Final Report

Land Use Study: Development in Proximity to Rail Operations

Submitted to City of Toronto
by IBI Group
and Stantec
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Accessibility

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Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Appendices

List of Exhibits

Table of Contents (continued)

Executive Summary

The City of Toronto has experienced significant growth in recent years and as a result there has been increased pressure for development on lands in proximity to rail operations. Development on these lands require special safety, noise and vibration considerations. Mitigation measures to create safe and comfortable places to live and work may be required as a result.

It is important to note that railways in Canada are federally and/or provincially regulated and the City of Toronto has no jurisdiction over railway operations, traffic volumes or materials carried. However, the City does have a role to play in regulating land use and managing development proposed on sites that are in proximity to rail operations. The City can enact land use policies, guidelines, regulatory frameworks, and/or development approval processes that support new developments that are compatible with their surroundings and utilize appropriate measures to mitigate potential safety, trespassing and nuisance issues related to rail operations.

The purpose of this study is to provide the City with recommendations specific to Toronto that staff can rely on as they respond to development applications on lands adjacent to rail corridors and yards.

This study provides the following recommendations:

- Rail typologies for the more than 200 km of rail corridors and yards within the city limits. Recommended Rail Types include freight, passenger, spurs, the Union Station rail corridor, and rail yards;
- Potential modifications to the City's existing Development Review Process that are intended to identify specific risk and safety issues that are related to development applications that are within certain distances of rail corridors and yards;
- Recommended mitigation measures to address safety, noise and vibration concerns related to land use, as well as drainage, emergency response, and legal agreements;
- Technical studies required to be submitted in support of development applications within a certain distance of rail operations, based on the Rail Type;
- Recommended Official Plan Amendments to existing policies and Schedule 3;

- A recommendation that City Planning staff develop a 'handbook' or brochure setting out guidelines for development applications in proximity to rail operations; and
- Identification of potential additional areas of study for consideration.

The handbook recommended above is intended to assist developers, community members and city staff in evaluating development opportunities in proximity to rail corridors and yards. A draft version of the handbook is provided in Appendix G of this report and is based on a review of best practices across Canada, and consultation with stakeholders, citizens, councillors and the development community, as well as a review of current rail safety trends.

It is also recommended that the Rail Type mapping, and the recommendations contained in this report should be reviewed and updated every five years, or sooner if a notable change to rail operations or industry standards for standard mitigation measures occurs.

Existing Policies and Guidelines

A comprehensive review of relevant policies, guidelines, and reports was completed for this study. Policies from other Canadian jurisdictions were also reviewed.

Consultation

The findings of this study have been developed in consultation with City of Toronto staff and councillors, railway owners and operators, the Federation of Municipalities and Railway Association of Canada, the development industry and key stakeholders, and the general public.

1 Council Direction

In recent years there have been increasing concerns about rail safety and the transportation of dangerous goods, particularly for developments near to rail infrastructure.

In a period of less than 60 years, from 1853 to 1911, the rail network throughout the City of Toronto was established, with the last major line being the entry into Toronto of the Canadian Northern Railway's Montreal to Toronto line through the Don Valley. Since that time the network has not changed very much in terms of configuration. The last major change was the introduction of the CN "bypass" line which re-routed CN through freight trains north of Steeles Avenue, completed in 1965.

The rail corridors in Toronto were built in a variety of configurations, with different widths of rights-of-way, orientations to the surrounding lands and in a variety of urban environments. While the function of almost all of these lines has changed considerably over time, their configuration has not.

The City of Toronto has experienced significant growth in recent years and as a result there has been increased pressure for development on lands in proximity to rail operations. Development on these lands require special considerations of safety, noise and vibration. Special treatments to create safe and comfortable places to live and work may be required as a result.

The initiation of this study is the product of Council direction that City Planning staff received during the adoption of the Dupont Regeneration Study (Official Plan Amendment 271) and the findings of the associated rail safety study conducted as part of that work. The City of Toronto retained IBI Group with Stantec to complete this study of land use and development in proximity to rail operations.

1.1 Jurisdiction

It is important to note that railways in Canada are federally and/or provincially regulated and the City of Toronto has no jurisdiction over the majority of factors that may result in a train derailment or release of material. Specifically, the City has no jurisdiction over rail operations, including the type, configuration, volume or speed of trains or over railway infrastructure and maintenance. The City is also not responsible for monitoring or enforcement against trespassing on railway lands.

However, the City does have a role to play in regulating land use and managing development proposed on sites that are in proximity to rail operations. The City can enact land use policies, guidelines, regulatory frameworks, and/or development approval processes that support new developments that are compatible with their surroundings and utilize appropriate measures to mitigate potential safety, trespassing and nuisance issues related to rail operations. Appropriate mitigation measures ultimately benefit both the future occupants of a development and the railway companies which operate throughout the city.

1.2 Background

There are several relevant policies, guidelines and reports regarding development and growth, and development in proximity to rail corridors, offer direction that can be applied to Toronto. This material includes:

- Growth Plan for the Greater Golden Horseshoe, 2017;
- The 2014 Provincial Policy Statement;
- The City of Toronto's "Dupont Street Regeneration Land Use Study" (2014) and Council Direction
- The City of Toronto's "North Toronto Subdivision Rail Corridor Risk Assessment and Management Study" (2014);
- FCM-RAC's "Guidelines for New Development in Proximity to Railway Operations" (2013);
- Metrolinx's "Adjacent Development Guidelines" (2013);
- Transport Canada's *Railway Safety Act* Review "Enhancing Rail Safety in Canada: Working Together for Safer Communities" (2018);
- The City of Toronto's Official Plan; and,
- City of Toronto Zoning By-law 569-2013.

The Ontario Planning Act requires that residential applications for development within 300 metres of rail corridors must be circulated to the rail operator(s).

Current or planned practices from other relevant Canadian jurisdictions have also been reviewed as part of this study to help establish recommendations for mitigation measures appropriate for Toronto, as discussed in Section 5.3.

1.2.1 The Growth Plan for the Greater Golden Horseshoe, 2017 (the Growth Plan)

The Growth Plan provides a strategic framework for managing growth and environmental protection in the Greater Golden Horseshoe region, of which the City forms an integral part. In addition to requiring municipalities to establish both population and employment growth targets the Growth Plan also requires municipalities to direct growth to strategic growth areas as well as take an integrative approach to infrastructure and land use planning. This includes ensuring transportation corridors are protected for future investment that land use designations on lands along these corridors are supportive to their function and that safety of users is taken into consideration.

1.2.2 2014 Provincial Policy Statement

The Ontario 2014 Provincial Policy Statement (PPS) provides policy direction to municipalities on land use planning and development as they pertain to provincial interest, and the provincial goal to enhance the lives of all Ontarians. The PPS aims to provide for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment. The PPS also directs municipalities to protect corridors and rights-of-way for infrastructure including transportation and transit facilities.

The PPS states that major facilities and sensitive land uses are to be designed with appropriate buffering and/or separation to prevent or mitigate adverse effects and minimize risk to public health and safety.

The relevant sections in the PPS, as referenced above, are as follows:

- **Policy 1.2.6.1**: “Major facilities and sensitive land uses should be planned to ensure they are appropriately designed, buffered and/or separated from each other to prevent or mitigate adverse effects from odour, noise and other contaminants, minimize risk to public health and safety, and to ensure the long-term viability of major facilities.”[1]
- **Policy 1.6.8.3**: “Planning authorities shall not permit development in planned corridors that could preclude or negatively affect the use of the corridor for the purpose(s) for which it was identified.”

  “New development proposed on adjacent lands to existing or planned corridors and transportation facilities should be compatible with, and supportive of, the long-term purposes of the corridor and should be designed to avoid, mitigate or minimize negative impacts on and from the corridor and transportation facilities.” [1]

The City is required under the PPS to ensure that its land use planning policies and decisions reflect these directives, and allow for continued presence and operation of Toronto's railway lines.

1.2.3 The City of Toronto's "Dupont Street Regeneration Land Use Study and Council Direction" (2014)

In 2013 Toronto City Council adopted Official Plan Amendment 231 (OPA 231), which directed City staff to complete a study of lands along the north side of Dupont Street between Ossington Avenue and Kendal Avenue. These lands are bordered to the north by a rail corridor – the Canadian Pacific Railway North Toronto Subdivision,

The resulting Dupont Street Regeneration Land Use Study examined:

- Appropriate land uses;
- Potential streetscape improvements;
- Urban design and built form guidelines;
- Transportation options;
- Street function and design;
- Impacts of rail corridor on potential development; and,
- The potential use of a development permit system.

What Is A Development?[1]

The PPS defines a development as:

The creation of a new lot, a change in land use, or the construction of buildings and structures requiring approval under the Planning Act, but does not include:

a) activities that create or maintain infrastructure authorized under an environmental assessment process;

b) works subject to the Drainage Act; or

c) for the purposes of policy 2.1.4(a), underground or surface mining of minerals or advanced exploration on mining lands in significant areas of mineral potential in Ecoregion 5E, where advanced exploration has the same meaning as under the Mining Act. Instead, those matters shall be subject to policy 2.1.5(a).

What is a Major Facility?[1]

The PPS defines major facilities as:

Facilities which may require separation from sensitive land uses, including but not limited to airports, transportation infrastructure and corridors, rail facilities, marine facilities, sewage treatment facilities, waste management systems, oil and gas pipelines, industries, energy generation facilities and transmission systems, and resource extraction activities.

What is a Sensitive Land Use?[1]

The PPS defines sensitive land uses as:

Buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities.

[1] Provincial Policy Statement, Ministry of Municipal Affairs and Housing Provincial Planning Policy Branch, 2014 (http://www.mah.gov.on.ca/Page215.aspx.)

The results of this study led to a series of staff recommendations that were adopted by City Council on 2014, through Zoning By-law 1011-2014 and Site and Area Specific Policy – Official Plan Amendment 271 (OPA 271). Zoning By-law 1011-2014 and OPA 271 were subsequently appealed to the Ontario Municipal Board (OMB) by the owners of five properties within the affected area (Case numbers PL141134, PL140860, PL150658, PL110543). A tentative settlement was reached, and endorsed by City Council in 2016, followed by the OMB issuing approval of OPA 271 and Zoning By-law 1011-2014, and a site-specific Official Plan amendment and Zoning By-law amendment applications for the five properties in early 2017.

As it relates to development in proximity to rail, the foregoing upheld the City's requirement for a setback. The application of, and requirements for, setbacks are discussed further in Sections 5 and 6.

More information on the Dupont Street Regeneration Land Use Study and Council Direction can be found here: https://www.toronto.ca/city-government/planning-development/planning-studies-initiatives/dupont-street-study-wards-19-and-20/.

1.2.4 The City of Toronto's "North Toronto Subdivision Rail Corridor Risk Assessment and Management Study" (2014)

The City of Toronto completed the North Toronto Subdivision Rail Corridor Risk Assessment and Management Study (North Toronto Study) in 2014. The study focused on risks to people and property adjacent to the CPR North Toronto Subdivision rail corridor to inform the Dupont Street Regeneration Land Use Study. The objective was to provide the City of Toronto with credible and defensible information to be used by City Staff as they developed the recommendations for the Dupont Street Regeneration Land Use Study,

The North Toronto Study identified that while train volumes are generally increasing, the rate of derailments is generally decreasing. The study also identified two main types of incident risks to lands adjacent to the corridor:

- Physical train derailment; and,
- Release of material (e.g. leak or spill of cargo).

The study noted that the cause and severity of derailment is not predictable and is dependent on a wide range of factors, the majority of which the City has no jurisdiction over. The two main risk factors within the City's jurisdiction were identified as:

- Building setback (risk decreases as setback increases); and,
- Population density (risk increases as density/ level of occupancy increase).

To mitigate these risks, the study recommended that the City consider the following measures for both sensitive and non-sensitive land uses, particularly where the use has a high density/occupancy:

- A physical barrier to absorb energy from and deflect a derailed train (typically a 2.5 m high earthen berm); and,
- A setback (typically 30 m).

1.2.5 FCM-RAC "Guidelines for New Development in Proximity to Railway Operations" (2013)

In May 2013, the Federation of Canadian Municipalities (FCM) and the Railway Association of Canada (RAC) published the "Guidelines for New Development in Proximity to Railway Operations" (FCM-RAC Guidelines), a collaborative effort between the two groups that provided proximity guidelines and best practices for development along railway lines.

The FCM and RAC began a partnership in 2003 through a Memorandum of Understanding by which the two parties would develop a common approach to prevent and resolve issues arising from developments being constructed in close proximity to rail corridors. The FCM-RAC Guidelines were borne of this partnership, with the aim to establish a common proximity guideline for all municipalities, improve awareness among industry and decision makers of issues and the need for effective planning and management, and develop resolution protocols to streamline decisions when conflicts emerged between railway companies, developers and regulators.[2] The FCM-RAC Guidelines include consideration of building setbacks, noise and vibration, safety barriers, security fencing, stormwater management and drainage, legal agreements, and construction issues.

The FCM-RAC Guidelines define standard mitigation measures for new residential development in proximity to a railway corridor. Along principal main lines, the standard recommended building setback is 30 m, measured from the property line to the building face. This setback provides a buffer from railway operations, including noise, vibrations, and emissions, accommodates a safety barrier (i.e., 2.5 m earthen berm), and addresses the fundamental land use incompatibilities.[2] Where the standard mitigation measures are not viable, alternative safety measures are recommended, including the application of the Development Viability Assessment tool.

The FCM-RAC Guidelines were developed with input from a steering committee made up of members from both industry and municipalities.

[2] Guidelines for New Development in Proximity to Railway Operations, The Federation of Canadian Municipalities and the Railway Association of Canada, May 2013.

On February 27, 2014 the Canadian Transportation Agency (CTA) cited the FCM-RAC Guidelines in one of its decisions (Decision No. 69-R-2014) regarding a noise complaint filed by Michael Girard. Section 57 of this decision states:

"A Municipality takes a risk when deciding to allow housing development in close proximity to a railway right of way and the Agency is of the opinion that Municipalities have a responsibility to assess compatibility issues before approving a housing development along a railway right of way, and if they approve a development, to ensure that the necessary mitigation measures are implemented. The Agency notes that the Municipality apparently authorized the residential construction along CP's main east-west rail transportation corridor. However, there was no evidence presented to the Agency of any mitigation measures having been implemented. In fact, CP draws attention to the fact that no berm or noise wall was constructed."[3]

The FCM-RAC Guidelines strongly recommend a proactive approach by municipalities to identify and plan for potential conflicts between rail operations and new developments. Toronto is a highly developed city with higher densities and demand for growth than many other municipalities in Canada. Most lands along rail corridors have been developed, and the city is experiencing greater demand for infill and adaptive re-use of lands in proximity to rail operations. This study considers ways to balance development and growth with the presence of existing and future rail operations in Toronto and provide tools for the review of development applications.

1.2.6 Metrolinx's "Adjacent Development Guidelines" (2013)

The Adjacent Development Guidelines were developed by Metrolinx to communicate the implications of development in close proximity to railway corridors, ensure safe and reliable rail operations, and minimize conflicts between current or future rail operations and development.[4]

Metrolinx/GO Transit have reviewed a wide range of projects and municipal by-laws and processes. Based on this experience the Adjacent Development Guidelines were developed to "inform and influence municipal land development approval processes and provide a consistent framework for land use decisions made in proximity to GO Transit operated railway corridors"[4] through the use of standards and best practices.[4]

The Adjacent Development Guidelines identifies mandatory measures for residential developments, and recommended measures for other types of developments. The mandatory safety measure for residential land use is the combination of a 2.5 m berm and 30 m building setback. The Adjacent

[3] Canadian Transportation Agency Decision No. 69-R-2014, February 27, 2014. Complaint by Michel Girard pursuant to section 95.3 of the Canada Transportation Act, S.C., 1996, c. 10, as amended. https://www.otc-cta.gc.ca/eng/ruling/69-r-2014, accessed 2017-07-05)
[4] Adjacent Development Guidelines, Metrolinx, 2013.

Development Guidelines also identifies mandatory or recommended technical studies, including noise and vibration impacts.[4]

1.2.7 Transport Canada's *Railway Safety Act Review* "Enhancing Rail Safety in Canada: Working Together for Safer Communities" (2018)

Under the *Railway Safety Act*, Transport Canada oversees the safety of federally-regulated railways, develops regulations, rules and standards, monitors compliance through audits and inspections, and takes enforcement action as required.[5] As part of this mandate, Transport Canada periodically conducts a review of the *Railway Safety Act*, to identify changes that have occurred in the railway industry and related legislation.

The previous review completed in 2007 recommended the inclusion of regulations to address the issue of residential and commercial land developments in proximity to rail operations. However, the recommendations were not implemented due to jurisdictional concerns.[6]

The 2018 review has assessed these jurisdictional concerns, including a legal opinion submitted by the Railway Association of Canada. As a result, Transport Canada has concluded that the federal government can and should require municipalities to provide notification to affected railway companies of land development within 300 m prior to authorization, and regulate land use within 30 m of rail operations. Regulations are to be developed in consultation with relevant provinces/territories, Indigenous communities, municipalities, railways, associations and citizen groups.[6]

The review also recommends the launch of a senior government-level dialogue with the provincial/territorial governments to promote the formal adoption of the FCM-RAC Guidelines in land use policies that apply to municipalities.[6]

1.2.8 Official Plan

There are several sections of the City of Toronto Official Plan policy which are relevant to this study, including:

- Section 2.2, Policy 4 which requires "new development on lands adjacent to existing or planned transportation corridors and facilities to be compatible with, and supportive of, the long-term purposes of the corridors and facilities and be designed to avoid, mitigate or minimize negative impacts on and from the transportation corridors and facilities";

[5] Rail Safety, Transport Canada, https://www.tc.gc.ca/eng/railsafety/menu.htm, accessed June 19, 2018.
[6] Railway Safety Act Review - Enhancing Rail Safety in Canada: Working Together for Safer Communities, Transport Canada, 2018

- Section 2.2.4, Policy 5 (as modified by Official Plan Amendment 231) which requires new developments that include sensitive uses that are within the influence area of major facilities (such as rail facilities) be planned to ensure they are appropriately designed, buffered and/or separated as appropriate as necessary to prevent or mitigate adverse effects from noise, vibration and emissions, as well as minimize risk to public health and safety; and
- Section 3.4, Policy 21 which also requires major facilities and sensitive land uses be located, designed and buffered as appropriate to avoid or mitigate adverse effects from noise, vibration, odour, and other contaminants, and promote safety; whereby, proponents of such facilities or developments may be required to provide studies in accordance with relevant guidelines to identify impacts and implement mitigation measures.

The *Planning Act* and City of Toronto Official Plan allow for an owner of land to enter into one or more agreements with the City to alter zoning requirements for a proposed development, subject to the City's approval and provisions. These agreements are enacted through By-laws which amend the City's General Zoning By-laws. The City maintains city-wide zoning maps through Zoning By-law 569-2013, which identifies the zoning categories from the City's General Zoning By-laws and amending Zoning By-laws by location.[7]

The *Planning Act* also provides the City the authority to regulate the division of lands through Plans of Subdivision, where the City can examine the proposed subdivision through municipal regulations and standards, for compatibility with surrounding lands, adequacy of utilities, municipal services and school sites, and the conservation of natural resources.[8] These subdivision agreements may also include provisions for mitigation measure in relation to adjacent rail infrastructure.

