ATTACHMENT D: EXAMPLE CALCULATIONS

Presents Example Calculations for Indirect Risks from Dioxin

Calculation of Adjusted Model Outputs

CONTAMINANT - TCDD				
			UNIT	UNIT
SOURCE	EMISSION RATE	Fv	DRY PARTICLE DEPOSITION	WET PARTICLE DEPOSITION
	g/sec	Unitless	g/m2/yr	g/m2/yr
CS - Arc. F. A Fug.	0	0.27	58.83418	2.3244
CS - Arc. F. B Fug.	0	0.27	58.83418	2.3244
CS - Baghouse A	0	0.27	2.20388	0.0259
CS - Baghouse B	0	0.27	0.03388	0.02154
CS - BH C, Arc F. A	0	0.27	0.04855	0.01338
CS - BH C, Arc F. B	0	0.27	0.04855	0.01338
NTC	8.62E-10	0.27	0.00478	0.00071
TXI	1.64E-08	0.27	0.00149	0.00959
Holnam	9.88E-10	0.27	0.00085	0.0005
TOTAL				
CONTAMINANT - TCDD				
			ACTUAL	ACTUAL
SOURCE	EMISSION RATE	Fv	DRY PARTICLE DEPOSITION	WET PARTICLE DEPOSITION
	g/sec	Unitless	g/m2/yr	g/m2/yr
CS - Arc. F. A Fug.	0	0.27	0	0
CS - Arc. F. B Fug.	0	0.27	0	0
CS - Baghouse A	0	0.27	0	0
CS - Baghouse B	0	0.27	0	0
CS - BH C, Arc F. A	0	0.27	0	0
CS - BH C, Arc F. B	0	0.27	0	0
NTC	8.62E-10	0.27	3.0078628E-12	4.467746E-13
TXI	1.64E-08	0.27	1.783828E-11	1.1481148E-10
Holnam	9.88E-10	0.27	6.13054E-13	3.6062E-13
TOTAL			2.15E-11	1.16E-10

Cancer Risk for Individual Chemicals for Adult Resident Scenario

Chemical	CR	HQ
2,3,7,8-TCDDioxin TEQ	2E-08	NA

Cancer Risk for Individual Chemicals for Adult Resident Scenario
Table 5.3.5

C R = (I*ED*EF*CSF)/(BW*AT*365)

CR	Individual lifetime cancer risk			(unitless)
I	Total daily intake of contamina	Table 5.3.4		(mg/day)
ED	Exposure duration		30	(yr)
EF	Exposure frequency		350	(day/yr)
BW	Body weight		70	(kg)
AT	Averaging time		70	(yr)
365	Units conversion factor		365	(day/yr)

Chemical	CR
2,3,7,8-TCDDioxin TEQ	1.8E-08

Total Daily Intake for Adult Resident Scenario
Table 5.3.4

I = Isoil + Iag + Idw

I	Total daily intake of contaminant		(mg/day)
Isoil	Daily intake of contaminant from soil	Table 5.3.1	(mg/day)
Iag	Daily intake of contaminant from agove-ground produce	Table 5.3.2	(mg/day)
Idw	Daily intake of contaminant from drinking water	Table 5.3.3	(mg/day)

Chemical Name	I (mg/day)
2,3,7,8-TCDDioxin TEQ	2.0E-11

Soil Intake for Adult Resident Scenario
Table 5.3.1

Isoil = Sc * CRsoil * Fsoil

Isoil	Daily intakeof soil			
Sc	Soil concentration	Table 4.1.1		(mg/kg)
CRsoil	Consuption rate of soil		0.0001	(kg/day)
Fsoil	Fraction of consumed soil contaminated		1	(unitless)

Chemical Name	Isoil (mg/day)
2,3,7,8-TCDDioxin TEQ	1.6E-11

Soil Concentration due to Deposition
Table 4.1.1

Average soil concentration over exposure duration Sc

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration		(mg/kg)	
Ds	Deposition term		(mg/kg-yr)	
Tc	Time period over which deposition occurs	Site specific	(yr)	IDETRAN
Sctc	Soil concentration at time Tc		(mg/kg)	
ks	Soil loss constant	Table 4.1.2	(yr^-1)	
T2	Exposure duration	Senario specific	(yr)	30 yrs

Soil concentration at time Tc Sctc

[Ds*(1-exp(-ks*Tc))]/ks

Depostion term Ds

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor		100	([mg-m^2]/[kg-cm^2])	
z	Soil mixing depth		1	(cm)	
BD	Soil bulk density		1.5	(g/cm^3)	
0.31536	Units conversion factor		0.31536	(m-g-s/cm-ug-yr)	
Vdv	Dry deposition velocity		3	(cm/s)	
Cyv	Normalized vapor phase air concentration	Modelled		(ug-s/g-m^2)	DISPC1-
Dywv	Normalized yearly wet deposition from vapor phase	Modelled		(s/m^2-yr)	DISPC1-
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Dywp	Normalized yearly wet deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.9E-07	2.9E-07	1.3E-08

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Soil Loss Constant
Table 4.1.2

ksl+kse+ksr+ksg+ksv

ks	Soil loss constant due to all processes		(yr^-1)
ksl	Loss constant due to leaching	Table 4.1.3	(yr^-1)
kse	Loss constant due to soil erosion		(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.1.4	(yr^-1)
ksg	Loss constant due to degradation	Chemical specific	(yr^-1)
ksv	Loss constant due to volatilization	Table 4.1.5	(yr^-1)

Chemical Name	ks (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Loss Constant Due to Leaching
Table 4.1.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching			(yr^-1)	
P	Average annual precipitation	Site specific		(cm/yr)	IDETRAN
I	Average annual irrigation	Site specific		(cm/yr)	IDETRAN
R	Average annual runoff	Site specific		(cm/yr)	IDETRAN
Ev	Average annual evapo-transporation	Site specific		(cm/yr)	IDETRAN
Qs	Soil volumetric water content		0.2	(mL/cm^3)	
z	Soil depth from which leaching removal occurs		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE

Chemical Name	ksl (yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05

Loss constant due to Runoff
Table 4.1.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff		(yr^-1)		
R	Average annual runoff	Site specific	(cm/yr)		IDETRAN
Qs	Soil volumetric water content	0.2	(cL/cm^3)		
z	Soil mixing depth	1	(cm)		
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)		IDECHE
BD	Soil bulk density	1.5	(g/cm^3)		

Chemical Name	ksr	(yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05	

Loss Constant due to Volitilization
Table 4.1.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization		(yr^-1)	
3.1536e7	Conversion constant		(s/yr)	
H	Henry's Law constant	Chemical specific	(atm-m^3/mol)	IDECHEM
z	Soil mixing depth	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHEM
R	Universal gas constant	8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density	1.5	(g/cm^3)	
T	Ambient air temperature	Site specific	(K)	IDETRAN-Tc
u	Average annual wind speed	Site specific	(m/s)	IDETRAN
ua	Viscosity of air	1.8E-04	(g/cm-s)	
pa	Density of air	1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific	(cm^2/s)	IDECHEM
A	Surface area of contaminated area	Site speficic	(m^2)	IDETRAN

Chemical Name	ksv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Above-Ground Produce Intake for Adult Resident Scenario
Table 5.3.2

(Pd+Pv+Pr)*CRag*Fag

Iag	Daily intake of contaminant from soil			(mg/day)
Pd	Concentration in above-ground produce due to deposition	Table 4.2.6		(mg/kg)
Pv	Concentration in above-ground produce due t air-to-plant transfer	Table 4.2.7		(mg/kg)
Pr	Concentration in above-ground produce due to root uptake	Table 4.2.8		(mg/kg)
CRag	Consumption rate of above-ground produce		0.0197	(kg/day)
Fag	Fraction of above-ground produce contaminated		0.25	(unitless)

Chemical Name	Iag (mg/day)
2,3,7,8-TCDDioxin TEQ	3.5E-12

Above-Ground Produce Concentration Due to Direct Deposition
Table 4.2.6

[[1000*(Dydp+(Fw*Dywp)]*Rp*[(1-exp(-kp*Tp)]]/(Yp*kp)

1000	Units conversion factor			(unitless)	
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Fw	Fraction of wet deposition that adheres to plant	Chemical specific		(unitless)	CHEMIC
Dywp	Yearly particle phase wet deposition rate	Modelled		(g/m^2/yr)	DISPC1-
Rp	Interception fraction of edible portion of plant		0.05	(unitless)	
kp	Plant surface loss coefficient		18	(yr^-1)	
Tp	Length of plant exposure to deposition of edible portion of plant, per harvest		0.16	(yrs)	
Yp	Yield or standing crop biomass of the edible portion of the plant		1.6	(kgDW/M^2)	

Chemical Name	Pd	(mg/kg)
2,3,7,8-TCDDioxin TEQ	1.2E-10	

Above-Ground Produce Concentration Due to Air-to-Plant Transfer
Table 4.2.7

(Cyv*Bv*VGag)/pa

Pv	Concentration of pollutant in the plant due to air-to-plant transfer		(mg/kg)	
Cyv	Normalized vapor phase air concentration	Modelled	(ug-sec/g-m^3)	DISPC1-
Bv	Air-to-plant biotransfer factor	Chemical specific	(mgplant/ugair)	CHEMIC
VGag	Empirical correction factor for above-ground produce	0.01	(unitless)	
pa	Density of air	1.2E+03	(g/m^3)	

Chemical Name	Pv (mg/kg)
2,3,7,8-TCDDioxin TEQ	7.0E-11

Above-Ground Produce Concentration Due to Root Uptake
Table 4.2.8

Sc*Br

Pr	Concentration of pollutant in the		(mg/kg)	
Sc	Average soil concentration of pollutant over exposure duration	Table 4.2.1	(mg/kg)	
Br	Plant-soil bioconcentration factor for above-ground produce	Chemical specific	(ug/gplant)/(ug/gsoil)	CHEMIC

Chemical Name	Pr (mg/kg)
2,3,7,8-TCDDioxin TEQ	5.2E-10

Soil Concentration due to Deposition
Table 4.2.1

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc))]]/(T2-T1)

Sc	Average soil concentration			(mg/kg)
Ds	Deposition term			(mg/kg-yr)
Tc	Time period over which deposition occurs	30	Site specific	(yr)
Sctc	Soil concentration at time Tc			(mg/kg)
ks	Soil loss constant		Table 4.1.2	(yr^-1)
T2	Exposure duration	30	Senario specific	(yr)
T1	Exposure duration	0	Senario specific	(yr)

[Ds*(1-exp(-ks*Tc))]/ks

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor			([mg-m^2]/[kg-cm^2])
z	Soil mixing depth	1		(cm)
BD	Soil bulk density	1.5		(g/cm^3)
0.31536	Units conversion factor	0.31536		(m-g-s/cm-ug-yr)
Vdv	Dry deposition velocity	3		(cm/s)
Cyv	Normalized vapor phase air concentration		Modelled	(ug-s/g-m^2)
Dywv	Normalized yearly wet deposition from vapor phase		Modelled	(s/m^2-yr)
Dydp	Normalized yearly dry deposition from particle phase		Modelled	(s/m^2-yr)
Dywp	Normalized yearly wet deposition from particle phase		Modelled	(s/m^2-yr)

