



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Guidance for the derivation of environmental risk limits

Part 11. Variables and default values used in the ERL
guidance documents

version 1.0

Colophon

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Overview of variables and defaults

This part of the ERL-guidance lists all variables and defaults that are used throughout the other parts of the guidance documents for ERL-derivation.

Table 1 List of defaults and variables used throughout the guidance documents on environmental risk limit derivation.

Symbol	Value	Description of variable	Unit
value used, see next column	10^{-6}	conversion factor, e.g. from mg to kg	kg/mg
value used, see next column	0.1	safety factor to account for uptake of maximally 10% of TL_{hh} (human toxicological threshold level)	–
value used, see next column	0.115	daily human consumption of fishery products	kg/d
value used, see next column	1.7	generalised ratio of soil organic matter content over organic carbon content. Derived from ratio $F_{om_{soil}}$ (soil organic matter content) over $F_{oc_{soil}}$ (soil organic carbon content) as used in REACH framework	kg_{om}/kg_{oc}
value used, see next column	70	average human body weight	kg
value used, see next column	1000	conversion factor from m^3 to litre	L/m^3
$AA-EQS_{fw}$		annual average environmental quality standard for freshwater	mg/L or mg/kg or equivalent
$AA-EQS_{sw}$		annual average environmental quality standard for saltwater	
ADI		acceptable daily intake	mg/kg _{bw} /d
AF		assessment factor	–
AF_{oral}		assessment factor applied in extrapolation of quality standards for secondary poisoning	–
BAF		bioaccumulation factor – field determined substance concentration ratio of organism to water, for the aquatic compartment generally used without subscript	L/kg_{ww}
BAF_{TL4}		bioaccumulation factor for trophic level 4– field determined substance concentration ratio of organism to water	L/kg_{ww}
BAF_{TL5}		bioaccumulation factor for trophic level 5– field determined substance concentration ratio of organism to water	L/kg_{ww}
BCF_{fish}		bioconcentration factor for fish on wet weight or on lipid weight basis	L/kg_{ww} or L/kg_{lw}
BCF_{mussel}		bioconcentration factor for mussels on wet weight or on lipid weight basis	L/kg_{ww} or L/kg_{lw}
BMF_1		biomagnification factor – substance concentration ratio of predator to (small) fish	kg/kg or kg_{lw}/kg_{lw}

Symbol	Value	Description of variable	Unit
BMF ₂		biomagnification factor - substance concentration ratio of top predator to predator	kg/kg or kg _{lw} /kg _{lw}
BMF _{b/m}		biomagnification factor – substance concentration ratio of top predator to birds or mammals	kg/kg or kg _{lw} /kg _{lw}
BSAF		biota to soil accumulation factor or biota to sediment accumulation factor	kg _{dw} ·kg _{ww} ⁻¹
BW		body weight	g or kg or equivalent
C _b		background concentration	mg/L or mg/kg or equivalent
C _{b, dissolved}		background concentration expressed as dissolved fraction	mg/L
C _{b, total}		background concentration expressed as total concentration	mg/L
C _{energy normalised}		concentration in diet (of toxicity test animal) on an energy basis	mg/kJ
C _{energy normalised b/m}		concentration in diet (=bird or mammal) of top predator on an energy basis	mg/kJ
C _{energy normalised, fish}		concentration in fish (= diet) on an energy basis	mg/kJ
C _{energy normalised, mussel}		concentration in mussels (=diet) on an energy basis	mg/kJ
C _{diet}		toxicological endpoint as diet concentration; such as the NOAEC, LOAEC, LC50 or similar	mg/kg _{fw} or mg/kg _{dw}
C _{food item}		concentration in food (=prey) item	mg/kg _{ww}
CL		clearance rate	mL/min
%clay		clay content	% (w/w)
CONV _{bird}		conversion factor from NOAEL to NOEC	kg _{bw} ·d/kg _{food}
CONV _{mammal}		conversion factor from NOAEL to NOEC	kg _{bw} ·d/kg _{food}
C _{porew_{comp}}		total concentration in pore water of compartment comp	mg·m ⁻³
CR _{inhalation}		Cancer Risk by inhalation	µg/m ³
C _{susp}		concentration of suspended matter in surface water	mg/L
C _{susp, Dutch standard}	30	concentration of suspended particulate matter in fresh water based on Dutch standard particulate matter characteristics	mg/L
C _{susp marine, WFD}	3	concentration of suspended particulate matter in marine water used in WFD guidance	mg/L
C _{susp, WFD}	15	concentration of suspended particulate matter in fresh water used in WFD guidance	mg/L
C _{total_{comp}}		total concentration in compartment comp	mg/m ³
DEE		daily energy expenditure	kJ/d
DegT50		half life value for degradation of a substance in an environmental compartment	d

