6E-06	107.15		1.7E+04	3.9E-04	NA	NA
TOLUIDINE, P-	106490		0.19		0.19	323.59366	6.1E-06	107.15		7.6E+03	4.3E-04	NA	NA
TOXAPHENE	8001352	0.001	1.1	0.001	1.12	1513.5612	3.4E-06	413.81		6.8E-01	5.5E-09	NA	NA

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Appendix A
Table 3—Physical and Toxicological Properties

Regulated Substance	CAS	RfDo (mg/kg-d)	CSFo mg/kg-d)-	RfDi (mg/m3)	CSFi	Koc	H Law (atm-m^3/mol)	Mol Wt	VOC?	Aqueous Sol (mg/L)	Vapor Pressure (atm)	TF Vol from Surface Soil	TF Vol from SubSurface Soil
TRIBROMOMETHANE (BROMOFORM)	75252	0.02	0.0079	0.02	0.00385	125.89254	6.1E-04	252.77		3.2E+03	7.8E-03	NA	NA
TRICHLOROBENZENE, 1,2,4-	120821	0.01		0.0571		1548.8166	2.6E-03	181.46	X	3.1E+01	4.4E-04	15882426	2366457
TRICHLOROBENZENE, 1,3,5-	180703	0.01		0.0571		3090.2954	1.4E-02	181.46	X	6.6E+00	5.3E-04	15894205	2385966.04
TRICHLOROBIPHENYL	2051618		7.7		7.7								
TRICHLOROETHANE, 1,1,1-	71556	0.571		0.571		100	1.9E-02	133.41	X	1.2E+03	1.6E-01	16228397	2376014.35
TRICHLOROETHANE, 1,1,2-	79005	0.004	0.057	0.004	0.056	75.857758	1.0E-03	133.41	X	4.4E+03	3.3E-02	15912408	2386981.13
TRICHLOROETHYLENE (TCE)	79016	0.002	0.011	0.143	0.00595	93.32543	1.1E-02	131.5	X	1.2E+03	9.5E-02	16150356	2376069.68
TRICHLOROPHENAL, 2,4,5-	95954	0.1		0.1		2398.8329	4.4E-06	197.46		9.7E+02	2.1E-05	NA	NA
TRICHLOROPHENOL, 2,4,6-	88062	0.042	0.011	0.042	0.0109	1071.5193	4.1E-06	197.46		7.5E+02	1.5E-05	NA	NA
TRICHLOROPHENOXY-ACETIC ACID, 2,4,5- (	93765	0.01		0.01		42.657952	9.1E-10	255.49		2.8E+02	9.9E-10	NA	NA
TRICHLOROPHENOXY-PROPIONIC ACID, 2,4	93721	0.008		0.008		1698.2437	1.3E-08	269.51		1.4E+02	6.8E-09	NA	NA
TRICHLOROPROPANE, 1,2,3-	96184	0.006	7	0.0005714	7	281.83829	3.8E-03	147.44	X	1.9E+03	4.9E-03	15917359	2386095.35
TRIETHYLAMINE	121448	TR	TR	TR	TR	51.286138	1.3E-05	101.19	X	1.5E+04	1.5E+01	15917359	2354502.17
TRIETHYLPHOSPHORO-THIOATE, O,O,O-	126681	TR	TR	TR	TR		7.2E-03	198.22	X	5.8E+02	2.1E-02	16376161	2373663.78
TRIFLURALIN	1582098	0.0075	0.0077	0.0075	0.0077		4.4E-05	335		1.0E+00	1.3E-07	NA	NA
TRIMETHYLAMINE	75503	0.002		0.0019999		144.54398	1.2E-02	59.11	X	1.0E+05	2.0E+01	16106756	2375802.09
TRINITROBENZENE, 1,3,5-	99354	0.00005		0.00005			8.6E-08	213.11		3.2E+02	1.3E-07	NA	NA
TRINITROGLYCEROL (NITROGLYCERIN)	55630	TR	TR	TR	TR		4.3E-08	227.09		1.8E+03	3.4E-07	NA	NA
VANADIUM	7440622	0.0000571		5.714E-05				50.9				NA	NA
VANADIUM PENTOXIDE	1314621	0.009		0.009				181.9				NA	NA
VINYL ACETATE	108054	1		0.0571		2.8183829	5.7E-04	86.1	X	2.0E+04	1.3E-01	15973723	2378817.36
VINYL BROMIDE	593602	0.000857	0.112	0.000857	0.112		6.9E-03	106.96	X	2.0E+04	1.3E+00	16365716	2373844.12
VINYL CHLORIDE	75014		1.9		0.294	10.471285	8.4E-02	62.5	X	2.7E+03	3.7E+00	17014496	2375633.86
WARFARIN	81812	0.0003		0.0003		912.01084	4.4E+03	308.32		9.2E-10	1.3E-08	NA	NA
XYLENES (TOTAL)	1330207	2		2			6.0E-03	106.17	X	1.9E+02	1.1E-02	16338402	2374337.24
ZINC AND COMPOUNDS	7440666	0.3		0.3				65.4				NA	NA

