

USER'S GUIDE

USEPA REGIONAL SCREENING LEVEL (RSL)

CALCULATOR

FOR

Soil-to-Groundwater Leaching

February 2020

VATTENASSOCIATES.COM

P 678.512.9688 | F 678.331.3881 3600 DALLAS HWY, SUITE 230-375, MARIETTA GA, 30064

1. INTRODUCTION

There are several different approaches that can be used to assess the potential leaching of regulated substances from soil to groundwater. These approaches may include:

- Preliminary Screening (e.g., using "look-up tables")
- Partition Equation
- Vadose Zone Modeling
- Leaching Test
- Direct Measurements (Observation-based)

The U.S. Environmental Protection Agency (USEPA) developed a Regional Screening level (RSL) Calculator to assess the soil to groundwater leaching pathway using the Partition Equation. This USEPA RSL Calculator can be used with default or your site-specific parameters. Using the USEPA RSL Calculator, you can also assume that there is an infinite (never ending) source of the regulated substance with continuous leaching. Alternatively, the USEPA RSL Calculator can be used to estimate the leaching from a finite or "mass-limited" source of the regulated substance. Both of the methods are presented below.

There are some differences between the default USEPA RSL Calculator parameters and those routinely used by the Georgia Environmental Protection Division (EPD). The USEPA RSL Calculator uses a default dilution attenuation factor (DAF) of 1.0, a target risk value for carcinogens of 10⁻⁶, and potentially different groundwater screening levels. You can adjust these and other parameters in the USEPA RSL Calculator.

The USEPA RSL Calculator can be accessed at: <u>https://www.epa.gov/risk/regional-screening-levels-rsls</u>

The following screen shots provide an example of how to use the USEPA RSL Calculator for tetrachloroethylene (PCE) with both infinite-source and mass-limited method. For this example default values are used for most of the parameters. However, a site specific DAF and a groundwater screening level are used.

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2. INFINITE-SOURCE LEACHING

Many conservative applications of the Partition Equation assume an infinite source or never-ending, constant leaching of regulated substances to groundwater. They also assume that the regulated substance is continuously present from land surface all the way down to the groundwater table.

The following screen shots provide an example of how to use the USEPA RSL Calculator for tetrachloroethylene (PCE) with the infinite-source method (*i.e.*, USEPA Method 1).

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Figure 1. Landing page for USEPA's Regional Screening Levels (RSLs). Select "**RSL Calculator**" to evaluate your soil-to-groundwater (leaching) pathway. <u>https://www.epa.gov/risk/regional-screening-levels-rsls</u>



Figure 2. To be consistent with EPD, adjust the target hazard quotient (THQ) to 1.0 for non-carcinogens and target risk (TR) to 10⁻⁵ for carcinogens.

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Select Scenario
Resident Indoor Worker Outdoor Worker Composite Worker (presented in Generic Tables) Construction Worker (Site Specific only) Fish (Site Specific Only) Soil to Groundwater Recreator (Site Specific only)
Select Screening Level Choice
Defaults Site Specific Select Chemical Info Type: Database biergroup defaults
User-provided
Select Risk Output
Ves
Select RfD/RfC Choice
Chronic Subchronic

Figure 3. Select the soil-to-groundwater (leaching) scenario and select user-provided, site-specific parameters.



Figure 4. From the dropdown menu select your chemical of interest (*e.g.*, PCE) and then select "**Retrieve**."

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RSL Calculator											
User-provided Inputs • Change or remove any of the following parameters. The master database will not be used. (RSLs)											
Change of remove any of the following parameters. The master database will hot be used. Home Page User's Guide What's New Frequent Que Equations RSL Calculato Generic Table											
Chemical	Inhalation Inhalation RAGS Part E Oral Chronic Dermal Chronic Reference Oral Reference Dose Concentration Slope Factor Unit Risk Factor KfD ₀ (mg/kg-day) RfC (mg/m ³) (mg/kg-day)SFo ⁻¹										
Tetrachloroethylene	Tetrachloroethylene 6.00E-03 4.00E-02 2.10E-03 2.60E-07 1										
	Scroll to the right										

Figure 5. Initial menu screen where you can al default parameters or start adding your site specific parameters. Scroll to the right of this menu to get more options.

