



# Methyl Tertiary-Butyl Ether (MTBE)

This fact sheet describes the Canadian Water Quality Guidelines for methyl tertiary-butyl ether (MTBE) to protect freshwater and marine life. It is part of the series *Guidelines at a Glance*, which summarizes information for the Canadian public on toxic substances and other parameters for which there are Canadian Environmental Quality Guidelines.

The National Guidelines and Standards Office of Environment Canada coordinates the development of Canadian Environmental Quality Guidelines in cooperation with the Canadian Council of Ministers of the Environment (CCME).

## Where does MTBE come from?

Methyl tertiary-butyl ether (MTBE) is a colourless, volatile, and flammable liquid synthesized for commercial uses. MTBE does not occur naturally in the environment. Only one manufacturer of MTBE operates in Canada, so the majority of the MTBE used in Canada is imported. MTBE is most commonly used by blending it with gasoline to boost octane levels and reduce carbon monoxide emissions. MTBE has been used at service stations throughout the country since 1986, but unlike in the United States, Canada does not require gasoline to contain MTBE. In 1998, 10% of gasoline in Canada contained MTBE, while in 2000 this had fallen to 2%.

MTBE enters the environment from leaking underground storage tanks, spills during manufacture or transport, runoff of residues deposited during vehicle use, and motorized water craft. Data collected from 1994 to 2002 show an average on-site release of MTBE from manufacturing and processing facilities in Canada to the environment of 121 tonnes per year. The highest on-site release was 171 tonnes in 1999. This is expected to decrease with ongoing reductions in the processing and use of MTBE in Canada.

## What happens to MTBE released into the environment?

Because of its high volatility, most MTBE released to the environment goes into the atmosphere as a gas. MTBE is also highly soluble in water, so groundwater supplies can be contaminated with significant amounts of the chemical. MTBE has a strong taste similar to the odour of turpentine, and it can make water undrinkable at very low levels (0.015 milligrams MTBE per litre of water).

MTBE does not bond well with lipids (fat), as other environmental pollutants do, nor does it associate with fine particles of organic matter. For these reasons, MTBE is not expected to accumulate significantly in aquatic food webs. Both photo-oxidation and biodegradation can break down MTBE, although the breakdown rate varies depending on specific environmental conditions. The time it takes for half of a given amount of MTBE to break down (known as half life) varies from a few days in air to more than 10 years in groundwater.

## What effects can MTBE have on fish and other forms of aquatic life?

Very few studies have been conducted to determine the effects of MTBE on aquatic life. In the available studies, MTBE had negative effects on the growth and reproduction of aquatic invertebrates and fish. At very high concentrations, invertebrates and fish died. Algae had reduced growth rates when exposed to MTBE, and at high concentrations MTBE acted as an algicide (kills algae). A species of marine mussel tolerated high levels of MTBE but had some irregularities in shell development.



## What levels of MTBE are safe for plants and animals that live in Canadian waters?

The Canadian Water Quality Guideline (CWQG) for the protection of freshwater life is 10 milligrams of MTBE per litre of water. This guideline is based on available toxicity data for six invertebrate species, three fish species, and three plant species.

The interim CWQG for the protection of marine life is 5 milligrams of MTBE per litre of water. Only an interim guideline can be given at present because insufficient data are available on the chronic, or long-term, effects of MTBE on marine species. This interim guideline is based on available toxicity data for six invertebrate species, two fish species, and one plant species.

If the levels of MTBE measured in fresh or salt water are less than the corresponding guideline, one would not expect to see adverse health effects in even the most sensitive species. In places where the CWQGs for MTBE are exceeded, adverse effects will not necessarily occur. Whether effects will occur depends on the amount by which the guideline levels are exceeded and on the kinds of plants and animals that live there. Further investigation at a particular site is needed to determine whether or not there is a negative impact.

## How do MTBE levels in Canadian waters compare to the guidelines?

A recent survey of MTBE in Canadian groundwater found 233 cases of contamination across Canada, although none of these cases exceeded the CWQG. The majority of groundwater occurrences were in British Columbia (147 cases) and Prince Edward Island (31 cases). MTBE levels ranged from less than 0.005 to greater than 3.4 milligrams of MTBE per litre of water. Most of these cases occurred near service stations or fuel storage facilities. Although fewer cases were reported in other provinces and the territories, we expect to find MTBE in most areas where blended gasoline has been used or stored. There is a lack of information on MTBE concentrations in Canadian surface waters.

## How can CWQGs be used to make a difference?

In general, Canadian Water Quality Guidelines can be used by Canadian federal, provincial, and territorial governments on a voluntary basis to set local guidelines, discharge limits for industry, and clean-up targets. CWQGs are most commonly used in environmental assessments as benchmarks or yardsticks to which measured levels are compared. Anyone can use the guidelines to determine if the level of MTBE measured in a sample of water has the potential to cause direct adverse environmental effects.

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