CHEMICAL UPDATE WORKSHEET

Chemical Name:	**Chromium III**
CAS #:	**16065-83-1**
Revised By:	RRD Toxicology Unit
Revision Date:	August 17, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	51.996	51.996	PP	EXP
Physical State at ambient temp	Inorganic	Inorganic	MDEQ	
Melting Point (˚C)	---	1900	PP	EXP
Boiling Point (˚C)	---	2642	PP	EXP
Solubility (ug/L)	NA	NA	NA	NA
Vapor Pressure (mmHg at 25˚C)	NA	NR	NA	NA
HLC (atm-m^3/mol at 25˚C)	NR	NR	NA	NA
Log Kow (log P; octanol-water)	NR	NR	NA	NA
Koc (organic carbon; L/Kg)	NR	NR	NA	NA
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	NR	NR	NA	NA
Diffusivity in Water (Dw; cm^2/s)	NR	NR	NA	NA
Soil Water Partition Coefficient (Kd; inorganics)	1.8E+6	1.8E+06	SSG	EST

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (˚C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unit less)	NA	NA	NA	NA
Critical Temperature (K)		NR	NA	NA
Enthalpy of Vaporization (cal/mol)		NR	NA	NA
Density (g/mL, g/cm^3)		NR	NA	NA
EMSOFT Flux Residential 2 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Residential 5 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	NA	NR	EMSOFT	NA

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	1.5	1.5E+0	IRIS, 1998	
RfD details	Rat chronic feeding study (Ivankovic & Preussmann, 1975); NOAEL=1,468 mg/kg/day; UF=100; MF=10. Critical effects = no observed effects. Based on IRIS discussion MDNR/ERD concludes that the NOAEL would be more accurately stated as a LOAEL and apply an UF of 1,000. CCD/RRD date: 3/01/1988.	**Tier 1 Source:** **IRIS:** **Basis:** IRIS is s Tier 1 source. **Critical Study**: Ivankovic, S; Preussmann, R. (1975) Absence of toxic and carcinogenic effects after administration of high doses of chromic oxide pigment in subacute and long-term feeding experiments in rats. Food Cosmet Toxicol 13:347-351. **Method(s)**: Male and female rats (60/group) were exposed to 0, 1%, 2% or 5% chromic oxide (Cr2O3) baked in bread (0, 360, 720 and 1,800 g/kg bodyweight, respectively) for 5 days/week for 600 feedings (840 total days). **Critical effect**: **End point or Point of Departure (POD):** NOAEL = 5%; adjusted NOAEL = 1,468 mg/kg/day (adjusted for chromium content and dosing schedule). **Uncertainty Factors**: UF = 100 (10 each for interspecies variability, interspecies extrapolation, and database deficiencies) **Source and date:** IRIS, Last revision date - 9/03/1998. An EPA screening level review in 2001 did not identify any critical new studies. A 1998 Toxicological Review is available. **Tier 2 Sources**: **PPRTV:** No PPRTV record available at this time. **MRL:** Per ATSDR List (12/2014), no oral MRL at this time. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD/RRD (3/01/1998), RfD = 1.5 mg/kg-day. See Part 201 Value RfD details.		Complete
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	--	NA	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
CSF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate data to determine the potential carcinogenicity of trivalent chromium". The classification of hexavalent chromium as a known human carcinogen raises a concern for the carcinogenic potential of trivalent chromium. **IRIS WOE Basis**: Occupational studies include mixed exposures to both Cr (III) and Cr (VI). The Cr(VI) species is the likely agent in reports of excess cancer risk in chromium workers. Data addressing exposures to Cr(III) alone are not available, and data are inadequate for an evaluation of human carcinogen potential. **Source and Date**: IRIS, 9/03/1998 **Tier 1 and 2 Sources:** **IRIS, 09/03/1998:** Quantitative estimate of cancer risk for oral exposure not available. **PPRTV:** No PPRTV record available at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 sources:** **MDEQ:** Per DEQ-CCD, no value at this time.		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	5.0	1.0E-1	ATSDR, 2012	
RfC/ITSL details	The ITSL was based on the TLV of 0.5 mg/m^3. CCD/AQD date, 12/26/1995	**Tier 2 Source:** **ATSDR:** **Basis:** No tier 1 source available. ATSDR inhalation intermediate MRL = 1.0E-4 mg/m^3 for effects of Cr III soluble particulates (chromium sulfate). **Critical Study**: Derelanko MJ, Rinehart WE, Hilaski RJ, et al. 1999. Thirteen-week sub chronic rat inhalation toxicity study with a recovery phase of trivalent chromium compounds, chromic acid and basic chromium sulfate. Toxicol Sci 52(2):278-288. **Method(s)**: CDF (Fisher 344/Crl BR VAF/Plus) rats were exposed to chromic oxide		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		or basic chromium sulfate by nose-only inhalation (0, 3, 10, or 30 mg Cr (III)/m^3 (measured concentrations) 6 hours/day, 5 days/week for 13 weeks. Of these 15 rats/sex/group, 10 rats/sex/group were examined and sacrificed after 13 weeks of exposure and 5 rats/sex/group were examined and sacrificed after an additional 13-week recovery (no exposure) period. **Critical effect**: respiratory tract lesions **End point or Point of Departure (POD):** LOAEL = 3 mg/m^3; $LOAEL_{HEC}$ = 0.04 mg/m^3 **Uncertainty Factors**: UF = 300 (10 each for interspecies variability and use of a LOAEL, and 3 for interspecies extrapolation) **Source and date:** ATSDR, 09/2014. A 2012 Toxicological Profile is available. **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (9/03/1998), no value at this time. **PPRTV:** No PPRTV record available at this time. **MRL:** Per ATSDR List (12/2014), no inhalation chronic MRL at this time. Inhalation intermediate MRL for soluble particulates is discussed above. An intermediate MRL for insoluble particulates = 1.0E-4 mg/m^3 is derived based on respiratory effects and UF = 90. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, (3/01/1995), ITSL = 5.0 µg/m^3. See Part 201 Value RfC/ITSL details.		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate data to determine the potential carcinogenicity of trivalent chromium". The classification of hexavalent chromium as a known human carcinogen raises a concern for the carcinogenic potential of trivalent chromium. **IRIS WOE Basis**: Occupational studies include mixed exposures to both Cr(III) and Cr(VI). The Cr(VI) species is the likely agent in reports of excess cancer risk in chromium workers. Data addressing exposures to Cr(III) alone are not available, and data are inadequate for an evaluation of human carcinogen potential.		Complete.