Chemical	Lower Explosive Limit LEL	Organic Carbon Partition Coefficient Koc (L/kg)	Soil-Water Partition Coefficient K _d (cm ³ /g)	Skin Permeability Constant K _p (cm/hr)	Fraction of Chemical that is ultimately absorbed FA (unitless)	Maximum Contamination Limit MCL (µg/L)	Water Solubility S (mg/L)
Tetrachloroethylene		9.49E+01		3.34E-02	1	41	206
		, , ,		1	I		

Figure 6. Input your site specific "Maximum Contaminant Limit" of 41 ug/L for PCE.¹

After populating this menu, scroll down and by-pass (for this example) the other menus for: Exposure Assessment Details; Risk-Based Water Concentration - Ingestion, Dermal, and Inhalation Exposure; and Mutagenic Parameters.

¹ Under HSRA the Type 2 RRS for groundwater must be developed in accordance with Sec. 391-3-19-.07(7)(b). You can use the USEPA RSLs "Resident Soil to Groundwater" as the Type 2 RRS. These screening levels for leaching can be accessed from the USEPA RSL landing page (see Figure 1). Using the PCE example, the USEPA RSLs protective of groundwater are 110 ug/L for carcinogenic effects (at a target risk of 10⁻⁶) and 41 ug/L for non-carcinogenic effects (at a target hazard quotient of 1.0). Because the RSL for non-carcinogenic effects is lower, it is selected for this evaluation.

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Dilution Factor for Migration to Gro	undwater	[•] Equations and Parameters
K (aquifer hydraulic conductivity) m/yr L (source length parallel to ground water flow) m d (mixing zone depth) m - site-specific d_a (aquifer thickness) m - site-specific	20 0.18	DAF (dilution attenuation factor) unitless i (hydraulic gradient) m/m I (infiltration rate) m/yr
NOTES: 1. When DAF is entered or calculated, the values for the blue DAF box in entered or calculated, the default value will be used. 2. If DAF is known, enter it, or enter your own site-specific values to calculated of the second secon	the Migration	to Groundwater section below will be populated. If DAF is not

Figure 7. After scrolling down to this menu, input your site specific dilution attenuation factor (DAF) of 20.

Migration to Groundwater Common Parameters										
DAF (dilution attenuation factor) unitless Method 1 - Partitioning Hethod 2 - Mass Limit	1.5	ρ_b (dry soil bulk density) kg/L								
 NOTES: 1. If DAF is known, enter it in the <u>Dilution Factor</u> section above. When DAF is entered or calculated in the section above, the value for the blue DAF box in this section will be populated. If DAF is not entered or calculated, the default value will be used. 2. The Partitioning Equation for Migration to Ground Water is used by default. To use the <u>Mass-Limit Equation</u>, select the Method 2 Equation toggle and enter the parameters below. 										
		↑ Top of Page								
Partitioning Eq	uation and Pa	arameters								
H [*] Determination at Temperature other than 25 degrees Celsius										
Method 1										
0.002 foc (fraction organic carbon in soil) g/g	0.134	$\boldsymbol{\theta}_a$ (air-filled soil porosity) $\boldsymbol{L}_{air}/\boldsymbol{L}_{soil}$								
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	0.3	$\begin{array}{l} \theta_w \left(water-filled \mbox{ soil porosity} \right) L_{water}/L_{soil} \\ T_w \left(groundwater \mbox{ temperature} \right) \mbox{ °Celsius} \end{array}$								
		↑ Top of Page								
Batrieve Clast										

Figure 8. You do not need to make any changes to this menu; however, note that the USEPA Calculator will be running the "infinite-source" Partitioning Equation (*i.e.*, **Method 1 - Partitioning**) with your site-specific parameters. Select "**Retrieve**" to continue.