1.3 Purpose of Study

The purpose of this study is to provide the City with recommendations specific to Toronto that staff can rely on as they respond to development applications on lands adjacent to rail corridors and yards. These recommendations must consider compatibility between rail corridors and potential development adjacent

[7] City of Toronto, Zoning By-laws: Zoning By-law 569-2013, https://www.toronto.ca/city-government/planning-development/zoning-by-law-preliminary-zoning-reviews/zoning-by-law-569-2013-2/ Last accessed April 3, 2018.
[8] City of Toronto, Development Guide: Draft Plan of Subdivision, https://www.toronto.ca/city-government/planning-development/application-forms-fees/building-toronto-together-a-development-guide/draft-plan-of-subdivision/ Last accessed April 3, 2018.

to these corridors, with mitigating measures identified where appropriate and feasible. This study must also balance the protection of people and property should a rail incident occur, the associated liability of the City, and the need to provide high quality developments to meet the City's growth objectives.

1.4 Study Structure

This study was completed in two phases with the following tasks:

Phase 1

- Conduct stakeholder interviews with major rail operators in the City regarding the technical aspects of their current and projected future operations. Rail operators include:
  - Canadian National Railway (CN),
  - Canadian Pacific Railway (CP),
  - Metrolinx,
  - VIA Rail (VIA),
  - CreateTO (formerly Toronto Port Lands Company [TPLC]); and,
  - Toronto Terminals Railway (TTR).
- Identify and map the inventory of rail infrastructure in the city and categorize which lines are 'principal', 'main', 'spur', 'yard', or any other appropriate category;
- Provide the profile, including photographic imagery of each major rail corridor/yard (including, where available, operational and incident histories, surrounding land uses, main operator, freight, passenger or both, if freight type of materials carried, frequency, speed, future plans and any other relevant information);
- Working with City's Project Manager, develop and apply a typology for each major yard and transportation rail corridor which includes, but is not limited to:
  - The identification and evaluation of current and potential future risks associated with each type of corridor/yard; and
  - Categorization and grouping of each piece of rail infrastructure based on common operational traits, with each identified 'Type' graphically represented in an appendix;
- Provide an Interim Report for Phase 1 (August 2017).

Phase 2

- Review and assess current or planned for "best practices" regarding rail/sensitive land use safety measures and mitigation approaches used in Canadian cities such as Montreal, Ottawa, Mississauga, Calgary, Edmonton, and Vancouver. The primary goal was to identify which municipal jurisdictions took a general approach to rail mitigation (one set of policies, regulations and standards applied to all land uses both sensitive and non-sensitive) and which (if any) took a more tailored approach (varying standards according to land use or other factors i.e.: geographic, nature of rail corridor, etc.);
- Conduct consultation with:
  - Internal stakeholders from various City of Toronto departments. The emphasis was on identifying any operational or technical issues, effect and impact related to mitigation measures both on a day to day basis and in the event of an emergency.
  - Major rail operators (CN, CP, Metrolinx, VIA, CreateTO, TTR) to continue technical and operational discussions. The objective was to gain a better understanding regarding the operators approach to mitigative features and the possible operational impacts/effects of different mitigative strategies;
  - Community, development and industry stakeholders, with City Planning.
- Based upon the results of Phase 1 and the consultative process of Phase 2, recommend a range of mitigation measures and criteria for each 'Type' of rail infrastructure in the City. Although within the context of the FCM-RAC Guidelines, the recommended mitigation measures should be specific to Toronto, the experienced condition of the subject rail infrastructure and the various abutting land uses in the City.
- Provide a report on findings, and recommended mitigation strategies/ approaches/ techniques (this report). The recommended mitigation strategies are compatible and suited to each of the previously identified 'Types' of rail infrastructure found in the City and graphically represented within an appendix. The report includes recommended/ required Official Plan policy amendments and identifies additional areas of study to be considered by Council.

1.5 Study Area

There are over 200 km (130 miles) of rail corridors across Toronto, owned or operated by Metrolinx, CN, CP, TTR, and CreateTO. Rail corridors are referred to as subdivisions. The subdivisions within the bounds of the City of Toronto are illustrated in Exhibit 1-1, and listed in Exhibit 1-2 with owner and length.

Exhibit 1-1: Map of Rail Corridor Subdivisions within City of Toronto Limits

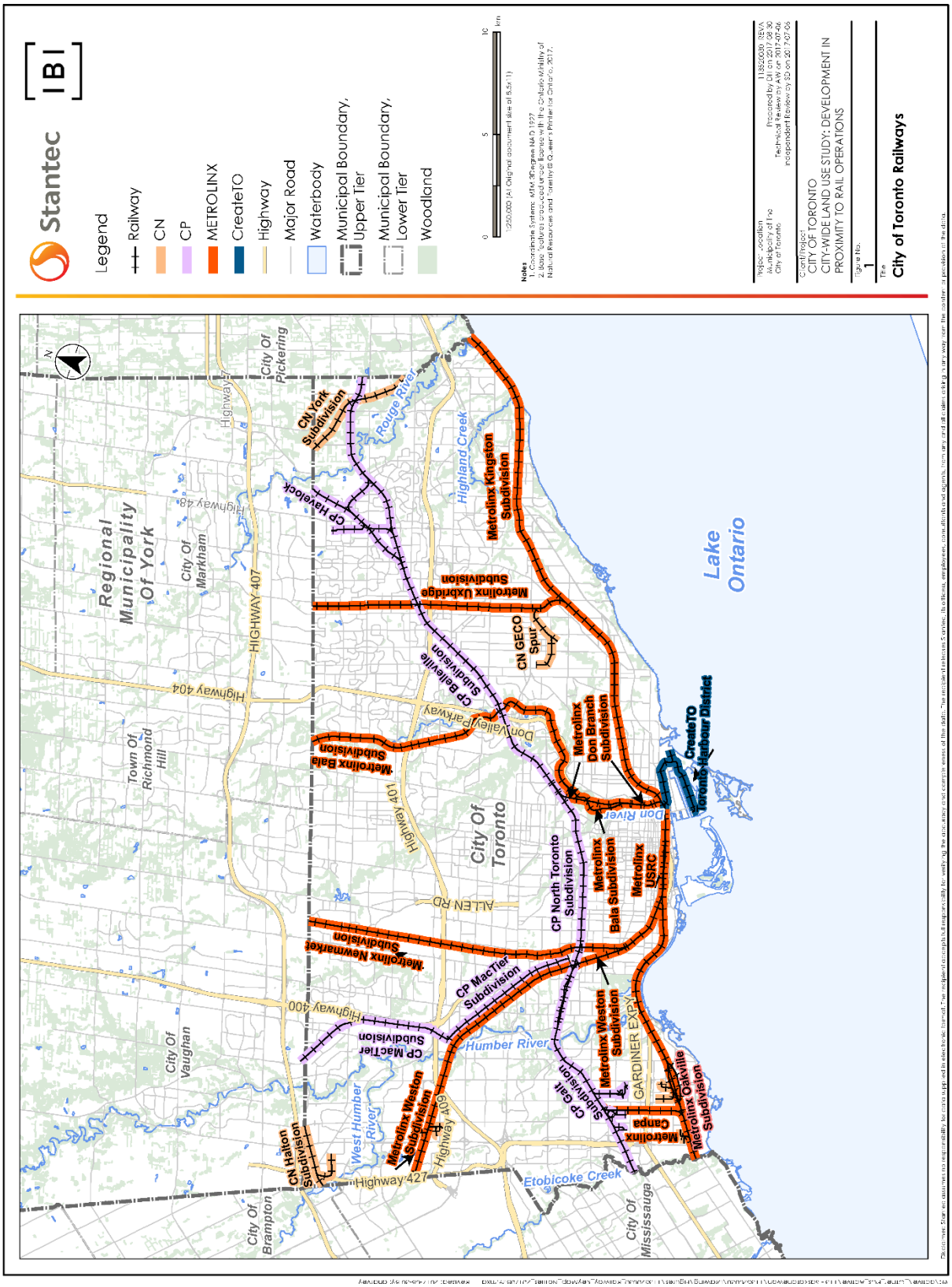

Exhibit 1-2: List of Rail Corridor Subdivisions within City of Toronto Limits

Subdivision (GO Rail Service)	Owner	Length (mi)	Length (km)
Agincourt Industrial Spur	CP	1.13	1.82
Bala (Richmond Hill GO)	Metrolinx	13.27	21.36
Belleville	CP	14.50	23.34
Canpa	Metrolinx	2.60	4.18
Don Branch	Metrolinx	3.20	5.15
Galt (Milton GO)	CP	7.20	11.59
GECO Branch	CN	2.28	3.67
Halton	CN	1.89	3.04
Havelock	CP	1.40	2.25
Highbury Industrial Lead	CN	0.45	0.72
Humberline Industrial Spur	CN	1.21	1.95
Islington Service Spur	CP	1.27	2.04
Kingston (Lakeshore East GO)	Metrolinx	16.40	26.39
MacTier	CP	9.41	15.14
Newmarket (Barrie GO)	Metrolinx	10.52	16.93
North Toronto	CP	5.90	9.50
Oakville (Lakeshore West GO)	Metrolinx	8.72	14.03
Staines Cross Connection	CP	1.10	1.77
Toronto Harbour District	CreateTO	3.50	5.63
Union Station Rail Corridor	Metrolinx	3.50	5.63
Uxbridge (Stouffville GO)	Metrolinx	8.22	13.23
Weston (Kitchener GO)	Metrolinx	11.60	18.67
York	CN	3.74	6.02
TOTAL LENGTH		**133.01**	**214.06**

1.6 Railway Owners and Operators

The railways within the City of Toronto are owned by the following companies:

- **CN** operates the largest rail network in Canada, and the only transcontinental network serving three coasts in North America, with approximately 19,600 route-miles of track across its network.[9] While CN historically owned much of the rail lines in Toronto, in recent years it has sold portions to Metrolinx, and continues to operate on Metrolinx-owned corridors. CN currently owns approximately 7% of rail lines in Toronto. CN owns a freight main line that runs near the northern limits of the city, with relatively short lengths in northeast Scarborough and northwest Etobicoke, and some spur lines.

- **CP** owns and operates a 14,000 mile network, from the Port of Vancouver to the Port of Montreal, serving major U.S. industrial centres, including Chicago, Newark, Philadelphia, Washington and Buffalo.[10] CP in recent years has also sold a portion of its rail lines in Toronto to Metrolinx, and continues to operate local freight services on Metrolinx-owned corridors. CP currently owns approximately 30% of the rail lines in Toronto. CP's lines continue north, east and west from the Junction (near Dundas Street West and Dupont Street), including main freight lines.

- **CreateTO** was launched as the City of Toronto's new real estate agency in January 2018, as part of the City-wide Real Estate Transformation. Toronto Port Lands Company (TPLC) and Build Toronto have been combined to form CreateTO.[11] TPLC was incorporated by the City of Toronto Economic Development Corporation in 1986, and is wholly owned by the City.[12] CreateTO, through the absorption of TPLC, currently owns much of the lands, and all of the railway line within the Port Lands, that connects with the USRC just west of the Don River. This line makes a large loop around the port area, running east from the USRC to serve the waste water treatment plant east of Leslie Street and returning southwest of the

[9] CN, Quick Facts and Figures, https://www.cn.ca/en/about-cn/who-we-are/facts-and-figures, accessed July 5, 2017.
[10] CP, Our History, http://www.cpr.ca/en/about-cp/our-history, accessed on July 5, 2017
[11] CreateTO, About Us, https://createto.ca/about-us/, accessed on November 7, 2018
[12] City of Toronto, Toronto Port Lands Company – Board Governance Structure, https://www.toronto.ca/city-government/accountability-operations-customer-service/city-administration/city-managers-office/agencies-corporations/toronto-port-lands/toronto-port-lands-company-board-governance-structure-2/, accessed on November 7, 2018

Shipping Channel to serve the PortsToronto facilities on Cherry Street.

- **Metrolinx** is an agency of the Government of Ontario, which was created to improve the coordination and integration of all modes of transportation in the Greater Toronto and Hamilton Area (GTHA). In 2009, Metrolinx merged with GO Transit, the regional rail transit service. When GO Transit was created in 1967, and through most of its existence, it operated passenger trains on CN and CP rail lines. Over the past several years, Metrolinx began acquiring segments of these lines. At present, Metrolinx operates seven commuter rail routes radiating from Union Station, owning 80% of the rail lines it uses, and approximately 60% of all rail lines within Toronto.[13,14]

- **TTR** is a jointly owned subsidiary of CN and CP, which operates the Union Station Rail Corridor (USRC) on behalf of Metrolinx. In 2000, the City of Toronto purchased Union Station from TTR, and GO Transit purchased the rail assets through the USRC. Following this sale, TTR continues to maintain and operate the rail assets in the USRC. The USRC runs from Strachan Avenue in the west to the Don River in the east. While it is 6.4 km long, approximately 3% of all rail lines in Toronto, it contains approximately 40 km of track because of the number of tracks located in this corridor (up to 16).[15]

- **VIA** is an independent Crown Corporation that was established in 1977 to operate Canada's national passenger rail service on behalf of the Government of Canada. VIA's service connects to over 400 communities across the country, with more than 500 departures weekly. VIA does not own any lines within the City of Toronto; however, one of its four main maintenance centres is located along the Oakville Subdivision in the city's southwest. VIA currently operates intercity rail services over four routes to and from Union Station, including its busiest route, along the Toronto-Ottawa-Montreal corridor.[16]

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[13] Metrolinx, Metrolinx Overview, http://www.metrolinx.com/en/aboutus/metrolinxoverview/metrolinx_overview.aspx, accessed July 5, 2017.
[14] Metrolinx, Rail Corridor Ownership, http://www.metrolinx.com/en/projectsandprograms/corridorownership/corridor_ownership.aspx, accessed July 5, 2017.
[15] Toronto Terminals Railway, About TTR, ttrly.com/about/about-ttr/, accessed July 5, 2017.
[16] VIA Rail Canada, Annual Report 2017, https://www.viarail.ca/sites/all/files/media/pdfs/About_VIA/our-company/annual-reports/2017/2017_Annual%20Report_EN.pdf, accessed June 5, 2018.

1.7 Rail Safety Trends in Canada

Events such as the Mississauga derailment in 1979 and the Lac-Mégantic disaster in 2013 (see sidebar) have raised public awareness of the movement of dangerous goods by rail and brought concerns about the safety of the interactions between railway operations and the urban environment to the fore.

The Transportation Safety Board of Canada (TSB) is an independent agency governed by the Canadian Transportation Accident Investigation and Safety Board Act

MISSISSAUGA 1979

On November 10, 1979 just before midnight, a Canadian Pacific (CP) freight train consisting of 106 cars of mixed cargo, which included dangerous goods/chemicals, derailed at Mavis Road north of Dundas Street in Cooksville (Mississauga). Twenty-three rail cars went off the tracks, and most caught fire including tanker cars which were carrying propane. Three loaded propane tank cars exploded.[17]

The fire resulting from this explosion was further fuelled by the chemical contents on other derailed cars. Cars carried a variety of dangerous chemicals, including chlorine. In response to the potential risk of chlorine gas spreading over the surrounding population, nearly 250,000 people were evacuated[17] – the largest evacuation in North America at the time[18]. Fortunately, no deaths or injuries were reported.[17]

The Mississauga Railway Accident Inquiry findings, generally referred to as the Grange Commission Report, were published in December 1980 and included recommendations for improvements for rail transportation of dangerous goods.

Lac-Mégantic 2013

On July 5, 2013 at around 1:15 am, a train carrying 7.7 million litres of crude oil in 72 tanker cars derailed near the centre of the town of Lac-Mégantic, Quebec. The train had been parked on a portion of a main track with a descending grade, with engine and hand brakes applied. Due to a combination of events, the train began to roll downhill towards Lac-Mégantic, approximately 11 km (7 miles) away. As it rolled downhill, the train picked up speed, peaking at just over 100 km/h (65 mph).[19]

Of the 72 tanker cars, 63 derailed, and most of the derailed cars were damaged and punctured. Approximately 6 million litres of crude oil were released and caught fire almost immediately. The fire and subsequent explosions resulted in 47 deaths and destroyed much of the downtown. Approximately 2,000 people were evacuated.[19]

The Transportation Safety Board completed an investigation in 2014, and made five recommendations regarding the securement of trains, tank car standards, route planning, risk assessments, and emergency response assistance plans.

[17] Mississauga Train Derailment, City of Mississauga, http://www.mississauga.ca/portal/home?paf_gear_id=9700018&itemId=5500001, accessed August 18, 2017.
[18] 10 of Canada's Worst Train Accidents, Maclean's, July 9, 2013, http://www.macleans.ca/society/life/10-of-canadas-worst-train-accidents/, accessed August 18, 2017.
[19] Lac-Mégantic Runaway Train and Derailment Investigation Summary, Transportation Safety Board of Canada, http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/r13d0054/r13d0054-r-es.asp, accessed August 18, 2017.

(S.C 1989, c.3). The TSB collects transportation accident data and conducts investigations for rail, air, marine and pipeline modes of transportation.

A review of the most recent statistical summary available from the TSB is "Statistical Summary - Railway Occurrences 2015"[20] was completed for this study, and is included in Appendix A.

Based on the review of the TSB's 2015 summary, the following trends in Canada are noted:

- The number of rail accidents reported to the TSB has fluctuated over the last 10 years of reporting (2006-2015);
- Collisions and derailments occur most frequently on non-main-track;
- Non-main-track collisions and derailments generally involve one or two cars, and have lower severity outcomes;
- Both main-track and non-main-track collisions and derailments can result in the release of product, including dangerous goods;
- Main-track collisions and derailments are generally related to track and equipment, whereas non-main-track are generally related to actions;
- Crossing and trespasser accidents often result in serious or fatal injuries; and,
- Crossing accidents can result in derailment and/or the release of dangerous goods.

"Main-track collisions and derailments are the most serious categories of rail accidents in terms of potential risk to the public and of financial loss (e.g., when passenger trains are involved or dangerous goods are released from trains that derail in populated areas)."[21]

The TSB also publishes selected data from its Rail Occurrence Database System on a monthly basis, for use by industry and the public to advance transportation safety. Incident history within the bounds of the City of Toronto was taken from the database and reviewed, and is included in Appendix A. Based on the review of the data, the following trends were noted for Toronto:

- The majority of incidents involved non-main-track derailments;

[20] Transportation Safety Board of Canada, Statistical Summary - Railway Occurrences 2015, http://tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.asp, accessed May 15, 2017.
[21] Transportation Safety Board of Canada, Statistical Summary - Railway Occurrences 2015, page 5 of http://tsb.gc.ca/eng/stats/rail/2015/sser-ssro-2015.pdf

- Collisions and derailments occur most frequently on non-main-track;
- Trespassing accounts for a small portion of incidents, but accounts for the majority of injuries and deaths;
- The majority of trespassing incidents resulted in injury or death; and
- Crossing incidents and movements exceeding limits of authority were also notable contributors to the total number of incidents; and,
- Cars with dangerous goods were not frequently involved in incidents, and of those incidents only a limited number led to spills or leaks.

