

**Substance Risk Evaluation for Determining Environmental Emergency Planning  
under the *Environmental Emergency Regulations* Set under the  
*Canadian Environmental Protection Act, 1999 (CEPA 1999)***

**Hexane  
(CAS No. 110-54-3)**

**Risk Evaluation Conclusion:**

- **Threshold Quantity of 4.5 tonnes (concentration 10%) due to aquatic toxicity and other considerations**
- **Is a candidate for the *Environmental Emergency Regulations***

**1.0 INTRODUCTION**

The *Environmental Emergency Regulations*, developed under Part 8 of the *Canadian Environmental Protection Act (CEPA)*, 1999 (Government of Canada, 2011), establish a list of substances for which fixed facilities must notify Environment Canada that they store or use the substance on-site, by providing notices to Environment Canada, reporting when the substance is released into the environment, and developing an environmental emergency plan (E2 plan) for each substance stored or used at a fixed facility at or above specified threshold quantities.

To determine if a substance is a candidate to be added to the *Environmental Emergency Regulations*, Environment Canada has developed a risk evaluation methodology based on the following hazard categories:

- Physical: flammable and combustible or oxidizing substances, or those having a potential to cause vapour cloud explosions or pool fires.
- Human Health: substances that are toxic by inhalation, are carcinogenic, or are corrosive.
- Environmental Health: substances that are: corrosive, persistent, bioaccumulative, or aquatically toxic.

For more information on the methodology for setting threshold quantities in the *Environmental Emergency Regulations*, please refer to Environment Canada (2014).

Hexane (CAS No. 110-54-3) was selected for risk evaluation because it is a substance (under the Government of Canada's Chemicals Management Plan  
[<http://www.ec.gc.ca/ese-ees/default.asp?lang=En&xml=C1B542C5-4A04-DD1F-74D8->

0E7B1459065C]) that, if spilled, could be immediately harmful to humans and/or the environment.

Following the risk evaluation, Environment Canada recommends that this substance be proposed for addition to Schedule 1 of the *Environmental Emergency Regulations* at a threshold quantity of 4.5 tonnes.

## **2.0 SUMMARY OF THE RISK EVALUATION**

### **2.1 Physical Hazard: Flammable, Combustible or Oxidizing Substances**

Because hexane has a flash point of -22°C (HSDB, 2005) and has a boiling point of 68.7°C (Government of Canada, 2009), this substance presents the possibility of a vapour cloud explosion. Therefore, a threshold of 18.35 tonnes is set for this substance as a result of its potential for combustibility.

### **2.2 Physical Hazard: Potential for Pool Fires**

It has been demonstrated via the Process Hazard Analysis Software Tools (PHAST) software that hexane is capable of causing a pool fire at a quantity of 33 tonnes.

### **2.3 Human Health Hazard: Inhalation Toxicity**

Because hexane has a vapour pressure greater than 10 mmHg (1.33 kPa) at 25°C (ATSDR, 1999), the substance has sufficient volatility to constitute an inhalation danger. The substance has an LC50 of 48,000 ppm (4 hrs) (RTECS, 2007) and an Immediately Dangerous to Life and Health (IDLH) of 1,100 ppm (NIOSH, 1995), however, IDHL is based on the Lower Explosively Limit (LEL) and is not a measure of toxicity. The LEL has been taken into account in regards to the substances combustibility, and therefore, the IDLH will not be considered with regards to inhalation toxicity.

Both the LC50 of 48,000 ppm (4 hrs) (RTECS, 2007) and the LD50 of 28,710 ppm (U.S. DOE, 2007) have been rejected because US EPA suggested for levels greater than 20,000 ppm and 5,000 ppm, respectively, these concentrations are considered to be relatively non-hazardous (Waxman, 1998).

Therefore, no threshold is set for the inhalation toxicity to humans.

### **2.4 Human Health Hazard: Carcinogenicity**

Because hexane is not classified in any group of International Agency for Research on Cancer (IARC, 2014) or the U.S. EPA (2005), and because the substance does not have a half-life longer than five years in any medium, no threshold is set for the carcinogenicity of this substance.

### **2.5 Human and Environmental Health Hazard: Corrosive Substances**

The measured pH is greater than 2 or less than 11.5, the substance is not considered corrosive and there is no associated threshold with this category.

## **2.6 Environmental Health Hazard: Persistent, Bioaccumulative, or Aquatically Toxic**

### *Lethal concentration*

The acute (short-term) aquatic toxicity for hexane has been determined to be moderately toxic based on studies of the most sensitive species, Fathead minnow (*Pimephales promelas*), with a lethal concentration (LC50 96 hours) of 2.5 mg/L (Geiger, *et al.*, 1990).

### *Persistence*

Hexane is classified as being non-persistent in water.

### *Bioaccumulation*

Hexane is slightly bioaccumulative.

### *Threshold*

Following the evaluation of the aquatic toxicity, the threshold is set at 4.5 tonnes.

## **2.7 Assigned Threshold**

Following the risk evaluation methodology developed under section 200 of CEPA 1999, the categories (flammability, combustibility, oxidizers, inhalation toxicity, aquatic toxicity, carcinogenicity, corrosiveness, pool fires) having the lowest scientific threshold will be compared against other risk management considerations. For example, the threshold will be compared to other provincial and federal legislation or voluntary programs that may already provide adequate management of the risk from an environmental emergency. Proposed thresholds may also be modified based on policy and other considerations as assessed during the preliminary public consultation period. For more information regarding the determination of thresholds, please refer to the *Implementation Guidelines for the Environmental Emergency Regulations 2011* (Environment Canada, 2011).