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Source and Date: IRIS, 9/03/1998 **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (9/03/1998), no value at this time. **PPRTV:** No PPRTV record available at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	No	No. The RfD or RfC/ ITSL is not based on a reproductive-developmental effect.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	100	100	SDWA, 1976	
SDWS details	SDWA, 1976	MI Safe Drinking Water Act (SDWA) 1976 PA 399.		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NA	SDWA, 1976 and USEPA SMCL List, 2015	
SMCL details	NA	SDWA, 1976 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Aesthetic value (ug/L)	NA	NA	NA	
Aesthetic Value details	NA	NA		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA	NA	
Others				

(C) Chemical-specific Absorption Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABSgi)	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABSgi details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AEd)	---	0.01	MDEQ, 2015	
AEd details				
Ingestion Absorption Efficiency (AEi)		0.5	MDEQ, 2015	
AEi Details				
Relative Source Contribution for Water (RSC_W)		0.7	MDEQ, 2015	
Relative Source Contribution for Soil (RSC_S)		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC_A)		1.0	MDEQ, 2015	
Others				

(D) Rule 57 Water Quality Values and GSI Criteria

Current GSI value (µg/L)	(G,X)
Updated GSI value (µg/L)	(G,X)
Rule 57 Drinking Water Value (µg/L)	120

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	120	6/1997
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	9,400	6/1997
Wildlife Value (WV)	NA	
Human Cancer Values for Drinking Water Source (HCV-drink)	NA	
Human Cancer values for non-drinking water source (HCV-Non-drink)	NA	
Final Chronic Value (FCV)	$(EXP(0.819*(LnH)+0.6848))*0.86^{D}$ D = value expressed as dissolved	7/1997
Aquatic maximum value (AMV)	$(EXP(0.819*(LnH)+3.7256))*0.316^{D}$ D = value expressed as dissolved	7/1997
Final Acute Value (FAV)	$(EXP(0.819*(LnH)+3.7256))*0.316*2^{D}$ D = value expressed as dissolved	7/1997

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 website
2. MDEQ Rule 57 table

(E) Target Detection Limits (TDL)

	Value	Source
Target Detection Limit – Soil (μg/kg)	2,000	MDEQ, 2015
Target Detection Limit – Water (μg/L)	10	MDEQ, 2015
Target Detection Limit – Air (ppbv)	NA	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	NA	MDEQ, 2015

CHEMICAL UPDATE WORKSHEET ABBREVIATIONS:

CAS # - Chemical Abstract Service Number.