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RSL Calculator									
Site-specific		Regional Screening Levels (RSLs)							
Output to Spreadsheet Output to PDF Imputted varius omericant from defaults are highlighted.		Home Page User's Guide What's New Frequent Questions Equations RSL Calculator Generic Tables							
	Default	Form-input							
Variable	Value	Value							
DAF (dilution attenuation factor) unitless	1	20							
DAF (dilution attenuation factor) unitless	1	20							
BW ₀₋₂ (mutagenic body weight) kg	15	15							
BW ₂₋₆ (mutagenic body weight) kg	15	15							
BW ₆₋₁₆ (mutagenic body weight) kg	80	80							
BW ₁₆₋₂₆ (mutagenic body weight) kg	80	80							
BW _{res-a} (body weight - adult) kg	80	80							
BW _{res-r} (body weight - child) kg	15	15							

Figure 9. The default output is generated within the USEPA Calculator and your site-specific DAF is highlighted in the output. You can also receive your output in an Excel spreadsheet and/or *.pdf (see Attachment A).



Figure 10. Excel spreadsheet output highlighting your site-specific Type 2 RRS for PCE (*i.e.*, 0.373 mg/kg).

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Site-specific Equation Inputs for Soil to Groundwater

* Inputted values different from	defaults are highlighted.		
Variable		Default Value	Form-input Value
DAF (dilution attenuation factor) unitless		1	20
DAF (dilution attenuation factor) unitless		1	20
THQ (target hazard quotient) unitless		0.1	1
BW ₀₋₂ (mutagenic body weight) kg		15	15
BW2-6 (mutagenic body weight) kg		15	15
BW ₆₋₁₆ (mutagenic body weight) kg		80	80
BW ₁₆₋₂₆ (mutagenic body weight) kg		80	80
BW _{res-a} (body weight - adult) kg		80	80
BW _{res-c} (body weight - child) kg		15	15
DFW _{res-adj} (age-adjusted dermal factor) cm ²	event/kg	2610650	2610650
DFWM _{res-adj} (mutagenic age-adjusted derma	I factor) cm ² -event/kg	8191633	8191633
ED _{res} (exposure duration - resident) years		26	26
ED ₀₋₂ (mutagenic exposure duration first pha	se) years	2	2
ED2-6 (mutagenic exposure duration second	ohase) years	4	4
ED ₆₋₁₆ (mutagenic exposure duration third ph	ase) years	10	10

Figure 11. Excel spreadsheet output with all of the parameters used to calculate site-specific Type 2 RRS for PCE. The two parameters you changed (*i.e.*, DAF and target hazard quotient) are highlighted in the output.

Site-s Regio Key: I = IR user's gui DAF=1; m	pecif onal S IS; P = Pl de; U = u: ax = ceilin	ic Scree PRTV; C ser proving limit	ening L) = OPP; A = vided; ca = c exceeded; s	evels ATSDR; C ancer; nc = at = Csat e	(RS = Ca none	SL) f EPA;) cancer; ded.	or (= PF * = wi	Soil to PRTV Scru here: nc S	o (eeni iL <	Groui ing Level; 100X ca S	ndv H = 1 SL; **	Water HEAST; D = where n	= DWS c SL <	HA; W = T 10X ca SL	EF aj ; SSL	oplied; E values	E = Rf are b	PF applie ased on	ed; G = se
Chor	nical	CAS	S Mutagor	2 Velatile	Ch	emical	(mall	SF SF	SF	IUR	IUR	RfD	Rf	RfC	RfC	CIARS	ADC	S	K 1
Tetrachlor	pethylene	127-18	B-4 No	Yes	Org	anics	2.1	0E-03	U	2.60E-07	U	6.00E-03	U U	4.00E-02	U	1	-	206	(cm /g) 1.90E-01
K \ (cm ³ /g)	Dilutio Attenua Facto (DAF (unitles	on tion r) ss) (at	HLC m-m ³ /mole)	Henry's Law Constant (unitless)	H' and HLC Ref	Norma Boiling Point BP (K)	BP Ref	Critica Tempera TC (K)	al ture	No TC Ref	ncard Ad Th (u	cinogenic 5L dult H=1 g/L)	Nonca	rcinogenia SL Child THI=1 ug/L)	Ca	rcinoge SL R=1E-0 (ug/L)	nic 6	Wate Concentr (Adu (mg/l	er ration lt) _)
9.49E+01	20		0.0177	7.24E-01	U	394.15	U	620		U	5.03	E+01	4.0	06E+01	1	.13E+01		1.01E+	-00
Wate Concentr (Child (mg/L	r ation Co i) .)	Water ncentra (Cance (mg/L)	Maxi Contai ition Le r) (Ma) (ug	mum minant vel Co CL) //L)	Wat ncen (MC (mg	ter tration (L) /L)	MCL (mg	based SL g/kg)											