### Other Considerations

At this time, there are no other considerations to take into account for this substance that would result in an increase or a decrease in the calculated threshold quantity.

### Findings

A proposed threshold of 4.5 tonnes is assigned for hexane based on its assessed aquatic toxicity. The threshold quantity and its respective concentration will not be finalized until after preliminary public consultation.

## **3.0 CONCLUSION**

Information concerning the quantities of hexane (CAS No. 110-54-3) in use in Canada indicates that the substance exists in commerce. Following the risk evaluation and policy considerations of hexane and taking into consideration the quantities in use in Canada, Environment Canada recommends that this substance be proposed for addition to

Schedule 1 of the *Environmental Emergency Regulations* under CEPA 1999 at a threshold quantity of 4.5 tonnes at a concentration of 10%.

When doing the emergency planning of a substance, it is important to take into consideration not only the most stringent assigned threshold quantity, but all of the other higher-threshold quantities that are noted in association with this substance. Other notable thresholds of concern also determined for this substance are: 18.35 tonnes for combustibility; and 33 tonnes for pool fire.

Even if the quantity of a substance in use is below the threshold quantity indicated in the *Environmental Emergency Regulations*, Environment Canada recommends that emergency planning be applied to this substance in order to minimize, or prevent, any impacts on humans or the environment in the event of a release of the substance.

#### 4.0 REFERENCES

ATSDR (Agency for Toxic Substances & Disease Registry). 1999. Toxicological Profile for n-Hexane. U.S. Department of Health and Human Services. Atlanta Georgia. Available from: <http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=393&tid=68>

Environment Canada. 2011. Implementation Guidelines for the Environmental Emergency Regulations 2011. Available from: <http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=1FB6D405-1>

Environment Canada. 2014. Summary of Risk Evaluation Framework for Determining Quantity Thresholds and Concentrations for Substances under the Environmental Emergency Regulations Set under the Canadian Environmental Protection Act, 1999 (CEPA 1999). Environment Canada. Available from: <http://www.ec.gc.ca/ee-ue/default.asp?lang=En&n=9605FFBD-1>

Geiger, DL, LT Brooke, and DJ Call, 1990. Acute Toxicities of Organic Chemicals to Fathead Minnows (*Pimephales promelas*). Ctr. for Lake Superior Environ. Stud. Univ. of Wisconsin-Superior, Superior, WI 5:326 p. 3217.

Government of Canada. 2009. Environment Canada, Health Canada. Final Screening Assessment for Hexane (CAS RN 110-54-3). Available from: <http://www.ec.gc.ca/ese-ees/default.asp?lang=En&xml=C1B542C5-4A04-DD1F-74D8-0E7B1459065C>

Government of Canada. 2011. Environmental Emergency Regulations, Canadian Environmental Protection Act, 1999. Environment Canada. Registered on December 8, 2011. Available from: <http://www.gazette.gc.ca/rp-pr/p2/2011/2011-12-21/html/sor-dors294-eng.html>

HSDB (Hazardous Substances Data Bank). 2005. n-Hexane. National Library of Medicine-US (NLM). Available from: <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>

IARC (International Agency for Research on Cancer). 2014. IARC Monographs Database on Cancer Risks to Humans. International Agency for Research on Cancer, World Health Organization. Available from:  
<http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>

NIOSH (National Institute for Occupational Safety and Health). 1995. n-Hexane. Documentation for Immediately Dangerous To Life or Health Concentrations (IDLHs). Available from:  
<http://www.cdc.gov/niosh/idlh/intridl4.html>

RTECS (Registry of Toxic Effects of Chemical Substances). 2007. n-Hexane. Canadian Centre for Occupational Health and Safety. MDL Information Systems Inc. Available from:  
<http://ccinfoweb2.ccohs.ca/rtecs/Action.lasso?-database=rtecs&-layout=Display&-response=detail.html&-op=eq&RTECS+NUMBER=MN9275000&-search>

U.S. DOE. 2007. Chemical Safety Program- Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 23 for Chemicals of Concern. Available from:  
<http://www.atlintl.com/DOE/teels/teel/complete.asp>

U.S. EPA (United States Environmental Protection Agency). 2005. Guidelines for Carcinogenic Risk Assessment. Available from: <http://www.epa.gov/cancerguidelines/>

Waxman, FM. 1998. Agrochemical and Pesticide Safety Handbook, Lewis Publishers, 124 p.

## **5.0 FURTHER READING**

Ketcheson K, Shrives J. 2010. Comparison of Threshold Quantities for Substances with Final AEGL-2 and IDLH Values under CEPA's Environmental Emergency Regulations. In: Proceedings of the Thirty-third Arctic and Marine Oilspill Program Technical Seminar on Environmental Contamination and Response. Environment Canada: Ottawa (ON). pp. 843-861.

U.S. EPA (U.S. Environmental Protection Agency). 1994. List of Regulated Toxic and Flammable Substances and Thresholds for Accidental Release Prevention. Federal Register, 59(20). Document Number 94-1556. 31. Washington (DC). Available from : <http://www.gpo.gov/fdsys/pkg/FR-1994-01-31/html/94-1556.htm>