Symbol	Value	Description of variable	Unit
DFI		daily food intake = ratio of the daily consumed mass of food and the body weight	$\text{kg}_{\text{food}}/\text{kg}_{\text{bw}}/\text{d}$
dose		toxicological endpoint such as NOAEL, LOAEL, LD50 or similar, expressed as daily dose	$\text{mg}/\text{kg}_{\text{bw}}/\text{d}$
DT50		half life value for dissipation of a substance in an environmental compartment	d
D_{ow}		apparent <i>n</i> -octanol:water partition coefficient for a dissociating substance at a given pH value	
EC_x		effect concentration exerting x% effect	mg/L
$EC10_{\text{Dutch standard sediment}}$		Concentration causing 10% effect in a toxicity study, expressed as a dry weight concentration, normalised to Dutch standard sediment characteristics	$\text{mg}/\text{kg}_{\text{dw}}$
$EC10_{\text{experimental sediment}}$		Concentration causing 10% effect in a toxicity study, expressed as a dry weight concentration in the test sediment	$\text{mg}/\text{kg}_{\text{dw}}$
energy content _{diet, dw}		energy content of dry weight laboratory diet fed to toxicity test animal	$\text{kJ}/\text{kg}_{\text{dw}}$
energy content _{dw, b/m}		energy content of dry weight food (=prey) item for top predator (birds or mammals)	$\text{kJ}/\text{kg}_{\text{dw}}$
energy content _{earthworm}		energy content of dry weight earthworm	$\text{kJ}/\text{kg}_{\text{dw}}$
energy content _{food item, dw}		energy content of dry weight food (=prey) item (e.g. fish, mussels, earthworms)	$\text{kJ}/\text{kg}_{\text{dw}}$
energy content _{food item, fw}		energy content of fresh weight food (=prey) item (e.g. fish, mussels, earthworms)	$\text{kJ}/\text{kg}_{\text{ww}}$
$F_{\text{air, comp}}$		fraction air in compartment comp (only relevant for soil)	m^3/m^3
$F_{\text{air, soil}}$	0.2	fraction air in soil	m^3/m^3
$F_{\text{air, susp}}$	0	fraction air in suspended matter	m^3/m^3
$f_{\text{u, acid}}$		fraction of un-dissociated acid (neutral form)	-
FOC_{comp}		weight fraction of organic carbon in compartment comp	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw}}$
$FOC_{\text{Dutch st. sediment}}$	0.0588	fraction organic carbon in Dutch standard sediment	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw}}$
$FOC_{\text{Dutch st. soil}}$	0.0588	fraction organic carbon in Dutch standard soil	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw}}$
$FOC_{\text{Dutch standard susp}}$	0.1176	fraction organic carbon in Dutch standard soil	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw}}$
$FOC_{\text{sediment, EU}}$	0.05	default weight fraction of soil organic carbon as defined in EU framework for standard sediment. The presented default value is valid for bulk sediment in REACH	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw soil}}$
$FOC_{\text{soil, EU}}$	0.02	default weight fraction of soil organic carbon as defined in REACH for standard soil	$\text{kg}_{\text{oc}}/\text{kg}_{\text{dw soil}}$