Figure 12. Portable document format (*.pdf, see Attachment A) output highlighting your site-specific Type 2 RRS for PCE (*i.e.*, 0.373 mg/kg).

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Site-specific Equation Inputs for Soil to Groundwater

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" inputted values different from	defaults are highlighted.

Variable	Default Value	Form-input Value
DAF (dilution attenuation factor) unitless	1	20
DAF (dilution attenuation factor) unitless	1	20
Bw n.2 (mutagenic body weight) kg	15	15
BW _{2.6} (mutagenic body weight) kg	15	15
BW _{6.16} (mutagenic body weight) kg	80	80
BW _{16.36} (mutagenic body weight) kg	80	80
BW,, (body weight - adult) kg	80	80
BW, (body weight - child) kg	15	15
DFW, age-adjusted dermal factor) cm 2-event/kg	2610650	2610650
DFWM, (mutagenic age-adjusted dermal factor) cm 2-event/kg	8191633	8191633
ED, (exposure duration - resident) years	26	26
ED, (mutagenic exposure duration first phase) years	2	2
ED,, (mutagenic exposure duration second phase) years	4	4
ED _{6.16} (mutagenic exposure duration third phase) years	10	10
ED _{16.36} (mutagenic exposure duration fourth phase) years	10	10
ED (exposure duration - adult) years	20	20
ED (exposure duration - child) years	6	6
EF, (exposure frequency) days/year	350	350
EF (mutagenic exposure frequency first phase) days/year	350	350
EF _{2.6} (mutagenic exposure frequency second phase) days/year	350	350
EF _{6.16} (mutagenic exposure frequency third phase) days/year	350	350
EF _{16.96} (mutagenic exposure frequency fourth phase) days/year	350	350
EF (exposure frequency - adult) days/year	350	350

Figure 13. Portable document format (*.pdf, see Attachment A) output with all of the parameters used to calculate the site-specific Type 2 RRS for PCE.

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3. MASS-LIMITED LEACHING

As discussed above, many conservative applications of the Partition Equation assume an infinite source or never-ending, constant leaching of regulated substances to groundwater. They also assume that the regulated substance is continuously present from land surface all the way down to the groundwater table. However, in some situations these assumptions can be in unrealistic and violate mass-balance considerations, especially for small source areas.

The USEPA RSL Calculator can be used to better assess the potential leaching for a finite or "masslimited" source. This method assumes that the depth of the regulated substance is known and it has not yet leached to groundwater.

The following screen shots provide an example of how to use the USEPA RSL Calculator for tetrachloroethylene (PCE) with the mass-limit method (*i.e.*, USEPA Method 2).

The initial steps in populating the USEPA RSL Calculator are the same for infinite source and masslimited source. Therefore, the screen shots in Figures 1 to 7 (above) are the same. Also, the steps to receive your output in an Excel spreadsheet and/or *.pdf are the same (see Attachment B).

