DEPARTMENT OF HEALTH

NOTICE OF PROPOSED RULEMAKING

The Director of the Department of Health, pursuant to the authority set forth in An Act to enable the District of Columbia to receive federal financial assistance under Title XIX of the Social Security Act for a medical assistance program, and for other purposes, approved December 27, 1967 (81 Stat. 744; D.C. Official Code, § 1-307.02), Reorganization Plan No. 4 of 1996, and Mayor's Order 97-42, dated February 18, 1997, hereby gives notice of the intent to adopt an amendment to Chapter 47 of Title 29 of the District of Columbia Municipal Regulations (DCMR) governing targeted case management services provided by the District of Columbia Child and Family Services Agency (CFSA) and its contractors.

The targeted case management program is designed to identify medical, social and educational needs of children in foster care, with a view towards achieving permanency in a timely manner. The proposed amendment would change the minimum qualifications for individual case managers providing targeted case management services from licensed graduate social workers to licensed social work associates. This change is consistent with the scope of practice of social work and would facilitate the provision of needed services to children who are either at risk of abuse and neglect or are abused and neglected and in the care and custody of CFSA. The Medicaid Program is also amending the applicable provisions of the District of Columbia State Plan for Medical Assistance (State Plan). The proposed rules will not become effective until approval by the Council of the District of Columbia and the United States Department of Health and Human Services of the corresponding State Plan amendment.

The Director also gives notice of his intent to take final rulemaking action to adopt these proposed rules not less than thirty (30) days from the date of publication of this notice in the *D.C. Register*.

Amend section 4704.2 (Staffing and Administration) of Chapter 47, Title 29 DCMR to read as follows:

4704.2 Each individual case manager shall meet the following minimum qualifications:

(a) Be licensed as a social worker associate pursuant to D.C. Official Code, § 3-1208.01; and

(b) Work under the supervision of a social worker who is licensed as an independent social worker in accordance with D.C. Official Code, § 3-1208.3 or licensed as an independent clinical social worker in accordance with D.C. Official Code, § 3-1208.4; and who has two years experience in social work.

Comments on the proposed rules should be sent in writing to Robert T. Maruca, Senior Deputy Director, Medical Assistance Administration, Department of Health, 825 North Capitol Street, N.E., 5th Floor, Washington, DC, not later than thirty (30) days from the date of publication of this notice in the *D.C. Register*. Copies of the proposed rules and corresponding State Plan may be obtained from the same address.

DEPARTMENT OF HEALTH

NOTICE OF PROPOSED RULEMAKING

The Director of the Department of Health, pursuant to the authority set forth in §§ 305 and 801 of the Brownfield Revitalization Amendment Act of 2000, effective June 15, 2001 (D.C. Law 13-312; D.C. Official Code §§ 8-633.05, 8-638.01 (Supp. 2003)), and section 1.d of Mayor's Order 2003-41, dated March 27, 2003, 50 DCR 2898, hereby gives notice of intent to take proposed rulemaking action to adopt the following amendments to Title 20 of the District of Columbia Municipal Regulations.

The proposed rules would add a new Chapter 75 to establish cleanup standards for contaminated properties that would allow a property to be used for residential or commercial and industrial purposes.

Title 20 (Environment) (February 1997) of the District of Columbia Municipal Regulations is amended by adding a new Chapter 75, to read as follows:

CHAPTER 75 - SOIL QUALITY STANDARDS

Sections

7500 GENERAL PROVISIONS

7500.1 This chapter establishes the minimum requirements for determining cleanup levels for hazardous substances in soil adequate to protect public health, safety, and welfare and the environment.

7500.2 A person who proposes or undertakes the cleanup of contaminated property in the District of Columbia (the "applicant") shall comply with the requirements of this chapter.

7500.3 The applicant shall submit proposed soil cleanup levels to the District of Columbia Department of Health, Environmental Health Administration (EHA), for approval before completing an environmental assessment of the site. For each contaminant of concern (COC) at each site, the applicant shall either:

(a) Use the generic soil quality standards listed in § 7510 as soil cleanup levels; or, alternatively,

(b) Develop site-specific soil cleanup levels (SSCLs) based on an estimate of the reasonable maximum exposure expected to occur under current and predicted future site conditions and land uses, in accordance with the requirements of this chapter.

7500.4 The applicant shall submit a soil and groundwater sampling and analysis plan to EHA for review and approval before collecting data. After implementing the approved sampling and analysis plan, the applicant shall submit the analytic results to EHA for review.

7500.5 The applicant shall ensure that the quantity and quality of the data collected and analyzed are sufficient to enable the applicant to complete, and EHA to review and approve, each of the following tasks:

(a) Calculation of the maximum soil concentration of each COC;

(b) Comparison of the maximum soil concentration of each COC to the generic soil quality standards;

(c) If the applicant proposes using SSCLs instead of the generic soil quality standards, development of a site conceptual exposure scenario (SCES);

(d) If the applicant proposes SSCLs, calculation of SSCLs;

(e) If the applicant proposes SSCLs, comparison of the maximum soil concentration of each COC to the SSCL for the COC;

(f) If the maximum soil concentration of a COC exceeds the generic soil quality standard, or, alternatively, the SSCL, for the COC, calculation of the representative soil concentration for the COC;

(g) Comparison of the representative soil concentration for each COC to the generic soil quality standard, or alternatively, the SSCL, for the COC; and

(h) Preparation of the environmental assessment of the site and, if required, a cleanup action plan that is protective of human health and the environment.

7500.6 Where the data are insufficient to develop SSCLs, the applicant shall use the generic soil quality standards in § 7510.

7500.7 If a COC is not listed in § 7510, the applicant shall develop a SSCL for the COC in accordance with the requirements of this chapter, including the requirements of § 7500.5 for the collection and analysis of sufficient data.

7500.8 The applicant shall obtain written approval from EHA before using any technical or scientific method, model, or equation not specifically approved in this chapter.

7500.9 An applicant proposing an alternative method, model, or equation shall provide EHA with supporting information sufficient to permit EHA to fully evaluate the proposed alternative.

7500.10 To obtain approval of commercial/industrial land use soil cleanup levels, the applicant shall develop, implement, and maintain institutional controls sufficient to ensure the continuing validity of the land use, receptor, and exposure assumptions underlying the proposed soil cleanup levels.

7500.11 After EHA reviews and approves a fully implemented, EHA-approved cleanup action plan, EHA shall issue the applicant a "No Further Action Letter" (Certificate of Completion).

7500.12 A No Further Action Letter shall state the permissible uses of the property and any requirements for long-term monitoring, institutional and engineering controls, and maintenance.

7501 DETERMINING REPRESENTATIVE SOIL CONCENTRATIONS FOR CONTAMINANTS OF CONCERN

7501.1 Except as provided in § 7501.2, the applicant shall calculate the field-measured, representative soil concentration for each site-specific COC.

7501.2 If the maximum soil concentration of a COC does not exceed the generic soil quality standard in § 7510 or the SSCL for the COC, then it shall not be necessary to calculate the representative soil concentration for the COC.

7501.3 The applicant shall use the following steps in calculating the representative soil concentrations for each COC:

(a) The applicant shall determine, subject to EHA approval, whether the data are sufficient to define the vertical and horizontal extent, magnitude, and character of the COCs at the site;

(b) The applicant shall:

(1) Ensure that the samples are representative of current site conditions and taken from areas of known or likely sources of contamination; and

(2) Collect additional samples if the samples are not representative of current site conditions (*e.g.*, if there is a new spill or remediation after the samples were collected);

(c) After determining, pursuant to paragraph (a) of this subsection, that the data are sufficient, the applicant shall calculate the representative soil concentration for each COC using the arithmetic mean (straight average). In calculating the representative soil concentration, the applicant shall:

(1) Exclude non-detect soil samples located at the periphery of the impacted area; and

(2) Treat non-detect soil samples within the impacted area as contaminated to one-half (½) the applicable detection limit; and

(d) The applicant shall also determine, subject to EHA approval, whether hotspots and discrete areas of contamination require additional evaluation.

7502 – 7509 RESERVED

7510 GENERIC SOIL QUALITY STANDARDS

7510.1 The following table shall establish the generic soil quality standards for residential and commercial/industrial land uses:

Generic Soil Quality Standards					
CHEMICAL	CAS #	Soil			
		Residential [mg/kg]		Commercial/Industrial [mg/kg]	
Acenaphthene	83-32-9	1.96E+02	*	1.96E+02	*
Acetone	67-64-1	6.59E+03		4.82E+04	
Acrolein	107-02-8	8.65E-02		6.96E-01	
Anthracene	120-12-7	8.08E+00	*	8.08E+00	*
Arsenic	7440-38-2	1.01E-01		4.03E-01	
Benzene	71-43-2	1.57E-01		4.29E-01	
Benzo(a)pyrene	50-32-8	1.05E-01		3.13E-01	
Benzo(b)fluoranthene	205-99-2	1.05E+00		3.13E+00	
Benzo(k)fluoranthene	207-08-9	8.16E+00	*	8.16E+00	*
Benzo(a)anthracene	56-55-3	1.05E+00		3.13E+00	
Benzo(g,h,I)perylene	191-24-2	4.17E+00	*	4.17E+00	*
Bromodichloromethane	75-27-4	1.24E+01		3.69E+01	
Bromoform	75-25-2	8.86E+01		2.55E+02	
Bromomethane	74-83-9	1.31E-01		1.05E+00	
Butylbenzylphthalate	85-68-7	3.70E+02	*	3.70E+02	*
sec-Butylbenzene	135-98-8	5.15E+02	*	5.15E+02	*
tert-Butylbenzene	98-06-6	5.17E+02	*	5.17E+02	*
Cadmium - water	7440-43-9	3.00E-01		1.31E+00	
Cadmium - food	7440-43-9	3.00E-01		1.31E+00	
Carbon disulfide	75-15-0	1.88E+01		1.51E+02	
Carbon tetrachloride	56-23-5	4.05E-02		1.27E-01	
Chlordane	57-74-9	2.19E+00		6.50E+00	
4-Chloroaniline	106-47-8	2.63E+02		1.93E+03	
Chlorobenzene	108-90-7	6.16E+01		4.97E+02	
Chloroethane	75-00-3	2.63E+01		2.12E+02	
Chloroform	67-66-3	6.07E-02		1.96E-01	
Chloromethane	74-87-3	8.58E-02		2.70E-01	
Beta-chloronaphthalene	91-58-7	5.74E+02	*	5.74E+02	*
2-Chlorophenol	95-57-8	3.29E+02		2.41E+03	
Chromium III	16065-83-1	9.88E+04		7.23E+05	
Chromium VI	18540-29-9	4.61E-02		2.01E-01	
Chrysene	218-01-9	3.92E+00	*	3.92E+00	*
Cobalt	7440-48-4	3.95E+03		2.89E+04	
Copper	7440-50-8	2.63E+03		1.93E+04	
Cumene	98-82-8	6.67E+02		6.97E+02	*
Cyanide (free)	57-12-5	1.32E+03		9.64E+03	
DDD	72-54-8	3.20E+00		9.54E+00	
DDE	72-55-9	2.26E+00		6.73E+00	
DDT	50-29-3	4.07E-03	*	4.07E-03	*
Diazinon	333-41-5	4.57E+00	*	4.57E+00	*
Dibenzofuran	132-64-9	2.33E+02	*	2.33E+02	*
Dibromochloromethane	124-48-1	9.15E+00		2.73E+01	
1,2-dibromoethane	106-93-4	9.02E-03		2.69E-02	
1,2-dichlorobenzene	95-50-1	6.09E+02	*	6.09E+02	*
1,3-dichlorobenzene	541-73-1	5.93E+01		2.36E+02	*
1,4-dichlorobenzene	106-46-7	5.06E+00		1.59E+01	
3,3-dichlorobenzene	91-94-1	1.71E+00		5.09E+00	
1,1-dichloroethane	75-34-3	9.22E+01		7.43E+02	

Generic Soil Quality Standards					
CHEMICAL	CAS #	Soil			
		Residential [mg/kg]		Commercial/Industrial [mg/kg]	
1,2-dichloroethane	107-06-2	8.07E-02		2.54E-01	
1,1-dichloroethene	75-35-4	5.46E-03		1.72E-02	
Total 1,2-dichloroethene	540-59-0	5.93E+02		3.71E+03	*
2,4-dichlorophenol	120-83-2	1.98E+02		1.45E+03	
1,2-dichloropropane	78-87-5	1.25E+00		1.00E+01	
Dieldrin	60-57-1	4.78E-02		1.42E-01	
Diethylphthalate	84-66-2	1.01E+03	*	1.01E+03	*
2,4-dimethylphenol	105-67-9	1.32E+03		9.64E+03	
Dimethylphthalate	131-11-3	2.25E+03	*	2.25E+03	*
1,2 -dinitrobenzene	528-29-0	2.63E+01		5.98E+01	*
1,3 -dinitrobenzene	99-65-0	6.59E+00		4.82E+01	
2,4 -dinitrophenol	51-28-5	1.32E+02		9.64E+02	
2,4 -dinitrotoluene	121-14-2	1.32E+02		1.69E+02	*
2,6 -dinitrotoluene	606-20-2	6.59E+01		9.61E+01	*
1,4 -dioxane	123-91-1	6.99E+01		2.08E+02	
Endosulfan	115-29-7	1.05E+01	*	1.05E+01	*
Endrin	72-20-8	1.98E+01		2.70E+01	*
Ethylbenzene	100-41-4	1.16E+03	*	1.16E+03	*
Ethylene Glycol	107-21-1	1.12E+05	*	1.12E+05	*
Ethylene Glycol monobutyl ether	111-76-2	3.16E+04		1.12E+05	*
Ethyl ether	60-29-7	1.15E+04	*	1.15E+04	*
Fluoranthene	206-44-0	1.01E+02	*	1.01E+02	*
Fluorene	86-73-7	1.45E+02	*	1.45E+02	*
Formaldehyde	50-00-0	1.79E+00		5.63E+00	
Heptachlor	76-44-8	1.58E-01		4.57E-01	
Heptachlor epoxide	1024-57-3	8.42E-02		2.51E-01	
Hexachlorobenzene	118-74-1	4.63E-01		1.36E+00	
Hexachlorobutadiene	87-68-3	5.83E+00		1.83E+01	
Hexachlorocyclopentadiene	77-47-4	1.03E+01		8.29E+01	
Hexane	110-54-3	7.88E-01		6.35E+00	
Iron	7439-89-6	1.98E+04		1.45E+05	
Lead	7439-92-1	4.00E+02		4.00E+02	
Mercury	7439-97-6	4.12E-03		4.12E-03	
Methylene chloride	75-09-2	1.90E+00		5.96E+00	
Methyl Ethyl Ketone	78-93-3	2.38E+03		1.92E+04	
MTBE	1634-04-4	1.44E+03		1.16E+04	
Naphthalene	91-20-3	7.06E+2		4.39E+03	
Nickel	7440-02-0	1.32E+03		9.64E+03	
n-Nitrosodipropylamine	621-64-7	1.10E-01		3.27E-01	
Pentachlorophenol	87-86-5	6.40E+00		1.91E+01	
Phenanthrene	85-01-8	1.40E+02	*	1.40E+02	*
Phenol	108-95-2	3.30E+04	*	3.30E+04	*
Pyrene	129-00-0	8.72E+01	*	8.72E+01	*
n-Propylbenzene	103-65-1	1.72E+03	*	1.72E+03	*
Selenium	7782-49-2	3.29E+02		2.41E+03	
Silver	7440-22-4	3.29E+02		2.41E+03	
Strychnine	57-24-9	1.98E+01		1.29E+02	*
Styrene	100-42-5	2.86E+03	*	2.86E+03	*
Tetrachloroethene	127-18-4	1.07E+00		3.36E+00	
Toluene	108-85-3	1.25E+02		7.76E+02	*
Toxaphene	8001-35-2	6.97E-01		2.07E+00	
1,2,4 -tribromobenzene	615-54-3	5.11E+01	*	5.11E+01	*
1,1,1 -trichloroethane	71-55-6	2.95E+02		2.00E+03	*

Generic Soil Quality Standards					
CHEMICAL	CAS #	Soil			
		Residential [mg/kg]		Commercial/Industrial [mg/kg]	
1,1,2 -trichloroethane	79-00-5	4.50E-01		1.41E+00	
Trichloroethene	79-01-6	6.56E-01		2.06E+00	
Trichlorofluoromethane	75-69-4	1.89E+01		1.52E+02	
2,4,5 -Trichlorophenol	95-95-4	3.67E+03	*	3.67E+03	*
2,4,6 -trichlorophenol	88-06-2	6.51E+01		1.89E+02	
1,1,2 -trichloropropane	598-77-6	8.21E+01	*	8.21E+01	*
1,2,3 -trichloropropane	96-18-4	3.84E-01		1.14E+00	
1,2,4 -trimethylbenzene	95-63-6	1.52E+01		1.23E+02	
1,3,5 -trimethylbenzene	108-67-8	1.04E+01		8.35E+01	
1,3,5 -trinitrobenzene	99-35-4	8.91E+01	*	8.91E+01	*
2,4,6 -trinitrotoluene	118-96-7	2.56E+01		7.63E+01	
Uranium (soluble salts) [IRIS]	7440-61-1	1.98E+02		1.45E+03	
Uranium (soluble salts) [Provisional]	7440-61-1	1.32E+01		9.64E+01	
Vanadium	7440-62-2	4.61E+02		3.38E+03	
Vanadium Pentoxide	1314-62-1	5.93E+02		8.89E+02	*
Vinyl Acetate	108-05-4	7.93E+01		6.39E+02	
Vinyl Chloride (lifetime)	75-01-4	1.25E-02		3.94E-02	
Vinyl Chloride (adult)	75-01-4	2.51E-02		7.88E-02	
m-Xylene	1330-20-7	3.32E+02	*	3.32E+02	*
o-Xylene	108-38-3	4.49E+02	*	4.49E+02	*
p-Xylene	95-47-6	5.96E+02	*	5.96E+02	*
Xylenes	106-42-3	5.04E+02	*	1.40E+03	*
Zinc	7440-66-6	1.98E+04		1.45E+05	

mg/kg: milligrams/kilograms
*: Calculated value exceeded saturated soil concentration and hence saturated soil concentrations are listed.
#: Calculated value exceeded pure component water solubility and hence water solubilities are listed as values.
RAFd (dermal relative absorption factor) for all chemicals other than BTEX (benzene, toluene, ethyl benzene, and xylenes (total) was 0.1

7511 SITE-SPECIFIC SOIL CLEANUP LEVELS

7511.1 An applicant proposing site-specific cleanup levels (SSCLs) shall:

(a) First, develop an site conceptual exposure scenario (SCES);

(b) Second, complete a SSCL evaluation by:

(1) Selecting input parameters;

(2) Calculating SSCLs;

(3) Comparing the maximum soil concentration for each COC with the SSCL for the COC; and

(4) If the maximum soil concentration of a COC exceeds the SSCL for the COC, comparing the representative soil concentration of the COC with the SSCL for the COC; and

(c) Third, prepare an environmental assessment of the site and, if required, a cleanup action plan for the site.

