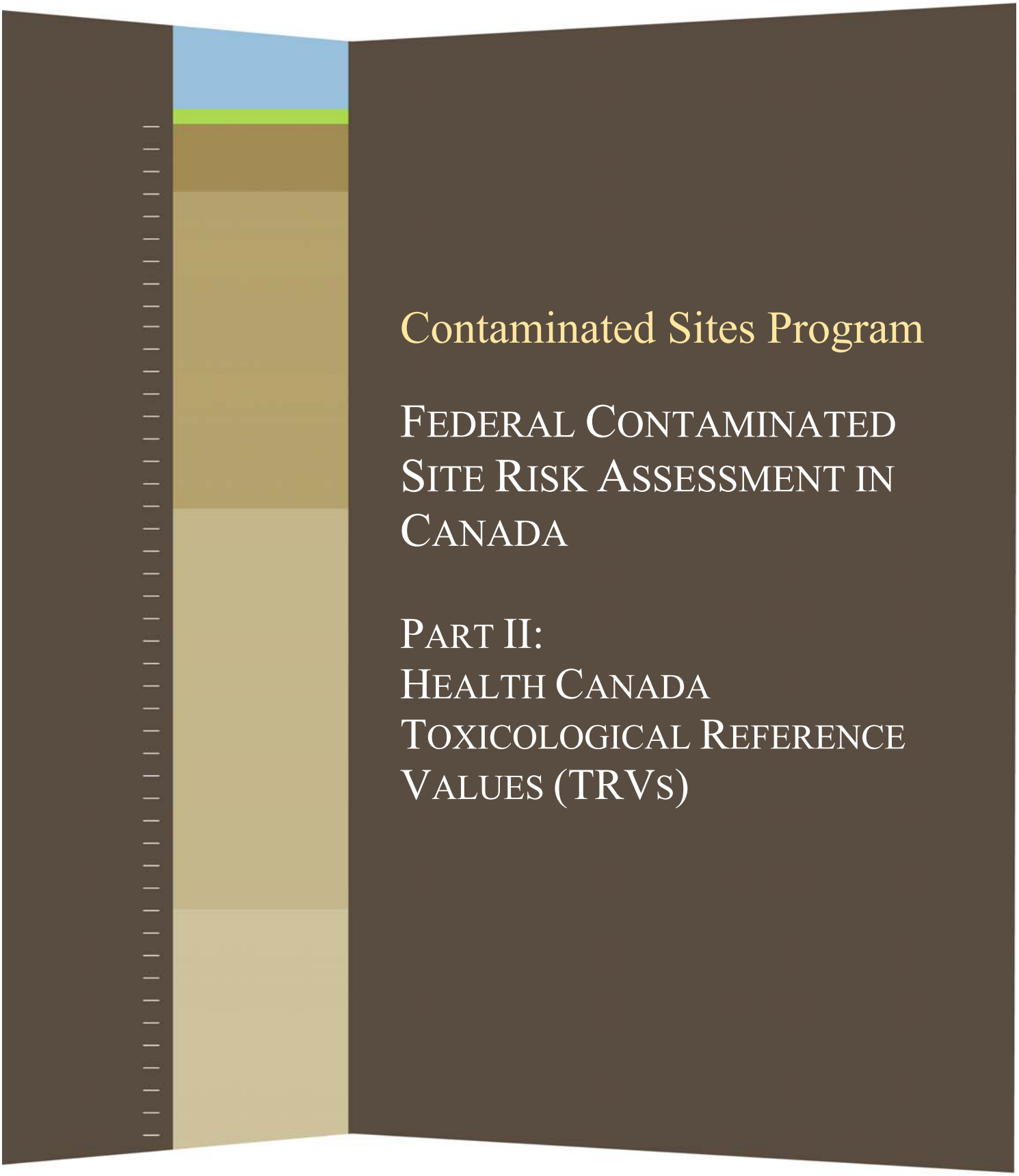
Health Canada Santé Canada



Contaminated Sites Program

Federal Contaminated Site Risk Assessment in Canada

Part II: Health Canada Toxicological Reference Values (TRVs)

Canada

FEDERAL CONTAMINATED SITE RISK ASSESSMENT IN CANADA

PART II:
HEALTH CANADA TOXICOLOGICAL REFERENCE VALUES (TRVS)

September 2004

Prepared by:

Environmental Health Assessment Services
Safe Environments Programme

Our mission is to help the people of Canada
maintain and improve their health.
Health Canada

Published by authority of the
Minister of Health

Également disponible en français sous le titre :
Partie II : Les valeurs de référence toxicologiques de Santé Canada

This publication can be made available in/on computer diskette/large print/audio-cassette/braille upon request.

