Goods Movement Discussion Paper

Brampton Mobility Plan

August 29, 2023

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1 Introduction

The City of Brampton is a major centre for freight transportation in Southern Ontario thanks to its proximity to the Greater Toronto Area (GTA) population and commerce centres and the US border, abundance of commercial land, proximity to major freight transportation nodes such as Pearson International Airport and CN and CP's intermodal rail yards, and a road network that supports efficient truck transportation. The city has over 12,000 businesses that are classified as "transportation and warehousing".

Brampton is part of the Region of Peel, which has been conducting proactive, industry leading goods movement planning for nearly two decades[1]. This has been spearheaded by the Peel Goods Movement Task Force, with the latest plans including the 2017-2021 Goods Movement Strategic Plan and 2019 Goods Movement Long Term Plan.

Given the significant effort that has been put into goods movement planning in Peel, and the fact that the primary goods movement routes and key nodes in the region are owned and operated by others (Province, Peel Region, railways, airport, private companies, etc.), this discussion paper is focused on identifying areas where City of Brampton can work to improve goods movement and livability in ways that compliment the work of the other stakeholders and network operators, including the province, region, railways, airport authority, trucking firms, etc.

Two areas that are explored include mitigating the impact of goods movement on community livability and reducing the impact of higher order transit such as BRT on truck operations. While goods movement is an essential function that serves business and residents, it also can have a range of negative impacts in urban areas including noise, pollution, safety, etc. Understanding the extent of these impacts, the community's perceptions of these impacts, and what mitigation measures are available, are the first steps in identifying improvements that maintain good movement flows while reducing its impacts.

The city is advocating for the addition of Bus Rapid Transit (BRT) on streets that are currently part of the Region's Strategic Goods Movement Network (SGMN), including on Steeles Avenue East and Queen Street East. While reallocating highway capacity from vehicular movement to transit would improve the people-moving capacity and throughput of the corridors, they would likely reduce vehicular and truck capacities. Opportunities to mitigate the impact of projects like these on truck travel times and reliability are reviewed, such as truck priority measures.

This discussion paper also provides a high-level review of the existing multi-modal goods movement network and conditions in Brampton, explores what other municipalities around the world are doing to improve goods movement and address similar issues, and looks at future trend and technologies that the City can begin to plan for and harness to improve goods movement and livability.

[1] https://www.peelregion.ca/transportation/goods-movement/

2 Existing Conditions

2.1 Past Work / Planning Context

This section provides a summary of some of the background repots and studies that are related to goods movement in Brampton.

2.1.1 Greater Golden Horseshoe Transportation Plan (2022)

The Ontario Ministry of Transportation recently completed the Greater Golden Horseshoe (GGH) Transportation Plan[2] which sets a Vision for Mobility in 2051. It includes infrastructure, service improvements and policies organized under four inter-related themes:

- Fighting gridlock and improving road performance
- Getting people moving on a connected transit system
- Supporting a more sustainable and resilient region
- Efficiently moving goods

Actions outlined in the plan that specifically apply to the City of Brampton include:

- Building/extending the Hurontario Light Rail Transit Line to Downtown Brampton
- Advance preliminary design for future higher order transit corridors such as the Brampton-Queen/Highway 7 West LRT Corridor

One of the outcomes of the planning study was the creation of a Strategic Goods Movement Network (SGMN) for the GGH, which identifies key multi-model freight corridors and connections. The SGMN is intended to be used for interjurisdiction collaboration on goods movement, including the planning and prioritization of improvement projects. **Figure 1** shows the SGMN.

Major components of the SGMN in Brampton include CN's Brampton Intermodal Yard, CN and CP's mainlines, Highways 407 and 410, and the proposed future GTA West Corridor on the north and west side of the City.

