

# **Response to Public Concerns regarding Fluoride Emissions from the Ashbridges Bay Treatment Plant September 2005**

## **Background**

At the public meeting on “Ashbridges Bay Treatment Plant (ABTP) – Public Health Studies” that was held on May 11, 2005, concerns were expressed that fluoride was not included as one of the chemicals included in the emissions study. To address the community’s concerns on this issue, an evaluation of fluoride emissions was conducted. This document provides an overview of potential health effects of fluoride and summarizes the results of the evaluation.

Fluoride is present in wastewater as a result of fluoridation of drinking water, discharge from home of consumer products such as fluoridated toothpaste and mouth rinse and some industrial sources. Fluoride does not evaporate readily. Fluoride can only become airborne and emitted from a wastewater treatment plant when it precipitates out from the wastewater into the sewage sludge or biosolids, and followed by incineration of the biosolids.

## **Health effects**

At very high levels of exposure fluoride can result in respiratory conditions such as bronchial hyperreactivity, worsening of asthma symptoms, impaired respiratory functions, respiratory irritation and skeletal fluorosis in humans. The World Health Organization (WHO) states that there is insufficient data to derive an air limit for the protection of human health, however, no effects have been found at exposures of up to 16  $\mu\text{g}/\text{m}^3$  of gaseous fluoride. Fluoride levels in ambient air less than 1  $\mu\text{g}/\text{m}^3$  (prolonged exposure) will prevent adverse effects in livestock and plants. These concentrations are also sufficient to protect human health (WHO, 2000).

## **Evaluation of fluoride emissions**

Fluoride has been measured in stack testing when the incinerator was in operation at the Ashbridges Bay Treatment Plant (CANADEER, 1994; EER, 1998).

Information for the recent evaluation was conducted using two different methods:

1. The first method estimated fluoride air emissions from ABTP incinerators and used this information to model the levels of fluoride in the air; and
2. The second method analyzed the likelihood of fluoride evaporating and precipitating out from the wastewater by comparing the fluoride levels in wastewater coming into the ABTP with those leaving the treatment plant.

The results are as follow:

- Fluoride air levels in the South Riverdale and Beaches communities as a result of the ABTP incineration are estimated to be 34-2800 times below the Ontario air standards and World Health Organization guidance when the incinerator was in operation (prior to 2003). The air standards and guidance are protective of human health.
- The data available also show that the water leaving the ABTP have the same level of fluoride as wastewater entering the plant. This shows that fluoride is not substantially evaporated or precipitated out of the water into the biosolids, and fluoridation of drinking water does not add a significant amount of fluoride to the biosolids or to the air.

In summary, this evaluation indicates that very little fluoride was emitted to air even when the incinerator was in operation. Fluoride present in the wastewater is unlikely to have caused negative effects on health in the community even when biosolids were incinerated prior to 2003. Details are provided in Appendix A.

### **Discharge into Lake Ontario**

The Ontario Ministry of the Environment (MOE) currently does not have a Provincial Water Quality Objective (PWQO) for inorganic fluoride. The Canadian Council of the Ministers of the Environment (CCME) has developed a surface water quality guideline of 0.12 mg/L for inorganic fluoride in fresh water for the protection of aquatic organisms (CCME, 2003).

In determining whether contaminants present in wastewater discharged into surface water meet the surface water quality guideline (for protection of aquatic organisms), the MOE considers the effect of dilution in the mixing zone. The dilution factor used for the ABTP is between 10 to 20 (Hall, 2005).

Taking into consideration both the levels of fluoride in the water leaving the plant (see Table 2 in Appendix A) and the dilution factor, it can be concluded that the discharge of fluoride from the ABTP would meet the CCME surface water guideline. It is therefore not a concern for aquatic life in Lake Ontario.

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## Appendix A Detailed Results

The estimated maximum ambient fluoride air levels in the South Riverdale and Beaches neighbourhoods as a result of incineration are summarized in Table 1.

**Table 1 Estimated ambient concentrations of fluoride (as hydrogen fluoride) due to ABTP air emissions (Ciccone, 2005)**

Community	Fluoride Levels in the Ambient Air ( $\mu\text{g}/\text{m}^3$ )							
	Air Quality Standards <sup>a</sup>		Scenario 1			Scenario 2		
	½ hr	24 hr	½ hr	24 hr	Annual	½ hr	24 hr	Annual
<b>Beaches</b>	4.3	0.86	0.0058	0.00096	0.000078	0.1028	0.0170	0.0014
<b>South Riverdale</b>	4.3	0.86	0.0191	0.00142	0.000133	0.1561	0.0253	0.0024

<sup>a</sup>MOE (2001, 2005)

Scenario 1 Incinerator in full operation (pre 1996)

Scenario 2 Incinerator in partial operation (2000-2002)

The estimated ambient levels of fluoride in the South Riverdale and Beaches neighbourhood are about 34-2800 times below the Ontario air standards (Table 1) and WHO's guidance of  $1 \mu\text{g}/\text{m}^3$ .

There are some monitoring data of fluoride in the wastewater entering (influent) and leaving the plant (effluent) for 2000 – 2004 (City of Toronto, 2001, 2002, 2003, 2004, 2005). Based on the reported values for these years, the concentration of fluoride is similar in the influent as compared to the effluent (Table 2). This suggests that fluoride has not substantially precipitated out of, or evaporated from, the wastewater. This is to be expected given that the fluoride added to drinking water is soluble and not volatile. Fluoridation of drinking water would therefore not add a significant amount of fluoride to the biosolids, which was then incinerated or land applied.

The wastewater information indicates that the amount of fluoride expected to be emitted to air during any time period is not significant, even when the incinerators were in operation at the ABTP (prior to 2003).

**Table 2 Fluoride in wastewater at ABTP (mg/L) - one-time measurement for annual plant survey**

Year	Influent	Effluent
2000	0.74	0.74
2001	0.54	0.54
2002	0.85	0.81
2003	0.57	0.54
2004	-	0.55

## **Appendix B References**

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