



Toronto Transit Commission
1900 Yonge Street, Toronto, ON M4S 1Z2
416-393-4000

January 28, 2020

Ulli Watkiss
City Clerk
Toronto City Hall
100 Queen Street West
Toronto, ON M5H 2N2

Dear Ulli Watkiss:

At its meeting on Monday, January 27, 2020 the TTC Board considered the attached report titled "Subway Air Quality – Toronto Public Health Study".

The Board adopted the recommendations in the subject report, as follows:

It is recommended that the TTC Board:

1. Adopt the recommendations from the report, HL13.8 – Subway Health Impacts Study, including:
 - Implementing PM2.5 mitigation measures that can be delivered in the short-term, including actions related to employee awareness and training programs, state of good repair (materials, equipment, procurement and procedures) and engineering reviews, as described in the report;
2. Identifying medium- and long-term mitigation measures, with a priority on Line 2, that can be implemented, to further improve air quality, as described in the report, including:
 - a. Reviewing operational systems and procedures, such as Automatic Train Control (ATC), train frequency and ventilation systems;
 - b. Reviewing procurement specification and deployment plans for replacement trains for future line modernization;

Jaye Robinson, Chair
Alan Heisey, Q.C., Vice-Chair
Richard J. Leary, Chief Executive Officer

Brad Bradford, Commissioner
Shelley Carroll, Commissioner
Joanne De Laurentiis, Commissioner
Jim Karygiannis, Commissioner

Ron Lalonde, Commissioner
Jennifer McKelvie, Commissioner
Denzil Minnan-Wong, Commissioner
Julie Osborne, Commissioner



- c. Including consideration of the potential improvements to air quality in the TTC's study of platform edge doors;
 - d. Monitoring levels of subway PM2.5 and evaluating the PM2.5 mitigation strategies that are implemented;
3. Requesting that TTC staff report back on opportunities for air quality improvement in the TTC subway system, including a review of emerging information and technology that has the potential to reduce air pollution in the subway system;
 4. Identify funding requirements through future budget processes to develop and implement further PM2.5 mitigation measures.

The foregoing is submitted for Council's consideration of HL13.8 Subway Health Impacts Study at its meeting on Wednesday, January 29, 2020.

Sincerely,

Original signed by

Kevin Lee
Head of Commission Services

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Subway Air Quality – Toronto Public Health Study

Date: January 27, 2020
To: TTC Board
From: Chief Safety Officer

Summary

Throughout 2019, Toronto Public Health (TPH) carried out a health assessment that focused on subway passenger exposure to air pollutants using well-established assessment approaches commonly used in the environmental health field: Human Health Risk Assessment and Health Impact Assessment. Those assessments provided new information about the public health risks associated fine particulate matter (PM_{2.5}) in the subway. As well, these risks were considered in the context of the broader potential health impacts (both positive and negative) from using the TTC subway system. It was recommended at the July 10, 2019 TTC Board meeting that staff report back when the Health Assessment Report from Toronto Public Health is complete. A copy of HL13.8 - Subway Health Impacts Study is attached in Appendix A.

The TTC completed its subway air quality study over 2017 and 2018 to provide current information on the air quality in the underground portions of the subway, and to determine employee exposures to airborne contaminants. This was an update to a similar, but smaller study in 1995. Work group specific reports were sent to management, Joint Health and Safety Committees and union safety representatives in February 2019. The summary report was then presented to the TTC's Safety, Security and Environment (SX) Committee in June 2019 and to the TTC Board on July 10, 2019.

A comparison was made between the two TTC studies (1995 and 2018) using several key markers that allowed for direct comparison (lead, barium, copper and manganese for certain job titles). Concentrations of these markers were between 10 and 10,000 times lower in the 2018 study than in the 1995 study. Results from the 1995 study were also well below Occupational Exposure Limits. Based on this, it appears that the subway air quality has shown improvement over time.

Based on the results of 5,697 air samples, the use of respiratory protection is not required for non-maintenance positions. Only one maintenance group, that is already part of the respiratory protection program, requires respirators due to an exceedance of silica and inhalable particulates during structure maintenance activities.

All of the remaining contaminants sampled in this study were well below the applicable occupational exposure limits specified in Ontario Regulation 833, Control of Exposure to Biological or Chemical Agents and Ontario Regulation 490/09, Designated Substances.