[2] https://www.ontario.ca/page/connecting-ggh-transportation-plan-greater-golden-horseshoe#section-9

Figure 1: GGH Strategic Goods Movement Network

Source: Ministry of Transportation Ontario

2.1.2 Region of Peel Goods Movement Long Term Plan (2019)

The Region of Peel, which includes the municipalities of Brampton, Mississauga, and Caledon, completed the Goods Movement Long Term Plan (GMLTP) in 2019. The report underlines the importance of goods movement to the Peel, stating that goods moving-related industries contribute $49 billion in GDP to the regional economy, which is estimated to be 21% of all goods movement-related GDP in Ontario, and 8.7% in all of Canada.

The Plan documents the Region's goods movement goals and provides a profile of the inter-modal goods movement network including road, air, rail, marine, and pipeline.

The Plan discusses the importance of Toronto Pearson International Airport, CN Brampton Intermodal yard, and the network of designated truck routes in serving goods movement in Peel. The 'Missing Link' project proposed in the GMLTP involves building a new rail corridor that would connect the CN bypass line at Bramalea with the CP through-route. This project would allow the separation of freight through-traffic from passenger service on the Milton GO and Kitchener GO lines. In addition to the new rail connector, this project would also require improvements to other CN and CP lines. However, in the Metrolinx Kitchener Line Business Case, an alternate option was recommended in lieu of the Missing Link.

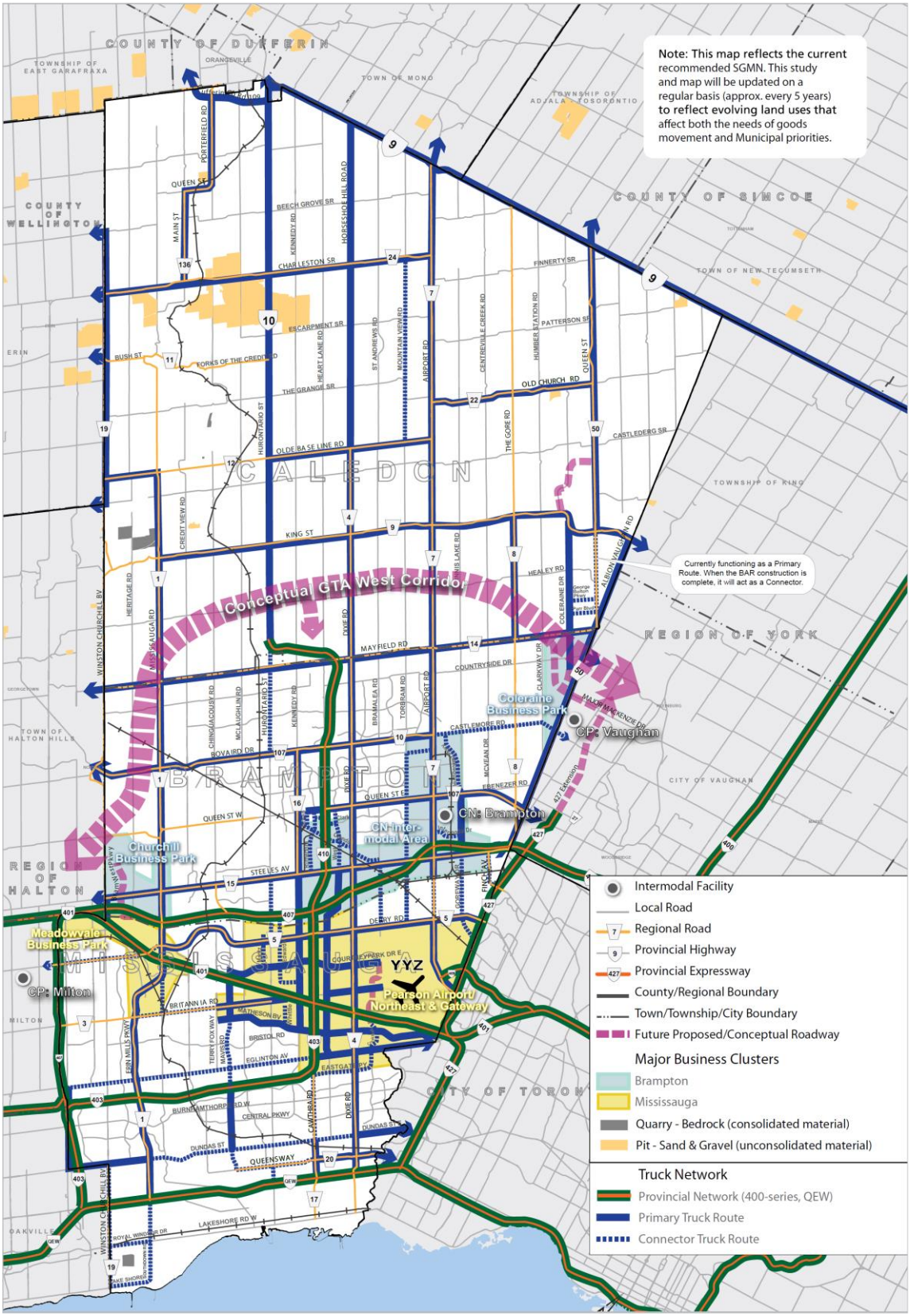
Peel Region is reported to have some of the highest truck volumes in North America[3]. Many regional roads are part of the Strategic Goods Movement Network and serve the Airport, intermodal yards, or major employment lands. However, some of these corridors are also adjacent to residential neighbourhoods. This can cause conflict due to increased demand on the roadways and with the impact of heavy vehicles near residential areas, parks, and schools.

