



## CHEMICAL UPDATE WORKSHEET

<b>Chemical Name:</b>	<b>Benzo(g,h,i)perylene</b>
<b>CAS #:</b>	<b>191-24-2</b>
<b>Revised By:</b>	RRD Toxicology Unit
<b>Revision Date:</b>	September 15, 2015

### (A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
<b>Molecular Weight (g/mol)</b>	276.34	276.34	EPI	EXP
<b>Physical State at ambient temp</b>	Solid	Solid	MDEQ	
<b>Melting Point (°C)</b>	---	278.00	EPI	EXP
<b>Boiling Point (°C)</b>	500	500.00	EPI	EXP
<b>Solubility (ug/L)</b>	0.26	0.26	EPI	EXP
<b>Vapor Pressure (mmHg at 25°C)</b>	1.0E-10	1.00E-10	EPI	EXP
<b>HLC (atm-m<sup>3</sup>/mol at 25°C)</b>	5.34E-8	3.31E-07	EPI	EXP
<b>Log Kow (log P; octanol-water)</b>	6.7	6.63	EPI	EXP
<b>Koc (organic carbon; L/Kg)</b>	3.86E+6	1.951E+06	EPI	EST
<b>Ionizing Koc (L/kg)</b>		NR	NA	NA
<b>Diffusivity in Air (Di; cm<sup>2</sup>/s)</b>	0.08	2.39E-02	W9	EST
<b>Diffusivity in Water (Dw; cm<sup>2</sup>/s)</b>	8.0E-6	6.0922E-06	W9	EST
<b>Soil Water Partition Coefficient (Kd; inorganics)</b>	NR	NR	NA	NA

	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)		NA	NA	NA
Enthalpy of Vaporization (cal/mol)		NA	NA	NA
Density (g/mL, g/cm <sup>3</sup> )		1.3	PC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm <sup>2</sup> )	NA	4.48E-09	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm <sup>2</sup> )	NA	4.48E-09	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm <sup>2</sup> )	NA	4.88E-09	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm <sup>2</sup> )	NA	4.88E-09	EMSOFT	EST

**(B) Toxicity Values/Benchmarks**

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
<b>Reference Dose (RfD) (mg/kg/day)</b>	7.1E-3	2.0E-3	MDEQ, 2015	
<b>RfD details</b>	RfD of most toxic noncarcinogenic PAH (naphthalene) downwardly adjusted by 10-fold factor and then used as RfD for this chemical on interim basis. Source: MDEQ-RRD RRD calculation date: 2/1/1993	<p><b>Tier 3 Source:</b>  <b>MDEQ:</b>  <b>Basis:</b> In the absence of chemical-specific toxicity data for benzo (g, h, i) perylene, NYDEC and TCEQ identify pyrene as an appropriate chemical surrogate and recommend the pyrene IRIS RfD (3.0E-2 mg/kg/d) without modification. Similarly, MDEQ identifies naphthalene as an appropriate chemical surrogate for benzo(g,h,i)perylene and applies an additional 10-fold uncertainty factor to the naphthalene IRIS RfD (2E-2 mg/kg/d) to account for significant deficiencies of the benzo(g,h,i)perylene toxicity database. The pyrene and naphthalene IRIS RfD values are nearly identical, so selection of either would not significantly affect the RfD for benz (g, h, i) perylene. The MDEQ RfD value is recommended because of the additional database deficiency consideration. See details below.</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> Per IRIS (12/1/1990), no value at this time.</p> <p><b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> No MRL record available at this time.</p> <p><b>Tier 3 Sources:</b>  <b>MDEQ/RRD (2/1/1993):</b> Per DEQ-CCD, the RfD for benzo(g,h,i)perylene is based on the EPA IRIS RfD of the most toxic noncarcinogenic polycyclic aromatic hydrocarbon, naphthalene, downwardly adjusted by 10-fold uncertainty factor and then used as the RfD for this chemical on interim basis. The most current (09/17/1998) IRIS RfD for naphthalene is 2.0E-2 mg/kg-day; therefore the benzo (g, h, i) perylene RfD would be 2.0E-3 mg/kg/d.</p> <p><b>New York DEC:</b> RfD= 0.03 mg/kg/day. Based on EPA IRIS RfD value (3E-2 mg/kg/d) for the chemical surrogate pyrene. An oral reference dose is available for pyrene,</p>		Complete



	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		<p>which is a chemically similar polycyclic aromatic hydrocarbon that can be used to represent benzo [g, h, i] perylene with respect to noncancerous endpoints. The basis for choosing pyrene as a chemical surrogate for benzo [g, h, i] perylene is that pyrene is expected to be toxicologically similar, and has the most stringent reference dose available among the polycyclic aromatic hydrocarbons.</p> <p><b>Texas CEQ:</b> RfD= 3.0E-02 mg/kg/day.                      No prepublished toxicity values are available for benzo [g, h, i] perylene in IRIS, HEAST, NCEA, or ATSDR. Benzo [g, h, i] perylene is structurally similar to pyrene. Pyrene will be used as a surrogate for benzo [g, h, i] perylene.</p>		
<b>Oral Cancer Slope Factor (CSF) (mg/kg-day)<sup>-1</sup></b>	NA	NA	MDEQ, 2015	
<b>CSF details</b>	NA	<p><b>Carcinogen Weight-of-Evidence (WOE) Class:</b> D, not classifiable as to human carcinogenicity  <b>IRIS WOE Basis:</b> based on no human data and inadequate animal data (lung implant, skin-painting and subcutaneous injection bioassays).  <b>Source and Date:</b> IRIS, 12/1/1990</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> Per IRIS (12/1/1990), no value at this time.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> NA; MRLs are for non-cancer effects only.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ:</b> Per DEQ-CCD, no value at this time.</p>		Complete
<b>Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)</b>	1.2E+1	7.0E+0	MDEQ, 2015	
<b>RfC/ITSL details</b>	ITSL based on	<b>Tier 3 Source:</b>		Complete