Rail collisions and derailments can be caused by a wide range of factors, with equipment and track the most frequently identified factors for main-line derailments. While accidents and incidents are rare, they can occur anywhere, at any time, with potentially sever consequences. It is also noted that of the potential incidents that can occur, trespassing represents the greatest risk for injury or fatality within the City of Toronto.

With this information in mind, City Council has directed this study to ensure that safety is fully considered in recommendations made regarding land uses adjacent to rail operations.

2 Phase 1: Developing Rail Typologies for Toronto

This section summarizes the findings of Phase 1 of this study. These finding were subsequently subject to review and input as part of the consultation program, discussed in Section 3.

2.1 Base Maps

Base maps of all railway corridors across the City of Toronto were developed using the latest information available from the City. The base maps are provided in Appendix B, including a key map. The base maps include:

- The rail network, specifying:
  - Main operator (e.g. CN, CP, Metrolinx, TTR, CreateTO),
  - Type of traffic (e.g. freight, passenger),
  - Trains per day (approximation for freight based on professional judgement – data not received from railway operators),
  - Railway type (e.g. principal main line, secondary main line, spur, yard)
  - Number of tracks,
  - Maximum operating speed,
  - Location of at-grade rail crossings (based on review of aerial imagery – data not received from railway owners),
  - Location of crossings and switches (based on review of aerial imagery – data not received from railway owners);
- The road network;
- Property fabric (based on the City's open data);
- Watercourses and waterbodies (based on the City's open data);
- Topography; and,
- An aerial background to illustrate existing land uses and natural features.

2.2 Database

In conjunction with the data collected for the base map, a database was constructed to tabulate the physical and operating characteristics of each rail corridor in the City, detailing all information collected during the study. This database is provided in Appendix B.

Existing and future train volume information by subdivision was requested from the rail owners and operators, but was not provided. In light of this, current train volumes were determined through the use of public sources and assumptions; for example, GO and VIA train schedules were used to develop passenger train volumes. Freight train volumes were estimated. Exhibit 2-1 provides a summary of this data by subdivision. The permissible speeds are determined by the rail owners and operators in accordance with Federal regulations. The City of Toronto does not control volumes or permissible speeds.

Exhibit 2-1: Current Volumes and Permissible Speeds of Railways through Toronto by Subdivision and Owner

Subdivision	Element (Main Line, Spur, Yard)	Volume Freight/ Passenger (No. of Trains Daily)	Permissible Speeds km/h (mph)
CN			
York	Main Line	20	80 (50)
GECO Branch	Spur	2	15 (10)
Highbury Industrial Lead	Spur	2	15 (10)
Halton	Main Line	20	80 (50)
Humberline Spur	Spur	2	15 (10)
CP			
Agincourt Industrial Spur	Spur	2	15 (10)
Belleville	Main Line	20	100 (60)
Staines Cross Connection	Secondary	16	25 (15)
Galt	Main Line	32	110 (70)
Havelock (KLR)	Secondary	2	50 (30)
MacTier	Main Line	18	70 (45)
North Toronto	Main Line	20	80 (50)
Islington Service Spur	Spur	2	15 (10)
Metrolinx			
Bala	Main Line	16	105 (65)
Canpa	Secondary	2	25 (15)
Don Branch	Secondary	0	15 (10)
Kingston	Main Line	153	160 (100)
Newmarket	Main Line	16	120 (75)
Oakville	Main Line	205	150 (95)
Union Station Rail Corridor West	Yard	435	100 (60)
Union Station Rail Corridor East	Yard	203	50 (30)
Uxbridge	Main Line	36	80 (50)
Weston	Main Line	206	130 (80)
CreateTO			
Harbour Lead	Spur	1>	15 (10)

2.3 Rail Typologies

A set of rail typologies for Toronto were developed based upon the specific characteristics of a given segment of a rail line within the municipal boundary, and will be used to identify appropriate risk management strategies for proposed new developments, as discussed in Section 6. These typologies have been developed in consultation with City of Toronto staff and councillors, railway owners and operators, the FCM-RAC, industry and public stakeholders, and the general public, as discussed in Section 3.

2.3.1 Methodology

A quantitative risk assessment identifies, analyses and ranks potential risks based on statistical methods, probabilities, and potential outcomes. The focus of this study is not a quantitative risk assessment of rail corridors or the statistical examination of train incident probabilities. The focus of this study is a qualitative assessment of risk based on rail corridor characteristics. This will provide a practical and proactive approach for the City of Toronto to identify and mitigate potential conflicts between rail operations and adjacent land uses, activities and people.

The history of incidents helps create an understanding of factors that influence risk. Analysis of incidents shows that a train derailment is often caused by more than one factor. As noted in Section 1.7, main-track collisions and derailments are generally related to track condition and equipment, whereas non-main-track are generally related to actions.

While examining past incidents helps to identify trends and patterns, given the number of factors related to rail incidents, it is not possible to predict where or when a future rail incident may occur. In addition, the City of Toronto has no jurisdiction over rail operations and most of the factors that may cause a derailment or release of material.

Therefore, the methodology applied to this study focuses on two key factors:

- The potential for a rail incident to occur; and,
- The potential severity of the outcome.

The proposed typologies were developed considering the following key trends and patterns noted in Section 1.7:

- Collisions and derailments occur most frequently on non-main-track; however non-main-track incidents generally have lower severity outcomes;

- Incident severity is directly related to the speed of the train; main-track collisions and derailments have the greatest potential risk to the public and of financial loss; and,
- Both main-track and non-main-track collisions and derailments can result in the release of product, including dangerous goods.

The potential severity of incidents will be taken into account through the mitigation strategies discussed in Section 6.

As described in the following sections, the typologies developed for the FCM-RAC Guidelines were the starting point to develop typologies for the City of Toronto. Recommended typologies also considered future uses of Toronto rail lines, and were refined based on the consultation process described in Section 3.

2.3.2 FCM-RAC Typologies

The FCM-RAC Guidelines define types of rail lines and recommend setbacks for new developments from railway corridors in order to: provide a buffer from railway operations; permit dissipation of rail-oriented emissions, vibrations and noise; and accommodate a safety barrier. The FCM-RAC Guidelines currently identify six Rail Types:

- Freight Rail Yard
- Principal Main Line
- Secondary Main Line
- Principal Branch Line
- Secondary Branch Line
- Spur Line

As discussed in Section 3.1, it was identified that a future revision to the FCM-RAC Guidelines will combine Main and Secondary Lines, resulting in three Rail Types:

- Freight Rail Yard
- Main Line
- Spur Line

2.3.3 Future Uses of Toronto Rail Lines

The development of rail typologies for the City of Toronto included a review of future plans for additional passenger services by Metrolinx. Future plans for

freight corridors were not available from other railways at the time of writing. Metrolinx's future plans include:

- RER and potentially High Speed Rail on the Newmarket, Weston, Kingston and Oakville Subdivisions;
- Possible future RER on the Galt, Bala and North Toronto Subdivisions; and,
- Introduction of GO train service on the MacTier, Don Branch, Belleville and Havelock Subdivisions.

Newmarket, Weston, Kingston and Oakville Subdivisions

Current GO train services on these subdivisions include:

- The Barrie Line operates on the Newmarket Subdivision with services from Union Station to Barrie (Avondale Waterfront) with 13 stations, inclusive.
- The Kitchener Line operates on the Weston Subdivision, currently offering commuter service from Union Station in Toronto to the City of Kitchener, with ten stations between.
- The Lakeshore East Line operates on the Kingston Subdivision, currently offering commuter service from Union Station in Toronto to Oshawa, with nine stations between.
- The Lakeshore West Line operates on the Oakville Subdivision, currently offering commuter service from Union Station to the GO Centre in Hamilton and to West Harbour Station (Hamilton), with eleven stations between.

On the Newmarket Subdivision RER is proposed from Union station along the entire route to Barrie.

For the Kitchener Line, RER is proposed between Brampton and Union Station, as well as all-day two-way commuter rail between Mt. Pleasant and Downtown Brampton as part of the 15-year plan under the Big Move (2008). In Metrolinx's Approved Changes to the Big Move (2013), peak period commuter rail is recommended between Kitchener and Mount Pleasant.

For the Lakeshore East and West Lines, RER is proposed between Oshawa and Hamilton (including Union Station between), as well as peak period commuter rail between Bowmanville and Oshawa, and Stoney Creek and Hamilton as part of the 15-year plan under the Big Move (2008). In Metrolinx's Approved Changes to the Big Move (2013) the location of the Oshawa Station and alignment between Oshawa and Bowmanville Stations have been adjusted.

Inter-city high speed or higher speed rail is also being considered along the Weston, Kingston and Oakville Subdivisions as part of the Ontario Ministry of Transportation's planned High Speed Rail in Ontario[22], with the first portion currently being studied from Toronto to London, Ontario, on the Weston Subdivision and VIA Rail Canada planning higher speeds and increased frequencies on the other lines.

Galt, Bala and North Toronto Subdivisions

Current GO train services on these subdivisions include:

- The Milton Line operates on the Galt Subdivision, currently offering commuter service from Union Station to Milton, with seven stations between.
- The Richmond Hill line operates on the Bala Subdivision, currently offering commuter service from Union Station to Gormley, with four stations between.
- The North Toronto Subdivision is currently used for freight only, with no commuter service.

For the Milton Line, two-way all-day commuter service is proposed for the entire line, as part of the 15-year plan under the Big Move (2008). Under the 25-year plan, RER was proposed for the southern portion of this line, from Cooksville to Union Station, with the remainder continuing to operate two-way all-day commuter service, however it is not included in the present RER program due to the difficulty in finding space for additional tracks.

For the Richmond Hill Line, two-way all-day commuter service is proposed from Richmond Hill Station to Union Station, as part of the 15-year plan under the Big Move (2008), with future upgrade to RER as part of the 25-year plan. Peak period commuter service is also proposed from Aurora Road (in Aurora) to Richmond Hill Station as part of the 15-year plan.

For the North Toronto Subdivision, peak period commuter service is proposed from Dundas West Station to Summer Hill Station, as part of the 15-year plan under the Big Move (2008) with trains possibly running through from the Milton, Kitchener and future North Pickering lines. At the time of writing, implementation of commuter service on this line is not actively being planned. RER service through this subdivision is a potential future consideration.

[22] Ontario Ministry of Transportation, "High Speed Rail in Ontario: Transforming mobility, connecting communities, integrating centres of innovation and fostering regional economic growth and development Special Advisor for High Speed Rail: Final Report", December 2016

MacTier, Belleville and Havelock Subdivisions and the Don Branch

Current operations on these subdivisions include:

- The MacTier and Belleville Subdivisions currently operate as principal freight corridors.
- The Havelock Subdivision operates as a secondary freight corridor.
- The Don Branch is a secondary freight/passenger corridor; however, it is currently not in use.

For the MacTier Subdivision, peak period commuter service is proposed from Bolton to Union Station as part of the 25-year plan in Metrolinx's Approved Changes to the Big Move (2013).

For the Belleville and Havelock Subdivisions, peak period commuter service is proposed, from Seaton in Pickering and Locust Hill in Markham (at Hwy 407), using the Don Branch Subdivision to reach Union Station, as part of the 15-year plan in Metrolinx's Approved Changes to the Big Move (2013).

2.3.4 Typologies

Each rail corridor type has been considered based on the potential for a rail incident to occur (based on rail infrastructure and operations), and the potential severity of the outcome should an incident occur (based on the type of train traffic, i.e. freight or passenger). Based upon the available information, the rail network is proposed to be categorized into typologies which are similar in terms of their physical and operational characteristics.

It is important to remember that freight trains can operate on any corridor in the City. Rail lines owned by Metrolinx have operating agreements that allow freight railways to continue to operate trains as required.

Over the last few decades there have been major changes in the configuration of freight services. There is an ongoing reduction in local pick-up and delivery of freight cars to sidings, warehouses and factories. The railways (whose traffic has been growing) have concentrated on moving commodities in bulk and using intermodal containers and trailers on flat cars for mixed freight operations rather than separate single car movements from origin to destination. CN and CP have consequently rationalized their networks, concentrating rail freight traffic on fewer trunk lines. Local freight train distribution runs are less frequent.

As discussed in Section 3.2.3, the RER program is currently under development by Metrolinx. The RER lines will have frequent passenger train services (two to four trains per hour with additional services in the peak). CN and/or CP will continue to have the right to run freight trains over most of the RER routes; however, such traffic is expected to be infrequent.

Surrounding topography and land uses also play a role in the potential severity of an incident. As such, attributes such as elevation of the rail line with respect to ground level and the proposed type of development adjacent to the corridor are taken into account in defining appropriate mitigation measures (Section 6).

Six Rail Types were identified for the City of Toronto in the Phase 1 report, and formed the basis for the consultation described in Section 3:

- Type A: Principal Through Freight
- Type B: Regional Express Rail (Passenger)
- Type C: Commuter Rail (Passenger)
- Type D: Secondary Freight
- Type E: Spurs
- Type F: Yards

3 Phase 1 Consultation

3.1 Federation of Canadian Municipalities and the Railway Association of Canada

This study has been undertaken with the FCM-RAC Guidelines as its foundation, building on the recommendation that municipalities take a proactive approach to managing development in proximity to rail operations.

The FCM-RAC Proximity Initiative, and individual members, were contacted for comments on the Phase 1 Interim Report. The FCM-RAC Proximity Initiative Project Manager attended two of the public meetings in fall 2017, and provided written comments on the Phase 1 Interim report. The comments received are attached in Appendix D. The FCM-RAC are generally supportive of the City's initiative.

FCM-RAC noted that their guidelines are intended to be updated on regular basis of every five years or less, and that an update is currently underway. One of the forthcoming updates has come as a result of working with the City of Montreal on their land use plan, Schéma d'Aménagement et de Développement de l'Agglomération de Montréal (as discussed in Section 5.2.1). The FCM-RAC indicated planned revisions to their guidelines will include:

- Municipalities are to consult with Railway companies to obtain railway classification information, as actual rail speeds, types and frequency are security-sensitive.
- Combined rail facility types for setback requirements, in particular the main line and secondary line types. This change is due to the variable nature of operations (e.g., freight operations can fluctuate with local and national economic conditions, and similarly passenger operations may vary with fluctuating schedules and passenger traffic over time). Setback recommendations will be:
  - Freight Rail Yard: 300 metres
  - Main Line: 30 metres
  - Spur line: 15 metres

These planned changes to the FCM-RAC Guidelines informed this study, as discussed in Section 5.1.2.

FCM-RAC comments also included:

- Railway Safety is a responsibility shared by multiple actors and stakeholders, including:
  - Municipalities and land use authorities: Municipal governments can ensure responsible land use policies, guidelines and regulatory frameworks, as well as a development approval process (discussed in Section 1.3); and,
  - Developers and contractors: Developers and contractors can avoid potential safety and drainage issues through appropriate temporary and permanent design measures (discussed in Section 6.3).
- Land use planning should account for noise reverberation that could impact sensitive receptors (discussed in Section 6.7).
- Railway owners and operators should review and validate mapping and databases provided in this report (discussed in Section 3.2).
- It should be made clear that rail speeds cannot be controlled or reduced by the City (discussed in Section 1.1).
- The FCM-RAC Guidelines recommend that either their Standard Mitigation Model or Development Viability Assessment (a study to be undertaken by a development proponent that addresses the viability of the project and suggests alternative safety measures) be used, with all mitigation measures designed to the highest possible urban standards (discussed in Sections 5.1.2 and 5.1.3).
- Other adverse impacts of rail operations (e.g. noise, vibration, fumes) can be avoided or minimized through good design practices enforced by zoning and land use bylaws where applicable, as per the policy recommendations provided by the FCM-RAC Guidelines (discussed in Section 6.7).

3.2 Railway Line Owners and Operators

The owners and operators of railways within the City of Toronto were contacted for input on this study. An interview guide was developed for Phase 1 of this study, requesting the following information:

- Rail Infrastructure
  - Base maps of lines
  - Type (Principal, Main, Spur, Yard)

  - Number of tracks, presence of crossings or switches
  - Location of fencing, noise walls, crash walls
  - Maximum allowable train speeds
  - Track elevation compared to adjacent lands
- Operations
  - Current and historic train volumes (daily, weekly, including number of trains and length of consists, passenger and freight)
  - Incident history, including derailments and trespassing
  - Employee time table, including locations of at-grade crossing, train speed limits, etc.
  - Future plans for track improvements, including spurs, yards or other infrastructure
  - Future plans for service increases (freight and passenger)

A list of contacts was prepared and a letter outlining this study and requesting cooperation was sent out by the City. Subsequently all were contacted by electronic mail or telephone. The agencies contacted to date include:

- CN;
- CP;
- Metrolinx/GO Transit;
- TTR;
- CreateTO; and,
- VIA Rail Canada (VIA).

Efforts to consult with the railway owners and operators continued into Phase 2 of this study, aiming to receive information not obtained during Phase 1 efforts, and input on the Phase 1 report findings and mapping.

3.2.1 Canadian National Railway

At the time of writing, no rail infrastructure or operational information has been received from CN. It is understood that comments on the Phase 1 Interim Report were included in the comments provided by the FCM-RAC (Appendix D).

3.2.2 Canadian Pacific Railway

At the time of writing, no rail infrastructure or operational information has been received from CP. It is understood that comments on the Phase 1 Interim Report were included in the comments provided by the FCM-RAC (Appendix D). It is recommended that City Planning staff continue to attempt to engage CP as any potential Official Plan Amendments and associated guidelines are developed and advanced for consideration.

3.2.3 Metrolinx

A meeting was held on June 21, 2017 with relevant staff as determined by Metrolinx and representatives of IBI Group and Stantec.

Metrolinx has purchased from CN the rights-of-way within the City for six of the seven commuter rail lines it operates. Metrolinx has also purchased the USRC from CN and CP. CP has sold to Metrolinx a section of the seventh line, the Milton Line, running from the USRC to West Toronto as well as the Don Branch on the east side of the USRC and the Canpa Subdivision in Etobicoke. The remainder of the Milton Line, west of West Toronto, operates on CP tracks (Exhibit 1-2).

Metrolinx has an ambitious program in development called Regional Express Rail (RER) on five of its lines (all except the Richmond Hill and Milton Lines). RER will involve electrifying each corridor and providing frequent two-way service. As such, RER may include providing additional tracks and structures on the relevant corridors. Metrolinx also operates the Union Pearson Express from Union Station to Pearson International Airport on the Weston Subdivision (Kitchener GO line).