The report identified eleven long term "pathways" to improve goods movement, including investing in Freight Data, Encouraging Off-Peak Delivery, Adapting E-commerce, and Investing in Infrastructure and Technology.

Figure 2 shows the Strategic Goods Movement Network in Peel.

[3] https://www.tac-atc.ca/sites/default/files/site/doc/publications/2021/ptm-goodsmvmt-e.pdf

Figure 2: Region of Peel Strategic Goods Movement Network



Source: Peel Region

2.1.3 Region of Peel Goods Movement Strategic Plan (2017-2021)

Completed concurrently with the Long Term Plan, the Strategic Plan included a review of the 23 actions that were identified in the 2012-2016 Strategic Plan. It also identified nine new actions to further progress goods movement planning over the next 5 years. They included:

1. Goods Movement and Logistics Planning Coordination
2. Foster Industry Innovation Through a CAV Corridor Pilot Project
3. Increase Capacity with Convenient and Feasible Off-Peak Deliveries
4. Adapt to Advancements in the E-Commerce Shift
5. Expand and Encourage the Use of Long Combination Vehicles
6. Understand and Manage Aggregate Movements and its Impact on Communities
7. Mainstream Goods Movement Transportation Through Education and Outreach
8. Pursue Alternative Fuels and Fuel Efficiency Initiatives
9. Demonstrate and Advance Peel's National Role and Importance in Freight Fluidity