The TTC remains committed to identifying, implementing and evaluating particulate matter 2.5 (PM2.5) mitigation measures that will further improve subway air quality for its workers and customers.

Recommendations

It is recommended that the TTC Board:

1. Adopt the recommendations from the report, HL13.8 - Subway Health Impacts Study, including:
 1. Implementing PM2.5 mitigation measures that can be delivered in the short-term, including actions related to employee awareness and training programs, state of good repair (materials, equipment, procurement and procedures) and engineering reviews, as described in the report;
 2. Identifying medium- and long-term mitigation measures, with a priority on Line 2, that can be implemented, to further improve air quality, as described in the report, including:
 - a. Reviewing operational systems and procedures, such as Automatic Train Control (ATC), train frequency and ventilation systems;
 - b. Reviewing procurement specification and deployment plans for replacement trains for future line modernization;
 - c. Including consideration of the potential improvements to air quality in the TTC's study of platform edge doors;
 - d. Monitoring levels of subway PM2.5 and evaluating the PM2.5 mitigation strategies that are implemented;
 3. Requesting that TTC staff report back on opportunities for air quality improvement in the TTC subway system, including a review of emerging information and technology that has the potential to reduce air pollution in the subway system;
 4. Identify funding requirements through future budget processes to develop and implement further PM2.5 mitigation measures;

Financial Summary

The cost of the Subway Air Quality study was approximately \$825,000 and the cost of the health assessment by Toronto Public Health was \$100,000 for a total of \$925,000. Most of the costs of the Subway Air Quality study were incurred in 2017 and 2018, with the balance of \$177,000 incurred in 2019. The total 2019 costs of \$177,000 were

included in the 2019 TTC Operating Budget, which was approved by the Board on January 24, 2019 and by City Council on March 7, 2019.

The TTC anticipates that items under recommendation 2.1 and 3 will be completed through existing base budget complement and funding. Requirements under 2.2 will be considered as part of mid and long term planning of relevant capital programs.

The Chief Financial Officer has reviewed this report and agrees with the financial impact information.

Equity/Accessibility Matters

The results of this work enable a fact-based evaluation of the need for any future measures to be taken to address the needs of sensitive populations.

Decision History

Board of Health Motion

At its May 17, 2017 meeting, Board of Health Chair Joe Mihevc put forth a Notice of Motion that:

“Directed the Medical Officer of Health to work with the Toronto Transit Commission, if requested and funded, to oversee an independent study of the health risks for passengers of air quality issues in the subway system, particularly in relation to mitigation measures that could be implemented.”

<http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2017.HL19.15>

TTC Board Motion

At its May 18, 2017 meeting, Commissioner Joe Mihevc put forth a Notice of Motion recommending that:

“TTC evaluate occupational exposures to fine particles and develop appropriate strategies to mitigate potential health impacts in consultation with responsible occupational health authorities; and further, that TTC provide support and resources to the Medical Officer of Health to oversee an independent study of the potential health impacts for passengers of air quality issues in the subway system, particularly in relation to mitigation measures that could be implemented.”

http://www.ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2017/May_18/Reports/19_Notice_of_Motion_Air_Quality.pdf

At its May 18, 2017 meeting, the Board referred the above Notice of Motion for a report that will address ways and means to study the potential impacts of air quality issues in

the subway system and for information on whether any other major subway systems have undertaken similar work.

Board Receives Report on Proposed Approach

At its September 5, 2017 meeting, the proposed approach to studying subway air quality issues was presented and received by the Board.

https://www.ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2017/September_5/Reports/13_Subway_Air_Quality.pdf

Board Receives TTCs Subway Air Quality Final Report

At its July 10, 2019 meeting, the TTCs Subway Air Quality Final Report was presented and received by the Board.

http://www.ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2019/July_10/Reports/7_Subway_Air_Quality_Final_Report_updated.pdf

Board of Health receives Toronto Public Health – Subway Health Impacts Study

At its meeting on January 13, 2020 the City of Toronto Board of Health considered HL13.8 – Subway Health Impacts Study. The item will be considered by City Council on January 29, 2020.