The RER planning, detailed design and implementation for corridor expansions and improvements are in different stages of development across the GO network. Some are currently in the environmental assessment stage, some are in detail design and approaching construction, others are in initial planning. As such, it is premature to analyze the precise spatial relationships of future conditions to adjacent land uses and planned/built form. Metrolinx provided the project team with the RER Initial Business Case (2015)[23] which includes the track configuration changes being planned. Exhibit 3-1 summarizes these changes, Scenario 5 being the recommended plan.

[23] Metrolinx, RER Initial Business Case, http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/GO_RER_Initial_Business_Case_Summary_EN.pdf

Exhibit 3-1: Track Changes (within City of Toronto) Proposed in the Metrolinx RER Initial Business Case (2015)

Line	Scenario 4 (Full Build)	Scenario 5 (Optimized - Recommended)
Lakeshore West	No change	No change
Milton	Restoration of second track West Toronto to Union Station Rail Corridor (USRC)	No change
	Four tracks to West Toronto (2 freight, 2 passenger)	
	Overpass of CP freight tracks at West Toronto	
Kitchener	Total of 4 tracks (including UPX)	Total of 4 tracks (including UPX)
Barrie	Double tracking	Double tracking
Richmond Hill	Double tracking	No change
Stouffville	Double tracking	Double tracking
	4 tracks on Kingston Sub from USRC to Scarborough Junction	4 tracks on Kingston Sub from USRC to Scarborough Junction
Lakeshore East	4 tracks on Kingston Sub from USRC to Scarborough Junction	4 tracks on Kingston Sub from USRC to Scarborough Junction
	3 tracks from Guildwood to Pickering	3 tracks from Guildwood to Pickering
Union Station Rail Corridor (USRC)	Additional Island platform with removal of track 15	Additional Island platform with removal of track 15

Metrolinx also provided information on the current operations and guidelines for setbacks and other mitigation measures in use for reviewing development applications along rail corridors. Metrolinx encouraged consideration of noise and vibration impacts of rail operations to adjacent development, in particular around rail yards which often operate 24 hours per day.

A second meeting with Metrolinx staff, City of Toronto staff, and IBI Group staff was held on December 19, 2017. Metrolinx staff provided comments on the draft rail typologies, and City of Toronto staff conveyed key findings from the public consultation held. The rail typologies were discussed including the recommendations of the FCM-RAC Proximity Initiative.

3.2.4 Toronto Terminals Railways Company

Currently USRC is self-contained with most of the property bounded by major roads or embankments. Trains generally move slowly with little danger of derailments. TTR noted that they have not had many problems with adjacent land uses despite recent developments, with the exception of noise complaints. With more daytime traffic, corridor maintenance is being pushed into night hours, causing some problems with residents, in particular in the St. Lawrence neighbourhood.

While passenger traffic, particularly GO, is increasing, freight traffic is very low. One train a week is scheduled through the USRC to serve industry in the port lands but is often operated only once every two or three weeks, and typically consists of five or six cars. CN no longer runs through freight trains along the Lakeshore corridor. CP does not currently operate any trains through the USRC.

Both CN and CP have the right to run trains through the corridor, which could be required if other rail corridors through Toronto are blocked by accidents or construction.

3.2.5 CreateTO

Currently train volumes in the Port Lands are low, with less than one CN train a week operating to serve the sewage treatment plant, carrying chemicals. The Keating Yard is no longer used as a yard but only to run around the locomotive on the trains into the port area. PortsToronto does not currently generate any train traffic.

The right-of-way is narrow, generally less than 30 feet (9 metres). CreateTO noted that they have not had any problems with abutting land uses which are all industrial but train speeds are quite low.

CreateTO does not have any plans for expansion but does have a responsibility to keep the track open to the PortsToronto facility. CreateTO staff indicated that they could redevelop the rail access at some time in the future if the right economic opportunity comes along.

3.2.6 VIA Rail Canada

VIA does not own any lines within the City of Toronto and therefore does not comment on development applications. VIA has a long-term lease on the Willowbrook rail yard for its Toronto Maintenance Centre, located on the south side of the Lakeshore West GO corridor (Oakville Subdivision) in Mimico. VIA is concerned about development adjacent to that yard, in particular related to potential noise complaints as the yard is in operation 24 hours per day.

While there are no confirmed service changes planned, VIA has been upgrading frequencies on services to Ottawa and Montreal. There could also be service improvements on the Lakeshore West and Kitchener GO lines. In the case of

the latter line, these would have to be coordinated with the Province's plans for High Speed Rail on this corridor to London and ultimately Windsor.[24]

VIA is considering electrification over the longer term; however, as VIA does not own the corridors, this must be coordinated with the rail corridor owners. VIA staff noted that electrification would impose a constraint on development over rail corridors.

3.3 Stakeholders and the Public

The consultation program for stakeholders and the public included the following opportunities for input, as detailed in the following sections:

- A project website (https://bit.ly/2GCY0up) was created where study information, reports, public meeting dates, project team contact information, and presentation materials were posted and comments permitted;
- A project mailing list was compiled with representatives of potentially interested groups, including community rail safety groups, ratepayers associations and residents associations, the developer community, and any other individuals who signed up through the project website;
- A briefing note was circulated to all City of Toronto Councillors in September 2017;
- Five public meetings were held in November 2017 to present the Phase 1 findings and gather feedback on the draft rail typologies and range of mitigation measures;
- An online survey for submission of comments was available in November 2017;
- After the public events, on December 4, 2017, a project update email was sent to everyone who signed up for the mailing list, with a request to provide all comments by December 15, 2017;
- A presentation was made to BILD Toronto on January 25, 2018;
- A second email update was sent to the project mailing list on February 28, 2018; and,
- The Phase 1 Report was posted to the project website for public review from February 28, 2018.

[24] Ministry of Transportation, High Speed Rail in Ontario, http://www.mto.gov.on.ca/english/publications/high-speed-rail-in-ontario-final-report/

3.3.1 City Councillors

A briefing note was provided to City of Toronto Councillors on September 18, 2017. This briefing note summarized the findings of the Phase 1 report and invited input from councillors through submitted comments and attendance at the public meetings. Councillors were also provided access to the Phase 1 Interim Report.

One councillor expressed their support of the study and provided comments which recommended:

- Noise and vibration be addressed by the study, including night time nuisances that can come from rail yards which operate at all times;
- Consideration be given to including TTC subway rail, particularly open-air segments;
- The City's guidelines/handbook be written in plain language; and,
- For implementation, if not by By-law or Official Plan Amendment(s), some form of report to come to Council with recommendations for guidelines.

These comments were taken into consideration in the development of the recommendations.

3.3.2 BILD Toronto

An individual presentation was made at the BILD Toronto Chapter meeting on January 25, 2018. BILD provided written comments, which can be found in Appendix E. These comments recommended the City:

- Maintain flexibility for the site design/mitigation measures, and
- Maintain the direction as "guidelines" not as an Official Plan Amendment.

These comments were taken into consideration in the development of this study and report.

3.3.3 Public Meetings

Notices for the meetings were posted in Metroland's community newspapers as well as the Toronto edition of Novae Res Urbis approximately 2 weeks prior to the first meeting. In addition to Councillor e-mail notification, approximately 450 notices were mailed out to resident and ratepayer groups as well as other interested parties.

The City held five meetings at public venues across Toronto in November 2017. Meetings were held from 7 p.m. to 9 p.m. and included:

- Mapping from Phase 1 showing proposed typologies for rail corridors within the city limits;
- A presentation on the findings of the Phase 1 Report and the mitigations being considered as part of Phase 2 of the study;
- A opportunity for members of the public to ask questions about the study to staff on hand for the meetings; and,
- A comment form for attendees to review and fill in with their thoughts two questions as well as general comments on the study.

At each meeting attendees were asked to sign in, with an option to receive project updates by adding themselves to the project mailing list. A summary of the meetings held and numbers of attendees is provided in Exhibit 3-2.

Exhibit 3-2: Public Meeting Dates, Locations, and Attendees

Date	Location	Attendees
November 6, 2017	Metro Hall, Rm. 308/309	15
November 8, 2017	Etobicoke Civic Centre, Council Chambers	12
November 16, 2017	North York Civic Centre, Council Chambers	6
November 21, 2017	Scarborough Civic Centre, Council Chambers	13
November 30, 2017	Metro Hall, Rm. 308/309	13

3.3.4 Summary of Public Comments

During the public meetings, attendees were able to ask questions and make comments. There were also questions posed by the project team regarding the study which attendees had an opportunity to discuss during the meeting and submit responses to/comments on at the end of the meeting or afterward. Submissions after the meeting could be submitted via mail, email, or an online survey on the project website.

Several questions and comments were made during the five meetings, and 21 people submitted written responses to the two questions and/or general comments. A summary of the discussions and the comments received including copies of the physical and online survey forms submitted can be found in Appendix F.

The two questions posed by the project team were:

1. What types of land use controls should be in place for future development to reduce the potential risks associated with

development in proximity to rail operations? Should land use controls be different for different rail corridor types?

2. What other issues should be considered in the guidelines for development in proximity to rail infrastructure? (These could include issues such as: built form, building set-backs, types of uses, arrangement of uses within a building, measures designed to address noise, vibration, light, etc.)

3.3.4.1 Key Themes

Based on the discussions at the public meetings and the forms received there were several key themes identified. The following items are based on a qualitative assessment of all comments and discussion. Some of the themes represent opposing opinions.

Support for land use controls in proximity to rail

There were several comments in support of establishing and enforcing specific land use controls for developments adjacent to rail corridors:

- Several comments were received indicating that residential uses should have a higher standard for mitigation, while others suggested that residential uses should be prohibited within close proximity to rail.
- Most of those who were in support of these controls agreed with varying the mitigation measured based on rail corridor characteristics.
- However, others suggested that the mitigation measures should be fixed for all types, given that track usage and traffic can be changed at any time by rail operators (e.g. a secondary line could become a main line in future).

Support for increased noise and vibration mitigation

Noise and vibration concerns were frequently raised by attendees. Several comments were made around ensuring measures are based on real world noise levels and/or future noise levels, and enhancing mitigation measures:

- Accounting for reflection and refraction of noise on existing developments as part of the study for proposed developments was suggested.
- Shunting activities on spurs were noted to generate significant noise and as such mitigation measures should be similar to main lines, despite lower volumes and speeds on spurs.

Support for a City policy with "teeth"

There were several comments that indicated that the outcome of this study should be a firmly enforceable policy or regulation, something more than a set of guidelines. Some expressed concern that without a firm policy or regulation in place by the city, developers would take their cases to the Ontario Municipal Board in an attempt to bypass these requirements in favour of lower standards based on precedent.

Support for provincial / federal regulations

While it was expressed and understood that the City does not have any jurisdiction over rail corridors and rail operations, several attendees urged the City to work with Federal and Provincial Regulators regarding rail operations:

- Attendees expressed support for federal or provincial regulations for rail operators around noise and vibration and safety; and,
- A particular concern was noted around planned increases in rail service and the process for rail companies to implement noise and vibration mitigation measures.

Debate around setbacks for rail corridors

Several participants commented that the standard setbacks recommended in the FCM-RAC Guidelines are too onerous and impractical for a city as developed as Toronto:

- Some felt that the City should focus on achieving a safety standard for deflection walls and noise and vibration barriers, rather than a fixed setback;
- Others expressed concerns with setbacks taking up too large a portion of land, limiting development and devaluing property; and,
- A suggestion was also made for potential occupants to be made aware of the proximity to the rail corridor and associated risks, and being allowed to choose to live in these properties.

Debate around setbacks for rail yards

There were varying opinions on the setbacks required for rail yards:

- Some felt that the 300 m setback found in the FCM-RAC Guidelines should be applied, while others felt this was too large;
- Several attendees noted that developments have occurred along the USRC (which is a yard) within 300 m of the property line; and,

- There were also comments suggesting that yards be separated into two groups: passenger and freight.

Other Comments

A range of other comments were received, including:

- Mitigation for light pollution and odours;
- Consider other forms of rail, including subways (in particular where at or above grade), light rail and streetcar corridors;
- Built form should only be considered through urban design guidelines;
- Consider enhanced mitigation measures around interlockings/switches;
- Improve safety around surface crossings for pedestrians of all abilities;
- Make stronger requirements for development to provide adequate pedestrian crossings of rail corridors to reduce trespassing;
- Consider changes in noise levels as rail corridors shift from diesel to electric;
- Develop tools for addressing the potential impacts of changing rail operations on existing neighbourhoods;
- Additions to existing buildings should trigger mitigation requirements;
- All reviews should be conducted by one entity, which will stamp or approve design; and,
- Consider requiring developers to submit emergency management plans

3.4 Conclusions from the Consultation Process

The comments received through the consultation process indicate that:

- The public is generally in support of the City taking action to enhance and enforce more standardized mitigation measures for new developments through land use controls. These controls and mitigation measures should account for risk management as well as noise and vibration.
- Given the advanced state of development in the city, there should be some flexibility provided through the inclusion of a process similar to

the FCM-RAC Guidelines' Development Viability Assessment. Through consultation with the City and appropriate railway owner, the Development Viability Assessment process would offer the opportunity to consider alternative mitigation measures, supported by appropriate studies and engineered design.

- Consideration should be given to:
  - Combining Type B: Regional Express Rail (Passenger) and Type C: Commuter Rail (Passenger), given that commuter rail service frequency on these corridors could be increased at some point in the future. (Section 4 of this report discusses typologies but an initial typology was described in the Phase 1 report and at the consultation meetings);
  - Combining Type D: Secondary Freight and Type A: Principal Through Freight, given that secondary freight lines operations can change over time. This would be consistent with the planned changes to the FCM-RAC Guidelines, where Main Line and Branch Line typologies are combined; and,
  - Creating a new typology specific to the USRC, given that it functions differently than a typical yard.

The need for further study of the following topics was identified:

- Enhancement of the requirements for the study of light pollution and odour impacts from rail on new developments, with more standardized mitigations;
- Inclusion of other forms of rail, such as subways (in particular where at or above grade), light rail and streetcar corridors, as part of an expansion of this study;
- Review of pedestrian safety around surface rail crossings, including people of all abilities, and potential areas where requirements could be enhanced; and,
- Review of the impacts of major changes to rail operations on the existing neighbourhoods that they pass through, and development of appropriate tools to address potential impacts.

4 Recommended Typologies

As discussed in Section 3.4, through the consultation process these typologies were refined, reducing the number from six to five. The five recommended Rail Types are:

- Type A: Through Freight
- Type B: Passenger
- Type C: Spurs
- Type D: Union Station Rail Corridor (USRC)
- Type E: Yards

Exhibit 4-1 maps the five rail typologies within the City of Toronto, and Exhibit 4-2 provides details on each of the typologies with key features. Each typology is described in more detail following the exhibit. A full set of the detailed Typology Maps are included in Appendix C.

Exhibit 4-1: Recommended Rail Typologies

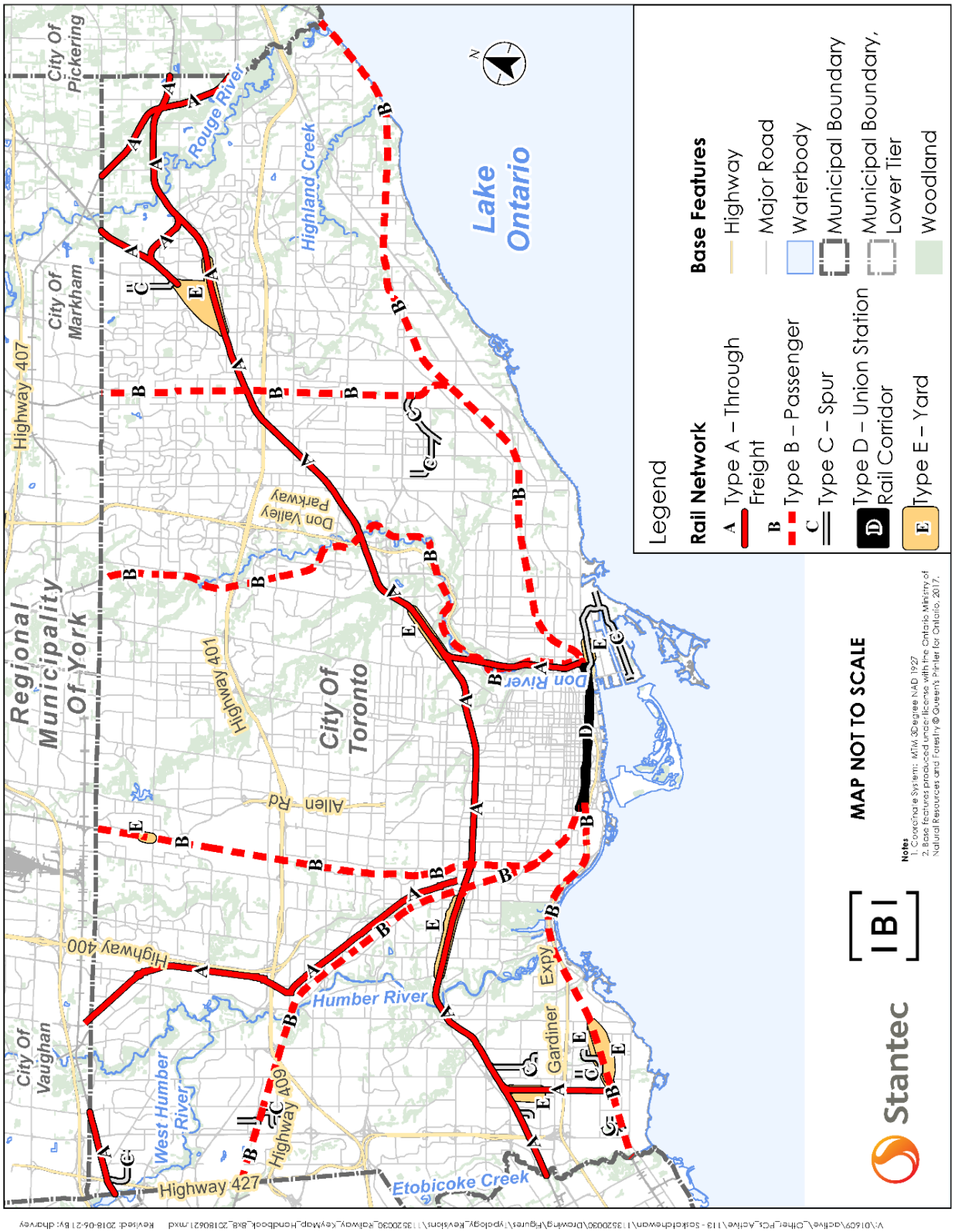


Exhibit 4-2: Recommended Rail Typology for the City of Toronto

Rail Type	Rail Class	Maximum Operating Speeds km/h (mph)	Train Traffic	Link To FCM-RAC Typology
A: Through Freight	Principal: Class 5 Secondary: Class 3	Principal: Freight 100 (60) Passenger 130 (80) Secondary: Freight 65 (40) Passenger 100 (60)	Principal: Typically higher volume of freight trains with heavier loads, longer trains, and higher speeds Secondary: Typically lower volume of passenger trains with lighter loads than principal, shorter trains and lower speeds; potential for through freight on these corridors	Main Line (Principal and Secondary)
B: Passenger	RER: Class 5 Commuter: Class 4	RER: Freight 100 (60) Passenger 160 (100) Commuter: Freight 100 (60) Passenger 130 (80)	RER: Typically higher volume of passenger trains with lighter loads than freight, shorter trains and higher speeds; potential for through freight on these corridors Commuter: Typically lower volume of passenger trains with lighter loads, shorter trains and lower speeds than RER; potential for through freight on these corridors	Main Line (Principal and Secondary)
C: Spurs	Class 1	Freight 15 (10) Passenger 25 (15)	Typically low volume of freight trains with lighter loads, short trains and low speeds	Spur Line
D: Union Station Rail Corridor (USRC)	Class 1	Freight 25 (15) Passenger 50 (30)	Typically high volume of passenger trains at low speeds; a passenger yard, but potential for freight	n/a
E: Yards	Class 1	Freight 15 (10) Passenger 25 (15)	Consider both freight and passenger rail yards	Freight Rail Yard

4.1 Type A: Through Freight

Type A corridors generally carry trains with heavier loads and higher operating speeds, with maximum operating speeds of 100 km/h for freight and 130 km/h for passenger. Principal through freight corridors typically carry train volumes exceeding five trains per day and potentially carry dangerous goods. These characteristics are consistent with those of the Main Line characteristics identified by the FCM-RAC Guidelines.

