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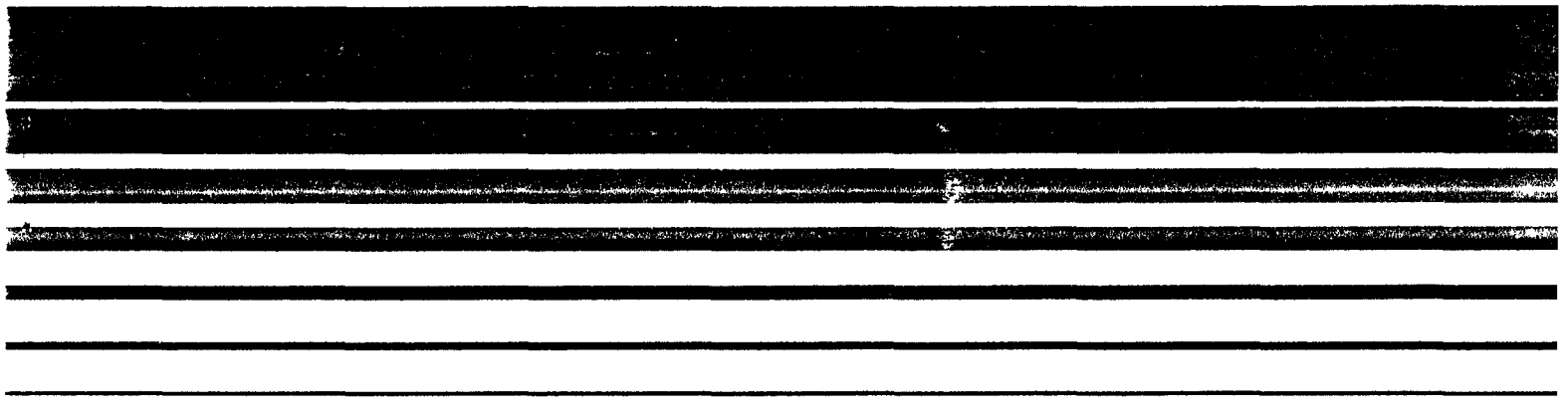
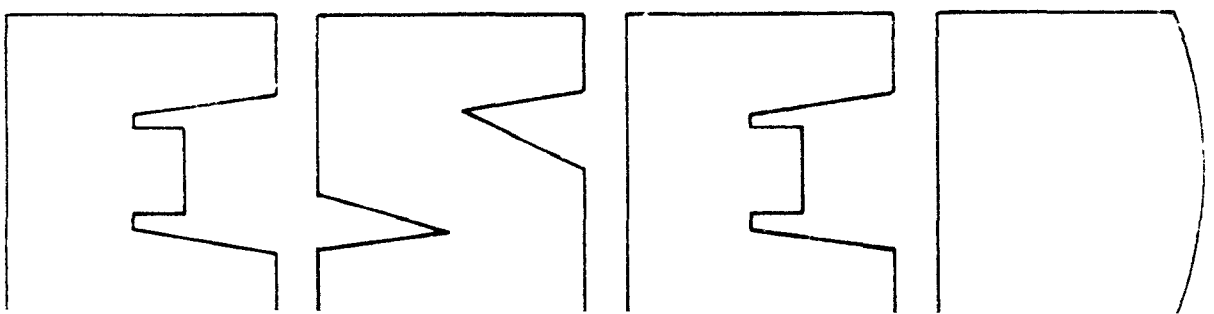
Physical — Chemical Properties and Categorization of RCRA Wastes According to Volatility





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Physical — Chemical Properties and Categorization of RCRA Wastes According to Volatility

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1. INTRODUCTION

1.1 Background

The U.S. Environmental Protection Agency (EPA) Office of Air Quality Planning and Standards (OAQPS) is currently investigating the control of volatile chemical air emissions from hazardous waste treatment, storage, and disposal facilities (TSDFs). Waste handling practices at these facilities include storage and treatment tanks, containers, waste piles, surface impoundments, landfills, and land treatment. As part of this investigation OAQPS will assess the risks of volatile chemical air emissions from TSDFs to human health and the environment and the costs and benefits of controlling these releases. Initial technical investigations include: (1) TSDF site assessments to collect engineering data on volatile air emission control practices, (2) monitoring of volatile air emissions from TSDFs, (3) identification and development of volatile air emissions models for estimating airborne releases of chemical substances from TSDFs, and (4) the gathering of health effects data for volatile chemical wastes. The chemical substances and waste streams which are being investigated are those considered hazardous under the Resource Conservation and Recovery Act (RCRA) of 1976 and listed in 40 CFR Section 261 Subpart D.

Currently, almost 500 chemical substances and chemical waste streams are "listed" as hazardous. Investigation of the potential air releases and resulting health risks of all listed RCRA wastes would be an extremely time consuming operation. Furthermore, the RCRA wastes span many orders of magnitude in volatility (many of the wastes are essentially non-volatile), making such an investigation even more cumbersome. EPA-OAQPS, therefore, must identify those RCRA wastes which are highly volatile and for which further investigation is required. EPA-OAQPS also needs to have the physical-chemical properties related to volatility of the RCRA wastes identified in order to support future

modeling efforts. This document reports on the results of gathering the physical-chemical properties of the RCRA wastes and the identification of those wastes handled at the various types of TSDFs which can be considered highly volatile.

1.2 Purpose and Scope

The purpose of this document is to present (1) the physical-chemical properties of the RCRA wastes related to volatility and (2) a waste categorization scheme based on the volatility of RCRA wastes from TSDFs. The physical-chemical properties were gathered and/or estimated to support the volatility categorization scheme. They are also presented to support future EPA-OAQPS air emission modeling investigations by providing the basic necessary modeling input parameters. Physical-chemical properties of RCRA wastes presented include:

- Molecular weight
- Boiling point
- Vapor pressure
- Solubility
- Log P (i.e., octanol/water partition coefficient)
- Henry's constant
- Relative soil volatility

Diffusion coefficients in air and water and water phase mass transfer coefficients are also presented for RCRA wastes which were identified as being highly volatile.

The waste categorization scheme is presented to support EPA-OAQPS efforts in identifying those RCRA wastes that are highly volatile and for which future monitoring, modeling, and health effects information gathering will be undertaken. The volatility categorization scheme is divided into three parts as follows:

- Volatility of pure substances
- Volatility from aqueous solutions
- Volatility from soil

This approach was necessary because a substance's volatility depends on the conditions under which it is handled at a TSDF. While a pure

chemical waste may be highly volatile, it's volatility may be significantly reduced when present in an aqueous condition or in soil. The three volatility categorizations are presented to represent the various types of waste handling practices performed at TSDFs: storage and treatment of pure substances in containers and storage tanks, treatment and/or storage of wastes in lagoons or surface impoundments, and treatment, storage, and disposal of wastes in soil systems (e.g, landfills, land treatment). Each categorization scheme is divided into four levels of chemical waste volatility as follows:

1. Highly volatile
2. Moderately volatile
3. Slightly volatile
4. Non-volatile

The RCRA wastes investigated, as previously mentioned, are those listed in 40 CFR Section 261 - Subpart D - List of Hazardous Wastes. This list specifically includes wastes that are coded as Ps and Us and individual metals that are coded as Ds. Generic waste streams that are coded as Ks, Fs, and Ds are listed but no physical-chemical property data is presented. Available information on the chemical constituents of these waste streams, however, is presented. For physical-chemical properties and volatility categorization of a chemical constituent in a generic waste stream, the investigator must refer to the chemical specific information presented for its appropriate, P, U, or D waste code. Chemical specific data may be used to approximate a chemicals' volatility behavior in a complex waste solution. Actual volatility of a chemical waste in complex solutions or mixtures is dependent on physical-chemical interactions of solution constituents. Calculation of the volatility of the generic waste stream constituents is a complex and time consuming operation requiring the use of activity coefficients which are generally unavailable for most RCRA wastes. Chemical-specific volatility data (i.e., volatility of pure substance and volatility in water and soil systems) must currently be used, therefore, to approximate a constituent's behavior in complex generic waste streams.

This report is divided into six sections. Following this introduction, details on the methodology used for gathering and/or estimating physical-chemical properties and for categorizing the RCRA wastes are presented (i.e., Section 2). Data gathering and categorization results are discussed in Section 3. Section 4 summarizes the results and presents recommendations for additional investigation, and Section 5 lists all references used in the task effort. Finally, all gathered data, physical-chemical property estimates, and waste categorization results are presented in the Appendix to this report.

2. METHODOLOGY

The following subsections describe the procedures used for gathering and/or estimating the physical-chemical properties of the RCRA wastes (Section 2.1) and the methodology used for categorizing the RCRA wastes according to volatility (Section 2.2). An overview of the required physical-chemical parameters including their relationship to volatility is also provided in Section 2.1.

2.1 Physical-Chemical Properties

The primary physical-chemical properties of RCRA wastes required to support a waste volatility categorization scheme are the waste's vapor pressure, solubility in water, Henry's law constant, relative soil volatility, and molecular weight. Following is a review of each of the properties and their relationship to a substance's volatility:

Vapor Pressure - This is defined as the pressure exerted by a gas when in equilibrium with its non-gaseous phase. Vapor pressure provides an indication of the escaping tendency of molecules from pure liquids or solids. A high vapor pressure implies low attractive forces between molecules in the liquid or solid and a high number of molecules being emitted into the vapor phase. These substances are considered volatile. Liquids with strong attractive forces, therefore, have low vapor pressures and are considered nonvolatile. Consequently, vapor pressure is an excellent indicator of emissions from pure substances. However, when liquids are mixed, vapor pressure does not provide an accurate means of estimating emissions of a single compound because of the additional interaction between the various types of molecules.

Solubility - This is defined as the total mass of a substance that will dissolve in a solvent (usually water) at a given temperature and pressure. The solubility of a substance affects the rate at which molecules of the substance will escape from a liquid via vaporization. Substances with high vapor pressures and low solubilities will readily vaporize from solution. Conversely, substances with high water solubilities and low vapor pressures will tend to remain in solution or be nonvolatile. The solubility of a substance is a required input to the calculation of Henry's law constant which is described below.

Henry's Law Constant - This is defined as the ratio of the partial pressure of the solute gas (i.e., the impurity or pollutant) divided by the mole fraction of the gas in solution (Sienko and Plane 1966). By taking into account partial pressure and solubility, Henry's law constant (H) gives an indication of the tendency of molecules to escape from a solution.

Henry's law constants provide some insight into the volatilization rate controlling processes. This constant is the best indicator of a compound's volatility. Some generalizations on the relationship between Henry's law constant and the emissions rate of compounds in an aqueous solution are given below (Lyman et al 1982):

- $H < 10^{-7}$ atm-m^3/mol. The substance is less volatile than water, and its concentration will increase as water evaporates; it is essentially nonvolatile.

- $10^{-7} < H < 10^{-5}$ atm-m^3/mol. The substance slowly volatilizes; the rate is controlled by slow molecular diffusion through air.

- $10^{-5} < H < 10^{-3}$ atm-m^3/mol. Volatilization starts to become a significant transfer mechanism; this range includes most polycyclic aromatic hydrocarbons and halogenated aromatics.

- $H > 10^{-3}$ atm-m^3/mol. Substances may be released in significant quantities; resistance from the water film is the rate controlling process.

These criteria will be the basis of the aqueous volatility categorization of the RCRA wastes (see Section 3.3 and Appendix C).

Molecular Weight - The molecular weight is indicative of the size of the molecule of a chemical waste. Molecular size affects the rate at which a chemical will diffuse through a medium (i.e., air, water, and soil). The molecular weight of a chemical waste is a required input to the calculation of the waste's ability to volatilize from soil as described below.

Relative Soil Volatility - The actual rate of volatilization of a substance from soil (e.g., landfills) depends upon the amount of the substance in the soil as well as soil type, soil water content, vapor pressure, molecular weight, and diffusivity (described later) of the substance, air flow rate over the surface, humidity, and temperature. Assuming all factors being equal except molecular weight and vapor pressure, a substance's relative volatility from soil is controlled by the soil water content. Essentially two different volatilization processes occur depending on whether the

soil is dry or wet. In a dry soil column, the chemical waste is assumed to move up the soil column via the air pockets within the soil. In a wet soil column, the chemical waste is transported from the soil body to the surface by capillary action, sometimes referred to as the wick effect. In other words, the soil column acts as a wick, and water contaminated with a chemical waste moves up the capillaries of the wick to replenish the contaminated water at the top of the column that is lost by evaporation. These types of transport mechanisms and methods for calculating relative wet and dry soil volatility are further discussed in Section 2.2.

Diffusion Coefficient - The diffusion coefficient is a measure of the molecular diffusion or net transport of a molecule in a liquid or gas medium and is a result of intermolecular collisions rather than turbulence or bulk transport. The process is promoted by gradients, such as pressure, temperature, and concentration. The rate of diffusion is a function of the properties of the chemical of interest and the medium through which it is being transported. Diffusion coefficients are not a required parameter for the categorization scheme used in this report; however, they are required values for actual calculation of a chemical's mass transfer from a TSDF site. Diffusion coefficients will be required in future EPA-OAQPS air emissions modeling efforts and are, therefore, provided in this report for those compounds considered highly volatile from soil and aqueous solutions (see Section 3.5 for further discussion).

Values for the above properties, except diffusion coefficients (as discussed), were required for the categorization of the RCRA wastes according to volatility. Additional properties were also required such as boiling point and octanol/water partition coefficients (i.e., Log P) when experimental values were not available in the literature; these required estimation via the use of these properties. Data gathering and estimation methods for the above properties are discussed in the next subsection.

2.2 Data Gathering/Estimation Methods

Experimental values for vapor pressure, solubility, and Henry's constant for the approximately 500 "listed" RCRA wastes were gathered from the readily available scientific literature. Literature sources used to gather experimental property data are listed in the reference section of this document. All the experimental data were normalized to ambient temperature (i.e., at 25°C) before being recorded. Where experimental data were lacking, property values were estimated via the use of the EPA-Office of Toxic Substance's Graphical Exposure Modeling System (GEMS). GEMS is a computerized data base which includes physical-chemical property estimation methods. The principal component of GEMS accessed for this effort was the CHEMEST system. CHEMEST is a computerized version of the estimation methods presented in the Handbook of Chemical Property Estimation Methods (Lyman et al. 1982). The specific approach for gathering and/or estimating values for physical-chemical properties is discussed below according to the specific property:

Vapor Pressure - Vapor pressures at 25°C of the RCRA wastes were obtained from the experimental literature. Vapor pressures gathered at temperatures other than 25°C were estimated at 25°C using the Clausius-Clapeyron equation:

$$\ln \frac{P_2}{P_1} = \frac{\Delta H_v (T_2 - T_1)}{R T_1 T_2}$$

where

P_1, P_2 = vapor pressures
T_1, T_2 = temperatures (experimental and 25°C)
R = proportionality constant
ΔH_v = heat of vaporization (as gathered from the experimental literature).

If no experimental data were available, vapor pressures were estimated from a waste's boiling point using the CHEMEST system: either the Antoine equation (for liquids and gases in the vapor pressure range of 10^{-3} to 760 mm of Hg) or the Modified Watson

Correlation (for liquids and solids in the vapor pressure range of 10^{-7} to 760 mm of Hg) was used. Boiling points for estimating vapor pressures were gathered from the experimental literature or estimated via CHEMEST using the Miessner Method (Lyman et al. 1982). The relative error in estimated vapor pressures using the methods of Lyman et al. is reported as 0 to 3 percent. The approximate error in boiling points estimated via the Miessner Method is 0 to 5 percent.

Solubility - Experimental solubility values were also gathered from the scientific literature. Where experimental values were lacking, the solubility of the RCRA wastes were estimated from Log K_{ow} (octanol-water partition coefficients) via standard regression equations in CHEMEST. Log K_{ow}'s were obtained from Hansch and Leo (1979) or estimated based on molecular structure using the CLOGP program in GEMS. CLOGP is a computerized version of a fragment additivity method for Log K_{ow} presented in Lyman et al. (1982). The approximate error in estimated solubility values is reported as between 0 and 10 percent. Estimated log K_{ow} values have an approximate error of $\pm$ 0.12 log K_{ow} units.

Henry's Law Constant - Values for Henry's law constant (H) were also gathered from the experimental literature. In general, however, values were extremely limited and the majority of the RCRA wastes required estimation of H values. The procedure used for estimating values of H is as follows (Lyman et al. 1982);

$$H = \frac{P_{vp}}{S}$$

where

P_{vp} = vapor pressure at 25°C in atm.
S = solubility in water at 25°C in mol/m^3.

For compounds with extremely high solubilities or those compounds described as "miscible", a solubility value of 10^6 mg/l was assumed when estimating H. In practical theory, the solubility of an infinitely miscible substance is the weight of one liter of the substance. As most of the miscible RCRA wastes have densities close to that of water (i.e., 0.8 to 1.2 g/ml), the use of 10^6 mg/l is a reasonable value for expressing miscibility and estimating H. Obviously, the use of this value will result in the introduction of significant error in estimated H values., This indeterminate error, however, is not considered to significantly affect the relative categorization of the RCRA wastes.

The methods discussed above are state-of-the-art procedures for estimating solubility, vapor pressure, and Henry's constant. Calculation of relative soil volatility required the development of a procedure specific to available data. Calculation of actual soil volatilization rates depends on concentrations of the waste in soil, data which is unknown and specific to each TSDF. Relative volatility, however, from both wet and dry soils, may be approximated by modifying standard equations for calculating actual wet and dry soil chemical volatilization rates. Several methods have been developed to estimate the volatility of a compound from nonaqueous environments. They vary widely in application and difficulty of calculation; however, most methods are based on a diffusion coefficient (the measure of a compound's ability to migrate through a vapor, liquid, or solid). Furthermore, as previously discussed, these methods can be divided into two major groups: (1) dry soil column methods and (2) wet soil column methods with water flux transport.

The methods selected for modification to calculate relative soil volatility were extracted from Lyman et al. (1982). They are straightforward and are also recommended above other methods evaluated by Lyman et al. during development of the physical-chemical properties estimation handbook. The methods and their modification to derive a relative dry and wet soil volatility are as follows:

Method 1 (dry soil column) (Hamaker Method as presented in W. L. Lyman et al. Handbook of Chemical Property Estimation Methods 1982):

$$Q_t = 2c_o\sqrt{Dt/\pi} \qquad (1)$$

where

Q_t = total loss of chemical per unit area over some time t (M/L^2)
c_o = initial concentration of chemical in soil (M/L^3)
D = diffusion coefficient of vapor through the soil (L^2/T)
π = 3.14159.

In this equation, c_o is unknown; however, it can be assumed that the soil air space is saturated with the vapor of the chemical waste. By assuming the vapor behaves as an ideal gas, one can apply the ideal gas law:

$$PV = nRT \qquad (2)$$

where

P = pressure (mm Hg)
V = volume (l)
n = number of moles
R = universal gas constant (mm Hg-l/mole-°K)
T = temperature (°K).

The expression for equilibrium vapor concentration with P_{vp}, vapor pressure at 25°C, as the only variable follows:

$$\text{equilibrium vapor concentration (EVC)} = \frac{N}{V} = \frac{P_{vp}}{RT} . \qquad (3)$$

In this equation, R and T are constants; therefore,

$$\frac{N}{V} \text{ (or } c_o) = KP_{vp} . \qquad (4)$$

Substituting equation (4) in equation (1) yields

$$Q_t = 2KP_{vp}\sqrt{Dt/\pi} . \qquad (5)$$

In this equation, 2, K, and t/π are constants and are assumed to be a common factor for all RCRA wastes. They can, therefore, be eliminated from further calculation. Equation (5) then reduces to:

$$Q_t \text{ (relative)} = K_1 P_{vp}\sqrt{D} \qquad (6)$$

Furthermore, according to Dalton's Law, diffusion coefficients are inversely proportional to the reciprocal of the square roots of molecular weights under fixed conditions. This relationship can be written:

$$D_y = D_x \frac{\sqrt{MW_x}}{\sqrt{MW_y}} \quad (7)$$

where

D_y = diffusion coefficient of RCRA waste
D_x = measured diffusion coefficient of compound x
MW_x = molecular weight of compound x
MW_y = molecular weight of compound y (i.e., the RCRA waste of interest).

In this equation, D_x and MW_x are also constants, therefore:

$$D_y = \frac{K_2}{\sqrt{MW_y}} \quad (8)$$

or

$$D_y = K_2 MW^{-1/2} . \quad (9)$$

Substituting the above into equation (6) yields

$$Q_{t\ (relative)} = K_1 P_{vp} \sqrt{K_2 MW^{-1/2}} . \quad (10)$$

or

$$Q_{t\ (relative)} = K_3 P_{vp}\ MW^{-1/4} . \quad (11)$$

Finally, since K_3 is constant for all RCRA wastes, equation (11) reduces to:

$$Q_{t\ (relative)} = P_{vp}\ MW^{-1/4} \quad (12)$$

This equation permits the calculation of the relative volatility of RCRA wastes from dry soil.