TR=Threshold of Regulation

APPENDIX A
TABLE 4-THRESHOLD OF REGULATION COMPOUNDS

		Ingestion		Soil to Groundwater Pathway	
Regulated Substance	CAS	Residential	Non-Residential	100xMSC for GW	Model-Unsaturated Zone Soil
ACETIC ACID	64197	100 T	100 T	0.5	0.01
ACETIC ANHYDRIDE	108247	100 T	100 T	0.5	0.01
AMYL ACETATE, N-	628637	100 T	100 T	0.5	0.02
AMYL ACETATE, SEC-	626380	100 T	100 T	0.5	8
ANTU (ALPHA-NAPHTHYLTHIOUREA)	86884	100 T	100 T	0.5	0.01
AZINPHOS-METHYL (GUTHION)	86500	100 T	100 T	0.5	1
BETA PROPIOLACTONE	57578	100 T	100 T	0.5	0.01
BIS(2-CHLORO-1-METHYLETHYL)ETHER	108601	100 T	100 T	0.5	0.01
BIS(2-CHLOROETHOXY)METHANE	111911	100 T	100 T	0.5	0.01
BROMOPHENYL PHENYL ETHER, 4-	101553	100 T	100 T	0.5	40
BUTYL ACETATE, N-	123864	100 T	100 T	0.5	0.01
BUTYL ACETATE, SEC-	105464	100 T	100 T	0.5	0.01
BUTYL ACETATE, TERT-	540885	100 T	100 T	0.5	0.01
BUTYLAMINE, N-	109739	100 T	100 T	0.5	0.01
CALCIUM CHROMATE	13765190	100 T	100 T		
CALCIUM CYANAMIDE	156627	100 T	100 T		
CARBONYL FLUORIDE	353504	100 T	100 T	0.5	0.01
CATECHOL	120809	100 T	100 T	0.5	0.01
CHLOROACETALDEHYDE	107200	100 T	100 T	0.5	0.01
CHLOROPHENYL PHENYL ETHER, 4-	7005723	100 T	100 T	0.5	2
CYCLOHEXANE	110827	100 T	100 T	0.5	0.02
DECABORANE	17702419	100 T	100 T	0.5	0.0050
DIBENZOFURAN	132649	100 T	100 T	0.5	5
DICHLORO-2-BUTENE, TRANS-1,3-	110576	100 T	100 T	0.5	0.01
DIETHANOLAMINE	111422	100 T	100 T	0.5	0.01
DIETHYLAMINE	109897	100 T	100 T	0.5	0.01
DIGLYCIDYL ETHER (DGE)	2238075	100 T	100 T	0.5	0.01
DIMETHYL PHTHALATE	131113	100 T	100 T	0.5	0.01
DIMETHYL SULFATE	77781	100 T	100 T	0.5	0.01
DIMETHYLPHENETHYLAMINE, ALPHA, ALPHA-	122098	100 T	100 T	0.5	0.01
DINITRO-O-CRESOL, 4,6-	534521	100 T	100 T	0.5	0.01
DIOXATHION	78342	100 T	100 T	0.5	0.01
ETHYL METHANESULFONATE	62500	100 T	100 T	0.5	0.01
ETHYLAMINE	75047	100 T	100 T	0.5	0.01
ETHYLENE CHLORHYDRIN	107073	100 T	100 T	0.5	0.01
FAMPHUR	52857	100 T	100 T	0.5	0.01
FENSULFOTHION	115902	100 T	100 T	0.5	0.01
HEXACHLOROPROPENE	1888717	100 T	100 T	0.5	0.01
HEXANONE, 2- (METHYL N-BUTYL KETONE)	591786	100 T	100 T	0.5	0.01
IODOMETHANE	74884	100 T	100 T	0.5	0.006
ISOAMYL ACETATE	123922	100 T	100 T	0.5	0.01
ISOBUTYL ACETATE	110190	100 T	100 T	0.5	0.01
ISODRIN	465736	100 T	100 T	0.5	1
ISOPHORONE DIISOCYANTE	4098719	100 T	100 T	0.5	0.01
ISOSAFROLE	120581	100 T	100 T	0.5	0.01
LITHIUM	7439932	100 T	100 T		
LITHIUM HYDRIDE	7580678	100 T	100 T		
MANGANESE CYCLOPENTADIENYL TRICARBONYL	12079651	100 T	100 T		
METHYL HYDRAZINE	60344	100 T	100 T	0.5	0.01
METHYL ISOAMYL KETONE	110123	100 T	100 T	0.5	0.01
METHYL ISOCYANATE	624839	100 T	100 T	0.5	0.01
METHYL MERCAPTAN	74931	100 T	100 T	0.5	0.01
METHYLAMINE	74895	100 T	100 T	0.5	0.01
METHYLCHLOROPHENOXYACETIC ACID (MCPA)	94749	100 T	100 T	0.5	0.01
MEVINPHOS	7786347	100 T	100 T	0.5	0.01
MONOCROTOPHOS	6923224	100 T	100 T	0.5	5.00E-03

