# RELIEF LINE SOUTH

# Appendix 6-5

Air Quality Assessment

Toronto Transit Commission c/o HDR Inc.

# AIR QUALITY ASSESSMENT: TORONTO TRANSIT COMMISSION RELIEF LINE

May 2018

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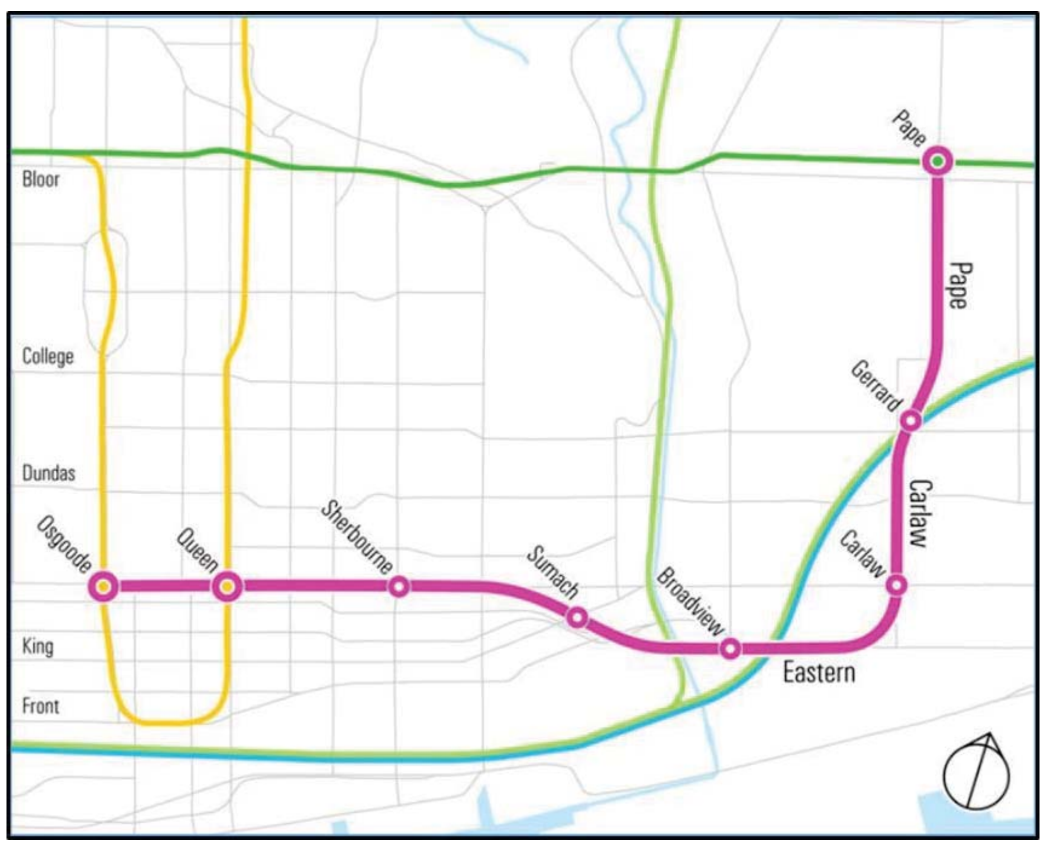
# 1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by HDR Inc. (HDR) to conduct a qualitative Air Quality Assessment (AQA) as part of the Transit Project Assessment Process (TPAP) for the proposed Relief Line (RL, or the Project). The Toronto Transit Commission (TTC) is proposing the RL as a means of relieving crowding on Line 1 and at the Yonge-Bloor station interchange. The preferred alignment connects the existing Pape Station to the existing Queen and Osgoode Stations, by way of Pape Avenue, Carlaw Avenue, Eastern Avenue and Queen Street. The preferred RL alignment is depicted schematically in Figure 1.

This report provides a high-level evaluation of the potential climate change and local air quality impacts from the proposed construction and operational plans for the preferred RL alignment and associated ancillary facilities. In later stages of planning and design, a more detailed evaluation may be required to identify, monitor and mitigate climate change and air quality impacts when specific details on construction and infrastructure elements are available.

**Figure 1. Preferred Relief Line Alignment**






Air Quality Assessment: Toronto Transit Commission Relief Line

## 1.1 Project Description

In May 2017, Toronto City Council approved the conceptual alignment and station locations for the Relief Line South subway. The approved alignment connects Line 1 at Osgoode and Queen Stations to Line 2 at Pape Station via Queen Street, Eastern Ave, Carlaw Ave, and Pape Ave. Following this approval, the conceptual design of the approved alignment commenced including conceptual construction methodologies, which form the main project input to this report. The outcome of this process informed the draft Environmental Project Report (EPR) for the Relief Line Project Assessment (RLPA) Transit Project Assessment Process (TPAP).