Method 2 (wet soil column) (Hamaker Method as presented in W.J. Lyman et al. Handbook of Chemical Property Estimation Methods, 1982):

$$Q_t = \frac{P_{vp}}{P_{H_2O}} \cdot \frac{D_v}{D_{H_2O}} (f_w)_v + c(f_w)_L \quad (13)$$

where

f_w = loss of water per unit area (M/L^2)
P_{vp} = vapor pressure of chemical
P_{H_2O} = vapor pressure of water
D_v = diffusion coefficient of chemical in air (L^2/T)
D_{H_2O} = diffusion coefficient of water vapor in air (L^2/T)
sub V = loss of vapor
sub L = loss of liquid
c = concentration of chemical in soil solution (M/M).

In this equation, the following parameters are assumed constant for all RCRA wastes; P_{H_2O}, D_{H_2O}, f_w, and c. Therefore, equation (13) can be written as follows:

$$Q_{t\ (relative)} = \frac{P_{vp}}{K_1} \cdot \frac{D_v}{K_2} \cdot K_3 + K_4\ (K_5) \qquad (14)$$

or

$$Q_{t\ (relative)} = KP_{vp}D_v + K' \qquad (15)$$

According to Dalton's Law as discussed in the dry soil column method; (see equations (7), (8), and (9));

$$D_v = \frac{K_v}{\sqrt{MW_v}} .$$

Therefore, via substitution, equation (14) can be written as:

$$Q_{t\ (relative)} = K\ P_{vp}\ \frac{K_v}{\sqrt{MW_v}} + K' . \qquad (16)$$

or

$$Q_{t\ (relative)} = K\ \frac{P_{vp}}{\sqrt{MW_v}} + K' . \qquad (17)$$

Finally, since the constants are assumed to be the same for all RCRA wastes, equation (17) reduces to:

$$Q_t = \frac{P_{vp}}{\sqrt{MW_v}} \quad \text{or} \quad P_{vp} MW_v^{-1/2} \quad . \tag{18}$$

This equation permits the calculation of the relative volatility of RCRA wastes from wet soil.

Other approaches using soil volatilization estimation methods may also have been developed; however, only minor refinements in relative soil volatility estimates would be obtained. It is believed that the approaches discussed essentially result in the identification of those RCRA wastes which will be highly volatile from TSDF soil systems (e.g., landfills and land treatment).

Diffusion coefficients (in air and water) - Diffusion coefficients of RCRA wastes in air and water were gathered or estimated for only those chemicals considered highly volatile in water and soil systems (see results in Section 3). As with the other physical-chemical properties, experimental values for diffusion coefficients were gathered from the scientific literature. Where experimental data were lacking, coefficients were calculated via the methods presented in Lyman et al. (1982). For diffusion coefficients in air, the Fuller, Schettler, and Giddings Method was used. For diffusion coefficients in water the Hayduk and Laudie method was used. Details on both methods are described completely in Lyman et al. (1982).

3. DATA GATHERING AND CATEGORIZATION RESULTS

3.1 Physical-Chemical Properties and Relative Soil Volatility

Experimental and estimated values for molecular weight, vapor pressure, solubility, Henry's constant, and relative wet and dry soil volatility of the "listed" RCRA wastes are presented in Appendix A. Boiling points and octanol/water partition coefficients are also listed in Appendix A, however, only when required to estimate vapor pressure and solubility, respectively. Literature references for experimental and/or estimated values are listed in the footnote to Appendix A. The comments section of the table for each chemical provides reasons where no data are recorded.

No data are presented for generic waste streams coded K, F, and D (except individual toxic metals and pesticides). Available information on the constituents of the generic waste streams is, however, presented under comments. Physical-chemical properties of a specific waste stream constituent can be obtained by referring to the data under the chemical-specific P or U waste stream code.

3.2 Categorization of RCRA Wastes According to Vapor Pressure

The ambient vapor pressure, as discussed in Section 2.1, provides a good indication of a pure substances volatility. Ambient vapor pressure, therefore, may be used to indicate relative waste volatility as a result of spills and leaks of pure chemical wastes from storage tanks and containers at TSDFs.

All RCRA wastes were ranked according to ambient vapor pressure and then categorized into four volatility groups as follows:

- Highly volatile wastes - those with ambient vapor pressures above 10 torr.
- Moderately volatile wastes - those with ambient vapor pressures in the 10^{-3} to 10 torr range.
- Slightly volatile wastes - those with ambient vapor pressures in the 10^{-5} to 10^{-3} torr range.

- Nonvolatile wastes - those with ambient vapor pressures below 10^{-5} torr.

Results of the categorization are presented in Appendix B.

3.3 Categorization of RCRA Wastes According to Aqueous Volatility

Values of Henry's constant were used to categorize the RCRA wastes according to aqueous volatility. Henry's constant, as discussed in Section 2.1, indicates a chemical's propensity to volatilize from aqueous solution. Henry's constant, therefore, may be used to indicate relative volatility of wastes under aqueous conditions, such as volatilization from impoundments, at TSDFs.

All RCRA wastes were ranked according to values of Henry's constant and then categorized into four volatility groups as follows (Lyman et al. 1982):

- Highly volatile wastes - values of Henry's constant above 10^{-3}
- Moderately volatile wastes - values of Henry's constant below 10^{-3} to 10^{-5}
- Slightly volatile wastes - values of Henry's constant below 10^{-5} to 10^{-7}
- Nonvolatile wastes - values of Henry's constant below 10^{-7}

Results of the categorization are presented in Appendix C.

3.4 Categorization of RCRA Wastes According to Relative Soil Volatility

Derivation of relative soil volatility values is discussed in Section 2.2. Relative soil volatility may be used to indicate a chemical wastes propensity to volatilize from TSDF landfills and land treatment systems. All RCRA wastes were ranked according to relative soil volatility values and then categorized into four classes as follows:

- Highly volatile - Relative soil volatility greater than 1
- Moderately volatile - Relative soil volatility from 1 to 10^{-3}
- Slightly volatile - Relative soil volatility from 10^{-3} to 10^{-6}
- Nonvolatile - Relative soil volatility below 10^{-6}

Results of the relative soil volatility categorization are presented in Appendix D.

3.5 Diffusion Coefficients of Highly Volatile RCRA Wastes

Diffusion coefficients in air and water for a subset of those RCRA wastes identified as highly volatile from water and soil were gathered from the scientific literature or estimated by the methods discussed in Section 2.2. Diffusion coefficients are presented to support future EPA-OAQPS air emission modeling efforts for TSDFs. Data were gathered for only a subset of highly volatile RCRA wastes due to the financial and manpower limitations of the task effort. Values for diffusion coefficients in air and water for RCRA wastes identified as highly volatile from water are presented in Appendix E.

Also presented in Appendix E are values for the estimated water phase mass transfer coefficients. Overall water phase mass transfer coefficients (K_L) were calculated based on the values of Henry's constant for the subset of highly volatile wastes. The values were calculated using the Southworth Equation presented in Lyman et al. (1982). In general, the Southworth equation can be used for calculating the overall liquid-phase mass transfer coefficient of chemicals:

$$K_L = \frac{(H/RT)\ k_g\ k_l}{(H/RT)\ k_g + k_l} \qquad (1.1)$$

where

k_g = gas-phase exchange coefficient
k_l = liquid-phase exchange coefficient
H = Henry's law constant at desired temperature
R = gas constant = 8.2×10^{-5} atm-m^3/mol
T = desired temperature in °K.

Equations for computing the values k_g and k_l are presented in Lyman et al. (1982). Different equations are recommended depending upon the molecular weight and Henry's law constant of the chemical and wind speed assumed to prevail at the site.

The value of the Henry's law constant for all chemicals for which K_L was calculated was greater than 10^{-3} atm-m^3/mol. For chemicals having a value for Henry's constant of 10^{-3} atm-m^3/mol or greater, the resistance of the water film dominates by a factor of at least ten and the mass transfer is liquid phase controlled (Lyman et al. 1982). Therefore, the overall liquid-phase mass transfer coefficient, K_L, is equal to the liquid-phase exchange coefficient, k_l, or

$$K_L = k_l \text{ for } H > 10^{-3} \text{ atm-m}^3\text{/mol}.$$

Consequently, only the liquid-phase exchange coefficients needed to be calculated in order to determine the overall liquid-phase mass transfer coefficient. Two equations were used to compute K_L (or k_l). The following equation was used to compute k_l for chemicals having a value for molecular weight of less than 65:

$$k_l = 20\sqrt{40/MW}$$

where MW = molecular weight. The equation,

$$k_l = 23.51\left(\frac{V_{curr}^{\ 0.969}}{Z^{\ 0.673}}\right)\sqrt{32/MW}\ e^{0.526\ (V_{wind} - 1.9)}$$

where

V_{curr} = current velocity (m/sec)
V_{wind} = wind velocity (m/sec)
Z = depth of water (m)

was used to compute k_l for chemicals having a value for molecular weight of greater than 65. For all calculations a wind speed, V_{wind}, of 3 meters/second, (i.e., average wind speed), a current velocity,

V_{curr} of 0.01 m/s (i.e., negligible current), and a depth, Z, of 1 meter, was assumed. These assumptions were considered to be a reasonable simulation of a TSDF waste impoundment or lagoon.

Values for diffusion coefficients in air and water for a subset of RCRA wastes identified as highly volatile from soil are presented in Appendix F. Soil volatilization rates (i.e., mass transfer coefficients) are not, however, presented. Calculation of soil volatilization rates requires knowledge of the concentration of the RCRA waste in soil. The rate, therefore, must be developed on a TSDF site-specific basis when modeling volatile emissions. Methods for calculating soil volatilization rates are presented in Lyman et al. (1982).

4. SUMMARY AND RECOMMENDATIONS

This document is a comprehensive catalog of physical-chemical properties of hazardous wastes currently regulated under RCRA. It specifically provides waste properties related to potential air emissions of the wastes from TSDFs. As a catalog of physical-chemical properties related to volatile air emissions, this report should prove to be a valuable reference guide for supplying required data in EPA-OAQPS's future TSDF air emission modeling efforts. The waste volatility categorization scheme also provides a useful guide for identifying whether a specific waste will volatilize from a TSDF and potentially present a health risk to the surrounding community. Furthermore, the waste volatility categorization scheme presents a format for the development of future TSDF waste-specific regulatory controls.

The data presented in this report should be used with the knowledge that a significant number of property values were estimated. In particular, Henry's constant (H) required estimation for the majority of the RCRA wastes. For certain wastes, estimation of boiling points, vapor pressures, and solubilities was also required. While the estimation procedures used are considered state-of-the-art, errors are inherent in the estimated values. Values presented for relative soil volatilities are unitless values; they should only be used for comparing relative volatilities of RCRA wastes from wet and dry soil. They were derived specifically for this task from documented soil volatilization rate formulas. It should also be noted that other sources of experimental property values are available; experimental values were not obtained as a result of an exhaustive literature search. The experimental reference sources used were those readily available or those that could be identified and accessed within the labor and financial resources available to the task effort.

While the data presented in this report are essentially complete and fulfill the requirements of the task objectives, several areas of future work are recommended. Recommendations for future work include:

- Estimation of additional gas and liquid phase diffusion coefficients and water phase mass transfer coefficients for highly volatile and moderately volatile RCRA wastes. This report only presents these values for a subset of the highly volatile RCRA wastes because of the time and budgetary restraints of the task effort.

- Identify, gather, and estimate additional physical-chemical properties (e.g., saturation vapor concentration, molar density of chemical vapor, atomic diffusion volume) for the RCRA wastes required as input parameters for TSDF airborne emissions models. This effort should follow final EPA-OAQPS selection of applicable air dispersion models.

- Investigate volatility of waste constituents from complex waste streams (e.g., generic waste streams coded K, D, and F). Intermolecular forces of waste stream constituents affect the volatilization behavior of the constituents. This effort would require the gathering and/or estimation of activity coefficients for each of the RCRA wastes. The activity coefficient is a correction factor compensating for non-ideal behavior and is invaluable in calculations involving multi-component phase equilibria.

- Identify and gather chemical constituent information, including concentration ranges, of generic waste streams. Extremely useful sources of information on generic waste stream constituents are the Hazardous Waste Background Documents prepared by EPA - Office of Solid Waste as required under RCRA.

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Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U001	Acetaldehyde	44	20.8	922.57		insoluble	---	360	139	1
U002	Acetone	58	56.2	200.1	-0.24	$2.3x10^6$	$6.8x10^{-6}$	720	26.3	1, 6
U003	Acetonitrile	41	81.6	100	-0.34	$2.2x10^6$	$2.47x10^{-6}$	40	15.6	1, 6
U004	Acetophenone	120	202	0 49		5,500	$1.41x10^{-5}$	$1.5x10^{-1}$	$4.5x10^{-2}$	1, 4
U005	2-Acetylaminofluorene	223	345	$2.1x10^{-7}$	3.255	140	$4.4x10^{-10}$	$5.4x10^{-8}$	$1.4x10^{-8}$	2
U006	Acetyl chloride	79	52	317		reacts with water	---	108	35.7	1, 2, 5 (Reacts with water)
U007	Acrylamide	71	87 @ 2mm	0.0328	1.55	205,000	$1 49x10^{-8}$	$1.1x10^{-2}$	$3.9x10^{-3}$	3, 6
U008	Acrylic acid	72	141.6	4.24		miscible	$4.0x10^{-7}$	1.4	$5.0x10^{-1}$	1
U009	Acrylonitrile	53	77.4	97.2	-0.92	73,500	$9.2x10^{-5}$	360	13.4	4, 6
U010	Mitomycin C	334	377	$4.1x10^{-8}$	-0.38	72	$2.5x10^{-10}$	$9.4x10^{-9}$	$2.2x10^{-9}$	2
U011	Amitrole	84	T_m= 159	NA	See Note	See Note	---	---	---	9, Log P cannot be estimated to derive solubility
U012	Aniline	93	184	0.8537	0.90	34,000	3.0710^{-6}	$2.7x10^{-1}$	$8.9x10^{-2}$	1, 3, 6
U013	Asbestos	See Note								Mineral of various compositions and properties.
U014	Auramine	304	NA	NA		NA	---	---	---	7, Solubility and vapor pressure cannot be estimated for organo-metallics

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U015	Azaserine	173	290	0.125×10^{-3}	See Note	See Note	---	3.3×10^{-5}	9.5×10^{-6}	2. Log P cannot be estimated to derive solubility
U016	3,4-Benzacridine	229	419	8×10^{-10}	4.565	0.035	7×10^{-9}	2.1×10^{-10}	5.3×10^{-11}	1
U017	Benzalchloride	161	205	0.327	2.815	410	1.7×10^{-4}	9.2×10^{-2}	2.6×10^{-2}	1
U018	1,2-Benzanthracene	228	435	10^{-10}	5.61	8.8×10^{-3}	3.4×10^{-9}	2.6×10^{-11}	6.6×10^{-2}	1
U019	Benzene	78	80.1	101**	2.13	1,780	5.5×10^{-3}	34.3	11.4	**VP = 76 @ 20°C; 60 @ 15°C 1, 6, 23, 30 (H = experimental)
U020	Benzenesulfonyl chloride	177	252	0.04**		Reacts with water	---	1.1×10^{-2}	3.0×10^{-3}	**VP = 10 @ 120°C 1 (Reacts with water)
U021	Benzidine	184	402	1×10^{-5}	1.34	1,550	1.91×10^{-8}	2.7×10^{-6}	7.4×10^{-7}	3, 6
U022	Benzo[a]pyrene	252	310-312 @ 10mm	1.9×10^{-10}	5.835	0.047	1.38×10^{-9} to 4.16×10^{-10}	4.8×10^{-11}	1.2×10^{-11}	2, 30
U023	Benzotrichloride	196	221	0.157	2.92	360	1.12×10^{-4}	4.2×10^{-2}	1.1×10^{-2}	2, 6
U024	Bis(2-chloroethoxy)methane	123	181	0.875	0.469	510,000	2.77×10^{-7}	2.6×10^{-1}	7.9×10^{-2}	1
U025	Dichloroethyl ether	143	178	1.4		10,200	2.58×10^{-5}	4.1×10^{-1}	1.2×10^{-1}	3
U026	Chlornaphazine	268	210 @ 5 mm	4.5×10^{-6}	3.69	57	2.8×10^{-8}	1.1×10^{-6}	2.7×10^{-7}	2
U027	Bis(2-chloroisopropyl) ether	171	187	0.85	2.58	19	1.03×10^{-4}	2.4×10^{-1}	6.5×10^{-2}	1
U028	Bis(2 ethylhexyl)phthalate	390	384	1.38×10^{-5}	9.8	2.7×10^{-5}	26.6	3.2×10^{-6}	7.0×10^{-7}	2

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil-Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U029	Bromomethane	95	3.56	5300**		900	5.26×10^{-3}	1,700	544	**VP = 761 @ 3.6°C 1, 3, 6, 30
U030	4-Bromophenyl phenyl ether	249	310	0.041	5.08	0.50	2.74×10^{-3}	1.1×10^{-4}	2.6×10^{-3}	1
U031	n-Butanol	74	117.25	6.5	0.88	91,000	7×10^{-6}	2.2	7.6×10^{-1}	1, 2, 3, 6
U032	Calcium chromate	156	T_{dec}=200	NA		163,500 @ 20	---	---	---	2, 1, Vapor pressure cannot be estimated for inorganic compounds
U033	Carbonyl fluoride	66	-83	NA		reacts	---	---	---	1, Substance is permanent gas at room temperature
U034	Trichloroacetaldehyde	147	97.75	35		100,000	6.77×10^{-5}	10.2	2.9	1, 3, 10
U035	Chlorambucil	304	363	1.39×10^{-7}	1.7	26,000	2.1×10^{-12}	3.3×10^{-8}	8.0×10^{-9}	2, 6
U036	Chlorodane, tech.	410	175 @ 2 torr	1×10^{-5}	5.94	0.0541	4.8×10^{-5}	2.2×10^{-6}	4.9×10^{-7}	6, 8, 31
U037	Chlorobenzene	113	132	11.8	2.18	500	3.93×10^{-3}	3.6	1.11	3, 6, 23 (H = experimental), 30
U038	Ethyl 4,4'-dichlorobenzilate	325	146-148 @ 0.4 mm	2.2×10^{-6}	4.812	1.6	5.89×10^{-7}	5.3×10^{-7}	1.2×10^{-7}	2
U039	4-Chloro m-cresol	142	235 T_m= 66-8	5.8×10^{-3}	3.10	3,846	2.83×10^{-7}	1.7×10^{-3}	4.9×10^{-4}	1,3
U041	1-Chloro-2,3-epoxypropane	92.5	116 5	18.8		60,000	3.8×10^{-5}	6.02	1.96	1, 3
U042	2-Chloroethyl vinyl ether	107	109	30.5	1.28	6,000	7.35×10^{-4}	9.5	2.9	2
U043	Ethene, chloro-	62.5	-13.9	2,660		1,100	0.199@20°C 0 023-0 69 @30°C	958	336	3
U044	Chloroform	119	61	172.1	1 97	9,300	$3 39 \times 10^{-3}$	51.6	15.8	1, 3, 6, 23

*** @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U045	Chloromethane	50	-24.2	5 (20) 6.7 (30)	0.91	4,000	0.38	1.8	$7.1x10^{-1}$	1, 3, 6, 28
U046	Chloromethyl methyl ether	81	59.5	214	-0.17	$2.5x10^{6}$	$9.12x10^{-6}$	70.6	23.8	1, 3
U047	β-Chloronaphthalene	162	236 T_m= 61	$5.15x10^{-3}$	4.005	12.85	$3.15x10^{-5}$	$1.4x10^{-3}$	$4.1x10^{-4}$	1, 30 (H = experimental)
U048	o-Chlorophenol	128.5	174.9	0.787		28,500	$4.7x10^{-6}$	23.6	$6.9x10^{-2}$	1, 3
U049	4-Chloro-o-toluidine, HC	142	241	0.105	2,285	1,900	$1.02x10^{-5}$	$3.1x10^{-2}$	$8.8x10^{-3}$	7
U050	Chrysene	228	488	10^{-13}		0.017	10^{-12}	$2.6x10^{-14}$	$6.6x10^{-15}$	1, 13
U051	Creosote	See Note								Mixture of substances (cresylic acids)
U052	Cresols and cresylic acid	108	o: 0.192 m: 0.202.8 p: 0.201.9	o: 0.432 m: 0.18 p: 0.16	1.95 (all isomers)	o: 31,000 m: 23,500 p: 24,000	$2x10^{-6}$ $1x10^{-6}$ $9.5x10^{-7}$	$1.3x10^{-1}$ $5.6x10^{-2}$ $5.0x10^{-2}$	$4.2x10^{-2}$ $1.7x10^{-2}$ $1.5x10^{-2}$	6, 3
U053	Crotonaldehyde	70	99-104	19		155,000	$1.13x10^{-5}$	6.6	2.3	3
U055	Cumene	120	153	4.507	3.66	50	$1.46x10^{-2}$	1.4	$4.1x10^{-1}$	1, 6, 29
U056	Cyclohexane	84	81	6.82	3.44	55	$1.78x10^{-1}$	2.3	$7.4x10^{-1}$	1, 3, 6, 30
U057	Cyclohexanone	98	156	4.57	0.81	23,000	$2.56x10^{-5}$	1.5	$4.6x10^{-1}$	1, 6
U058	Cyclophosphamide	261	329	$2.8x10^{-6}$	0 63	4,000	$2 37x10^{-10}$	$7.0x10^{-7}$	$1.7x10^{-7}$	2
U059	Daunomycin	528	533	$9.4x10^{-15}$	1.83	30,000	$2 18x10^{-19}$	$2.0x10^{-15}$	$4.1x10^{-16}$	2, 6

