

# TORONTO STAFF REPORT

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August 29, 2003

To: Board of Health  
From: Dr. Sheela V. Basrur, Medical Officer of Health  
Subject: Air Quality and Off-road Diesel Fuel in Toronto

Purpose:

To report on recent developments relating to the use of off-road diesel fuel and their implications for air quality in Toronto.

Financial Implications and Impact Statement:

There are no financial implications arising from this report.

Recommendations:

It is recommended that:

- (1) the Board of Health reiterate its request to the federal Minister of the Environment to reduce the public health risks arising from diesel emissions by:
  - (a) limiting the concentration of sulphur in off-road diesel fuel to 15 parts per million by 2010, as proposed in the United States;
  - (b) applying this limit to diesel fuel used in locomotive and marine applications and generators;
  - (c) providing incentives for the early introduction of low-sulphur diesel; and
- (2) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

Background:

The Board of Health at its meeting on February 19, 2001 requested that the Medical Officer of Health, in consultation with the City Solicitor, investigate the means by which the City could prohibit the sale and/or use of off-road diesel within the City, and report back to the Board of Health.

At its July 29, 2002 meeting, the Board of Health adopted the report, "Assessing the Health Impact of Diesel Exhaust in Toronto", and recommended that the federal Minister of Environment take additional steps to reduce the public health risks arising from diesel emissions by (a) harmonizing sulphur standards for off-road diesel with those for on-road diesel fuels, and (b) providing incentives for the early introduction of low-sulphur diesel.

This report provides information on recent developments regarding the concentration of sulphur in off-road diesel fuel, and activities related to limiting the sale and use of off-road diesel fuel in Toronto.

Comments:

Air Quality and Health Implications:

Off-road diesel fuel contains high concentrations of sulphur, relative to gasoline and on-road diesel fuel. The sulphur in off-road diesel is emitted to the air, contributing to air pollution, when the fuel is burned in construction equipment, generators, ferries, trains and other machines that do not require a road licence. City staff estimate that use of off-road diesel is responsible for 23% of the sulphur dioxide emitted from transportation sources in Toronto, or approximately 5% of all sulphur oxides emitted in Toronto. According to Environment Canada, Canadian off-road emissions of nitrogen oxides and volatile organic compounds are predicted to become greater than those from on-road vehicles over 2005 to 2010. Emissions of PM<sub>10</sub> (particulate matter of diameter less than ten microns) from off-road engines are already greater than those from on-road engines. Reducing the level of sulphur in fuels would decrease the engine emissions of numerous pollutants that impact health, including carbon monoxide, nitrogen oxide, volatile organic compounds, sulphur dioxide, sulphate particles and benzene.

When burned in fuel and emitted, sulphur can form many chemical compounds (e.g. sulphur dioxide, SO<sub>2</sub>; or sulphate, SO<sub>4</sub>), that are collectively known as sulphur oxides (SO<sub>x</sub>). In the air, sulphur oxides can become mixed with water vapour to form acid aerosols or very fine secondary particles containing sulphates. As a gas or fine particle, sulphur oxides can be inhaled deep into the lung, and sulphur dioxide is known to cause narrowing of air passages of asthmatics. Toronto Public Health estimated that sulphur dioxide contributed annually to approximately 9% of the air pollution-related premature deaths and 8% of the pollution-related hospital admissions due to respiratory problems (based on 1995 data). Long-term health effects of fine particles are also associated with cardiac and respiratory problems. Environment Canada anticipates that reducing the allowable level of sulphur in off-road diesel could reduce the annual number of air quality-related premature deaths, hospital admissions, emergency room visits, new cases of chronic bronchitis, children with respiratory illness and asthma symptom days.

### Concentration of Sulphur in Off-road Diesel Fuel:

The concentration of sulphur in off-road diesel fuel is unregulated in Canada and averages approximately 3,000 parts per million (ppm) in Ontario (2002 data). This is much higher than what is found in Canadian gasoline and on-road diesel fuel. By federal regulation, gasoline will be limited to 30 ppm sulphur by January 2005, and on-road diesel fuel to 15 ppm by mid-2006.

Sulphur concentration in off-road diesel fuel is also currently unregulated in the USA. In May, 2003, the US EPA released a proposed rule that would regulate the level of sulphur in off-road diesel fuel to a maximum of 15 ppm. As an interim measure, the proposal would require refiners to produce off-road, locomotive and marine diesel fuel with a maximum sulphur concentration of 500 ppm by June 1, 2007. By June 1, 2010, the limit on sulphur in fuel used for off-road applications (excluding locomotive and marine applications) would be 15 ppm. The US EPA is considering including locomotive and marine diesel fuel in the 15 ppm cap by 2010.

As part of its proposed rule, the US EPA is also proposing new off-road diesel engine emission standards, and meeting these standards will require vehicles to employ highly efficient after-treatment systems. Ultra-low sulphur diesel fuel is required by 2010 to allow the after-treatment devices installed in 2011 model year off-road diesel engines to operate properly.

