

Title:	Alberta Ambient Air Quality Objectives - Naphthalene
Number:	AEP, Air Policy, 2016, No. 1
Program Name:	Air Policy Branch
Effective Date:	September 1, 2016
This document was updated on:	
ISBN No:	ISBN 978-1-4601-2580-9 (Print) ISBN 978-1-4601-2581-6 (PDF)
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Alberta ambient air quality objectives are issued by Alberta Environment and Parks, under Section 14 (1), the *Environmental Protection and Enhancement Act*, 1992. In 2013, Health Canada recommended a human health protective value of $10 \mu\text{g m}^{-3}$ for residential indoor air quality. However, a lower level is selected for Alberta's objective with the recognition that there is a difference in methodology between Health Canada and other agencies, and with acknowledgement that there are no anticipated negative social or economic consequences of having the lower level for outdoor air in Alberta. Therefore:

- The annual average Alberta Ambient Air Quality Objective for gaseous naphthalene is $3 \mu\text{g m}^{-3}$ based on health effects.

Characteristics

Naphthalene (C_{10}H_8) is a bicyclic aromatic hydrocarbon with the lowest molecular weight of all polycyclic aromatic hydrocarbons. Naphthalene occurs naturally in fossil fuels such as petroleum and coal and is produced from distillation of either petroleum or coal tar. Its main use is as an intermediate in the production of phthalic anhydride (used in the manufacture of plasticizers, resins, dyes, and insect repellents). Naphthalene has historically been used as a moth repellent and as a deodorizer for diaper pails and toilets.

Naphthalene is emitted as a product of incomplete combustion, and may be released from wildfires. Anthropogenic sources of naphthalene result from domestic combustion of wood and fossil fuels, emissions from gasoline and diesel exhaust as well as gasoline evaporation. Major industrial sources of naphthalene include coal tar and coke production, oil and gas extraction, petroleum refining, petrochemical manufacturing, wood preserving operations (creosote impregnation), asphalt industries (paving and roofing) and wastewater treatment plants.

Air emissions of naphthalene account for 92% of all naphthalene releases to the environment. Naphthalene emitted to the atmosphere will exist mainly in the gas-phase at ambient temperatures. Naphthalene in air is destroyed by reaction with hydroxyl radicals with a typical half-life of less than a day. Due to this short time in the atmosphere, naphthalene has limited potential for long-range transport.

There is limited information on the odour concentration thresholds for naphthalene. Two of the lowest reported thresholds are $7 \mu\text{g m}^{-3}$ (AIHA, 2013) and $7.5 \mu\text{g m}^{-3}$ (WHO, 2010).

Ambient monitoring of naphthalene in Alberta is by integrated 24-hour samples, collected every six days. Annual average naphthalene levels in Alberta are below $0.2 \mu\text{g m}^{-3}$ levels.

Effects

Inhaled naphthalene is readily absorbed in the lungs, and distributed throughout the body. Short-term exposure to high concentrations can cause hemolytic anemia, cataracts and damage to lungs; although, normal concentrations in ambient or indoor air are not sufficient to cause such effects. Earlier long-term experimental studies in animals raised concerns that naphthalene causes damage to the nose and lung and may have cancer-causing properties in those organs, but recent studies have confirmed that differential toxicity exists among species, and at this time, there are no known cancer-causing concerns for humans at environmental exposure levels.

Limited information exists on the effects of naphthalene on vegetation, and has not been used as the basis for the ambient air objective.

Objectives in Other Jurisdictions

Outside of North America, few jurisdictions have developed an air quality objective for naphthalene. The differences between objectives (e.g. US EPA and Health Canada) is mainly due to uncertainty factors used when extrapolating from the adverse effects observed in the animal toxicological studies to adverse effects expected in humans (Table 1).

Table 1: Summary of Selected Air Quality Objectives and Guidelines for Naphthalene

Agency	Objective Title	Objective Value ($\mu\text{g m}^{-3}$) Averaging Time		
		1-hr	24-hr	Annual
Ontario MOE	Ambient air quality criterion	50 (10 min)	22.5	
Health Canada	Indoor Air Quality Guideline			10 (long term)
US ATSDR	Chronic Minimum Risk Level			3.7
US EPA	Reference Concentration			3
California EPA	Chronic Reference Exposure Level			9
Texas CEQ	Effects screening level	200		50
WHO	Indoor Air Quality Guideline			10

References

American Industrial Hygiene Association 2013. Odor Thresholds for Chemicals with Established Occupational Health Standards (2nd Ed). Falls Church, Virginia.

Alberta Environment 2013. Assessment Report on Naphthalene for Developing Ambient Air Quality Objectives, 2013 Update. All information was taken from this reference unless otherwise noted.

Health Canada 2013. Naphthalene in Indoor Air. Accessed April 2015 http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/air/naphthalene_fs-fi/naphthalene_fs-fi-eng.pdf .

WHO 2010. World Health Organization guidelines for indoor air quality: selected pollutants.

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Date: May 19, 2016