Including secondary freight corridors in this typology reflects the potential for secondary corridors to become main lines in the future. Secondary freight corridors carry lower train volumes, generally less than 5 trains per day, with typical speeds ranging between 10 and 30 km/h. Freight running along these lines can include dangerous goods. Trains are typically shorter on secondary freight corridors. Secondary freight corridors may also be used to store loaded or empty freight railcars.

CN ordinarily runs through freight trains north of Toronto, with only small portions of the York and Halton Subdivisions, which carry these trains, running through the northeast and northwest corners of the city, respectively.

CP ordinarily runs through freight trains through the central portion of Toronto, along several of its subdivisions, including Galt, MacTier, North Toronto, and Belleville.

Secondary freight corridors currently include the CP Staines Cross Connection, CP Havelock, the former CP Don Branch (no service at present) and the CP Canpa Subdivisions.

Both CN and CP reserve the right to run through freight trains along rail lines that are owned by Metrolinx.

Type A rail corridors may carry high volumes of trains, at generally higher speeds, and are likely to carry dangerous goods through Toronto. Given these characteristics, should an incident occur on a Type A rail corridor the outcome is likely to be more severe compared to other types of rail corridors. As noted previously, the outcome is also dependent on adjacent land use, topography, and other factors.

4.2 Type B: Passenger

Type B corridors within the City of Toronto are operated by Metrolinx/GO Transit. Commuter rail service is provided along several subdivisions, namely the Kingston, Uxbridge, Bala, Newmarket, Weston, Galt and Oakville subdivisions.

Commuter service varies by route and time of day, with some lines operating all-day service with headways as low as 10 minutes during peak periods and others operating only during peak periods. This offers a peak capacity between 5,000 and 20,000 passengers per hour per direction. Average speeds are 30 km/h to 50 km/h.[25] Maximum operating speeds are 100 km/h for freight and 130 km/h for passenger.

This typology includes rail corridors identified as part of the Regional Express Rail (RER) program, as discussed in Section 3.2.3.

Type B rail corridors are expected to have higher train volumes and maximum speeds than Type A corridors. However, RER trains are expected to be no more than 12 double-decker cars long, meaning lighter train loads than on Through Freight lines. RER corridors are also less likely to carry dangerous goods than Type A corridors. As noted previously, all corridors may carry through freight with dangerous goods at any time, per existing arrangements between Metrolinx, CN and CP.

Given these characteristics, should an incident occur on a Type B rail corridor, the outcome is likely to be less severe than Type A, but there is the potential for outcomes to be as severe. As noted previously, the outcome is also dependent on adjacent land use, topography, and other factors.

4.3 Type C: Spurs

Type C corridors are portions of secondary track used to access specific properties or customers, to load and unload railcars. Spurs usually carry only freight trains.

Speeds on spur lines are lower, with a maximum operating speed of 25 km/h. While trains may be carrying dangerous goods, the trains are usually moving slowly or stopped, resulting in a reduced potential for severe outcomes when compared to Types A and B, should an incident occur. As noted previously, the outcome is also dependent on adjacent land use, topography, and other factors.

4.4 Type D: Union Station Rail Corridor (USRC)

The USRC is the central focus for passenger train services operated by VIA and GO Transit, with plans to increase train frequency and potentially operating speeds. The USRC is technically a yard; however, the corridor also serves through passenger trains, and includes Canada's busiest train station. The corridor contains a series of primary tracks feeding the majority of rail

[25] Metrolinx, "The Big Move – Transforming Transportation in the Greater Toronto and Hamilton Area", November 2008.

subdivisions within the city, as well as several secondary tracks which are used to store or service railcars or locomotives. The USRC primarily serves passenger trains but can also serve freight.

The USRC passes through some of the most developed lands in the city, including the downtown core. A mix of medium- and high-rise buildings are located adjacent to the majority of the corridor, primarily made up of residential, office and retail uses. From the eastern limit, through Union Station and up to Lower Simcoe Street, the corridor is elevated, with sloped ground on either side. Between Lower Simcoe Street and the western limit the corridor is generally below grade, with deflection walls on either side.

Speeds within the USRC are generally lower, with a maximum operating speed of 50 km/h. A re-signalling of the USRC is in progress which will permit higher train speeds. Trains in the USRC are also less likely to carry dangerous goods than Type A corridors. (As noted previously, all corridors may carry through freight with dangerous goods at any time, per existing arrangements between Metrolinx, CN and CP.)

However, the noise and vibration associated with the USRC can fluctuate and potentially be greater than Type A, B and C rail corridors due to the more intensive operations, including limited maintenance and repairs, 24 hours per day.

Given these characteristics, should an incident occur on a Type D rail corridor, the outcome is likely to be less severe than Types A and B, but potentially greater than Types C and E. As noted previously, the outcome is also dependent on adjacent land use, topography, and other factors.

4.5 Type E: Rail Yards

Rail yards are a series of several secondary tracks which are used to configure trains or to store, maintain or load/unload railcars or locomotives. Rail yards may serve only freight trains, only passenger trains, or both freight and passenger trains. Rail yards may store loaded or empty freight railcars.

Speeds within yards are lower, with a general maximum operating speed of 25 km/h. While trains may be carrying dangerous goods, the trains are usually moving slowly or stopped, resulting in a reduced potential for severe outcomes when compared to Types A, B, C and D, should an incident occur. As noted previously, the outcome is also dependent on adjacent land use, topography, and other factors.

Noise and vibration associated with yards are potentially the greatest of all Rail Types, with more intensive and frequent operations than the USRC, including maintenance and major repairs, 24 hours per day.

Some rail yards in Toronto include a main line operating through the yard, and through trains may maintain greater speeds than trains stopping or starting in the yard. However, given that yard setbacks are greater than main line setbacks, a separate typology was not developed for this combined situation.

5 Phase 2: Current Mitigation Measures – Best Practices

This section provides the background information reviewed to develop policy and process recommendations for the City. First, existing guidelines and best practices for development in proximity to rail operations was reviewed. Next, these best practices were considered in Toronto's context of existing policies and processes, as discussed in Section 6.

5.1 FCM-RAC Guidelines

A review of the FCM-RAC Guidelines, as well as the policies of other Canadian jurisdictions was completed to identify current best practices. This section summarizes the findings of the review, which were used to help shape recommendations for the City of Toronto.

The FCM-RAC Guidelines are the product of a collaborative effort between regulators and industry, to provide guidelines and best practices for development in proximity to rail corridors. The FCM-RAC Guidelines recommend a standard set of mitigation measures for such developments, as well some alternative measures, and guidelines for supporting studies.

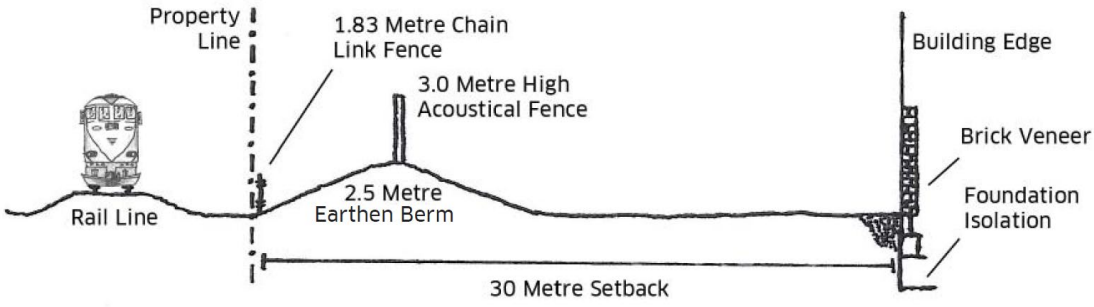
5.1.1 Identifying Type of Rail and Mitigation Requirements

The FCM-RAC Guidelines currently recommend that proponents within 300 m of rail operation contact the relevant railway(s) directly to obtain information on the classification, traffic volume, and traffic speed of the rail line(s) in proximity to any proposed development. However, as noted in Section 3.1, forthcoming changes to the FCM-RAC Guidelines will recommend proponents submit a request to the municipality to obtain this information from the relevant railway(s) as some of this information may be security sensitive.

5.1.2 Standard Mitigation Measures

The FCM-RAC Guidelines recommend a standard configuration for mitigation measures of new residential developments in proximity to rail infrastructure, consisting of a setback, earthen berm, chain-link security fence, and noise and vibration attenuation, as illustrated in Exhibit 5-1. The FCM-RAC Guidelines also provide direction on stormwater management and drainage, and warning clauses and other legal agreements. All mitigation measures are to be designed to the highest possible urban standards.

Exhibit 5-1: FCM-RAC Guidelines Standard Mitigation for New Residential Development in Proximity to Rail Infrastructure[26]



Not to Scale

Setbacks

The recommended setbacks for new residential buildings in proximity to railway operations vary based on the type of rail operations, and are shown in Exhibit 5-2. The recommended setbacks are measured from the mutual property line to the proposed building face. Based on comments provided by the FCM-RAC in response to this study (Section 3.1), the setbacks are planned to be modified in an upcoming update to the FCM-RAC Guidelines, as noted in Exhibit 5-2.

Exhibit 5-2: FCM-RAC Guidelines Standard Residential Building Setback

Type	Setback (m) 2014 Guidelines	Setback (m) Upcoming Guidelines
Freight Rail Yard	300	300
Principal Main Line	30	30
Secondary Main Line	30	n/a
Principal Branch Line	15	n/a
Secondary Branch Line	15	n/a
Spur Line	15	15

n/a: typology will be combined in upcoming FCM-RAC updated guidelines

Earthen Berms and Security Fences

Earthen berms, also called “safety berms”, serve as a safety barrier made up of highly compacted earthen materials. Materials used should be compacted to 95% modified proctor, which is a measure of the in-situ dry unit weight of the material as a percentage of the known maximum dry unit weight of that material.

[26] Guidelines for New Development in Proximity to Railway Operations, The Federation of Canadian Municipalities and the Railway Association of Canada, May 2013

The berms are constructed parallel to the rail corridor, with the foot of the berm on the rail side adjoining to the property line, and returns at the ends. The FCM-RAC Guidelines specify the height and side slope of these berms, as summarized in Exhibit 5-3. Berms constructed to these specifications will have a full width of up to 15 m, accounting for a centre approximately 2.5 m higher than the grade at the mutual property line, on which a noise barrier may be constructed. A 1.83 m high chain-link fence is also recommended along the property line (if not already in place) for trespassing prevention.

Exhibit 5-3: FCM-RAC Guidelines Recommended Earthen Berm Specifications

Type	Height* (m)	Minimum Side Slope (H:V)
Principal Main Line	2.5	2.5:1
Secondary Main Line	2.0	2.5:1
Principal Branch Line	2.0	2.5:1
Secondary Branch Line	2.0	2.5:1
Spur Line	No Requirement	No Requirement

*Height of berm to be measured from grade at mutual property line

The FCM-RAC Guidelines recommend consideration be given to using urban design guidelines as a way to establish specifications for appropriate use and design of berms. The guidelines also advise that trespassing issues can often be avoided through prudent land use planning around rail corridors, and ensuring the provision of adequate pedestrian crossings near uses with higher pedestrian traffic. For example, adequate pedestrian crossings should be provided for access between schools, commercial uses, parks or plazas in proximity to railway facilities.

Noise and Vibration Attenuation

The FCM-RAC Guidelines identify minimum noise influence areas to consider around rail infrastructure. Given the site-specific nature of noise, noise impacts and appropriate mitigation should be determined through a noise impact study completed by a qualified acoustic consultant using the criteria provided by the FCM-RAC Guidelines. The criteria includes indoor and outdoor sound level limits for various spaces within residential dwellings during specific time windows. Proponents are also recommended to consult the Canadian Transportation Agency report, Railway Noise Measurement and Reporting Methodology (2011) for guidance on the recommended content and format of a noise impact study.

Noise is typically mitigated by noise walls/barriers which reduce noise levels from the corridor taking into account building setback and materials, path of noise, topography, and noise reflection and diffraction.

In comments provided by FCM-RAC, consideration for noise reverberation is recommended, to determine if noise may be reflected off of tall buildings to sensitive receptors (e.g. residences) on the other side of the railway infrastructure.

Exhibit 5-4 summarizes the FCM-RAC Guidelines minimum noise influence areas within which noise impact studies are recommended for any new development, as well as the typical minimum heights for noise barriers (provided as a point of reference only). The heights provided are measured from the top of the track to the top of the noise barrier, and can include the height of the berm in combination.

Exhibit 5-4: FCM-RAC Guidelines Recommended Minimum Noise Influence Areas and Typical Minimum Noise Barrier Heights

Type	Noise Influence Area (m)	Typical Minimum Heights for Noise Barriers* (m)
Freight Rail Yard	1000	Not provided
Principal Main Line	300	5.5
Secondary Main Line	250	4.5
Principal Branch Line	150	4.0
Secondary Branch Line	75	No minimum
Spur Line	75	No minimum

*Reference only. Heights to be determined through analysis using criteria provided in FCM-RAC Guidelines, and applicable legislation.

Vibration, similar to noise, is site specific in nature. Specific vibration levels and appropriate mitigation measures should be determined through a vibration impact study completed by a qualified acoustic or vibration consultant using the criteria provided by the FCM-RAC Guidelines. It is recommended that such studies are completed early in the development process, as mitigation may be challenging.

Vibration is primarily mitigated by building placement and structural design modifications, which account for:

- Operational and vehicle factors: speed, suspension, flat or worn wheels;
- Rail factors: type, condition, support system;
- Geology: soil, subsurface conditions (particularly stiffness and internal damping of the soil, and depth of bedrock); and,

- Receiving building: vibration energy that reaches building foundations, coupling of building foundation to soil, propagation of vibration through building.

The FCM-RAC Guidelines recommend a minimum vibration influence area of 75 m from a rail corridor, within which a vibration impact study should be required for any new development.

The FCM-RAC Guidelines also recommend consideration be given to including a requirement for noise impact and vibration impact studies to be completed as part of any Official Plan or zoning by-law amendment for lands near to rail infrastructure or where necessary.

Variations to Standard Mitigation Measures

There are a few variations also provided by the FCM-RAC Guidelines, provided site conditions allow:

- In scenarios where the railway line is set below the grade of the property line by an equivalent height to or greater than the required height of the berm, no berm is required, as illustrated in Exhibit 5-5;
- On the development side of the berm, the grade does not need to be dropped back to the original elevation, and can be set higher or use a more gradual slope;
- The setback can be reduced through a reciprocal increase to the height of the berm; and,
- A ditch or valley can be used in lieu of a berm, provided the depth is equivalent to or greater than the inverse of the required berm height measured from the grade at the mutual property line, as illustrated in Exhibit 5-6. Under this condition, it may be advantageous to shift the noise barrier closer to the proposed development or rail operations to avoid the additional height that would be required if set at the bottom of the ditch.

The FCM-RAC Guidelines do not address scenarios where a rail corridor is significantly elevated or above grade. This scenario is discussed in Section 6 of this report.

Exhibit 5-5: Railway Below Grade (in Cut) from FCM-RAC Guidelines[26]

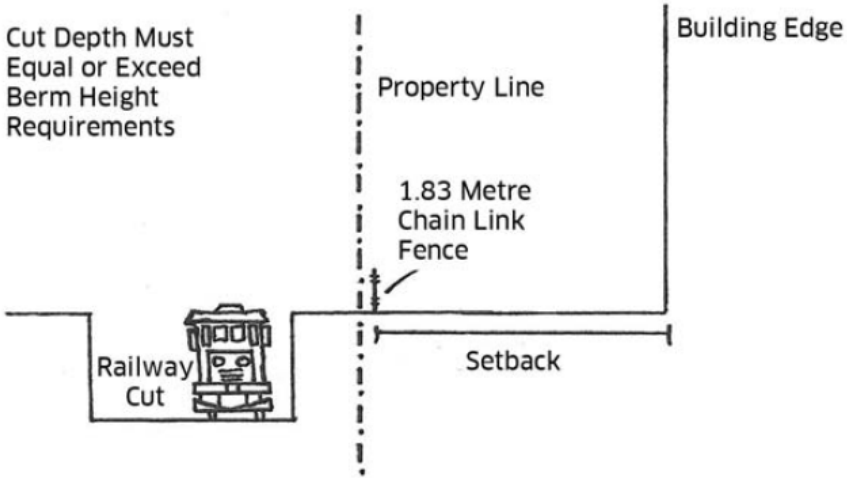


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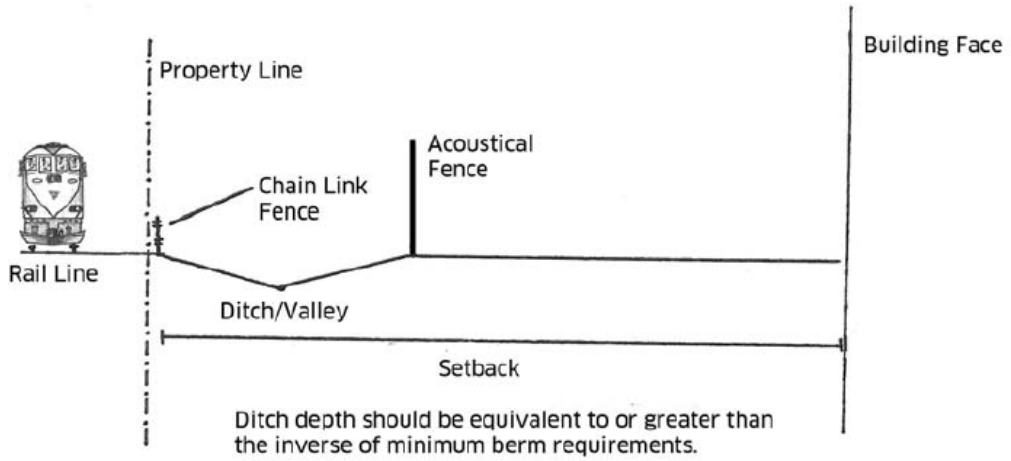
Exhibit 5-6: Crash Valley or Ditch from FCM-RAC Guidelines[26]



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5.1.3 Alternative Mitigation Measures

The FCM/RAC Guidelines recommend that in developments where the applicant has demonstrated that standard mitigation measures are not technically or practically feasible, a Development Viability Assessment (DVA) be undertaken by the proponent to address the viability of the project and suggest alternative safety measures, such as deflection walls or deflection berms, also called “crash walls” or “crash berms”. All studies and designs in support of alternative mitigation measures should be prepared by a qualified expert and reviewed by the affected railway(s).