7511.2 To develop and evaluate SSCLs, the applicant shall collect, in accordance with the requirements of this chapter, the following data:

(a) Nature and magnitude of the contamination;

(b) Site information, including land use and receptor information;

(c) Adjacent land use and receptor information;

(d) Vadose zone soil characteristics;

(e) Saturated zone and groundwater characteristics;

(f) Distribution of COCs in soil;

(g) Distribution of COCs in groundwater; and

(h) Description of any response, corrective action, or cleanup measures already performed and/or proposed.

7512 SITE CONCEPTUAL EXPOSURE SCENARIO

7512.1 An applicant proposing SSCLs shall identify in the SCES all known, potential, or suspected sources of contamination; types and concentrations of COCs detected at the site; potentially contaminated media; and potential exposure pathways and routes, including known or potential current and future receptors.

7512.2 The applicant shall include in the SCES a description of each of the following:

(a) Current land use;

(b) Short-term future land use; and

(c) Long-term future land use.

7512.3 The applicant shall evaluate in the SCES the on-site area currently or likely to be contaminated by site-specific COCs, which shall consist of the area within the legal boundaries of the property on which the source of the COCs is or was located, and include the soil, soil vapor, groundwater, and surface water within those legal boundaries.

7512.4 The applicant shall evaluate in the SCES the off-site area currently or likely to be contaminated by site-specific COCs, which shall consist of the area outside the legal boundaries of the property on which the source of the COCs is or was located or which is impacted by an on-site source, and include the soil, soil vapor, groundwater, and surface water outside of those legal boundaries.

7512.5 The applicant may present the SCES in either a graphical or tabular format.

7512.6 The applicant shall update and revise the SCES as investigations produce new information about the site.

7513 CURRENT AND FUTURE LAND USE

7513.1 For the purpose of this chapter, the applicant shall classify the current and future land use as either residential or commercial/industrial. Classification as residential land use generally results in lower (more stringent) risk-based soil cleanup levels. The completion of an approved cleanup action plan to residential soil cleanup levels will generally allow unrestricted land use.

7513.2 An applicant proposing SSCLs shall conduct a walking land use survey of the area within a one thousand-foot (1,000-foot) radius of the source.

7513.3 The applicant shall, based on the survey required in § 7513.2, prepare a map that clearly and accurately shows each of the following:

(a) All current residential and commercial/industrial land structures and uses, including all basements and cellars;

(b) All utilities;

(c) Surface waters;

(d) Environmentally sensitive areas;

(e) Recreational areas;

(f) Community and urban gardens; and

(g) Agricultural areas.

7513.4 The applicant shall include a copy of the map required in § 7513.3 in all reports and work plans proposing soil cleanup levels.

7513.5 The applicant shall include in the SCES a description of the short-term and long-term future land use of the site and the surrounding area, subject to the following:

(a) If the applicant does not know the future land use, the applicant shall project the likely land use based on the following:

(1) The zoning classification of the site and surrounding area;

(2) Applicable comprehensive plan provisions and the comprehensive plan or generalized land use map; and

(3) Surrounding land use patterns; and

(b) When it is not possible to project future land use patterns based on the criteria in paragraph (a) of this subsection, the applicant shall identify the future land use as residential land use.

7513.6 The applicant shall include in the SCES a water well survey, documenting:

(a) Each of the following types of wells:

(1) All public water supply wells within one (1) mile of the bounds of the site;

(2) All private water supply wells within one-half (½) mile of the bounds of the site;

(3) All dewatering wells within a one thousand-foot (1,000-foot) radius of the source; and

(b) For each well identified pursuant to paragraph (a) of this subsection, each of the following characteristics:

(1) The age of the well;

(2) The depth of the well;

(3) The screen interval for the well;

(4) The well's mode of operation (continuous or intermittent); and

(5) Whether the well is used for water use or dewatering.

7513.7 Where ecological receptors, surface waters, or environmentally sensitive areas may be present, the applicant shall conduct a walking survey to identify and

map the receptors within a one thousand–foot (1,000-foot) radius of the impacted area. After the applicant has identified and mapped the ecological receptors, the applicant shall consult with EHA to ensure that the SCES is sufficient to support EHA review and approval of the proposed SSCLs and any proposed environmental assessment and cleanup action plan.

7514 RECEPTORS

7514.1 An applicant proposing SSCLs shall, in the SCES and in accordance with the requirements of this section, identify the current and predicted short-term and long-term future on-site and off-site receptors and evaluate their risk of exposure to each COC.

7514.2 The applicant shall identify all human receptors who live or work either on the site or within a one thousand-foot (1,000-foot) radius of the source.

7514.3 If the contaminant plume extends or is likely to extend more than one thousand (1,000) feet from the source, the applicant shall identify all human receptors that live or work within the impacted area.

7514.4 The applicant shall identify and evaluate each of the following human receptors:

(a) Residential land use – child;

(b) Residential land use – adult;

(c) Commercial/industrial worker – adult; and

(d) Construction worker and utility worker – adult.

7514.5 An applicant does not need to evaluate the risk of exposure to human receptors other than those listed in § 7515.4, such as visitors and occasional maintenance workers, unless those other receptors have or are likely to have as great a risk as the listed receptors.

7514.6 The applicant shall evaluate ecological receptors identified pursuant to § 7513.7 in consultation with EHA.

7514.7 The applicant shall evaluate surface waters to determine the potential effect of migration from the site of contaminated surface water runoff or groundwater. With EHA approval, the applicant may estimate soil cleanup levels by accounting for the mixing of groundwater discharge with stream flow.

7514.8 The applicant shall identify and evaluate all on-site and potentially affected off-site underground utilities to determine:

(a) The ability of the utility to serve as a preferential pathway; and

(b) Potential adverse impacts on the utility from COCs.

7515.9 The applicant shall conduct soil vapor surveys along utility corridors or in manholes to identify and evaluate potential human exposure.

7515 EXPOSURE PATHWAYS AND ROUTES

7515.1 An applicant proposing SSCLs shall evaluate the following exposure pathways and routes to determine if they are complete:

(a) Inhalation;

(b) Surficial soils;

(c) Subsurface soils;

(d) Groundwater; and

(e) Other pathways and routes necessary to determine whether the proposed SSCLs would adequately protect human health and the environment.

7515.2 The applicant may exclude from further analysis, subject to EHA approval, a pathway determined to be incomplete.

7515.3 The applicant shall evaluate the following exposure pathways and routes associated with contaminated surficial soil:

(a) Leaching to groundwater and potential ingestion of groundwater;

(b) Leaching to groundwater and potential migration to surface waters;

(c) Outdoor inhalation of vapor emissions and particulates;

(d) Dermal contact; and

(e) Ingestion of soil.

7515.4 The applicant shall evaluate the following exposure pathways and routes associated with contaminated subsurface soils:

(a) Indoor inhalation of vapor emissions and particulates;

(b) Outdoor inhalation of vapor emissions and particulates;

(c) Leaching to groundwater and potential ingestion of groundwater; and

(d) Leaching to groundwater and potential migration to surface waters.

7515.5 The applicant shall evaluate the following exposure pathways and routes associated with contaminated groundwater:

(a) Indoor inhalation of vapor emissions;

(b) Outdoor inhalation of vapor emissions;

(c) Ingestion of groundwater; and

(d) Migration and discharge into surface waters.

7515.6 The applicant shall determine if current soil and groundwater concentrations of the COCs could generate unacceptably high levels of volatile vapors within the breathing zone indoors or outdoors, as follows:

(a) The applicant may conduct a qualitative evaluation of the outdoor inhalation pathway associated with groundwater, unless such inhalation constitutes a critical pathway;

(b) Except as provided in paragraph (a) of this subsection, the applicant shall conduct a quantitative evaluation of the indoor and outdoor inhalation pathway in accordance with any one of the following methods to determine whether the model-estimated concentrations are exceeded and whether further study or cleanup is required:

(1) The applicant may compare measured soil concentrations of the COCs to risk-based target inhalation levels calculated pursuant to the equations (models) in Appendix A to this chapter;

(2) The applicant may compare site-specific risk-based target inhalation levels based on the use of approved site-specific soil data and the equations in Appendix A with the risk-based target inhalation levels calculated pursuant to the equations in Appendix A; or, alternatively, use the site-specific levels to estimate the risks (*i.e.*, the lifetime cancer risk or Hazard Quotient for adverse health effects) for current and future land use; or

(3) The applicant may compare indoor or outdoor air measurements to the risk-based target inhalation levels, calculated pursuant to the equations in Appendix A.

7516 NATURE AND MAGNITUDE OF CONTAMINATION

7516.1 The applicant shall evaluate the nature and magnitude of the contamination, including:

(a) Identifying the hazardous substance spilled or released, including the specific chemicals spilled or released, for purposes of identifying COCs;

(b) Estimating the amount of hazardous substance spilled or released;

(c) Identifying the location and time of the spill or release, including developing a vertical and horizontal isoconcentration map of the COCs, to delineate the extent of contamination; and

(d) Analyzing for effectiveness the response, corrective action, or cleanup measures already performed.

7517 SITE INFORMATION

7517.1 An applicant proposing SSCLs shall submit one (1) or more maps of the site to EHA, as necessary, that are drawn to scale, with a bar scale and an arrow indicating the direction of North, and that show the location of all of the following:

(a) Current and previous structures;

(b) Current and previous activities and uses that caused or were likely to have caused the spill or release of hazardous substances; and

(c) Monitoring wells, including any wells that may have been abandoned; water use wells; soil borings; soil vapor extraction wells; soil excavation areas; and dewatering wells.

7517.2 The applicant shall submit information to EHA on ground surface conditions, including the slope of the surface and the type, extent, and condition of any pavement.

7517.3 The applicant shall submit to EHA the following information on any underground utilities, conduits, and vaults (utilities) on or adjacent to the site:

(a) Type and location of each utility located within the area of known or likely soil and groundwater impact, where the spill or release migrated, may have migrated, or may migrate in the future;

(b) The depth of each utility relative to the depth of the groundwater, accounting for seasonal fluctuations of groundwater levels, and including cross-sectional diagrams;

(c) The direction of flow in each utility;

(d) Type and location of each utility on a base map that also contains a diagram showing the extent and thickness of free product, if any, and known or likely impacts to soil and groundwater;

(e) The types of materials (*e.g.*, polyvinyl chloride (PVC), terra cotta, concrete, or steel) used in the construction and installation of each utility;

(f) Any present or past disruption of any utility, including any complaints or reports of disruption that have been filed with EHA, other regulatory agencies, or the owner or operator of the utility;

(g) Air sampling and analysis data, as appropriate, of any utility; and

(h) Information about the potential impacts on the utility from dissolved contaminants, when present.

7517.4 The applicant shall submit the following information concerning groundwater use:

(a) Information concerning any present or former water supply well on the site, including location, construction details, total depth of the well, screen interval, age, mode of operations, and the current and past use of the water; and

(b) Information concerning any present dewatering well on or adjacent to the site, including location, construction details, total depth of the well, screen interval, age, mode of operation, and disposition of the water.

7517.5 The applicant shall submit to EHA the following information concerning regional hydrogeology, soil types, and aquifer characteristics:

(a) The type and depth of aquifers in the area, and whether the aquifers are confined, semi-confined, or unconfined;

(b) General aquifer characteristics, including yield, Total Dissolved Solids, and water salinity; and

(c) Information on surface waters within a one thousand-foot (1,000-foot) radius of the source that have been, or could be, potentially impacted by a hazardous substance spill or release from the site, including the location shown on an area map, and information concerning the type (perennial or intermittent), water flow rate, flow direction, depth of water, width of the water body, and water use.

7517.6 If contamination or cleanup activities on a site threaten to cause an explosion or fire or to damage a utility, the applicant shall immediately notify EHA, the District of Columbia Department of Fire and Emergency Medical Services, and the owner or operator of the utility. The applicant shall also immediately undertake emergency response measures to eliminate explosion, fire, and vapor hazards.

7517.7 If free product is present, the applicant shall remove the product to the maximum extent practicable.

7518 SOIL INVESTIGATION

7518.1 The applicant shall collect and analyze soil and groundwater data sufficient in quantity and quality to:

(a) Identify the impacted area;

(b) Define the vertical and horizontal extent of soil impacts; and

(c) Ensure that the maximum and representative concentrations of the COCs are detected at the site.

7518.2 Unless directed otherwise by EHA, the applicant shall determine the extent of impact by the COCs based on the generic soil quality standards in § 7510.

7518.3 To determine the spatial extent of the contamination, the applicant shall drill soil borings starting from the known or suspected source area.

7518.4 To determine the vertical extent of the contamination, the applicant shall:

(a) Take soil borings that extend up to the water table; and

(b) Collect samples from the surficial and subsurface soil zones pursuant to the requirements in §§ 7519 through 7521.

7519 VADOSE ZONE CHARACTERISTICS

7519.1 The applicant shall collect and analyze data relating to the following vadose zone soil characteristics:

(a) Thickness of the vadose zone and depth to groundwater;

(b) Dry bulk density;

(c) Porosity;

(d) Volumetric water content/moisture concentration; and

(e) Fractional organic carbon content in soil.

7519.2 The applicant shall collect and analyze samples from each lithology that may affect the transport of COCs.

7519.3 The applicant shall determine the thickness of the vadose zone (the distance from the ground surface to the depth at which the water table is encountered, minus the thickness of the capillary fringe) based on soil boring logs, as described in § 7521.2(g).

7519.4 The applicant shall estimate depth to groundwater using an average static depth from the ground surface to groundwater over the source area. The applicant may use an annual average depth for each monitoring well for sites with considerable seasonable fluctuation in water table level.

7519.5 The applicant shall determine dry bulk density, the dry weight of a soil sample divided by the field volume of the soil sample (in grams per cubic centimeter (g/cc)), pursuant to ASTM Method D2937, *Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.*

7519.6 The applicant shall determine porosity, the ratio of the volume of the voids in cubic centimeters to the volume of the soil sample in cubic centimeters, by the following methods:

(a) Laboratory analysis, using the following formula:

$$n = 1 - \rho_b/\rho_s$$

where:

n = porosity (cc/cc)
ρ_b = dry bulk density (g/cc)
ρ_s = specific gravity or particle density (g/cc).

The applicant may use ASTM Method D854, *Standard Test Method for Specific Gravity of Solids by Water Pycnometer*, to determine specific gravity. If specific gravity is not available, the applicant may assume two and sixty-five one hundredths grams per cubic centimeter (2.65 g/cc) as the specific gravity for most mineral soils; or, alternatively,

(b) If site-specific values are not available, the applicant may, with prior approval by EHA, estimate porosity from a reliable literature source.

7519.7 The applicant shall estimate volumetric water content, the ratio of the volume of water to the volume of soil. When a laboratory reports gravimetric water content pursuant to ASTM Method D2216, *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock*, the applicant shall use the following formula to convert the results to volumetric water content:

$$\theta_{wv} = \theta_{wg} * \frac{\rho_b}{\rho_l}$$

where:

θ_{wv} = volumetric water content (cc water / cc soil)
θ_{wg} = gravimetric water content, typically reported by the laboratory (g of water / g of soil)
ρ_b = dry bulk density (g of dry soil/cc of soil)
ρ_l = density of water (g/cc).