In August 2003, the federal government released a discussion paper on designing a Canadian regulation to align allowable sulphur levels in off-road diesel fuel with those of the proposed US rule. The discussion paper proposed limiting sulphur levels in off-road diesel fuel to 15 ppm, with an interim limit of 500 ppm, by the same dates as in the US proposal. However, within this framework, the Canadian government is considering simpler rules, with fewer exceptions to the sulphur limits and fewer administrative requirements than the American proposal. This proposal is consistent with Environment Canada's "Federal Agenda on Cleaner Vehicles, Engines and Fuels", released in 2001, which outlined the government's plan to reduce pollution from vehicles, engines and fuels.

It should be noted that in California, sulphur limits for off-road diesel fuel will be lowered to 15 ppm earlier than in the rest of the United States. In California, limits on sulphur in fuels apply to both on-road and off-road fuels, and in that state off-road diesel fuel is already limited to 500 ppm sulphur. In California, it is proposed that the maximum allowable level of sulphur in all on-road and off-road diesel fuel sold, will be reduced from 500 ppm to 15 ppm, starting June 1, 2006. The proposed regulation has been approved, and it is anticipated that it will be finalized by the California Air Resources Board executive officer in the near future.

It is recommended that the federal Minister of Environment be requested to limit the concentration of sulphur in off-road diesel fuel to 15 parts per million by 2010, as is proposed in the United States, as this change would substantially reduce sulphur-related emissions from the off-road sector. It is recommended that the 15 ppm limit be applied to diesel fuel used in locomotive and marine applications as well.

### Limiting the Sale and Use of Off-road Diesel Fuel in Toronto:

As one component of its Low Sulphur Fuel Purchasing Policy, in recent years the City of Toronto has purchased lower-sulphur on-road diesel fuel for its off-road applications, thus substantially reducing sulphur emissions from the corporation's participating fleets. It is noteworthy that the majority of the emission reductions achieved by the City policy result from this particular practice. All off-road diesel fuel is dyed and is exempt from the Provincial Fuel Tax (road tax). Therefore, when the City purchases on-road diesel fuel for off-road purposes, the fuel is dyed by the supplier and is exempt from the fuel tax, making the purchase affordable.

Limiting the sale and/or use of off-road diesel fuel throughout Toronto would require other off-road diesel fleets to use lower-sulphur on-road diesel fuel, as is done by the City of Toronto. This approach would reduce fuel-related sulphur emissions throughout the City, contributing to cleaner air. However, preliminary investigations indicate that it would be difficult to implement and enforce. Alternatively, a federal standard to limit the allowable sulphur concentration in off-road diesel fuel would dramatically reduce sulphur-related emissions from the off-road sector across the country.

In response to BOH direction to investigate means of limiting off-road diesel use in Toronto, Toronto Public Health prepared a proposal and applied to the Toronto Atmospheric Fund (TAF) for funding. Toronto Public Health proposed undertaking a feasibility study for the development of a by-law that would prohibit the sale and use of off-road (high-sulphur) diesel fuel in Toronto. The strategy did not receive TAF funding. Without enhanced resources, Toronto Public Health is not able to proceed with the by-law feasibility study.

City staff also had discussions with the fuel industry regarding the idea of entering into a memorandum of understanding with the City, that would state that the fuel supplier commits to selling only low-sulphur diesel fuel at its fuel stations in the City of Toronto. The supplier would benefit by creating a green image for itself, while Toronto's residents would benefit through access to cleaner fuels and improved air quality. The fuel industry indicated there were logistical difficulties in pursuing this option.

On several occasions, the Board of Health and the Medical Officer of Health have already encouraged the federal government to reduce the allowable level of sulphur in off-road diesel fuel to 15 ppm, the limit for on-road diesel fuel. Given that by-law development and implementation is a lengthy process, and given that the federal government has proposed a 15 ppm limit by 2010, a City of Toronto by-law might only provide benefits for a few additional years, at considerable expense. The recommended approach is to encourage the federal government to adopt a 15 ppm limit on sulphur in off-road diesel fuel by 2010, as is proposed in the United States and to provide incentives for its early introduction.

### Conclusions:

Off-road diesel fuel is very high in sulphur, relative to gasoline and on-road diesel fuel, and therefore the use of this fuel contributes disproportionately to air pollutant emissions in the City. The concentration of sulphur in off-road diesel fuel is not regulated in Canada, and in Ontario the

average sulphur concentration is approximately 3,000 ppm (2002 data). City staff have considered several approaches to limiting the sale and use of off-road diesel fuel in Toronto, recognizing that the regulation of fuels is not within municipal jurisdiction. The federal government plans to substantially reduce the allowable concentration of sulphur in off-road diesel to harmonize with a recently announced US proposed limit of 15 ppm. The federal Minister of Environment should be encouraged to limit the concentration of sulphur in off-road diesel fuel to 15 parts per million by 2010, as is proposed in the United States, and to apply this limit to diesel fuel used in locomotive and marine applications and generators, in order to improve air quality and health in Canada.

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