Development Viability Assessment (DVA)

A DVA as described in the FCM/RAC Guidelines is a generalized tool that may be customized by a municipality to be used in cases where the prescribed standard mitigation measures cannot be met. The Guidelines provide specific criteria for a DVA as follows:

- Identification of all potential hazards to the operational railway, its staff, customers, and the future residents of the development;
- Identification of operational requirements of the railway facilities and the whole life cycle of the development;
- Identification of design and construction issues that may impact on the feasibility of the new development;
- Identification of the potential risks and necessary safety controls and design measures required to reduce the risks to the safety and operational integrity of the railway corridor and avoid long-term disruptions to railway operations that would arise from a defect or failure of structure elements; and,
- Identification of how an incident could be managed if it were to occur.

The Guidelines recommend that a DVA be completed by a qualified expert with direct consultation with the affected railway(s) to ensure all pertinent concerns or issues are addressed. A DVA should include all relevant studies and designs for alternative mitigation measures. All mitigation measures are to be designed to the highest possible urban standards.

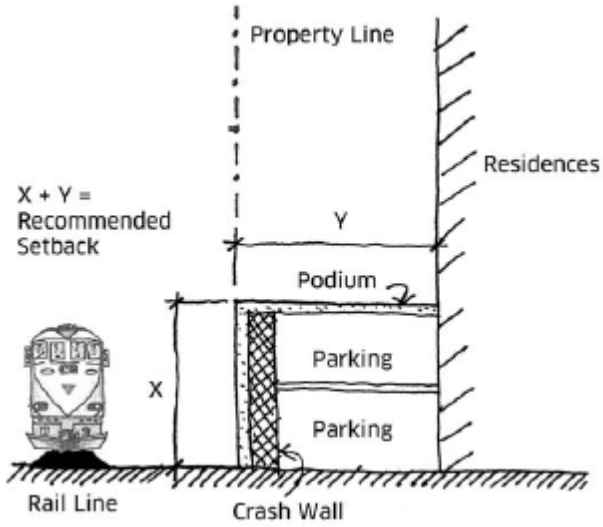
Deflection Walls and Berms

Deflection walls, as illustrated in Exhibit 5-7, are structures, typically made of concrete, which are designed to absorb the energy from the impact of a derailed train, with equivalent resistance to a standard berm. The design of these walls varies based on the characteristics of the potential impact, accounting for the anticipated train speed, weight and angle of impact. Given this variability, a standard design is not provided by the FCM-RAC Guidelines, but rather design requirements will be provided by relevant railway(s).

The FCM-RAC Guidelines note that horizontal setback requirements may be reduced with the construction of a crash wall, which may be incorporated into a low-occupancy building such as parking structure for a residential tower. This concept requires the setback distance to be measured as a combination of horizontal and vertical distances, with the total adding up to the recommended 30 m setback. Exhibit 5-7 illustrates an interpretation of this configuration, noting the vertical height of the wall as “Y” and the horizontal setback as “X”, adding up to the recommended setback. For example, if the crash wall is 2.5 m tall, then the horizontal setback may be reduced to 27.5 m. A standard design is not

provided by the FCM-RAC Guidelines. Design requirements for crash walls will be provided by the relevant railway(s).

Exhibit 5-7: Deflection Wall with Combined Horizontal and Vertical Setback[26]

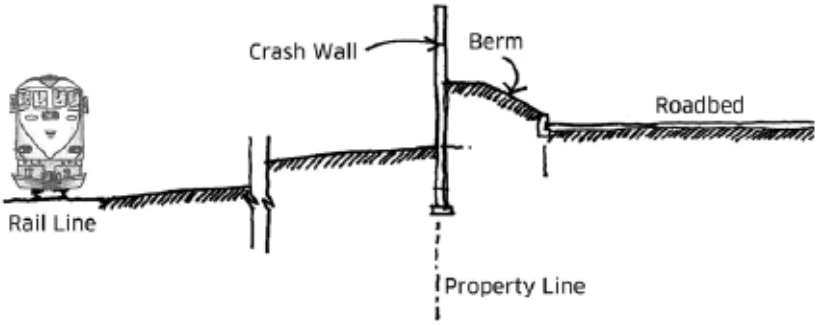


Not to scale

Deflection berms, as illustrated in Exhibit 5-8, are hybrid structures which combine an earthen berm and a deflection wall, and are generally preferred over deflection walls because they have a greater ability to absorb impacts due their compositional material and greater mass. This greater ability to absorb impacts also causes less deflection of the train back into the corridor, resulting in less time for a derailed train to come to a stop. Where space is limited, deflection berms can also offer an alternative to the wider standard berm. Like deflection walls, deflection berms do not have a standard design, but rather design requirements will be provided by the relevant railway(s).

The FCM-RAC Guidelines note that no berm is required where the railway line is in a cut of equivalent depth. The FCM-RAC Guidelines also identify that noise can be attenuated where the railway line is below the sensitive receptor.

Exhibit 5-8: Typical Deflection Berm[26]



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5.1.4 Stormwater Management and Drainage

The FCM-RAC Guidelines note that stormwater management and drainage associated with a proposed development should not adversely impact the function, operation, or maintenance of an adjacent rail corridor, nor area development. Rail corridors are generally not designed to accommodate additional flows from adjacent properties, so a proposed development should not discharge or direct any additional flows to the rail corridors.

The FCM-RAC Guidelines note that development-related changes to drainage should be addressed within the site of development, designed to be captured and reused on site, or diverted away from the rail corridor to an appropriate drainage or management system. Buildings should generally be designed to avoid overflow of gutters and balconies discharging into the rail corridor. Proponents should consult with the relevant railway(s) regarding any potential changes to existing drainage patterns. Any proposed changes to existing rail corridor drainage patterns should be substantiated by a drainage report. Costs associated with any upgrades to the drainage system to accommodate a proposed development should be borne by the proponent.

The FCM-RAC Guidelines also state that stormwater flows should be designed to:

- Maintain the structural integrity of rail corridor infrastructure;
- Avoid scour or deposition; and,
- Prevent obstruction to the rail corridor with stormwater or associated debris.

5.1.5 Warning Clauses and Other Legal Agreements

The FCM-RAC Guidelines recommend appropriate warning clauses be considered as an essential component to stakeholder communications and all

parties interested in selling, purchasing, or leasing residential lands in proximity to rail corridors. These parties should be made aware of any property constraints, and potential implications associated with rail operations, such as:

- The potential for annoyance or disruptions; and,
- The potential for increased rail activities.

The Guideline encourages municipalities to consult with applicable railway(s) to develop appropriate warning clauses. Additional recommendations include:

- Indication that complaints regarding noted implications should not be directed to the railways;
- Appropriate legal agreements and restrictive covenants registered on the title be used to secure construction and maintenance of any required mitigation measures, and ensure use of warning clauses and any other notification requirements;
- Consideration by municipalities of using environmental easements for operational emissions, registered on the title of relevant properties;
- Specific direction for real estate sales and marketing representatives, such as mandatory disclosure protocols, ensuring site constraints and mitigation measures are communicated through marketing materials, signage, websites and sales staff;
- Requirements by municipalities for sales centres to:
  - Identify lots or blocks which may experience noise and vibration impacts;
  - Identify type and location of sound barriers and security fencing;
  - Identify required warning clauses;
  - Display statement that railways can operate 24 hours a day, seven days a week; and,
  - Provide public access to any relevant studies completed for property in question.

Municipalities are also encouraged to establish a minimum influence area, within which warning clauses or other notifications mechanisms are required.

5.1.6 Urban Design Guidelines and Comprehensive Zoning Requirements

The FCM-RAC Guidelines recommend developing specific urban design guidelines for developments near rail corridors as a means to suggest

appropriate building layout and design, including podium design, setbacks, and step backs. The Guidelines also suggest consideration be given to regulating podium and balcony design for areas in proximity to rail operations through comprehensive zoning requirements.

5.2 Other Canadian Jurisdictions

The following sections summarize the best practices from other Canadian cities:

- Montreal;
- Calgary;
- Ottawa; and,
- Mississauga.

5.2.1 Montreal

The Montreal Agglomeration Council is responsible for the oversight of all of the municipalities and boroughs which make up the island of Montreal, each of which is responsible for its own budget and services, including urban planning. Through the Montreal Agglomeration Council, Montreal became the first city in Canada to adopt the FCM-RAC Guidelines into its long-term development plan: Schéma d'Aménagement et de Développement de l'Agglomération de Montréal, or the Montreal Urban Agglomeration Land Use and Development Plan (the Montreal Development Plan)[27]. The Montreal Development Plan directly specifies that new developments along the railway network should adhere to the FCM-RAC Guidelines, for the purposes of reducing risk from accidents involving dangerous goods, enhancing safety and minimizing the impacts of noise and vibration.

This is enacted through a requirement for local municipalities or boroughs/arrondissements to include regulations for sensitive land uses adjacent to a rail yard or principal railway right-of-way in their urban planning by-laws. Sensitive land uses are defined to be residential and institutional/collective facilities (e.g., hospital, library, school, nursery, etc.). New developments are to be evaluated against these regulations through the submission of a DVA by the developer to the local municipality. Guidelines for the DVA are included in the Appendix of the Montreal Development Plan, and are similar to those provided by the FCM-RAC Guidelines.

[27] "Montreal adopts new guidelines for residential developments near railway operations", Cision, http://www.newswire.ca/news-releases/montreal-adopts-new-guidelines-for-residential-developments-near-railway-operations-516951061.html accessed 2017-09-15.

The Montreal Development Plan also highlights the importance of avoiding nuisances for new developments, as this can impact the health and well-being of occupants. Local municipalities are required to include urban planning regulations that prohibit land in proximity to a rail yard or principal railway right-of-way to be occupied by sensitive uses if the criteria summarized in Exhibit 5-9 are exceeded.

Exhibit 5-9: Noise and Vibration Limits from the Montreal Development Plan

Criteria	Distance from Rail Yard or Principal Rail Line	Limit
Vibration	75 m	0.14 mm/s
Noise	300 m	40 dBA Leq (24 h) inside 55 dBA Leq (24 h) outside

5.2.2 Calgary

Through direct discussion with City of Calgary staff, it is understood that the City intends to shift the current model for risk management assessments away from peer reviews, and towards having a specific scope and set of criteria that must be met in a submission made by a qualified expert on a proponent's behalf. This shift is based on the City's experience with the current process, to enhance clarity on requirements for proponents and to reduce the potential for disputes.

In June 2016, the City of Calgary Council directed administrative staff to begin the preparation of a Rail Policy, based on the terms of reference submitted to council by staff. As part of developing this policy, staff engaged with internal divisions, railways, development industry groups and six residential communities that are facing development pressures along rail corridors.

Over the course of 2017, City staff developed a proposed Development Next to Freight Rail Corridors Policy, including an Implementation Guide and amendments to the Land Use Bylaw. These were submitted by City staff to the Standing Policy Committee on Planning and Urban Development on April 30, 2018, with the recommendation that the proposed policy be forwarded to the Public Hearing of Council in June of 2018 to be adopted. The Committee opted to refer the policy to the Administration for further consultation with external stakeholders and return to the Committee at its next meeting in June 2018.

The proposed policy applies to specific types of new developments and redevelopments within the "Rail Proximity Envelope" for safety and noise established by the City, including high density residential and commercial uses, and particular sensitive uses. The policy excludes development solely adjacent to spur lines, or Light Rail Transit.

The Safety Envelope is generally 30 m deep and 7 m high, measured horizontally and vertically from the freight rail corridor property line, respectively. The Noise Envelope is generally 30 m deep and 64 m high, measured horizontally and vertically from the freight rail corridor property line, respectively.

As part of developing this proposed policy, the City completed a Baseline Risk Assessment, which included consultation with experts, analysis employing a nationally used risk standard, and comparison of other risk tolerance levels. Through this assessment, the City established risk tolerance levels for the annual probability of train derailment leading to fatality, based on:

- Rail operations;
- Building uses;
- Building dimensions;
- Number of occupants;
- Duration of exposure;
- Ease of evacuation; and,
- Occupants' abilities to self-evacuate.

This included the determination of Maximum Building Widths and Maximum Use Widths for every individual parcel along the city's rail corridors.

Under the proposed policy, a development/re-development applicant would identify the following using mapping available through the City's website:

- Proposed land use;
- Annual probability of a potential train derailment leading to a fatality; and,
- Maximum Building Width and Maximum Use Width.

Depending on the characteristics identified and the development/re-development proposed, additional studies may be required, including:

- Site-Specific Risk Assessment;
- Train Impact Structural Review; and,
- Noise Study.

Each of these studies, if required, would need to be developed in accordance with the scope identified by the City and prepared by an appropriate Professional Engineer retained by the applicant.

Site-Specific Risk Assessments include quantitative and qualitative assessments of the risks and hazards, and proposed mitigation measures. Train Impact Structural Reviews include the evaluation of the effect of a direct impact from a train on the building, and whether the building would experience a progressive collapse. Noise Studies evaluate impact of noise from rail operations on development, and proposed mitigation measures.

Mitigation measures identified for a proposed development/re-development are dependent on the findings of the required studies, accounting for safety, noise, and an access strategy in the event of emergency. Advisory statements, noting vibration, chemical release, and firefighter access to rail corridor and water be considered, are also included in the proposed policy. All proposed developments/re-developments adjacent to the rail corridor are required to provide a fence or similar barrier along the property line parallel to the rail corridor to prevent trespassing, with a minimum height of 1.83 m.

The requirements of the proposed policy are summarized in Appendix H.

5.2.3 Ottawa

The City of Ottawa has created a draft amendment to their Official Plan with the intention to bring it into conformity with the 2014 Provincial Policy Statement. Ottawa's current Zoning By-law includes 30 m setback requirements for residential use buildings, daycares and schools in rural zones. Ottawa is aiming to give jurisdiction in the Zoning By-law to regulate setbacks for new developments in proximity to active and potential future railway corridors (which may include abandoned rail lines acquired by the city for future rail and light rail operations) in both rural and urban zones, for expanded land uses. The draft amendment includes reference to the FCM-RAC Guidelines. The recommendations in the draft amendment are to:

- Require proponents proposing to construct new developments within 300 m of rail corridor or potential rail corridor to:
  - Consult owner(s) and operator(s) of appropriate line(s);
  - Ensure development includes appropriate setbacks and mitigation measures (berm, deflection barrier, fence, or similar physical measure); and,
  - Place notice on property title of presence or future presence of adjacent railway corridor for future purchasers.
- Include a provision that the Zoning By-law may be amended to require minimum setbacks between new buildings or land uses and existing or potential rail corridors, as identified in the Official Plan;

- The (potential) minimum setback requirement in the Zoning By-law may only be reduced if the proponent is able to provide an alternative which maintains the same level of protection. This would be assessed through consultation by the City with the rail owner/operator. Information required from proponent may include, but is not limited to:
  - Existing land uses that will limit the future use of rail corridor;
  - Proposed setback from adjacent rail corridor;
  - Information on the alternative mitigation measure; and
  - Other information limiting the future use of rail corridor;
- Remove references to abandoned rail lines that are not currently designated for future operation in the Official Plan.

5.2.4 Mississauga

City of Mississauga's council adopted a by-law amendment to its Official Plan in December 2016 to account for the recommendations provided by the FCM-RAC Guidelines and the Ministry of the Environment, Conservation and Parks' (MECP) "Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning (NPC-300)" (NPC-300).

The amendment included:

- Potential requirement of noise impact study for residential and other noise-sensitive land uses proposed in proximity to rail lines, with a requirement (as per NPC-300) to achieve sound levels below 55 dBA for outdoor living areas, or below 60 dBA with the requirement to include a warning clause to prospective purchasers.
- Requirement of a noise and/or vibration study for sensitive land uses and other noise and vibration sensitive development (development that includes sleeping quarters, reading rooms and offices) proposed in proximity to rail lines, with appropriate mitigation measures identified to meet NPC-300 requirements. The proximities prescribed to trigger such study follow those provided in the FCM-RAC Guidelines (as per Exhibit 5-4 for noise, and within 75 m of rail lines and yards for vibration).
- Requirement that development applications for dwellings (including significant additions) and places of public assembly incorporate appropriate setbacks and safety barriers, as per industry best practices and the requirements of the relevant railway(s), to the satisfaction of the City of Mississauga.

- Potential requirement for security fencing to prevent trespassing on rail corridors.
- Overarching direction for proposed development to respect rail corridors and operations through design and implementation of mitigation measures as needed.
- Addition of noise impact studies to the list of studies that may be required for official plan amendments, rezoning, draft plan of subdivision or condominium, or consent application.
- Several references to NPC-300 including its new noise classification (Class 4) for stationary sources.

5.3 City of Toronto Current Practices and Policies

Currently, where development proposals that are in proximity to rail are received, City Planning staff refer to the FCM-RAC Guidelines plus input from the associated railway owner and/or operator to identify setback, safety barrier and security barrier requirements.

Development applications may also require specific supporting studies to accompany their application, as outlined in the Development Guide[28]. The City of Toronto has development review processes and requirements for planning approvals from the City. Official Plan Schedule 3 Application Requirements identifies the required documents for Official Plan and Zoning By-Law amendments, plans of subdivision, plans of condominium, consents to sever and site plan control approvals, including supporting studies for noise, vibration and stormwater management.

The following is a summary of existing policies and requirements.

5.3.1 Setback, Safety Barrier and Security Barrier Requirements

City of Toronto Planning staff generally use the FCM-RAC standards as a starting point for setback, safety barrier and security barrier requirements. In certain scenarios, the City of Toronto has previously allowed developers to account for the vertical grade difference to reduce the required setback. This has been allowed provided the total combination of the vertical with the horizontal setback equals 30 metres and is supported by a peer reviewed safety study.