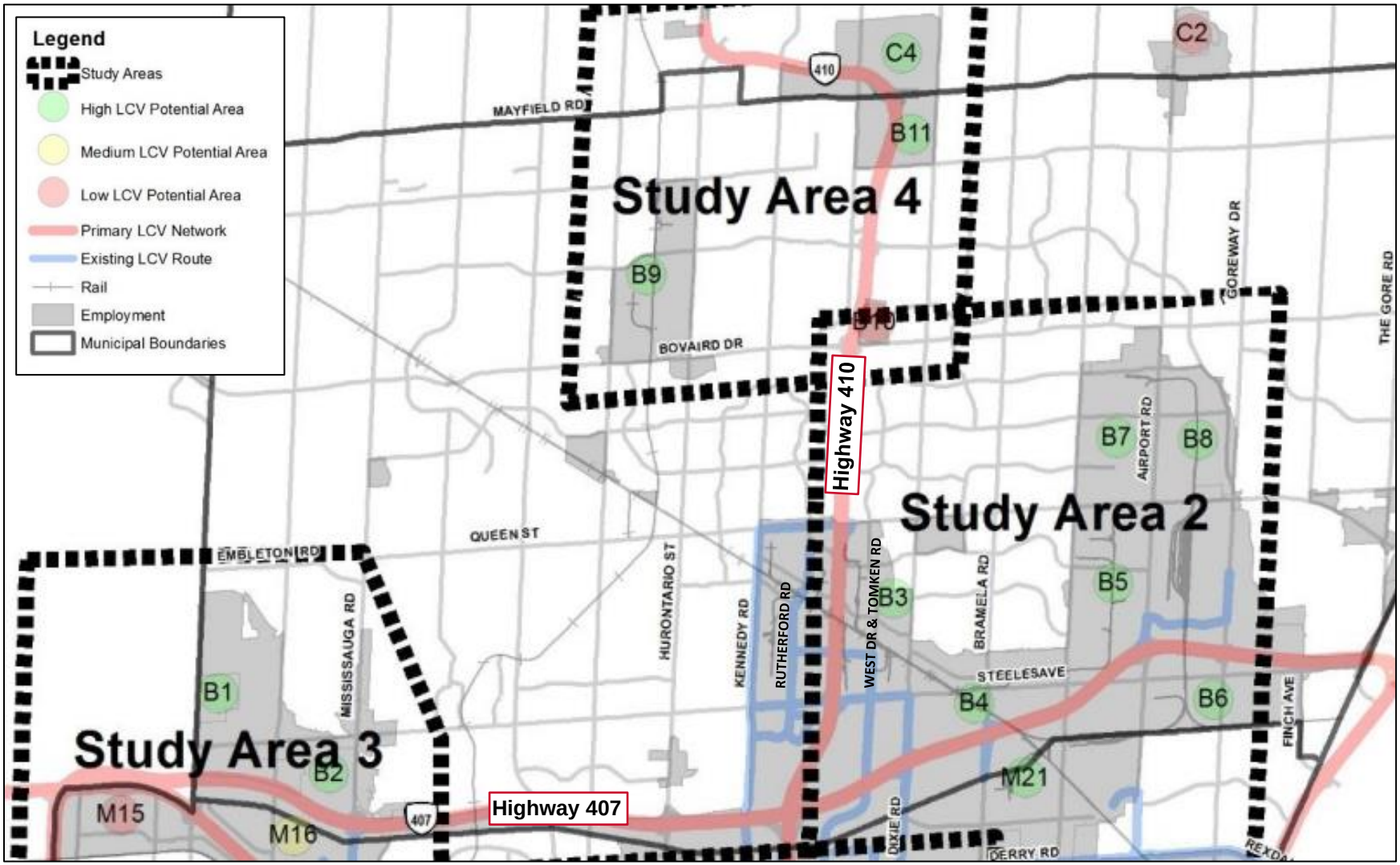
2.1.4 Peel Region Long Combination Vehicle Usage Study (2019)

The Long Combination Vehicle (LCV) Usage Study is a report outlining the analysis and subsequent actions that can be taken to expand and encourage the use of long combination vehicles in the Region of Peel. In Ontario, long combination vehicles (LCVs) consist of a tractor pulling two trailers up to 40 m in length. Trips within the Region of Peel account for 26% of all LVC trips operating within Ontario, and in total 5% originate or are destined for the City of Brampton. LCVs are restricted to specific highways and roads. The Study recommends that LCV routes and facilities should be compatible with surrounding land uses. Efforts should be made to avoid locating LCV parking facilities next to residential areas due to noise and light pollution. Instead, truck parking capacity should be expanded by using land around freeway off-ramps and other strategic locations.

Areas with high LCV potential are identified below in **Figure 3**. The primary LCV network in Brampton is along Highway 410 and Highway 407 with LCV routes on Kennedy Road, Rutherford Road, West Drive/Tomken Road, Dixie Road, Bramalea Road and Steeles Avenue. Most areas of high LCV potential are located in the business areas around CN's Brampton Intermodal Yard.