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.6E-07	2.9E-07	1.3E-08

Soil Loss Constant
Table 4.2.2

ksl+kse+ksr+ksg+ksv

ks	Soil constatn due to leaching			(yr^-1)
kse	Loss constant due to soil erosion		0	(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.2.4		(yr^-1)
ksg	Loss constant due to degradation	Chemical specific		(yr^-1)
ksv	Loss constant due to volatilization	Table 4.2.5		(yr^-1)

Chemical Name	ks	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Loss Constant due to Degradation
Appendix A

ksg 0.0E+00

0.0E+00

Loss Constant Due to Leaching
Table 4.2.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching			(yr^-1)
P	Average annual precipitation	Site specific		(cm/yr)
I	Average annual irrigation	Site specific		(cm/yr)
R	Average annual runoff	Site specific		(cm/yr)
Ev	Average annual evapo-transporation	Site specific		(cm/yr)
Qs	Soil volumetric water content		0.2	(mL/cm^3)
z	Soil depth from which leaching removal occurs		1	(cm)
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)

Chemical Name	ksl	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05	

Loss Constant due to Runoff
Table 4.2.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff		(yr^-1)		
R	Average annual runoff	Site specific	(cm/yr)	IDETRAN	
Qs	Soil volumetric water content	0.2	(cL/cm^3)		
z	Soil mixing depth	1	(cm)		
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHEM	
BD	Soil bulk density	1.5	(g/cm^3)		

Chemical Name	ksr (yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05

Loss Constant due to Volitilization
Table 4.2.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization			(yr^-1)	
3.1536e7	Conversion constant			(s/yr)	
H	Henry's Law constant	Chemical specific		(atm-m^3/	IDECHE
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE
R	Universal gas constant		8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density		1.5	(g/cm^3)	
T	Ambient air temperature	Site specific		(K)	IDETRAN
u	Average annual wind speed	Site specific		(m/s)	IDETRAN
ua	Viscosity of air		1.8E-04	(g/cm-s)	
pa	Density of air		1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific		(cm^2/s)	IDECHE
A	Surface area of contaminated area	Site speficic		(m^2)	IDETRAN

Chemical Name	ksv (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Drinking Water Intake for Adult Resident Scenario
Table 5.3.3

Cdw*CRdw*Fdw

Idw	Daily intake of contaminant from drinking water			(mg/day)
Cdw	Dissolved contaminant concentration in drinking water	Table 4.4.24		(mg/L)
CRdw	Consumption rate of drinking water		1.4	(L/day)
Fdw	Fraction of drinking water contaminated		1	(unitless)

Chemical Name	Idw	(mg/day)
2,3,7,8-TCDDioxin TEQ	3.0E-13	

Dissolved Water Concentration
Table 4.4.24

Cwt/(1+Kdsw*TSS*1e-6)

Cdw	Dissolved phase water concentration		(mg/L)	
Cwt	Total concentration in water column	Table 4.5.23	(mg/L)	
Kdsw	Suspended sediment/surface water partition coefficient	Chemical specific	(L/kg)	CHEMIC
TSS	Total suspended solids	10	(mg/L)	
1e-6	Conversion factor	1.0E-06	(kg/mg)	

Chemical Name	Cdw (mg/L)
2,3,7,8-TCDDioxin TEQ	2.1E-13

Total Water Column Concentration
Table 4.4.23

Fwater*Cwtot*[(dw+db)/dw]

Cwr	Total concentration in water column		(mg/L)		
Fwater	Fraction of total water body contaminant concentration that occurs in the water column	Table 4.4.16	(unitless)		
Cwtot	Total water concentration in surface water system, including water column and bed sediment	Table 4.4.15	(mg/L)		
db	Depth of upper benthic layer	0.03	(m)		
dw	Depth of the water column	Site specific	(m)	IDESW-G	

Chemical Name	Cwt (mg/L)
2,3,7,8-TCDDioxin TEQ	2.1E-12

Total Waterbody Concentration
Table 4.4.15

Lt/[(Vfx*Fwater)+Kwt*WAw*(dw+db)]

Cwtot	Total water body concentration		(mg/L)	
Lt	Total chemical load into water body, including deposition, runoff and erosion	Table 4.4.7	(g/yr)	
Vfx	Average volumetric flow rate through water body	Site specific	(m^3/yr)	IDESW-E
Fwater	Fraction of total water body comtaminat concentration that occurs in the water column	Table 4.416	(unitless)	
kwt	Overall total waterbody dissipation rate constant	Table 4.4.17	(unitless)	
WAw	Waterbody surface area	Site specific	(m^3)	IDESW-B
dw	Depth of water column	Site specific	(m)	IDESW-G
db	Depth of upper benthic layer	0.03	(m)	

Chemical Name	Cwtot	(mg/L)
2,3,7,8-TCDDioxin TEQ	2.1E-10	

Fraction in Water Column and Benthic Sediment
Table 4.4.16

[(1+Kdsw*TSS*1e-6)*(dw/(dw+db))]/[(1+Kdsw*TSS*1e-6)*(dw/(dw+db)+(Qbs+Kdbs*BS)*db/(dw+db)]

Fwater	Fraction of total water body contaminant concentration that occurs in the water column		(unitless)	
Kdsw	Suspended sediment/surface partition coeficient	Chemical specific	(L/kg)	CHEMIC
TSS	Total suspended solids	10	(mg/L)	
1e-6	Conversion factor	1.0E-06	(kg/mg)	
dw	Depthof water column	Site specific	(m)	IDESW-G
db	Depth of upper benthic layer	0.03	(m)	
dz	Total waterbody depth	(dw+db)	(m)	16.53
Qbs	Bed sediment porosity	0.6	(Lwater/L)	
Kdbs	Bed sediment/sediment pore water partition coefficient	Chemical specific	(L/kg)	CHEMIC
BS	Bed sediment concentration	1	(g/cm^3)	

1-Fwater

Fbenth	Fraction of total water body contaminant concentration that occurs in the benthic		(unitless)

Chemical Name	Fwater	(unitless)	Fbenthic (unitless)
2,3,7,8-TCDDioxin TEQ	1.0E-02		9.9E-01

Total Waterbody Load
Table 4.4.7

Ldep+Ldif+Lri+Lr+Le

Lt	Total contaminant load to the water		(g/yr)
Ldep	Total particle phase and wet phase contaminant direct deposition load to waterbody	Table 4.4.8	(g/yr)
Ldiff	Vapor phase contaminat diffusion load to waterbody	Table 4.4.12	(g/yr)
Lri	Rnoff load from impervious surfaces	Table 4.4.9	(g/yr)
Lr	Runoff load from pervious surfaces	Table 4.4.10	(g/yr)
Le	Soil erosion load	Table 4.4.11	(g/yr)

Chemical Name	Lt (g/yr)
2,3,7,8-TCDDioxin TEQ	7.2E-01

Overall Total Waterbody Dissipation Rate Constant
Table 4.4.17

(Fwater*kv)+(Fbenthic*kb)

kwt	Overall total waterbody dissipation rate constant		(yr^-1)
fwater	Fraction of total waterbody contaminant concentreation that occurs in the water column	Table 4.4.16	
kv	Water column volatilization rate	Table 4.4.18	(yr^-1)
fbenth	Fraction o total waterbody contaminant concentreation that occurs in the benthic sediments	Table 4.4.16	
kb	Benthic burial rate constant	Table 4.4.22	(yr^-1)

Chemical Name	Kwt	(yr^-1)
2,3,7,8-TCDDioxin TEQ	6.6E+00	

Deposition to Waterbody
Table 4.4.8

(Dywwv+Dytwp)*WAw

Ldep	Total particle phase and wet phase contaminant direct load to waterbody		(g/yr)
Dywwv	Normalized yearly watershed average wet deposition from vapor phase	Modeled	(s/m^2-Yr
Dytwp	Normalized yearly watershed average total deposition from particle phase	Modeled	(s/m^2-Yr
WAw	Water body area	Site-specific	(m^2)

Chemical Name	Ldep (g/yr)
2,3,7,8-TCDDioxin TEQ	2.7E-03

Diffusion Load to Waterbody
Table 4.4.12

(Kv*Cywv*WAw*1e-6)/[(H/(R*T)]

Ldif	Dry vapor phase contaminant diffusion load to waterbody			(g/yr)
Kv	Diffusive mass transfer coefficient	Tabel 4.4.19		(m/yr)
Cywv	Normalized yearly watershed average vapor phase air concentration	Modeled		(ug-s/g-m^3)
WAw	Waterbody surface area	Site-specific		(m^2)
H	Henry's Law constant	Chemical-specific		(atm-m^3/mol)
R	Universal gas constant		8.1E-05	(atm-m^3/mol-K)
Tw	Waterbody temperature		298	(K)
1e-6	Conversion factor		1.0E-06	(g/ug)

Chemical Name	Ldif	(g/yr)
2,3,7,8-TCDDioxin TEQ	6.6E-01	

Impervious Runoff Load to Waterbody
Table 4.4.9

(Dywwv+Dytwp)*WAi

Lri	Impervious surface runoff load		(g/yr)
WAi	Impervious watershed area receiving pollutant deposition	Site-specific	(m^2)
Dywwv	Normalized yearly watershed average wet deposition from vapor phase	Modeled	(s/m^2-yr)
Dytwp	Normalized yearly watershed average total deposition from particle phase	Modeled	(s/m^2-yr)

Chemical Name	Lri (g/yr)
2,3,7,8-TCDDioxin TEQ	8.1E-04

Impervious Runoff Load to Waterbody
Table 4.4.9

(Dywwv+Dytwp)*WAi

Lri	Impervious surface runoff load		(g/yr)
WAi	Impervious watershed area receiving pollutant deposition	Site-specific	(m^2)
Dywwv	Normalized yearly watershed average wet deposition from vapor phase	Modeled	(s/m^2-yr)
Dytwp	Normalized yearly watershed average total deposition from particle phase	Modeled	(s/m^2-yr)

Chemical Name	Lri (g/yr)
2,3,7,8-TCDDioxin TEQ	8.1E-04

Pervious Runoff Load to Waterbody
Table 4.4.10

R*(WAI-WAi)*[(Sc*1.5*.01)/(.2+(1.5*2.8e+5))]

Lr	Pervious surface runoff load			(g/yr)
R	Average annual surface runoff	Sit-specific		(cm/yr)
Sc	Pollutant concentration in watershed soils	Table 4.4.1		(mg/kg)
Bd	Soil bulk density		1.5	(g/cm^3)
Kds	Soil-water partition coefficient	Chemical-specific		(L/kg)
WAI	Total watershed area receiving pollutant deposition	Site-specific		(m^2)
WAi	Impervious watershed area receiving pollutant deposition	Site-specific		(m^2)
0.01	Conversion factor		0.01	(kg-cm^2/mg-m^2)
Qs	Volumetric soil water content		0.2	(cm^3/cm^3)