Cat. H46-2/04-368E
ISBN 0-662-38245-5

PREFACE

Federal Contaminated Site Risk Assessment in Canada: Part II: Health Canada Toxicological Reference Values (TRVs) was prepared in support of the Federal Contaminated Sites Accelerated Action Plan (FCSAAP), a program designed to ensure improved and continuing federal environmental stewardship as it relates to contaminated sites located on federally owned or operated properties.

This document is a companion to *Federal Contaminated Site Risk Assessment in Canada: Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA)* and was prepared by the Environmental Health Assessment Services Division, Safe Environments Programme, Health Canada.

As the practice of risk assessment advances, and as the FCSAAP proceeds, new and updated information on toxicological reference values and other aspects of risk assessment will be published. As a result, it is anticipated that revisions to this document will be necessary from time to time to reflect this new information. Health Canada should be consulted at the address below to confirm that the version of the document in your possession is the most recent edition and that the most recent TRVs are being used.

Questions, comments, criticisms, suggested additions or revisions to this document should be directed to:

Contaminated Sites Program
Environmental Health Assessment Services
Safe Environments Programme
Health Canada
2720 Riverside Drive
Sir Charles Tupper Building, 4th Floor, PL 6604M
Ottawa, ON K1A 0K9
Fax: (613) 941-8921
E-mail: cs-sc@hc-sc.gc.ca
See also:
http://www.hc-sc.gc.ca/hecs-sesc/ehas/contaminated_sites.htm

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

DWQG	Drinking water quality guidelines
FCSAAP	Federal Contaminated Sites Accelerated Action Plan
JECFA	Joint Expert Committee on Food Additives
JMPR	Joint Meeting on Pesticide Residues
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzo-dioxin
PCDF	Polychlorinated dibenzo-furan
PQRA	Preliminary quantitative risk assessment
SF_{inh}	Inhalation slope factor
SF_{oral}	Oral slope factor
TC	Tolerable concentration
TC_{05}	Tumorigenic concentration: concentration (air, water) found to induce a 5% increase in the incidence of, or deaths due to, tumours considered to be associated with exposure
TD_{05}	Tumorigenic dose: dose found to induce a 5% increase in the incidence of, or deaths due to, tumours considered to be associated with exposure
TDI	Tolerable daily intake
TRV	Toxicological reference value
UR_{Inh}	Inhalation unit risk
WHO/FAO	World Health Organization / Food and Agriculture Organization

HEALTH CANADA TOXICOLOGICAL REFERENCE VALUES (TRVS)

Name	Non-Carcinogenic Toxicological Reference Values		Carcinogenic Toxicological Reference Values			
	Health Canada TDI [a] (mg/kg-d)	Health Canada TC (mg/m^3)	Oral slope factor from TD_{05} [b] $(mg/kg\text{-}d)^{-1}$	Inhalation slope factor from TC_{05} [c] $(mg/kg\text{-}d)^{-1}$	Inhalation unit risk from TC_{05} [c] $(mg/m^3)^{-1}$	Oral slope factor from DWQG [a] $(mg/kg\text{-}d)^{-1}$
Aldicarb	0.001					
Aldrin + dieldrin	0.0001					
Aniline	0.007 [b]					
Arsenic			2.8	2.80E+01	6.40E+00	1.7 [h]
Atrazine + metabolites	0.0005					
Azinphos-methyl	0.0025					
Barium	0.016					
Bendiocarb	0.004					
Benzene				1.46E-02	3.30E-03	3.10E-01
Benzo(a)pyrene				1.37E-01	3.10E-02	2.30
Benzo(b)fluoranthene				8.20E-03	1.90E-03	
Benzo(j)fluoranthene				6.80E-03	1.60E-03	
Benzo(k)fluoranthene				5.50E-03	1.30E-03	
Bis(2-ethyl-hexyl) phthalate	0.044 [b]					
Bis(Chloro-methyl) ether				4.13E+01	9.43E+00	
Boron	0.0175					
Bromoxynil	0.0005					
Cadmium	0.0008			4.29E+01	9.80E+00	
Carbaryl	0.01					
Carbofuran	0.01					
Carbon tetrachloride						4.90E-02
Chloramine, mono	0.048					
Chlorobenzene	0.43 [b]	0.01 [b]				
Chlorpyrifos	0.01					
Chromium, hexavalent	0.001			3.31E+02	7.58E+01	
Chromium, total	0.001			4.76E+01	1.09E+01	
Copper	0.03 [d]					
Cyanazine	0.0013					
Cyanide, free	0.02 [d]					
DDT	0.01 [e]					
Diazinon	0.002					
Dibutyl phthalate	0.063 [b]					
Dicamba	0.0125					