LCV routes are currently not provided to some of the major commercial/industrial areas include the Churchill Business Park, Coleraine Business Park, Van Kirk Drive Area, and much of the Brampton Business Area. The City of Brampton may wish to advocate for the expansion of the LCV into these areas, pending consultation with businesses in these areas that they would be interested in joining the program.

Figure 3: LCV Route Expansion Areas – Brampton Area



Source: Peel Region

2.1.5 2015 Transportation Master Plan Update

The 2015 Transportation Master Plan Update (TMPU) addressed transportation challenges and provided strategic solutions to help facilitate population and employment growth to 2041. The TMPU identified a future road network, future transit network, cycling network, active transportation policies, goods movement recommendations, and transportation demand management programs (TDM).

A separate background paper is being prepared as part of this Mobility Plan study that will identify the status and progress of recommendations from the 2015 TMPU and the changes in the transportation context in the seven years since the plan was updated that is driving the need for the current BMP study. This includes the Brampton 2040 Vision, the development of the Complete Streets Guide, and the new Brampton Plan (draft).

The Goods Movement Section in the TMPU identified Brampton's de facto Goods Movement Network (roads without truck restrictions). It also provided a number of recommendations that were focused in the areas of improving cycling safety with respect to goods movement vehicles / routes and the benefits of conducting a freight audit. A freight audit was recommended, based on the guidelines for freight audits within MTO's Freight-Supportive Guidelines[4].

2.2 Existing Conditions

2.2.1 Road

Figure 5 shows the effective goods movement network in Brampton from the 2015 TMPU. It is based on road classifications and truck restrictions (or lack there of). It consists of components from the Regional Strategic Goods Movement Network (SGMN) which is generally owned and operated by Peel Region and the province (Highways 407 and 410). The network generally provides a consistent grid across the city and connects to the major business / employment areas. It also includes potential goods movement routes through the planned development areas in northeast and northwest Brampton.

While **Figure 3** shows the recently completed Highway 427 extension east of Brampton (in Vaughan), it does not include the GTA West Connector that is envisioned to be built just north of Brampton in Caledon. The figure also shows the employment areas in the city, which include commercial, retail, light industrial and logistics and warehouse uses. Some of the major business park areas include:

The **Brampton Business Park**, which surrounds CN's Brampton Intermodal Terminal, and is located just north of Pearson Airport (which is in Mississauga). It includes a range of business that rely on the multi-modal goods movement network, such as a Chrysler Assembly plant.

The **Coleraine Business Park** is located in the northeast corner of Brampton, immediately west of CP's Vaughan Intermodal Terminal. The area is largely still largely a greenfield site, but it has

[4] https://www.ontario.ca/files/2022-03/mto-freight-supportive-guidelines-en-2022-03-31.pdf

significant development potential given its proximity to the Vaughan Intermodal terminal, Highway 50, and the future GTA West Connector.

The **Churchill Business Park** is a growing business park located in the southwest corner of Brampton. It includes a number of distribution and logistic centres, including an Amazon Fulfillment Centre. The major road network connections to the area include Steels Avenue, Mississauga Road and Highway 407.

There is also a commercial centre around **Van Kirk Drive** in northwestern Brampton that includes both commercial retail, light industrial and shipping and distribution centres, including North Bay Distribution and Day & Ross Freight. It is bounded by Hurontario Street, Bovaird Drive, McLaughlin Road, and Wanless Drive