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Migration to Groundwater Common Parameters										
DAF (dilution attenuation factor) unitless Method 1 - Partitioning Method 2 - Mass Limit	1.5 $$\rho_b$ (dry soil bulk density) kg/L $$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $									
 NOTES: 1. If DAF is known, enter it in the <u>Dilution Factor</u> section above. When DAF is entered or calculated in the section above, the value for the blue DAF box in this section will be populated. If DAF is not entered or calculated, the default value will be used. 2. The Partitioning Equation for Migration to Ground Water is used by default. To use the <u>Mass-Limit Equation</u>, select the Method 2 Equation toggle and enter the parameters below. 										
	↑ Top of Page									
Mass Limit Equati	on and Parameters									
Method 2										
3 d _s (depth of source) m - site-specific	70 ED _{res} (exposure duration) yr									
	↑ Top of Page									
Retrieve Clear										

Figure 14. The USEPA Calculator will be running the "mass-limited source" Partitioning Equation (*i.e.,* **Method 2 – Mass Limit**) with your site-specific parameters. For this example, we assumed that PCE was only is present in the subsurface soils to a depth of 3 meters (9.8 feet below land surface). Select "**Retrieve**" to continue.

Site-specific Regional Screening Levels (RSL) for Soil to Groundwater Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; V										
Chemical	CAS Number	S (mg/L)	K _d (cm³/g)	K _{oc} (cm³/g)	Dilution Attenuation Factor (DAF) (unitless)	MCL-based SL (mg/kg)				
Tetrachloroethylene	127-18-4	2.06E+02	1.90E-01	9.49E+01	2.00E+01	2.30E+00				
Output generated 29FEB2020:12:29:53										

Figure 15. Excel spreadsheet output highlighting your site-specific Type 2 RRS for PCE (*i.e.*, 2.30 mg/kg). This mass-limited value is 6-times higher than the infinite source or never-ending leaching value of 0.373 mg/kg presented in Figures 9 and 11. A copy of the *.pdf output is provided in Attachment B.

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4. MORE INFORMATION

For more information on the Residential Soil-to-Groundwater (leaching) Calculator, see Section 4.8 - Soil to Groundwater of USEPA RSLs - User's Guide.

Link: https://www.epa.gov/risk/regional-screening-levels-rsls-users-guide

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Vatten Associates User's Guide USEPA RSL Calculator

ATTACHMENT A

EXAMPLE USEPA RSL CALCULATOR OUTPUT

FOR

INFINITE-SOURCE LEACHING

OF

TETRACHLOROETHYLENE (PCE)

(*.PDF FORMAT)

* Inputted values different from

defaults are highlighted.

1

Variable	Default Value	Form-input
DAF (dilution attenuation factor) unitless	1	20
DAF (dilution attenuation factor) unitless	1	20
BW, (mutagenic body weight) kg	15	15
BW, (mutagenic body weight) kg	15	15
BW (mutagenic body weight) kg	80	80
BW ₁₆₂₆ (mutagenic body weight) kg	80	80
BW _{resa} (body weight - adult) kg	80	80
BW _{resc} (body weight - child) kg	15	15
DFW recard (age-adjusted dermal factor) cm ² -event/kg	2610650	2610650
DFWM (mutagenic age-adjusted dermal factor) cm ² -event/kg	8191633	8191633
ED _{rec} (exposure duration - resident) years	26	26
$ED_{n,2}$ (mutagenic exposure duration first phase) years	2	2
ED _{2.6} (mutagenic exposure duration second phase) years	4	4
$ED_{6,16}$ (mutagenic exposure duration third phase) years	10	10
ED _{16.26} (mutagenic exposure duration fourth phase) years	10	10
ED _{rec.a} (exposure duration - adult) years	20	20
ED _{men} (exposure duration - child) years	6	6
EF _{ree} (exposure frequency) days/year	350	350
$EF_{a,2}$ (mutagenic exposure frequency first phase) days/year	350	350
$EF_{_{2,6}}$ (mutagenic exposure frequency second phase) days/year	350	350
EF _{6.16} (mutagenic exposure frequency third phase) days/year	350	350
EF _{16.26} (mutagenic exposure frequency fourth phase) days/year	350	350
EF _{rec.a} (exposure frequency - adult) days/year	350	350
EF _{ree} (exposure frequency - child) days/year	350	350
ET _{res} (exposure time) hours/day	24	24
ET_ventres.arti (age-adjusted exposure time) hours/event	0.67077	0.67077
ET_ventree.madi (mutagenic age-adjusted exposure time) hours/event	0.67077	0.67077
$ET_{n,2}$ (mutagenic dermal exposure time first phase) hours/event	0.54	0.54
$ET_{_{2,6}}$ (mutagenic dermal exposure time second phase) hours/event	0.54	0.54
$ET_{_{6,16}}$ (mutagenic dermal exposure time third phase) hours/event	0.71	0.71
$ET_{_{16-26}}$ (mutagenic dermal exposure time fourth phase) hours/event	0.71	0.71