7519.8 The applicant shall estimate fractional organic carbon content, the weight of organic carbon in the soil divided by the weight of the soil, using ASTM Method D2974, *Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils*, or an alternative method approved by EHA.

7519.9 For construction worker or utility worker exposure, the applicant shall calculate representative concentrations of the COCs in the zone where construction-related or utility-related activities are likely to occur, including surficial and subsurface soils.

7520 SURFICIAL SOIL SAMPLING AND ANALYSIS

7520.1 The applicant shall collect and analyze soil samples from boreholes at a depth of one (1) foot below the surface, or two (2) inches below impervious pavement, whichever is shallower.

7520.2 For sites where a soil evaluation that meets the requirements of this chapter has already been completed:

(a) The applicant is not required to collect soil samples if the site is paved and likely to remain so;

(b) The applicant is not required to evaluate exposure pathways associated with surficial soil at sites where the only COCs are volatiles (*e.g.*, Benzene, Toluene, Ethyl benzene, and Xylenes (total) (BTEX));

(c) The applicant shall collect surficial soil samples at unpaved sites where the COCs are non-volatile (*e.g.*, polyaromatic hydrocarbons (PAHs) or metals) and there is evidence of a surficial spill or shallow leak, including a piping leak; and

(d) The applicant is not required to collect soil samples at paved sites where the COCs are non-volatile and there is evidence of a surficial spill or a leaking shallow pipe, unless the pavement is likely to be removed.

7521 SUBSURFACE SOIL SAMPLING AND ANALYSIS

7521.1 The applicant shall conduct pathway-specific, subsurface soil sampling and analysis as follows:

(a) For the exposure pathway for indoor inhalation of vapors emissions and particulates from subsurface soil, for current land use, the applicant shall collect and analyze soil samples from borings adjacent to the current structure of concern or, where appropriate, from the most contaminated boring.

(b) For the exposure pathway for indoor inhalation of vapor emissions and particulates from subsurface soil, for future land use, the applicant shall collect and analyze samples within the footprint of the planned structure or from the most contaminated boring;

(c) For the exposure pathway for outdoor inhalation of vapor emissions and particulates from subsurface soil, the applicant shall collect and analyze representative concentrations of COCs from the entire soil source area; and

(d) For the exposure pathway for the leaching of COCs to groundwater, the applicant shall take the following parameters into account in collecting and analyzing samples:

(1) Thickness of the contaminated soil zone;

(2) Distance from the bottom of the source area to the water table, if any; and

(3) Representative soil concentration of COCs within the soil source area.

7521.2 The applicant shall sample soil in accordance with the following requirements and procedures:

(a) Submit as-built diagrams, with depth to groundwater, for each monitoring well that is installed;

(b) Collect samples from the soil source area or, if the soil source area has not been identified, from an area that is representative of the site;

(c) Collect samples to determine the vertical and horizontal extent of soil contamination, with a minimum of four (4) soil borings at each site;

(d) Extend soil borings to the water table or, if no groundwater is encountered, to a specified depth, not less than twenty (20) feet below the ground surface.

(e) Collect and field screen samples at either two-foot (2-foot) or five-foot (5-foot) intervals, preserving and submitting to the laboratory for analysis at least two (2) samples corresponding to the highest field screening readings;

(f) Comply with any additional sampling and analysis requirements of § 7521.3, if necessary;

(g) Use a geologist to log all soil borings to indicate the depths correlating with changes in lithology, soil vapor analyses, occurrence of groundwater, total depth, visual and olfactory observations, and any other pertinent geologic or environmental data;

(h) Develop a continuous soil profile from at least one (1) boring, with detailed lithologic descriptions, with particular emphasis on characteristics that control chemical migration and distribution, including zones of higher or lesser permeability, changes in lithology, correlation between vapor concentrations and different lithologic zones, obvious areas of soil discoloration, organic content, fractures, and other lithologic characteristics;

(i) Collect all samples in accordance with methods approved by EHA;

(j) Preserve all samples according to the requirements of the laboratory analyses to be performed;

(k) Extract all samples within the holding times of each particular analysis;

(*l*) Conduct sample analyses according to EHA-approved analytic methods and EPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW 846);

(m) Use quality assurance and quality control (QA/QC) procedures adequate to ensure sample quality and integrity. Use surrogate and spike recovery and trip blanks whenever possible;

(n) Decontaminate all sampling equipment using EHA, EPA, and industry standard protocols;

(o) Decommission all boreholes using the methods described in American Society for Testing and Materials (ASTM) Guidance D5299, *Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities*; and

(p) Seal the borehole from total depth to the surface with a bentonite/cement grout (six percent (6%) to eight percent (8%) bentonite powder).

7521.3 Depending on the nature of contamination, additional subsurface soil sampling below twenty (20) feet below the ground surface may be required. An applicant collecting additional samples pursuant to this subsection shall collect and field screen the samples at either two-foot (2-foot) or five-foot (5-foot) intervals. The applicant shall also collect and analyze at least one (1) sample from the capillary fringe. The number of samples, other than the capillary fringe sample, may vary depending on the thickness of the zone sampled; however, the applicant shall collect and analyze at least two (2) samples corresponding to the highest field screening readings.

7521.4 The applicant shall delineate the soil source area based on the soil analytic data and review of the historical use of the site, and according to the following additional procedures:

(a) Evaluate each source area separately if more than one (1) soil source area is identified at a site;

(b) Use the largest dimension of the soil source as the length of the source are; and

(c) Use the distance from the surface in the source area to the zone where the concentrations of the contaminants are above quantification limits as the depth of the subsurface soil.

7522 SATURATED ZONE CHARACTERISTICS

7522.1 The applicant shall collect and analyze data relating to the following characteristics of the saturated zone:

(a) Horizontal hydraulic conductivity and, if necessary, vertical hydraulic conductivity;

(b) Hydraulic gradient (magnitude and direction);

(c) Saturated zone soil characteristics (bulk density, porosity, and fractional organic carbon content);

(d) Indicators of natural attenuation; and

(e) Potential for tidal influences.

7522.2 The applicant shall estimate hydraulic conductivity using:

(a) Pump tests or slug tests;

(b) Grain size distribution of the porous formation; or

(c) Literature values corresponding to the type of soil in the saturated zone, when the applicant provides EHA with adequate reference and justification for the value chosen.

7522.3 The applicant shall estimate the magnitude and direction of the horizontal gradient of hydraulic potential by comparing water levels measured in the monitoring wells. For sites with seasonal variation in hydraulic gradient, the applicant shall estimate the average hydraulic gradient for each season.

7522.4 Where the stratigraphy or site conditions suggest that the upward or downward flow of groundwater may be a significant factor in determining saturated zone characteristics, the applicant shall estimate the vertical gradient of hydraulic potential.

7522.5 The applicant shall estimate bulk density, porosity, and fractional organic carbon content by using the methods described in § 7519.

7522.6 The applicant may measure the natural attenuation of COC concentrations at a site through various indicators, including chemical concentrations, geo-chemical indicators, electron acceptors, microorganisms, and carbon dioxide. The applicant shall classify these indicators into three (3) "lines of evidence" or types of site-specific data for evaluation as follows:

(a) The applicant may demonstrate a reduction in the concentrations of COCs by evaluating measured concentrations over time with monitoring wells, providing a primary line of evidence;

(b) The applicant may measure geo-chemical indicators, including dissolved oxygen, dissolved nitrates, manganese, ferrous iron, sulfate, and methane, in at least three (3) monitoring wells located along the flow line, in the background or up-gradient location, within the plume near the source, and within the plume in a down-gradient well, providing a secondary line of evidence; and

(c) The applicant may conduct microbiological studies to demonstrate microbial activity and its ability to degrade the COCs, including identification of the microorganisms present and their cell counts, providing a tertiary line of evidence.

7523 GROUNDWATER SAMPLING AND ANALYSIS

7523.1 The applicant shall collect groundwater samples sufficient to delineate the vertical and horizontal extent of the contaminant plume and to provide representative concentrations for each COC.

7523.2 The applicant may use temporary sampling points to screen the levels of groundwater impacts and to assist in determining the optimal location of permanent monitoring wells.

7523.3 The applicant shall install permanent monitoring wells sufficient in number to document the migration of COCs and groundwater flow according to the following requirements:

(a) The monitoring wells shall delineate the vertical and horizontal extent of the groundwater contamination;

(b) The minimum number of monitoring wells shall be as follows:

(1) One (1) monitoring well installed in the source;

(2) One (1) monitoring well installed up-gradient of the source; and

(3) Three (3) monitoring wells installed down-gradient of the source.

(c) The applicant shall consider the concentration of COCs in the impacted area and the occurrence of free product in the placement and design of the monitoring wells;

(d) The applicant shall install each monitoring well in accordance with the EHA well-drilling approval for the well;

(e) The applicant shall install well casings and screen materials appropriate to the sampling and analysis to be performed. The screen interval shall straddle the water table, at least six (6) feet above and six (6) feet below the water table;

(f) After installation, the applicant shall develop and gauge each monitoring well in accordance with the EHA well-drilling approval for the well;

(g) The applicant shall conduct a site survey to establish well elevations. Based on the groundwater elevations, the applicant shall determine, and plot on a map, groundwater flow direction and gradient; and

(h) If the groundwater samples fail to delineate the contamination in all directions, the applicant shall install new monitoring wells, in accordance with the requirements of this subsection, based on the location of the soil source area and groundwater flow direction.

7523.5 The applicant shall collect groundwater samples in accordance with the following requirements and procedures:

(a) Before collecting a sample, the applicant shall purge the monitoring well of free product an adequate number of well volumes to remove the standing water from the well casing, screen, and surrounding filter pack, unless EHA has approved the use of a low-purge or no-purge technique to collect the samples;

(b) The applicant shall collect the samples using EPA-approved methods and equipment;

(c) The applicant shall preserve the samples according to the requirements of the laboratory analyses to be used; and shall extract the samples within the holding times of each particular analysis to be used;

(d) The applicant shall use EPA or state-certified laboratories, and shall conduct the sample analyses in accordance with EHA-approved analytic methods and EPA *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW 846);

(e) The applicant shall use quality assurance and quality control (QA/QC) procedures adequate to ensure sample quality and integrity. The applicant shall use surrogate and spike recovery and trip blanks whenever possible. The applicant shall include chain of custody forms and laboratory QA/QC procedures in the reports submitted to EHA; and

(f) The applicant shall decontaminate all sampling equipment in accordance with EHA, EPA, and industry standard protocols.

7523.6 The applicant shall provide EHA with an estimate of the length, width, and thickness of the aquifer sufficient to evaluate the potential use of groundwater in the future at a point down-gradient from the source.

7523.7 If COC migration is known or suspected of affecting surface waters, the applicant shall collect and analyze samples sufficient in number to determine the nature and extent of any impact. The applicant shall collect samples both upstream and downstream of the groundwater discharge point. The applicant shall, in addition, collect sediment samples when necessary to address risk to receptors.

7524 CALCULATION OF SITE-SPECIFIC SOIL CLEANUP LEVELS

7524.1 An applicant proposing SSCLs shall calculate the SSCLs using the EHA-approved models and equations, including input parameters, set forth in Appendices B through E of this chapter.

7524.2 If an applicant proposes an alternative model or equation to those set forth in Appendices B through E, the applicant shall submit to EHA verification of the model or equation and a copy of the computational software.

7524.3 An applicant proposing residential SSCLs shall calculate SSCLs for each COC for both adult and child receptors. The applicant shall use the lower of the adult or child value for each COC as the soil cleanup level.

7525 SELECTION OF INPUT PARAMETERS

7525.1 An applicant proposing SSCLs shall use the following input parameters:

(a) Exposure factors, which may be based on the default exposure factors established by EHA in Appendix B to this chapter, unless the applicant can justify alternative values based on site-specific considerations;

(b) The chemical and physical properties of the COCs, as set forth in Appendix C, unless the applicant can justify alternative values;

(c) Toxicity values for the COCs, determined according to the most recent toxicity values published by EPA in the Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST), or by EHA in Appendix D, whichever is the most protective of human health and the environment;

(d) The default fate and transport parameters in Appendix E shall be used to predict the movement and behavior of COCs in soil; and

(e) Target risk levels for both carcinogenic and non-carcinogenic adverse health effects, as follows:

(1) For carcinogenic effects, an individual excess lifetime cancer risk of one in a million (10^{-6}) for both current and future receptors; and

(2) For non-carcinogenic effects, a hazard quotient (HQ) of one (1) for both current and future receptors.

7526 COMPARISON OF REPRESENTATIVE SOIL CONCENTRATIONS WITH SITE-SPECIFIC SOIL CLEANUP LEVELS

7526.1 An applicant proposing SSCL shall compare the site-specific representative concentration of each COC with the proposed SSCL for that COC.

7526.2 If the representative soil concentration of a COC exceeds the SSCL for the COC, then the applicant shall prepare, for review and approval by EHA, an environmental assessment and, if required, a proposed cleanup action plan.

7527 – 7598 RESERVED

7599 DEFINITIONS AND ABBREVIATION

7599.1 When used in this chapter, the following terms have the meanings ascribed:

Aquifer – a water-bearing layer of rock or sediment capable of yielding a significant amount of groundwater. A confined aquifer is an aquifer whose upper and perhaps lower boundary is defined by a layer of natural material that does not readily transmit water. An unconfined aquifer is an aquifer in which the water table is at or near atmospheric pressure; the aquifer may or may not be saturated to the top of the aquifer.

Applicant – a person who proposes or undertakes the cleanup of contaminated property in the District of Columbia;

Approval – written approval by EHA.

Approved – approved in writing by EHA.

Breathing zone – a zone of air in the vicinity of an organism from which respired air is drawn.

Capillary fringe – a zone in the soil just above the water table that remains saturated or almost saturated.

Chemical Abstracts Service Registry (CAS) Number – a unique number assigned to a chemical by the Chemical Abstracts Service, a division of the American Chemical Society.

Contaminant of Concern (COC) – a limited set of chemicals, specific to the hazardous substance spilled or released at a given site, that poses the majority of the risk to human health or the environment.

Cleanup – efforts to mitigate environmental damage or a threat to human health, safety, or welfare resulting from a hazardous substance, including removal of a hazardous substance from the environment, restoration, and other measures that are necessary to mitigate or avoid further threat to human health, safety, or welfare, or to the environment, including any actions to investigate, study, or assess any actual or suspected release.

Cleanup level – the concentration of a hazardous substance that may be present within a specified medium and under specified exposure conditions without posing a threat to human health, safety, or welfare or to the environment.

Commercial/industrial land use – land or structures where an individual is typically on-site less than an average of eight (8) hours per day. For purposes of this chapter, the term "commercial/industrial land use" includes land or structures where individuals work, but do not reside on a continuing basis, including commercial uses; offices; hotels, motels, and similar uses providing short-term transient accommodations; clinics; medical and dental offices; and industrial uses, including gasoline stations, automobile repair stations, dry cleaning establishments, industrial and manufacturing operations, and fleet operations.

Contamination – a release, discharge, or threatened release of a hazardous substance.

Ecological receptor – a member or local population of plant or animal species in the geographic area of the site and habitat on or adjacent to the site.

Environmental assessment – an evaluation of subsurface geology, hydrology, surface characteristics, and site conditions to determine if a release has occurred, the levels of COCs, and the extent of migration of COCs. The environmental assessment includes data on groundwater quality, receptors, and exposure pathways and routes, and generates information to support decisions about the cleanup action plan.

Environmentally sensitive area – a geographic area that, in the determination of EHA, is especially sensitive to change or alteration, including:

(a) wetlands;

(b) an area of unique, scarce, fragile, or vulnerable natural habitat;

(c) an area of high natural productivity or essential habitat for living organisms, including habitat for threatened and endangered species and wildlife breeding and wintering areas;

(d) an area of unique geologic or topographic significance;

(e) an area needed to protect, maintain, or replenish land or water resources; and

(f) public parks.

Exposure pathway – the physical course a COC takes from the source to a receptor.

Exposure route – the way by which a COC comes in contact with a receptor, including ingestion, inhalation, or dermal contact.

Free product – a hazardous substance that is present as a nonaqueous phase liquid; for purposes of this definition, a "nonaqueous phase liquid" is a liquid that is not dissolved in water.

Groundwater – underground water, but excluding water in pipes, tanks, and other containers created or set up by a person.

Hazardous substance – in accordance with § 201 of the Brownfield Revitalization Amendment Act of 2000, effective June 15, 2001 (D.C. Law 13-312; D.C. Official Code § 8-631.02 (Supp. 2003)), the term "hazardous substance" shall include:

(a) any substance designated as a hazardous substance pursuant to § 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, approved December 11, 1980 (94 Stat. 2767; 42 USC §§ 9601 *et seq.*);

(b) the substances listed in § 7510;

(c) petroleum;

(d) any petroleum-based substance comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing, including motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils; and

(e) any other substance identified as a hazardous substance by EHA in regulations adopted pursuant to § 305 of the Brownfield Revitalization Amendment Act of 2000, effective June 15, 2001 (D.C. Law 13-312; D.C. Official Code § 8-633.05.