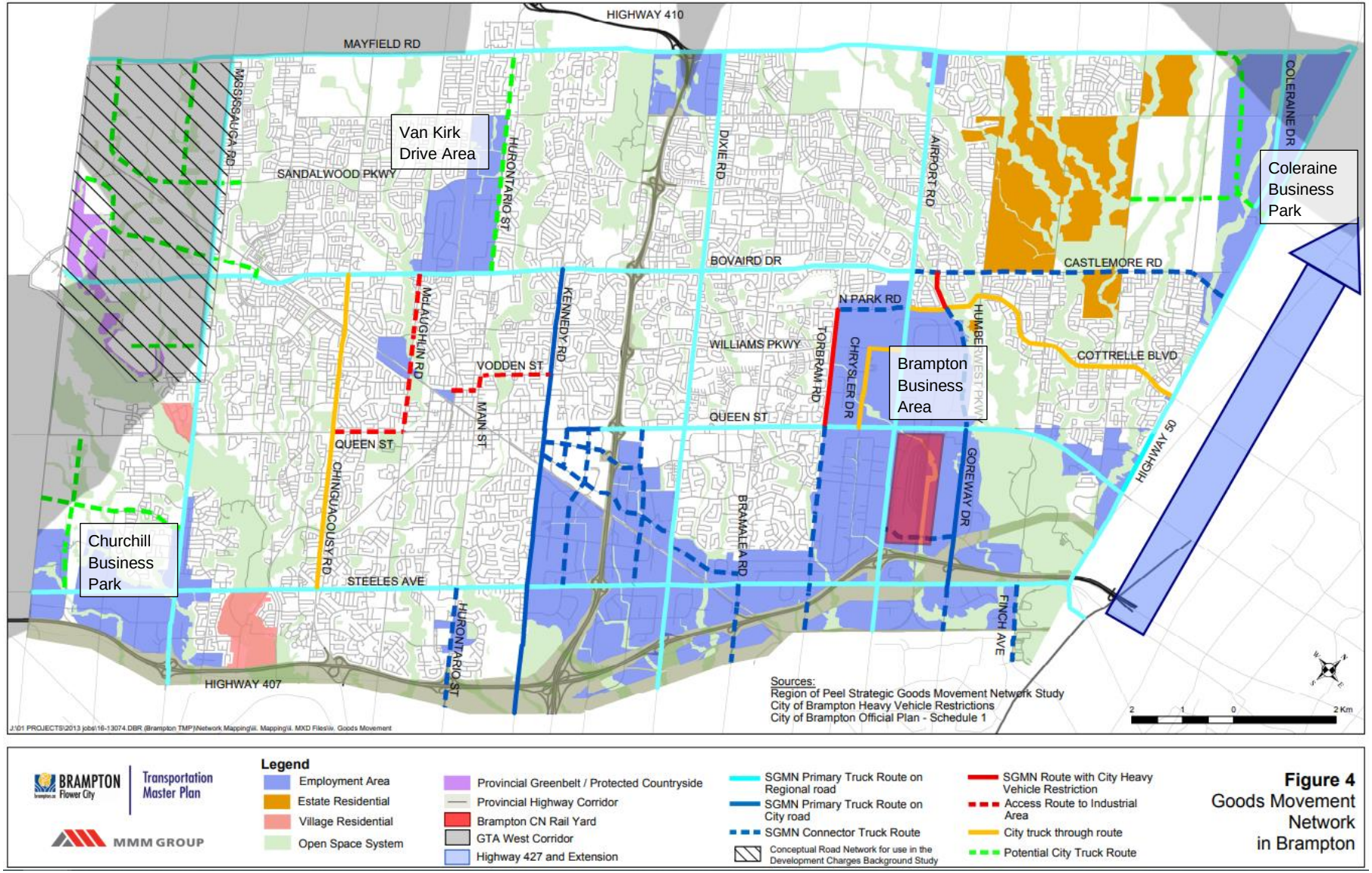
The effective truck route network in Brampton is defined based on the truck restrictions in the city, which are shown in **Figure 6**. Heavy vehicles are restricted from many local streets, while some streets have weight and travel time restrictions. The restrictions are published in the City's bylaw, and are communicated with signage on-street, as shown in **Figure 4**.