Chemical Name	Lr	(g/yr)
2,3,7,8-TCDDioxin TEQ	2.2E-05	

Erosion Load to Waterbody
Table 4.4.11

Xe*(WAI-WAi)*SD*3*[(Sc*2.8e+5*1.5)/(.2+2.8e+5*1.5)]*.001

Le	Soil erosion load			(g/yr)
Xe	Unit soil loss	Table 4.4.13		(kg/m^2/yr)
Sc	Pollutant concentration in watershed soils	Table 4.4.1		(mg/kg)
BD	Soil bulk density		1.5	(g/cm^3)
Qs	Volumetric soil water content		0.2	(cm^3/cm^3)
Kds	Soil-water partition coefficient	Chemical-specific		(L/kg)
WAI	Total watershed area recieving pollutant deposition	Site-specific		(m^2)
WAi	Impervious watershed area recieving pollutant deposition	Site-specific		(m^2)
SD	Watershed sediment delivery ratio	Table 4.4.14		(unitless)
ER	Soil snrichment ratio		3	(unitless)
0.001	Conversion factor		0.001	[(g/kg)]/[(mg/kg)]

Chemical Name	Le (g/yr)
2,3,7,8-TCDDioxin TEQ	5.4E-02

Water Column Volatiliziation Loss Rate Constant
Table 4.4.18

Kv/[(dw+.03)*(1+2.1e+6*10*1e-6)]

kv	Water column volatilzation rate		(yr^-1)
Kv	Overall transfer rate	Table 4.4.19	(m/yr)
dz	Total waterbody depth	dw+db	(m)
Kdsw	Suspended sediments/surface water partition coefficient	Chemical-specific	(L/kg)
TSS	Total suspended solids	10	(mg/L)
1e-6	Conversion factor	1.0E-06	(kg/mg)

Chemical Name	kv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	6.5E+02	

Benthic Burial Rate Constant
Table 4.4.22

[(Xe*WAl*SD*1e+3-Vfx*10)/(WAw*10)]/[(10*1e-6)/(1*.03)]

kb	Benthic burial rate constant		(yr^-1)
Xe	Unit soil loss	Table 4.4.13	(kg/m^2/yr)
WAl	Watershed area recieving fallo	Site-specific	(m^2)
SD	Watershed sediment delivery ratio	Table 4.4.14	(unitless)
1e3	Conversion factor	1.0E+03	(g/kg)
Vfx	Average volumetric flow rate through watershed	Site-specific	(m^3/yr)
TSS	Total suspended solids	10	(mg/L)
WAw	Waterbody surface area	Site-specific	(m^2)
BS	Benthic soilds concentration	1	(kg/L)
db	Depth of upper benthic sedime layer	0.03	(m)
1e-6	Conversion factor	1.0E-06	(kg/mg)

Chemical Name	kb (yr^-1)			
2,3,7,8-TCDDioxin TEQ	1.4E-01	4.3E+02	3.3E-04	

Overall Transfer Rate
Table 4.4.19

[Kl^-1+[(Kg*H)/(Rg*Tw)]^-1]^-1*Q^(Tw-2)

Kv	Overall transfer rate			(m/yr)
Kl	Liquid phase transfer coefficien	Tabel 4.4.20		(m/yr)
Kg	Gas phase transfer coefficient	Table 4.4.21		(m/yr)
H	Henry's Law constant	Chemical-specific		(atm-m^3/mol)
Rg	Universal gas constant		8.1E-05	(atm-m^3/mol-K)
Tw	Waterbody temperature		298	(K)
Q	Temperature correction factor		1.026	(unitless)

Chemical Name	Kv	(m/yr)
2,3,7,8-TCDDioxin TEQ	1.2E+05	

Watershed Soil Concentration Due to Deposition
Table 4.4.1

Average soil concentration over exposure duration Sc

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration over exposure duration			(mg/kg)
Ds	Depostion term			(mg/kg-yr)
Tc	Time period over which deposition occurs	Site-specific		(yr)
Sctc	Soil concentration at time Tc			(mg/kg)
ks	Soil loss constant	Table 4.4.2		(yr^-1)
T2	Exposure duration		30	(yr)
T1	Time at beginning of exposure		0	(yr)

Soil concentration at time Tc Sctc

[Ds*(1-exp(-ks*Tc))]/ks

Sctc	Soil concentration at time Tc		(mg/kg)
Ds	Depostion term		(mg/kg-yr)
ks	Soil loss constant	Table 4.4.2	(yr^-1)
T2	Exposure duration	Scenario-specific	(yr)

Depostion term Ds

[100*[[.31536*Vdv*Cywv]+Dywwv+Dytwp]]/z*BD

Ds	Depostion term			(mg/kg-yr)	
Vdv	Dry deposition velocuty		3	(cm/s)	
Cywv	Normalized yearly watershed average vapor phase air concentration	Modeled		(ug-s/g-m^3)	DISPERS
Dywwv	Normalized yearly watershed	Modeled		(s/m^2-yr)	DISPERS

		average wet deposition from vapor phase			
	Dytwp	Normalized yearly watershed average total (wet and dry) deposition from particle phase	Modeled	(s/m^2-yr)	DISPERS
	BD	Soil bulk density	1.5	(g/cm^3)	
	z	Soil mixing depth	1	(cm)	
	100	Units conversion factor		[mg-m^2]/[kg-cm^2]	

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.4E-07	1.9E-07	1.9E-08

Universal Soil Loss Equation (USLE)
Table 4.4.13

(RF*K*LS*C*PF*(907.18/4047)

Xe	Unit soil loss		(kg/m^2/yr)
RF	USLE rainfall factor	Site-specific	(yr^-1)
K	USLE erodibility factor	0.36	(ton/acre)
LS	USLE length-slope factor	1.5	(unitless)
C	USLE cover management factor	0.1	(unitless)
PF	USLE supporting praciice factor	1	(unitless)
907.18	Conversion factor	907.18	(kg/ton)
4047	Conversion factor	4047	(m^2/acre)

Chemical Name	Xe (kg/m^2/yr)
2,3,7,8-TCDDioxin TEQ	3.6E+00

Sediment Delivery Ratio
Table 4.4.14

a*(WAI)^-.125

SD	Watershed sediment delivery ratio		(unitless)	
WAI	Watershed area recieving fallout	Site-specific	(m^2)	IDESW
a	Empirical intercept coefficient	Watershed-specific	(unitless)	
b	Empirical slope coefficient	0.125	(unitless)	

Chemical Name	SD
2,3,7,8-TCDDioxin TEQ	1.0E-01

Liquid Phase Transfer Coefficient (Quiescent lake or pond)
Table 4.4.20

(Cd^0.5*W)*(pa/pw)^0.5*(vk^0.33/y2)*(uw/(pw*Dw))^-0.67*31500000)

Kl	Liquid phase transfer coefficient		(m/yr)
Dw	Diffusivity of chemical in water	Chemical-specific	(cm^2/s)
Cd	Drag coefficient	0.0011	(unitless)
W	Wind velocity, 10 m above water Surface	Site-specific	(m/s)
pa	Density of air corresponding to water temperature	1.2E-03	(g/cm^3)
pw	Density of water corresponding to water temperature	1	(g/cm^2)
vk	von Karman's constant	0.4	(unitless)
y2	Dimensionless viscous sublayer thickness	4	(unitless)
uw	Viscosity of water corresponding to the water temperature	1.7E-02	(g/cm-s)
3.15e7	Conversion constant	3.2E+07	(s/yr)

Chemical Name	Kl (m/yr)
2,3,7,8-TCDDioxin TEQ	2.0E+02

Gas Phase Transfer Coefficient (Quiescent lake or pond)
Table 4.4.21

(Cd^.5*W)*(vk^.33/y2)*[ua/(pa*Da)]^-.67*3.15e+7

Kg	Gas phase transfer coefficient			(m/yr)
Cd	Drag coefficient		0.0011	(unitless)
W	Wind velocity, 10 m above water surface	Site-specific		(m/s)
vk	van Karman's constant		0.4	(unitless)
y2	Dimensionless viscous sublayer thickness		4	(unitless)
ua	Viscosity of air corresponding to the air temperature		1.8E-04	(g/cm-s)
pa	Density of air corresponding to water temperature		1.2E-03	(g/cm^3)
Da	Diffusivity of chemical in air	Chemical-specific		(cm^2/s)
3.15e7	Conversion constatn		3.2E+07	(s/yr)

Chemical Name	Kg (m/yr)
2,3,7,8-TCDDioxin TEQ	4.5E+05

Soil Loss Constant
Table 4.4.2

ksl+kse+ksr+ksg+ksv

ks	Soil loss constant due to all processes		(yr^-1)
ksl	Loss constant due to leaching	Table 4.4.3	(yr^-1)
kse	Los constan due to soil erosion	Talbe 4.4.4	(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.4.5	(yr^-1)
ksg	Loss constant due to degradation	Chemical-specific	(yr^-1)
ksv	Loss constan due to volatilization	Table 4.4.6	(yr^-1)

Chemical Name	ks (yr^-1)
2,3,7,8-TCDDioxin TEQ	9.2E-02

Loss Constant Due to Leaching
Table 4.4.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/BD))]

ksl	Loss constant due to leaching			(yr^-1)
P	Average annual precipitation	Site-specific		(cm/yr)
I	Average annual irrigation	Site-specific		(cm/yr)
R	Average annual runoff	Site-specific		(cm/yr)
Ev	Average annual evapotranspiration	Site-specific		(cm/yr)
Qs	Soil volumetric water content		0.2	(mL/cm^3)
z	Soil depth from which leaching removal occurs		1	(cm)
Kds	Soil-water partition coefficient	Chemical-specific		(cm^3/g)
BD	Soil bulkdensity		1.5	(g/cm^3)

Chemical Name	ksl (yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05

Loss Constant due to Erosion
Table 4.4.4

[(.1*Xe*SD*ER)/(BD*z)]*[(Kds*BD)/(Qs+(Kds*BD))]

kse	Loss constant due to erosion			(yr^-1)	
Xe	Unit soil loss	Table 4.4.13		(kg/m^2/yr)	
SD	Sediment delivery ration	Table 4.4.14		(unitless)	
ER	Contaminant enrichment ratio		3	(unitless)	
z	Soil mixing depth		1	(cm)	
Qs	Soil volumetric water content		0.2	(mL/cm^3)	
Kds	Soil-water partition coefficient	Chemical-specific		(cm^3/g)	Chemical
BD	Soil bulk density		1.5	(g/cm^3)	

Chemical Name	kse	(yr^-1)
2,3,7,8-TCDDioxin TEQ	7.4E-02	

Loss constant due to Runoff
Table 4.4.5

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff		(yr^-1)		
R	Average annual runoff	Site specific	(cm/yr)		IDETRAN
Qs	Soil volumetric water content	0.2	(mL/cm^3)		
z	Soil mixing depth	1	(cm)		
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)		IDECHE
BD	Soil bulk density	1.5	(g/cm^3)		