* Inputted values different from

defaults are highlighted.

Variable	Default Value	Form-input Value
ET (dermal exposure time - adult) hours/event	0.71	0.71
ET (dermal exposure time - child) hours/event	0.54	0.54
$ET_{n,2}$ (mutagenic inhalation exposure time first phase) hours/day	24	24
$ET_{_{2,6}}$ (mutagenic inhalation exposure time second phase) hours/day	24	24
$ET_{_{6.16}}$ (mutagenic inhalation exposure time third phase) hours/day	24	24
$ET_{_{16,26}}$ (mutagenic inhalation exposure time fourth phase) hours/day	24	24
$ET_{m_{e-2}}$ (inhalation exposure time - adult) hours/day	24	24
ET_{mex} (inhalation exposure time - child) hours/day	24	24
$EV_{a,2}$ (mutagenic events) per day	1	1
$EV_{2,e}$ (mutagenic events) per day	1	1
EV _{6.16} (mutagenic events) per day	1	1
EV _{16.26} (mutagenic events) per day	1	1
EV _{rac.a} (events - adult) per day	1	1
EV_{max} (events - child) per day	1	1
THQ (target hazard quotient) unitless	0.1	1
IFW recarii (adjusted intake factor) L/kg	327.95	327.95
IFWM	1019.9	1019.9
IRW_{n} (mutagenic water intake rate) L/day	0.78	0.78
IRW _{2.6} (mutagenic water intake rate) L/day	0.78	0.78
IRW 6.16 (mutagenic water intake rate) L/day	2.5	2.5
IRW ₁₆₂₆ (mutagenic water intake rate) L/day	2.5	2.5
IRW _{rac-a} (water intake rate - adult) L/day	2.5	2.5
IRW , water intake rate - child) L/day	0.78	0.78
K (volatilization factor of Andelman) L/m ³	0.5	0.5
LT (lifetime) years	70	70
$SA_{n,2}$ (mutagenic skin surface area) cm ²	6365	6365
SA _{2.6} (mutagenic skin surface area) cm ²	6365	6365
SA _{6.16} (mutagenic skin surface area) cm ⁻²	19652	19652
$SA_{16.76}$ (mutagenic skin surface area) cm ²	19652	19652
SA_{mean} (skin surface area - adult) cm ²	19652	19652
SA_{res-c} (skin surface area - child) cm ²	6365	6365

* Inputted values different from

defaults are highlighted.

Variable	Default Value	Form-input Value
$I_{\rm cc}$ (apparent thickness of stratum corneum) cm	0.001	0.001
TR (target risk) unitless	1.0E-06	1.0E-05

