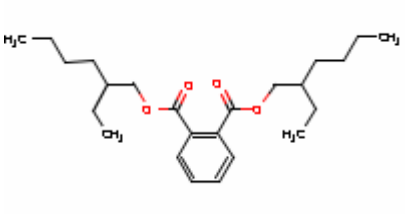
Illinois Environmental Protection Agency
Bureau of Water – Water Quality Standards Section

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 (µg/L)		LMHHNC (µg/L)	
Drinking	Nondrinking	Drinking	Nondrinking
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 = 7.143×10^{-4}

Human Health Calculations

Bioaccumulation Factor:

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

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

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

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 = NOAEL / UF = 0.019 mg/kg-day

Risk Associated Dose:

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

LMHHTC Calculation

$$\text{LMHHTC} = \frac{\text{ADE x BW x RSC}}{\text{WC x } [(FC_{TL3} \text{ x } BAF_{HHTL3}) + (FC_{TL3} \text{ x } BAF_{HHTL3})]}$$

$$\text{Drinking water LMHHTC} = \frac{0.019 \text{ mg/kg-day x } 70 \text{ kg x } 0.8}{2.0 \text{ l/day x } [(0.0036 \text{ kg/day x } 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day x } 1232.2 \text{ l/kg})]}$$

$$= 0.060 \text{ mg/l} = \mathbf{60\ \mu g/L}$$

$$\text{Nondrinking water LMHHTC} = \frac{0.019 \text{ mg/kg-day x } 70 \text{ kg x } 0.8}{0.01 \text{ l/day x } [(0.0036 \text{ kg/day x } 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day x } 1232.2 \text{ l/kg})]}$$

$$= 0.067 \text{ mg/l} = \mathbf{67\ \mu g/L}$$

LMHHNC Calculation

$$\text{LMHHNC} = \frac{\text{RAD x BW}}{\text{WC x } [(FC_{TL3} \text{ x } BAF_{HHTL3}) + (FC_{TL3} \text{ x } BAF_{HHTL3})]}$$

$$\text{Drinking water LMHHNC} = \frac{7.143 \text{ x } 10^{-4} \text{ mg/kg-day x } 70 \text{ kg}}{2.0 \text{ l/day x } [(0.0036 \text{ kg/day x } 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day x } 1232.2 \text{ l/kg})]}$$

$$= 0.0028 \text{ mg/l} = \mathbf{2.8\ \mu g/L}$$

$$\text{Nondrinking water LMHHNC} = \frac{7.143 \text{ x } 10^{-4} \text{ mg/kg-day x } 70 \text{ kg}}{0.01 \text{ l/day x } [(0.0036 \text{ kg/day x } 506.2 \text{ l/kg}) + (0.0114 \text{ kg/day x } 1232.2 \text{ l/kg})]}$$

$$= 0.00315 \text{ mg/l} = \mathbf{3.2\ \mu g/L}$$

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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