Chemical Name	ksr	(yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05	

Loss Constant due to Volitilization
Table 4.4.6

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da))^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization			(yr^-1)	
3.1536e7	Conversion constant		3.2E+07	(s/yr)	
H	Henry's Law constant	Chemical specific		(atm-m^3/mol)	IDECHEM
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHEM
R	Universal Gas constant		8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density		1.5	(g/cm^3)	
T	Ambient air temperature	Site specific		(K)	IDETRAN-Tc
u	Average annual wind speed	Site specific		(m/s)	IDETRAN
ua	Viscosity of air		1.8E-04	(g/cm-s)	
pa	Density of air		1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific		(cm^2/s)	IDECHEM
A	Surface area of contaminated area	Site speficic		(m^2)	IDESW

Chemical Name	ksv (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Cancer Risk for Individual Chemicals for Subsistence Farmer Scenario

Chemical	CR	HQ
2,3,7,8-TCDDioxin TEQ	1E-06	NA

Cancer Risk for Individual Chemicals for Subsistence Farmer Scenario
Table 5.1.6

C R = (I*ED*EF*CSF)/(BW*AT*365)

CR	Individual lifetime cancer risk			(unitless)
I	Total daily intake of contamina	Table 5.1.5		(mg/day)
ED	Exposure duration		40	(yr)
EF	Exposure frequency		350	(day/yr)
BW	Body weight		70	(kg)
AT	Averaging time		70	(yr)
365	Units conversion factor		365	(day/yr)

Chemical	CR
2,3,7,8-TCDDioxin TEQ	1.0E-06

Hazard Quotient for Individual Chemicals for Subsi
Table 5.1.7

HQ = I/(BW*RfD)

HQ	Hazard Quotient			(unitless)
I	Total daily intake of contaminant	Table 5.1.4		(mg/day)
BW	Body weight		70	(kg)
RfD	Reference dose	Chemical-specific		(mg/kg/da

Chemical Name	HQ	(unitless)
2,3,7,8-TCDDioxin TEQ	NA	

Total Daily Intake for Subsistence Farmer Scenario
Table 5.1.5

I = Isoil + Iag + Ibeef + Imilk + Idw

I	Total daily intake of contaminant		(mg/day)
Isoil	Daily intake of contaminant from soil	Table 5.1.1	(mg/day)
Iag	Daily intake of contaminant agove-ground produce	Table 5.1.2	(mg/day)
Ibeef	Daily intake of contaminant from beef	Table 5.1.3	(mg/day)
Imilk	Daily intake of contaminant from milk	Table 5.1.3	(mg/day)
Idw	Daily intake of contaminant from drinking water	Table 5.1.4	(mg/day)

Chemical Name	I (mg/day)
2,3,7,8-TCDDioxin TEQ	8.4E-10

Soil Intake for Subsistence Farmer Scenario
Table 5.1.1

Isoil = Sc * CRsoil * Fsoil

Isoil	Daily intakeof soil			
Sc	Soil concentration	Table 4.1.1		(mg/kg)
CRsoil	Consuption rate of soil		0.0001	(kg/day)
Fsoil	Fraction of consumed soil contaminated		1	(unitless)

Chemical Name	Isoil	(mg/day)
2,3,7,8-TCDDioxin TEQ	2.0E-11	

Soil Concentration due to Deposition
Table 4.1.1

Average soil concentration over exposure duration — Sc

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration		(mg/kg)	
Ds	Deposition term		(mg/kg-yr)	
Tc	Time period over which deposition occurs	Site specific	(yr)	IDETRAN
Sctc	Soil concentration at time Tc		(mg/kg)	
ks	Soil loss constant	Table 4.1.2	(yr^-1)	
T2	Exposure duration	Senario specific	(yr)	30 yrs

Soil concentration at time Tc — Sctc

[Ds*(1-exp(-ks*Tc))]/ks

Depostion term — Ds

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor		100	([mg-m^2]/[kg-cm^2])	
z	Soil mixing depth		1	(cm)	
BD	Soil bulk density		1.5	(g/cm^3)	
0.31536	Units conversion factor		0.31536	(m-g-s/cm-ug-yr)	
Vdv	Dry deposition velocity		3	(cm/s)	
Cyv	Normalized vapor phase air concentration	Modelled		(ug-s/g-m^2)	DISPC1-
Dywv	Normalized yearly wet deposition from vapor phase	Modelled		(s/m^2-yr)	DISPC1-
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Dywp	Normalized yearly wet deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	2.0E-07	3.6E-07	1.3E-08

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Soil Loss Constant
Table 4.1.2

ksl+kse+ksr+ksg+ksv

ks	Soil loss constant due to all processes		(yr^-1)
ksl	Loss constant due to leaching	Table 4.1.3	(yr^-1)
kse	Loss constant due to soil erosion		(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.1.4	(yr^-1)
ksg	Loss constant due to degradation	Chemical specific	(yr^-1)
ksv	Loss constant due to volatilization	Table 4.1.5	(yr^-1)

Chemical Name	ks	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Loss Constant Due to Leaching
Table 4.1.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching			(yr^-1)	
P	Average annual precipitation	Site specific		(cm/yr)	IDETRAN
I	Average annual irrigation	Site specific		(cm/yr)	IDETRAN
R	Average annual runoff	Site specific		(cm/yr)	IDETRAN
Ev	Average annual evapo-transporation	Site specific		(cm/yr)	IDETRAN
Qs	Soil volumetric water content		0.2	(mL/cm^3)	
z	Soil depth from which leaching removal occurs		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE

Chemical Name	ksl	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05	

Loss constant due to Runoff
Table 4.1.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff			(yr^-1)	
R	Average annual runoff	Site specific		(cm/yr)	IDETRAN
Qs	Soil volumetric water content		0.2	(cL/cm^3)	
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE
BD	Soil bulk density		1.5	(g/cm^3)	

Chemical Name	ksr	(yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05	

Loss Constant due to Volitilization
Table 4.1.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization		(yr^-1)	
3.1536e7	Conversion constant		(s/yr)	
H	Henry's Law constant	Chemical specific	(atm-m^3/mol)	IDECHEM
z	Soil mixing depth	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHEM
R	Universal gas constant	8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density	1.5E+00	(g/cm^3)	
T	Ambient air temperature	Site specific	(K)	IDETRAN-Tc
u	Average annual wind speed	Site specific	(m/s)	IDETRAN
ua	Viscosity of air	1.8E-04	(g/cm-s)	
pa	Density of air	1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific	(cm^2/s)	IDECHEM
A	Surface area of contaminated area	Site speficic	(m^2)	IDETRAN

Chemical Name	ksv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Above-Ground Produce Intake for Subsistence Farmer Scenario
Table 5.1.2

(Pd+Pv+Pr)*CRag*Fag

Iag	Daily intake of contaminant from soil		(mg/day)
Pd	Concentration in above-ground produce due to deposition	Table 4.2.6	(mg/kg)
Pv	Concentration in above-ground produce due t air-to-plant transfer	Table 4.2.7	(mg/kg)
Pr	Concentration in above-ground produce due to root uptake	Table 4.2.8	(mg/kg)
CRag	Consumption rate of above-ground produce	0.028	(kg/day)
Fag	Fraction of above-ground produce contaminated	1	(unitless)

Chemical Name	Iag	(mg/day)
2,3,7,8-TCDDioxin TEQ	2.0E-11	

Above-Ground Produce Concentration Due to Direct Deposition
Table 4.2.6

[[1000*(Dydp+(Fw*Dywp)]*Rp*[(1-exp(-kp*Tp)]]/(Yp*kp)

1000	Units conversion factor			(unitless)	
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Fw	Fraction of wet deposition that adheres to plant	Chemical specific		(unitless)	CHEMIC
Dywp	Yearly particle phase wet deposition rate	Modelled		(g/m^2/yr)	DISPC1-
Rp	Intercetion fraction of edible portion of plant		0.04	(unitless)	
kp	Plant surface loss coefficient		18	(yr^-1)	
Tp	Length of plant exposure to deposition of edible portion of plant, per harvest		0.16	(yrs)	
Yp	Yield or standing crop biomass of the edible portion of the plant		1.7	(kgDW/M^2)	

Chemical Name	Pd (mg/kg)
2,3,7,8-TCDDioxin TEQ	1.1E-10

Above-Ground Produce Concentration Due to Air-to-Plant Transfer
Table 4.2.7

(Cyv*Bv*VGag)/pa

Pv	Concentration of pollutant in the plant due to air-to-plant transfer		(mg/kg)	
Cyv	Normalized vapor phase air concentration	Modelled	(ug-sec/g-m^3)	DISPC1-
Bv	Air-to-plant biotransfer factor	Chemical specific	(mgplant/ugair)	CHEMIC
VGag	Empirical correction factor for above-ground produce	0.01	(unitless)	
pa	Density of air	1.2E+03	(g/m^3)	

Chemical Name	Pv (mg/kg)
2,3,7,8-TCDDioxin TEQ	7.0E-11

Above-Ground Produce Concentration Due to Root Uptake
Table 4.2.8

Sc*Br

Pr	Concentration of pollutant in the		(mg/kg)	
Sc	Average soil concentration of pollutant over exposure duration	Table 4.2.1	(mg/kg)	
Br	Plant-soil bioconcentration factor for above-ground produce	Chemical specific	(ug/gplant)/(ug/gsoil)	CHEMIC

Chemical Name	Pr (mg/kg)
2,3,7,8-TCDDioxin TEQ	5.2E-10

Soil Concentration due to Deposition
Table 4.2.1

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration			(mg/kg)
Ds	Deposition term			(mg/kg-yr)
Tc	Time period over which deposition occurs	30	Site specific	(yr)
Sctc	Soil concentration at time Tc			(mg/kg)
ks	Soil loss constant		Table 4.1.2	(yr^-1)
T2	Exposure duration	30	Senario specific	(yr)
T1	Exposure duration	0	Senario specific	(yr)

[Ds*(1-exp(-ks*Tc))]/ks

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor			([mg-m^2]/[kg-cm^2])
z	Soil mixing depth		1	(cm)
BD	Soil bulk density		1.5	(g/cm^3)
0.31536	Units conversion factor		0.31536	(m-g-s/cm-ug-yr)
Vdv	Dry deposition velocity		3	(cm/s)
Cyv	Normalized vapor phase air concentration	Modelled		(ug-s/g-m^2)
Dywv	Normalized yearly wet deposition from vapor phase	Modelled		(s/m^2-yr)
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)
Dywp	Normalized yearly wet deposition from particle phase	Modelled		(s/m^2-yr)

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.6E-07	2.9E-07	1.3E-08

Soil Loss Constant
Table 4.2.2

ksl+kse+ksr+ksg+ksv

ks	Soil constatn due to leaching		(yr^-1)
kse	Loss constant due to soil erosion	0	(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.2.4	(yr^-1)
ksg	Loss constant due to degradation	Chemical specific	(yr^-1)
ksv	Loss constant due to volatilization	Table 4.2.5	(yr^-1)