All concentrations in mg/kg. T=Threshold of Regulation value; M=MSC from Table 1

APPENDIX A
TABLE 4-THRESHOLD OF REGULATION COMPOUNDS

		Ingestion		Soil to Groundwater Pathway	
Regulated Substance	CAS	Residential	Non-Residential	100xMSC for GW	Model-Unsaturated Zone Soil
NAPHTHOQUINONE, 1,4-	130154	100 T	100 T	0.5	0.01
NITRIC ACID	7697372	100 T	100 T		
NITROQUINOLINE-1-OXIDE, 4-	56575	100 T	100 T	0.5	0.01
OSMIUM TETROXIDE	20816120	100 T	100 T	0.5	0.005
PENTABORANE	19624227	100 T	100 T	0.5	0.01
PENTACHLOROETHANE	76017	100 T	100 T	0.5	1
PERCHLOROMETHYL MERCAPTAN	594423	100 T	100 T	0.5	0.01
PHENYL MERCAPTAN	108985	100 T	100 T	0.5	0.03
PICOLINE, 2-	109068	100 T	100 T	0.5	0.01
PROPANOL, 1-	71238	100 T	100 T	0.5	0.01
PROPANOL, 2- (ISOPROPYL ALCOHOL)	67630	100 T	100 T	0.5	0.01
PROPIONIC ACID	79094	100 T	100 T	0.5	0.01
PROPIONITRILE (ETHYL CYANIDE)	10710	100 T	100 T	0.5	0.01
PROPYLENE IMINE	75558	100 T	100 T	0.5	0.01
PYRETHRUM	8003347	100 T	100 T	0.5	0.01
QUINONE (p-BENZOQUINONE)	106514	100 T	100 T	0.5	0.01
RESORCINOL	108463	100 T	100 T	0.5	0.01
SELENIUM HEXAFLUORIDE	7783791	100 T	100 T		
SODIUM BISULFITE	7631905	100 T	100 T		
SULFIDE	18496258	100 T	100 T	0.5	0.005
SULFUR MONOCHLORIDE	10025679	100 T	100 T		
SULFURIC ACID	7664939	100 T	100 T		
TELLURIUM	13494809	100 T	100 T		
TELLURIUM HEXAFLUORIDE	7783804	100 T	100 T		
TEPP (TETRAETHYL PYROPHOSPHATE)	107493	100 T	100 T	0.5	0.01
TETRAHYDROFURAN	109999	100 T	100 T	0.5	0.01
TETRANITROMETHANE	509148	100 T	100 T	0.5	0.01
THIONAZIN	297972	100 T	100 T	0.5	0.01
TRIETHYLAMINE	121448	100 T	100 T	0.5	0.01
TRIETHYLPHOSPHOROTHIOATE, O,O,O-	126681	100 T	100 T	0.5	0.01
TRINITROGLYCEROL (NITROGLYCERIN)	55630	100 T	100 T	M	0.01

The soil-to-groundwater model values in this table are designed to be applied to unsaturated soils. The value to be used for saturated soils can be calculated by dividing the unsaturated soil value by 10.