## 1.2 Study Area Description

The proposed RL will be located in dense urban areas including residential, commercial and institutional areas with a portion of the RL passing under the Don Valley Parkway and the Don River. The preferred route transitions between the downtown core, which is primarily dense commercial use, to an area that is primarily residential.

Other land uses along the route consist of health care, educational, places of worship, cultural venues (concert halls, theatres, smaller music venues), museums and gallery space, and buildings that have been registered on the Toronto Heritage registry.

## 1.3 Study Objectives

The objectives of this qualitative AQA are as follows:

- To identify the potential contaminants of concern due to the construction and operation of the Project.
- To identify the primary climate change and local air quality impacts due to construction and operation of the Project.
- To identify the climate change impacts on the Project.
- To provide recommendations for mitigation, if warranted.

# 2 CONTAMINANTS OF CONCERN

Suspended particulate matter (SPM or dust) is the primary contaminant of concern that may impact air quality during the construction of the Project. There are no regulated exposure limits for dust generated as a result of construction activities in the Province of Ontario, however, the Ministry of Environment and Climate Change (MOECC) expects that emissions from construction activities comply with the O. Reg. 419/05 SPM criteria. Sources of dust emissions include cut-and-cover construction techniques, tunnelling, demolition, material handling and trackout by construction vehicles on public roads. Other contaminants including nitrogen oxides ($NO_x$), carbon monoxide (CO), sulphur dioxide ($SO_2$), particulate matter less than 10 microns ($PM_{10}$), particulate matter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOCs) and greenhouse gases (GHGs) are emitted from the tailpipe of construction equipment. During the operation of the Project, emissions of SPM in the form of "rail dust" can be generated through general wear of the subway system, specifically as a result of railcar steel wheels rolling on steel rail tracks.





# 3 CONSTRUCTION IMPACTS AND MITIGATION

## 3.1 Climate Change

### 3.1.1 Impact of the Project on Climate Change

A recent study from the University of Toronto (Saxe *et al.,* 2017) has identified key factors that impact climate change as a result of the construction of new subway infrastructure. GHG emissions associated with construction activities are attributable to:

- Manufacturing of construction materials.
- Energy consumed at construction sites.
- Transportation energy used in the movement of people, materials and machinery/equipment to and from the site.
- Infrastructure design and size.

These key factors, among others, will impact the overall carbon footprint generated from the construction of the Project which will in turn have an impact on climate change.

### 3.1.2 Mitigation for Impact of the Project on Climate Change

To minimize GHG emissions during construction it is recommended that:

- all construction equipment used on the project be well maintained and kept in good working condition;
- where possible optimize the movement of people, materials and machinery/equipment to, from and on-site;
- where possible avoid unnecessary idling of heavy duty equipment and vehicles; and,
- where possible, in particular where noise/vibration is not a concern, extend construction hours and/or overnight work to reduce construction-related traffic flow disruption and the overall duration of the construction project.

### 3.1.3 Impact of Climate Change on the Project

The Greater Toronto Area (GTA) is expected to experience increasing incidents of extreme weather events due to climate change, including unusual cold spells, extreme heat and extended heat waves, flooding and ice storms (TPH, 2015). Based on the results of "Toronto's Future Weather and Climate Driver Study" prepared by SENES in 2011, climate change is expected to impact the Project area in various ways. In particular, high winds and heavy rain are anticipated to become more frequent and more extreme. Extreme heat indicators demonstrate that the number of days experiencing extreme temperatures days will increase significantly by the 2040s. On the other hand, extreme cold events are anticipated to decrease correspondingly by the 2040s, where the number of days exhibiting extremely cold temperatures could decrease. More frequent and intense summer rain events are anticipated in the future, as well as an increase in days with tornados. These events have the potential to result in power outages, damage to infrastructure, and disruption to transportation which can ultimately delay construction of the RL. In addition, health and safety of construction personnel may be compromised during these extreme events.

### 3.1.4 Mitigation for Impact of Climate Change on the Project

To mitigate the impact of climate change on the Project, it is recommended that adequate plans for severe weather events and emergencies, closures and rerouting, be implemented during the construction phase. Health and safety plans should also be developed to ensure that on-site personnel are aware and are properly trained to recognize and respond to hazards and emergencies caused by extreme weather events.

## 3.2 Air Quality

### 3.2.1 Construction Impacts

As stated in Section 3, SPM or dust is the primary contaminant of concern that may impact air quality during the construction of the RL. Sources of dust emissions include cut-and-cover construction techniques, tunnelling, demolition, material handling and trackout by construction vehicles on public roads. The quantity of dust generated is dependent on the specific construction activities within the corridor. Other contaminants including $NO_x$, CO, $SO_2$, $PM_{10}$, $PM_{2.5}$ and VOCs are emitted from the tailpipe of construction equipment and vehicles. As with other similar linear construction projects, it is expected that dust and tailpipe emissions will be temporary at the location where construction activities occur along the corridor.