*Recorded only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U060	DDD	320	365	$1.5x10^{-7}$		$5x10^{-6}$	0.0126	$3.6x10^{-8}$	$8.4x10^{-9}$	2, 9
U061	DDT	354	260 T_m= 109	$1.5x10^{-7}$	3.98 to 6.19	$1.28x10^{-3}$	$5.2x10^{-5}$	$3.5x10^{-8}$	$8.0x10^{-9}$	6, 8, 20, 30
U062	Diallate	270	150 @ 9 mm	$7.88x10^{-3}$		14	$1.99x10^{-4}$	$2.0x10^{-3}$	$4.8x10^{-4}$	2, 8
U063	Dibenz[ah]anthracene	278	447	$5.2x10^{-11}$**		0.044	10^{-10}	$1.3x10^{-11}$	$3.12x10^{-12}$	**VP = 4 @ 275°C 1, 8
U064	1,2:7,8-Dibenzopyrene	302	483	10^{-12}	7.22	$1.6x10^{-5}$	$2x10^{-8}$	$2.4x10^{-13}$	$5.8x10^{-14}$	
U066	1,2-Dibromo-3-chloropropane	236	196	0.513		1,000	$1.593x10^{-4}$	$1.3x10^{-1}$	$3.3x10^{-2}$	1, 3
U067	Ethylenedibromide	186	131-132 T_m=9.3	11		4,310	$6.25x10^{-4}$	3.0	$8.1x10^{-1}$	1, 5
U068	Methylene bromide	174	97	45.8		12,000	$3.16x10^{-4}$	12.8	3.47	30
U069	Di-butyl phthalate	278	340	10^{-3}		400	$1.09x10^{-6}$	$2.4x10^{-4}$	$6.0x10^{-5}$	1
U070	o-Dichlorobenzene	147	180.5	1.45	3.38	145	$1.94x10^{-3}$	$4.2x10^{-1}$	$1.2x10^{-1}$	3, 6, 23, 30 (H = experimental)
U071	m-Dichlorobenzene	147	173	2.1	3.38	123	$2.63x10^{-3}$	$6.1x10^{-1}$	$1.7x10^{-1}$	3, 23, 30 (H = experimental)
U072	p-Dichlorobenzene	147	174	0.67	3 39	69	$2.37x10^{-3}$	$1.9x10^{-1}$	$5.5x10^{-2}$	1, 6, 21, 23, 30 (H = experimental)
U073	3,3'-Dichlorobenzidine	253	334 T_m= 133	$1.12x10^{-7}$	2.79	38.3	10^{-9}	$2.8x10^{-8}$	$7.0x10^{-9}$	1, 3
U074	1,4-Dichloro-2-butene	125	154	4.00	1.73	9,701	$6.78x10^{-5}$	1.2	$3.6x10^{-1}$	1
U075	Dichlorodifluoromethane	121	-29.8	4,830		280	0.40 to 0.43	1,450	439	1, 3, 30

0.258) - estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U076	1,1-Dichloroethane	99	57	193.4	1.79	5,500	5.45×10^{-3}	61.9	19.4	1, 6, 23 (H = experimental)
U077	1,2-Dichloroethane	99	84	75.683	1.48	8,690	1.10×10^{-3}	24.2	7.6	1, 3, 6, 23 (H = experimental)
U078	1,1-Dichloroethylene	97	31.9	630.1		3,200	1.5×10^{-2}	202	64.0	1, 15, 23 (H = experimental), 30 (H = 0.154 @ 20°C)
U079	1,2-Dichloroethylene	97	48-60	cis = 217 trans = 352		~ 700	6.60×10^{-3} 5.32×10^{-3}	69.2 112.3	22.0 35.7	2, 5, 23 (H = 6.6×10^{-3}) 30 (H = 5.32×10^{-3})
U080	Methylene chloride	85	41	427.8	1.25	16,700	3.19×10^{-3}	141.1	46.4	1, 3, 6, 23 (H = experimental)
U081	2,4-Dichlorophenol	163	210	0.118**	3.08 to 3.30	4,500	5.62×10^{-6}	3.3×10^{-2}	9.2×10^{-3}	**VP = 110 @ 147°C 1, 3, 6
U082	2,6-Dichlorophenol	163	219-220 T_M= 68-69	0.0165	2.895	172	2×10^{-5}	4.6×10^{-3}	1.3×10^{-3}	1,5
U083	1,2-Dichloropropane	113	96	50		2,700	2.8×10^{-3}	15.5	4.7	1, 3, 5, 23 (H = experimental)
U084	1,3-Dichloropropane	113	120.4	28	2.00	1,000	1.77×10^{-3}	8.68	2.6	1, 3, 6, 30
U085	1,2:3,4-Diepoxybutane	86	138	7.52	-1.26	8.3×10^{7}	1.02×10^{-8}	2.48	8.1×10^{-1}	2
U086	N,N-Diethylhydrazine	88	99	See Note	See Note	See Note	---	---	---	1. Log P cannot be estimated to derive solubility. Vapor pressure cannot be estimated.
U087	o,o-Diethyl-s-methyl-dithiophosphate		See Note	See Note	See Note	See Note	---	---	---	2, Properties cannot be estimated for thiophosphates
U088	Diethylphthalate	222	298	8.1×10^{-3}	3.58	50	4.75×10^{-5}	2.1×10^{-3}	5.4×10^{-4}	3
U089	Diethylstilbestrol	268	418	2.1×10^{-12}	5.37	.015	5.07×10^{-11}	5.3×10^{-13}	1.3×10^{-13}	7

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U090	Dihydrosafrole	164	198	0.269	2.985	240	2.3×10^{-4}	7.5×10^{-2}	2.1×10^{-2}	2
U091	3,3'-Dimethoxybenzidine	244	331	1.9×10^{-7}	1.23	1,800	10^{-11}	4.75×10^{-8}	1.2×10^{-8}	3
U092	Dimethylamine	48	7.4	2.1	-0.3	2.3×10^{6}	5.89×10^{-8}	7.9×10^{-1}	3.0×10^{-1}	3, 6
U093	Dimethylaminoazobenzene	225	sublimes	NA	4.58	160	---	---	---	3, 6, Vapor pressure cannot be estimated
U094	7,12-Dimethylbenz[a]anthracene	256	477	3.9×10^{-12}	6.94	1.3×10^{-3}	1.03×10^{-9}	9.8×10^{-13}	2.4×10^{-13}	7
U095	3,3-Dimethylbenzidine	212	327	2.9×10^{-7}	2.69	46	1.75×10^{-9}	7.5×10^{-8}	2.0×10^{-8}	2
U096	α,α-Dimethylbenzohydro-peroxide	152	253	1.1×10^{-2}**	See Note	See Note	---	3.1×10^{-3}	8.9×10^{-4}	**VP = 2.7×10^{-2} @ 60°C 4. Log P cannot be estimated to derive solubility
U097	Dimethylcarbamoyl chloride	107	167-168	2.49	See Note	See Note	---	7.7×10^{-1}	2.5×10^{-1}	1, 4 (hydrolyzes)
U098	1,1-Dimethylhydrazine	60	63	157	See Note	See Note	---	56.5	20.3	1, 5. Log P cannot be estimated to derive solubility
U099	1,2-Dimethylhydrazine	60	81	67.99	See Note	See Note	---	24.5	8.8	1, 5. Log P cannot be estimated to derive solubility
U101	2,4-Dimethylphenol	122	210	0.118**	2.30	1,600	1.18×10^{-5}	3.5×10^{-2}	1.07×10^{-2}	**VP = 10 @ 89.3°C, 1 @ 51.8°C; 1
U102	Dimethylphthalate	194	283.8	3.59×10^{-3}		4,300	2.1×10^{-7}	9.7×10^{-4}	2.6×10^{-4}	1, 3
U103	Dimethyl sulfate	126	188.5	0.570**		28,000	3.37×10^{-6}	0.171	5.1×10^{-2}	**VP<1 @ 20°C 1, 2
U105	2,4-Dinitrotoluene	182	300 T_m= 70	8.54×10^{-5}		270	7.6×10^{-8}	2.3×10^{-5}	6.3×10^{-6}	1, 3

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U106	2,6-Dinitrotoluene	182	157 T_m= 66	1.71	2.525	550	7.42×10^{-4}	4.6×10^{-1}	1.3×10^{-1}	1
U107	Di-n-octyl phthalate	391	384	6.8×10^{-8}	5.22	0.4	3×10^{-7}	1.5×10^{-8}	3.5×10^{-9}	11
U108	1,4-Diethylene dioxide	88	101	37	-0.42	6×10^{7}	7.14×10^{-7}	12.2	3.9	3, 6
U109	1,2-Diphenylhydrazine	184	178 T_m= 131	5.23×10^{-5}	2.95	180,000	10^{-11}	1.5×10^{-5}	3.9×10^{-6}	1
U110	Dipropylamine	88	110	30	1.46 to 1.73	12,000	3.32×10^{-4}	12.0	4.3	1, 5, 6
U111	Di-N-propylnitrosamine	130	206	0.419**		10,000	7.2×10^{-6}	1.3×10^{-1}	3.7×10^{-2}	**VP = 13 @ 89°C 1, 3, 6
U112	Ethyl acetate	88	77	82.2	0.73	79,000	1.2×10^{-4}	27.1	8.8	1, 3, 6
U113	Ethyl acrylate	114	118	36.141		20,000	2.71×10^{-4}	10.8	3.4	1, 3
U114	Ethylenebis(dithiocarbamic acid)	212	319	3.67×10^{-4}	<-3	$>10^{6}$	$<10^{-10}$	9.5×10^{-5}	2.5×10^{-5}	23
U115	Ethylene oxide	44	13.5	1,294	-0.30	2.1×10^{6}	3.63×10^{-5}	505	195	1, 5, 6
U116	Ethylene thiourea	102	T_m ~200	NA	-0.66	10,418	NA	---	---	1, 6, Properties cannot be estimated due to thiourea fragment
U117	Ethyl ether	74	34.51	540	0.77; 0.83; 0.89	60,500	8.69×10^{-4}	184	62.8	1, 3, 6
U118	Ethylmethacrylate	114	117	19	1.485	19,000	1.49×10^{-4}	5.9	1.78	1

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U119	Ethyl methanesulfonate	124	85-86 @ 10 mm	0.328	0.09	$1.7x10^6$	$3.14x10^{-8}$	$9.8x10^{-2}$	$3.0x10^{-2}$	7
U121	Trichloromonofluoromethane	137	23.7	768		1,100	$5.83x10^{-2}$	223	65.6	1, 3, 5, 23
U122	Formaldehyde	30	-21	4,433		600,000	$2.92x10^{-4}$	1,906	809	1, 4
U123	Formic acid	46	100.7	33.4	-0.54	$4.6x10^6$	$4.4x10^{-7}$	$1.5x10^{-5}$	4.9	1, 6
U124	Furan	68	31.36	633.99		10,000	$5.7x10^{-3}$	222	76.9	1, 3
U125	Furfural	96	161.7	2.39		83,000	$3.6x10^{-6}$	$7.7x10^{-1}$	$2.4x10^{-1}$	1, 3
U126	Glycidylaldehyde	72	97	42.6	-0.529	$7x10^6$	$5.8x10^{-7}$	14.5	5.02	5
U127	Hexachlorobenzene	285	322 T_m= 230	$1.25x10^{-5}$	4.13	0.035	$6x10^{-5}$@20°C $1.7x10^{-3}$ @25°C	$2.7x10^{-6}$	$6.5x10^{-7}$	1, 6, 16, 23, 30 ($4.9x10^{-5}$)
U128	Hexachlorobutadiene	261	215	0.269	4.14	10	$9.14x10^{-3}$ @20°C $10.3x10^{-3}$ @25°C	$6.7x10^{-2}$	$1.7x10^{-2}$	1, 23
U129	α-Hexachlorocyclohexane	291	323 T_m=113	$3.3x10^{-6}$	1.19	10	$3.16x10^{-7}$	$7.9x10^{-7}$	$1.9x10^{-7}$	1, 3, 29 ($H = 4.93x10^{-7}$), 30
U130	Hexachlorocyclopentadiene	273	239	0.08	4.3	6.4	0.0164	$2.0x10^{-2}$	$4.8x10^{-3}$	1, 3, 23
U131	Hexachloroethane	237	T_{sub}= 186	0.6		50	$9.85x10^{-3}$	$1.5x10^{-1}$	$3.9x10^{-2}$	1, 3, 5, 23, 28, 30 ($H = 1.3x10^{-2}$)
U132	Hexachlorophene	407	412 T_m=166-167	10^{-12}	7.54	410,000	10^{-18}	$2.2x10^{-13}$	$5.0x10^{-14}$	1, 3, 6
U133	Hydrazine	32	113.5	14.38		miscible	$6.0x10^{-7}$	6.1	2.5	1, 3
U134	Hydrofluoric acid	20	19.7	800		miscible	$2.0x10^{-5}$	378	179	2

*Presented only if required for other calculations. **Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U135	Hydrogen sulfide	34	-85 5	20		4,000		8.2	3.4	1, 2
U136	Hydroxydimethylarsineoxide	138	T_m=196	NA		667,000				1, Vapor pressure cannot be estimated for organo-metallics
U137	Indeno[1,2,3-cd]pyrene	276	T_m=162.5 - 164	~10^{-10}	7.66	$5x10^{-5}$	$7.2x10^{-7}$	$2.5x10^{-11}$	$6.0x10^{-12}$	31
U138	Methyl iodide	142	42.4	400		14,000	$5x10^{-3}$	116	33.6	1, 3
U139	Iron dextran	See Note	See Note	See Note	---	See Note	---	---	---	2, (This substance is actually a mixture of five dissimilar constituents)
U140	Isobutanol	74	99.5	10	0.61	95,000	$1.03x10^{-5}$	3.4	1.2	1, 3, 6
U141	Isosafrole	162	253	0.026	2.435	1,400	$4.08x10^{-6}$	$7.3x10^{-3}$	$2.0x10^{-3}$	1
U142	Kepone			$2.6x10^{-8}$			$5.6x10^{-5}$			
U143	Lasiocarpine	See Note								Mixture of chemical substances
U144	Lead acetate	325	T_m=280	NA		625,000	---	---	---	1, Vapor pressure cannot be estimated for inorganic salt
U145	Lead phosphate	365	T_m = 800	NA		0.14	---	---	---	1, Vapor pressure cannot be estimated for inorganic salt
U146	Lead subacetate	808	T_m=75	NA		456,000	---	---	---	1, Vapor pressure cannot be estimated for inorganic salt
U147	Maleic anhydride	98	197-199 T_m=60	$5x10^{-5}$(20) $2x10^{-4}$(30)		163,000	~10^{-10}	$1.6x10^{-5}$	$5.1x10^{-6}$	1, 3
U148	Maleic hydrazide	112	T_{dec}>300 T_m = 292	See Note		6,000	---	---	---	1, 9, Compound decomposes

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U149	Malononitrile	66	219	0.148		130,000	10^{-7}	5.2×10^{-2}	1.82×10^{-2}	1, 10
U150	Melphalan	305	376 T_m = 183	4×10^{-8}	1.283	400	10^{-11}	9.6×10^{-9}	2.3×10^{-9}	5
U151	Mercury	200	357	1.3×10^{-3}		0.03	1.14×10^{-2}	3.51×10^{-4}	9.2×10^{-5}	1, 20, 29
U152	1,4-Dioxane	88	101	37	-0.42	6×10^{6}	7×10^{-7}	12.2	4.0	1, 5, 6
U153	Methanethiol	48	6.2	1,520		23,300	4×10^{-3}	578	219	1, 3, 5
U154	Methyl alcohol	32	65	113.9	-0.64	4.4×10^{6}	1.1×10^{-6}	47.8	20.1	1, 6
U155	Methapyrilene	266.39	173-5	1.89	2.004	8,500	7.6×10^{-5}	4.7×10^{-1}	1.2×10^{-1}	1
U156	Methyl chlorocarbonate	94.5	71	113	See Note	Reacts with water	---	36.2	11.6	1 (Reacts with water)
U157	3-Methylcholanthrene	268	T_m= 180 280 @ 80mm	3.79×10^{-6}	6.965	1.7×10^{-4}	7.7×10^{-3}	9.5×10^{-7}	2.3×10^{-7}	1
U158	4,4'-Methylenebis(2-chloroaniline)	269	T_m=99-107	6×10^{-6}		15	1.4×10^{-7}	1.50×10^{-6}	3.7×10^{-7}	3, 4
U159	2-Butanone	72	79.6	89.6**	0.29	353,000	2.4×10^{-5}	30.5	10.6	**VP = 77.5 @ 20; 199.28 @ 42.8 and 247.7 @ 48.1 1, 4, 6
U160	Methylethyleketone peroxide	90	19	See Note			---	---	---	4, (Substance decomposes in gas phase).
U161	4-Methyl-2-pentanone	100	116.85	19**		19,000	1.32×10^{-4}	6.08	1.9	**VP = 6 @ 20°C 1, 3
U162	Methyl methacrylate	100	101	35.5**		15,000	3.11×10^{-4}	11.4	3.6	**VP = 32 @ 24°C, 40 @ 26°C 1, 3, 4

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U163	N-Methyl-N'-nitro-N-nitrosoguanidine	147	89	69.1		NA		20	5.7	5, Solubility cannot be estimated for guanidine compounds
U164	Methylthiouracil	142	T_{dec}= 300	$4.8x10^{-5}$	0.22	51	$1.8x10^{-7}$	$1.4x10^{-5}$	$4.0x10^{-6}$	2, 6
U165	Naphthalene	81	218	0.232**	3.06 to 330	30	$4.8x10^{-4}$	$7.7x10^{-2}$	$2.6x10^{-2}$	**VP = 1 @ 53°C 4, 6, 30 (H - experimental)
U166	1,4-Naphthalenedione	158	213	0.201	1.78 1.71	11,695	$3.6x10^{-6}$	$5.6x10^{-2}$	$1.6x10^{-2}$	4, 6
U167	1-Naphthalamine	143	246	0.0559	2.24	2221	$4.7x10^{-6}$	$1.6x10^{-2}$	$4.7x10^{-3}$	1, 5, 6
U168	2-Naphthalamine	143	246	0.0559	2.28	1,958	$5.4x10^{-6}$	$1.6x10^{-2}$	$4.7x10^{-3}$	1, 5, 6
U169	Nitrobenzene	123	210.8	0.209		1,900	$2.4x10^{-5}$	$6.3x10^{-1}$	$1.9x10^{-2}$	1, 3, 23 (H = experimental)
U170	4-Nitrophenol	139	279 T_m = 115	$3.88x10^{-5}$		16,000	10^{-10}	$1.15x10^{-5}$	$3.3x10^{-6}$	1, 3
U171	2-Nitropropane	89	120	17.5		17	0.121	5.8	1.6	1, 3
U172	N-Nitroso-di-n-butylamine	158	157	4.11	2.5	1,100	$7.9x10^{-4}$	1.15	$3.3x10^{-1}$	4,
U173	N-Nitrosodiethanolamine	124	128	14.2	-1.539	$3x10^8$	$8x10^{-9}$	4.26	1.28	5
U174	N-Nitrosodiethylamine	102	175-177	1.73	0.48	408,320	$6x10^{-7}$	$5.4x10^{-1}$	$1.7x10^{-1}$	3, 6
U176	N-Nitroso-N-ethylurea	117	125	16.3	0.48	470,000	$5.4x10^{-6}$	4.9	1.5	5
U177	N Nitroso-N-methylurea	103	107	33.5	-0.03	$2x10^6$	$2.2x10^{-6}$	10.4	3.3	5, 6