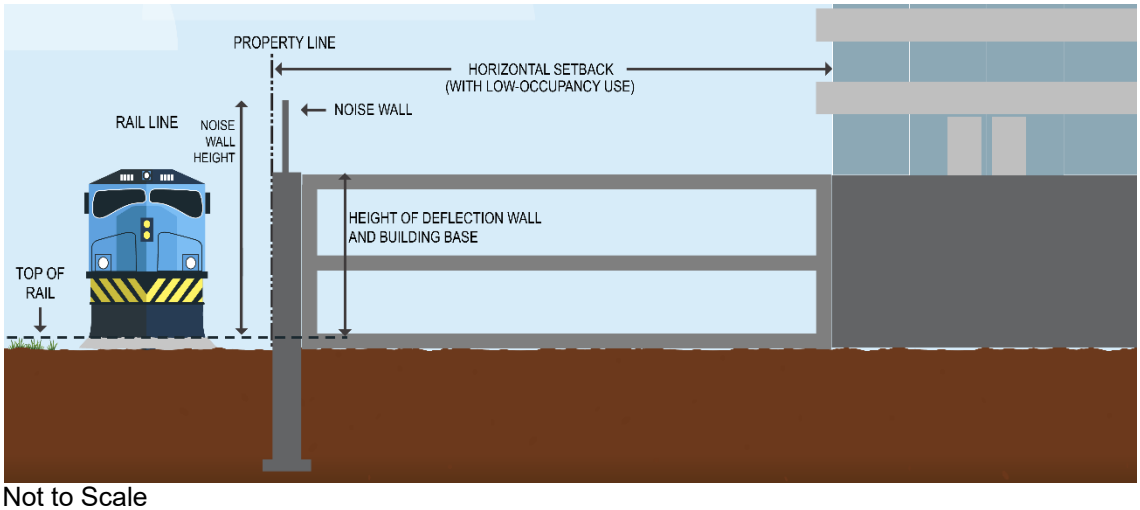
[28] https://www.toronto.ca/city-government/planning-development/application-forms-fees/building-toronto-together-a-development-guide/

The use of the reduced setback along with vertical grade difference has also been widely used around the western side of the USRC (Type D), where much of the rail corridor is at an elevation below the surrounding lands.

In certain instances development applicants have demonstrated that the existing site and/or built form context made the application of the FCM-RAC Guidelines standard earthen berm unrealistic. As such the City (in consultation with the relevant rail operators) has previously accepted alternative measures such as the use of a deflection wall combined with the base of a building as illustrated in Exhibit 5-10, where uses within that base are low-occupancy (typically parking).

It should be noted that in these and other instances, where alternative measures have been proposed, the City has required the submission of rail risk mitigation and safety studies that were then peer reviewed at the applicant's expense. The City's main objective in these instances was to ensure the proposed alternative measures were designed to the highest industry standards possible and offered the equivalent or higher levels of safety as the FCM/RAC recommended standards.

Exhibit 5-10: Alternative Mitigation Example - Deflection Wall Combined with Building Base Containing Low-Occupancy Use



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5.3.2 Noise, Vibration and Odour

Section 3.4, Policy 21 of the City of Toronto's Official Plan identifies the requirement for major facilities including rail infrastructure and sensitive lands uses to be "appropriately designed, buffered and/or separated from each other to prevent adverse effects from noise, vibration, odour and other contaminants, and to promote safety."[29] To ensure this is upheld, the City may require

[29] Official Plan, The City of Toronto, https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/official-plan/, accessed October 18, 2018.

proponents submitting development applications for sites adjacent to rail infrastructure to prepare studies as part of the application in accordance with established guidelines. The proponent would also be responsible for the implementation of any mitigation measures identified by such studies. As per Schedule 3 of the Official Plan, and depending on the nature of the development and its proximity to noise and vibration causing sources, Noise Impact and Vibration Studies may be required for Zoning By-Law, Plan of Subdivision, Consent to Sever, and Site Plan Control applications.

Established guidelines for noise include but are not limited to City of Toronto Development Guidelines, City of Toronto Noise By-Law (Chapter 591 of the Toronto Municipal Code) and MECP Environmental Noise Guidelines. Established guidelines for vibration include but are not limited to City of Toronto Development Guidelines, and standards recommended by CN and CP.

5.3.3 Stormwater Management

The City's Wet Weather Flow Management Guidelines identify specific requirements for developments, generally aimed at maintaining or improving on pre-development hydrological conditions. The policy identifies three key (interim) wet weather flow management goals: maintaining a water balance for annual runoff volumes, meeting water quality objectives and guidelines, and maintaining or reducing water quantities for peak flows. As per Schedule 3 of the Official Plan, Servicing and Stormwater Management Reports are required for Zoning By-Law, Plan of Subdivision, Plan of Condominium, Consent to Sever, and Site Plan Control applications.

5.3.4 Warning Clauses

The City has existing legal mechanisms (i.e. Site Plan agreements) for the requirement of warning clauses in documentation for stakeholders, and all parties interested in selling, purchasing, or leasing residential lands in proximity to rail corridors.

6 Recommendations for Toronto

Based on the analysis of industry best practices, guidelines, comments from stakeholders and the public and the observed practices of other jurisdictions in Canada, the following recommendations are provided for the City of Toronto's consideration. These recommendations are intended to be incorporated within the City of Toronto's existing development review and land use policy framework and would be applied when assessing, considering or reviewing development proposals that are proximity to rail operations.

It is also recommended that the City consider preparing a brochure or handbook providing information and guidelines for development in proximity to rail operations. A Preliminary draft of this handbook is provided in Appendix G. It is also recommended that the Rail Typologies identified in Phase 1 of this study and described in Section 6.1 below be made accessible to the public through the City's website and the City's Interactive Toronto Map (See: http://map.toronto.ca/maps/map.jsp?app=TorontoMaps_v2).

It is acknowledged that the City will maintain ongoing consultation with rail operators and stakeholders on the additional steps recommended for development applications within the Review Influence Areas.

6.1 Rail Typologies

Five Rail Types are recommended within the city limits:

- Type A: Through Freight
- Type B: Passenger
- Type C: Spurs
- Type D: Union Station Rail Corridor (USRC)
- Type E: Yards

Exhibit 6-1 maps the recommended rail typologies in Toronto.

Exhibit 6-1: Map of Recommended Rail Typologies

6.2 Recommended Amendments to the Official Plan

6.2.1 City of Toronto Official Plan Policy 4 of Section 2.2:

Minor deletion (~~strikethrough~~) and one addition (**bold**) are proposed as follows:

Require new development on lands adjacent to existing or planned transportation corridors and facilities to **follow rail safety and risk mitigation best practices to ensure new developments are** ~~be~~ compatible with, and supportive of, the long term purposes of the corridors and facilities and be designed to avoid, mitigate or minimize negative impacts on and from the transportation corridors and facilities.

6.2.2 City of Toronto Official Plan Policy 21 of Section 3.4:

One deletion (~~strikethrough~~) and two additions (**bold**) are proposed as follows:

Major facilities such as airports, transportation/rail infrastructure, corridors and yards, waste management facilities and industries, and sensitive land uses **and/or high occupancy uses** such as residences**, offices**, and educational and health facilities will be appropriately designed, buffered and/or separated from each other to prevent adverse effects from noise, vibration, odour and other contaminants, and to promote safety. To assist in identifying impacts and mitigative measures, the proponent may be required to prepare studies in accordance with guidelines established for this purpose. The proponent will be responsible for implementing any required mitigative measures.

Consider the addition of a sidebar in Section 3.4 of the Official Plan that defines High and Low Occupancy as follows:

'High Occupancy Uses include uses in which a high density of people live, work, sleep, shop or conduct other activities throughout the day. Examples include, but are not necessarily limited to: buildings with multiple residential units, office buildings, major retail centres, community centres, schools, day care centres, educational and health facilities and hotels.

Low Occupancy Uses are those non-sensitive, low intensity land uses that do not require a high density of people to gather throughout the day. Examples include, but are not necessarily limited to: parking lots/garages, loading/unloading/garbage pick-up and other service areas, storage facilities, certain manufacturing uses with low employment densities, non-hazardous utility uses, small scale and/or ancillary retail and passive recreational uses.'

6.2.3 City of Toronto Official Plan Schedule 3:

The addition of an application requirement to the table in Schedule 3 for all listed application types is recommended, as follows:

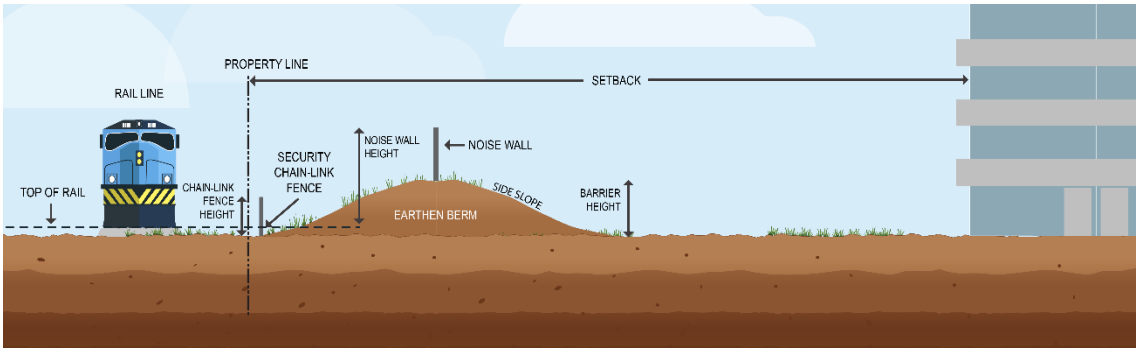
> **Rail safety and Risk Assessment** – if the proposed development is within the review influence area of a Rail Type.

The recommended assessment would require development applicants whose sites fall within a rail Review Influence Area to submit a study that identifies any potential rail related risks and the proposed mitigation measures. As such it is also recommended that City Planning staff prepare a Terms of Reference for such studies.

6.3 Recommended Standard Mitigation Measures

As a standard mitigation measure, it is recommended that the City continue to follow rail safety and risk mitigation best practices as identified by the FCM-RAC Guidelines. Exhibit 6-2 presents the configuration of the standard mitigation measures.

Exhibit 6-2: Recommended Standard Mitigation Measures



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This section focuses on permanent impacts and mitigation measures; however, developers and contractors should also take into account potential temporary safety and drainage issues that could occur during construction. Appropriate design and mitigation measures to address these temporary issues should be included in their submission to the City.

6.3.1 Standard Mitigation - Building Setback

The standard building setbacks recommended for Toronto are summarized in Exhibit 6-3. Setbacks are measured horizontally from the mutual property line with the rail operations and the closest face of the proposed building.

Exhibit 6-3: Recommended Setbacks for New Developments in Toronto

Type	Setback* (m)
A: Through Freight	30
B: Passenger	30
C: Spurs	15
D: Union Station Rail Corridor (USRC)	30
E: Yards	300

*Measured from mutual property line to nearest face of building

The City may consider low-occupancy uses within the setback, however such uses are not substitutes for safety barriers. Low-occupancy/ancillary uses could include:

- Parking;
- Mechanical rooms;
- Storage; and
- Access laneways.

Low-occupancy uses within the setback should be engineered as independent structures.

6.3.2 Standard Mitigation - Earthen Berm

The standard recommended safety barrier is an earthen berm, with a minimum 2.5:1 horizontal to vertical ratio. Minimum berm heights are summarized by Rail Type in Exhibit 6-4. Heights of safety barriers such as berms should be measured from the greater elevation of grade at mutual property line or highest top of track elevation.

The safety barrier should be:

- Constructed parallel to the rail corridor, with the foot of the barrier outside of the rail property.

Berms should:

- Include returns at the ends; and,
- Be made of earthen materials compacted to 95% modified proctor.

Design drawings for the safety barrier should be submitted for review as part of the development application. Safety barriers should be continuous with barriers on adjacent properties, where appropriate.

Exhibit 6-4: Recommended Earthen Berm Heights for New Developments in Toronto

Type	Height* (m)
A: Through Freight	2.5
B: Passenger	2.5
C: Spurs	No requirement
D: Union Station Rail Corridor (USRC)	2.5
E: Yards	No Requirement

*Height of safety barrier to be measured from greater elevation of grade at mutual property line or top of highest rail track

6.3.3 Standard Mitigation - Security Barriers

A minimum 1.83 m high chain-link fence, or approved equivalent along the mutual property line with the rail corridor is recommended to be required for all Rail Types.

6.3.4 Noise and Vibration Mitigation

On average, the minimum height of a typical noise barrier is approximately 5.5 metres. However, exact specifications and the design for any required noise and vibration mitigation measures will be established through required studies and assessments.

6.4 Alternative Mitigation Measures

It is recommended that where the applicant has demonstrated the use of the recommended standard mitigation measures are not technically or practically feasible, alternative measures can be proposed. Examples of some potential alternative measures are discussed below. If alternative measures are proposed it is recommended that the applicant submit a Rail Safety and Risk Assessment study prepared by a qualified expert that should demonstrate that the proposed alternative measures are as safe and offer the same or greater level of risk mitigation as the standard mitigation measures. The submitted report should be peer reviewed by an expert third party, at the applicant's expense.

6.4.1 Alternative Setback - Combination of Horizontal and Vertical

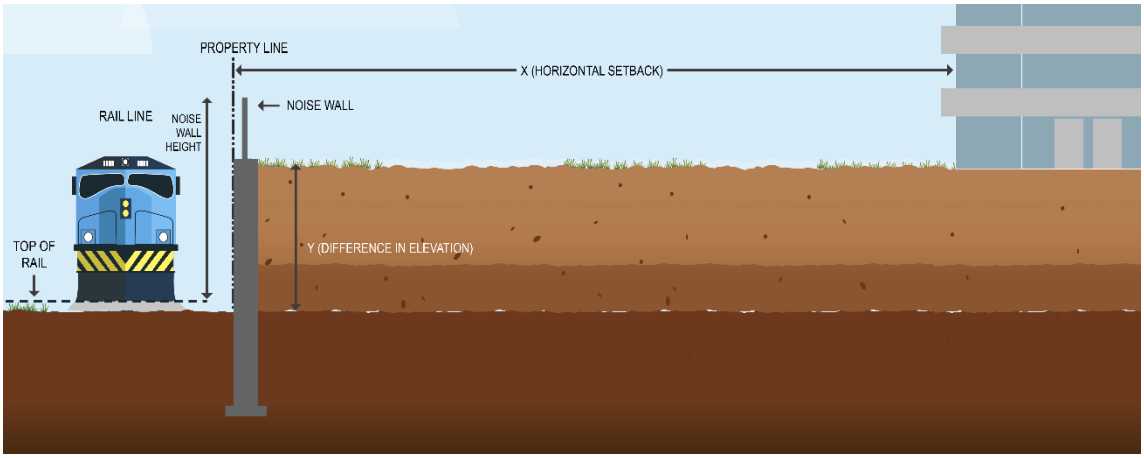
Where it has been demonstrated by the applicant that the standard building setback cannot be applied an alternative approach/measure that uses a combination of vertical and horizontal setbacks may be considered. For example, adjacent to Type A, B and D the minimum horizontal setback may be reduced to 20 m, provided the vertical difference in elevation is 10 m or greater with the building higher in elevation. Conversely, the vertical difference must be greater than 2.5 m (in which case the horizontal difference would need to be 27.5 m or greater).

The horizontal distance should be measured from the mutual property line with the rail operations and the closest face of the proposed building.

The vertical distance should be measured from the grade at the face of the proposed building to the higher of either the grade at the mutual property line, or the highest top of track elevation.

Exhibit 6-5 illustrates a typical configuration using the combined horizontal (X) and vertical (Y) setback.

Exhibit 6-5: Example of Typical Combined Horizontal and Vertical Setback



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6.4.2 Alternative Safety Barrier

Where the applicant has demonstrated that the current built-form context of land and/or the relevant Rail Type may limit the feasibility of the application of the standard earthen berm, alternative safety barriers presented in the FCM-RAC Guidelines may be considered, including:

- Crash ditch or valley;
- Deflection Wall (or Crash Wall);
- Deflection Berm (or Crash Berm); or,
- Deflection Wall combined with building base containing low-occupancy use.

Typical configurations for the above noted alternative measures are illustrated in Exhibit 6-6 through Exhibit 6-9.

Exhibit 6-6: Typical Crash Ditch/Valley

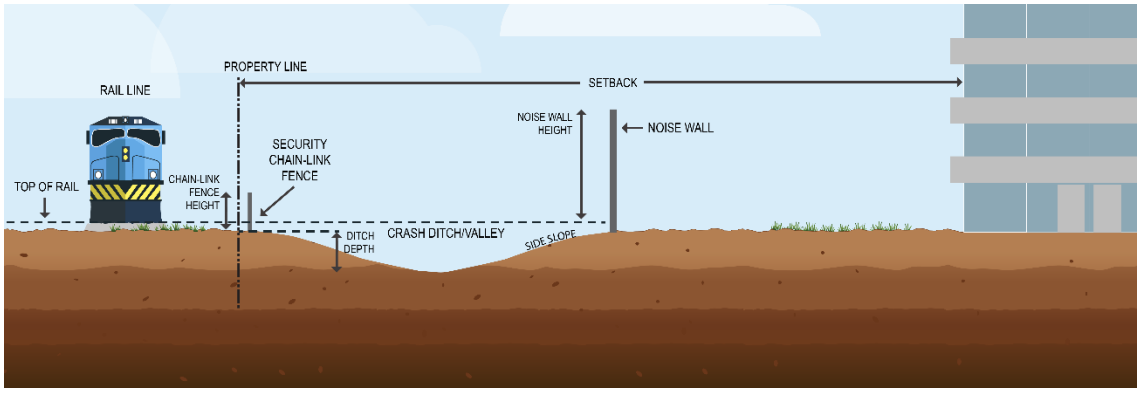

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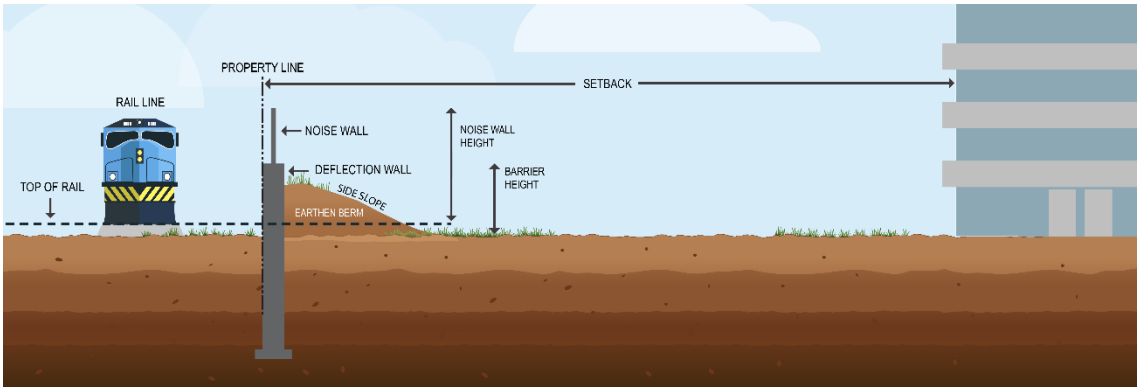
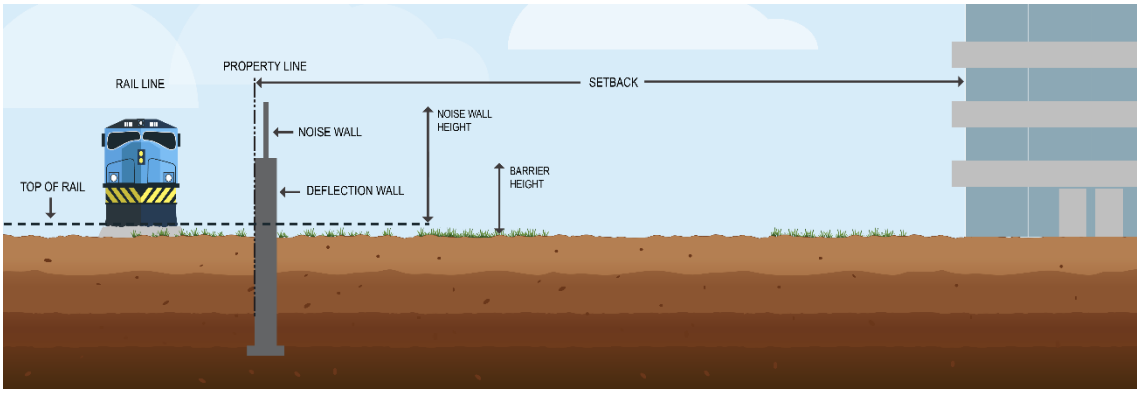
Exhibit 6-7: Typical Deflection Berm