### 3.2.2 Mitigation Measures

There are several ways that dust can be mitigated during the construction of the RL infrastructure. Dry air and high winds have the potential to cause the release and dispersion of dust emissions. The Environment and Climate Change Canada (ECCC) publication “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” provides several mitigation measures for reducing emissions during construction activities. Mitigation of road dust, as recommended in the ECCC document, includes the use of wind barriers (i.e., fencing or solid barriers, or trees and shrubs), wetting or non-chloride dust suppressants, equipment washing, limiting vehicle speeds on unpaved road surfaces, and limiting the exposed area which may be a source of dust. Given the temporary nature of construction projects, the use of dust suppression techniques, wind speed reduction and the use of low silt content materials are the most common types of mitigation applied.

The MOECC expects that emission from construction activities comply with the O. Reg. 419/05 SPM criteria. TTC Master Specifications require contractors to incorporate mitigation or control measures into construction activities to achieve compliance with this objective. Control measures articulated in the





Controls and Methods Plan will need to be carried out diligently under contractual specifications. Such measures include, but are not limited to:

- Develop a comprehensive environmental Controls and Methods Plan for dust control.
- Cover or wet down dry materials to prevent blowing dust and debris.
- Prevent dust from blowing across the worksite and from leaving the worksite, in particular frequently wet paved and unpaved temporary roads and excavated areas.
- Comply with provincial ordinances and Engineer's requirements regarding minimizing of dust and airborne pollution.
- Wash down the streets within the worksite on a weekly basis and as additionally directed by the Engineer.
- Securely cover excavated material being removed from the worksite and all fill materials being delivered to the worksite to prevent blowing of dust or fines into the streets and haul routes.
- Application of calcium chloride shall be kept to minimum and shall be restricted to vehicle right-of-way. In close proximity to watercourses, frequent applications of water shall be the preferred method. Obtain the Engineer's approval before chemicals for dust control are used.

Tailpipe emissions during the construction phase can be controlled by following the recommendations outlined in Section 3.1.2.

# 4 OPERATIONAL IMPACTS AND MITIGATION

## 4.1 Climate Change

### 4.1.1 Impacts of the Project on Climate Change

The RL is designed as a means of relieving crowding on Line 1 and at the Yonge-Bloor station interchange in addition to providing transit coverage to a broader area of Toronto. The operation of the RL is expected to have a positive influence on public transit ridership and surrounding land use by concentrating residences and employment around the new stations (Saxe *et al.,* 2017). Concentrating land uses can reduce the distance people need to travel to work by way of locating jobs and amenities closer to residences which can ultimately reduce GHG emissions.

### 4.1.2 Mitigation for Impact of the Project on Climate Change

Reductions in GHG emissions and impacts on climate change will be realized by applying the City of Toronto's Change is in the Air, Climate Change Action Plan, which provides guidance on sustainability measures. This guidance will be applied to this Project including the Green Development Standards, Green Roof/Eco-Roof Strategy, and Sustainable Transportation Strategy.

### 4.1.3 Impacts of Climate Change on the Project

The RL will be located below ground and will be susceptible to flooding events which may result in power outages, damage to infrastructure and disruption to transportation. In addition, there are components of the subway system which will be located above ground and could be directly impacted by extreme weather conditions. The surface components of the RL which will need to be designed to withstand extreme weather conditions include the traction power substations, ventilation shaft exhausts for the tunnel and emergency exit infrastructure.

### 4.1.4 Mitigation for Impact of Climate Change on the Project

To mitigate the impact of climate change on the Project, it is recommended that adequate plans for severe weather events and emergencies, closures and rerouting, and traveller information alerts be implemented during the operation phase. Health and safety plans should also be developed to ensure that on-site personnel are aware and are properly trained to recognize and respond to hazards and emergencies caused by extreme weather events.

## 4.2 Air Quality

### 4.2.1 Operation and Maintenance Impact

Small, localized impacts on SPM levels are anticipated due operation of the RL. A recent urban transportation exposure study (Ryswyk *et al.,* 2017) found that the operation of Toronto's existing rail transit



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system can produce emissions of SPM or "rail dust" as a result of conventional steel wheels rolling on steel rail tracks through regular wear on the system. The components of rail dust are largely metallic, particularly in iron. The rail dust can travel through ventilation shafts and subway entrances via forced air ventilation and the piston effect of train movement. System features identified in the study which affect the level of rail dust within the subway include distance to outside air, depth and elevation.

### 4.2.2 Mitigation Measures

To mitigate the air quality impacts from rail dust, it is recommended that the TTC employ standard operating procedures for equipment and/or machinery comprising the rail system and will ensure that regular maintenance is performed in accordance with good engineering practices or as recommended by the supplier such that the equipment is kept in good operating condition. To mitigate rail dust, it is also recommended that the TTC adhere to conditions outlined in all permits, authorizations and/or approvals.

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