Chemical Name	ks (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Loss Constant due to Degradation
Appendix A

ksg 0.0E+00

0.0E+00

Loss Constant Due to Leaching
Table 4.2.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching			(yr^-1)
P	Average annual precipitation	Site specific		(cm/yr)
I	Average annual irrigation	Site specific		(cm/yr)
R	Average annual runoff	Site specific		(cm/yr)
Ev	Average annual evapo-transporation	Site specific		(cm/yr)
Qs	Soil volumetric water content		0.2	(mL/cm^3)
z	Soil depth from which leaching removal occurs		1	(cm)
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)

Chemical Name	ksl	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05	

Loss Constant due to Runoff
Table 4.2.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff		(yr^-1)		
R	Average annual runoff	Site specific	(cm/yr)	IDETRAN	
Qs	Soil volumetric water content	0.2	(cL/cm^3)		
z	Soil mixing depth	1	(cm)		
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHEM	
BD	Soil bulk density	1.5	(g/cm^3)		

Chemical Name	ksr (yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05

Loss Constant due to Volitilization
Table 4.2.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization		(yr^-1)	
3.1536e7	Conversion constant		(s/yr)	
H	Henry's Law constant	Chemical specific	(atm-m^3/	IDECHE
z	Soil mixing depth	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHE
R	Universal gas constant	8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density	1.5	(g/cm^3)	
T	Ambient air temperature	Site specific	(K)	IDETRAN
u	Average annual wind speed	Site specific	(m/s)	IDETRAN
ua	Viscosity of air	1.8E-04	(g/cm-s)	
pa	Density of air	1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific	(cm^2/s)	IDECHE
A	Surface area of contaminated area	Site speficic	(m^2)	IDETRAN

Chemical Name	ksv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Beef and Milk Intake for Subsistence Farmer Scenario
Talbe 5.1.3

Ibeef = Tbeef * CRbeef * Fbeef

Imilk = Amilk * CRmilk * Fmilk

Ibeef	Daily intake of comtaminated beef		(mg/kg)
Abeef	Concentration in beef	Table 4.3.9	(mg/kg)
CRbeef	Consumption rate of beef	0.057	(kg/day)
Fbeef	Fraction of beef contaminated	1	(unitless)
Imilk	Daily intake of comtaminated milk		(mg/kg)
Amilk	Concentration in milk	Table 4.3.10	(mg/kg)
CRmilk	Consumption rate of milk	0.18	(kg/day)
Fmilk	Fraction of milk contaminated	1	(unitless)

Chemical Name	Ibeef (mg/kg)	Imilk (mg/kg)
2,3,7,8-TCDDioxin TEQ	4.9E-10	3.1E-10

Beef Concentration due to Plant and Soil Ingestion
Table 4.3.9

Abeef = (F * Qp * Pe + Qs * Sc) * Babeef

Abeef	Concentration of pollutant in beef			(mg/kg)
F	Franction of plant grown on contaminated soil and eaten by animal		1	(unitless)
Qp	Quantity of plant eaten by the animal each day		6.76	(kg/day)
Pe	Total concentration of pollutant in the plant eaten by animal	Table 4.3.6, 4.3.7, 4.3.8		(mg/kg)
Qs	Quantity of soil eaten by animal		0.5	(kg/day)
Sc	Soil concentration	Table 4.1.1		(mg/kg)
Babeef	Biotransfer factor for beef	Chemical-specific		(d/kg)

Chemical Name	Abeef	(mg/kg)
2,3,7,8-TCDDioxin TEQ	8.6E-09	

Total con

Pe = Pd + Pv + Pr

Chemical Name	
2,3,7,8-TCDDioxin TEQ	1.7E-08

Above-Ground Produce Concentration Due to Direct Deposition
Table 4.2.6

Pd = [[1000*(Dydp+(Fw*Dywp)]*Rp*[(1-exp(-kp*Tp)]]/(Yp*kp)

1000	Units conversion factor		(unitless)	
Dydp	Normalized yearly dry deposition from particle phase	Modelled	(s/m^2-yr)	DISPC1-
Fw	Fraction of wet deposition that adheres to plant	Chemical	(unitless)	CHEMIC
Dywp	Yearly particle phase wet deposition rate	Modelled	(g/m^2/yr)	DISPC1-
Rp	Intercetion fraction of edible portion of plant	0.5	(unitless)	
kp	Plant surface loss coefficient	18	(yr^-1)	
Tp	Length of plant exposure to deposition of edible portion of plant, per harvest	0.12	(yrs)	
Yp	Yield or standing crop biomass of the edible portion of the plant	0.24	(kgDW/M^2)	

Chemical Name	Pd	(mg/kg)
2,3,7,8-TCDDioxin TEQ	9.3E-09	

Forage (Pasture Grass/Hay) concentration due to Air-to-Plant Transf
Table 4.3.7

Pv = (Cyv*Bv*VGag)/pa

Pv	Concentration of pollutant in the plant due to air-to-plant transfer		(mg/kg)
Cyv	Vapor phase air concentration of pollutant in air due to direct emissions	Modeled	(ug/m2)
Bv	Air-to-plant biotransfer factor	Chemical-specific	[(mg/kg)]/
VGag	Empirical correction factor that reduces produce concentration because Bv was developed for azalea leaves	1	(unitless)
pa	Density of air	1.2E+03	(g/m3)

Chemical Name	Pv
2,3,7,8-TCDDioxin TEQ	7.0E-09

Forage/Silage/Grain concentration due to Root Uptake
Table 4.3.8

Pr = Sc*Br

Pr	concentration of polutant in the plant due to direct uptake from soil		(mg/kg)
Sc	Average soil concentration of pollutant overexposre duration	Table 4.1.1	(mg/kg)
Br	Plant-soil bioconcentration factor	Chemical-specific	(ug/g)/(ug

Chemical Name	Pr (mg/kg)
2,3,7,8-TCDDioxin TEQ	6.6E-10

Milk concentration due to Plant and Soil Ingestion
Table 4.3.10

Amilk = (F*Qp*Pe+Qs*Sc)*Bamilk

F	Fraction of plant grown on contaminated soil and eaten by aminal		1	(unitless)
Qp	Quantity of plant eaten by the animal each day		9.63	(kg/day)
Pe	Total concentration of pollutant in the plant eaten by animal	Table 4.3.6, 4.3.7, 4.3.8		(mg/kg)
Qs	Quantity of soil eaten by animal		0.4	(kg/day)
Sc	Soil concentration	Table 4.1.1		(mg/kg)
Bamilk	Biotransfer factor for milk	Chemical-specific		(d/kg)

Chemical Name	Amilk	(mg/kg)		
2,3,7,8-TCDDioxin TEQ	1.7E-09		1.6E-07	8.0E-08

Drinking Water Intake for Adult Resident Scenario
Table 5.3.3

Cdw*CRdw*Fdw

Idw	Daily intake of contaminant from drinking water			(mg/day)
Cdw	Dissolved contaminant concentration in drinking water	Table 4.4.24		(mg/L)
CRdw	Consumption rate of drinking water		1.4	(L/day)
Fdw	Fraction of drinking water contaminated		1	(unitless)

Chemical Name	Idw (mg/day)
2,3,7,8-TCDDioxin TEQ	3.0E-13

Dissolved Water Concentration
Table 4.4.24

Cwt/(1+Kdsw*TSS*1e-6)

Cdw	Dissolved phase water concentration		(mg/L)		
Cwt	Total concentration in water column	Table 4.5.23	(mg/L)		
Kdsw	Suspended sediment/surface water partition coefficient	Chemical specific	(L/kg)	CHEMIC	
TSS	Total suspended solids	10	(mg/L)		
1e-6	Conversion factor	1.0E-06	(kg/mg)		

Chemical Name	Cdw (mg/L)
2,3,7,8-TCDDioxin TEQ	2.2E-13

Total Water Column Concentration
Table 4.4.23

Fwater*Cwtot*[(dw+db)/dw]

Cwr	Total concentration in water column			(mg/L)	
Fwater	Fraction of total water body contaminant concentration that occurs in the water column	Table 4.4.16		(unitless)	
Cwtot	Total water concentration in surface water system, including water column and bed sediment	Table 4.4.15		(mg/L)	
db	Depth of upper benthic layer		0.03	(m)	
dw	Depth of the water column	Site specific		(m)	IDESW-G

Chemical Name	Cwt (mg/L)
2,3,7,8-TCDDioxin TEQ	2.2E-12

Total Waterbody Concentration
Table 4.4.15

Lt/[(Vfx*Fwater)+Kwt*WAw*(dw+db)]

Cwtot	Total water body concentration		(mg/L)	
Lt	Total chemical load into water body, including deposition, runoff and erosion	Table 4.4.7	(g/yr)	
Vfx	Average volumetric flow rate through water body	Site specific	(m^3/yr)	IDESW-E
Fwater	Fraction of total water body comtaminat concentration that occurs in the water column	Table 4.416	(unitless)	
kwt	Overall total waterbody dissipation rate constant	Table 4.4.17	(unitless)	
WAw	Waterbody surface area	Site specific	(m^3)	IDESW-B
dw	Depth of water column	Site specific	(m)	IDESW-G
db	Depth of upper benthic layer	0.03	(m)	

Chemical Name	Cwtot	(mg/L)
2,3,7,8-TCDDioxin TEQ	2.2E-10	

Fraction in Water Column and Benthic Sediment
Table 4.4.16

[(1+Kdsw*TSS*1e-6)*(dw/(dw+db))]/[(1+Kdsw*TSS*1e-6)*(dw/(dw+db)+(Qbs+Kdbs*BS)*db/(dw+db)]

Fwater	Fraction of total water body contaminant concentration that occurs in the water column		(unitless)	
Kdsw	Suspended sediment/surface partition coeficient	Chemical specific	(L/kg)	CHEMIC
TSS	Total suspended solids	10	(mg/L)	
1e-6	Conversion factor	1.0E-06	(kg/mg)	
dw	Depthof water column	Site specific	(m)	IDESW-G
db	Depth of upper benthic layer	0.03	(m)	
dz	Total waterbody depth	(dw+db)	(m)	16.53
Qbs	Bed sediment porosity	0.6	(Lwater/L)	
Kdbs	Bed sediment/sediment pore water partition coefficient	Chemical specific	(L/kg)	CHEMIC
BS	Bed sediment concentration	1	(g/cm^3)	

1-Fwater

Fbenth	Fraction of total water body contaminant concentration that occurs in the benthic	(unitless)

Chemical Name	Fwater (unitless)	Fbenthic (unitless)
2,3,7,8-TCDDioxin TEQ	1.0E-02	9.9E-01

Total Waterbody Load
Table 4.4.7

Ldep+Ldif+Lri+Lr+Le

Lt	Total contaminant load to the water		(g/yr)
Ldep	Total particle phase and wet phase contaminant direct deposition load to waterbody	Table 4.4.8	(g/yr)
Ldiff	Vapor phase contaminat diffusion load to waterbody	Table 4.4.12	(g/yr)
Lri	Rnoff load from impervious surfaces	Table 4.4.9	(g/yr)
Lr	Runoff load from pervious surfaces	Table 4.4.10	(g/yr)
Le	Soil erosion load	Table 4.4.11	(g/yr)

