

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File for Chlordane (Technical) (CAS# 57-74-9 and 12789-03-6)
FROM: Keisha Williams, Air Quality Division (AQD)
DATE: October 27, 2015
SUBJECT: Screening Level for Chlordane (Technical)

The initial threshold screening level (ITSL) for chlordane (CAS#57-74-9 and 12789-03-6) is 0.7 $\mu\text{g}/\text{m}^3$ with an annual averaging time and the initial risk screening level (IRSL) is 0.01 $\mu\text{g}/\text{m}^3$ with an annual averaging time. The ITSL and IRSL are based on the United States Environmental Protection Agency's (USEPA's) reference concentration (RfC) and inhalation unit risk, respectively, for chlordane (technical) (USEPA, 1998). The IRSL and ITSL were adopted by the MDEQ AQD on November 3, 1997 and March 17, 1998, respectively.

Background on ITSL

The ITSL was originally established with an averaging time set at 24 hours per AQD Rules 232 (2). It is being changed at this time to annual, as allowed per Rule 229 (2), because the EPA derivation of the RfC accounted for chronic exposure.

The RfC for chlordane is based on critical effects of "hepatic effects" in rats that were exposed for 8 hours/day, 5 days/week for 13 weeks to 0, 0.1, 1.0, or 10 mg/m^3 technical chlordane (USEPA, 1998). A no observable adverse effect level (NOAEL) was at 1.0 mg/m^3 and used to derive the RfC as follows:

$$RfC = \frac{NOAEL_{Human\ Equivalent\ Concentration}}{uncertainty\ factors}$$

Where

$$-NOAEL_{Human\ Equivalent\ Concentration} = NOAEL_{adjusted\ for\ time} \times dosimetric\ adjustment\ factor$$

$$-NOAEL_{adjusted\ for\ time} = 10 \frac{mg}{m^3} \times \frac{8\ hours}{24\ hours} \times \frac{5\ days}{7\ days} = 0.24 \frac{mg}{m^3}$$

$$-dosimetric\ adjustment\ factor = regional\ deposited\ dose\ ratio_{extra-respiratory\ effects}$$

-regional deposited dose ratio_{extra-respiratory effects} was estimated to be 2.7 for a mass median aerodynamic diameter of 1.8 μm and sigma g of 3.1, based on dosimetric modeling (USEPA, 1994).

$$-NOAEL_{Human\ Equivalent\ Concentration} = 0.24 \frac{mg}{m^3} \times 2.7 = 0.65 \frac{mg}{m^3}$$

Uncertainty factors are 10 for subchronic to chronic duration extrapolation, 10 for intraspecies extrapolation, and 10 for interspecies extrapolation and database deficiencies.

$$RfC = \frac{0.65 \frac{mg}{m^3}}{10 \times 10 \times 10} = 6.5 \times 10^{-4} \frac{mg}{m^3}$$

$$\approx 7 \times 10^{-4} \frac{mg}{m^3}$$

$$ITSL = 7 \times 10^{-4} \frac{mg}{m^3} \times \frac{1000 \mu g}{mg} = 0.7 \frac{\mu g}{m^3}$$

Background on IRSL

Chlordane is classified as a “probable carcinogen...by all routes of exposure” (USEPA, 1998). The inhalation unit risk value of 0.0001 per $\mu g/m^3$ was derived from the oral slope factor, which was derived from 3 different studies that showed dose-related hepatocellular carcinoma in mice (USEPA, 1998). The IRSL and secondary risk screening level (SRSL) are calculated as follows:

$$IRSL = \frac{1 \times 10^{-6}}{\text{unit risk estimate}} = \frac{1 \times 10^{-6}}{\frac{0.0001}{\frac{\mu g}{m^3}}} = 0.01 \frac{\mu g}{m^3}$$

$$SRSL = \frac{1 \times 10^{-6}}{\text{unit risk estimate}} = \frac{1 \times 10^{-5}}{\frac{0.0001}{\frac{\mu g}{m^3}}} = 0.1 \frac{\mu g}{m^3}$$

References:

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environmental Quality.

USEPA. 1998. Chemical Assessment Summary: Chlordane (Technical); CASRN 12789-03-6. Integrated Risk Information System, US Environmental Protection Agency, Accessed on October 19, 2015.

http://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0142_summary.pdf