Hotspot - an area where the maximum concentration of a COC is ten (10) times greater than the average concentration.

Hydraulic conductivity - the discharge of water per unit area per unit hydraulic gradient in a subsurface formation.

Hydraulic gradient – the direction of groundwater flow due to changes in the depth of the water table.

Impacted area – the area delineated by visual or olfactory evidence of contamination or by laboratory results higher than the generic soil quality standards in § 7510, whichever area is greater.

Institutional control – any legal, institutional, or administrative mechanism meant to prevent contamination or the potential exposure to hazardous substances, including any measure to ensure that use of the property, after completion of response or cleanup action, remains in conformity with the levels of any residual hazardous substance left on the property. Institutional controls include restrictions on use or access, including fencing, deed restrictions, and restrictive zoning.

Leaching – the downward transport of dissolved or suspended substances by water passing through a soil or other permeable material.

Medium (media) – the contaminated environmental substance, including soil, surface water, groundwater, or air.

Person – any individual, partnership, corporation, trust, association, firm, joint-stock company, organization, commission, or government agency.

Plume – a visible or measurable discharge or release of a hazardous substance from a given point of origin.

Receptor – persons, structures, utilities, surface waters, water supply wells, plants and animals, habitats, and other things or areas that are or that may be adversely affected by a release.

Release – the addition, introduction, leaking, pumping, spilling, emitting, discharging, escaping, dumping, injecting, disposing, or leaching of any hazardous substance into the environment, including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance.

Residential land use – land or structures where an individual is typically on-site eight (8) or more hours per day, and any other sensitive human activity areas. Residential land use includes all dwellings, schools, child development centers, hospitals, nursing homes, community-based residential facilities, parks, and playgrounds, and similar structures and uses.

Site – unless specified otherwise in this chapter, the area or areas defined by the vertical and horizontal extent of migration of the COCs.

Site conceptual exposure scenario (SCES) – a qualitative site assessment that documents current site conditions and illustrates the known and potential distribution of COCs, release mechanisms, exposure pathways and routes, and human and environmental receptors.

Site-specific – activities, information, and data unique to a particular site.

Soil – an unconsolidated geologic material, including clay, loam, loess, silt, sand, gravel, tills, or a combination of these materials.

Source – the place or thing from which hazardous substances are or were released into the environment, including underground storage tanks and piping and any product contained therein.

Source area – the location of the highest soil and groundwater concentrations of the COCs.

Surface waters – all waters and water courses naturally open to the atmosphere, including rivers, lakes, ponds, wetlands, inland waters, streams, reservoirs, and impoundments.

Subsurface soils – native soils extending from one (1) foot below the ground surface to the water table.

Surficial soils – soils extending from the surface to one (1) foot below the ground surface in unpaved areas; except that, for purposes of evaluating the exposure pathways for construction or utility workers, surficial soil means the soil from the ground surface to the typical depth of construction or utility work.

Vadose zone – the unsaturated soil zone through which COCs migrate to the groundwater and vapors move upwards to the ground surface or into an enclosed space.

Water table – the water level of an unconfined aquifer, below which the pore spaces are generally saturated.

7599.2 Terms not defined in this chapter shall be given the meanings ascribed in other chapters of Title 20 DCMR (Environment) and in Title 21 DCMR (Water and Sanitation).

APPENDICES TO CHAPTER 75 - SOIL QUALITY STANDARDS

Appendix A Models/Equations for Estimating Risk-Based Target Levels

Indoor Inhalation of Vapor Emissions
Outdoor Inhalation of Vapor Emissions
Direct Ingestion of Groundwater (chemicals without D.C. water quality standards)
Subsurface Soil Concentrations Protective of Indoor Vapor Inhalation
Groundwater Concentrations Protective of Indoor Vapor Inhalation
Inhalation of Vapors and Particulates, Dermal Contact, and Ingestion of Chemicals in Surficial Soil
Subsurface Soil Concentrations Protective of Leaching to Groundwater
Volatization Factors
- Volatization Factor from Groundwater to Indoor (Enclosed Space) Air
- Volatization Factor from Groundwater to Outdoor (Ambient) Air (for construction worker only)
- Volatization Factor from Subsurface Soil to Indoor (Enclosed Space) Air
- Volatization Factor from Surficial Soil
- Delivery of Particulate Chemicals from Soil to Air

Effective Diffusion Coefficients
- Effective Diffusion Coefficient in Soil Based on Vapor-Phase Concentration
- Effective Diffusion Coefficient Between Groundwater and Surface Soil
- Effective Diffusion Coefficient for the Capillary Fringe
- Effective Diffusion Coefficient Through Foundation Cracks

Domenico Model: Dilution Attenuation Factor (DAF) in the Saturated Zone
Leaching Factor from Subsurface Soil to Groundwater
Soil Concentration at which Dissolved Pore Water and Vapor Phases Become Saturated
Allowable Soil and Groundwater Concentration for Groundwater Resource Protection
Stream Protection: Allowable Groundwater Concentration at the Point of Discharge
Stream Protection: Allowable Soil and Groundwater Concentration at the Source and Point of Compliance
Schematic Description of Domenico's Model

APPENDIX A

MODELS/EQUATIONS FOR ESTIMATING RISK-BASED TARGET LEVELS

INDOOR INHALATION OF VAPOR EMISSIONS

Carcinogenic effects

$$RBTL_{ai} = \frac{TR \times BW \times AT_c \times 365}{IR_{ai} \times ET_{in} \times ED \times EF \times SF_i}$$

Non-carcinogenic effects

$$RBTL_{ai} = \frac{THQ \times BW \times AT_{nc} \times 365 \times RfD_i}{IR_{ai} \times ET_{in} \times ED \times EF}$$

Source: RAGS, Vol. I, 1989, p. 6-44

where:

$RBTL_{ai}$	=	Risk-based target level in indoor air [mg/m^3]
TR	=	Target risk or the increased chance of developing cancer over a lifetime due to exposure to a chemical [-]
THQ	=	Target hazard quotient for individual constituents [-]
BW	=	Body weight [kg]
AT_c	=	Averaging time for carcinogens[years]
AT_{nc}	=	Averaging time for non-carcinogens[years]
IR_{ai}	=	Indoor inhalation rate [m^3/hr]
ET_{in}	=	Indoor Exposure time [hr/day]
ED	=	Exposure duration [years]
EF	=	Exposure frequency [days/year]
RfD_i	=	The chemical-specific inhalation reference dose [mg/(kg-day)]
SF_i	=	The chemical-specific inhalation cancer slope or potency factor [mg/(kg-day)]$^{-1}$

OUTDOOR INHALATION OF VAPOR EMISSIONS

Carcinogenic effects

$$RBTL_{ao} = \frac{TR \times BW \times AT_c \times 365}{IR_{ao} \times ET_{out} \times ED \times EF \times SF_i}$$

Non-carcinogenic effects

$$RBTL_{ao} = \frac{THQ \times BW \times AT_{nc} \times 365 \times RfD_i}{IR_{ao} \times ET_{out} \times ED \times EF}$$

Source: RAGS, Vol. I, 1989, p. 6-44

Where:

$RBTL_{ao}$	=	Risk-based target level in outdoor air [mg/m^3]
TR	=	Target risk or the increased chance of developing cancer over a lifetime due to exposure to a chemical [-]
THQ	=	Target hazard quotient for individual constituents [-]
BW	=	Body weight [kg]
AT_c	=	Averaging time for carcinogens[years]
AT_{nc}	=	Averaging time for non-carcinogens[years]
IR_{ao}	=	Outdoor inhalation rate [m^3/hr]
ET_{out}	=	Outdoor Exposure time [hr/day]
ED	=	Exposure duration [years]
EF	=	Exposure frequency [days/year]
RfD_i	=	The chemical-specific inhalation reference dose [mg/(kg-day)]
SF_i	=	The chemical-specific inhalation cancer slope or potency factor [mg/(kg-day)]$^{-1}$

DIRECT INGESTION OF GROUNDWATER

(ONLY FOR CHEMICALS WITHOUT DC WATER QUALITY STANDARDS)

Carcinogenic effects

$$RBTL_w = \frac{TR \times BW \times AT_c \times 365}{IRW \times ED \times EF \times SF_o}$$

Non-carcinogenic effects

$$RBTL_w = \frac{THQ \times BW \times AT_{nc} \times 365 \times RfD_o}{IR_W \times ED \times EF}$$

Source: RAGS, Vol. I, 1989, p. 6-35

Where:

$RBTL_w$	=	Risk-based target level for ingestion of groundwater [mg/L-H_2O]
TR	=	Target risk or the increased chance of developing cancer over a lifetime due to exposure to a chemical [-]
THQ	=	Target hazard quotient for individual constituents [-]
BW	=	Body weight [kg]
AT_c	=	Averaging time for carcinogens[years]
AT_{nc}	=	Averaging time for non-carcinogens[years]
IR_W	=	Water ingestion rate [L/day]
ED	=	Exposure duration [years]
EF	=	Exposure frequency [days/year]
RfD_o	=	The chemical-specific oral reference dose [mg/(kg-day)]
SF_o	=	The chemical-specific oral cancer slope or potency factor $[mg/(kg\text{-}day)]^{-1}$

SUBSURFACE SOIL CONCENTRATIONS PROTECTIVE OF INDOOR VAPOR INHALATION

$$RBTL_{si} = \frac{RBTL_{ai}}{VF_{sesp}}$$

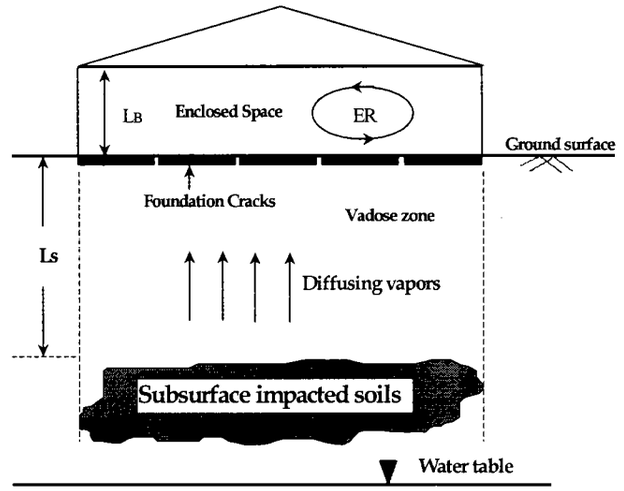
where:

$RBTL_{si}$ = Risk-based target level for indoor inhalation of vapors from subsurface soils [mg/kg-soil]

$RBTL_{ai}$ = Risk-based target level for indoor inhalation of air [mg/m^3-air]

VF_{sesp} = Volatilization factor from subsurface soil to indoor (enclosed space) air [(mg/m^3-air)/(mg/kg-soil)]

Source: ASTM E1739-95



GROUNDWATER CONCENTRATIONS PROTECTIVE OF INDOOR VAPOR INHALATION

$$RBTL_{wi} = \frac{RBTL_{ai}}{VF_{wesp}}$$

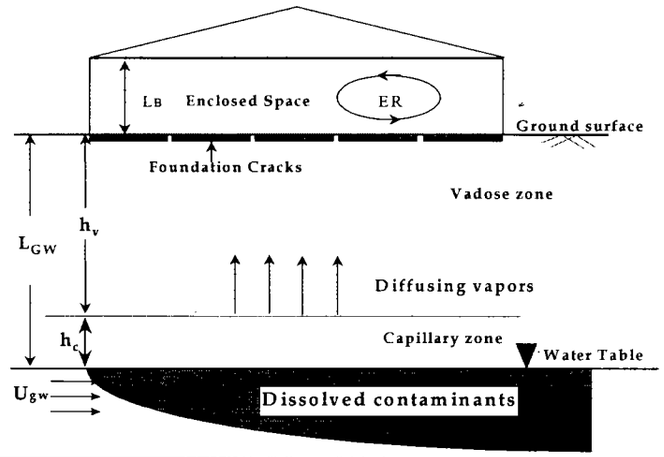
where:

$RBTL_{wi}$ = Risk-based target level for indoor inhalation of vapors from groundwater [mg/L-H_2O]

$RBTL_{ai}$ = Risk-based target level for indoor inhalation of air (mg/m^3-air)

VF_{wesp} = Volatilization factor from groundwater to indoor (enclosed space) air [(mg/m^3-air)/(mg/L-H_2O)]

Source: ASTM E1739-95



INHALATION OF VAPORS AND PARTICULATES, DERMAL CONTACT AND INGESTION OF CHEMICALS IN SURFICIAL SOIL

Carcinogenic effects

$$RBTL_{SS}=\frac{TR\times BW\times AT_c\times 365}{EF\times ED\times[(SF_o\times 10^{-6}\times(IR_{soil}\times RAF_o+SA\times M\times RAF_d))+(SF_i\times IR_{ao}\times ET_{out}\times(VF_{SS}+VF_p))]}$$

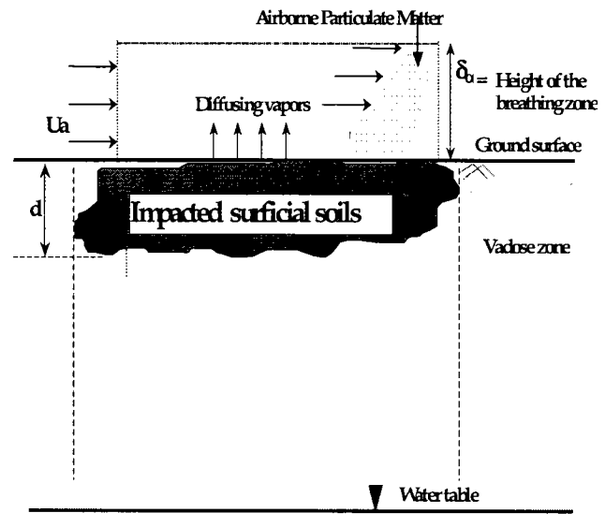
Non-carcinogenic effects

$$RBTL_{SS}=\frac{THQ\times BW\times AT_{nc}\times 365}{EF\times ED\times\left[\frac{10^{-6}\times(IR_{soil}\times RAF_o+SA\times M\times RAF_d)}{RfD_o}+\frac{(24\times IR_{ao}\times(VF_{ss}+VF_p))}{RfD_i}\right]}$$

Where:

$RBTL_{ss}$	=	Risk-based target level in surficial soil [mg/kg]
TR	=	Target risk or the increased chance of developing cancer over a lifetime due to exposure to a chemical [-]
THQ	=	Target hazard quotient for individual constituents [-]
BW	=	Body weight [kg]
AT_c	=	Averaging time for carcinogens [years]
AT_{nc}	=	Averaging time for non-carcinogens [years]
ED	=	Exposure duration [years]
EF	=	Exposure frequency [days/year]
IR_{soil}	=	Soil ingestion rate [mg/day]
RAF_o	=	Oral relative absorption factor [-]
SA	=	Skin surface area [cm^2/day]
M	=	Soil to skin adherence factor [mg/cm^2]
RAF_d	=	Dermal relative absorption factor [-]
IR_{ao}	=	Outdoor inhalation rate [m^3/hr]
ET_{out}	=	Outdoor Exposure time [hr/day]
SF_o	=	Oral cancer slope factor [$(mg/kg\text{-}day)^{-1}$]
SF_i	=	Inhalation cancer slope factor [$(mg/kg\text{-}day)^{-1}$]
RfD_o	=	The chemical-specific oral reference dose [(mg/kg-day)]
RfD_i	=	The chemical-specific inhalation reference dose [(mg/kg-day)]
VF_p	=	Volatilization factor of particulates [$(mg/m^3\text{-air})/(mg/kg\text{-soil})$]
VF_{ss}	=	Volatilization factor from surficial soil [$(mg/m^3\text{-air})/(mg/kg\text{-soil})$]

Source: ASTM E1739-95

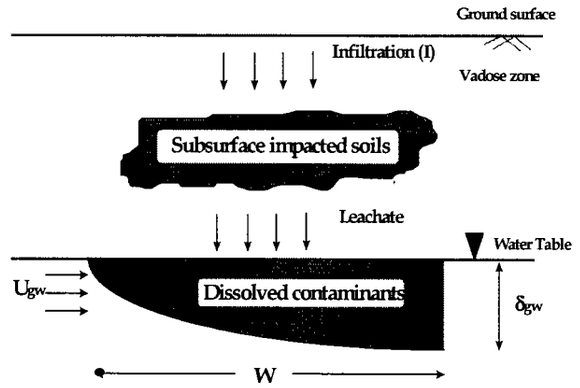


SUBSURFACE SOIL CONCENTRATIONS PROTECTIVE OF LEACHING TO GROUNDWATER

$$RBTL_{SL}=\frac{RBTL_w}{LF_{SW}}$$

where:

$RBTL_{SL}$ = Risk-based target level for leaching to groundwater from subsurface soil [mg/kg-soil]
$RBTL_w$ = Risk-based target level for ingestion of groundwater [mg/L-H_2O]
LF_{SW} = Leaching Factor (from subsurface soil to groundwater) [(mg/L-H_2O)/(mg/kg-soil)]