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U178	N-Nitroso-N-methylurethane	132	109	31.2**		13,000	$4.17x10^{-4}$	9.4	2.7	**VP = 13 @ 65°C 1, 10, 20
U179	N-Nitrosopiperidine	114	217	0.244	0.63	284,318	$9.78x10^{-5}$	$7.6x10^{-2}$	$2.3x10^{-2}$	6
U180	N-Nitrosopyrrolidine	100	52	284	-0.19	$3x10^6$	$1.13x10^{-5}$	$7.6x10^{-2}$	28.4	5
U181	5-Nitro-o-toluidine	152	178 T_m= 108	0.280	2.085	340	$1.67x10^{-4}$	$7.8x10^{-2}$	$2.3x10^{-2}$	1, 5
U182	Paraldehyde	132	128	25.3		120,000	$3.66x10^{-5}$	7.6	2.2	1, 2, 3, 4 (Substance is a formaldehyde polymer and decomposes in gas phase).
U183	Pentachlorobenzene	250	277 T_m = 86	$4.12x10^{-4}$	5.705	0.10	$1.3x10^{-3}$	$1.0x10^{-4}$	$2.7x10^{-5}$	1
U184	Pentachloroethane	202	162	3.5		500	$2.17x10^{-3}$	$7.6x10^{-3}$	$2.5x10^{-1}$	1, 3, 5, 28, 30
U185	Pentachloronitrobenzene	295	240 T_m = 144	$2.38x10^{-3}$	5.45	0.032	0.0288	$5.79x10^{-4}$	$1.4x10^{-4}$	1, 5
U186	1,3-Pentadiene	68	42	414	2.30	870	0.0424	145	50.2	1
U187	Phenacetin	179	266 T_m=138	$3.16x10^{-3}$	1.57 (no HCl)	530	$1.4x10^{-6}$	$8.5x10^{-4}$	$2.6x10^{-4}$	1, , 5, 6
U188	Phenol	94	182	0.62	1.48	82,000	$1 3x10^{-6}$	$2.0x10^{-1}$	$6.4x10^{-2}$	1, 6, 23
U189	Phosphorus sulfide	222	514	See Note	See Note	$1.17x10^{-4}$	See Note	---	---	1, 12 (Substance slowly reacts with water).
U190	Phthalic anhydride	148	295.1 T_m=132	$2x10^{-4}$ @ 20°	-0.62	152,990	$\sim 10^{-10}$	$5.4x10^{-5}$	$1.2x10^{-5}$	**VP = 0.001 @ 30°C 1, 2, 3, 4 ,6 (Substance hydrolyzes in water)
U191	2-Picoline	93	128 8	10	1.11	51,000	$2 4x10^{-5}$	3.2	1.0	1, 6

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U192	Pronamide	256	321	4.02×10^{-4}		15	9×10^{-6}	1.0×10^{-4}	2.5×10^{-5}	9, 23
U193	1,3-Propane sultone	122	180 @ 30mm T_m= 30-33	6.37×10^{-4}	-0.4	2.3×10^{6}	10^{-11}	1.9×10^{-4}	5.8×10^{-5}	2
U194	1-Propanamine	59	49	280**		miscible	2.0×10^{-5}	101	36	** VP = 400 @ 31.5°C
U196	Pyridine	79	115.5	20	-1.69	3×10^{8}	7×10^{-9}	6.8	2.3	1, 3, 6
U197	ρ-Benzoquinone	108	T_m=115.7	0.09	0.20	23,655	5×10^{-7}	2.8×10^{-2}	8.7×10^{-3}	1, 3, 6
U200	Reserpine	609	T_m= 265	$>1.02\times10^{-3}$	0.74	190	4.28	2.0×10^{-4}	$>4.1\times10^{-5}$	1, 3
U201	Resorcinol	110	280 T_m=111	1.2×10^{-5}		2.20×10^{6}	10^{-13}	3.7×10^{-6}	1.1×10^{-5}	1, 3
U202	Saccharin and salts	183	243 T_{dec}=229	2.69×10^{-3}		3,448	1.9×10^{-7}	7.3×10^{-4}	2.0×10^{-4}	1, 4
U203	Safrole	162	234.5	0.0709	2.435	1,400	1.08×10^{-5}	2.0×10^{-2}	5.6×10^{-3}	1
U204	Selenium dioxide	111	T_m= 340	0.16**		38,400	6.0×10^{-7}	4.9×10^{-2}	1.5×10^{-2}	**VP = 1 @ 157°C 1
U205	Sulfur selenide		See Note	See Note	---	See Note	---	---	---	12 (Sulfur and selenium form semi-continuous solid solutions containing SeS, SeS_2 + SSe_2 as actual constituents).
U206	Streptozotocin	265	285 T_m= 115	1.27×10^{-4}	-1.45	4×10^{6}	10^{-11}	3.2×10^{-5}	7.8×10^{-6}	2, 6
U207	1,2,4,5-Tetrachlorobenzene	216	243-246 T_m = 140	2.14×10^{-3}		6	1.0×10^{-4}	5.6×10^{-4}	1.5×10^{-4}	1, 16
U208	1,1,1,2-Tetrachloroethane	168	130.5	10		560	2.76×10^{-3}	2.8	7.7×10^{-1}	1, 4, 30
U209	1,1,2,2-Tetrachloroethane	168	146.2	4.2		3,000	4.7×10^{-4}	1.18	3.2×10^{-1}	1, 2, 5, 30

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U210	Tetrachloroethylene	166	121	**	2.60	100	2.87×10^{-2}			**VP = 10 @ 14°C 1, 2, 6, 23, 30 (H = 0.012 @ 20°C)
U211	Tetrachloromethane	154	76.54	115.3	2.70	500	2.13×10^{-2}	32.3	9.3	1, 5, 6, 12, 23, 30 (H = experimental)
U212	2,3,4,6-Tetrachlorophenol	232	150 T_m= 70	1.55	4.10	10.6	4.46×10^{-2}	4.0×10^{-1}	1.0×10^{-1}	1, 6
U213	Tetrahydrofuran	72	67	149	0.73	130,988	1.08×10^{-4}	50.7	17.6	1, 5, 6
U214	Thallium(I)acetate	263	T_m = 110	NA		soluble	---	---	---	1, Properties cannot be estimated for inorganic compounds
U215	Thallium(I)carbonate	468	T_m = 272	insignificant ($< 10^{-6}$)		52,000	---	--	---	**VP = 10 @ 517°C 1, Properties cannot be estimated for inorganic compounds
U216	Thallium(I)chloride	240	720 T_m=430	insignificant ($< 10^{-5}$)		2,900		2.5		1, Properties cannot be estimated for inorganic compounds
U217	Thallium(I)nitrate	266	430 T_m=206	See Note		95,500	---	---	---	1, 12 (Substance decomposes to Tl_2O_3 + NO_x, higher temp. measurements may include contributions from decomposition products.
U218	Thioacetamide	75	T_m=114	NA		163,000	---	---	---	1, 4, Vapor pressure cannot be estimated because of the thioacetamide group
U219	Thiourea	76	T_m=182	NA		91,800	---	---	---	1, 3, Properties cannot be estimated due to thio fragment
U220	Toluene	92	110 6	26.8	2 69	515	6.64×10^{-3}	8.6	2.8	1, 3, 6, 23, 30 (H = experimental)

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U221	Toluenediamine	122	255 T_m=61	$1.77x10^{-3}$	0.345	120,000	$2.3x10^{-9}$	$5.3x10^{-4}$	$1.6x10^{-3}$	1
U222	o-Toluidine hydrochloride	143	242.2 T_m=215	$1.19x10^{-3}$	1.57 (no HCL)	30	$7.55x10^{-6}$	$3.5x10^{-4}$	$1.0x10^{-4}$	1
U223	Toluenediisocyanate	174	251	0.0217**	---	reacts with water	---	$6.1x10^{-3}$	$1.65x10^{-3}$	**VP = 11 @ 126°C 2, 4 (Reacts with water)
U224	Toxaphene	258	T_m=65-90	NA		0.40	$4.89x10^{-3}$	---	---	1, 16, 5, 23 (H = experimental) Vapor pressure cannot be estimated
U225	Bromoform	253	149.5	5.6		3,190	$5.32x10^{-4}$	1.40	$3.5x10^{-1}$	1, 3, 5, 23, 30 (H = $6.12x10^{-4}$)
U226	1,1,1-Trichloroethane	133	74.1	117**	2.49	950	$4.92x10^{-3}$	33.9	10.1	**VP = 99.7 @ 20°C 1, 4, 6, 23, 30 (H = $3.42x10^{-2}$ @ 20°C)
U227	1,1,2-Trichloroethane	187	113.67	22.4**		4,500	$1.18x10^{-3}$	6.05	1.6	**VP = 75.86 @ 50°C 1, 3, 5, 30
U228	Trichloroethylene	131	87	71.6	2 29	1,100	$8.92x10^{-3}$	21.5	6.3	1, 2, 6, 23, 30 (H = experimental
U230	2,4,5-Trichlorophenol	197	T_{sub}=252 T_m=67	0.0496	3 72	<2,000	$6x10^{-6}$	$1.3x10^{-2}$	$3.5x10^{-3}$	2, 3, 6
U231	2,4,6-Trichlorophenol	197	246	0.0149**	3.69	800	$4.82x10^{-6}$	$4.0x10^{-3}$	$1.06x10^{-3}$	**VP = 1 @ 76.5°C 1, 3, 6
U232	2,4,5-T	255	294 T_m=150-159	$2 44x10^{-5}$		238	$3.44x10^{8}$	$6.1x10^{-6}$	$1.5x10^{-6}$	8
U233	Silvex	269.5	310 T_m=181 6	$7.12x10^{-6}$		140	$1 8x10^{-8}$	$1.8x10^{-6}$	$4.3x10^{-7}$	2, 4

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
U234	Benzene, 1,3,5-trinitro-	213	315 T_m=122	2.86**	1.18	350	2.3×10^{-3}	0.75	0.20	**VP = 2 @ 17.5°C 1, 2, 6
U235	Tris (2,3-dibromopropylphosphate)	697	T_{dec}= 255	$<1\times10^{-3}$	2.83 to 3.21	6.3	1.46×10^{-4}	1.9×10^{-4}	$<3.8\times10^{-5}$	15
U236	Trypan blue	961	decomposes		See Note	See Note	---	---	---	7. Log P cannot be estimated to derive solubility.
U237	Uracil, 5[bis(2-chloromethyl) amino]	224	224	0.168	-1.585	6×10^{8}	10^{-10}	4.4×10^{-2}	1.1×10^{-2}	1
U238	Ethyl carbamate (urethane)	89	185 T_m=48	0.3575	-0.15	2×10^{6}	2×10^{-8}	1.2×10^{-1}	3.8×10^{-2}	1, 2, 6
U239	Xylene	106	137-140	o = 2.77 p = 3.15 m = 3.20	5.0 6.5 6.0	175	5.27×10^{-3} 2.51×10^{-3} 2.55×10^{-3}	2.05 9.8×10^{-1} 9.9×10^{-1}	2.7×10^{-1} 3.1×10^{-1} 3.1×10^{-1}	3, 30 (H = experimental)
U240	2,4-D Salts & Esters		See Note	See Note		See Note	---	---	---	Mixture of compounds
U242	Pentachlorophenol	266	109-110	1.1×10^{-4}		80	4.8×10^{-7}	1.1×10^{-4}	6.7×10^{-6}	1, 3
U243	Hexachloropropene	249	210	0.344	4.38	4.5	2.5×10^{-2}	8.6×10^{-2}	2.9×10^{-2}	2, 7
U244	Bis(dimethylthiocarbamoyldisulfide)		NA	NA		NA	NA	- -	---	Properties cannot be estimated for disulfides
U246	Bromine cyanide	106	61.5	100	See Note	Reacts with water	---	31.1	9.7	1, 4 (Hydrolyzes in water to HOCN + HBr)

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P001	Warfarin	308	432	10^{-11} T_m = 161	0.05 to 2.52	860	10^{-15}	$2.4x10^{-12}$	$5.7x10^{-13}$	6, 8
P002	1-Acetyl-2-thiourea	118	206	0.14	NA	NA	NA	$4.2x10^{-2}$	$1.3x10^{-2}$	1, (Log P and solubility cannot be estimated due to presence of thiourea fragment)
P003	Acrolein	56	53	258		280,000	$6.79x10^{-5}$	95.5	34.5	1, 3
P004	Aldrin	365	T_m= 104	$6x10^{-6}$	3.01	0.2	$4.96x10^{-4}$	$1.4x10^{-6}$	$3.1x10^{-7}$	6, 20, 23 (H=$4.96x10^{-4}$), 28, 30 (H=$2.8x10^{-5}$), 29 (H = $1.44x10^{-5}$)
P005	Allyl alcohol	58	97	28.10	0.17	62,000	$3.47x10^{-6}$	10.1	3.7	1, 5, 6
P006	Aluminum phosphide	58	See Note	See Note	See Note	Reacts	See Note	---	---	12, (Substance has high melting point (m.p. 1350°C), vapor pressure negligible to m.p. Reacts with water).
P007	5-(Aminomethyl)-3-isoxazol	114	258 T_{dec}=75	$1.4x10^{-3}$	-1.815	$6.4x10^8$	10^{-13}	$4.3x10^{-4}$	$1.3x10^{-4}$	2
P008	4-Pyridinamine	94	108	25.8	0.26 0.28	730,000	$4.4x10^{-6}$	8.3	2.7	1, 5, 6
P009	Ammonium picrate	246	209	0.230		10,000	$7.4x10^{-6}$	$5.8x10^{-2}$	$1.5x10^{-2}$	4
P010	Arsenic acid	142	decomposes	See Note		167,000	---	---	---	12, (Arsenic acid decomposes to AS_2O_5 + H_2O) in gas phase.)
P011	Arsenic V oxide	230	T_{dec}=300	See Note		$1.5x10^6$	---	---	---	1, 3, (AS_2O_5 decomposes to AS_2O_3 + O_2 in gas phase.)
P012	Arsenic II oxide	198	457.2	$8.3x10^{-8}$**		17,000	$\sim 1.7x10^{-12}$	$2.2x10^{-8}$	$5.9x10^{-9}$	**VP = $2x10^{-7}$ @ 60°C 1, 4, 12

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P013	Barium cyanide	189	NA	NA		800,000	-	---	---	1, Boiling point and vapor pressure cannot be estimated for inorganic substances
P014	Benzenethiol	110	168.7	~1.5	2.52	706	$3.1x10^{-4}$	$4.7x10^{-1}$	$1.4x10^{-1}$	1, 3, 6
P015	Beryllium dust	9	2,500 T_m=1,287	$2.7x10^{-7}$**	---	insoluble (<1 mg/l)	---	$1.6x10^{-7}$	$9.0x10^{-8}$	1, **VP ≈ 10^{-5} @ 942°C
P016	Bis(chloromethyl)ether	115	104	36.3**	-0.38	22,000	$2.5x10^{-4}$	11.3	3.4	**VP ≈ 30 @ 22°C 1, 19
P017	Bromoacetone	137	136.5 T_m=36.50	5.51**	---	miscible	$9.9x10^{-7}$	1.6	$4.71x10^{-1}$	1, ** VP=8 mm @ 31.5°C
P018	Brucine	394	470	10^{-12}	0.22	33,620	10^{-17}	$2.2x10^{-12}$	$5.0x10^{-14}$	1
P020	Dinoseb(2,4-dinitro-6-sec-butylphenol)	240	223	0.0576		100	$1.82x10^{-4}$	$1.4x10^{-2}$	$3.7x10^{-3}$	8
P021	Calcium cyanide	92	T_{dec}=350	See Note	See Note	reacts	See Note	---	---	1, 12, (Substance decomposes to carbon + calcium cyanamide. Also reacts with water to yield HCN.)
P022	Carbon disulfide	76	46.25	357	NA	2,940	0.012	121	41.0	1, 3, 5, (Log P cannot be estimated due to structure)
P023	Chloroacetaldehyde	78.5	85	317	-0.5	$7x10^6$	$4.7x10^{-6}$	108	35.8	1, 3
P024	p-Chloroaniline	127.5	232 T_m= 72.5	0.015	1.83	1,855	$3x10^{-6}$	$4.5x10^{-3}$	$1.3x10^{-3}$	1, 3, 6
P026	1-(o-Chlorophenyl) thiourea	181	275	$4.0x10^{-4}$	1.19	3,800	$2.51x10^{-8}$	$1.1x10^{-4}$	$3.0x10^{-5}$	1
P027	3 Chloropropionitrile	90	174-176	1.33	NA	45,000	$3.5x10^{-6}$	$4.3x10^{-1}$	$1.4x10^{-1}$	2
P028	Benzylchloride	126	179	1 25	2 30	1,619	2 $36x10^{-4}$	$3.8x10^{-1}$	$1.1x10^{-1}$	1, 6

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P029	Copper cyanides ($CuCN;Cu(CN)_2$)	89 115	See Note	See Note		2.6 1.8	---	---	---	25, 12, (Substance decomposes to Cu + C_2N_2: in equilibrium with these products.)
P030	Cyanides									See specific compound
P031	Cyanogen	52	-21	3,980**		27.5	9.91	1,473	552	**VP = 5 atm @ 21.4 1, 2
P033	Cyanogen chloride	61	12.66	1,190		30,000	$3.2x10^{-3}$ reacts slowly	428	152.4	1, 3, 4, (Hydrolyzes to HOCN + HCl)
P034	2-Cyclohexyl-4,6-dinitrophenol	266	291.5	$2.87x10^{-3}$**	4.81	1.2	$8.37x10^{-4}$	$7.2x10^{-4}$	$1.7x10^{-4}$	**VP = 1mm @ 132.86 1
P035	2,4-D	221	278 T_m=140.5	$1.59x10^{-4}$**		620	$7.5x10^{-8}$	$4.1x10^{-5}$	$1.1x10^{-5}$	**VP = 0.4 @ 160°C 1, 8
P036	Dichlorophenylarsine	223	255	2.7**		hydrolyzes	---	$7.0x10^{-1}$	---	**VP = 14 @ 131°C 1, Compound hydrolyzes in water and wet soil
P037	Dieldrin	381	T_m=175	$7.78x10^{-7}$	6.20	0.19	$1.1x10^{-5}$	$1.8x10^{-7}$	$4.0x10^{-8}$	1, 7, 8, 15, 23, 30, 31 (H = experimental)
P038	Diethylarsine	134	105	30	See Note	See Note	---	8.7	2.6	1, Solubility of inorganic chemicals cannot be estimated
P039	Disulfoton	274	108 @ 0.01 mm	$1.8x10^{-4}$		25	$2.59x10^{-6}$	$4.5x10^{-5}$	$1.1x10^{-5}$	2, 9
P040	O,O-Diethyl o-pyrazinyl Phosphorothioate	248	80	$3x10^{-3}$		100	$8.58x10^{-6}$	$7.5x10^{-4}$	$1.9x10^{-4}$	1, 8
P041	Diethyl-p-nitrophenyl phosphate	275	169-170	$7.8x10^{-5}$	1.69	10,000	$2.83x10^{-9}$	$2.0x10^{-5}$	$4.7x10^{-6}$	2
P042	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-epinephrine	211	306	$4x10^{-4}$	NA	NA*	-	$1.0x10^{-4}$	$2.8x10^{-5}$	2, *Log P cannot be estimated due to epinephrine fragment

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P043	Diisopropylfluorophosphate	184	183	0.579	---	15,000	$9.1x10^{-6}$	$1.6x10^{-1}$	$4.3x10^{-2}$	2
P044	Dimethoate	229	T_m = 52	$8.5x10^{-6}$	0.5	25,000	10^{-10}	$2.2x10^{-6}$	$5.6x10^{-7}$	6, 8, 9
P045	Thiofanox	218	296	$1.7x10^{-4}$		52,000	$9.37x10^{-10}$	$4.4x10^{-5}$	$1.2x10^{-4}$	8
P046	α,α-Dimethylphenethylamine	149	205 @ 750mm	0.276	2.17	2,900	$1.86x10^{-5}$	$7.9x10^{-2}$	$2.3x10^{-2}$	2
P047	4,6-Dinitro-o-cresol (and salts)	198	214 T_m=86.5	0.018		130	$1.4x10^{-5}$	$4.8x10^{-3}$	$1.3x10^{-3}$	1, 9, 23 (H = experimental)
P048	2,4-Dinitrophenol	184	T_m=116	NA	1.50	19,500	---	---	---	1, 6, Boiling point and vapor pressure cannot be estimated due to presence of nitro groups
P050	Endosulfan	407	T_m= 70-100	$1x10^{-5}$	5.34	0.22	$2.5x10^{-5}$	$2.2x10^{-6}$	$5.0x10^{-7}$	8, 9
P051	Endrin	381	T_m=245	$2x10^{-7}$	5.3	0.024	$4.2x10^{-6}$	$4.6x10^{-8}$	$1.0x10^{-8}$	1, 2, 8, 16
P054	Ethylenimine	43	56	200		miscible	$1.1x10^{-5}$	78	30	**VP = 160 @ 20°C & 250 @ 30°C 1
P056	Fluorine	19	permanent gas	permanent gas		reacts	---			1, (Reacts with water)
P057	Fluoroacetimide	77	181	0.875	-1.05	$3.8x10^{-7}$	$2.33x10^{-9}$	$3.0x10^{-1}$	$1.0x10^{-1}$	2,6,7
P058	Fluoroacetic acid, sodium salt		decomposes	NA		NA	---	---	---	1, (decomposes)
P059	Heptachlor	373	T_m = 96	$3x10^{-4}$		0.56	$1.48x10^{-3}$	$6.9x10^{-5}$	$1.6x10^{-5}$	8, 28, 23
P060	Hexachlorohexahydro, exo, exo dimethanonaphthalene	365	379	$1.4x10^{-4}$	-0.39	$8.5x10^{6}$	$1.17x10^{-7}$	$3.2x10^{-5}$	$7.3x10^{-6}$	1

