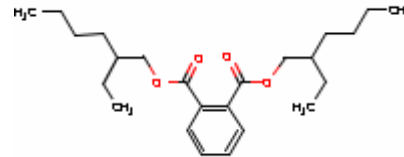




Lake Michigan Basin Water Quality Standards

Di(2-ethylhexyl)phthalate (DEHP)

CAS: 117-81-7
Water Solubility: 0.27 mg/L
Log K_{ow} : 7.6



Derived Criteria

Human Health: Where no standard is applicable for a chemical substance within waters of the Lake Michigan Basin, human health numeric values or criteria may be calculated pursuant to 35 IAC 302.540. A Tier I Lake Michigan Basin Human Health Threshold Value (LMHHTV) is derived based on disease or functional impairment due to a physiological mechanism for which there is a threshold dose below which no damage occurs (35 IAC 302.585). A Tier I Lake Michigan Basin Human Health Nonthreshold Value (LMHHNV) is derived based on disease or functional impairment due to a physiological mechanism for which any dose may cause some risk of damage from cancer or a nonthreshold mechanism (35 IAC 302.590). Values are derived for surface waters classified as public water supplies (drinking), as well as surface waters not used as human drinking water sources (nondrinking).

Tier I Lake Michigan Basin Human Health Criteria			
LMHHTC ($\mu\text{g/L}$)		LMHHNC ($\mu\text{g/L}$)	
<u>Drinking</u>	<u>Nondrinking</u>	<u>Drinking</u>	<u>Nondrinking</u>
60	67	2.8	3.2

Exposure and Toxicity Data

BCF = 114 (Stephan 1993)
 $f_{fd} = 0.09475$
 $FCM_{TL3} = 11.708$
 $FCM_{TL4} = 16.749$
 $f_1 = 0.048$ (% lipid from Stephan 1993)
 $BAF_{HHTL3} = 506.2$ l/kg
 $BAF_{HHTL4} = 1232.2$ l/kg
NOAEL = 19 mg/kg-day (IRIS, 6/20/06)
UF = 1,000 (IRIS, 6/20/06)
ADE = 0.019 mg/kg-day
Carcinogen Assessment: B2, probable human carcinogen (IRIS, 6/20/06)
Cancer slope factor (q_1): 1.4×10^{-2} per mg/kg-day (IRIS, 6/20/06)
 $RAD = 7.143 \times 10^{-4}$

Human Health Calculations

Bioaccumulation Factor:

BAF predicted based on Log K_{ow} (ChemID, 6/20/06) and measured BCF (Stephan 1993)
 $\text{Log } K_{ow} = 7.6, K_{ow} = 39,810,717$

$$f_{fd} = 1 / [1 + (0.00000024 \text{ kg/L})(K_{ow})] = 0.09475$$

$$\text{Baseline } BAF_{T3} = (FCM_{TL3})\{[\text{measured BCF} / f_{fd}] - 1\} \{1 / f_1\} = 293,472$$

$$\text{Baseline } BAF_{T4} = (FCM_{TL4})\{[\text{measured BCF} / f_{fd}] - 1\} \{1 / f_1\} = 419,481$$

$$BAF_{HHTL3} = [(\text{Baseline } BAF_{T3})(0.0182)+1] = 506.2$$

$$BAF_{HHTL4} = [(\text{Baseline } BAF_{T4})(0.0310)+1] = 1232.2$$

Acceptable Daily Exposure:

$$ADE = \text{NOAEL} / \text{UF} = 0.019 \text{ mg/kg-day}$$

Risk Associated Dose:

$$RAD = 0.00001 / q_1 = 7.143 \times 10^{-4} \text{ mg/kg-day}$$

LMHHTC Calculation

$$\text{LMHHTC} = \frac{\text{ADE} \times \text{BW} \times \text{RSC}}{\text{WC} \times [(\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}}) + (\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}})]}$$

$$\begin{aligned} \text{Drinking water LMHHTC} &= \frac{0.019 \text{ mg/kg-day} \times 70 \text{ kg} \times 0.8}{2.0 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1232.2 \text{ l/kg})]} \\ &= 0.060 \text{ mg/l} = \mathbf{60 \mu\text{g/L}} \end{aligned}$$

$$\begin{aligned} \text{Nondrinking water LMHHTC} &= \frac{0.019 \text{ mg/kg-day} \times 70 \text{ kg} \times 0.8}{0.01 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1232.2 \text{ l/kg})]} \\ &= 0.067 \text{ mg/l} = \mathbf{67 \mu\text{g/L}} \end{aligned}$$

LMHHNC Calculation

$$\text{LMHHNC} = \frac{\text{RAD} \times \text{BW}}{\text{WC} \times [(\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}}) + (\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}})]}$$

$$\begin{aligned} \text{Drinking water LMHHNC} &= \frac{7.143 \times 10^{-4} \text{ mg/kg-day} \times 70 \text{ kg}}{2.0 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1232.2 \text{ l/kg})]} \\ &= 0.0028 \text{ mg/l} = \mathbf{2.8 \mu\text{g/L}} \end{aligned}$$

$$\begin{aligned} \text{Nondrinking water LMHHNC} &= \frac{7.143 \times 10^{-4} \text{ mg/kg-day} \times 70 \text{ kg}}{0.01 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1232.2 \text{ l/kg})]} \\ &= 0.00315 \text{ mg/l} = \mathbf{3.2 \mu\text{g/L}} \end{aligned}$$

REFERENCES

ChemIDplus. United States National Library of Medicine, Toxicology Data Network (TOXNET). <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CHEM>

Integrated Risk Information System (IRIS). United States National Library of Medicine, Toxicology Data Network (TOXNET). <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?IRIS>

Stephen, CE. 1993. Derivation of Proposed Human Health and Wildlife Bioaccumulation Factors for the Great Lakes Initiative. Environmental Research Laboratory, Office of Research and Development, U.S. EPA, Duluth, MN.

Derivation History

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Contact Information

Brian Koch
Water Quality Standards, Bureau of Water
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794-9276