Chemical Name	Lt	(g/yr)
2,3,7,8-TCDDioxin TEQ	7.3E-01	

Overall Total Waterbody Dissipation Rate Constant
Table 4.4.17

(Fwater*kv)+(Fbenthic*kb)

kwt	Overall total waterbody dissipation rate constant		(yr^-1)
fwater	Fraction of total waterbody contaminant concentreation that occurs in the water column	Table 4.4.16	
kv	Water column volatilization rate	Table 4.4.18	(yr^-1)
fbenth	Fraction o total waterbody contaminant concentreation that occurs in the benthic sediments		
kb	Benthic burial rate constant	Table 4.4.22	(yr^-1)

Chemical Name	Kwt	(yr^-1)
2,3,7,8-TCDDioxin TEQ	6.6E+00	

Deposition to Waterbody
Table 4.4.8

(Dywwv+Dytwp)*WAw

Ldep	Total particle phase and wet phase contaminant direct load to waterbody		(g/yr)
Dywwv	Normalized yearly watershed average wet deposition from vapor phase	Modeled	(s/m^2-Yr
Dytwp	Normalized yearly watershed average total deposition from particle phase	Modeled	(s/m^2-Yr
WAw	Water body area	Site-specific	(m^2)

Chemical Name	Ldep (g/yr)
2,3,7,8-TCDDioxin TEQ	2.7E-03

Diffusion Load to Waterbody
Table 4.4.12

(Kv*Cywv*WAw*1e-6)/[(H/(R*T)]

Ldif	Dry vapor phase contaminant diffusion load to waterbody			(g/yr)
Kv	Diffusive mass transfer coefficient	Tabel 4.4.19		(m/yr)
Cywv	Normalized yearly watershed average vapor phase air concentration	Modeled		(ug-s/g-m^3)
WAw	Waterbody surface area	Site-specific		(m^2)
H	Henry's Law constant	Chemical-specific		(atm-m^3/mol)
R	Universal gas constant		8.2E-05	(atm-m^3/mol-K)
Tw	Waterbody temperature		298	(K)
1e-6	Conversion factor		1.0E-06	(g/ug)

Chemical Name	Ldif (g/yr)
2,3,7,8-TCDDioxin TEQ	6.7E-01

Impervious Runoff Load to Waterbody
Table 4.4.9

(Dywwv+Dytwp)*WAi

Lri	Impervious surface runoff load		(g/yr)
WAi	Impervious watershed area receiving pollutant deposition	Site-specific	(m^2)
Dywwv	Normalized yearly watershed average wet deposition from vapor phase	Modeled	(s/m^2-yr)
Dytwp	Normalized yearly watershed average total deposition from particle phase	Modeled	(s/m^2-yr)

Chemical Name	Lri	(g/yr)
2,3,7,8-TCDDioxin TEQ	8.1E-04	

Pervious Runoff Load to Waterbody
Table 4.4.10

R*(WAI-WAi)*[(Sc*1.5*.01)/(.2+(1.5*2.8e+5))]

Lr	Pervious surface runoff load			(g/yr)
R	Average annual surface runoff	Sit-specific		(cm/yr)
Sc	Pollutant concentration in watershed soils	Table 4.4.1		(mg/kg)
Bd	Soil bulk density		1.5	(g/cm^3)
Kds	Soil-water partition coefficient	Chemical-specific		(L/kg)
WAI	Total watershed area receiving pollutant deposition	Site-specific		(m^2)
WAi	Impervious watershed area receiving pollutant deposition	Site-specific		(m^2)
0.01	Conversion factor		0.01	(kg-cm^2/mg-m^2)
Qs	Volumetric soil water content		0.2	(cm^3/cm^3)

Chemical Name	Lr (g/yr)
2,3,7,8-TCDDioxin TEQ	2.2E-05

Erosion Load to Waterbody
Table 4.4.11

Xe*(WAl-WAi)*SD*3*[(Sc*2.8e+5*1.5)/(.2+2.8e+5*1.5)]*.001

Le	Soil erosion load			(g/yr)
Xe	Unit soil loss	Table 4.4.13		(kg/m^2/yr)
Sc	Pollutant concentration in watershed soils	Table 4.4.1		(mg/kg)
BD	Soil bulk density		1.5	(g/cm^3)
Qs	Volumetric soil water content		0.2	(cm^3/cm^3)
Kds	Soil-water partition coefficient	Chemical-specific		(L/kg)
WAl	Total watershed area recieving pollutant deposition	Site-specific		(m^2)
WAi	Impervious watershed area recieving pollutant deposition	Site-specific		(m^2)
SD	Watershed sediment delivery ratio	Table 4.4.14		(unitless)
ER	Soil snrichment ratio		3	(unitless)
0.001	Conversion factor		0.001	[(g/kg)]/[(mg/kg)]

Chemical Name	Le	(g/yr)
2,3,7,8-TCDDioxin TEQ	5.4E-02	

Water Column Volatiliziation Loss Rate Constant
Table 4.4.18

Kv/[(dw+.03)*(1+2.1e+6*10*1e-6)]

kv	Water column volatilzation rate			(yr^-1)
Kv	Overall transfer rate	Table 4.4.19		(m/yr)
dz	Total waterbody depth	dw+db		(m)
Kdsw	Suspended sediments/surface water partition coefficient	Chemical-specific		(L/kg)
TSS	Total suspended solids		1.0E+01	(mg/L)
1e-6	Conversion factor		1.0E-06	(kg/mg)

Chemical Name	kv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	6.5E+02	

Benthic Burial Rate Constant
Table 4.4.22

[(Xe*WAI*SD*1e+3-Vfx*10)/(WAw*10)]/[(10*1e-6)/(1*.03)]

kb	Benthic burial rate constant			(yr^-1)
Xe	Unit soil loss	Table 4.4.13		(kg/m^2/yr)
WAI	Watershed area recieving fallout	Site-specific		(m^2)
SD	Watershed sediment delivery ratio	Table 4.4.14		(unitless)
1e3	Conversion factor		1.0E+03	(g/kg)
Vfx	Average volumetric flow rate through watershed	Site-specific		(m^3/yr)
TSS	Total suspended solids		10	(mg/L)
WAw	Waterbody surface area	Site-specific		(m^2)
BS	Benthic soilds concentration		1	(kg/L)
db	Depth of upper benthic sediment layer		0.03	(m)
1e-6	Conversion factor		1.0E-06	(kg/mg)

Chemical Name	kb (yr^-1)		
2,3,7,8-TCDDioxin TEQ	1.4E-01	4.3E+02	3.3E-04

Overall Transfer Rate
Table 4.4.19

[Kl^-1+[(Kg*H)/(Rg*Tw)]^-1]^-1*Q^(Tw-2)

Kv	Overall transfer rate			(m/yr)
Kl	Liquid phase transfer coefficien	Tabel 4.4.20		(m/yr)
Kg	Gas phase transfer coefficient	Table 4.4.21		(m/yr)
H	Henry's Law constant	Chemical-specific		(atm-m^3/mol)
Rg	Universal gas constant		8.1E-05	(atm-m^3/mol-K)
Tw	Waterbody temperature		298	(K)
Q	Temperature correction factor		1.026	(unitless)

Chemical Name	Kv	(m/yr)
2,3,7,8-TCDDioxin TEQ	1.2E+05	

Watershed soil Concentration Due to Deposition
Table 4.4.1

Average soil concentration over exposure duration Sc

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration over exposure duration			(mg/kg)
Ds	Depostion term			(mg/kg-yr)
Tc	Time period over which deposition occurs	Site-specific		(yr)
Sctc	Soil concentration at time Tc			(mg/kg)
ks	Soil loss constant	Table 4.1.2		(yr^-1)
T2	Exposure duration		30	(yr)
T1	Time at beginning of exposure		0	(yr)

Soil concentration at time Tc Sctc

[Ds*(1-exp(-ks*Tc))]/ks

Sctc	Soil concentration at time Tc		(mg/kg)
Ds	Depostion term		(mg/kg-yr)
ks	Soil loss constant	Table 4.1.2	(yr^-1)
T2	Exposure duration	Scenario-specific	(yr)

Depostion term Ds

[100*[[.31536*Vdv*Cywv]+Dywwv+Dytwp]]/z*BD

Ds	Depostion term			(mg/kg-yr)	
Vdv	Dry deposition velocuty		3	(cm/s)	
Cywv	Normalized yearly watershed average vapor phase air concentration	Modeled		(ug-s/g-m^3)	DISPERS
Dywwv	Normalized yearly watershed	Modeled		(s/m^2-yr)	DISPERS

		average wet deposition from vapor phase			
	Dytwp	Normalized yearly watershed average total (wet and dry) deposition from particle phase	Modeled	(s/m^2-yr)	DISPERS
	BD	Soil bulk density	1.5	(g/cm^3)	
	z	Soil mixing depth	1	(cm)	
	100	Units conversion factor		[mg-m^2]/[kg-cm^2]	

Chemical Name	Sc	(mg/kg)	Sctc	(mg/kg)	Ds	(mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.4E-07		1.9E-07		1.0E-08	

Universal Soil Loss Equation (USLE)
Table 4.4.13

(RF*K*LS*C*PF*(907.18/4047)

Xe	Unit soil loss		(kg/m^2/yr)
RF	USLE rainfall factor	Site-specific	(yr^-1)
K	USLE erodibility factor	0.36	(ton/acre)
LS	USLE length-slope factor	1.5	(unitless)
C	USLE cover management factor	0.1	(unitless)
PF	USLE supporting praciice factor	1	(unitless)
907.18	Conversion factor	907.18	(kg/ton)
4047	Conversion factor	4047	(m^2/acre)

Chemical Name	Xe	(kg/m^2/yr)
2,3,7,8-TCDDioxin TEQ	3.6E+00	

Sediment Delivery Ratio
Table 4.4.14

a*(WAI)^-.125

SD	Watershed sediment delivery ratio		(unitless)	
WAI	Watershed area recieving fallout	Site-specific	(m^2)	IDESW
a	Empirical intercept coefficient	Watershed-specific	(unitless)	
b	Empirical slope coefficient	0.125	(unitless)	

Chemical Name	SD
2,3,7,8-TCDDioxin TEQ	1.0E-01

Soil Loss Constant
Table 4.4.2

ksl+kse+ksr+ksg+ksv

ks	Soil loss constant due to all processes		(yr^-1)
ksl	Loss constant due to leaching	Table 4.4.3	(yr^-1)
kse	Los constan due to soil erosion	Talbe 4.4.4	(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.4.5	(yr^-1)
ksg	Loss constant due to degradation	Chemical-specific	(yr^-1)
ksv	Loss constan due to volatilization	Table 4.4.6	(yr^-1)

Chemical Name	ks	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.2E-02	

Liquid Phase Transfer Coefficient (Quiescent lake or pond)
Table 4.4.20

(Cd^0.5*W)*(pa/pw)^0.5*(vk^0.33/y2)*(uw/(pw*Dw))^-0.67*31500000)