Section (A) Chemical-Physical Properties

Reference Source(s):

CRC	Chemical Rubber Company Handbook of Chemistry and Physics, 95th edition, 2014-2015
EMSOFT	USEPA Exposure Model for Soil-Organic Fate and Transport (EMSOFT) (EPA, 2002)
EPA2001	USEPA (2001) Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature. Office of Solid Waste and Emergency Response, Washington, D.C.
EPA4	USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.
EPI	USEPA's Estimation Programs Interface SUITE 4.1, Copyright 2000-2012
HSDB	Hazardous Substances Data Bank
MDEQ	Michigan Department of Environmental Quality
NPG	National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards
PC	National Center for Biotechnology Information's PubChem database
PP	Syracuse Research Corporation's PhysProp database
SCDM	USEPA's Superfund Chemical Data Matrix
SSG	USEPA's Soil Screening Guidance: Technical Background Document, Second Edition, 1996
USEPA/EPA	United States environmental protection agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.
W9	USEPA's User Guide for Water9 Software, Version 2.0.0, 2001

Basis/Comments:

EST	estimated
EXP	experimental
EXT	extrapolated
NA	not available or not applicable
NR	not relevant

Section (B) Toxicity Values/Benchmarks

Sources/References:

ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CAL DTSC	California Department of Toxic Substances Control
CAL OEHHA	CAEPA Office of Environmental Health Hazard Assessment
CCD	MDEQ Chemical Criteria Database
ECHA	European Chemicals Agency (REACH)
OECD HPV	Organization for Economic Cooperation and Development HPV Database
HEAST	USEPA's Health Effects Assessment Summary Tables
IRIS	USEPA's Integrated Risk Information System
MADEP	Massachusetts Department of Environmental Protection
MDEQ/DEQ	Michigan Department of Environmental Quality
DEQ-CCD/AQD	MDEQ Air Quality Division
DEQ-CCD/RRD	MDEQ Remediation and Redevelopment Division
DEQ-CCD/WRD	MDEQ Water Resources Division
MNDOH	Minnesota Department of Health

NJDEP	New Jersey Department of Environmental Protection
NYDEC	New York State Department of Environmental Conservation
OPP/OPPT	USEPA's Office of Pesticide Programs
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Values
RIVM	The Netherlands National Institute of Public Health and the Environment
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USEPA OSWER	USEPA Office of Solid Waste and Emergency Response
USEPA MCL	USEPA Maximum Contaminant Level
WHO	World Health Organization
WHO IPCS	International Programme on Chemical Safety (IPCS/INCHEM)
WHO IARC	International Agency for Research on Cancers
NA	Not Available.
NR	Not Relevant.

Toxicity terms:

BMC	Benchmark concentration
BMCL	Lower bound confidence limit on the BMC
BMD	benchmark dose
BMDL	Lower bound confidence limit on the BMD
CSF	Cancer slope Factor
CNS	Central nervous system
IURF or IUR	Inhalation unit risk factor
LOAEL	Lowest observed adverse effect level
LOEL	Lowest observed effect level
MRL	Minimal risk level (ATSDR)
NOAEL	No observed adverse effect level
NOEL	No observed effect level
RfC	Reference concentration
RfD	Reference dose
p-RfD	Provisional RfD
aRfD	Acute RfD
UF	Uncertainty factor
WOE	Weight of evidence

Section (C) Chemical-specific Absorption Factors

MDEQ	Michigan Department of Environmental Quality
USEPA RAGS-E	United States Environmental Protection Agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

Section (D) Rule 57 Water Quality Values and GSI Criteria

GSI	Groundwater-surface water interface
NA	A value is not available or not applicable.
ID	Insufficient data to derive value
NLS	No literature search has been conducted