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P062	Hexaethyltetraphosphate	--	See Note	See Note		reacts	---	---	---	Boiling point and vapor pressure cannot be estimated
P063	Hydrocyanic acid	27	25.7	730	-1.5	$5.6x10^7$	$4.65x10^{-7}$	321	140	1, 3, 6
P064	Methyl isocyanate	57	59.6	201		Reacts with water	---	12.3	26.6	1, 4 (Reacts with water)
P065	Mercury fulminate	284	explodes	See Note		700**	---	---	---	**@ 12°C 1, 10, 12 ($Hg(ONC)_2$ detonates at fairly low temp. Gas phase contains decomposition products in addition to chemical)
P066	Methomyl	162	T_m= 78-79	$5x10^{-5}$		58,000	10^{-10}	$1.4x10^{-5}$	$3.9x10^{-6}$	9, 8
P067	2-Methylaziridine	57	20	92.0	-0.35	$3.1x10^6$	$2.22x10^{-5}$	33.1	12.2	1
P068	Methyl hydrazine	46	87.5	49.6		miscible	$3.0x10^{-6}$	16.4	7.3	4
P069	2-Methyllactonitrile	85	251	0.0244	-0.508	$7.7x10^6$	10^{-10}	$7.4x10^{-2}$	$2.6x10^{-3}$	5
P070	Aldicarb	190		10^{-4}		60,000	10^{-10}	$2.7x10^{-4}$	$7.3x10^{-6}$	9
P071	Methyl parathion	263	236 T_m= 38	0.0249		50	$1.97x10^{-7}$	$6.5x10^{-3}$	$1.6x10^{-3}$	9, 30
P072	α-Napthylthiourea	202	337	$5.1x10^{-7}$		680	$2.26x10^{-10}$	$1.4x10^{-7}$	$3.6x10^{-8}$	3
P073	Nickel carbonyl	171	43	400		180	~0.5	112	30.6	1
P074	Nickel cyanide	111	decomposes	NA		$9.1x10^{-3}$	---	---	---	25, (decomposes)

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm-m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P075	Nicoline	162	246	0.0557**	1.17	74,000	1.6×10^{-7}	1.6×10^{-2}	4.4×10^{-3}	**VP = 28.4 @ 133.8°C 1, 5, 6
P076	Nitric oxide	30	-151.7	permanent gas @ 20°C		4.6 ml/ 100ml @ 20	---	---	---	2
P077	p-Nitroaniline	138	331.7 T_m = 149	4×10^{-3}		800	10^{-6}	1.2×10^{-3}	3.4×10^{-4}	1, 3
P078	Nitrogen dioxide	46	21.0	800		reacts	---	307	118	1, 12 (reacts with water to yield NO an nitric acid)
P081	1,2,3-Propanetriol, trinitroate	227	256	0.26**		1,200 1,800	5.18×10^{-5}	6.8×10^{-2}	1.73×10^{-2}	**VP = 2 @ 125°C 1, 2, 3
P082	N-Nitrosodimethylamine (Dimethylnitrosamine)	74	153	4.87**	-0.74	1.4×10^{7}	3×10^{-8}	1.6	5.7×10^{-1}	**VP = 14 @ 50°C 3
P084	N-Nitrosomethylvinylamine	86		16**	0.03	30,000	5.65×10^{-5}	5.3	1.7	**VP = 30 mm @ 47°C 2, 3
P085	Octamethylpyrophosphoramide	286	154 @ 2mm	10^{-3}		miscible	3.7×10^{-10}	2.4×10^{-3}	5.9×10^{-5}	2
P087	Osmium tetraoxide	254	T_m= 40	10		57,000	5.86×10^{-5}	2.5	6.3×10^{-1}	1, 10
P088	Endothall	230	See Note	NA	See Note	100,000	---	---	---	2. Boiling point and Log P cannot be estimated
P089	Parathion	297	113	3.78×10^{-5}		24	1.21×10^{-6}	9.1×10^{-6}	2.2×10^{-6}	1, 8, 30
P092	Phenylmercuric acetate	336	T_m= 149	9×10^{-6}		4,370	10^{-9}	2.2×10^{-6}	4.9×10^{-7}	2, 8
P093	N-Phenylthiourea	152	255	0.0162	0.73	2,200	1.47×10^{-7}	4.5×10^{-3}	1.3×10^{-3}	2, 6
P094	Phorate	260	75-78 @ 01 mm	8×10^{-4}		50	5.47×10^{-6}	2.0×10^{-4}	5.0×10^{-5}	2

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P095	Phosgene	99	7.56	1,430	See Note	slightly	---	458	144	1. Log P cannot be estimated to derive solubility
P096	Phosphine	34	-87.7	$1.4x10^{-4}$		2,600	0.189	$5.7x10^{-5}$	$2.4x10^{-5}$	1
P097	Dimethylcarbamoyl chloride	107	167-168 @ 775 mm	2.6		20,000	$1.81x10^{-3}$	$8.1x10^{-1}$	$2.5x10^{-1}$	2
P098	Potassium cyanide	65	NA	insignificant ($< 10^{-6}$)		500,000	---	---	---	4, Boiling points and vapor pressures cannot be estimated for inorganic chemicals
P099	Potassium silver cyanide	199	See Note	See Note		250,000**	---	---	---	**@ 20°C 3, 10. Boiling point cannot be estimated to derive vapor pressure.
P101	Propane nitrile	55	97.35	40		119,000	$2.4x10^{-5}$	14.8	5.4	2
P102	2-Propyn-1-ol	56	113.6	9.56	-1.09	$3.2x10^{-7}$	$2x10^{-8}$	3.5	1.28	1
P103	Selenourea	123	T_{dec}=213	NA		100,000**	---	---	---	**19°C 1, 10, (Decomposes)
P104	Silver cyanide	134	T_{dec}=320	See Note		23 @ 20°C	---	---	---	1, 12 (Substance decomposes to Ag + C_2N_2. Equilibrium with metal + C_2N_2 exists)
P105	Sodium azide	65	T_m= 350	See Note		417,000	---	---	---	1, 27 (Decomposes to N_2 + sodium nitride in gas phase)
P106	Sodium cyanide	49	1,496	insignificant ($< 10^{-6}$)		480,000	---	---	---	1, Boiling points and vapor pressures cannot be estimated for inorganic chemicals
P107	Strontium sulfide	119	T_m=2;000	insignificant ($<10^{-6}$)		insoluble, reacts at low temp.	See Note	---	---	1, 12 (Substance reacts with water or moisture to yield H_2S + $Sr(OH)_2$

... @ 25°C, estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P108	Strychnine and salts	334	463	1.2×10^{-11}**	1.93	156	10^{-14}	2.76×10^{-12}	6.6×10^{-13}	**VP = 5 @ 270°C 1, 2, 6
P109	Tetraethyldithiopyrophosphate	222	265	0.0148	See Note	See Note	---	3.8×10^{-3}	9.9×10^{-4}	1, Log P cannot be estimated to derive solubility
P110	Tetraethyl lead	323	decomposes	0.19**	See Note	See Note	---	4.5×10^{-2}	1.1×10^{-2}	**VP = 0.15 @ 20°C 3. Log P cannot be estimated to derive solubility
P111	Tetraethylpyrophosphate	290	124 @ 1 mm	4.7×10^{-4}	See Note	See Note	---	1.1×10^{-4}	2.8×10^{-5}	2. Log P cannot be estimated to derive solubility
P112	Tetranitromethane	196	126	13**	0.606	530,000	6.33×10^{-6}	3.5	9.3×10^{-1}	**VP = 10 @ 23°C; 8.4 @ 20°C 1, 5
P113	Thallic oxide	457	T_m = 717	insignificant (< 10^{-6})		NA	---	---	---	3, Vapor pressure and solubility cannot be estimated for inorganic chemicals
P114	Thallium selenate	551	T_m=7,400	insignificant (< 10^{-6})		21,300**	---	---	---	**10°C 1
P115	Sulfuric acid, thallium(1)salt		T_m = 632	insignificant (< 10^{-6})		48,700	---	---	---	1, Vapor pressure and solubility cannot be estimated for inorganic chemicals
P116	Thiosemicarbazide	91	T_m = 183	NA		soluble	---	---	---	1, Vapor pressure and solubility cannot be estimated for inorganic chemicals
P118	Trichloromethyl mercaptan	151	136	5.78	1.74	11,000	1.04×10^{-4}	1.7	4.7×10^{-1}	1, Vapor pressure and solubility cannot be estimated for inorganic chemicals
P119	Ammonium vanadate	117	T_m= 200	NA		4,400	---	---	---	1, Vapor pressure and solubility cannot be estimated for inorganic chemicals

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A Physical Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
P120	Vanadium pentoxide	182	T_m= 690 T_{dec}= 1,750	insignificant ($<10^{-6}$)		8,000	-	---	---	1, Vapor pressure and solubility cannot be estimated for inorganic chemicals
P121	Zinc cyanide	117	See Note	See Note	- -	50	- -	- -	--	4, 12 (Substance decomposes to ZN + C_2N_2: in equilibrium with those products)
P122	Zinc phosphide	258	1100	See Note	- -	reacts	---	---	---	1, 12 (Substance reacts with water to yield PH_3 = $Zn(OH)_2$))
P123	Octachlorocamphene	412	389	$8.08x10^{-6}$	6.97	$2.1x10^{-3}$	$2.07x10^{-3}$	$1.8x10^{-6}$	$4.0x10^{-7}$	5

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
D000	Any combination of arsenic, barium, cadmium, and chromium waste.									
D001	Solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D.									No information available on wastestream constituents
D002	Solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D.									No information available on wastestream constituents
D003	Solid waste that exhibits the characteristics of reactivity, but is not listed as a hazardous waste in Subpart D.									No information available on wastestream constituents
D004	Arsenic	75	75	1 @ 372°C		insoluble		nonvolatile	nonvolatile	1
D005	Barium	137	1,600	NA		reacts slowly with water		nonvolatile	nonvolatile	1, Vapor pressure cannot be be estimated, however should be less than 10^{-6} at 25°C
D006	Cadmium	112	765	10^{-5} @ 148°C		insoluble		nonvolatile	nonvolatile	1
D007	Chromium	52	2,672	10^{-5} @ 907°C		insoluble		nonvolatile	nonvolatile	1
D008	Lead	207	1,740	10^{-5} @ 483°C		insoluble		nonvolatile	nonvolatile	1
D009	Mercury	200	357	$1.3x10^{-3}$		$3x10^{-2}$	$1.14x10^{-2}$	$3.5x10^{-4}$	$1.2x10^{-4}$	1, 29
D010	Selenium	79	685	NA		insoluble		nonvolatile	nonvolatile	1, Vapor pressure cannot be estimated, however should be less than 10^{-6} at 25°C
D011	Silver	108	2,060	NA		insoluble		nonvolatile	nonvolatile	1, Vapor pressure cannot be estimated, however should be less than 10^{-6} at 25°C

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
D012	Endrin (1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,endo-5,8-dimethane naphthalene).	381	T_m=235°	$2x10^{-7}$		0.024 0.26	$3.86x10^{-7}$	$4.5x10^{-8}$	$1.0x10^{-8}$	31
D013	Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer)	291	T_m=112.9°	$9.4x10^{-6}$		7.3	$4.93x10^{-7}$	$2.3x10^{-6}$	$5.5x10^{-7}$	29, 31
D014	Methoxychlor (1,1,1-Trichloro-2,2-bis[p-methoxy phenol]) ethane	346	T_m p,p'= 89°	NA		< 1 mg/l	---	---	---	8, Vapor pressure cannot be be estimated
D015	Toxaphene (technical clorinated camphene, 67-69 percent chlorine).	343-517	T_{dec} = 120°	0.2-0.4		~ 3	$\sim 7.5x10^{-2}$	$\sim 3.0x10^{-1}$	$\sim 8.9x10^{-2}$	31
D016	2,4-D(2,4-Dichlorophenoxyacetic acid)	221	278 T_m=140.5°	$1.59x10^{-4}$**		620	$7.5x10^{-8}$	$4.1x10^{-5}$	$1.1x10^{-5}$	**VP = 0.4 mm @ 160°C 8
D017	2,4,5-TP Silvex (2,4,5-Trichloro-phenoxypropionic acid)	255	T_m=154°	NA		238 @ 30°	---	---	---	8, Vapor pressure cannot be estimated

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
F001	Spent halogenated solvents used in degreasing, tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and the chlorinated fluorocarbons; sludges from the recovery of these solvents in degreasing operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								
F002	Spent halogenated solvents, tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoro-ethane, o-dichlorobenzene, trichlorofluoromethane, the still bottoms from the recovery of these solvents.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								
F003	Spent non-halogenated solvents, xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, n-butyl alcohol, cyclohexanone; the still bottoms from the recovery of these solvents.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								
F004	Spent non halogenated solvents: cresols and cresylic acid, nitrobenzene; and the still bottoms from the recovery of these solvents.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								
F005	Spent non halogenated solvents, methanol, toluene, methyl ethyl ketone, methyl isobutyl ketone, carbon disulfide, isobutanol, pyridine; the still bottoms from the recovery of these solvents.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								
F006	Wastewater treatment sludges from electroplating operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cadmium, hexavalent chromium, nickel, and complexed cyanide.

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
F007	Spent plating bath solutions from electroplating operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts, copper, nickel, and other heavy metals depending on plating operation.
F008	Plating bath sludges from the bottom of plating baths from electroplating operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts and heavy metals depending on the operation.
F009	Spent stripping and cleaning bath solutions from electro-plating operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts and heavy metal salts.
F010	Quenching bath sludge from oil baths from metal heat treating operations where cyanides are used in the process (except for precious metals heat-treating quenching bath sludges).	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts and heavy metal salts.
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations (except for precious metals heat treating spent cyanide solutions from salt bath pot cleaning).	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts and heavy metal salts.
F012	Quenching wastewater treatment sludges from metal heat treating operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes complexed cyanide.
F014	Cyanidation wastewater treatment tailing pond sediment from mineral metals recovery operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes complexed cyanide.
F015	Spent cyanide bath solutions from mineral metals recovery operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes cyanide salts
F019	Wastewater treatment sludges from chemical conversion coating of aluminum	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium, and complexed cyanides

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K001	Bottom sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes pentachlorophenol, phenol, 2-chlorophenol, p-chloro-m-cresol, 2,4-dimethylphenyl, 2,4-dinitrophenol, trichlorophenols, tetrachlorophenols, 2,4-dinitrophenol, creosote, chrysene, naphthalene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno (1,2,3-cd) pyrene, benz(a)anthracene, dibenz(a)anthracene, acenaphthalene.
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K003	Wastewater treatment sludge from the production of molybdate orange pigments.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K004	Wastewater treatment sludge from the production of zinc yellow pigments.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium.
K005	Wastewater treatment sludge from the production of chrome green pigments.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated).	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium.
K007	Wastewater treatment sludge from the production of iron blue pigments.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes complexed cyanide and hexavalent chromium.
K008	Oven residue from the production of chrome oxide green pigments	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium.

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K009	Distillation bottoms from the production of acetaldehyde from ethylene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes chloroform formaldehyde, methylene chloride methyl chloride, paraldehyde, and formic acid.
K010	Distillation side cuts from the production of acetaldehyde from ethylene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes chloroform, formaldehyde, methylene chloride, paraldehyde, methyl chloride, formic acid, and chloroacetaldehyde.
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes acrylonitrile, acetonitrile, and hydrocyanic acid.
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes acrylonitrile, acetonitrile, and hydrocyanic acid.
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestram includes acetonitrile and acrylamide.
K015	Still bottoms from the distillation of benzyl chloride.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes benzyl chloride, chlorobenzene, toluene, and benzotrichloride.
K016	Heavy ends or distillation residues from the production of carbon tetrachloride.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorobenzene, hexachlorobutadiene, carbon tetrachloride, hexachloroethane, and perchloroethylene.
K017	Heavy ends from purification in production of epichlorohydrin	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes epichlorohydrin, chloroethers, [bis(chloromethyl) ether and bis (2-chloroethyl) ethers], trichloropropane, dichloropropanols
K018	Heavy ends from the fractionation column in ethyl chloride production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes 1,2-dichloroethane, trichloroethylene, hexachlorobutadiene, hexachlorobenzene

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Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes ethylene dichloride; 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,1,2,2-tetrachlorethane; 1,1,1,2-tetrachloroethane; trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, and vinylidene chloride.
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride.
K021	Aqueous spent antimony catalyst wastes from fluoromethanes production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes antimony, carbon tetrachloride, and chloroform.
K022	Distillation bottom tars from the production of phenol/acetone from cumene	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phenol and tars (polycyclic aromatic hydrocarbons).
K023	Distillation light ends from the production of phthalic anhydride from naphthalene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phthalic anhydride and maleic anhydride.
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phthalic anhydride and 1,4-naphthoquinone
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes meta-dinitrobenzene and 2,4-dinotrotoluene.
K026	Stripping still tails from the production of methyl ethyl pyridines.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes paraldehyde, pyridines, and 2-picoline.

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**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K027	Centrifuge residue from toluene diisocyanate production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes toluene diisocyanate, and toluene-2,4-diamine
K028	Spent catalyst from the hydrochlorinator reactor in 1,1,1-TCE production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes 1,1,1-trichloroethane and vinyl chloride
K029	Waste from production steam stripper in 1,1,1-Trichloroethane production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes 1,2-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, vinylidene chloride, and chloroform
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorobenzene, hexachlorobutadiene, hexachloroethane, 1,1,2-tetrachloroethane; 1,1,2,2-tetrachloroethane; ethylene dichloride
K031	By-products salts generated in the production of MSMA and cacodylic acid.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains arsenic
K032	Wastewater treatment sludge from chlordane production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorocyclopentadiene
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorocyclopentadiene
K034	Filter solids from filtration of hexachlorocyclopentadiene	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorocyclopentadiene
K035	Wastewater treatment sludges generated in the production of creosote	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes creosote, chrysene, naphthalene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd) pyrene, benzo(a)anthracene, dibenzo(a)anthracene, acenaphthalene

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant (atm m^3/mol)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes toluene, phosphorodithioic and phosphorothioic acid esters
K037	Wastewater treatment sludges from the production of disulfoton.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes toluene, phosphorodithioic and phosphorothioic acid esters
K038	Wastewater from the washing and stripping of phorate production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phosphorodithioic and phosphorothioic acid esters
K040	Wastewater treatment sludge from the production of phorate.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters
K041	Wastewater treatment sludge from the production of toxaphene.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes toxaphene
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexachlorobenzene and orthodichlorobenzene
K043	2,6-Dichlorophenol waste from the production of 2,4-D	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes 2,4-dichlorophenol, 2,6-dichlorophenol, and 2,4,6-trichlorophenol
K044	Wastewater treatment sludges from the manufacturing and processing of explosives.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								No information on constituents.
K045	Spent carbon from wastewater treatment in explosives production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								No information on constituents.

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K046	Wastewater treatment sludges from the manufacturing, formulation, and loading of lead-based initiating compounds.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY.								Wastestream contains lead
K047	Pink/red water from TNT operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes dinitrotoluene isomers and dinitrobenzoic acid isomers.
K048	Dissolved air flotation (DAF) float from the petroleum refining industry.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K049	Slop oil emulsion solids from the petroleum refining industry.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium.
K051	API separator sludge from the petroleum refining industry.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium and lead.
K052	Tank bottoms (leaded) from the petroleum refining industry.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes lead.
K060	Ammonia still lime sludge from coking operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains cyanide, naphthalene, phenolic compounds, and arsenic

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K061	Emission control dust/sludge from the electric furnace production of steel	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium, lead, cadmium, and possibly nickel.
K062	Spent pickle liquor from steel finishing operations	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium, lead, and dilute spent HCl.
K069	Emission control dust/sludge from secondary lead smelting.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes hexavalent chromium, lead, and cadmium.
K071	Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes mercury
K073	Chlorinated hydrocarbon waste from purification step of diaphragm cell process using graphite anodes in chlorine production.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains chloroform, carbon tetrachloride, hexachloroethane, trichloroethane, tetrachloroethylene, dichloroethylene, 1,1,2,2-tetrachloroethane
K083	Still bottoms from aniline production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains aniline, diphenylamine, nitrobenzene, phenylenediamine
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains arsenic
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains benzene, dichlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, pentachlorobenzene, hexachlorobenzene, benzyl chloride

*Presented only if required for other calculations

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K087	Decanter tank tar sludge from coking operations.	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream includes phenol, naphthalene, and polynuclear aromatics
K093	Distillation light ends from production of phthalic anhydride from o-xylene	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains phthalic anhydride and maleic anhydride
K094	Distillation bottoms from production of phthalic anhydride from o-xylene	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains phthalic anhydride
K095	Distillation bottoms from the production of 1,1,1-trichloroethane	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains 1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane
K096	Heavy ends from heavy ends column from the production of 1,1,1-trichloroethane	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains 1,2-dichloroethane, 1,1,1-dichloroethane, 1,1,2-trichloroethane
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contasin chlordane and heptachlor
K098	Untreated process wastewater from production of toxaphene	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains toxaphene
K099	Untreated wastewater from production of 2,4 D	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains 2,4-dichlorophenol and 2,4,5-trichlorophenol
K100	Waste leaching solution from acid leaching of emission control dust/ sludge from secondary lead smelting	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains hexavalent chromium, lead, and cadmium
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains arsenic

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Appendix A. Physical-Chemical Properties and Relative Soil Volatility of RCRA Wastes

Waste Code	Waste Name	Molecular Weight (g/mol)	Boiling Point* (°C)	Vapor Pressure @ 25°C (mm Hg)	Log P*	Solubility in H_2O @ 25°C (mg/l)	Henry's Constant ($atm\text{-}m^3/mol$)	Relative Dry Soil Volatility $P_{vp}MW^{-1/4}$	Relative Wet Soil Volatility $P_{vp}MW^{-1/2}$	Reference/Comments
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains arsenic
K103	Process residues from aniline extraction from the production of aniline	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains aniline, nitrobenzene, and phenylene-diamine
K104	Combined wastewater streams generated from nitrobenzene/ aniline production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains aniline, benzene, diphenylamine, nitro-benzene, phenylenediamine
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains benzene, monochlorobenzene, dichloro-benzenes, and 2,4,6-trichloro-phenol
K106	Wastewater treatment sludge from the mercury cell process in chlorine production	SEE SPECIFIC WASTE UNDER P OR U WASTE CODES FOR PROPERTY DATA.								Wastestream contains mercury

*Presented only if required for other calculations.