Kl	Liquid phase transfer coefficient		(m/yr)
Dw	Diffusivity of chemical in water	Chemical-specific	(cm^2/s)
Cd	Drag coefficient	0.0011	(unitless)
W	Wind velocity, 10 m above water Surface	Site-specific	(m/s)
pa	Density of air corresponding to water temperature	1.2E-03	(g/cm^3)
pw	Density of water corresponding to water temperature	1	(g/cm^2)
vk	von Karman's constant	0.4	(unitless)
y2	Dimensionless viscous sublayer thickness	4	(unitless)
uw	Viscosity of water corresponding to the water temperature	1.7E-02	(g/cm-s)
3.15e7	Conversion constant	3.2E+07	(s/yr)

Chemical Name	Kl (m/yr)
2,3,7,8-TCDDioxin TEQ	2.0E+02

Gas Phase Transfer Coefficient (Quiescent lake or pond)
Table 4.4.21

(Cd^.5*W)*(vk^.33/y2)*[ua/(pa*Da)]^-.67*3.15e+7

Kg	Gas phase transfer coefficient			(m/yr)
Cd	Drag coefficient		0.0011	(unitless)
W	Wind velocity, 10 m above water surface	Site-specific		(m/s)
vk	van Kaman's constant		0.4	(unitless)
y2	Dimensionless viscous sublayer thickness		4	(unitless)
ua	Viscosity of air corresponding to the air temperature		1.8E-04	(g/cm-s)
pa	Density of air corresponding to water temperature		1.2E-03	(g/cm^3)
Da	Diffusivity of chemical in air	Chemical-specific		(cm^2/s)
3.15e7	Conversion constatn		3.2E+07	(s/yr)

Chemical Name	Kg (m/yr)
2,3,7,8-TCDDioxin TEQ	4.5E+05

Loss Constant Due to Leaching
Table 4.4.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/BD))]

ksl	Loss constant due to leaching			(yr^-1)
P	Average annual precipitation	Site-specific		(cm/yr)
I	Average annual irrigation	Site-specific		(cm/yr)
R	Average annual runoff	Site-specific		(cm/yr)
Ev	Average annual evapotranspiration	Site-specific		(cm/yr)
Qs	Soil volumetric water content		0.2	(mL/cm^3)
z	Soil depth from which leaching removal occurs		1	(cm)
Kds	Soil-water partition coefficient	Chemical-specific		(cm^3/g)
BD	Soil bulkdensity		1.5	(g/cm^3)

Chemical Name	ksl	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05	

Loss Constant due to Erosion
Table 4.4.4

[(.1*Xe*SD*ER)/(BD*z)]*[(Kds*BD)/(Qs+(Kds*BD))]

kse	Loss constant due to erosion			(yr^-1)	
Xe	Unit soil loss	Table 4.4.13		(kg/m^2/yr)	
SD	Sediment delivery ration	Table 4.4.14		(unitless)	
ER	Contaminant enrichment ratio		3	(unitless)	
z	Soil mixing depth		1	(cm)	
Qs	Soil volumetric water content		0.2	(mL/cm^3)	
Kds	Soil-water partition coefficient	Chemical-specific		(cm^3/g)	Chemical
BD	Soil bulk density		1.5	(g/cm^3)	

Chemical Name	kse	(yr^-1)
2,3,7,8-TCDDioxin TEQ	7.4E-02	

Loss constant due to Runoff
Table 4.4.5

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff			(yr^-1)	
R	Average annual runoff	Site specific		(cm/yr)	IDETRAN
Qs	Soil volumetric water content		0.2	(mL/cm^3)	
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE
BD	Soil bulk density		1.5	(g/cm^3)	

Chemical Name	ksr	(yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05	

Loss Constant due to Volitilization
Table 4.4.6

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da))^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization			(yr^-1)	
3.1536e7	Conversion constant		3.2E+07	(s/yr)	
H	Henry's Law constant		Chemical specific	(atm-m^3/mol)	IDECHEM
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient		Chemical specific	(cm^3/g)	IDECHEM
R	Universal gas constant		8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density		1.5	(g/cm^3)	
T	Ambient air temperature		Site specific	(K)	IDETRAN-Tc
u	Average annual wind speed		Site specific	(m/s)	IDETRAN
ua	Viscosity of air		1.8E-04	(g/cm-s)	
pa	Density of air		1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air		Chemical specific	(cm^2/s)	IDECHEM
A	Surface area of contaminated area		Site speficic	(m^2)	IDESW

Chemical Name	ksv (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Cancer Risk for Individual Chemicals for Subsistence Fisher Scenario

Chemical	CR	HQ
2,3,7,8-TCDDioxin TEQ	8E-07	NA

Cancer Risk for Individual Chemicals for subsistence Fisher Scenario
Table 5.2.6

C R = (I*ED*EF*CSF)/(BW*AT*365)

CR	Individual lifetime cancer risk			(unitless)
I	Total daily intake of contamina	Table 5.3.4		(mg/day)
ED	Exposure duration		30	(yr)
EF	Exposure frequency		350	(day/yr)
BW	Body weight		70	(kg)
AT	Averaging time		70	(yr)
365	Units conversion factor		365	(day/yr)

Chemical	CR
2,3,7,8-TCDDioxin TEQ	7.8E-07

Hazard Quotient for Individual Chemicals for Subsi
Table 5.2.6

HQ = I/(BW*RfD)

HQ	Hazard Quotient			(unitless)
I	Total daily intake of contaminant	Table 5.2.4		(mg/day)
BW	Body weight		70	(kg)
RfD	Reference dose	Chemical-specific		(mg/kg/da

Chemical Name	HQ	(unitless)
2,3,7,8-TCDDioxin TEQ	NA	

Total Daily Intake for Subsistence Fisher Scenario
Table 5.2.5

I = Isoil + Iag + Ifish + Idw

I	Total daily intake of contaminant		(mg/day)
Isoil	Daily intake of contaminant from soil	Table 5.2.1	(mg/day)
Iag	Daily intake of contaminant from agove-ground produce	Table 5.2.2	(mg/day)
Ifish	Daily intake of contaminant from fish	Table 5.2.3	(mg/day)
Idw	Daily intake of contaminant from drinking water	Table 5.2.4	(mg/day)

Chemical Name	I (mg/day)
2,3,7,8-TCDDioxin TEQ	8.5E-10

Soil Intake for Susbsistence Fisher Scenario
Table 5.2.1

Isoil = Sc * CRsoil * Fsoil

Isoil	Daily intakeof soil			
Sc	Soil concentration	Table 4.1.1		(mg/kg)
CRsoil	Consuption rate of soil		0.0001	(kg/day)
Fsoil	Fraction of consumed soil contaminated		1	(unitless)

Chemical Name	Isoil (mg/day)
2,3,7,8-TCDDioxin TEQ	1.6E-11

Soil Concentration due to Deposition
Table 4.1.1

Average soil concentration over exposure duration — Sc

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc))]]/(T2-T1)

Sc	Average soil concentration		(mg/kg)	
Ds	Deposition term		(mg/kg-yr)	
Tc	Time period over which deposition occurs	Site specific	(yr)	IDETRAN
Sctc	Soil concentration at time Tc		(mg/kg)	
ks	Soil loss constant	Table 4.1.2	(yr^-1)	
T2	Exposure duration	Senario specific	(yr)	30 yrs

Soil concentration at time Tc — Sctc

[Ds*(1-exp(-ks*Tc))]/ks

Depostion term — Ds

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor		100	([mg-m^2]/[kg-cm^2])	
z	Soil mixing depth		1	(cm)	
BD	Soil bulk density		1.5	(g/cm^3)	
0.31536	Units conversion factor		0.31536	(m-g-s/cm-ug-yr)	
Vdv	Dry deposition velocity		3	(cm/s)	
Cyv	Normalized vapor phase air concentration	Modelled		(ug-s/g-m^2)	DISPC1-
Dywv	Normalized yearly wet deposition from vapor phase	Modelled		(s/m^2-yr)	DISPC1-
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Dywp	Normalized yearly wet deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-

Chemical Name	Sa (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.6E-07	2.9E-07	1.3E-08

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Soil Loss Constant
Table 4.1.2

ksl+kse+ksr+ksg+ksv

ks	Soil loss constant due to all processes		(yr^-1)
ksl	Loss constant due to leaching	Table 4.1.3	(yr^-1)
kse	Loss constant due to soil erosion		(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.1.4	(yr^-1)
ksg	Loss constant due to degradation	Chemical specific	(yr^-1)
ksv	Loss constant due to volatilization	Table 4.1.5	(yr^-1)

Chemical Name	ks	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Loss Constant Due to Leaching
Table 4.1.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching		(yr^-1)	
P	Average annual precipitation	Site specific	(cm/yr)	IDETRAN
I	Average annual irrigation	Site specific	(cm/yr)	IDETRAN
R	Average annual runoff	Site specific	(cm/yr)	IDETRAN
Ev	Average annual evapo-transporation	Site specific	(cm/yr)	IDETRAN
Qs	Soil volumetric water content	0.2	(mL/cm^3)	
z	Soil depth from which leaching removal occurs	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHE

Chemical Name	ksl (yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05

Loss constant due to Runoff
Table 4.1.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff			(yr^-1)	
R	Average annual runoff	Site specific		(cm/yr)	IDETRAN
Qs	Soil volumetric water content		0.2	(cL/cm^3)	
z	Soil mixing depth		1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)	IDECHE
BD	Soil bulk density		1.5	(g/cm^3)	

Chemical Name	ksr	(yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05	

Loss Constant due to Volitilization
Table 4.1.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization		(yr^-1)	
3.1536e7	Conversion constant		(s/yr)	
H	Henry's Law constant	Chemical specific	(atm-m^3/mol)	IDECHEM
z	Soil mixing depth	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHEM
R	Universal gas constant	8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density	1.5E+00	(g/cm^3)	
T	Ambient air temperature	Site specific	(K)	IDETRAN-Tc
u	Average annual wind speed	Site specific	(m/s)	IDETRAN
ua	Viscosity of air	1.8E-04	(g/cm-s)	
pa	Density of air	1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific	(cm^2/s)	IDECHEM
A	Surface area of contaminated area	Site speficic	(m^2)	IDETRAN

Chemical Name	ksv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Above-Ground Produce Intake for Adult Resident Scenario
Table 5.2.2

(Pd+Pv+Pr)*CRag*Fag

Iag	Daily intake of contaminant from soil		(mg/day)
Pd	Concentration in above-ground produce due to deposition	Table 4.2.6	(mg/kg)
Pv	Concentration in above-ground produce due t air-to-plant transfer	Table 4.2.7	(mg/kg)
Pr	Concentration in above-ground produce due to root uptake	Table 4.2.8	(mg/kg)
CRag	Consumption rate of above-ground produce	0.028	(kg/day)
Fag	Fraction of above-ground produce contaminated	0.25	(unitless)