Source: ASTM E1739-95

VOLATILIZATION FACTORS

VF_{wesp} : Volatilization factor from groundwater to indoor (enclosed space) air [(mg/m^3-air)/(mg/L-H_2O)]

$$VF_{wesp} = \frac{H \times \left[\frac{D_{ws}^{eff} / L_{GW}}{ER \times L_B} \right]}{1 + \left[\frac{D_{ws}^{eff} / L_{GW}}{ER \times L_B} \right] + \left[\frac{D_{ws}^{eff} / L_{GW}}{\left(D_{crack}^{eff} / L_{crack} \right) \times h} \right]} \times 10^3$$

where:

H	=	Chemical specific Henry's Law constant[(mg/cm^3-air)/ (mg/cm^3-H_2O)]
L_{GW}	=	Depth to groundwater [cm]
L_B	=	Enclosed space volume/infiltration area ratio [cm]
L_{crack}	=	Enclosed space foundation or wall thickness [cm]
ER	=	Enclosed space air exchange rate [1/s]
D_{ws}^{eff}	=	Effective diffusion coefficient between groundwater and soil surface [cm^2/s]
D_{crack}^{eff}	=	Effective diffusion coefficient through foundation cracks [cm^2/s]
h	=	Areal fraction of cracks in foundation and/or walls [cm^2-cracks/ cm^2-total area]
10^3	=	Conversion factor [L/m^3]

Source: ASTM E1739-95

VF_{wamb} : Volatilization factor from groundwater to outdoor (ambient) air [(mg/m^3-air)/(mg/L-H_2O)]

- For Construction Worker Only

$$VF_{wamb} = \frac{H}{1 + \left[\frac{U_a \times \delta_a \times L_{GW}}{W_{ga} \times D_{ws}^{eff}} \right]} \times 10^3$$

where:

H	=	Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]
U_a	=	Wind speed at δ_a above ground surface [cm/s]
δ_a	=	Breathing zone height [cm]
L_{GW}	=	Depth to groundwater [cm]
W_{ga}	=	Length of groundwater source area parallel to wind direction [cm]
D_{ws}^{eff}	=	Effective diffusion coefficient between groundwater and soil surface [cm^2/s]
10^3	=	Conversion factor [L/m^3]

Source: ASTM E1739-95

VF_{sesp} : Volatilization factor from subsurface soil to indoor (enclosed space) air [(mg/m^3-air)/(mg/kg-soil)]

$$VF_{sesp} = \frac{\dfrac{H \times \rho_s}{[\theta_{ws} + (K_s \times \rho_s) + (H \times \theta_{as})]} \times \left[\dfrac{D_s^{eff} / L_s}{ER \times L_B}\right]}{1 + \left[\dfrac{D_s^{eff} / L_s}{ER \times L_B}\right] + \left[\dfrac{D_s^{eff} / L_s}{(D_{crack}^{eff} / L_{crack}) \times h}\right]} \times 10^3$$

Source: ASTM E1739-95

where:

H	=	Chemical specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]
ρ_s	=	Dry soil bulk density [g-soil/cm^3-soil]
θ_{ws}	=	Volumetric water content in vadose zone soils [cm^3-H_2O/cm^3-soil]
K_s	=	$f_{oc} \times K_{oc}$
	=	Chemical-specific soil-water sorption coefficient for the unsaturated zone [cm^3-H_2O/g-soil]
θ_{as}	=	Volumetric air content in vadose zone soils [cm^3-air/cm^3-soil]
L_s	=	Depth to subsurface soil sources [cm]
L_B	=	Enclosed space volume/infiltration area ratio [cm]
L_{crack}	=	Enclosed space foundation or wall thickness [cm]
ER	=	Enclosed space air exchange rate [1/s]
D_s^{eff}	=	Effective diffusion coefficient in soil based on vapor-phase concentration [cm^2/s]
D_{crack}^{eff}	=	Effective diffusion coefficient through foundation cracks [cm^2/s]
h	=	Areal fraction of cracks in foundation and/or walls [cm^2-cracks/ cm^2-total area]
10^3	=	Conversion factor [(cm^3-kg)/(m^3-g)]

VF_{ss} : Volatilization factor from surficial soil [(mg/m^3-air)/(mg/kg-soil)]

**** choose the smaller of the two ****

$$VF_{ss} = \frac{2 \times W_a \times \rho_s}{U_a \times \delta_a} \times \sqrt{\frac{D_s^{eff} \times H}{\pi \times [\theta_{ws} + (K_s \times \rho_s) + (H \times \theta_{as})] \times \tau}} \times 10^3$$

where:

W_a	=	Length of soil source area parallel to wind direction [cm]
ρ_s	=	Dry soil bulk density [g-soil/cm^3-soil]
U_a	=	Wind speed at δ_a above ground [cm/s]
δ_a	=	Breathing zone height [cm]
D_s^{eff}	=	Effective diffusion coefficient in soil based on vapor-phase concentration [cm^2/s]
H	=	Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]
θ_{ws}	=	Volumetric water content in vadose zone soils [cm^3-H_2O/cm^3- soil]
K_s	=	$f_{oc} \times K_{oc}$
	=	Chemical-specific soil-water sorption coefficient for the unsaturated zone [cm^3-H_2O/g-soil]
θ_{as}	=	Volumetric air content in the vadose zone soils [cm^3-air/cm^3-soil]
τ	=	Averaging time for vapor flux [s]
	=	*ED (yr) × 365 (day/yr) × 86400 (sec/day)*
10^3	=	Conversion factor [(cm^3-kg)/(m^3-g)]

Source: ASTM E1739-95

$$VF_{ss} = \frac{W_a \times \rho_s \times d}{U_a \times \delta_a \times \tau} \times 10^3$$

where:

W_a	=	Length of soil source area parallel to wind direction [cm]
ρ_s	=	Dry soil bulk density [g-soil/cm^3-soil]
d	=	Depth to base of surficial soil zone [cm]
U_a	=	Wind speed at δ_a above ground surface [cm/s]
δ_a	=	Breathing zone height [cm]
τ	=	Averaging time for vapor flux [s]
	=	*ED (yr) × 365 (day/yr) × 86400 (sec/day)*
10^3	=	Conversion factor [(cm^3-kg)/(m^3-g)]

Source: ASTM E1739-95

VF_p :	Delivery of particulate chemicals from soil to air [(mg/m^3-air)/(mg/kg-soil)]
	$$VF_p = \frac{P_e \times W_a}{U_a \times \delta_a} \times 10^3$$
where:	
P_e =	Particulate emission rate [g-soil/cm^2-sec]
W_a =	Length of soil source area parallel to wind direction [cm]
U_a =	Wind speed at δ_a above ground surface [cm/s]
δ_a =	Breathing zone height [cm]
10^3 =	Conversion factor [(cm^3-kg)/(m^3-g)]
Source: ASTM E1739-95	

EFFECTIVE DIFFUSION COEFFICIENTS

D_s^{eff} : effective diffusion coefficient in soil based on vapor-phase concentration [cm^2/s]

$$D_s^{eff} = D^a \times \frac{\theta_{as}^{3.33}}{\theta_T^{2.0}} + D^w \times \frac{1}{H} \times \frac{\theta_{ws}^{3.33}}{\theta_T^{2.0}}$$

where:

D^a = Chemical-specific diffusion coefficient in air [cm^2/s]

D^w = Chemical-specific diffusion coefficient in water [cm^2/s]

θ_{as} = Volumetric air content in vadose zone [cm^3-air/cm^3-soil]

θ_{ws} = Volumetric water content in vadose zone [cm^3-H_2O/cm^3-soil]

θ_T = Total soil porosity in the impacted zone [cm^3/cm^3-soil]

H = Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]

D_{ws}^{eff} : effective diffusion coefficient between groundwater and surface soil [cm^2/s]

$$D_{ws}^{eff} = (h_{cap} + h_v) \times \left[\frac{h_{cap}}{D_{cap}^{eff}} + \frac{h_v}{D_s^{eff}} \right]^{-1}$$

where:

h_{cap} = Thickness of capillary fringe [cm]

h_v = Thickness of vadose zone [cm]

D_{cap}^{eff} = Effective diffusion coefficient through capillary fringe [cm^2/s]

D_s^{eff} = Effective diffusion coefficient in soil based on vapor-phase concentration [cm^2/s]

Continued

EFFECTIVE DIFFUSION COEFFICIENTS (CONTINUED FROM PREVIOUS PAGE)

D_{cap}^{eff}: effective diffusion coefficient for the capillary fringe [cm^2/s]

$$D_{cap}^{eff} = D^a \times \frac{\theta_{acap}^{3.33}}{\theta_T^{2.0}} + D^w \times \frac{1}{H} \times \frac{\theta_{wcap}^{3.33}}{\theta_T^{2.0}}$$

where:

D^a	=	Chemical-specific diffusion coefficient in air [cm^2/s]
D^w	=	Chemical-specific diffusion coefficient in water [cm^2/s]
θ_{acap}	=	Volumetric air content in capillary fringe soils [cm^3-air/cm^3-soil]
θ_{wcap}	=	Volumetric water content in capillary fringe soils [cm^3-H_2O/cm^3-soil]
θ_T	=	Total soil porosity [cm^3/cm^3-soil]
H	=	Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]

Source: ASTM E1739-95

D_{crack}^{eff}: effective diffusion coeff. through foundation cracks [cm^2/s]

$$D_{crack}^{eff} = D^a \times \frac{\theta_{acrack}^{3.33}}{\theta_T^{2.0}} + D^w \times \frac{1}{H} \times \frac{\theta_{wcrack}^{3.33}}{\theta_T^{2.0}}$$

where:

D^a	=	Chemical-specific diffusion coefficient in air [cm^2/s]
D^w	=	Chemical-specific diffusion coefficient in water [cm^2/s]
θ_{acrack}	=	Volumetric air content in foundation/wall cracks [cm^3-air/cm^3-total volume]
θ_{wcrack}	=	Volumetric water content in foundation/wall cracks [cm^3-H_2O/cm^3-total volume]
θ_T	=	Total soil porosity [cm^3/cm^3-soil]
H	=	Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]

DOMENICO MODEL: DILUTION ATTENUATION FACTOR (DAF) IN THE SATURATED ZONE

Domenico model for multi-dimensional transport with decay and continuous source:

$$\frac{C(x,y,z,t)}{C_o} = (1/8)\ exp\left[\frac{x}{2\times\alpha_x}\left[1-\sqrt{1+\frac{4\times\lambda\times\alpha_x}{v}}\right]\right]\times erfc\left[\frac{\left[(x-v\times t)\sqrt{1+\frac{4\times\lambda\times\alpha_x}{v}}\right]}{2\sqrt{\alpha_x\times v\times t}}\right]$$

$$\times\left[erf\left[\frac{(y+Y/2)}{2\times\sqrt{\alpha_y\times x}}\right]-erf\left[\frac{(y-Y/2)}{2\times\sqrt{\alpha_y\times x}}\right]\right]\times\left[erf\left[\frac{(z+\delta_{gw})}{2\times\sqrt{\alpha_z\times x}}\right]-erf\left[\frac{(z-\delta_{gw})}{2\times\sqrt{\alpha_z\times x}}\right]\right]$$

where:

C	=	dissolved-phase concentration [mg/L]
C_o	=	dissolved-phase concentration at the source (at x=y, $0\le z\le\delta_{gw}$) [mg/L]
v	=	seepage velocity [cm/year]
λ	=	first order decay rate [1/year]
α_x	=	longitudinal dispersivity [cm]
α_y	=	lateral dispersivity [cm]
α_z	=	vertical dispersivity [cm]
x, y, z	=	spatial coordinates [cm]
t	=	time [year]
x	=	distance along the centerline from the downgradient edge of dissolved-plume source zone or source well [cm]
Y	=	width of soil source perpendicular to the groundwater flow direction [cm]
δ_{gw}	=	groundwater mixing zone thickness [cm]
DAF	=	$C_o/C(x)$

Source: Domenico, P.A. and F.W. Schwartz, 1990, Physical and Chemical Hydrogeology. John Wiley and Sons, NY, 824 p. (Eqn. 17.21)

At the centerline, for steady-state (after a long time) the concentration can be obtained by setting $y = 0$, $z = 0$, and $x << v \times t$ as:

$$\frac{C(x)}{C_o} = exp\left[\frac{x}{2\times\alpha_x}\left[1-\sqrt{1+\frac{4\times\lambda\times\alpha_x}{v}}\right]\right]\times erf\left[\frac{Y}{4\times\sqrt{\alpha_y\times x}}\right]\times erf\left[\frac{\delta_{gw}}{2\times\sqrt{\alpha_z\times x}}\right] \quad (1)$$

At the centerline, for steady-state, the DAF without decay can be obtained by setting y = 0, z = 0, x << vt, and λ = 0 as:

$$\frac{C(x)}{C_o} = erf\left[\frac{Y}{4\times\sqrt{\alpha_y\times x}}\right]\times erf\left[\frac{\delta_{gw}}{2\times\sqrt{\alpha_z\times x}}\right] \quad (2)$$

Note: Comparing to ASTM E1739-95, p. 31, where $Y = S_w$, $\delta_{gw} = S_d$, $v = u$, and $C_o = C_{source}$

At the centerline, for steady-state, the DAF with decay can be calculated using Equation (2). In Equation (2), the retarded seepage velocity (v) is calculated as:

$$v = (K \times i)/(R_s \times \theta_{TS})$$

where:

K	=	Hydraulic conductivity [cm/year]
i	=	Hydraulic gradient [--]
θ_{TS}	=	Total porosity in the saturated zone [cm^3/cm^3-soil]
R_s	=	Retardation factor in the saturated zone [--]

LF_{SW}: Leaching Factor from subsurface soil to groundwater [(mg/L-H_2O)/(mg/kg-soil)]	C_s^{SAT}: Soil concentration at which dissolved pore water and vapor phases become saturated [(mg/kg-soil)]
$$LF_{SW} = \frac{\rho_s}{[\theta_{ws} + K_s \times \rho_s + H \times \theta_{as}] \times \left(1 + \frac{U_{gw} \times \delta_{gw}}{I \times W}\right)}$$	$$C_s^{sat} = \frac{S}{\rho_s} \times [H \times \theta_{as} + \theta_{ws} + K_s \times \rho_s]$$
where:	where:
ρ_s = Dry soil bulk density [g-soil/cm^3-soil]	S = Pure component solubility in water [mg/L-H_2O]
θ_{ws} = Volumetric water content in vadose zone soils [cm^3-H_2O/cm^3- soil]	ρ_s = Dry soil bulk density [g-soil/cm^3-soil]
K_s = $f_{oc} \times K_{oc}$ = Chemical-specific soil-water sorption coefficient for the unsaturated zone [mL-H_2O/g-soil]	H = Chemical-specific Henry's Law constant [(mg/cm^3-air)/ (mg/cm^3-H_2O)]
f_{oc} = Fractional organic carbon content in the unsaturated zone [(g-C)/(g-soil)]	θ_{as} = Volumetric air content in the vadose zone soils [cm^3-air/cm^3-soil]
H = Chemical-specific Henry's Law constant [(L-H_2O)/(L-air)]	θ_{ws} = Volumetric water content in vadose zone soils [cm^3-H_2O/cm^3- soil]
θ_{as} = Volumetric air content in the vadose zone soils [cm^3-air/cm^3-soil]	K_s = $f_{oc} \times K_{oc}$ = Chemical-specific soil-water sorption coefficient for the unsaturated zone [cm^3-H_2O/g-soil]
U_{gw} = Groundwater Darcy Velocity [cm/year]	
d_{gw} = Groundwater mixing zone thickness [cm]	
I = Infiltration rate of water through soil [cm/year]	
W = Length of source area parallel to groundwater flow [cm]	
Source: ASTM E1739-95	Source: ASTM E1739-95

ALLOWABLE SOIL AND GROUNDWATER CONCENTRATION FOR GROUNDWATER RESOURCE PROTECTION

$$\text{Allowable soil concentration at the source}[\text{mg/kg}] = \textit{Target groundwater concentration at the POE} \times \frac{DAF_{POE}}{LF_{SW}}$$

$$\text{Allowable groundwater concentration at the source}[\text{mg/L}] = \textit{Target groundwater concentration at the POE} \times DAF_{POE}$$

$$\text{Allowable groundwater concentration at the POC}[\text{mg/L}] = \textit{Target groundwater concentration at the POE} \times \frac{DAF_{POE}}{DAF_{POC}}$$

where:

POE	=	Point of exposure
POC	=	Point of compliance
DAF_{POE}	=	Dilution Attenuation Factor between the point of exposure and the source
DAF_{POC}	=	Dilution Attenuation Factor between the point of compliance and the source
LF_{SW}	=	Dry soil leaching factor [(mg/L-H_2O)/(mg/kg-soil]

Concentration at POE is expressed in mg/L-H_2O

Additional relationships used in the calculation of allowable soil and groundwater concentration with chemical degradation:

$$\text{First order decay rate}[1/\text{day}] = \frac{0.693}{Half\,Life}$$

$$\text{Retardation Factor for Organics in the saturated zone } (R_s) = 1 + \left(\frac{\rho_{ss} \times K_{ss}}{\theta_{TS}}\right) \qquad K_{ss} = foc_s \times K_{oc}$$

where:

ρ_{ss}	=	Saturated zone soil bulk density [g-soil/cm^3-soil]
K_{ss}	=	Chemical-specific soil-water sorption coefficient in the saturated zone [cm^3-H_2O/g-soil]
K_{oc}	=	Chemical-specific soil-water distribution coefficient for metals in the saturated zone [cm^3/g-C]
θ_{TS}	=	Total porosity in the saturated zone [cm^3/cm^3-soil]
foc_s	=	Fractional organic carbon content in the saturated zone [g-C/g-soil]

STREAM PROTECTION: ALLOWABLE GROUNDWATER CONCENTRATION AT THE POINT OF DISCHARGE

Where:

$$C_{gw} = \frac{C_{sw}\left(Q_{gw} + Q_{sw}\right)}{Q_{gw}} - C_{su}\left(\frac{Q_{sw}}{Q_{gw}}\right)$$

Q_{gw} = Impacted groundwater discharge into the stream [ft^3/day]
C_{gw} = Allowable concentration in groundwater at the point of discharge into the stream [mg/L]
Q_{sw} = Stream flow upstream of the point of groundwater discharge (stream flow rate) [ft^3/day]
C_{sw} = Allowable concentration at the downstream edge of the stream's mixing zone [mg/L]
C_{su} = The COCs' concentration upstream of the groundwater plume discharge [mg/L]

STREAM PROTECTION: ALLOWABLE SOIL AND GROUNDWATER CONCENTRATION AT THE SOURCE & POC

$$\text{Allowable soil concentration at the source}[\text{mg/kg}] = \textit{Target surface water concentration}[\text{mg/L}]\ \textit{at the POE} \times \frac{DAF_{POE}}{LF_{SW}}$$

$$\text{Allowable groundwater concentration at the source}[\text{mg/L}] = \textit{Target surface water concentration}[\text{mg/L}]\ \textit{at the POE} \times DAF_{POE}$$

$$\text{Allowable groundwater concentration at the POC}[\text{mg/L}] = \textit{Target surface water concentration}[\text{mg/L}]\ \textit{at the POE} \times \frac{DAF_{POE}}{DAF_{POC}}$$

Additional relationships used in the calculation of allowable soil and groundwater concentration with chemical degradation:

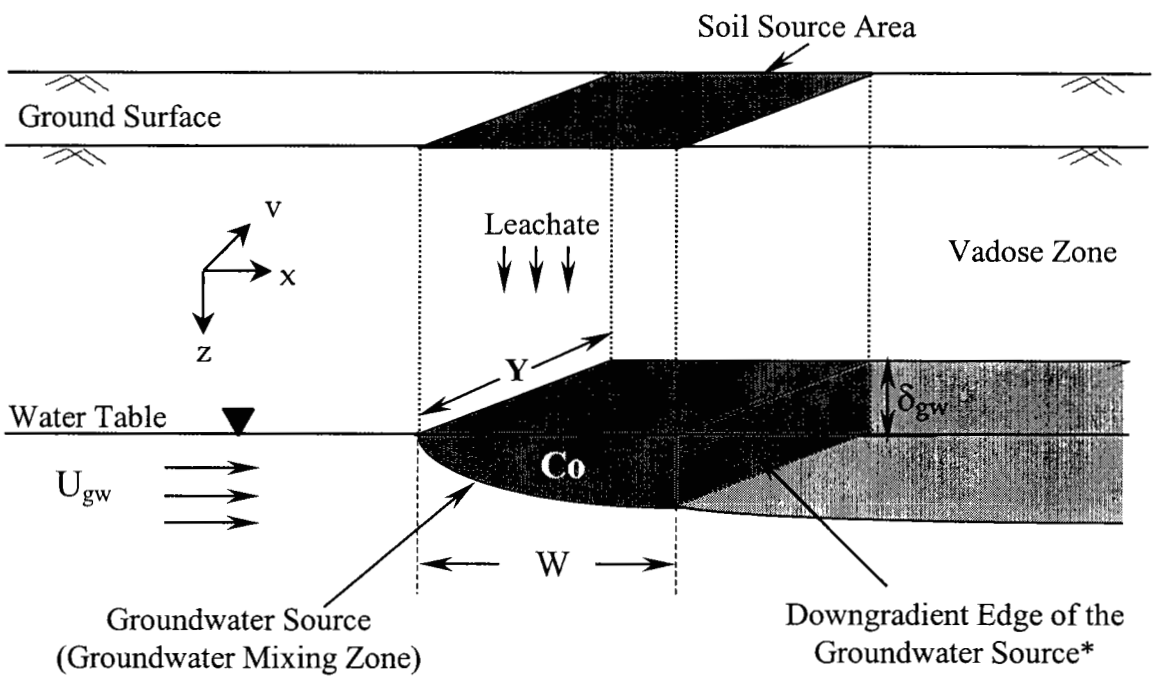
$$\text{First order decay rate}[1/\text{day}] = \frac{0.693}{\textit{Half Life}}$$

$$\text{Retardation Factor for Organics in the saturated zone } (R_s) = 1 + \left(\frac{\rho_{ss} \times K_{ss}}{\theta_{TS}}\right) \qquad K_{ss} = foc_s \times K_{oc}$$

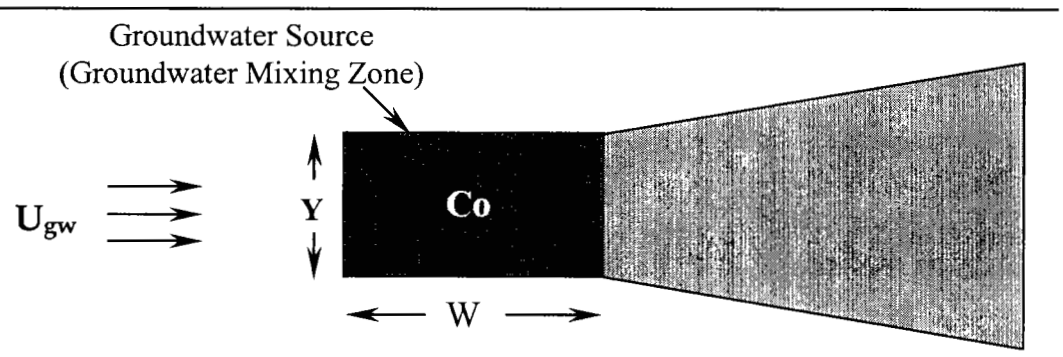
where:

ρ_{ss}	=	Saturated zone soil bulk density [g-soil/cm^3-soil]
K_{ss}	=	Chemical-specific soil-water sorption coefficient in the saturated zone [cm^3-H_2O/g-soil]
K_{oc}	=	Chemical-specific soil-water distribution coefficient for metals in the saturated zone [cm^3/g-C]
θ_{TS}	=	Total porosity in the saturated zone [cm^3/cm^3-soil]
foc_s	=	Fractional organic carbon content in the saturated zone [g-C/g-soil]

SCHEMATIC DESCRIPTION OF DOMENICO'S MODEL



SECTION



PLAN

Note:
(* Assumes only vertical leaching, i.e., there is no horizontal spreading in the unsaturated zone.)

APPENDIX B

Default Exposure Factors

(Continued on Next Page)

EXPOSURE PARAMETER	SYMBOL	UNITS	DEFAULT VALUE	REFERENCE
Averaging Time - Carcinogen	ATc	years	70	EPA, 1989
Averaging Time - Noncarcinogen (equals exposure duration):	ATn	years	Receptor dependent	EPA, 1989
Body Weight:				
Adult Receptors	BW	kg	70	EPA, 1989
Child Receptors	BW	kg	15	EPA, 1989
Exposure Duration:				
Resident Child	ED	years	6	EPA, 1989
Resident Adult	ED	years	30	EPA, 1989
Commercial Worker	ED	years	25	EPA, 1989
Construction Worker	ED	years	1	Professional Judgment
Exposure Frequency:				
Residents	EF	days/yr	350	EPA, 1989
Commercial Worker	EF	days/yr	250	EPA, 1989
Construction Worker	EF	days/yr	90	Professional Judgment
Soil Ingestion Rate:				
Resident Child	IR soil	mg/day	200	EPA, 1989
Resident Adult	IR soil	mg/day	100	EPA, 1989
Commercial Worker	IR soil	mg/day	50	EPA, 1989
Construction Worker	IR soil	mg/day	480	Hawley, 1985
Daily Water Ingestion Rate:				
Resident Adult	IRw	L/day	2	EPA, 1989
Hourly Indoor Inhalation Rate:				
Resident Child	IRai	m^3/hr	0.417	EPA, 1997
Resident Adult	IRai	m^3/hr	0.633	EPA, 1997
Commercial Worker	IRai	m^3/hr	1.5	EPA, 1997
Exposure Time for Indoor Inhalation:				
Resident Child	ETin	hr/day	18	Professional Judgment
Resident Adult	ETin	hr/day	18	Professional Judgment
Commercial	ETin	hr/day	10	Professional Judgment
Hourly Outdoor Inhalation Rate:				
Resident Child	IRao	m^3/hr	1	EPA, 1997
Resident Adult	IRao	m^3/hr	1.5	EPA, 1997
Commercial Worker	IRao	m^3/hr	1.5	EPA, 1997
Construction Worker	IRao	m^3/hr	1.5	EPA, 1997

Default Exposure Factors

(Continued from Previous Page)

EXPOSURE PARAMETER	SYMBOL	UNITS	DEFAULT VALUE	REFERENCE
Exposure Time for Outdoor Inhalation:				
Resident Child and Adult	ETout	hr/day	10	Professional Judgment
Commercial Worker	ETout	hr/day	10	Professional Judgment
Construction Worker	ETout	hr/day	10	Professional Judgment
Soil skin adherence factor	M	mg/cm^2	0.15	Kissel et al., 1996, Holmes et al., 1996
Oral relative absorption factor	RAFo	---	1	ASTM, 1995
Dermal relative absorption factor:				
Volatiles	RAFd	---	0.5	ASTM, 1995
PAHs	RAFd	---	0.05	ASTM, 1995
TPH				
C5 - C6 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C6 - C8 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C8 - C10 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C10 - C12 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C12 - C16 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C16 - C35 (Aliphatics)	RAFd	---	0.1	TRRP, 1999
>C8 - C10 (Aromatics)	RAFd	---	0.1	TRRP, 1999
>C10 - C12 (Aromatics)	RAFd	---	0.1	TRRP, 1999
>C12 - C16 (Aromatics)	RAFd	---	0.1	TRRP, 1999
>C16 - C21 (Aromatics)	RAFd	---	0.13	TRRP, 1999
>C21 - C35 (Aromatics)	RAFd	---	0.13	TRRP, 1999
Skin surface area for dermal contact with soil:				
Adult receptors	SA	cm^2/d	5000	EPA, 1997
Child receptors	SA	cm^2/d	2500	EPA, 1997
Construction Worker	SA	cm^2/d	7250	EPA, 1992
Hazard Quotient for individual constituents/routes	THQ	---	1	
Individual Excess Lifetime Cancer Risk for constituents/routes	TR	---	$1x10^{-6}$	

Sources

1. US EPA. 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Interim Final. Washington D. C., Office of Emergency and Remedial Response. EPA/540/1-89/002.

2. Hawley, J.K. 1985. Assessment of Health Risk from Exposure to Contaminated Soil, Risk Analysis 5:289-302.

3. Exposure Factors Handbook, Volume I. August 1997. U.S. EPA, Washington D.C. EPA/600/P-95/002Fa.

4. Holmes, K.K., Kissel, J.C., and Richter, K.Y. 1996. Investigation of the Influence of Oil on Soil Adherence to Skin, Journal of Soil Contamination, 5(4):301-308.

5. Kissel, J.C., Richter, K.Y., and Fenske, R. 1996. Field Measurements of Dermal Soil Loading Attributable to Various Activities: Implications of Exposure Assessment, Risk Analysis, 16(1): 116-125.

6. American Society for Testing and Materials, 1995. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, Designation: E1739-95. ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428.

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8. Texas Natural Resource Conservation Commission, September 1999. Texas Risk Reduction Program, Chapter 350.

APPENDIX C

CHEMICAL - PHYSICAL PROPERTIES FOR AN EXTENDED LIST OF CHEMICALS

(Continued on Next Page)

CHEMICAL	CAS #	Molecular Weight	Water Solubility (mg/L)	Henry's Law Constant (L-water/L-air)	Koc (cm^3/g)	Diffusion Coefficient in air (cm^2/s)	Diffusion Coefficient in water (cm^2/s)	log Kd
Acenaphthene	83-32-9	1.54E+02	4.24E+00	6.36E-03	4.60E+03	4.21E-02	7.69E-06	
Acetone	67-64-1	5.88E+01	1.00E+06	1.59E-03	5.75E-01	1.24E-01	1.14E-05	
Acrolein	107-02-8	5.61E+01	2.00E+05	1.83E-04	5.24E-01	1.05E-01	1.12E-05	
Anthracene	120-12-7	1.78E+02	4.34E-02	2.67E-03	1.84E+04	3.24E-02	7.74E-06	
Arsenic	7440-38-2	7.49E+01	NA	NA	NA	NA	NA	
Benzene	71-43-2	7.81E+01	1.75E+03	2.28E-01	6.61E+01	8.80E-02	9.80E-06	
Benzo(a)pyrene	50-32-8	2.52E+02	1.62E-03	4.63E-05	9.54E+05	4.30E-02	9.00E-06	
Benzo(b)fluoranthene	205-99-2	2.52E+02	1.50E-02	4.55E-04	5.50E+05	2.26E-02	5.56E-06	
Benzo(k)fluoranthene	207-08-9	2.52E+02	8.00E-04	3.40E-05	1.02E+06	2.26E-02	5.56E-06	
Benzo(a)anthracene	56-55-3	2.28E+02	9.40E-03	1.37E-04	1.38E+06	5.10E-02	9.00E-06	
Benzo(g,h,I)perylene	191-24-2	2.76E+02	2.64E-04	5.70E-06	1.58E+06	4.90E-02	5.65E-05	
Bromodichloromethane	75-27-4	1.64E+02	6.74E+03	6.56E-02	5.50E+01	2.98E-02	1.06E-05	
Bromoform	75-25-2	2.53E+02	3.10E+03	2.19E-02	1.26E+02	1.49E-02	1.03E-05	
Bromomethane	74-83-9	9.49E+01	1.52E+04	5.90E-01	9.00E+00	7.28E-02	1.21E-05	
Butylbenzylphthalate	85-68-7	3.12E+02	2.69E+00	5.17E-05	1.37E+04	1.74E-02	4.83E-06	
sec-Butylbenzene	135-98-8	1.34E+02	1.81E+01	5.07E-01	2.83E+03	5.76E-02	6.75E-06	
tert-Butylbenzene	98-06-6	1.34E+02	1.51E+01	8.56E-01	3.41E+03	5.84E-02	6.76E-06	
Cadmium - water	7440-43-9	1.12E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E+00
Cadmium - food	7440-43-9	1.12E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E+00
Carbon disulfide	75-15-0	7.61E+01	1.19E+03	1.24E+00	5.25E+01	1.04E-01	1.00E-05	
Carbon tetrachloride	56-23-5	1.54E+02	7.93E+02	1.25E+00	1.52E+02	7.80E-02	8.80E-06	
Chlordane	57-74-9	4.10E+02	5.60E-02	1.99E-03	5.13E+04	1.18E-02	4.37E-06	
4-Chloroaniline	106-47-8	1.28E+02	5.30E+03	1.36E-05	6.60E+01	4.83E-02	1.01E-05	
Chlorobenzene	108-90-7	1.13E+02	4.72E+02	1.52E-01	2.24E+02	7.30E-02	8.70E-06	
Chloroethane	75-00-3	6.45E+01	5.70E+03	3.65E-01	3.24E+00	8.50E-01	1.10E-05	
Chloroform	67-66-3	1.19E+02	7.92E+03	1.50E-01	5.25E+01	1.04E-01	1.00E-05	
Chloromethane	74-87-3	5.05E+01	7.25E+03	1.44E+00	2.51E+01	1.26E-01	6.50E-06	
Beta-chloronaphthalene	91-58-7	1.63E+02	6.74E+00	2.54E-02	8.51E+03	6.18E-02	6.98E-06	
2-Chlorophenol	95-57-8	1.29E+02	2.20E+04	1.60E-02	2.88E+02	5.01E-02	9.46E-06	
Chromium III	16065-83-1	5.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E+00
Chromium VI	18540-29-9	5.20E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+00
Chrysene	218-01-9	2.28E+02	1.60E-03	3.88E-03	2.45E+05	2.48E-02	6.21E-06	
Cobalt	7440-48-4	5.89E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E+00
Copper	7440-50-8	6.36E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E+00
Cumene	98-82-8	1.20E+02	5.00E+01	6.07E-01	1.38E+03	6.50E-02	7.10E-06	
Cyanide (free)	57-12-5	2.60E+01	1.00E+05	0.00E+00	0.00E+00	5.21E-01	2.28E-05	
DDD	72-54-8	3.20E+02	9.00E-02	1.66E-04	4.58E+04	1.69E-02	4.76E-06	
DDE	72-55-9	2.42E+02	6.50E-02	8.73E-04	8.64E+04	1.44E-02	5.87E-06	
DDT	50-29-3	3.54E+02	2.50E-02	3.32E-03	5.14E+00	1.37E-02	4.95E-06	
Diazinon	333-41-5	3.04E+02	4.00E+01	4.70E-06	3.26E-01	1.80E-02	4.90E-06	
Dibenzofuran	132-64-9	1.68E+02	2.86E+00	5.28E-03	8.13E+03	5.15E-02	7.04E-06	
Dibromochloromethane	124-48-1	2.08E+02	5.25E+03	3.25E-02	6.30E+01	1.96E-02	1.05E-05	
1,2-dibromoethane	106-93-4	1.88E+02	4.32E+03	2.93E-02	1.02E+02	2.17E-02	1.90E-05	
1,2-dichlorobenzene	95-50-1	1.47E+02	1.56E+02	7.79E-02	3.79E+02	6.90E-02	7.90E-06	
1,3-dichlorobenzene	541-73-1	1.47E+02	1.30E+02	1.37E-01	1.70E+02	6.42E-02	7.10E-06	
1,4-dichlorobenzene	106-46-7	1.47E+02	7.38E+01	9.96E-02	6.16E+02	6.90E-02	7.90E-06	
3,3-dichlorobenzene	91-94-1	2.53E+02	3.11E+00	8.65E-07	7.24E+02	1.94E-02	6.74E-06	
1,1-dichloroethane	75-34-3	9.90E+01	5.06E+03	2.30E-01	5.34E+01	7.42E-02	1.05E-05	
1,2-dichloroethane	107-06-2	9.90E+01	8.52E+03	4.01E-02	1.41E+01	1.04E-01	9.90E-06	
1,1-dichloroethene	75-35-4	9.69E+01	2.40E+03	1.06E+00	6.50E+01	9.00E-02	1.04E-03	
Total 1,2-dichloroethene	540-59-0	9.69E+01	6.30E+03	3.80E-01	4.57E+01	7.10E-02	1.20E-05	
2,4-dichlorophenol	120-83-2	1.63E+02	4.50E+03	1.30E-04	7.24E+01	3.46E-02	8.77E-06	
1,2-dichloropropane	78-87-5	1.13E+02	2.80E+03	1.17E-01	4.70E+01	7.82E-02	8.73E-06	
Dieldrin	60-57-1	3.81E+02	1.95E-01	1.11E-04	2.55E+04	1.25E-02	4.74E-06	