	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
	<p>ERD's Type B criteria value, assumed to be equivalent to an RfD of 3.6 µg/kg/d for naphthalene</p> <p>CCD/AQD date: 7/19/1993</p>	<p><b>MDEQ:</b>  <b>Basis:</b> In the absence of chemical-specific toxicity data for benzo (g, h, i) perylene, NYDEC identify pyrene as an appropriate chemical surrogate and recommend the pyrene RfC based on route to route extrapolation of the IRIS RfD (3.0E-2 mg/kg/d). Similarly, MDEQ identifies naphthalene as an appropriate chemical surrogate for benzo(g,h,i)perylene and prefers the naphthalene RfC based on route to route extrapolation of the MDEQ RfD (2.0E-2 mg/kg-day). See details below.</p> <p><b>Tier 1 and 2 Sources:</b>  <b>IRIS:</b> Per IRIS (12/1/1990), no value at this time.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> No MRL record available at this time.</p> <p><b>Tier 3 Sources:</b>  <b>MDEQ/RRD:</b> RfC = 7E+0 µg/m<sup>3</sup>  <b>Basis:</b> As per previous AQD methodology, RfC based on RRD RfD of 2.0E-3 mg/kg/d (2 µg/kg/d) for naphthalene (multiplied by 70 kg/20m<sup>3</sup>).  <b>Source and date:</b> MDEQ-RRD – 09/15/2015</p> <p><b>New York DEC:</b> RfC = 100 µg/m<sup>3</sup>, based on route-to-route extrapolation from the surrogate chemical pyrene's RfD value of 0.03 mg/kg/d (assuming a 70 kg adult breathing 20 m<sup>3</sup>/d).</p>		
Inhalation Unit Risk Factor (IURF) ((µg/m <sup>3</sup> ) <sup>-1</sup> )	NA	NA	MDEQ, 2015	
IURF details	NA	<p><b>Carcinogen Weight-of-Evidence (WOE) Class:</b> D, not classifiable as to human carcinogenicity  <b>IRIS WOE Basis:</b> based on no human data and inadequate animal data (lung implant, skin-painting and subcutaneous injection bioassays).  <b>Source and Date:</b> IRIS, 12/1/1990</p> <p><b>Tier 1 and 2 Sources:</b></p>		Complete



	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		<p><b>IRIS:</b> Per IRIS (12/1/1990), no value at this time.  <b>PPRTV:</b> No PPRTV record available at this time.  <b>MRL:</b> NA; MRLs are for non-cancer effects only.</p> <p><b>Tier 3 Source:</b>  <b>MDEQ:</b> Per DEQ-CCD, no value at this time.</p>		
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 is not based on a reproductive-developmental effect.	MDEQ, 2014	
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	--	NO	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NO	SDWA, 1976 and USEPA SMCL List	
SMCL details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	NA	NA	NA	
Aesthetic Value details	NA	NA		



	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
<b>Phytotoxicity Value? (Y/N)</b>	NO	Not evaluated.	NA	
<b>Phytotoxicity details</b>	NA	NA	NA	
<b>Others</b>				

**(C) Chemical-specific Absorption Factors**

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABS <sub>gi</sub> )	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABS <sub>gi</sub> details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE <sub>d</sub> )	---	0.13	MDEQ, 2015	
AE <sub>d</sub> details				
Ingestion Absorption Efficiency (AE <sub>i</sub> )		0.5	MDEQ, 2015	
AE <sub>i</sub> Details				
Relative Source Contribution for Water (RSC <sub>w</sub> )		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC <sub>s</sub> )		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC <sub>A</sub> )		1.0	MDEQ, 2015	
Others				

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

<b>Current GSI value (µg/L)</b>	ID
<b>Updated GSI value (µg/L)</b>	ID
<b>Rule 57 Drinking Water Value (µg/L)</b>	ID

	<b>Rule 57 Value (µg/L)</b>	<b>Verification Date</b>
<b>Human Non-cancer Values- Drinking water source (HNV-drink)</b>	ID	9/2010
<b>Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)</b>	ID	9/2010
<b>Wildlife Value (WV)</b>	NA	NA
<b>Human Cancer Values for Drinking Water Source (HCV-drink)</b>	NA	NA
<b>Human Cancer values for non-drinking water source (HCV-Non-drink)</b>	NA	NA
<b>Final Chronic Value (FCV)</b>	ID	6/2010
<b>Aquatic maximum value (AMV)</b>	ID	6/2010
<b>Final Acute Value (FAV)</b>	ID	6/2010

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 [website](#)
2. MDEQ Rule 57 [table](#)

**(E) Target Detection Limits (TDL)**

	<b>Value</b>	<b>Source</b>
<b>Target Detection Limit – Soil (<math>\mu\text{g}/\text{kg}</math>)</b>	330	MDEQ, 2015
<b>Target Detection Limit – Water (<math>\mu\text{g}/\text{L}</math>)</b>	1	MDEQ, 2015
<b>Target Detection Limit – Air (ppbv)</b>	NA	MDEQ, 2015
<b>Target Detection Limit – Soil Gas (ppbv)</b>	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
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**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