Symbol	Value	Description of variable	Unit
$F_{OC_{susp, EU}}$	0.1	default weight fraction of organic carbon in suspended matter; defined in EU framework for standard sediment. The presented default value is valid for suspended matter in REACH	$kg_{oc}/kg_{dw \text{ soil}}$
$F_{OC_{susp, REACH}}$	0.1	weight fraction of organic carbon in suspended matter as defined in REACH	kg_{oc}/kg_{dw}
$f_{om, \text{experimental sediment}}$		fraction organic matter in experimental sediment	kg_{oc}/kg_{dw}
$f_{om, \text{Dutch standar sediment}}$	0.1	fraction organic matter in Dutch standard sediment	kg_{oc}/kg_{dw}
$F_{solid_{comp}}$		fraction solids in compartment comp	–
$F_{solid_{soil}}$	0.6	fraction solids in soil	m^3/m^3
$F_{solid_{susp}}$	0.1	fraction solids in suspended matter	m^3/m^3
$F_{water_{comp}}$		fraction water in compartment comp	m^3/m^3
$F_{water_{soil}}$	0.2	fraction water in compartment soil	m^3/m^3
$F_{water_{susp}}$	0.9	fraction water in compartment susp	m^3/m^3
H		Henry's law constant	$Pa \cdot m^3/mol$
HC ₅		hazardous concentration for 5% of the species represented in a species sensitivity distribution (SSD)	mg/L or mg/kg or equivalent
HC _{5, median}		median estimate of the 5 th percentile of the SSD	mg/L or mg/kg or equivalent
HC ₅₀		hazardous concentration for 50% of the species; geometric mean of log normally distributed toxicity data	mg/L or mg/kg or equivalent
JG-MKE _{sediment, NL, EqP, dw}		annual average maximum environmental quality standard in sediment based on equilibrium partitioning, expressed in dry weight sediment with standard Dutch characteristics	mg/kg_{dw}
JG-MKE _{sediment, NL, EqP, ww}		annual average maximum environmental quality standard in sediment based on equilibrium partitioning, expressed in wet weight sediment with standard Dutch characteristics	mg/kg_{dw}
$K_{air-water}$		air-water partition coefficient	m^3/m^3
$K_{comp-water}$		partition coefficient between compartment and water	m^3/m^3
K_{oc}		partition coefficient between organic carbon and water	L/kg_{oc}
K_{ow}		<i>n</i> -octanol water partition coefficient	–
K_p		partition coefficient	L/kg_{dw}
$K_{p_{comp}}$		partition coefficient solids-water in compartment comp	L/kg_{dw}
$K_{p_{sed}}$		partition coefficient solid-water in sediment	L/kg_{dw}
$K_{p_{soil}}$		solids-water partition coefficient in soil	m^3/kg
$K_{p_{susp}}$		partition coefficient solid-water in suspended matter	L/kg_{dw}
$K_{p, \text{susp-water}}$		partition coefficient between suspended matter and water	L/kg_{dw}
$K_{sed-water}$		sediment-water partition coefficient	m^3/m^3

Symbol	Value	Description of variable	Unit
$K_{\text{soil-water}}$		soil-water partition coefficient	m^3/m^3
$K_{\text{susp-water}}$		suspended matter-water partition coefficient	m^3/m^3
LD50		dose that causes 50% lethality	$\text{mg}/\text{kg}_{\text{bw}}$
lipid content $_{\text{b/m}}$		wet weight lipid content of birds or mammals (default value may be replaced if specific study data are known) that are prey to top predator	%
lipid content $_{\text{earthworm}}$	1	wet weight lipid content of earthworm (default value may be replaced if specific study data are known)	%
lipid content $_{\text{fish}}$	5	wet weight lipid content of fish (default value may be replaced if specific study data are known)	%
lipid content $_{\text{mussel}}$	1	wet weight lipid content of mussels (default value may be replaced if specific study data are known)	%
MAC-EQ $_{\text{fw}}$		maximum acceptable concentration-quality standard for freshwater (final standard)	mg/L
MAC-EQ $_{\text{sw}}$		maximum acceptable concentration-quality standard for saltwater (final standard)	mg/L
MAC-QS $_{\text{fw, eco}}$		maximum acceptable concentration-quality standard for freshwater based on direct ecotoxicity	mg/L
MAC-QS $_{\text{sw, eco}}$		maximum acceptable concentration-quality standard for saltwater based on direct ecotoxicity	mg/L
MDD		minimum detectable difference; related to field study interpretation: the difference between control and treatment that can be detected as significant, given a specific test design and control performance	%
moisture content $_{\text{b/m}}$		fraction of water in the total fresh weight diet (bird/mammal) eaten by top predator	-
moisture content $_{\text{diet}}$		fraction of water in the total fresh weight diet (fed to laboratory test animal or eaten by the predator)	-
moisture content $_{\text{earthworm}}$	84.3	fraction of water in the fresh weight earthworm (default value may be replaced if measured value is available)	-
MPA		maximum permissible addition (general term)	mg/L or mg/kg or equivalent
MPA $_{\text{water, dissolved}}$		maximum permissible addition in water, expressed as the dissolved part of the substance concentration in the water	mg/L
MPA $_{\text{water, total}}$		maximum permissible addition in water, expressed as the total (dissolved + adsorbed) substance concentration in the water	mg/L