CHEMICAL - PHYSICAL PROPERTIES FOR AN EXTENDED LIST OF CHEMICALS

(Continued from Previous Page)

CHEMICAL	CAS #	Molecular Weight	Water Solubility (mg/L)	Henry's Law Constant (L-water/L-air)	Koc (cm^3/g)	Diffusion Coefficient in air (cm^2/s)	Diffusion Coefficient in water (cm^2/s)	log Kd
Ethylene Glycol	107-21-1	6.21E+01	1.00E+06	2.49E-06	1.25E-01	1.08E-01	1.22E-05	
Ethylene Glycol monobutyl ether	111-76-2	1.18E+02	1.00E+06	2.16E-05	1.25E-01	6.51E-02	8.15E-06	
Ethyl ether	60-29-7	7.41E+01	6.10E+04	2.70E-02	7.59E+00	7.40E-02	9.30E-06	
Fluoranthene	206-44-0	2.02E+02	2.06E-01	6.60E-04	4.90E-04	3.02E-02	6.36E-06	
Fluorene	86-73-7	1.66E+02	1.98E+00	2.61E-03	7.30E+03	3.63E-02	7.88E-06	
Formaldehyde	50-00-0	3.00E+01	5.50E+05	1.38E-05	2.18E+00	1.80E-01	2.00E-05	
Heptachlor	76-44-8	3.73E+02	1.80E-01	4.47E-01	9.53E+03	1.12E-02	5.96E-06	
Heptachlor epoxide	1024-57-3	3.89E+02	2.00E-01	3.90E-04	8.32E+04	1.32E-02	4.23E-06	
Hexachlorobenzene	118-74-1	2.85E+02	6.20E+00	5.41E-02	2.82E+04	5.42E-02	5.91E-06	
Hexachlorobutadiene	87-68-3	2.61E+02	3.23E+00	3.34E-01	6.92E+03	5.61E-02	6.16E-06	
Hexachlorocyclopentadiene	77-47-4	2.74E+02	1.80E+00	1.11E+00	5.37E+04	1.61E-02	7.21E-06	
Hexane	110-54-3	8.62E+01	1.30E+01	4.66E+01	4.79E+02	2.00E-01	7.77E-06	
Iron	7439-89-6	5.59E+01	NA	NA	NA	NA	NA	
Lead	7439-92-1	2.07E+02	NA	NA	NA	NA	NA	
Mercury	7439-97-6	2.01E+02	3.00E-02	4.74E-02	NA	NA	NA	
Methylene chloride	75-09-2	8.49E+01	1.30E+04	8.98E-02	1.17E+01	1.01E-01	1.17E-05	
Methyl Ethyl Ketone	78-93-3	7.21E+01	2.40E+05	1.94E-03	1.23E+00	8.08E-02	9.80E-06	
MTBE	1634-04-4	8.82E+01	4.80E+04	2.44E-02	1.41E+01	7.92E-02	9.41E-05	
Naphthalene	91-20-3	1.28E+02	3.14E+01	2.00E-02	1.55E+03	5.90E-02	7.50E-06	
Nickel	7440-02-0	5.87E+01	NA	NA	NA	NA	NA	
n-Nitrosodipropylamine	621-64-7	1.30E+02	9.89E+03	9.23E-05	2.00E+01	5.45E-02	8.17E-06	
Pentachlorophenol	87-86-5	2.66E+02	1.95E+03	1.00E-06	4.07E+02	5.60E-02	6.10E-06	
Phenanthrene	85-01-8	1.78E+02	9.94E-01	5.40E-03	1.41E+04	3.33E-02	7.47E-06	
Phenol	108-95-2	9.41E+01	8.28E+04	1.63E-05	2.88E+01	8.20E-02	9.10E-06	
Pyrene	129-00-0	2.02E+02	1.35E-01	4.51E-04	6.46E+04	2.72E-02	7.24E-06	
n-Propylbenzene	103-65-1	1.20E+02	5.70E+01	4.82E-01	3.00E+03	6.50E-02	7.80E-06	
Selenium	7782-49-2	7.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.40E-01
Silver	7440-22-4	1.08E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.00E+00
Strychnine	57-24-9	3.34E+02	1.43E+02	6.65E-12	7.94E+01	8.00E-02	8.00E-06	
Styrene	100-42-5	1.04E+02	3.10E+02	1.13E-01	9.12E+02	7.10E-02	8.00E-06	
Tetrachloroethene	127-18-4	1.66E+02	2.00E+02	7.54E-01	7.90E+01	7.20E-02	8.20E-06	
Toluene	108-88-3	9.21E+01	5.26E+02	2.72E-01	1.35E+02	8.70E-02	8.60E-06	
Toxaphene	8001-35-2	4.14E+02	7.40E-01	2.46E-04	9.58E+04	1.16E-02	4.34E-06	
1,2,4 -tribromobenzene	615-54-3	3.15E+02	1.00E+01	1.29E-02	5.00E+02	1.10E-02	5.00E-05	
1,1,1 -trichloroethane	71-55-6	1.33E+02	1.33E+03	7.05E-01	1.35E+02	7.80E-02	8.80E-06	
1,1,2 -trichloroethane	79-00-5	1.33E+02	4.42E+03	3.74E-02	5.01E+01	7.80E-02	8.80E-06	
Trichloroethene	79-01-6	1.31E+02	1.10E+03	4.22E-01	9.33E+01	7.90E-02	9.10E-06	
Trichlorofluoromethane	75-69-4	1.37E+02	1.10E+03	4.03E+00	1.59E+02	8.70E-02	9.70E-06	
2,4,5 -Trichlorophenol	95-95-4	1.97E+02	1.20E+03	1.78E-04	2.95E+02	2.91E-02	7.03E-06	
2,4,6 -trichlorophenol	88-06-2	1.97E+02	8.00E+02	3.19E-04	1.32E+02	3.18E-02	6.25E-06	
1,1,2 -trichloropropane	598-77-6	1.47E+02	4.44E+01	1.58E-02	1.74E+02	7.10E-02	7.90E-06	
1,2,3 -trichloropropane	96-18-4	1.47E+02	1.90E+03	1.58E-02	3.89E+02	7.10E-02	7.90E-06	
1,2,4 -trimethylbenzene	95-63-6	1.20E+02	5.68E+01	1.84E-01	5.89E+02	6.22E-02	7.28E-06	
1,3,5 -trimethylbenzene	108-67-8	1.20E+02	5.15E+01	2.72E-01	5.89E+02	6.21E-02	7.23E-06	
1,3,5 -trinitrobenzene	99-35-4	2.13E+02	3.53E+02	2.87E-06	1.41E+01	8.00E-02	8.00E-06	
2,4,6 -trinitrotoluene	118-96-7	2.27E+02	1.30E+02	1.90E-05	3.02E+02	5.41E-02	6.57E-06	
Uranium (soluble salts) [IRIS]	7440-61-1	2.38E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E+00
Uranium (soluble salts) [Provisional]	7440-61-1	2.38E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E+00
Vanadium	7440-62-2	5.09E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E+00
Vanadium Pentoxide	1314-62-1	1.82E+02	8.00E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Vinyl Acetate	108-05-4	8.61E+01	2.00E+04	2.29E-02	5.24E+00	8.50E-02	9.20E-06	
Vinyl Chloride (lifetime)	75-01-4	6.25E+01	2.76E+03	1.11E+00	1.86E+01	1.06E-01	1.23E-06	
Vinyl Chloride (adult)	75-01-4	6.25E+01	2.76E+03	1.11E+00	1.86E+01	1.06E-01	1.23E-06	
m-Xylene	108-38-3	1.06E+02	1.60E+02	3.05E-01	1.95E+02	7.00E-02	7.80E-06	
o-Xylene	95-47-6	1.06E+02	1.78E+02	7.36E-04	2.41E+02	8.70E-02	1.00E-05	
p-Xylene	106-42-3	1.06E+02	1.85E+02	3.18E-01	3.09E+02	7.69E-02	8.44E-06	
Xylenes	1330-20-7	1.06E+02	1.98E+02	2.93E-01	6.92E+02	7.40E-02	8.50E-06	
Zinc	7440-66-6	6.54E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E+00

APPENDIX D

Toxicity Properties of Contaminants of Concern

CHEMICAL	CAS #	CSFo [1/(mg-kg/d)]	CSFi [1/(mg-kg/d)]	RfDo [mg-kg/d]	RfDi [mg-kg/d]
Acenaphthene	83-32-9	NA	NA	6.00E-02	NA
Acetone	67-64-1	NA	NA	1.00E-01	NA
Acrolein	107-02-8	NA	NA	2.00E-02	5.70E-06
Anthracene	120-12-7	NA	NA	3.00E-01	NA
Arsenic	7440-38-2	1.50E+00	1.50E+00	3.00E-04	NA
Benzene	71-43-2	5.50E-02	2.90E-02	3.00E-03	1.70E-03
Benzo(a)pyrene	50-32-8	7.30E+00	6.10E+00	NA	NA
Benzo(b)fluoranthene	205-99-2	7.30E-01	6.10E-01	NA	NA
Benzo(k)fluoranthene	207-08-9	7.30E-02	6.10E-02	NA	NA
Benzo(a)anthracene	56-55-3	7.30E-01	6.10E-01	NA	NA
Benzo(g,h,I)perylene	191-24-2	NA	NA	3.00E-02	NA
Bromodichloromethane	75-27-4	6.20E-02	NA	2.00E-02	NA
Bromoform	75-25-2	7.90E-03	3.90E-03	2.00E-02	NA
Bromomethane	74-83-9	NA	NA	1.40E-03	1.40E-03
Butylbenzylphthalate	85-68-7	NA	NA	2.00E-01	NA
sec-Butylbenzene	135-98-8	NA	NA	4.00E-02	NA
tert-Butylbenzene	98-06-6	NA	NA	4.00E-02	NA
Cadmium - water	7440-43-9	NA	6.30E+00	5.00E-04	5.7E-05
Cadmium - food	7440-43-9	NA	6.30E+00	1.00E-03	5.7E-05
Carbon disulfide	75-15-0	NA	NA	1.00E-01	2.00E-01
Carbon tetrachloride	56-23-5	1.30E-01	5.30E-02	7.00E-04	5.71E-04
Chlordane	57-74-9	3.5E-01	3.5E-01	5.00E-04	2.00E-04
4-Chloroaniline	106-47-8	NA	NA	4.00E-03	NA
Chlorobenzene	108-90-7	NA	NA	2.00E-02	1.7E-02
Chloroethane	75-00-3	2.90E-03	NA	4.00E-01	2.90E+00
Chloroform	67-66-3	6.10E-03	8.10E-02	1.00E-02	8.6E-05
Chloromethane	74-87-3	1.30E-02	3.5E-03	NA	8.6E-02
Beta-chloronaphthalene	91-58-7	NA	NA	8.00E-02	NA
2-Chlorophenol	95-57-8	NA	NA	5.00E-03	NA
Chromium III	16065-83-1	NA	NA	1.50E+00	NA
Chromium VI	18540-29-9	NA	4.10E+01	3.00E-03	3.00E-05
Chrysene	218-01-9	7.30E-03	6.10E-03	NA	NA
Cobalt	7440-48-4	NA	NA	6.00E-02	NA
Copper	7440-50-8	NA	NA	4.00E-02	NA
Cumene	98-82-8	NA	NA	1.00E-01	1.10E-01
Cyanide (free)	57-12-5	NA	NA	2.00E-02	NA
DDD	72-54-8	2.40E-01	NA	NA	NA
DDE	72-55-9	3.40E-01	NA	NA	NA
DDT	50-29-3	3.40E-01	3.40E-01	5.00E-04	NA
Diazinon	333-41-5	NA	NA	9.00E-04	NA
Dibenzofuran	132-64-9	NA	NA	4.00E-03	NA
Dibromochloromethane	124-48-1	8.40E-02	NA	2.00E-02	NA
1,2-dibromoethane	106-93-4	8.50E+01	7.60E-01	NA	5.70E-05
1,2-dichlorobenzene	95-50-1	NA	NA	9.00E-02	NA
1,3-dichlorobenzene	541-73-1	NA	NA	9.00E-04	NA
1,4-dichlorobenzene	106-46-7	2.40E-02	2.2E-02	3.00E-02	2.29E-01
3,3-dichlorobenzene	91-94-1	4.50E-01	NA	NA	NA
1,1-dichloroethane	75-34-3	NA	NA	1.00E-01	1.40E-01
1,2-dichloroethane	107-06-2	9.10E-02	9.10E-02	3.00E-02	1.40E-03
1,1-dichloroethene	75-35-4	6.00E-01	1.75E-01	9.00E-03	NA
Total 1,2-dichloroethene	540-59-0	NA	NA	9.00E-03	NA
2,4-dichlorophenol	120-83-2	NA	NA	3.00E-03	NA
1,2-dichloropropane	78-87-5	6.80E-02	NA	NA	1.14E-03
Dieldrin	60-57-1	1.60E+01	1.60E+01	5.00E-05	NA
Diethylphthalate	84-66-2	N/A	NA	8.00E-01	NA