**Vapor pressure @ 25°C estimated via extrapolation from experimental value.

Footnote to Appendix A

References used for Physical-Chemical Property Data

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Appendix B. RCRA Waste Categorization Based on Vapor Pressure
(Volatility of Pure Substances)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Highly Volatile Wastes - Those with ambient vapor pressures above 10 torr		
Carbonyl fluoride	permanent gas @ 25°C	U033
Fluorine	permanent gas @ 25°C	P056
Phosphine	permanent gas @ 25°C	P096
Nitric oxide	permanent gas @ 25°C	P076
Hydrogen sulfide	15,200	U135
Bromomethane	5,300	U029
Dichlorodifluoromethane	4,830	U075
Formaldehyde	4,433	U122
Ethene, chloro	2,660	U043
Dimethylamine	1,596	U092
Methanethiol	1,520	U153
Ethylene oxide	1,294	U115
Phosgene	1,215	P095
Cyanogen chloride	1,000	P033
Methyl ethyl ketone peroxide	944 (est)	U160
Acetaldehyde	922.6 (est)	U001
2-Methylaziridine	920	P067
Hydrofluoric acid	800	U134
Nitrogen dioxide	800	P078
Trichloromonofluoromethane	768	U121
Nitrogen (IV) oxide	760	P078
Hydrofluoric acid	760	U134
Hydrogen cyanide	730	P063
Furan	634	U124
1,1-Dichloroethylene	630.1	U078
Ethyl ether	439.8	U117
Methylene chloride	427.8	U080
1,3-Pentadiene	414	U186
Nickel carbonyl	400	P076
Methyl iodide	400	U138
Carbon disulfide	357	P022
Methylene bromide	340	U068
Acetyl chloride	317	U006
Chloroacetaldehyde	317	P023
N-Nitrosopyrrolidine	284	U180
1-Propanamine	280	U194
Acrolein	220	P003
1,2-Dichloroethylene	217	U079
Chloromethyl methyl ether	214	U046
Methyl isocyanate	201	P064
Acetone	200.1	U002
Ethylenimine	200	P054
1,1-Dichloroethane	193.4	U076

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Highly Volatile Wastes - (continued)		
Chloroform	172.1	U044
1,1-Dimethylhydrazine	157	U098
Tetrahydrofuran	149	U213
Tetrachloromethane	115.3	U211
Methanol	113.9	U154
Methylchlorocarbonate	113	U156
Acetonitrile	100	U003
Cyanogen bromide	100	U246
1,1,1-Trichloroethane	99.7	U226
Acrylonitrile	97.2	U009
Ethyl acetate	82.2	U112
2-Butanone	77.5	U159
Benzene	76	U019
1,2-Dichloroethane	75.7	U077
1,1,2-Trichloroethane	75	U227
Trichloroethylene	70	U228
N-Methyl-N'-nitro-N-nitroso-guanidine	69.1	U163
1,2-Dimethylhydrazine	68	U099
1,2-Dichloropropane	50	U083
Methylhydrazine	49.6	P068
Glycidylaldehyde	42.6	U126
Propanenitrile	40	P101
Ethyl acrylate	40	U113
1,4-Dioxane	37	U152
1,4-Diethylenedioxide	37	U108
Trichloroacetaldehyde	35	U034
N-Nitroso-N-methyl urea	33.5	U177
Formic acid	33.4	U123
Methyl methacrylate	32	U162
N-nitroso-N-methyl urethane	31.2	U178
Dipropylarsine	30	U110
Diethylarsine	30	P038
Bis(chloromethyl) ether	30	P016
Allyl alcohol	28.1	P005
1,3-Dichloropropane	28	U084

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Highly Volatile Wastes - (continued)		
Toluene	26.8	U220
4-Pyridinamine	25.8	P008
Paraldehyde	25.3	U182
Pyridine	20	U196
Ethylmethacrylate	19	U118
Crotonaldehyde	19	U053
N-nitroso-N-ethylurea	16.3	U176
N-Nitrosomethyl vinyl amine	16	P084
Hydrazine	14.38	U133
N-nitrosodiethanolamine	14.2	U173
Tetranitromethane	13	P112
2-Nitropropane	13	U171
1-Chloro-2,3-epoxypropane	12	U041
Chlorobenzene	11.8	U037
Ethylene dibromide	11	U067
Osmium tetroxide	10	P087
Isobutanol	10	U140
4-Methyl-2-pentanone	10	U161
2-Picoline	10	U191
1,1,1,2-Tetrachloroethane	10	U209
2-Chloroethyl vinyl ether	10	U042
Tetrachloroethylene	10	U210
Moderately Volatile Wastes -	Those with ambient vapor pressures in the 10^{-3} to 10 torr range	
2-Propyn-1-ol	9.56	P012
Bromoacetone	8.0	P017
1,2:3,4-Diepoxybutane	7.52	U085
Cyclohexane	6.82	U056
o-xylene	6.60	U239
n-Butanol	6.50	U031
Trichloromethanethiol	5.78	P118
Bromoform	5.60	U225
Chloromethane	5.0	U045
Dimethylnitrosamine	4.87	P082
Cyclohexanone	4.57	U057
Cumene	4.50	U055
Acrylic acid	4.24	U008

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Moderately Volatile Wastes - (continued)		
N-Nitroso-di-n-butylamine	4.11	U172
1,4-Dichloro-2-Butene	4.00	U074
Pentachloroethane	3.50	U184
m-xylene	3.20	U239
p-xylene	3.15	U239
Furfural	3.0	U125
Benzene, 1,3,5-trinitro	2.86	U234
Dichlorophenylarsine	2.70	P036
Dimethylcarbamoyl chloride	2.60	U097
m-Dichlorobenzene	2.10	U071
Methapyrilene	1.89	U155
N-Nitrosodiethylamine	1.73	U174
2,3,4,6-Tetrachlorophenol	1.55	U212
o-Dichlorobenzene	1.45	U070
Dichloroethylether	1.40	U025
3-Chloropropionitrile	1.33	P027
Benzyl chloride	1.25	P028
Benzenethiol	1.0	P014
Benzotrichloride	1.0 (@ 45.8°C)	U023
Fluoroacetamide	0.88	P057
Bis(2-chloroethoxy)methane	0.88	U024
Bis(2-chloroisopropyl)ether	0.85	U027
Aniline	0.85	U012
p-Dichlorobenzene	0.67	U072
Phenol	0.62	U188
Hexachloroethane	0.60	U131
Diisopropyl fluorophosphate	0.58	P043
1,2-Dibromo-3-chloropropane	0.513	U066
Acetophenone	0.49	U004
Cresols	0.43	U052
2,4-Dichlorophenoxyacetic acid	0.40	P035
Toxaphene	0.40	D015
Ethyl carbamate	0.36	U238
Hexachloropropene	0.34	U243
Ethylmethanesulfonate	0.33	U119
Benzyl chloride	0.30	U017
Nitrobenzene	0.30	U169
5-Nitro-o-toluidine	0.28	U181
α,α-Dimethylphenethylamine	0.28	P046
Selenium dioxide	0.16	U204
N-Nitrosopiperidine	0.244	U179
Ammonium picrate	0.23	P009

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Moderately Volatile Wastes - (continued)		
1,4-Naphthalenedione	0.20	U166
Tetraethyl lead	0.19	P110
Hexachlorobutadiene	0.17	U128
Uracil,5(bis-2-chloromethyl-amino-)	0.168	U237
Malononitrile	0.148	U149
1-Acetyl-2-thiourea	0.14	P002
2,4-Dichlorophenol	0.118	U081
2,4-Dimethylphenol	0.118	U101
4-Chloro-σ-toluidine	0.105	U049
p-Benzoquinone	9×10^{-2}	U197
Hexachlorocyclopentadiene	8×10^{-2}	U130
Safrole	7×10^{-2}	U203
Dinoseb	5.8×10^{-2}	P020
1-Naphthylamine	5.6×10^{-2}	U167
2-Naphthylamine	5.6×10^{-2}	U168
Nicotine	5.0×10^{-2}	P075
Naphthalene	5.3×10^{-2}	U165
2,4,5-Trichlorophenol	5.0×10^{-2}	U230
p-Chloroaniline	5.0×10^{-2}	P024
Benzenesulfonylchloride	4.0×10^{-2}	U020
Acrylamide	3.0×10^{-2}	U007
Isosafrole	2.6×10^{-2}	U141
Methyl parathion	2.5×10^{-2}	P071
2-Methyl acetonitrile	2.4×10^{-2}	P069
4,6-Dinitro-o-cresol	1.8×10^{-2}	P047
2,6-Dichlorophenol	1.7×10^{-2}	U082
Tetraethyldithiopyrophosphate	1.5×10^{-2}	P0109
Dimethyl phthalate	1.0×10^{-2}	U102
Diallate	8.8×10^{-3}	U062
Diethylphthalate	8.1×10^{-3}	U088
4-Chloro-m-cresol	5.8×10^{-3}	U039
B-Chloronaphthalene	5.6×10^{-3}	U)47
Phenacetin	3.2×10^{-3}	U187
o,o-Diethyl(σ-pyrazinyl) phosphorothioate	3.0×10^{-3}	P040
2-Cyclohexyl-4,6-dinitrophenol	2.9×10^{-3}	U034
Saccharin	2.7×10^{-3}	U202
Pentachloronitrobenzene	2.4×10^{-3}	U185

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Moderately Volatile Wastes - (continued)		
1,2,4,5-Tetrachlorobenzene	2.1×10^{-3}	U207
Toluenediamine	1.8×10^{-3}	U221
N-Phenyl thiourea	1.6×10^{-3}	P093
p-Nitroaniline	1.5×10^{-3}	P077
5-Aminomethyl-3-isoxazolol	1.4×10^{-3}	P007
Mercury	1.3×10^{-3}	U151
σ-Toluidine hydrochloride	1.2×10^{-3}	U222
Octamethylpyrophosphoramide	1.0×10^{-3}	P085
Slightly Volatile Wastes - Those with ambient vapor pressures in the 10^{-5} to 10^{-3} torr range		
Reserpine	$<10^{-3}$	U200
Tris(2,3-dibromopropyl) phosphate	$<10^{-3}$	U235
Phorate	8.0×10^{-4}	P094
1,3-Propanesultone	6.4×10^{-4}	U193
Tetraethylpyrophosphate	4.7×10^{-4}	P111
Pentachlorobenzene	4.1×10^{-4}	U183
Pronamide	4.0×10^{-4}	U192
1-(σ-Chlorophenyl)thiourea	4.0×10^{-4}	P026
1,2-Benzenediol,4[1-hydroxy-2(methylaminoethyl)-	4.0×10^{-4}	P042
Ethylenebis(dithiocarbamic acid)	3.7×10^{-4}	U114
Heptachlor	3.0×10^{-4}	P081
Nitroglycerin	2.6×10^{-4}	P081
Phthalic anhydride	2.0×10^{-4}	U190
Disulfoton	1.8×10^{-4}	P039
Thiofanax	1.7×10^{-4}	P045
2,4-D	1.6×10^{-4}	D016
Aldrin	1.4×10^{-4}	P060
Azaserine	1.3×10^{-4}	U015
Streptozotocin	1.3×10^{-4}	U206
Pentachlorophenol	1.1×10^{-4}	U242
ALdicarb	1.0×10^{-4}	P070
Diethyl-p-nitrophenylphosphate	9.8×10^{-5}	P041
2,4-Dinitrotoluene	8.5×10^{-5}	U105
1,2-Diphenyl hydrazine	5.2×10^{-5}	U109
Maleic anhydride	5.0×10^{-5}	U147

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Slightly Volatile Wastes - (continued)		
Methomyl	5.0×10^{-5}	P066
Methylthiouracil	4.8×10^{-5}	U164
Parathion	3.8×10^{-5}	P089
2,4,5-T	2.4×10^{-5}	U232
Bis(2-ethylhexyl)phthalate	1.4×10^{-5}	U028
Resorcinol	1.2×10^{-5}	U201
Hexachlorobenzene	1.1×10^{-5}	U127
Chlordane	1.0×10^{-5}	U036
Endosulfan	1.0×10^{-5}	P050
Benzidine	1.0×10^{-5}	U021
Lindane	9.4×10^{-6}	D013
Nonvolatile Wastes - Those with ambient vapor pressures below 10^{-5} torr range		
Phenylmercuric acetate	9.0×10^{-6}	P092
Dimethoate	8.5×10^{-6}	P044
Octachlorocamphene	8.1×10^{-6}	P123
Silvex	7.1×10^{-6}	U233
Aldrin	6.0×10^{-6}	P004
4,4'-Methylene bis(2-chloroaniline)	6.0×10^{-6}	U158
3-Methylcholanthrene	3.8×10^{-6}	U157
Hexachlorocyclohexane	3.3×10^{-6}	U129
Cyclophosphamide	2.8×10^{-6}	U058
Ethyl,4,4'-Dichlorobenzilate	2.2×10^{-6}	U038
Dieldrin	7.8×10^{-7}	P037
α-Naphthylthiourea	5.1×10^{-7}	P072
3,3-Dimethylbenzidine	2.9×10^{-7}	U095
Beryllium dust	2.7×10^{-7}	P015
2-Acetyl-1-aminofluorene	2.1×10^{-7}	U005
Endrin	2.0×10^{-7}	P051
3,3'-Dimethoxybenzidine	1.9×10^{-7}	U091
DDD	1.5×10^{-7}	U060
DDT	1.5×10^{-7}	U061
Chlorambucil	1.4×10^{-7}	U035
3,3'-Dichlorobenzidine	1.1×10^{-7}	U073
2,4-Dichlorophenoxyacetic acid	1.0×10^{-7}	U240
Arsenic (III) oxide	8.3×10^{-8}	P012

Appendix B. (Continued)

Waste Name	Ambient Vapor Presssure (torr) @ 25°C	Waste Code
Nonvolatile Wastes - (continued)		
Di-n-octylphthalate	6.8×10^{-8}	U107
Mytomycin C	4.1×10^{-8}	U010
Melphalan	4.0×10^{-8}	U150
3,4-Benzacridine	8.0×10^{-10}	U016
Benzo[a]pyrene	1.8×10^{-10}	U022
1,2-Benzanthracene	1.0×10^{-10}	U018
Dibenz[a,h]anthracene	5.2×10^{-11}	U063
Strychnine	1.2×10^{-11}	P108
Warfarin	1.0×10^{-11}	P001
7,12-Diemthylbenz[a,h]anthracene	3.9×10^{-12}	U094
Diethylstilbesterol	2.1×10^{-12}	U089
Hexachlorophene	1.0×10^{-12}	U064
Brucine	1.0×10^{-12}	P018
Chrysene	1.0×10^{-13}	U050
Daunomycin	9.4×10^{-15}	U059
4-Bromophenylphenylether	4.1×10^{-20}	U030
α,α-Dimethylbenzyl-hydroperoxide	1.1×10^{-24}	U096

Compounds with Negligible (but undetermined) Vapor Pressures

	Waste Code	Evidence
Thallium carbonate	U215	Melting point 273°C, decomposes to Tl_2O, the product boils at 1080°C.
Thallium sulfate	P115	Melts at 632°C.
Lead phosphate	U145	Melting point at 1014°C.
Lead subacetate	U146	Melting point at 475°C.
Thallium nitrate	U217	Decomposes at 800°C.
Strontium sulfide	P107	Melting point at 2000°C.
Zinc phosphide	P122	Melting point at 1100°C.
Thallium (I) chloride	U216	Vapor pressure of 10 torr at 507°C.

Appendix B. (Continued)

Waste Name	Waste Code	Evidence
Compounds with Negligible (but undetermined) Vapor Pressures - (continued)		
Arsenic	D004	Vapor pressure of 1 torr at 372°C
Asbestos	U013	Melting point above 1000°C.
Thallium selenite	P114	Melting point over 400°C.
Lead acetate	U144	Decomposes to the oxide above 280°C.
Calcium cyanide	U032	Decomposes to nonvolatile oxides at 200°C.
Sodium cyanide	P106	Vapor pressure 150 torr at 800°C.
Aluminum phosphide	P006	Melting point at 1350°C.
Copper cyanides	P029	Melting point at 473°C.
Zinc cyanide	P121	Melting point at 800°C.
Potassium cyanide	P098	Melting point at 634°C.
Vanadium pentoxide	P120	Decomposes at 1750°C, melting point at 690°C.
Thallic oxide	P113	Melting point at 717°C
Ammonium vanadate	P119	Melting point at 200°C
Silver	D011	Boiling point at 2000°C
Barium	D005	Boiling point at 1600°C
Cadmium	D006	Boiling point at 765°C
Chromium	D007	Boiling point at 2672°C
Lead	D008	Boiling point at 1740°C
Selenium	D010	Boiling point at 685°C

Appendix C. RCRA Waste Categorization Based on Aqueous Volatility (Henry's Constant)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Highly Volatile Wastes - Values of H above 10^{-3}		
Bis(2-ethyl hexyl phthalate)	26.6	U028
Cyanogen	9.91	P031
Reserpine	4.28	U200
Nickel carbonyl	0.5	P073
Dichlorodifluoromethane	0.415	U075
Chloromethane	0.38	U045
Chloroethene	0.199	U043
Phosphine	0.19	P096
Cyclohexane	0.18	U056
2-Nitropropane	0.12	U171
Trichloromonofluoromethane	5.8×10^{-2}	U121
2,3,4,6-Tetrachlorophenol	4.5×10^{-2}	U212
1,3-Pentadiene	4.2×10^{-2}	U186
Pentachloronitrobenzene	2.9×10^{-2}	U185
Tetrachloroethylene	2.87×10^{-2}	U210
Hexachloropropene	2.5×10^{-2}	U243
Tetrachloromethane	2.13×10^{-2}	U211
Hexachlorocyclopentadiene	1.60×10^{-2}	U130
1,1-Dichloroethylene	1.50×10^{-2}	U078
Cumene	1.40×10^{-2}	U055
DDD	1.26×10^{-2}	U060
Carbon disulfide	1.2×10^{-2}	P022
Mercury	1.14×10^{-2}	D009
Hexachloroethane	9.85×10^{-3}	U131
Hexachlorobutadiene	9.14×10^{-3}	U128
Trichloroethylene	8.92×10^{-3}	U228
3-Methylcholanthrene	7.7×10^{-3}	U157
1,2-Dichloroethylene (CIS)	6.6×10^{-3}	U079
Toluene	6.64×10^{-3}	U220
Furan	5.7×10^{-3}	U124
Benzene	5.55×10^{-3}	U019
1,1-Dichloroethane	5.45×10^{-3}	U076
1,2-Dichloroethylene (trans)	5.32×10^{-3}	U079
o-Xylene	5.27×10^{-3}	U239
Bromomethane	5.26×10^{-3}	U029
Methyl iodide	5.0×10^{-3}	U138
1,1,1-Trichloroethane	4.92×10^{-3}	U226
Toxaphene	4.89×10^{-3}	U224
Methanethiol	4.0×10^{-3}	U153
Chlorobenzene	3.93×10^{-3}	U037