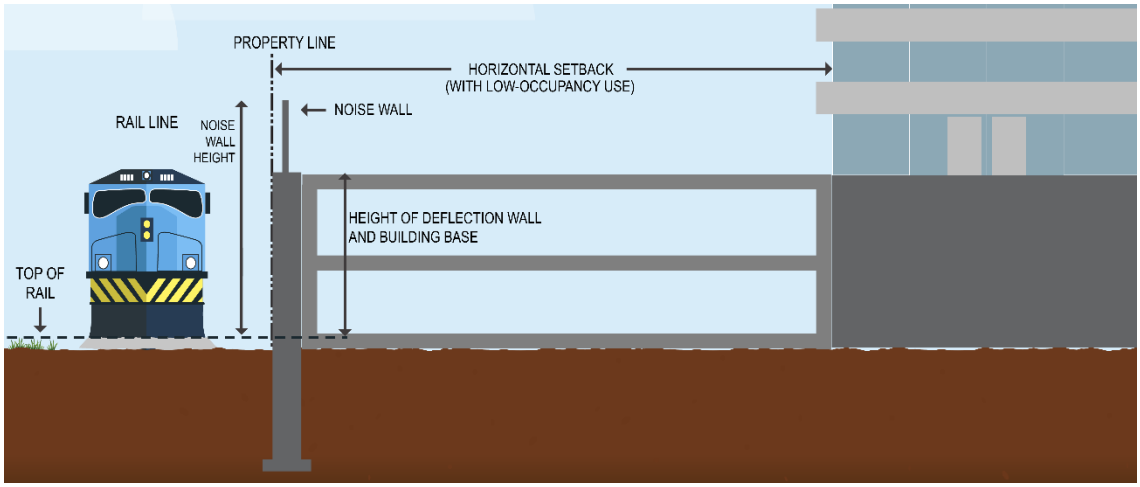
Not to scale

Exhibit 6-8: Typical Deflection Wall



Not to scale

Exhibit 6-9: Deflection Wall Combined with Building Base Containing Low-Occupancy Use



Not to Scale

Applicants proposing any of the above or other alternative safety barrier measures should be required to submit a Rail Safety and Risk Assessment study that includes design drawings.

All alternative safety barriers should be designed to the highest industry standards and ensure a level of safety that is equal to, or exceeds the safety levels provided by the standard earthen berm and, at a minimum, include the following within the required study:

- Identification of all potential hazards to the operational railway, its staff, customers, and the future residents of the development;
- Identification of operational requirements of the railway facilities and the whole life cycle of the development;
- Identification of design and construction issues that may impact on the feasibility of the new development;
- Identification of the potential risks and necessary safety controls and design measures required to reduce the risks to the safety and operational integrity of the railway corridor and avoid long-term disruptions to railway operations that would arise from a defect or failure of structure elements; and,
- Identification of how an incident could be managed if it were to occur.

6.4.3 Other Factors to Consider

Some other factors that may need to be considered and addressed in a Rail Safety and Risk Assessment study include, but are not necessarily limited to the following:

Elevated Rail Corridor

For developments where the adjacent rail corridor is elevated above the mutual property line and development lands, berms, deflection walls and deflection berms can be used, but will still be required to meet the height requirements, relative to the highest top of track elevation. Additional consideration will need to be given to providing appropriate structural support, particularly where there is a substantial difference in grade. Where a ditch or valley is proposed, additional consideration will need to be given to the dimensions required to contain a train in the event of derailment.

At-Grade Rail Crossings

At-grade rail crossings within the vicinity of the proposed development should be identified as part of the development application. The impact of the new development on pedestrian, cycling and vehicle volumes at such crossings

should be identified and assessed, with mitigation measures provided as needed and submitted for review as part of the application.

Emergency Response

Emergency response to the proposed development as well as the adjacent rail corridor should be considered in the development's design. One or more access points for emergency response should be included, depending on the size and location of the property. Access to water supply for firefighting along the rail corridor should be considered. City Planning staff may circulate the submitted safety report to the City's Office of Emergency Management for comment on these matters.

Security Barriers and Trespassing

The potential for trespassing on or across rail corridors due to existing and proposed land uses and pedestrian desire lines should be assessed to provide appropriate pedestrian infrastructure.

A more robust security barrier may be appropriate if the existing trespassing issues are identified by the railway to further prevent trespassing, such as a solid wood fence. Security barriers may be combined with noise barriers, subject to the required studies and assessments.

Noise, Vibration, and Odours

The impact of noise and noise reverberation on sensitive receptors (potentially including the proposed development), vibration, odours and fumes should also be considered when reviewing a proposed development.

6.5 Recommended Development Review Process for Applications in Proximity to Rail Operations

The following section generally describes and recommends modifications to the City of Toronto's existing development review process that would apply should an application be received for development on lands that are in proximity to rail infrastructure. This modified process is graphically illustrated in Exhibit 6-11 below. It should be noted that the steps highlighted in this section are in addition to, and intended to be incorporated within the City's existing development application review structure.

6.5.1 Pre-Application Stage

If a proposed development requires an Official Plan amendment, Zoning By-law amendment, Plan of Subdivision, Consent to Sever or Site Plan Control Application (Minor Variance if the proposal includes a change to a High Occupancy Use), the developer should first check via the City's interactive

mapping system if the subject site is in proximity to rail infrastructure, the Rail Type for the infrastructure, and if the site falls within the Review Influence Area for that particular Rail Type, as shown in Exhibit 6-10 below.

Exhibit 6-10: Recommended Review Influence Areas

Type	Review Influence Area* (m)	Noise Influence Area* (m)	Vibration Influence Area*(m)
A: Through Freight	300	300	75
B: Passenger	300	300	75
C: Spurs	75	75	75
D: Union Station Rail Corridor	300	300	75
E: Yards	1000	1000	75

*Measured from mutual property line to face of building

If the subject site falls within the influence areas shown above, additional studies and assessments may be required. The developer should then follow the standard practice of contacting City Planning for a pre-application consultation. City Planning staff should identify any potential rail related study requirements as part of a complete application, along with any other requirements as appropriate, and provide the Terms of Reference for the required studies. This will be in addition to any other studies and materials required by the City in support of the application.

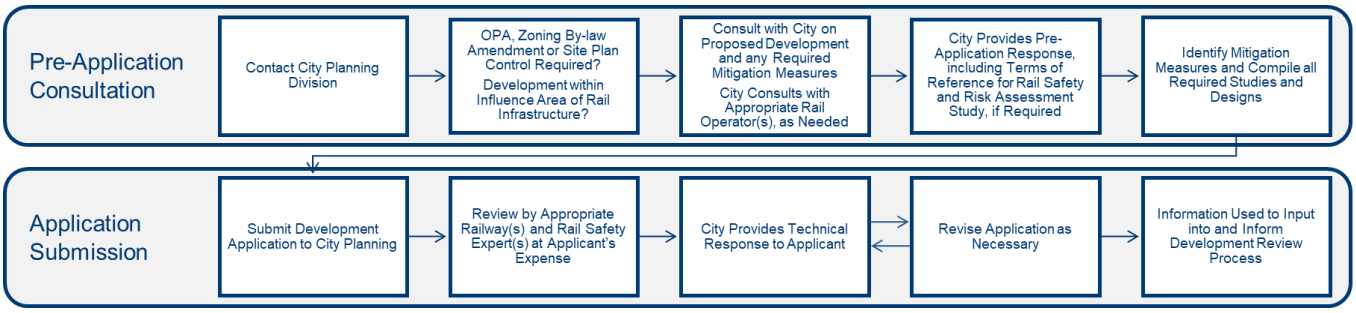
6.5.2 Application Submission/Review Stage

A Development Application submitted to City Planning should include all materials identified during the pre-application consultation. Rail related materials will, as per the City's standard practices, be circulated to the relevant rail operator(s) for review and comment. The submitted Rail Safety and Risk Assessment study will also be circulated by City Planning staff to the City's peer reviewer.

Additional consultation with the City, railway(s), local community and councillors may be required during the Development Review Process.

Exhibit 6-11 provides an overview of the additional steps required in the Development Application process for developments in proximity to rail operations. This table is also included as part of the recommended handbook, provided in Appendix G.

Exhibit 6-11: Recommended Steps for Modified Development Application Review Process



6.6 Applicability

The recommended steps outlined in Section 6.5 would apply to developments as defined under the Ontario 2014 Provincial Policy Statement (see Section 1.2.2) that meet all of the following requirements:

- High-occupancy uses;
- Within the Review Influence Areas (see Section 6.5.1); and,
- Required for:
  - Official Plan Amendment;
  - Zoning By-law amendment;
  - Plan of Subdivision;
  - Consent to Sever; or,
  - Site Plan Control application.

In the context of the City's Zoning By-law 569-2013, the uses under the following zone categories constitute high-occupancy residential and commercial uses, or sensitive uses:

- Residential;
- Residential Apartment;
- Commercial;
- Commercial Residential;
- Commercial Residential Employment; and,
- Institutional.

6.7 Recommended Study Requirements

Under the City's Official Plan Section 2.2.4 Policy 5 (as amended by OPA 231), Section 3.4 Policy 21, and Schedule 3, supporting studies may be required for a development application. Additional requirements for the following studies are recommended to be added to the terms of reference for development applications in proximity to rail:

- Noise Impact Assessment;
- Servicing and Stormwater Management Report;
- Vibration Study; and,
- Compatibility/Mitigation Study.

Proposed developments within the influence area may require appropriate mitigation measures and additional studies, as discussed in Section 6.5.1.

6.7.1 Noise Impact Assessment

The Noise Impact Assessment (currently subject to peer review) should conform to:

- The City's existing guidelines and any applicable by-laws;
- The FCM-RAC Guidelines;
- Requirements identified by relevant railway(s);
- The MECP Environmental Noise Guidelines; and,
- Any other applicable municipal and provincial legislation.

Considerations include but are not limited to:

- Noise levels generated by existing and foreseeable rail operations, accounting for:
  - Building setback;
  - Building materials;
  - Path of noise;
  - Topography; and,
  - Noise reflection and diffraction.
- Impact of reverberation off of buildings to surrounding sensitive receptors.

The study should identify:

- If noise attenuation is needed; and,
- If so, recommend appropriate mitigation measures.

Proponents should also consult the Canadian Transportation Agency's Railway Noise Measurement and Reporting Methodology (2011) for guidance on the recommended content and format of a noise impact study.

6.7.2 Servicing and Stormwater Management Report

The Servicing and Stormwater Management Report should conform to:

- The City of Toronto's Wet Weather Flow Management Guidelines; and,
- Any other requirements identified by the City of Toronto and the Toronto Region Conservation Authority.

The Servicing and Stormwater Management Report should ensure and/or recommend that:

- There are no adverse impacts on the rail corridor and operations;
- There are no discharges or additional flows directed to the rail corridors;
- Buildings are generally designed to avoid overflow of gutters and balconies into the rail corridor;
- Relevant railway(s) are consulted on any potential changes to drainage patterns that could impact their corridors and yards; and,
- Stormwater flows are design to maintain structural integrity, avoid scour and deposition, and prevent obstruction from stormwater or related debris of rail corridors.

6.7.3 Vibration Study

The Vibration Study should conform to:

- The City's guidelines (e.g. Development Guidelines);
- The FCM-RAC Guidelines; and,
- Any other applicable municipal and provincial legislation.

Considerations include but are not limited to:

- The vibration generated by existing and foreseeable rail operations, accounting for:

- Operational and vehicle factors: speed, suspension, flat or worn wheels;
- Rail factors: type, condition, support system;
- Geology: soil, subsurface conditions (particularly stiffness and internal damping of the soil, and depth of bedrock); and,
- Receiving building: vibration energy that reaches building foundations, coupling of building foundation to soil, propagation of vibration through building.

The study should identify:

- If vibration attenuation is needed; and,
- If so, recommend appropriate mitigation measures.

6.7.4 Compatibility/Mitigation Studies

Revised policies and requirements for compatibility and mitigation studies were recently adopted by Toronto Council and brought into force by the Local Planning Appeal Tribunal as a partial settlement to the ongoing appeal of OPA 231, which enacted the results of the City's Municipal Comprehensive Review of employment lands, policies and designations. Policy 5 of Section 2.4 requires that sensitive uses that are proposed within the influence area of 'major facilities' should be planned to ensure they are appropriately designed, buffered and/or separated as appropriate. Under the 2014 PPS, rail facilities are considered 'major facilities' and would include corridors, spurs and yards.

Considerations in accordance with this Official Plan policy would include:

- Preventing or mitigating adverse effects from noise vibration, and emissions including dust and odour;
- Minimizing risk to public health and safety and;
- Ensuring compliance with any environmental approvals, registration, guidelines and legislation.

In addition to emissions noted above another consideration could include air quality, particularly for those developments proposed within the influence area of rail yards.

6.7.5 Professional Requirements

All reports and detailed design drawings used in support of an application for a proposed development should be prepared, stamped and signed by qualified and licenced Professional Engineers. All mitigation measures should be designed to the highest possible urban standards.

6.8 Urban Design Guidelines and Comprehensive Zoning Requirements

It is recommended that the City consider the inclusion of specific guidelines and/or specific zoning requirements for developments near rail operations in its urban design guidelines, accounting for safety barrier design, podium design, setbacks, step backs, balcony design (e.g. recessed vs protruding), landscape design, and materials.

6.9 Update Protocol

The recommendations provided take into account known and anticipated future plans for rail operations and infrastructure in Toronto at the time of writing. However, future plans may change, with implications on adjacent developments. Mapping completed for this study which identifies the typologies assigned to rail corridors may also change.

Over the course of implementing policy based on the recommendations from this report, and development of new industry practices, the City of Toronto may also identify improvements that could be made to these recommendations and the development review process.

Given the potential for change and improvement, the Rail Type mapping, and the recommendations contained in this report should be reviewed and updated every five years, or sooner if a notable change to rail operations or industry standards for standard mitigation measures occurs.

6.10 Areas for Potential Further Study

During the course of this study, additional related matters were identified that are recommended for future study:

- **Light Pollution and Odour Impacts**: Developments in proximity to rail may be subject to variations in light pollution and odours, based on changes to operations. A review of potential enhancements to the requirements for the study of light pollution and odour impacts from rail on new developments should be considered, with the potential to identify more standardized mitigations;
- **TTC Subway Lines**: There are portions of the TTC subway network that are exposed/above ground which may carry similar planning concerns to those identified for rail. A review of TTC and City policy for subway lines and surrounding lands should be considered for review;

- **Pedestrian Safety**: A review of pedestrian safety (including people of all abilities) around surface rail crossings, and potential areas where requirements could be enhanced should be considered. The potential for trespassing of the rail corridor and including an adequate security barrier should also be reviewed;
- **Changes to Rail Operations**: A review of the impacts of major changes to rail operations on the existing neighbourhoods that they pass through should be considered, with the potential to develop appropriate tools to address the impacts; and,
- **Noise and Vibration Limits**: A review of the impacts of noise and vibration on humans and the standards used in other jurisdictions to address these impacts should be considered, with the aim to identify a specific limit(s) for new developments in the city.

7 Summary and Conclusions

The purpose of this report is to provide the City with credible and defensible recommendations specific to Toronto that staff can rely on as they respond to development applications for lands in proximity to rail operations. A comprehensive literature/best practices review was completed for this study, which included:

- Growth Plan for the Greater Golden Horseshoe (2017);
- Provincial Policy Statement" (2014);
- FCM-RAC 's "Guidelines for New Development in Proximity to Railway Operations" (2013);
- Metrolinx's "Adjacent Development Guidelines" (2013);
- City of Toronto Official Plan and Zoning By-laws;
- Transport Canada's *Railway Safety Act* Review "Enhancing Rail Safety in Canada: Working Together for Safer Communities" (2018);
- "North Toronto Subdivision Rail Corridor Risk Assessment and Management Study" (2014); and,
- Policy from other Canadian jurisdictions including:
  - Montreal;
  - Calgary;
  - Ottawa; and,
  - Mississauga.

This study also included consultation with City of Toronto staff and councillors, railway owners and operators, the FCM-RAC, industry and public stakeholders, and the general public.

Through this review and consultation, five types of rail were identified within the Toronto and assigned Review Influence Areas:

- Type A: Through Freight – 300 m
- Type B: Passenger – 300 m
- Type C: Spurs – 75 m
- Type D: Union Station Rail Corridor (USRC) – 300 m

- Type E: Yards – 1000 m

Amendments to the City's Official Plan have been recommended that include:

- minor text modifications to existing policies in Sections 2.4 and 3.4 to specifically include consideration of risk and safety issues related to development that is in proximity to rail infrastructure;
- Amendment to Schedule 3 of the Official Plan to add the requirement for Rail Risk Mitigation and Safety Studies as part of a Complete Application for Official Plan, Zoning, Site Plan Applications, Plans of Subdivision and Consents for development proposed in proximity to rail infrastructure; and
- Addition of a sidebar to Section 3.4 defining 'High' and 'Low' Occupancy Uses.

Based on an assessment of existing policies, guidelines and best practices, this study recommends that the FCM/RAC Guidelines standard mitigation measures as the base standard for the City of Toronto. However, in cases where a development applicant has demonstrated that the standard mitigation measures are not technically or practically feasible, alternative measures can be proposed. Alternative measures must meet or exceed the standard mitigation measures in terms of risk reduction and safety, and meet the requirements established by the City through consultation with the relevant railway(s) and other experts in this field (if needed). It is recommended that the City continue its current practice of requiring third party peer reviews of any submitted alternative measures within Rail Safety and Risk Assessment studies.

This study also recommends integrating consideration of rail proximity into the City's current development review practices. These recommendations should also be set out in a handbook in order to help provide guidance to develop applicants, the general public and City Planning staff in the assessment and review of development applications proposed in proximity to rail infrastructure.