Toxicity Properties of Contaminants of Concern

CHEMICAL	CAS #	CSFo [1/(mg-kg/d)]	CSFi [1/(mg-kg/d)]	RfDo [mg-kg/d]	RfDi [mg-kg/d]
Ethylene Glycol	107-21-1	NA	NA	2.00E+00	NA
Ethylene Glycol monobutyl ether	111-76-2	NA	NA	5.00E-01	3.70E+00
Ethyl ether	60-29-7	NA	NA	2.00E-01	NA
Fluoranthene	206-44-0	NA	NA	4.00E-02	NA
Fluorene	86-73-7	NA	NA	4.00E-02	NA
Formaldehyde	50-00-0	NA	4.50E-02	2.00E-01	NA
Heptachlor	76-44-8	4.50E+00	4.50E+00	5.00E-04	NA
Heptachlor epoxide	1024-57-3	9.10E+00	9.10E+00	1.30E-05	NA
Hexachlorobenzene	118-74-1	1.60E+00	1.60E+00	8.00E-04	NA
Hexachlorobutadiene	87-68-3	7.80E-02	7.80E-02	2.00E-04	NA
Hexachlorocyclopentadiene	77-47-4	NA	NA	7.00E-03	2.00E-05
Hexane	110-54-3	NA	NA	6.00E-02	5.71E-02
Iron	7439-89-6	NA	NA	3.00E-01	NA
Lead	7439-92-1	NA	NA	NA	NA
Mercury	7439-97-6	NA	3.00E-02	NA	8.60E-05
Methylene chloride	75-09-2	7.50E-03	1.65E-03	6.00E-02	8.60E-01
Methyl Ethyl Ketone	78-93-3	NA	NA	6.00E-01	2.86E-01
MTBE	1634-04-4	NA	NA	8.57E-01	8.57E-01
Naphthalene	91-20-3	NA	NA	2.00E-02	8.60E-04
Nickel	7440-02-0	NA	NA	2.00E-02	NA
n-Nitrosodipropylamine	621-64-7	7.00E+00	NA	NA	NA
Pentachlorophenol	87-86-5	1.20E-01	NA	3.00E-02	NA
Phenanthrene	85-01-8	NA	NA	4.00E-02	NA
Phenol	108-95-2	NA	NA	6.00E-01	NA
Pyrene	129-00-0	NA	NA	3.00E-02	NA
n-Propylbenzene	103-65-1	NA	NA	4.00E-02	NA
Selenium	7782-49-2	NA	NA	5.00E-03	NA
Silver	7440-22-4	NA	NA	5.00E-03	NA
Strychnine	57-24-9	NA	NA	3.00E-04	NA
Styrene	100-42-5	NA	NA	2.00E-01	2.86E-01
Tetrachloroethene	127-18-4	5.20E-02	2.00E-03	1.00E-02	1.4E-01
Toluene	108-85-3	NA	NA	2.00E-01	1.1E-01
Toxaphene	8001-35-2	1.10E+00	1.10E+00	NA	NA
1,2,4 -tribromobenzene	615-54-3	NA	NA	5.00E-03	NA
1,1,1 -trichloroethane	71-55-6	NA	NA	2.80E-01	6.30E-01
1,1,2 -trichloroethane	79-00-5	5.70E-02	5.60E-02	4.00E-03	NA
Trichloroethene	79-01-6	1.10E-02	6.00E-03	6.00E-03	NA
Trichlorofluoromethane	75-69-4	NA	NA	3.00E-01	2.00E-01
2,4,5 -Trichlorophenol	95-95-4	NA	NA	1.00E-01	NA
2,4,6 -trichlorophenol	88-06-2	1.10E-02	1.00E-02	NA	NA
1,1,2 -trichloropropane	598-77-6	NA	NA	5.00E-03	NA
1,2,3 -trichloropropane	96-18-4	2.00E+00	NA	6.00E-03	1.4E-03
1,2,4 -trimethylbenzene	95-63-6	NA	NA	5.00E-02	1.70E-03
1,3,5 -trimethylbenzene	108-67-8	NA	NA	5.00E-02	1.70E-03
1,3,5 -trinitrobenzene	99-35-4	NA	NA	3.00E-02	NA
2,4,6 -trinitrotoluene	118-96-7	3.00E-02	NA	5.00E-04	NA
Uranium (soluble salts) [IRIS]	7440-61-1	NA	NA	3.00E-03	NA
Uranium (soluble salts) [Provisional]	7440-61-1	NA	NA	2.00E-04	NA
Vanadium	7440-62-2	NA	NA	7.00E-03	NA
Vanadium Pentoxide	1314-62-1	NA	NA	9.00E-03	NA
Vinyl Acetate	108-05-4	NA	NA	1.00E+00	5.71E-02
Vinyl Chloride (lifetime)	75-01-4	1.50E+00	3.00E-02	3.00E-03	2.8E-02
Vinyl Chloride (adult)	75-01-4	7.50E-01	1.5E-02	3.00E-03	2.8E-02
m-Xylene	1330-20-7	NA	NA	2.00E+00	NA
o-Xylene	108-38-3	NA	NA	2.00E+00	NA
p-Xylene	95-47-6	NA	NA	2.00E+00	NA
Xylenes	106-42-3	NA	NA	2.00E+00	8.60E-02
Zinc	7440-66-6	NA	NA	3.00E-01	NA

APPENDIX E
Default Fate and Transport Parameters

Parameter	Symbol	Unit	Tier 1 Values
SOIL PARAMETERS:			
Length of Soil Source Area Parallel to Wind Direction	W_a	cm	1500
Depth to Subsurface Soil Sources	L_s	cm	30.48
Lower Depth of Surficial Soil Zone	d	cm	30.48
Thickness of Capillary Fringe	h_{cap}	cm	5
Thickness of Vadose Zone*	h_v	cm	295
Dry Soil Bulk Density	ρ_s	g/cm^3	1.8
Fractional Organic Carbon Content in the Vadose Zone	foc	g-C/g-soil	0.01
Total Porosity in the Vadose Zone	θ_T	cm^3/cm^3-soil	0.3
Volumetric Water Content in Capillary Fringe*	θwcap	cm^3/cm^3	0.27
Volumetric Water Content in Vadose Zone	θws	cm^3/cm^3	0.2
Volumetric Water Content in Foundation or Wall Cracks	θwcrack	cm^3/cm^3	0.2
Volumetric Air Content in Capillary Fringe*	θacap	cm^3/cm^3	0.03
Volumetric Air Content in Vadose Zone*	θas	cm^3/cm^3	0.1
Volumetric Air Content in Foundation/Wall Cracks*	θacrack	cm^3/cm^3	0.1
GROUNDWATER PARAMETERS:			
Depth to Groundwater	L_{gw}	cm	300
Length of Groundwater Source Area Parallel to Wind Direction	Wga	cm	1500
Width of GW Source Perpendicular to the GW Flow Direction	Y	cm	1500
Length of the GW Source Parallel to the GW Flow Direction	W	cm	1500
Total Porosity in the Saturated Zone	θ_{TS}	cm^3/cm^3-soil	0.3
Saturated Zone Dry Soil Bulk Density	ρ_{ss}	g/cm^3	1.8
Fractional Organic Carbon Content in the Saturated Zone	foc_s	g/g	0.01
Groundwater Mixing Zone Thickness	d_{gw}	cm	200
Hydraulic Conductivity in the Saturated Zone	K	cm/year	76000
Hydraulic Gradient in the Saturated Zone	i	--	0.004
Groundwater Darcy Velocity*	U_{gw}	cm/year	304
Infiltration Rate	I	cm/year	14
STREAM PARAMETERS:			
Stream Flow Rate Upstream of the Point of Groundwater Discharge	Q_{sw}	ft^3/day	Variable
Impacted Groundwater Discharge into the Stream	Qgw	ft^3/day	Calculated
COCs Concentration Upstream of the Groundwater Plume Discharge	Csu	mg/L	0
AMBIENT AIR PARAMETERS:			
Breathing Zone Height	δ_a	cm	200
Wind Speed within the Breathing Zone	U_a	cm/s	225
ENCLOSED SPACE PARAMETERS:			
Enclosed Space Air Exchange Rate:			
Residential	ER	1/sec	0.00014
Commercial/Construction Worker	ER	1/sec	0.00023
Enclosed Space Volume/Infiltration Area Ratio:			
Residential	L_B	cm	200
Commercial/Construction Worker	L_B	cm	300

Default Fate and Transport Parameters

Parameter	Symbol	Unit	Tier 1 Values
ENCLOSED SPACE PARAMETERS (Continued):			
Enclosed Space Foundation or Wall Thickness			
Residential	Lcrack	cm	15
Commercial/Construction Worker	Lcrack	cm	15
Areal Fraction of Cracks in Foundation/Walls			
Residential	h	cm^2/cm^2	0.01
Commercial/Construction Worker	h	cm^2/cm^2	0.01
PARTICULATE EMISSION RATE:			
Residential and Commercial	Pe	g/cm^2sec	6.90E-14
Construction Worker	Pe	g/cm^2sec	6.90E-09
AVERAGING TIME FOR VAPOR FLUX:			
Resident Child	τ	sec	1.89E+08
Resident Adult	τ	sec	9.46E+08
Commercial Worker	τ	sec	7.88E+08
Construction Worker	τ	sec	3.15E+07
GROUNDWATER RESOURCE PROTECTION PARAMETERS:			
Distance from the Downgradient Edge of the Groundwater Source to the Point of Exposure	Xpoe	ft	Variable
Longitudinal Dispersivity*	α_x	ft	Xpoe/10
Transverse Dispersivity*	α_y	ft	Xpoe/30
Vertical Dispersivity*	α_z	ft	Xpoe/200
Distance from the Downgradient Edge of the Groundwater Source to the Point of Compliance	Xpoc	ft	Variable
Longitudinal Dispersivity*	α_x	ft	Xpoc/10
Transverse Dispersivity*	α_y	ft	Xpoc/30
Vertical Dispersivity*	α_z	ft	Xpoc/200
STREAM PROTECTION PARAMETERS:			
Distance from the Downgradient Edge of the Groundwater Source to the Stream	Xs	ft	Variable
Longitudinal Dispersivity*	α_x	ft	Xs/10
Transverse Dispersivity*	α_y	ft	Xs/30
Vertical Dispersivity*	α_z	ft	Xs/200
Distance from the Downgradient Edge of the Groundwater Source to the Point of Compliance	Xspoc	ft	Variable
Longitudinal Dispersivity*	α_x	ft	Xspoc/10
Transverse Dispersivity*	α_y	ft	Xspoc/30
Vertical Dispersivity*	α_z	ft	Xspoc/200

NOTE:
* = Calculated value

Persons wishing to comment on the proposed rules shall submit written comments, no later than thirty (30) days after the date of publication of this notice in the *D.C. Register*, to the Department of Health, Office of the General Counsel, 825 North Capitol Street, N.E., 4th Floor, Washington, D.C. 20002. Copies of the proposed rules may be obtained for a small fee to cover the cost of copying from the Department of Health, Environmental Health Administration, Bureau of Hazardous Material and Toxic Substances, 51 N Street, N.E. 3rd Floor, Washington, D.C. 20002.

PUBLIC SERVICE COMMISSION OF THE DISTRICT OF COLUMBIA
1333 H STREET, N.W., SUITE 200, WEST TOWER
WASHINGTON, D.C. 20005

NOTICE OF PROPOSED RULEMAKING

Gas Tariff 03-2, In the Matter of the Application of the Washington Gas Light Company for Authority to Amend Gas Tariff Provisions

1. The Public Service Commission of the District of Columbia ("Commission") hereby gives notice, pursuant to Sections 2-505(a) and 34-601 of the District of Columbia Code,[1] of the Application of the Washington Gas Light Company ("WGL" or "the Company") for Authority to Amend Gas Tariff, P.S.C. D.C. No. 3.[2] The Commission will act upon WGL's Application not less than 30 days from the date this Notice appears in the *D.C. Register*.

2. In its application, WGL is requesting authority to amend the following tariff pages:

GAS TARIFF, P.S.C. of D.C. No. 3
Tenth Revised Page No. 27A
Third Revised Page No. 27F

3. The revised tariff language serves to formalize credit terms with delivery service suppliers by moving credit language from the individual supplier agreements to the Company's tariff.[3] According to WGL, the proposed language is the product of discussions with suppliers aimed at refining the current credit calculation methodology, allowing suppliers greater flexibility with respect to their required credit amounts and providing credit amounts that more accurately reflect financial risks to the Company and the Company's sales customers in today's volatile natural gas market.[4]

4. WGL seeks to revise General Service Provision No. 3, Firm Delivery Service Agreement, Rate Schedule 5.[5] According to WGL, the revisions proposed implement a "security amount" for Delivery Service suppliers based on three factors the Company believes defines its

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1 D.C. Code, 2001 Ed. §§ 2-505(a) and 34-601.

2 *Gas Tariff 03-2, In the Matter of the Application of the Washington Gas Light Company for Authority to Amend Gas Tariff, P.S.C. D.C. No. 3,* Letter from Bernice K. McIntyre, Senior Counsel, Washington Gas Light Company, to Sanford M. Speight, Esq., Acting Commission Secretary, Public Service Commission of the District of Columbia (Sept. 5, 2003).

3 *Id.*

4 *Id.*

5 *Id.*

associated risk.[6] These factors are volume, price, and time.[7] The volume component is based on seasonal design day, supplier requirements.[8] The price component is based on seasonal, delivered cost of gas to the Company.[9] The time component is based on WGL's processing, administrative, and notification activities in the event of delivery service supplier non-performance.[10]

5. As an initial credit measure, the Company proposes to assess new suppliers to the Delivery Service Program a security amount of $5,000 if joining the Delivery Service Program in the summer months or $10,000 if joining the Program in the winter months.[11] Existing suppliers will be assessed according to the three factors -- volume, price, and time.[12] According to the Company, the proposed tariff language acknowledges the seasonal nature of credit risk and calculates a credit requirement that reflects a greater amount in the winter period and a lesser amount in the summer period.[13]

6. The proposed tariff pages are on file with the Commission. A copy of the tariff may be reviewed at the Office of the Commission Secretary, Second Floor, West Tower, 1333 H Street, N. W., Washington, D.C. 20005, between the hours of 9:00 a.m. and 5:30 p.m., Monday through Friday. A copy of the proposed tariff pages and attachments are available, upon request, at a per page reproduction fee. Comments on the proposed tariff revisions, setting forth the specific grounds for each representation, should be made in writing to Sanford M. Speight, Acting Commission Secretary, at the above address. Comments must be received within 30 days of publication of this Notice in the *D.C. Register*. Reply comments must be received within 45 days of publication of this Notice.

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6 *Id.*

7 *Id.*

8 *Id.*

9 *Id.*

10 *Id.*

11 *Id.*

12 *Id.*

13 *Id.* at 1-2.

OFFICE OF THE CORPORATION COUNSEL

NOTICE OF EMERGENCY AND PROPOSED RULEMAKING

Pursuant to the authority set forth in section 861 of the District of Columbia Government Comprehensive Merit Personnel Act of 1978, effective March 3, 1979, D.C. Law 2-139, as added by the Legal Service Establishment Amendment Act of 1998 ("Legal Service Act"), effective April 20, 1999, D.C. Law 12-260, D.C. Official Code § 1-608.61 (2001), the Corporation Counsel hereby gives notice of his adoption, on an emergency basis, of the following amendments to Chapter 36 of the District of Columbia Personnel Regulations, pertaining to the Legal Service.

Emergency action to adopt these rules is necessary to allow the Corporation Counsel the option of appointing two or more Evaluation Panels to review draft performance evaluations for approximately 300 Legal Service line attorneys for FY 2003. Legal Service supervisors are required to complete these evaluations by October 8, 2003. Currently, Chapter 36 provides for the appointment of only one Evaluation Panel of three senior attorneys to perform this important function. The function must be completed by early November, in order to assure enough time for other required reviews and processes -- including Corporation Counsel review, comment, and approval of evaluations; discussion of the approved evaluations between the raters and the attorneys evaluated; appeals by such attorneys; and disposition of the appeals by the Corporation Counsel -- before the first full pay period in January 2004. Annual performance ratings are used to adjust, up or down, the Attorney Retention Allowance ("ARA"), which is a substantial component of the pay of Legal Service attorneys. The law requires these annual adjustments to be made effective the first full pay period in January of each year. Experience during the three years since Chapter 36 was adopted shows that one Evaluation Panel is unlikely to be able to complete its work, including the return of many draft evaluations for revision, followed by additional review, in time to permit any required ARA adjustments to be completed by the first full pay period in January. To ensure timely adjustment of ARAs by the first full pay period in January 2004, it is imperative that the Corporation Counsel be able to appoint at least two Evaluation Panels on or before October 8, 2003. Thus, changes to Chapter 36, authorizing the Corporation Counsel to make such appointments, need to be adopted immediately.

These emergency rules were adopted on October 1, 2003 and will remain effective for 120 days, or until publication of the final rules in the D.C. Register, whichever occurs first. The Corporation Counsel hereby gives notice of his intent to take final rulemaking action to adopt these proposed rules (which are identical to the emergency rules) in not less than 30 days from the date of publication of this notice in the D.C. Register.

Chapter 36 of the D.C. Personnel Regulations is amended as follows:

Subsections 3605.5, 3605.6, and 3605.7 of section 3605 (Evaluation of Performance -- Office of the Corporation Counsel Line Attorneys) are amended to read as follows:

3605.5 Beginning with the rating period 2000-2001, the Corporation Counsel shall select a three (3) member Evaluation Panel of attorneys at the DS-15 level or above.

Beginning with the rating period 2002-2003, the Corporation Counsel shall select at least one, and may select two or more, three (3) member Evaluation Panels of attorneys at the DS-15 grade or above.

3605.6 The Evaluation Panel or Panels shall collectively review the evaluations of all line attorneys to assure that the evaluations comply with this Chapter and that performance standards are being applied consistently throughout the Office. When two (2) or more Panels have been appointed, each Panel may review only a proportionate share of all the evaluations submitted. The Evaluation Panel or Panels shall complete their review and make any recommendations for changes to the Corporation Counsel within twenty (20) days of receipt of the evaluations.

3605.7 As soon as practicable after the receipt of the recommendations of the Panel or Panels, the Corporation Counsel shall complete his or her review. In reviewing evaluations of line attorneys, the Corporation Counsel may consult with the supervisor who prepared the evaluation, any person who prepared an advisory evaluation, and the supervisors in the chain of command for the relevant unit.

All persons desiring to comment on the subject matter of this proposed rulemaking should file comments in writing not later than thirty (30) days after the date of publication of this notice in the D.C. Register. Comments should be filed with Wayne C. Witkowski, Esq., 1350 Pennsylvania Avenue, N.W., Room 409, Washington, D.C. 20004. Copies of these rules may be obtained at the address stated above.