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Highly Volatile Wastes - (continued)		
Chloroform	3.39×10^{-3}	U044
Cyanogen chloride	3.2×10^{-3}	P033
Methylene chloride	3.19×10^{-3}	U080
1,2-Dichloropropane	2.8×10^{-3}	U083
1,1,1,2-Tetrachloroethane	2.76×10^{-3}	U208
4-Bromopropylphenylether	2.74×10^{-3}	U030
m-Dichlorobenzene	2.63×10^{-3}	U071
m-Xylene	2.55×10^{-3}	U239
p-Xylene	2.51×10^{-3}	U239
Hexachlorohexahydro-exo,exo-dimethanonaphthalene	2.49×10^{-3}	P060
p-Dichlorobenzene	2.37×10^{-3}	U072
Benzene, 1,3,5-trinitro	2.3×10^{-3}	U234
Pentachloroethane	2.17×10^{-3}	U184
Octachlorocamphene	2.01×10^{-3}	P123
o-Dichlorobenzene	1.94×10^{-3}	U070
Dimethylcarbamoylchloride	1.8×10^{-3}	P097
1,3-Dichloropropane	1.77×10^{-3}	U084
Hexachlorobenzene	1.7×10^{-3}	U127
Heptachlor	1.48×10^{-3}	P059
Pentachlorobenzene	1.3×10^{-3}	U183
1,1,2-Trichloroethane	1.18×10^{-3}	U227
1,2-Dichloroethane	1.10×10^{-3}	U077
Moderately Volatile Wastes - Values of H below 10^{-3} to 10^{-5}		
Ethyl ether	8.69×10^{-4}	U117
2-Cyclohexyl,4,6-dinitrophenol	8.37×10^{-4}	P034
N-Nitroso-di-n-butylamine	7.9×10^{-4}	U172
2,6-Dinitrotoluene	7.42×10^{-4}	U106
2-Chloroethyl vinyl ether	7.35×10^{-4}	U042
Ethylene dibromide	6.25×10^{-4}	U067
Bromoform	5.32×10^{-4}	U225
Aldrin	4.96×10^{-4}	P004
Naphthalene	4.8×10^{-4}	U165
1,1,2,2-Tetrachloroethane	4.7×10^{-4}	U209
N-nitroso-N-methyl urethane	4.17×10^{-4}	U178
Dipropylamine	3.32×10^{-4}	U110
Methylene bromide	3.16×10^{-4}	U068
ß-Chloronapthalene	3.15×10^{-4}	U047
Methyl methacrylate	3.11×10^{-4}	U162

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Moderately Volatile Wastes - (continued)		
Benzenethiol	3.10×10^{-4}	P014
Formaldehyde	2.92×10^{-4}	U122
Ethyl acrylate	2.71×10^{-4}	U113
Bischloromethylether	2.50×10^{-4}	P016
Benzylchloride	2.36×10^{-4}	P028
Dihydrosafrole	2.30×10^{-4}	U090
Diallate	1.99×10^{-4}	U062
Dinoseb	1.82×10^{-4}	P020
Benzal chloride	1.70×10^{-4}	U017
5-Nitro-o-toluidine	1.67×10^{-4}	U181
1,2-Dibromo-3-Chloropropane	1.59×10^{-4}	U066
Ethyl Methacrylate	1.49×10^{-4}	U118
Tris(2,3-dibromopropyl)phosphate	1.46×10^{-4}	U235
4-Methyl-2-pentanone	1.32×10^{-4}	U161
Ethyl acrylate	1.20×10^{-4}	U112
Benzotrichloride	1.12×10^{-4}	U023
Tetrahydrofuran	1.08×10^{-4}	U213
Trichloromethylmercaptan	1.04×10^{-4}	P118
Bis-2-chloroisopropyl ether	1.03×10^{-4}	U027
1,2,4,5-Tetrachlorobenzene	1.0×10^{-4}	U207
N-Nitrosopiperidine	9.78×10^{-5}	U179
Acrylonitrile	9.2×10^{-5}	U009
Methapyriline	7.6×10^{-5}	U135
Acrolein	6.79×10^{-5}	P003
1,4-Dichloro-2-butene	6.78×10^{-5}	U074
Trichloroacetaldehyde	6.77×10^{-4}	U034
Osmium tetroxide	5.86×10^{-5}	P087
N-Nitrosomethylvinylamine	5.65×10^{-5}	P084
Kepone	5.6×10^{-5}	U142
DDT	5.2×10^{-5}	U061
Nitroglycerin	5.18×10^{-5}	P081
Chlordane	4.8×10^{-5}	U036
Diethylphthalate	4.75×10^{-5}	U088
1-Chloro-2,3-epoxypropane	3.8×10^{-5}	U041
Paraldehyde	3.66×10^{-5}	U182
Ethylene oxide	3.63×10^{-5}	U115
Dichloroethylether	2.58×10^{-5}	U025
Cyclohexanone	2.56×10^{-5}	U057
Endosulfan	2.5×10^{-5}	P050
Propanenitrile	2.4×10^{-5}	P101
2-Butanone	2.4×10^{-5}	U159

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Moderately Volatile Wastes - (continued)		
2-Picoline	2.4×10^{-5}	U191
Nitrobenzene	2.4×10^{-5}	U169
Methyl aziridine	2.22×10^{-5}	P067
Hydrofluoric acid	2.0×10^{-5}	U134
1-Propanamine	2.0×10^{-5}	U194
2,6-Dichlorophenol	2.0×10^{-5}	U082
α,α-Dimethylphenethylamine	1.86×10^{-5}	P046
Acetophenone	1.41×10^{-5}	U004
2,4-Dimethylphenol	1.18×10^{-5}	U101
Crotonaldehyde	1.13×10^{-5}	U053
N-Nitrosopyrrolidine	1.13×10^{-5}	U180
Dieldrin	1.1×10^{-5}	P037
Ethylenimine	1.1×10^{-5}	P054
Safrole	1.08×10^{-5}	U203
Isobutanol	1.03×10^{-5}	U140
4-Chloro-o-toluidine	1.02×10^{-5}	U049
Slightly Volatile Wastes - Values of H from 10^{-5} to 10^{-7}		
Chloromethyl methylether	9.12×10^{-6}	U046
Diisopropylfluorophosphate	9.1×10^{-6}	P043
Pronamide	9.0×10^{-6}	U192
oo-Diethyl-o-pyrazinyl-phosphorothioate	8.58×10^{-6}	P040
α-Toluidine hydrochloride	7.55×10^{-6}	U222
Ammoniun Picrate	7.4×10^{-6}	P009
Di-n-propylnitrosamine	7.2×10^{-6}	U111
n-Butanol	7.0×10^{-6}	U031
Acetone	6.8×10^{-6}	U002
Tetranitromethane	6.33×10^{-6}	P112
2,4,5-Trichlorophenol	6.0×10^{-6}	U230
2,4-Dichlorophenol	5.62×10^{-6}	U081
Phorate	5.47×10^{-6}	P094
N-Nitroso-N-ethylurea	5.4×10^{-6}	U176
2-Naphthalamine	5.4×10^{-6}	U168
2,4,6-Trichlorophenol	4.82×10^{-6}	U231
Chloroacetaldehyde	4.7×10^{-6}	P023
o-Chlorophenol	4.7×10^{-6}	U048
4-Pyridinamine	4.4×10^{-6}	P008
Endrin	4.2×10^{-6}	P051

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Slightly Volatile Wastes - (continued)		
1-Naphthalamine	4.1×10^{-6}	U167
Isosafrole	4.08×10^{-6}	U141
Furfural	3.6×10^{-6}	U125
1,4-Naphthalenedione	3.6×10^{-6}	U166
3-Chloropropionitrile	3.5×10^{-6}	P027
Allyl alcohol	3.47×10^{-6}	P005
Dimethyl sulfate	3.37×10^{-6}	U103
Aniline	3.07×10^{-6}	U012
p-Chloroaniline	3.0×10^{-6}	P024
Methyl hydrazine	3.0×10^{-6}	P068
Disulfoton	2.59×10^{-6}	P039
Acetonitrile	2.47×10^{-6}	U003
N-Nitroso-N-methylurea	2.20×10^{-6}	U177
Cresols	2.0×10^{-6}	U052
Phenacetin	1.4×10^{-6}	U187
4,6-Dinitro-o-cresol	1.4×10^{-6}	P047
Phenol	1.3×10^{-6}	U188
Parathion	1.21×10^{-6}	P089
Methanol	1.1×10^{-6}	U154
Dibutylphthalate	1.09×10^{-6}	U069
p-Nitroaniline	1.0×10^{-6}	P077
Bromoacetone	9.9×10^{-7}	P017
Indeno [1,2,3,-cd] pyrene	7.2×10^{-7}	U137
1,4-Diethylenedioxide	7.14×10^{-7}	U108
1,4-Dioxane	7.0×10^{-7}	U152
N-Nitrosodiethylamine	6.0×10^{-7}	U174
Hydrazine	6.0×10^{-7}	U133
Selenium dioxide	6.0×10^{-7}	U204
Ethyl-4,4'-dichlorobenzilate	5.89×10^{-7}	U038
Glycidylaldeyde	5.80×10^{-7}	U126
p-Benzoquinone	5.0×10^{-7}	U197
Lindane	4.93×10^{-7}	D013
Pentachlorophenol	4.8×10^{-7}	U242
Hydrocyanic acid	4.65×10^{-7}	P063
Formic acid	4.4×10^{-7}	U123
Acrylic acid	4.0×10^{-7}	U008
α-Hexachlorocyclohexane	3.16×10^{-7}	U129
Di-n-octylphthalate	3.0×10^{-7}	U107
4-Chloro-m-cresol	2.83×10^{-7}	U039
Bis-2-chloromethoxymethane	2.77×10^{-7}	U024
Dimethylphthalate	2.10×10^{-7}	U102

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Slightly Volatile Wastes - (continued)		
Methyl parathion	1.97×10^{-7}	P071
Saccharin	1.90×10^{-7}	U202
Methylthiouracil	1.80×10^{-7}	U164
Nicotine	1.6×10^{-7}	P075
N-Phenylthiourea	1.47×10^{-7}	P093
4,4'-Methylenebis(2-chloroaniline)	1.40×10^{-7}	U158
Bromoacetone	1.17×10^{-7}	P017
Malononitrile	1.0×10^{-7}	U149
Nonvolatile Wastes - Values of H below 10^{-7}		
2,4-Dinitrotoluene	7.6×10^{-8}	U105
2,4-D	7.5×10^{-8}	P035
Dimethylamine	5.9×10^{-8}	U092
2,4,5-T	3.44×10^{-8}	U232
Ethylmethanesulfonate	3.14×10^{-8}	U119
Dimethylnitrosamine	3.0×10^{-8}	P082
Chlornaphazine	2.8×10^{-8}	U026
1-(α-Chlorophenylthiourea)	2.51×10^{-8}	P026
Ethyl carbamate	2.0×10^{-8}	U238
1,2,7,8-Dibenzopyrene	2.0×10^{-8}	U064
2-Propyn-1-ol	2.0×10^{-8}	P102
Benzidine	1.91×10^{-8}	U021
Silvex	1.80×10^{-8}	U233
Acrylamide	1.49×10^{-8}	U007
1,2:3,4-Diepoxybutene	1.02×10^{-8}	U085
n-Nitrosodiethanolamine	8.0×10^{-9}	U173
3,4-Benzacridine	7.0×10^{-9}	U016
Pyridine	7.0×10^{-9}	U196
1,2-Benzanthracene	3.4×10^{-9}	U018
Diethyl-p-nitrophenylphosphate	2.83×10^{-9}	P041
Fluoroacetamide	2.33×10^{-9}	P057
Toluenediamine	2.30×10^{-9}	U221
3,3'-Dimethylbenzidine	1.75×10^{-9}	U095
Benzo[a]pyrene	1.38×10^{-9}	U022
7,12-Dimethylbenz[A]anthracene	1.03×10^{-9}	U094
3,3'-Dichlorobenzidine	1.0×10^{-9}	U073
Phenylmercuricacetate	1.0×10^{-9}	P092
Thiofanox	9.37×10^{-10}	P045
2-Acetylaminofluorene	4.4×10^{-10}	U005
Mitomycin C	2.5×10^{-10}	U101
Cyclophosphamide	2.37×10^{-10}	U058

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Nonvolatile Wastes - (continued)		
α-naphthylthiourea	2.26×10^{-10}	P072
Urcil,5[Bis-2-chloromethylamino]	1.0×10^{-10}	U237
Aldicarb	1.0×10^{-10}	P070
Dibenz[AH]anthracene	1.0×10^{-10}	U063
Methomyl	1.0×10^{-10}	P066
Dimethoate	1.0×10^{-10}	P044
Etylenebis(dithiocarbamic acid)	1.0×10^{-10}	U114
2-Methylacetonitrile	1.0×10^{-10}	P069
4-Nitrophenol	1.0×10^{-10}	U170
Maleic anhydride	1.0×10^{-10}	U147
Phthalic anhydride	1.0×10^{-10}	U190
Diethylstilbesterol	5.1×10^{-11}	U089
2,4-D salts and esters	3.6×10^{-11}	U240
3,3'-Dimethoxybenzidine	1.0×10^{-11}	U091
1,3-Propane sultone	1.0×10^{-11}	U193
1,2-Diphenylhydrazine	1.0×10^{-11}	U109
Streptozotocin	1.0×10^{-11}	U206
Melphalan	1.0×10^{-11}	U150
Chlorambucil	2.1×10^{-12}	U035
Arsenic III oxide	1.7×10^{-12}	P012
Chrysene	1.0×10^{-12}	U050
5-(Aminomethyl)-3-isoxazolol	1.0×10^{-13}	P007
Resorcinol	1.0×10^{-13}	U201
Strychnine	1.0×10^{-14}	P108
Warfarin	1.0×10^{-15}	P001
Brucine	1.0×10^{-18}	P018
Hexachlorophene	1.0×10^{-18}	U132
Daunomycin	2.2×10^{-19}	U059
Wastes with no Henry's Constant Value Available		
Chromium		D007
Arsenic		D004
Lead		D008
Cadmium		D006
Barium		D004
Acetaldehyde		U001
Selenium		D010
Silver		D011
Arsenic acid		P010
Sodium cyanide		P106

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm\text{-}m^3/mole$)	Waste Code
Wastes with no Henry's Constant Value Available - (continued)		
2,4-Dinitrophenol		P048
Benzenesulfonyl chloride		U020
2,4,STP Silvex		D017
Lindane		D013
Aluminum phosphide		P006
Copper cyanide		P029
Dichlorophenyl arsine		P036
Zinc cyanide		P121
Nickel cyanide		P074
Potassium cyanide		P098
Nitrogen dioxide		P078
Tetraethyl lead		P110
Tetraethyl pyrophosphate		P111
Bromine cyanide		U246
Bis(dimethylthiocarbamoyldisulfide)		U244
Silver cyanide		P104
Nitric oxide		P076
Calcium chromate		U032
Calcium cyanide		P021
Endothall		P088
Acetyl chloride		U006
Dimethylaminoazobenzene		U093
Auramine		U014
Octamethylpyrophosphoramide		P085
N,N-Diethylhydrazine		U086
α,α-Diethyl-S-methyl-dithiophosphate		U087
Azaserine		U015
Epinephrine		P042
α,α-Dimethylbenzeylhydroperoxide		U096
Tetraethyldithiopyrophosphate		P109
Arsenic V oxide		P011
Carbonyl fluoride		U033
Mercuric fulminate		P065
Strontiun sulfide		P107
Potassium silver cyanide		P099
Hexaethyl tetraphosphate		P062
Diethyl arsine		P038
Thallium selenate		P114
Selenourea		P103
1-Acetyl-2-Thiourea		P002
Toluenediisocyanate		U223
Hydrogen sulfide		U135

Appendix C. (Continued)

Waste Name	Henry's Constant ($atm-m^3/mole$)	Waste Code
Wastes with no Henry's Constant Value Available - (continued)		
Trypan blue		U236
Zinc phosphide		P122
1,2-Dimethylhydrazine		U099
Methyl isocyanate		P064
Amitrole		U011
1,1-Dimethylhydrazine		U098
Iron dextran		U139
Thallium I acetate		U214
Thiosemicarbazide		P116
Thallium I carbonate		U215
Thalloas sulfate		P115
Ethylene thiourea		U116
Dimethylcarbamoylchloride		U097
Lasiocarpine		U143
N-Methyl-N'-nitro-N-nitrosoguanidine		U163
Ammoniun vanadate		P119
Sodium azide		P105
Phosgene		P095
Sulfur selenide		U205
Hydroxydimethylarsineoxide		U136
Phosphorus sulfide		U189
Fluorine		P056
Barium cyanide		P013
Sodium fluoroacetate		P058
Beryllium dust		P015
Vanadium pentoxide		P120
Methylchlorocarbonate		U156
Lead phosphate		U145
Maleic hydrazide		U148
Lead subacetate		U146
Thallium I nitrate		U217
Thallium I chloride		U216
Thioacetamide		U218
Asbestos		U013
Methylethyl ketone peroxide		U160
Thiourea		U219
Lead acetate		U144

Appendix D. RCRA Waste Categorization Based on Relative Soil Volatility

Waste Name	Waste Code	Relative Soil Volatility
Highly Volatile Wastes - Those with relative soil volatility greater than 1		
Formaldehyde	U122	809.4
Cyanogen	P031	551.9
Bromomethane	U029	544.0
Dichlorodifluoromethane	U075	439.1
Ethene, chloro	U043	336.5
Methanethiol	U153	219.4
Ethylene oxide	U115	195.1
Hydrofluoric acid	U134	179.0
Cyanogen chloride	P033	152.4
Phosgene	P095	143.7
Hydrocyanic acid	P063	140.5
Acetaldehyde	U001	139.1
Nitrogen dioxide	P078	118.0
Furan	U124	76.9
Trichloromonofluoromethane	U121	65.6
1,1-Dichloroethylene	U078	64.0
Ethyl ether	U117	62.8
Pentadiene	U186	50.2
Methylene chloride	U080	46.4
Carbon disulfide	P022	41.0
1-Propanamine	U194	36.0
Chloroacetaldehyde	P023	35.8
Acetyl chloride	U006	35.7
Trans-1,2-dichloroethylene	U079	35.7
Acrolein	P003	34.5
Methyl iodide	U138	33.6
Nickel carbonyl	P073	30.6
Ethylenimine	P054	30.0
N-nitrosopyrrolidine	U180	28.4
Methyl isocyanate	P064	26.7
Acetone	U002	26.3
Chloromethyl methylether	U046	23.8
Cis-1,2-dichloroethylene	U079	22.0
1,1-Dimethylhydrazine	U098	20.3
Methanol	U154	20.1
1,1-Dichloroethane	U076	19.4
Tetrahydrofuran	U213	17.6
Chloroform	U044	15.8
Acetonitrile	U003	15.6
Acrylonitrile	U009	13.4
2-Methylaziridine	P067	12.2

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Highly Volatile Wastes - (continued)		
Methylchlorocarbonate	U156	11.6
Benzene	U019	11.4
2-Butanone	U159	10.6
1,1,1-Trichloroethane	U226	10.1
Bromine cyanide	U246	9.71
Tetrachloromethane	U211	9.29
1,2-Dimethylhydrazine	U099	8.78
Ethyl acetate	U112	8.76
1,2-Dichloroethane	U077	7.61
Methyl hydrazine	P068	7.31
Trichloroethylene	U228	6.26
N-methyl-N'-nitro-N-nitroso-isoguanidine	U163	5.70
Propane nitrile	P101	5.39
Glycidylaldehyde	U126	5.02
Formic acid	U123	4.93
1,2-Dichloropropane	U083	4.70
Dipropylamine	U110	4.33
1,4-Dioxane	U152	3.99
1,4-Diethylene dioxide	U108	3.94
Allyl alcohol	P005	3.69
Methyl methacrylate	U162	3.55
Methylene bromide	U068	3.47
Hydrogen sulfide	U135	3.43
Ethyl acrylate	U113	3.40
Bis(chloromethyl)ether	P016	3.39
N-nitroso-N-methylurea	U177	3.30
2-Chloroethyl vinyl ether	U042	2.95
Trichloroacetylaldehyde	U034	2.89
Toluene	U220	2.79
N-nitroso-n-methylurethane	U178	2.72
4-Pyridinamine	P008	2.66
1,3-Dichloropropane	U084	2.63
Diethylarsine	P038	2.59
Hydrazine	U133	2.54
Crotonaldehyde	U053	2.27
Pyridine	U196	2.25
Paraldehyde	U182	2.20
1-Chloro-2,3-epoxypropane	U041	2.00
4-Methyl-2-pentanone	U161	1.90
Ethylmethacrylate	U118	1.78
1,1,2-Trichloroethane	U227	1.64
2-Nitropropane	U171	1.60