Name	Non-Carcinogenic Toxicological Reference Values		Carcinogenic Toxicological Reference Values			
	Health Canada TDI [a] (mg/kg-d)	Health Canada TC (mg/m^3)	Oral slope factor from TD_{05} [b] $(mg/kg\text{-}d)^{-1}$	Inhalation slope factor from TC_{05} [c] $(mg/kg\text{-}d)^{-1}$	Inhalation unit risk from TC_{05} [c] $(mg/m^3)^{-1}$	Oral slope factor from DWQG [a] $(mg/kg\text{-}d)^{-1}$
Dichlorobenzene, 1,2-	0.43 [b]					
Dichlorobenzene, 1,4-	0.11 [b]	0.095 [b]				
Dichlorobenzidine, 3,3'-			6.76E-02			
Dichloroethane, 1,2-			8.06E-03			7.50E-02 [h]
Dichloroethylene, 1,1	0.003					
Dichloromethane	0.05 [b]			9.90E-05	2.30E-05	7.90E-05
2,4-D	0.01					
Dichorophenol, 2,4-	0.1					
Diclofop-methyl	0.001					
Dimethoate	0.002					
Dinoseb	0.001					
Diquat	0.008					
Diuron	0.0156					
Fluoride, inorganic	0.122					
Glyphosate	0.03					
Hexachlorobenzene	0.0005 [b]		8.3E-01			
Indeno(1,2,3-cd)pyrene				1.6E-02	3.8E-03	
Lead	0.0036					
Malathion	0.02					
Mercury, inorganic (ionic)	0.0003 [d]					
Methoxychlor	0.1					
Methyl methacrylate	0.05 [b]	0.052 [b]				
Methyl tertiary- butyl ether	0.01 [b]	0.037 [b]				
Metolachlor	0.005					
Metribuzin	0.0083					
Monochlorobenzene	0.0089					
Nickel chloride	0.0013 [b]					
Nickel oxide		0.00002 [b]				
Nickel subsulphide		0.000018 [b]				
Nickel sulfate	0.05 [b]	0.0000035 [b]				
Nickel, metallic		0.000018 [b]				
Nickel, oxidic/sulphidic/ soluble				5.5E+00	1.3E+00	
Nickel, soluble				3.1E+00	7.1E-01	
Nickel, sulphidic						