Site-specific Regional Screening Levels (RSL) for Soil to Groundwater

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Che T	emical ype	e mg/k)	SF g-day) ⁻¹	SF Ref	IUR (ug/m)	IUR ³) ⁻¹ Ref	RfD (mg/kg-day	RfD y) Ref	RfC (mg/m³)	RfC Ref	GIABS	ABS	S (mg/L)	K _d \ (cm³/g)
Tetrachloroethylene	127-18-4	No	Yes	Org	anics	2.10)E-03	υź	2.60E-	07 U	6.00E-03	U	4.00E-02	U	1	-	206	1.90E-01
K _o \ (cm ³ /g) 9.49E+01	on tion ^{or} (atmoss)	HLC (m³/mole) (0.0177 2	Henry's Law Constant unitless) 7.24E-01	H` and HLC Ref ∪	Norma Boiling Point BP (K) 394.15	BP Ref	Critic Temper TC (K) 620	cal ature :)	TC Ref U	Noncard A Ti (u 5.03	cinogenic SL dult H=1 g/L) 8E+01	Noncar C T (u 4.00	cinogenic SL :hild HI=1 ig/L) 5E+01	Car T	rcinoger SL R=1E-05 (ug/L) .13E+02	nic 5	Wate oncentr (Adul (mg/L 1.01E+	r ation t)) 00

Water	Water	Maximum Contaminant	Water				
Concentration (Child) (mg/L)	Concentration (Cancer) (mg/L)	Level (MCL) (ug/L)	Concentration (MCL) (mg/L)	MCL-based SL (mg/kg)	3	T	T
8.12E-01	2.26E+00	4.10E+01	8.20E-01	3.73E-01			

Vatten Associates User's Guide USEPA RSL Calculator

ATTACHMENT B

EXAMPLE USEPA RSL CALCULATOR OUTPUT

FOR

MASS-LIMITED LEACHING

OF

TETRACHLOROETHYLENE (PCE)

(*.PDF FORMAT)

* Inputted values different from

defaults are highlighted.

1

Variable	Default Value	Form-input Value
DAF (dilution attenuation factor) unitless	1	20
DAF (dilution attenuation factor) unitless	1	20
BW _{0.2} (mutagenic body weight) kg	15	15
BW _{2.6} (mutagenic body weight) kg	15	15
BW _{6.16} (mutagenic body weight) kg	80	80
BW _{16.26} (mutagenic body weight) kg	80	80
BW _{rec-a} (body weight - adult) kg	80	80
BW _{rec} (body weight - child) kg	15	15
DFW _{rec.arti} (age-adjusted dermal factor) cm ² -event/kg	2610650	2610650
DFWM _{recardi} (mutagenic age-adjusted dermal factor) cm ² -event/kg	8191633	8191633
ED _{ree} (exposure duration - resident) years	26	26
$ED_{n,2}$ (mutagenic exposure duration first phase) years	2	2
ED _{2.6} (mutagenic exposure duration second phase) years	4	4
ED _{6.16} (mutagenic exposure duration third phase) years	10	10
ED _{16.26} (mutagenic exposure duration fourth phase) years	10	10
ED _{reca} (exposure duration - adult) years	20	20
ED _{rec} (exposure duration - child) years	6	6
EF, (exposure frequency) days/year	350	350
$EF_{\mathfrak{a},\mathfrak{c}}$ (mutagenic exposure frequency first phase) days/year	350	350
EF _{2.6} (mutagenic exposure frequency second phase) days/year	350	350
$EF_{_{6,16}}$ (mutagenic exposure frequency third phase) days/year	350	350
EF _{16.26} (mutagenic exposure frequency fourth phase) days/year	350	350
EF _{ree-a} (exposure frequency - adult) days/year	350	350
EF rec (exposure frequency - child) days/year	350	350
ET _{rec} (exposure time) hours/day	24	24
ET_avent.rec.adj (age-adjusted exposure time) hours/event	0.67077	0.67077
ET _{avent.rec.madi} (mutagenic age-adjusted exposure time) hours/event	0.67077	0.67077
$ET_{n,2}$ (mutagenic dermal exposure time first phase) hours/event	0.54	0.54
$ET_{_{2,6}}$ (mutagenic dermal exposure time second phase) hours/event	0.54	0.54
$ET_{_{6.16}}$ (mutagenic dermal exposure time third phase) hours/event	0.71	0.71
$ET_{_{16:26}}$ (mutagenic dermal exposure time fourth phase) hours/event	0.71	0.71

* Inputted values different from

defaults are highlighted.