All concentrations in mg/kg. T=Threshold of Regulation value; M=MSC from Table 1

APPENDIX A
TABLE 5—MEDIUM-SPECIFIC CONCENTRATIONS FOR RADIONUCLIDES

		GROUNDWATER			SOIL				
ISOTOPE[a]	FORM[b]	RESIDENTIAL	NONRESIDENTIAL	BASIS	RESIDENTIAL	BASIS	NONRESIDENTIAL	BASIS	SOIL TO GROUNDWATER
Ac-227+D	All	0.7	2.98	Ingest	18.7	Ingest	58.2	Direct	70
Am-241	All	2.33	9.92	Ingest	62.2	Ingest	276	Ingest	233
Am-243+D	All	2.33	9.92	Ingest	49	Direct	148	Direct	233
Sb-125+D	All	300	300	MCL					
	Tartaremetric				18.7	Direct	56.6	Direct	3000
	Others				18.7	Direct	56.6	Direct	3000
Bi-207	All	200	200	MCL	5.41	Direct	16.4	Direct	2000
Cd-109	All	600	600	MCL	4490		13600	60000	
C-14	All	2000	2000	MCL					
	Organic				139	Vapor	629	Vapor	200000
	CO				101000	Vapor	455000	Vapor	200000
	CO_2				12200	Vapor	55100	Vapor	200000
Cs-134	All	20000	20000	MCL	4.89	Direct	14.8	Direct	2000000
Cs-135	All	900	900	MCL	39400	Ingest	175000	Ingest	90000
Cs-137+D	All	200	200	MCL	10.5	Direct	31.8	Direct	20000
Cl-36	All	700	700	MCL	51300		155000		70000
Co-60	All	100	100	MCL					
	Oxides				2.34	Direct	7.07	Direct	10000
	Hydrides				2.34	Direct	7.07	Direct	10000
	Organics				2.34	Direct	7.07	Direct	10000
Cm-243	All	3.63	15.4	Ingest	72.7	Direct	220	Direct	363
Cm-244	All	4.58	19.4	Ingest	122	Ingest	539	Ingest	438
Cm-248	All	0.66	2.8	Ingest	17.5	Ingest	77.5	Ingest	66
Eu-152	All	60	60	MCL	5.34	Direct	16.2	Direct	6000
Eu-154	All	200	200	MCL	4.81	Direct	14.6	Direct	20000
Eu-155	All	600	600	MCL	317	Direct	961	Direct	60000
H-3	All	20000	20000	MCL	303	Vapor	1370	Vapor	2000000
I-129	All	1	1	MCL	1000	Ingest	4430	Ingest	100
Fe-55	All	200	200	MCL	483000	Ingest	2140000	Ingest	20000
Pb-210+D	All	1.57	6.68	Ingest	41.8	Ingest	185	Ingest	157
Mn-54	All	2000	2000	MCL	8.91	Direct	27	Direct	200000
Np-237+D	All	2.7	11.5	Ingest	32.8	Direct	99.4	Direct	270
Ni-59	All	300	300	MCL	1400000	Ingest	6200000	Ingest	30000
Ni-63	All	50	50	MCL	519000	Ingest	2300000	Ingest	5000