[HL13.8 - Subway Health Impacts Study](#)

Issue Background

On April 25, 2017, a Health Canada study entitled, “The Urban Transportation Exposure Study (UTES)” was published in a peer-reviewed scientific journal. The UTES compared particulate matter (PM) exposures between major subway systems in Canada. The purpose of the UTES was to gather information about PM levels and therefore it did not draw conclusions about the impact of the PM levels on health. The UTES confirmed previous internal assessments that found that the PM is primarily iron from steel wheels and rails, and that PM concentrations are higher in an enclosed subway station than outside.

The purpose of the UTES was to better understand commuter exposure to air pollutants in metro systems across three Canadian cities. The UTES found that PM_{2.5} exposures were higher in Toronto (95 µg/m³) than in Montreal (35 µg/m³) and Vancouver (19 µg/m³), which was based primarily on the differences in these agency’s operating systems.

Previous TTC Subway Air Quality Studies

The TTC has conducted comprehensive subway air quality studies in 1977, 1980 and 1995. These were performed to provide information on the air quality in the

underground portions of the subway and determined both employee and customer exposures to airborne contaminants. The 1995 study found that none of the 280 samples taken were above the occupational exposure limits for employees. In those past studies, PM_{2.5} was never measured because no occupational exposure standards exist to compare to. Respirable dust that includes PM_{2.5} was measured because it has an occupational exposure limit.

Since that time, numerous job-specific workplace investigations have been completed and recommendations were implemented as required.

Comments

TTC's Commitment to Improving Air Quality

The TTC remains committed to doing its part to improve air quality in the city of Toronto and in its underground subways.

The TTC has been actively pursuing ways to ensure that our fleet is moving to greener technology that will reduce greenhouse gas emissions and outdoor air pollution. The TTC is procuring 255 second generation hybrid buses that are 20% cleaner than the previous generation by the end of 2019, and procuring 60 battery-electric buses that are 95% cleaner than our current diesel fleet by end of Q1 2020.

Subway air quality has improved over time. The PM_{2.5} levels have decreased since the introduction of the TR subway train on Line 1. Additional measures to reduce greenhouse gas emissions and air pollution in the subway include:

- Retrofitting existing work cars with the latest emission control technologies such as catalytic converters and diesel exhaust filters.
- All new work cars are equipped with the latest emission control technologies.
- On the older T1 revenue fleet, filters are being upgraded to Minimum Efficiency Reporting Value (MERV) 9. These air filters can remove pollutants as small as 1 to 3 microns, including PM_{2.5}.

The TTC will be reviewing, monitoring and evaluating the effectiveness of these various mitigation measures in addition to the introduction of Automatic Train Control on Line 1 with respect to its impact on PM 2.5 levels in the subway.

Limited Research

The existing research on subway PM 2.5 and associated health effects to the public is limited. The TTC has partnered with Health Canada in two separate air quality monitoring campaigns in order to begin to bridge the research gap that exists. Further collaborations with Health Canada are currently being considered.

The TTC has reached out to other transit organizations with similar subway systems, namely New York City Transit Authority and Transport for London as this issue is not unique to the TTC. We have begun to exchange information around PM identification,

potential mitigation measures, emerging technologies, research opportunities and monitoring strategies as we all agree this issue warrants further exploration.

Exposure Limits

The Ontario Ministry of Labour and Health Canada are responsible for establishing safe exposure limits for employees and the public, respectively. The TTC is responsible for complying with all applicable legislation and appropriate industry best practices and standards.

Occupational Exposure Limits

The Ministry of Labour sets out occupational exposure limits in Ontario Regulation 833, Control of Exposure to Biological or Chemical Agents and other related Regulations such as Ontario Regulation 490/09, Designated Substances. An occupational exposure limit is an upper limit on the acceptable concentration of a hazardous substance in workplace air for a particular material or class of materials.

Public Exposure Limits

Public exposures are distinct from employee exposures as they have to take into account vulnerable populations, including; infants, young children, seniors and those in various states of health (e.g., with respiratory illnesses such as Chronic Obstructive Pulmonary Disease (COPD)).

Health Canada has indicated that in regards to public health, there are no directly comparable standards for PM2.5 levels in the subway. Public exposure standards are normally for outdoor air, and are often averaged over 24 hours or even a year, which makes them difficult to apply to typical commuter exposure patterns and durations.

Contact

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Signature

Betty Hasserjian
Chief Safety Officer (Acting)

Attachments

Attachment 1 – HL13.8 - Subway Health Impacts Study