Symbol	Value	Description of variable	Unit
MPC		maximum permissible concentration (general term)	mg/L or mg/kg or equivalent
MPC _{air}		maximum permissible concentration in air	µg/m ³
MPC _{air, eco}		maximum permissible concentration in air based on ecotoxicological data	µg/m ³
MPC _{air, hh}		maximum permissible concentration in air based on human toxicological data	µg/m ³
MPC _{Dutch st. sed, dw}		maximum permissible concentration in sediment based on equilibrium partitioning, expressed in dry weight Dutch standard sediment	mg/kg _{dw}
MPC _{Dutch st. soil, dw}		maximum permissible concentration in soil based on equilibrium partitioning, expressed in dry weight Dutch standard soil	mg/kg _{dw}
MPC _{human}		maximum permissible concentration for humans	mg/kg _{bw.} /d or equivalent
MPC _{sed}		Maximum Permissible Concentration in sediment	mg/kg _{dw}
MPC _{sed, eco}		Maximum Permissible Concentration in sediment based on ecotoxicological data	mg/kg _{dw}
MPC _{sed, eco, fw}		Maximum Permissible Concentration in sediment based on ecotoxicological data for the freshwater compartment	mg/kg _{dw}
MPC _{sed, eco, sw}		Maximum Permissible Concentration in sediment based on ecotoxicological data for the saltwater compartment	mg/kg _{dw}
MPC _{sed, EU, dw}		maximum permissible concentration in sediment expressed in dry weight sediment with REACH characteristics	µg/kg _{dw}
MPC _{sed, fw}		Maximum Permissible Concentration in freshwater sediment	mg/kg _{dw}
MPC _{sed, secpois}		Maximum Permissible Concentration in sediment based on secondary poisoning	mg/kg _{dw}
MPC _{sed, secpois, fw}		Maximum Permissible Concentration in sediment based on secondary poisoning for the freshwater compartment	mg/kg _{dw}
MPC _{sed, secpois, sw}		Maximum Permissible Concentration in sediment based on secondary poisoning for the saltwater compartment	mg/kg _{dw}
MPC _{sed, sw}		Maximum Permissible Concentration in saltwater sediment	mg/kg _{dw}
MPC _{soil, EU, dw}		maximum permissible concentration in soil expressed in dry weight soil with REACH characteristics	µg/kg _{dw}
MPC _{soil, EU, EqP, dw}		maximum permissible concentration in soil based equilibrium partitioning, expressed in dry weight soil with standard TGD characteristics	µg/kg _{dw}

Symbol	Value	Description of variable	Unit
$MPC_{\text{soil, EU, EqP, ww}}$		maximum permissible concentration in soil based equilibrium partitioning, expressed in wet weight soil with standard TGD characteristics	$\mu\text{g}/\text{kg}_{\text{ww}}$
$MPC_{\text{soil, hh}}$		maximum permissible concentration in soil, based on based on indirect exposure of humans	$\text{mg}/\text{kg}_{\text{dw}}$
$MPC_{\text{soil, NL, EqP, dw}}$		maximum permissible concentration in soil based equilibrium partitioning, expressed in dry weight soil with standard TGD characteristics	$\mu\text{g}/\text{kg}_{\text{dw}}$
$MPC_{\text{soil, NL, EqP, ww}}$		maximum permissible concentration in soil based equilibrium partitioning, expressed in wet weight soil with standard TGD characteristics	$\mu\text{g}/\text{kg}_{\text{ww}}$
M_w		molecular weight	g/mol
NA		negligible addition	mg/L or mg/kg or equivalent
NC		negligible concentration	mg/L or mg/kg or equivalent
NC_{air}		negligible concentration in air	$\mu\text{g}/\text{m}^3$
NC_{sed}		negligible concentration in sediment	$\text{mg}/\text{kg}_{\text{dw}}$
$NC_{\text{sed, fw}}$		negligible concentration in freshwater sediment	$\text{mg}/\text{kg}_{\text{dw}}$
$NC_{\text{sed, sw}}$		negligible concentration in saltwater sediment	$\text{mg}/\text{kg}_{\text{dw}}$
NC_{sw}		negligible concentration in saltwater	mg/L
$NOAEL_{\text{bird}}$		no observed adverse effect level for birds	$\text{mg}/\text{kg}_{\text{bw}}/\text{d}$
$NOAEL_{\text{mammal, oral chr}}$		no observed adverse effect level for mammals	$\text{mg}/\text{kg}_{\text{bw}}/\text{d}$
$NOEC_{\text{bird}}$		no observed effect concentration for birds	$\text{mg}/\text{kg}_{\text{food}}$
$NOEC_{\text{mammal, food chr}}$		no observed effect concentration for mammals	$\text{mg}/\text{kg}_{\text{food}}$
% o.c.		organic carbon content	% (w/w)
% o.m.		organic matter content	% (w/w)
pK_a		-log of dissociation constant	–
PNEC		predicted no effect concentration	mg/L or mg/kg or equivalent
$PNEC_{\text{oral}}$		predicted no effect concentration for oral intake	$\text{kg}/\text{kg}_{\text{fd}}$
P_v		vapour pressure	Pa
$QS_{\text{biota, hh food}}$		quality standard for secondary poisoning, expressed in freshwater biota consumed by humans	$\text{mg}/\text{kg}_{\text{ww}}$
$QS_{\text{biota, secpois, fw}}$		quality standard for secondary poisoning, expressed in freshwater biota	$\text{mg}/\text{kg}_{\text{ww}}$