APPENDIX A
TABLE 5—MEDIUM-SPECIFIC CONCENTRATIONS FOR RADIONUCLIDES

		GROUNDWATER			SOIL				
ISOTOPE[a]	FORM[b]	RESIDENTIAL	NONRESIDENTIAL	BASIS	RESIDENTIAL	BASIS	NONRESIDENTIAL	BASIS	SOIL TO GROUNDWATER
Nb-94	All	2060	8770	Ingest	3.73	Direct	11.3	Direct	206000
Pu-238	Nitrates	31.3	133	Ingest	833	Ingest	3690	Ingest	3130
	Oxides	195	830	Ingest	5190	Ingest	23000	Ingest	19500
	Others	2.77	11.8	Ingest	73.7	Ingest	326	Ingest	277
Pu-239	Nitrates	28.5	121	Ingest	759	Ingest	336	Ingest	3010
	Oxides	182	774	Ingest	4830	Ingest	21400	Ingest	18800
	Others	2.45	10.4	Ingest	65.1	Ingest	288	Ingest	257
Pu-240	Nitrates	28.5	121	Ingest	759	Ingest	3360	Ingest	2850
	Oxides	182	774	Ingest	4830	Ingest	21400	Ingest	18200
	Others	2.45	10.4	Ingest	65.1	Ingest	288	Ingest	245
Pu-241+D	All	122	519	Ingest	3260	Ingest	14400	Ingest	12200
Pu-242	Nitrates	30.1	128	Ingest	800	Ingest	3540	Ingest	3010
	Oxides	188	800	Ingest	5000	Ingest	22100	Ingest	18800
	Others	2.57	10.9	Ingest	68.3	Ingest	302	Ingest	257
Pu-244+D	All	2.63	11.2	Ingest	23.5	Direct	71.3	Direct	263
K-40	All	554	2360	Ingest	44.8	Direct	136	Direct	55400
Pm-147	All	11100	47200	Ingest	295000	Ingest	1310000	Ingest	1110000
Pa-231(+)	All	0.96	4.09	Ingest	25.5	Ingest	113	Ingest	96
Ra-266+D	All	20[c]	20[b]	MCL	3.41	Direct	10.3	Direct	2000
Ra-228+D	All	20[c]	20[b]	MCL	6.46	Direct	19.6	Direct	2000
Ru-106+D	All	30	30	MCL	38.8	Direct	117	Direct	3000
Sm-147	All	58.5	249	Ingest	1560	Direct	6890	Direct	5850
Sm-151	All	1000	1000	MCL	824000	Direct	3650000	Direct	100000
Ag-108m+D	All	1400	5960	Ingest	4.74	Direct	14.3	Direct	140000
Na-22	All	400	400	MCL	3.42	Direct	10.4	Direct	40000
Sr-90+D	All	8	8	MCL					
	Soluble Salt				2000	Ingest	8860	Ingest	800
	SrTiO3				12700	Ingest	56400	Ingest	800
Tc-99	All	900	900	MCL	215000	Ingest	954000	Ingest	90000
Tl-204	All	3290	13900	Ingest	23900	Direct	72400	Direct	329000
Th-228+D	All	14	59.6	Ingest	3.97	Direct	12	Direct	1400
Th-229+D	All	2.45	10.4	Ingest	24.2	Direct	73.3	Direct	245
Th-230(+)	All	19.9	84.7	Ingest	528	Ingest	2340	Ingest	1990

APPENDIX A
TABLE 5—MEDIUM-SPECIFIC CONCENTRATIONS FOR RADIONUCLIDES

		GROUNDWATER			SOIL				
ISOTOPE[a]	FORM[b]	RESIDENTIAL	NONRESIDENTIAL	BASIS	RESIDENTIAL	BASIS	NONRESIDENTIAL	BASIS	SOIL TO GROUNDWATER
Th-232(+)	All	3.76	16	Ingest	100	Ingest	443	Ingest	376
U-232	All	8.09	34.4	Ingest	215	Ingest	954	Ingest	804
U-233	All	39	166	Ingest	1040	Ingest	4590	Ingest	3900
U-234(+)	Hexavalent	40.5	172	Ingest	1080	Ingest	4770	Ingest	4050
	Insoluble	421	1790	Ingest	1120	Ingest	49600	Ingest	42100
U-235+D	All	20[c]	20[b]	MCL	59.6	Direct	181	Direct	4320
U-236	Hexavalent	42.1	179	Ingest	1120	Ingest	4930	Ingest	4210
	Insoluble	439	1860	Ingest	11700	Ingest	51700	Ingest	43900
U-238+D	All	20[c]	20[b]	MCL	419	Direct	1270	Direct	672

All MSCs in pci/L for groundwater and pci/g for soils, except for the groundwater MSCs for U-235 and U-238 which are in mg/L.