Name	Non-Carcinogenic Toxicological Reference Values		Carcinogenic Toxicological Reference Values			
	Health Canada TDI [a] (mg/kg-d)	Health Canada TC (mg/m^3)	Oral slope factor from TD_{05} [b] $(mg/kg-d)^{-1}$	Inhalation slope factor from TC_{05} [c] $(mg/kg-d)^{-1}$	Inhalation unit risk from TC_{05} [c] $(mg/m^3)^{-1}$	Oral slope factor from DWQG [a] $(mg/kg-d)^{-1}$
Nitrilotriacetic acid (NTA)	0.01					
Paraquat (as dichloride)	0.001					
Parathion	0.005					
Pentachlorobenzene	0.001 [b]					
Pentachlorophenol	0.006					
Phenol	0.06 [d]					
Phorate	0.0002					
Picloram	0.02					
PCBs	0.001 [f]					
PCDD/PCDF	1.00E-08 [b]					
PCDD/PCDF	2.0E-09 [g]					
Simazine	0.0013					
Styrene	0.12 [b]	0.092 [b]				
Terbufos	0.00005					
Tetrachlorobenzene, 1,2,3,4-	0.0034 [b]					
Tetrachlorobenzene, 1,2,3,5-	0.00041 [b]					
Tetrachlorobenzene, 1,2,4,5-	0.00021 [b]					
Tetrachloroethylene	0.014 [b]	0.36 [b]				
Tetrachlorophenol, 2,3,4,6-	0.01					
Toluene	0.22 [b]	3.8 [b]				
Trichlorobenzene, 1,2,3-	0.0015 [b]					
Trichlorobenzene, 1,2,4-	0.0016 [b]	0.007 [b]				
Trichlorobenzene, 1,3,5-	0.0015 [b]	0.0036 [b]				
Trichloroethylene			2.5E-04	2.7E-03	6.1E-04	
Trichlorophenol,2,4,6-						2.0E-02
Trifluralin	0.0048					
Uranium (non-radiological)	0.0006 [d]					
Vinyl chloride						2.60E-01
Xylene, mixed isomers	1.5 [b]	0.18 [b]				

NOTES

a – From *Canadian Guidelines for Drinking Water Quality, Supporting Documentation* (Health Canada, 2002), unless otherwise indicated.

b – For non-carcinogens, TDI and TC values taken directly from Health Canada (1996); for carcinogens, oral slope factor derived as: $SF_{oral} = 0.05/TD_{05}$; TD_{05} from Health Canada (1996).

c – Inhalation unit risk derived as: $UR_{Inh} = 0.05/TC_{05}$; inhalation slope factor derived as: $SF_{Inh} = 0.05/(TC_{05} \times 16\ m^3/day/70.7\ kg)$; TC_{05} from Health Canada (1996); inhalation rate from Allan and Richardson (1998) and Richardson (1997); adult body weight from Richardson (1997).

d – From *CCME Soil Quality Guidelines* and supporting documentation on health-based guidelines prepared by Health Canada.

e – WHO/FAO Joint Meeting on Pesticide Residues (JMPR) (the Food Directorate, Health Canada, generally endorses and applies the TDIs for pesticide residues derived by the JMPR).

f – Grant, D.L. (1983) (this TDI is still applied by Health Canada for the assessment of PCB exposure from foods and other sources).

g – Officially, the Health Canada TDI for PCDD/PCDF is 10 pg/kg-d (Health Canada, 1996); however, the WHO/FAO Joint Expert Committee on Food Additives and Contaminants (JECFA) recently proposed a revised TDI of 2 pg/kg-d. The Food Directorate, Health Canada, generally endorses and applies the TDIs for food contaminants derived by the JECFA, and it is anticipated that this revised TDI will be implemented. Therefore, it is recommended that preliminary quantitative risk assessments (PQRAs) for PCDDs/PCDFs in Canada employ this more conservative TDI.

h – Although the TRV from the *Canadian Drinking Water Quality Guidelines Supporting Documentation* is presented, it is recommended that the comparable TRV from the more recent assessment (Health Canada, 1996) be employed for risk characterization.

REFERENCES

Allan, M., and G.M. Richardson. 1998. Probability density functions describing 24-hour inhalation rates for use in human health risk assessments. *Human and Ecological Risk Assessment* 4(2): 379-408.

Grant, D.L. 1983. "Regulation of PCBs in Canada." In: *PCBs: Human and Environmental Hazards*. Edited by F.M. D'Itri and M.A. Kamrin. Toronto: Butterworth Publishers; pp. 383-392.

Health Canada. 1996. *Health-Based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for Priority Substances*. Report no. 96-EHD-194. Ottawa, Ontario.

Health Canada. 2002. *Guidelines for Canadian Drinking Water Quality, Supporting Documentation*. Ottawa, Ontario. Available online at: http://www.hc-sc.gc.ca/hecs-sesc/water/dwgsup.htm

Richardson, G.M. 1997. *Compendium of Canadian Human Exposure Factors for Risk Assessment*. Ottawa: O'Connor Associates Environmental Inc.