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Highly Volatile Wastes - (continued)		
N-nitroso-N-ethylurea	U176	1.51
2-Propyn-1-ol	P102	1.28
N-Nitrosodiethanolamine	U173	1.28
Isobutanol	U140	1.16
Chlorobenzene	U037	1.11
2-Picoline	U191	1.04
Moderately Volatile Wastes - Those with relative soil volatility from 1 to 10^{-3}		
Tetranitromethane	P112	9.3×10^{-1}
1,2,3,4-Diepoxybutane	U085	8.1×10^{-1}
Ethylene dibromide	U067	8.1×10^{-1}
1,1,1,2-Tetrachloroethane	U208	7.7×10^{-1}
n-Butanol	U031	7.6×10^{-1}
Cyclohexane	U056	7.4×10^{-1}
Chloromethane	U045	7.1×10^{-1}
Osmiumtetraoxide	P087	6.3×10^{-1}
Dimethylnitrosamine	P082	5.7×10^{-1}
Acrylic acid	U008	5.0×10^{-1}
Bromoacetone	P017	4.7×10^{-1}
Trichloromethyl mercaptan	P118	4.7×10^{-1}
Cyclohexanone	U057	4.6×10^{-1}
Cumene	U055	4.1×10^{-1}
1,4-Dichloro-2-butene	U074	3.6×10^{-1}
Bromoform	U225	3.5×10^{-1}
N-nitroso-di-n-butylamine	U172	3.3×10^{-1}
1,1,2,2-Tetrachloroethane	U209	3.2×10^{-1}
m-Xylene	U239	3.1×10^{-1}
p-Xylene	U239	3.1×10^{-1}
Dimethylamine	U092	3.0×10^{-1}
o-Xylene	U239	2.7×10^{-1}
Pentachloroethane	U184	2.5×10^{-1}
Dimethyl carbonyl chloride	P097	2.5×10^{-1}
Furfural	U125	2.4×10^{-1}
Benzene, 1,3,5-trinitro	U234	2.0×10^{-1}
m-Dichlorobenzene	U071	1.7×10^{-1}
N-Nitrosodiethylamine	U174	1.7×10^{-1}
Benzenethiol	P014	1.4×10^{-1}
3-Chloropropionitrile	P027	1.4×10^{-1}
2,6-Dinitrotoluene	U106	1.3×10^{-1}
Dichloroethyl ether	U025	1.2×10^{-1}
o-Dichlorobenzene	U070	1.2×10^{-1}
Metapyriline	U155	1.2×10^{-1}

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Moderately Volatile Wastes - (continued)		
Benzylchloride	P028	1.1×10^{-1}
Fluoroacetimide	P057	1.0×10^{-1}
2,3,4,6-Tetrachlorophenol	U212	1.0×10^{-1}
Aniline	U012	8.9×10^{-2}
Toxaphene (technical chlorinated camphene)	D015	8.9×10^{-2}
Bis(2-chloroethoxy)methane	U024	7.9×10^{-2}
o-Chlorophenol	U048	6.9×10^{-2}
1,2-Benzanthracene	U018	6.6×10^{-2}
Bis(2-chloroisopropyl)ether	U027	6.5×10^{-2}
Phenol	U188	6.4×10^{-2}
Dimethyl sulfate	U103	5.1×10^{-2}
p-Dichlorobenzene	U072	5.5×10^{-2}
Acetophenone	U004	4.4×10^{-2}
Diisopropylfluorophosphate	P043	4.3×10^{-2}
o-Cresols	U052	4.2×10^{-2}
Hexachloroethane	U131	3.9×10^{-2}
Ethyl carbamate	U238	3.8×10^{-2}
Di-N-propylnitrosamine	U111	3.7×10^{-2}
1,2-Dibromo-3-chloropropane	U066	3.3×10^{-2}
Ethylmethane sulfonate	U119	3.0×10^{-2}
Hexachloropropene	U243	2.9×10^{-2}
Benzalchloride	U017	2.6×10^{-2}
Naphthalene	U165	2.6×10^{-2}
N-Nitrosopiperidine	U179	2.3×10^{-2}
5-Nitro-o-toluidine	U181	2.3×10^{-2}
α,α,-Dimethylphenethylen-amine	P046	2.3×10^{-2}
Dihydrosafrole	U090	2.1×10^{-2}
Nitrobenzene	U169	1.9×10^{-2}
Malononitrile	U149	1.8×10^{-2}
1,2,3-Propanetriol, trinitroate	P081	1.7×10^{-2}
m-Cresols	U052	1.7×10^{-2}
Hexachlorobutadiene	U128	1.7×10^{-2}
1,4-Napthalenedione	U166	1.6×10^{-2}
p-Cresols	U052	1.5×10^{-2}
Ammonium picrate	P009	1.5×10^{-2}
Selenium dioxide	U204	1.5×10^{-2}
1-Acetyl-2-thiourea	P002	1.3×10^{-2}
Benzotrichloride	U023	1.1×10^{-2}
1,4-Dimethylphenol	U101	1.1×10^{-2}
Uracil, 5[bis(2-chloromethyl)-amino]	U237	1.1×10^{-2}

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Moderately Volatile Wastes - (continued)		
Tetraethyl lead	P110	1.1×10^{-2}
2,4,-Dichlorophenol	U081	9.2×10^{-3}
4-Chloro-o-toluidene	U049	8.8×10^{-3}
p-Benzoquinone	U197	8.7×10^{-3}
Safrole	U203	5.6×10^{-3}
Hexachlorocyclopentadiene	U130	4.8×10^{-3}
1-Napthalamine	U167	4.7×10^{-3}
2-Napthalamine	U168	4.7×10^{-3}
Nicotine	P075	4.4×10^{-3}
Acrylamide	U007	3.9×10^{-3}
Dinosob (2,4-dinitro-6-secbutyl-phenol)	P020	3.7×10^{-3}
2,4,5-Trichlorophenol	U230	3.5×10^{-3}
Benzene sulfonyl chloride	U020	3.0×10^{-3}
2-Methylacetonitrile	P069	2.6×10^{-3}
4-Bromophenyl phenyl ether	U030	2.6×10^{-3}
Isosafrole	U141	2.0×10^{-3}
Toluene diisocyanate	U223	1.7×10^{-3}
Methyl parathion	P071	1.6×10^{-3}
Toluene diamine	U221	1.6×10^{-3}
p-Chloroaniline	P024	1.3×10^{-3}
N-phenylthiourea	P093	1.3×10^{-3}
2,6-Dichlorophenyl	U082	1.3×10^{-3}
4,6-Dinitro-o-cresol (and salts)	P047	1.3×10^{-3}
2,4,6-Trichlorophenol	U231	1.1×10^{-3}
Slightly Volatile Wastes - Those with relative soil volatility below 10^{-3} to 10^{-6}		
Tetraethyldithiopyrophosphate	P109	9.9×10^{-4}
α,α-Dimethylbenzo-hydroperoxide	U096	8.9×10^{-4}
Diethyl phthalate	U088	5.4×10^{-4}
4-Chloro-m-cresol	U039	4.9×10^{-4}
Diallate	U062	4.8×10^{-4}
ß-Chloronapthalene	U047	4.1×10^{-4}
p-Nitroaniline	P077	3.4×10^{-4}
Phenacetin	U187	2.6×10^{-4}
Dimethylphthalate	U102	2.6×10^{-4}
Saccharin and salts	U202	2.0×10^{-4}
o,o-Diethyl-o-pyrazinylphos-phorothioate	P040	1.9×10^{-4}

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Slightly Volatile Wastes - (continued)		
2-Cyclohexyl-4,6-dinitrophenol	P034	1.8×10^{-4}
1,2,4,5-Tetrachlorobenzene	U207	1.5×10^{-4}
Pentachloronitrobenzene	U185	1.4×10^{-4}
5-(Aminomethyl)-3-isoxazolol	P007	1.3×10^{-4}
o-Toluidine hydrochloride	U222	1.0×10^{-4}
Mercury	U151	9.2×10^{-5}
Dibutyl phthalate	U069	6.0×10^{-5}
Octamethylpyrophosphoramide	P085	5.9×10^{-5}
1,3-Propane sultone	U193	5.8×10^{-5}
Phorate	P094	5.0×10^{-5}
Reserpine	U200	$>4.1 \times 10^{-5}$
Tris(2,3-dibromopropyl) phosphate	U235	$<3.8 \times 10^{-5}$
1-(o-Chlorophenyl)thioruea	P026	3.0×10^{-5}
Tetraethylpyrophospate	P111	2.8×10^{-5}
1,2-Benzenediol, 4-[hydroxy-2-(methylamino)ethyl)	P042	2.8×10^{-5}
Pentachlorobenzene	U183	2.6×10^{-5}
Ethylenebis(diethiocarbonic acid)	U114	2.5×10^{-5}
Promamide	U192	2.5×10^{-5}
Phosphine	P026	2.4×10^{-5}
Heptachlor	P059	1.6×10^{-5}
Thiofanox	P045	1.2×10^{-5}
Phthalic anhydride	U190	1.2×10^{-5}
Disulfoton	P039	1.1×10^{-5}
Resorcinol	U201	1.1×10^{-5}
2,4-D	P035	1.1×10^{-5}
Azaserine	U015	9.5×10^{-6}
Streptozotocin	U206	7.8×10^{-6}
Hexahclorohexahydro,exo,exo dimethanonaphthalene	P060	7.3×10^{-6}
Aldicarb	P070	7.3×10^{-6}
Pentachlorophenol	U242	6.7×10^{-6}
2,4-Dinitrotoluene	U105	6.3×10^{-6}
Maleic anhydride	U147	5.1×10^{-6}
Diethyl-p-nitrophenyl phosphate	P041	4.7×10^{-6}
Methylthiouracil	U164	4.0×10^{-6}
1,2-Diphenylhydrazine	U109	3.9×10^{-6}

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Slightly Volatile Wastes - (continued)		
Methomyl	P066	3.9×10^{-6}
4-Nitrophenol	U170	3.3×10^{-6}
Parathion	P089	2.2×10^{-6}
2,4,5'-T	U232	1.5×10^{-6}
Nonvolatile Wastes - Those with relative soil volatility below 10^{-6}		
Benzidine	U021	7.4×10^{-7}
Bis-(2-ethylhexyl)phthalate	U028	7.0×10^{-7}
Hexachlorobenzene	U127	6.5×10^{-7}
Dimethoate	P044	5.6×10^{-7}
Endosulfan	P050	5.0×10^{-7}
Phenyl mercuric acetate	P092	4.9×10^{-7}
Chlorodane, tech	U036	4.9×10^{-7}
Silvex	U233	4.3×10^{-7}
Octachlorocamphene	P123	3.9×10^{-7}
4,4'-Methylenebis (2-chloroaniline)	U158	3.7×10^{-7}
Aldrin	P004	3.1×10^{-7}
Chlornaphazine	U026	2.7×10^{-7}
3-Methcholanthrene	U157	2.3×10^{-7}
α-hexachlorocyclohexane	U129	1.9×10^{-7}
Cyclophosphamide	U058	1.7×10^{-7}
Ethyl 4,4'-dichlorobenzilate	U038	1.2×10^{-7}
Beryllium dust	P015	9.0×10^{-8}
Dieldrin	P037	4.0×10^{-8}
α-Naphthylthiourea	P072	3.6×10^{-8}
3,3-Dimethylbenzidine	U095	2.0×10^{-8}
2-Acetylaminoflourene	U005	1.4×10^{-8}
3,3'-Dimethoxybenzidine	U091	1.2×10^{-8}
Endrin	P051	1.0×10^{-8}
DDD	U060	8.4×10^{-9}
Chloroambucil	U035	8.0×10^{-9}
DDT	U061	8.0×10^{-9}
3,3'-Dichlorobenzidine	U073	7.0×10^{-9}
Arsenic (III) oxide	P012	5.9×10^{-9}
Di-n-octylphthalate	U107	3.5×10^{-9}
Melphalan	U150	2.3×10^{-9}
Mitomycin C	U010	2.2×10^{-9}

Appendix D. (Continued)

Waste Name	Waste Code	Relative Soil Volatility
Nonvolatile Wastes - (continued)		
3,4-Benzacridine	U016	5.3×10^{-11}
Benzo(a)pyrene	U022	1.2×10^{-11}
1,2-Benzanthracene	U108	6.6×10^{-12}
Ideno[1,2,3-CD]pyrene	U137	6.0×10^{-12}
Dibenzo[a,h]anthracene	U063	3.1×10^{-12}
Strychnine and salts	P018	6.6×10^{-13}
Warfarin	P001	5.7×10^{-13}
7,12-Dimethylbenz[a]anthracene	U094	2.4×10^{-13}
Diethylstilbestrol	U089	1.3×10^{-13}
1,2:7,8-Dibenzopyrene	U064	5.8×10^{-14}
Brucine	P018	5.0×10^{-14}
Hexachlorophene	U132	5.0×10^{-14}
Chrysene	U050	6.6×10^{-15}
Daunomycin	U059	4.1×10^{-16}

Appendix E. Diffusion Coefficients in Air and Water For RCRA Wastes Identified as Highly Volatile from Water

Waste Name	Waste Code	Henry's Law Constant (atm-m^3/mol)	Diffusion Coefficient in Air* (cm^2/sec)	Diffusion Coefficient in Water** (cm^2/sec)	Liquid-Phase Mass Transfer Coefficient (cm/hr)
Bis(2-ethylhexyl phthalate)	U028	26.6	0.0378	3.78×10^{-6}	0.138
Cyanogen	P031	9.91	0.1144(2)	1.14×10^{-5}	18.40
Reserpine	U200	4.28	0.0339	3.37×10^{-6}	0.111
Dichlorodifluoromethane	U075	2.75	0.0944(2)	1.13×10^{-5}	0.248
Nickel Carbonyl	P073	0.5	†††	†††	0.217
Chloromethane	U045	0.38	0.1085	1.18×10^{-5}	18.76
Phosphine	P096	0.19	0.1570	1.71×10^{-5}	22.75
Cyclohexane	U056	0.18	0.0839	9.10×10^{-6}	0.298
2-Nitropropane	U171	0.12	0.0884	9.90×10^{-6}	0.289
Pentachloroethane	U184	0.10	0.0717	8.20×10^{-6}	0.192
Hexachlorobutadiene	U128	9.14×10^{-2}	0.0614	6.78×10^{-6}	0.169
Trichlorofluoromethane	U121	5.8×10^{-2}	0.0862	1.02×10^{-5}	0.233
Hexachloroethane	U131	1.3×10^{-2}	0.0674	7.64×10^{-6}	0.177
2,3,4,6-Tetrachlorophenol	U212	4.5×10^{-2}	0.0624	6.88×10^{-6}	0.179
1,3-Pentadiene	U186	4.2×10^{-2}	0.0912	9.84×10^{-6}	0.331
Tetrachloromethane	U211	3.0×10^{-2}	0.0828(1)	1.00×10^{-5}	0.220
Pentachloronitrobenzene	U185	2.9×10^{-2}	0.0533	6.11×10^{-6}	0.159
Hexachloropropene	U243	2.5×10^{-2}	0.0636	7.09×10^{-6}	0.173
1,1,1-Trichloroethane	U226	3.42×10^{-2}	0.0794(1)	9.30×10^{-6}	0.236
Hexachlorocyclopentadiene	U130	1.60×10^{-2}	0.0621	6.49×10^{-6}	0.165
1,1-Dichloroethylene	U078	1.50×10^{-2}	0.1144(2)	1.14×10^{-5}	0.277
Cumene	U055	1.40×10^{-2}	0.0702	7.55×10^{-6}	0.249
DDD	U060	1.26×10^{-2}	0.0494	5.19×10^{-6}	0.152
Carbon disulfide	P022	1.2×10^{-2}	0.1045(1)	1.28×10^{-5}	0.313
Trichloroethylene	U228	8.92×10^{-3}	0.0875(1)	1.03×10^{-5}††	0.238
3-Methylcholanthrene	U157	7.1×10^{-3}	0.0501	5.28×10^{-6}	0.167
Toluene	U220	6.64×10^{-3}	0.0849(1)	9.10×10^{-6}	0.284
1,2-Dichloroethylene	U079	6.6×10^{-3}	0.1144(2)†	1.14×10^{-5}	0.277
Furan	U124	5.7×10^{-3}	0.1070	1.24×10^{-5}	0.331
Bromomethane	U029	5.3×10^{-3}	0.1141	1.46×10^{-5}	0.280
Benzene	U019	5.5×10^{-3}	0.0932(1)	1.03×10^{-5}	0.309
Methyl iodide	U138	5.0×10^{-3}	0.1025	1.32×10^{-5}	0.229
Toxaphene	U224	4.89×10^{-3}	***	***	0.170

Appendix E. (Continued)

Waste Name	Waste Code	Henry's Law Constant ($atm\text{-}m^3/mol$)	Diffusion Coefficient in Air* (cm^2/sec)	Diffusion Coefficient in Water** (cm^2/sec)	Liquid-Phase Mass Transfer Coefficient (cm/hr)
1,1-Dichloroethane	U076	5.45×10^{-3}	0.0919(1)	1.25×10^{-5}	0.274
1,3-Dichloropropane	U084	4.2×10^{-3}	0.0817	9.22×10^{-6}	0.257
Methanethiol	U153	4.0×10^{-3}	0.1242	1.43×10^{-5}	18.26
Chlorobenzene	U037	3.93×10^{-3}	0.0747(1)	9.31×10^{-6}	0.257
Chloroform	U044	3.39×10^{-3}	0.0888(1)	1.19×10^{-5}	0.250
Methylene chloride	U080	3.19×10^{-3}	0.1037(1)	1.29×10^{-5}	0.296
1,1,1,2-Tetrachloroethane	U208	2.76×10^{-3}	0.0739	8.4×10^{-6}	0.210

*Estimated via the Fuller, Schettler, and Giddings Method in Lyman et al. (1982).
**Estimated via the Hayduk and Laudie Method in Lyman et al. (1982).
***Cannot calculate because chemical consists of a mixture of molecules.
(1) Experimental value obtained from Lugg (1968).
(2) Experimental value obtained from Barr and Watts (1972).
† Assumed to be the same value as the experimental value of it's isomer, 1,1-dichloroethylene.
†† Estimated by Wilke and Chang Method (Lyman 1981).
†††Cannot calculate diffusion coefficient because a value for the structural contribution of nickel is needed to compute molar volume. A value for the structural contribution of nickel was not found in the information reviewed.

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Appendix F. Diffusion Coefficients in Air and Water For RCRA Wastes Identified as Highly Volatile from Soil

Waste Name	Waste Code	Relative Soil Volatility		Diffusion Coefficient in Air* (cm^2/sec)	Diffusion Coefficient in Water** (cm^2/sec)
		Dry	Wet		
Formaldehyde	U122	1906	809	0.1728	2.06×10^{-5}
Cyanogen	P031	1473	552	0.1185	1.33×10^{-5}
Bromomethane	U029	1700	544	0.1139	1.46×10^{-5}
Dichlorodifluoromethane	U075	1450	439	0.0944(2)	1.13×10^{-5}
Chloroethene	U043	958	336	0.1225(2)	1.29×10^{-5}
Methanethiol	U153	578	219	0.1242	1.43×10^{-5}
Ethylene oxide	U115	505	195	0.1329	1.54×10^{-5}
Dimethylamine	U092	—	193	0.0567	1.07×10^{-5}
Hydrofluoric acid	U134	378	179	0.2553	3.44×10^{-5}
Cyanogen chloride	P033	428	152	0.1213	1.47×10^{-5}
Phosgene	P095	458	144	0.1010	1.23×10^{-5}
Hydrocyanic acid	P063	321	140	0.1677	1.87×10^{-5}
Acetaldehyde	U001	360	139	0.1415	1.71×10^{-5}
Methylethylketone peroxide	U160	302	100	0.0853	9.50×10^{-6}
Furan	U124	222	77	0.1070	1.24×10^{-5}
Trichlorofluoromethane	U121	223	66	0.0862	1.02×10^{-5}
1,1-Dichloroethylene	U078	202	64	0.1144(2)	1.14×10^{-5}
Ethyl ether	U117	184	63	0.0892	9.70×10^{-6}
1,3-Pentadiene	U186	145	50	0.0912	9.84×10^{-6}
Methylene chloride	U080	141	46	0.1037(1)	1.29×10^{-5}
Carbon disulfide	P022	121	41	0.1045(1)	1.28×10^{-5}
Chloroacetaldehyde	P023	108	36	0.1032	1.21×10^{-5}
Acetyl chloride	U006	108	36	0.1050	1.24×10^{-5}
1-Propanamine	U194	101	36	0.0996	1.08×10^{-5}
Acrolein	P003	96	34	0.1131	1.29×10^{-5}
Methyl iodide	U138	116	34	0.1025	1.32×10^{-5}

(1) Experimental value obtained from Lugg (1968).
(2) Experimental value obtained from Barr and Watts (1972).
*Estimated via the Fuller, Schettler, and Giddings Method in Lyman et al. (1982).
**Estimated via the Hayduk and Laudie Method in Lyman et al. (1982).

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16. ABSTRACT

The purpose of this report is to present (1) the physical-chemical properties of the RCRA wastes related to volatility and (2) a waste categorization scheme based on the volatility of RCRA wastes from hazardous waste treatment, storage, and disposal facilities. The physical-chemical properties include basic input parameters for air emission modeling.

Physical-chemical properties of RCRA wastes presented include - molecular weight, boiling point, vapor pressure, solubility, Henry's Law constant, diffusion coefficients and mass transfer coefficients. RCRA wastes are categorized by vapor pressure, aqueous volatility, and relative soil volatility.

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