[a] Isotopes marked with (+D) include the health effects (e.g. Dose Conversion Factors) of immediate short lived (half life less than 6 months) progenies. Isotopes marked with the symbol (+) are long lived (greater than 6 month halflife) progenies in a decay chain and need be accounted for separately.

[b] Before any values for a chemical form are used, the longterm stability of the form must be established. Otherwise most conservative MSC (i.e. the smallest value) should be used.

[c] These values are from reference: USEPA 1995, Drinking Water regulations and Health Advisories, Office of Water Management. The MCL's for U-235+D and U-238+D are given in units of ug/l. The conversion factors are:
1 ug of U-235=2.162 pci
1 ug of U-238=0.3362 pci

APPENDIX A
Table 6
DEFAULT VALUES FOR CALCULATING MEDIUM-SPECIFIC CONCENTRATIONS FOR LEAD

Input Values Used in UBK Model for Lead (for residential exposure scenario)

Geometric Standard Deviation (GSD)	1.42 (default)	Drinking water intake	Model default
Outdoor air lead concentration	0.2 µg/m^3 (default)	Soil lead level	495 µg/g
Indoor air lead concentration (% of outdoor)	30	Indoor dust lead level	495 µg/g
Time spent outdoors	Model default	Soil/dust ingestion weighting factor (%)	45
Ventilation rate	Model default	Paint lead intake	Model default
Lung absorption	Model default	Maternal contribution method	Infant model
Dietary lead intake	Model default	Mother's blood lead at birth	7.5 µg/dL blood (model default)
GI method/bioavailability	Non-linear	Target blood lead level	10 µg/dL blood
Lead concentration in drinking water	4.00 µg/L (default)		

Input Values Used in SEGH Equation (for nonresidential exposure scenario)

Centration of lead in soil (S)	987 µg/g
Target blood lead level in adults (T)	20 µg/dL blood
Geometric standard deviation of blood lead distribution (G)	1.4
Baseline blood lead level in target population (B)	4 µg/dL blood
Number of standard deviations corresponding to degree of protection required for the target population (n)	1.645 (for 95% of population)
Slope of blood lead to soil lead relationship (δ)	7.5 µ/dL blood per µg/g soil

REFERENCE

WIXSON, B. G. (1991). The Society for Environmental Geochemistry and Health (SEGH) Task Force Approach to the Assessment of Lead in Soil. *Trace Substances in Environmental Health*. 11-20.

TABLE 7
CONSTITUENTS OF POTENTIAL ECOLOGICAL CONCERN

METALS
Arsenic III
Arsenic V
Barium
Beryllium
Cadmium
Chromium III
Chromium IV
Cobalt
Copper
Iron
Lead
Manganese
Mercury, inorganic
Mercury, methyl
Molybdenum
Nickel
Selenium
Vanadium
Zinc
Cyanide

ORGANICS
Acenaphthene
Aldrin*
Benzene
Benzo(a)pyrene
Biphenyl
Bis(2-ethylhexyl)phthalate
Bromophenyl phenyl ether,4-
Butylbenzyl phthalate
Chlordane*
Chlorobenzene
DDT (and metabolites)
Diazinon
Dibenzofuran
Dichlorbenzene, 1,2-
Dichlorobenzene,1,3-
Dichlorobenzene,1,4-
Dichlorobenzene,1,1-
Dieldrin
Diethyl phthalate
Di-n-butyl phthalate
Endosulfan (mixed isomers)
Endosulfan, alpha
Endosulfan, beta
Endrin
Ethylbenzene
Fluoranthene
Fluorene
Heptachlor
Hexachloroethane
Hexachlorocyclohexane (Lindane)
Kepone*
Malathion
Methoxychlor
Mirex*
Naphthalene
Pentachlorobenzene
Pentachlorophenol
Polynuclear aromatic hydrocarbons
Polychlorinated biphenyls (PCB)
Phenanthrene
Pyrene
Tetrachloroethane,1,1,2,2-
Tetrachloroethylene
Tetrachloromethane
Toluene
Toxaphene
Tribromomethane
Trichlorobenzene,1,2,4-
Trichloroethane,1,1,1-
Trichloroethylene
Xylene, m-

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