Symbol	Value	Description of variable	Unit
$QS_{\text{biota, secpois, sw}}$		quality standard for secondary poisoning, expressed in saltwater biota	mg/kg _{ww}
$QS_{\text{dw, hh}}$		quality standard for surface water based on a drinking water standard	mg/L
$QS_{\text{fw, eco}}$		quality standard for freshwater based on ecotoxicity data	mg/L
$QS_{\text{fw, secpois}}$		quality standard for freshwater based on secondary poisoning	mg/L
$QS_{\text{sediment, EU, EqP, dw}}$		maximum permissible concentration in sediment based equilibrium partitioning, expressed in dry weight sediment with standard REACH characteristics	mg/kg _{dw}
$QS_{\text{sediment, EU, EqP, ww}}$		maximum permissible concentration in sediment based equilibrium partitioning, expressed in wet weight sediment with standard REACH characteristics	mg/kg _{dw}
QS_{susp}		quality standard expressed as a concentration in suspended matter	mg/kg _{dw}
$QS_{\text{sw, eco}}$		quality Standard for saltwater based on ecotoxicity data	mg/L
$QS_{\text{sw, secpois}}$		quality standard for saltwater based on secondary poisoning	mg/L
$QS_{\text{water, dissolved}}$		quality standard for surface water, expressed as the dissolved part of the substance concentration in the water	mg/L
$QS_{\text{water, hh food}}$		quality standard for surface water, based on human consumption of fishery products	mg/L
$QS_{\text{water, total}}$		quality standard for surface water, expressed as the substance concentration in the total (unfiltered) water sample	mg/L
R	8.314	gas constant	Pa.m ³ /mol.K
RHO_{soil}	1700	bulk density of wet soil	kg _{ww} .m ⁻³
RHO_{solid}	2500	density of the solid phase	kg _{solid} /m _{solid} ³
RHO_{susp}	1150	bulk density of wet suspended particulate matter	kg _{ww} /m
S		salinity	‰ = ppt ≈ psu
SRA_{eco}		serious risk addition for the ecosystem	mg/L or mg/kg or equivalent
SRC_{eco}		serious risk concentration for the ecosystem	mg/L or mg/kg or equivalent
$SRC_{\text{fw, eco}}$		serious risk concentration for the freshwater ecosystem	mg/L
SRC_{sed}		serious risk concentration in sediment	mg/kg _{dw}
$SRC_{\text{sed, eco}}$		serious risk concentration in sediment based on ecotoxicity data	mg/kg _{dw}
$SRC_{\text{sed, eco, fw}}$		serious risk concentration in freshwater sediment based on ecotoxicological data	mg/kg _{dw}
$SRC_{\text{sed, eco, sw}}$		serious risk concentration in saltwater sediment based on ecotoxicological data	mg/kg _{dw}

Symbol	Value	Description of variable	Unit
$SRC_{sw, eco}$		serious risk concentration for the saltwater ecosystem	mg/L
S_w		water solubility	mg/L
TCA		tolerable concentration in air	$\mu\text{g}/\text{m}^3$
TDI		tolerable daily intake	$\text{mg}/\text{kg}_{\text{bw}}/\text{d}$
TEMP	285	environmental temperature	K
TL		trophic level of a species (as derived from food web or trophic magnification studies)	-
TTL_{hh}		toxicological threshold level for human health (ADI, TDI, $NOAEL_{\text{oral}}/\text{AF}$, etc.)	$\text{mg}/\text{kg}_{\text{bw}}/\text{d}$
T_b		boiling point	$^{\circ}\text{C}$
T_m		melting point	$^{\circ}\text{C}$
TMF		trophic magnification factor - average increase in contaminant concentration per trophic level	kg/kg or $\text{kg}_{\text{lw}}/\text{kg}_{\text{lw}}$
TOX_{oral}		either $LC50_{\text{bird}}$, $NOEC_{\text{bird}}$ or $NOEC_{\text{mammal, food chr}}$	$\text{mg}/\text{kg}_{\text{food}}$