Chemical Name	Iag	(mg/day)
2,3,7,8-TCDDioxin TEQ	5.0E-12	

Above-Ground Produce Concentration Due to Direct Deposition
Table 4.2.6

[[1000*(Dydp+(Fw*Dywp)]*Rp*[(1-exp(-kp*Tp)]]/(Yp*kp)

1000	Units conversion factor			(unitless)	
Dydp	Normalized yearly dry deposition from particle phase	Modelled		(s/m^2-yr)	DISPC1-
Fw	Fraction of wet deposition that adheres to plant	Chemical specific		(unitless)	CHEMIC
Dywp	Yearly particle phase wet deposition rate	Modelled		(g/m^2/yr)	DISPC1-
Rp	Intercetion fraction of edible portion of plant		0.05	(unitless)	
kp	Plant surface loss coefficient		18	(yr^-1)	
Tp	Length of plant exposure to deposition of edible portion of plant, per harvest		0.16	(yrs)	
Yp	Yield or standing crop biomass of the edible portion of the plant		1.6	(kgDW/M^2)	

Chemical Name	Pd	(mg/kg)
2,3,7,8-TCDDioxin TEQ	1.2E-10	

Above-Ground Produce Concentration Due to Air-to-Plant Transfer
Table 4.2.7

(Cyv*Bv*VGag)/pa

Pv	Concentration of pollutant in the plant due to air-to-plant transfer		(mg/kg)	
Cyv	Normalized vapor phase air concentration	Modelled	(ug-sec/g-m^3)	DISPC1-
Bv	Air-to-plant biotransfer factor	Chemical specific	(mgplant/ugair)	CHEMIC
VGag	Empirical correction factor for above-ground produce	0.01	(unitless)	
pa	Density of air	1.2E+03	(g/m^3)	

Chemical Name	Pv	(mg/kg)
2,3,7,8-TCDDioxin TEQ	7.0E-11	

Above-Ground Produce Concentration Due to Root Uptake
Table 4.2.8

	Sc*Br				
	Pr	Concentration of pollutant in the		(mg/kg)	
	Sc	Average soil concentration of pollutant over exposure duration	Table 4.2.1	(mg/kg)	
	Br	Plant-soil bioconcentration factor for above-ground produce	Chemical specific	(ug/gplant)/(ug/gsoil)	CHEMIC

Chemical Name	Pr	(mg/kg)
2,3,7,8-TCDDioxin TEQ	5.2E-10	

Soil Concentration due to Deposition
Table 4.2.1

[[(Ds*Tc-Sctc)/ks]+[(Sctc/ks)*(1-exp(-ks*(T2-Tc)]]/(T2-T1)

Sc	Average soil concentration			(mg/kg)
Ds	Deposition term			(mg/kg-yr)
Tc	Time period over which deposition occurs	30	Site specific	(yr)
Sctc	Soil concentration at time Tc			(mg/kg)
ks	Soil loss constant		Table 4.1.2	(yr^-1)
T2	Exposure duration	30	Senario specific	(yr)
T1	Exposure duration	0	Senario specific	(yr)

[Ds*(1-exp(-ks*Tc))]/ks

[100*[(.31536*Vdv*Cyv+Dywv)+(Dydp+Dywp)]]/(z*BD)

100	Units conversion factor			([mg-m^2]/[kg-cm^2])
z	Soil mixing depth	1		(cm)
BD	Soil bulk density	1.5		(g/cm^3)
0.31536	Units conversion factor	0.31536		(m-g-s/cm-ug-yr)
Vdv	Dry deposition velocity	3		(cm/s)
Cyv	Normalized vapor phase air concentration		Modelled	(ug-s/g-m^2)
Dywv	Normalized yearly wet deposition from vapor phase		Modelled	(s/m^2-yr)
Dydp	Normalized yearly dry deposition from particle phase		Modelled	(s/m^2-yr)
Dywp	Normalized yearly wet deposition from particle phase		Modelled	(s/m^2-yr)

Chemical Name	Sc (mg/kg)	Sctc (mg/kg)	Ds (mg/kg-yr)
2,3,7,8-TCDDioxin TEQ	1.6E-07	2.9E-07	1.3E-08

Soil Loss Constant
Table 4.2.2

ksl+kse+ksr+ksg+ksv

ks	Soil constatn due to leaching		(yr^-1)
kse	Loss constant due to soil erosion	0	(yr^-1)
ksr	Loss constant due to surface runoff	Table 4.2.4	(yr^-1)
ksg	Loss constant due to degradation	Chemical specific	(yr^-1)
ksv	Loss constant due to volatilization	Table 4.2.5	(yr^-1)

Chemical Name	ks (yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02

Loss Constant due to Degradation
Appendix A

ksg 0.0E+00

0.0E+00

Loss Constant Due to Leaching
Table 4.2.3

(P+I-R-Ev)/[Qs*z*(1+(BD*Kds/Qs))]

ksl	Loss constant due to leaching			(yr^-1)
P	Average annual precipitation	Site specific		(cm/yr)
I	Average annual irrigation	Site specific		(cm/yr)
R	Average annual runoff	Site specific		(cm/yr)
Ev	Average annual evapo-transporation	Site specific		(cm/yr)
Qs	Soil volumetric water content		0.2	(mL/cm^3)
z	Soil depth from which leaching removal occurs		1	(cm)
Kds	Soil-water partition coefficient	Chemical specific		(cm^3/g)

Chemical Name	ksl	(yr^-1)
2,3,7,8-TCDDioxin TEQ	9.0E-05	

Loss Constant due to Runoff
Table 4.2.4

[R/(Qs*z)]*[1/(1+(Kds*BD)/Qs)]

ksr	Loss constant due to runoff		(yr^-1)		
R	Average annual runoff	Site specific	(cm/yr)		IDETRAN
Qs	Soil volumetric water content	0.2	(cL/cm^3)		
z	Soil mixing depth	1	(cm)		
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)		IDECHEM
BD	Soil bulk density	1.5	(g/cm^3)		

Chemical Name	ksr (yr^-1)
2,3,7,8-TCDDioxin TEQ	3.0E-05

Loss Constant due to Volitilization
Table 4.2.5

[(3.1536e+7*H)/(z*Kds*R*T*BD)]*[.482*u^.78*(ua/(pa*Da)^-.67]*[((4*A/(Pi))^.5)^-.11]

ksv	Loss constant due to volatilization		(yr^-1)	
3.1536e7	Conversion constant		(s/yr)	
H	Henry's Law constant	Chemical specific	(atm-m^3/	IDECHE
z	Soil mixing depth	1	(cm)	
Kds	Soil-water partition coefficient	Chemical specific	(cm^3/g)	IDECHE
R	Universal gas constant	8.1E-05	(atm-m^3/mol-K)	
BD	Soil bulk density	1.5	(g/cm^3)	
T	Ambient air temperature	Site specific	(K)	IDETRAN
u	Average annual wind speed	Site specific	(m/s)	IDETRAN
ua	Viscosity of air	1.8E-04	(g/cm-s)	
pa	Density of air	1.2E-03	(g/cm^3)	
Da	Diffusivity of contaminant in air	Chemical specific	(cm^2/s)	IDECHE
A	Surface area of contaminated area	Site speficic	(m^2)	IDETRAN

Chemical Name	ksv	(yr^-1)
2,3,7,8-TCDDioxin TEQ	1.8E-02	

Fish Intake for Subsistence Fisher Scenario
Table 5.2.3

Ifish = Cfish * CRfish * Ffish

Ifish	Daily intakeof contaminant from fish			(mg/day)
Cfish	Fish concentration	Table Cfish		(mg/kg)
CRfish	Consumption rate of fish		0.06	(kg/day)
Ffish	Fraction of fish contaminated		1	(unitless)

Chemical Name	Ifish (mg/day)
2,3,7,8-TCDDioxin TEQ	8.3E-10

Chemical Name	Cfish=Cfish+Cfish+ Cfish	Fish Cone (mg/kg)
2,3,7,8-TCDDioxin TEQ	1.4E-08	

Fish Concentration from Dissolved Water concentration
Table 4.4.26

Cfish = Cdw * BCF

Cfish	fish concentration		(mg/kg)
Cdw	Dissolved water concentration	Table 4.4.24	(mg/L)
BCF	Biocontration	Chemical-specific	(L/kg)

Chemical Name	Cfish (mg/kg)
2,3,7,8-TCDDioxin TEQ	0.0E+00

Fish Concentration from Dissolved Water concentration
Table 4.4.26

Cfish = Cdw * BCF

Cfish	fish concentration		(mg/kg)
Cdw	Dissolved water concentration	Table 4.4.24	(mg/L)
BCF	Biocontration	Chemical-specific	(L/kg)

Chemical Name	Cfish (mg/kg)
2,3,7,8-TCDDioxin TEQ	0.0E+00

Fish concentration from Total Water Column Concentration
Table 4.4.27

Cfish=Cwt*BAF

Cfish	Fish concentration		(mg/kg)
Cwt	Total water coumn concentratio	Table 4.4.23	(mg/L)
BAF	Bioaccumulation factor	Chemical-specific	(L/kg)

Chemical Name	Cfish (mg/kg)
2,3,7,8-TCDDioxin TEQ	0.0E+00

Fish Concentration from Bed Sediments
Table 4.4.28

Cfish = (Csb * flipid * BSAF)/OCsed

Cfish	Fish concentration			(mg/kg)
Csb	Concentration of contaminant sorbed to bed sediment	Table 4.4.25		(mg/kg)
flipid	fish lipid content		0.07	(unitless)
BSAF	Biota to sediment accumulation factor	Chemical-specific		(unitless)
OCsed	Fraction organic carbon in bottom sediment		0.04	(unitless)

Chemical Name	Cfish	(mg/kg)
2,3,7,8-TCDDioxin TEQ	1.4E-08	

Concentration Sorbed to Bed Sediment
Table 4.4.25

Csb=fbenth*Cwtot*[Kdbs/(Qbs+Kdbs*BS)]*(dw+db)/db

Csb	Concentration sorbed to bed sediment			(mg/kg)
fbenth	Fraction of total water body contaminant concentration that occurs in bed sediment	Table 4.4.16		(unitless)
Cwtot	Total water concentration in surface water system, including water column	Table 4.4.15		(mg/L)
dw	Total depth of water column	Site-specific		(m)
db	Depth of upper benthic layer		0.03	(m)
Qbs	Bed sediment porosity		0.6	(unitless)
Kdbs	Bed sediment/sediment pore water partition coefficient	Chemical-specific		(L/kg)
BS	Bedsediment concentration		1	(kg/L)

Chemical Name	Csb (mg/kg)
2,3,7,8-TCDDioxin TEQ	1.2E-07

Drinking Water Intake for Subsistence Fisher Scenario
Table 5.2.4

Cdw*CRdw*Fdw

Idw	Daily intake of contaminant from drinking water			(mg/day)
Cdw	Dissolved contaminant concentration in drinking water	Table 4.4.24		(mg/L)
CRdw	Consumption rate of drinking water		1.4	(L/day)
Fdw	Fraction of drinking water contaminated		1	(unitless)

Chemical Name	Idw (mg/day)
2,3,7,8-TCDDioxin TEQ	3.0E-13