Variable	Default Value	Form-input Value
ET (dermal exposure time - adult) hours/event	0.71	0.71
ET (dermal exposure time - child) hours/event	0.54	0.54
$ET_{a,2}$ (mutagenic inhalation exposure time first phase) hours/day	24	24
$ET_{_{2,6}}$ (mutagenic inhalation exposure time second phase) hours/day	24	24
$ET_{_{\kappa_{16}}}$ (mutagenic inhalation exposure time third phase) hours/day	24	24
$ET_{_{16,26}}$ (mutagenic inhalation exposure time fourth phase) hours/day	24	24
ET_{mean} (inhalation exposure time - adult) hours/day	24	24
ET_{rec} (inhalation exposure time - child) hours/day	24	24
$EV_{\alpha,2}$ (mutagenic events) per day	1	1
$EV_{2.6}$ (mutagenic events) per day	1	1
EV _{6.16} (mutagenic events) per day	1	1
EV _{16.26} (mutagenic events) per day	1	1
EV _{rac.a} (events - adult) per day	1	1
EV _{res.} r (events - child) per day	1	1
THQ (target hazard quotient) unitless	0.1	1
IFW recardi (adjusted intake factor) L/kg	327.95	327.95
IFWM recent (mutagenic adjusted intake factor) L/kg	1019.9	1019.9
IRW _{0.2} (mutagenic water intake rate) L/day	0.78	0.78
IRW _{2.6} (mutagenic water intake rate) L/day	0.78	0.78
IRW 6.16 (mutagenic water intake rate) L/day	2.5	2.5
IRW ₁₆₂₆ (mutagenic water intake rate) L/day	2.5	2.5
IRW _{rac-a} (water intake rate - adult) L/day	2.5	2.5
IRW , water intake rate - child) L/day	0.78	0.78
K (volatilization factor of Andelman) L/m ³	0.5	0.5
LT (lifetime) years	70	70
$SA_{n,2}$ (mutagenic skin surface area) cm 2	6365	6365
SA _{2.6} (mutagenic skin surface area) cm ²	6365	6365
SA _{6.16} (mutagenic skin surface area) cm ⁻²	19652	19652
$SA_{16.76}$ (mutagenic skin surface area) cm ²	19652	19652
SA_{mean} (skin surface area - adult) cm ²	19652	19652
SA_{res-c} (skin surface area - child) cm ²	6365	6365

* Inputted values different from

defaults are highlighted.

Variable	Default Value	Form-input Value
$I_{\rm cc}$ (apparent thickness of stratum corneum) cm	0.001	0.001
TR (target risk) unitless	1.0E-06	1.0E-05

Site-specific Regional Screening Levels (RSL) for Soil to Groundwater

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = DWSHA; W = TEF applied; E = RPF applied; G = see user's guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Tetrachloroethylene 12 Dilution	27-18-4 No	Yes	0				-	(~ g/ /		(iiig/kg-ua)		(mg/m ⁻)	Rei	GIABS	ADD	(mg/L)	(cm³/g)
Dilution			Orga	nics	2.10)E-03	U 2	2.60E-0	7 U	6.00E-03	U	4.00E-02	U	1	-	206	1.90E-01
Attenuation Factor K _o \ (DAF) (cm ³ /g) (unitless)	HLC (atm-m³/mole)	Henry's Law Constant (unitless)	H`E and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critica Temperat TC (K)	al ture	TC Ref	oncarc S Ac TH (ug	cinogenic 5L Jult H=1 g/L) 5 + 01	Noncar C Ti (u	cinogenic SL hild HI=1 g/L)	Care TF	cinogen SL R=1E-05 (ug/L)	ic C	Water oncentra (Adult (mg/L	ation

Water	Water	Maximum Contaminant	Water		N		
Concentration	Concentration	Level	Concentration	MCL-based			
(Child) (mg/L)	(Cancer) (mg/L)	(MCL) (ug/L)	(MCL) (mg/L)	SL (mg/kg)			
8.12E-01	2.26E+00	4.10E+01	8.20E-01	2.30E+00			