Figure 4: Truck Restriction Signage - Hallstone Road

Source: Google Maps

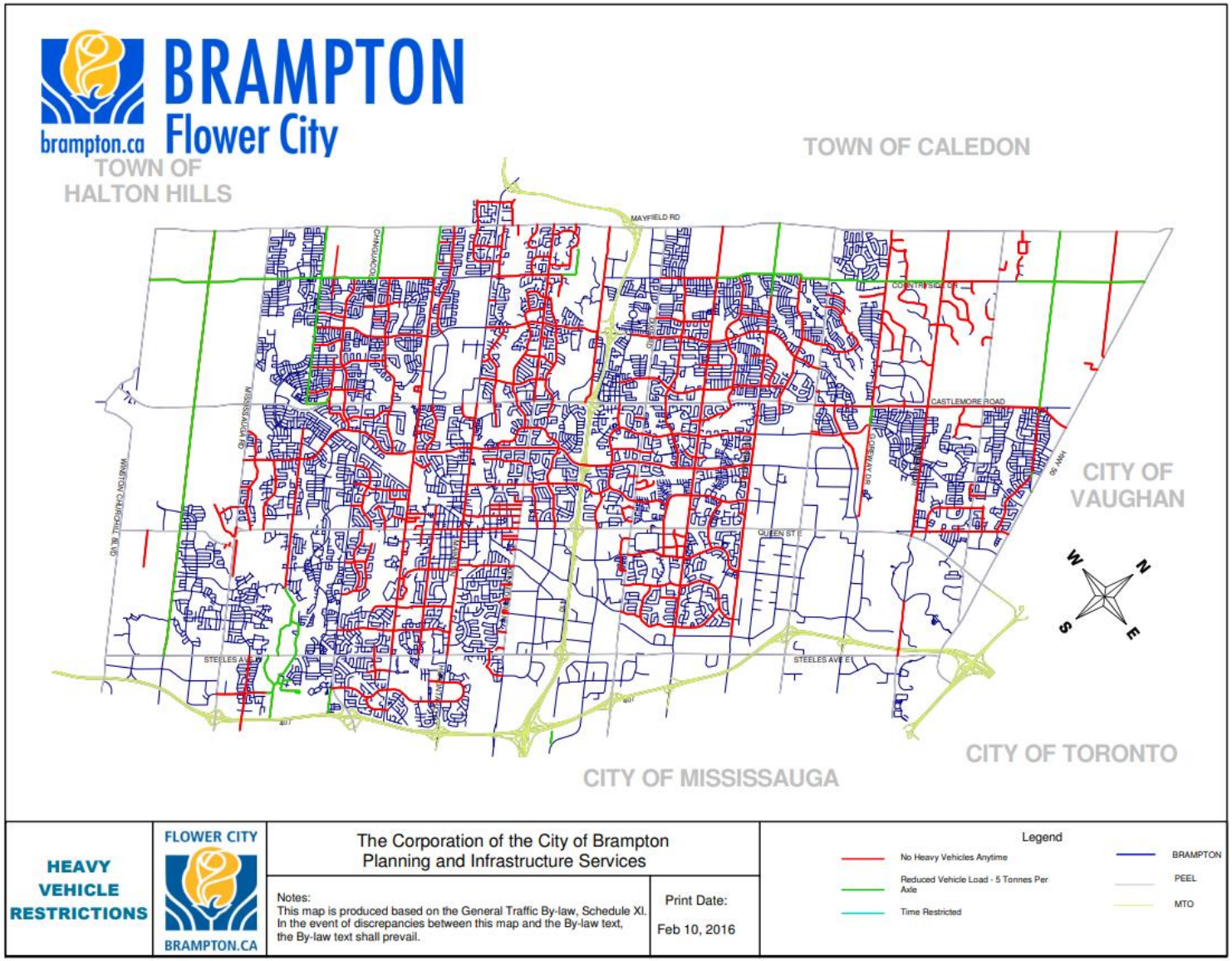
The Region of Peel also enforces its own truck restrictions through a bylaw and on-street signage, with the restrictions shown in **Figure 7**. Roads in Brampton with timed truck restrictions include Winston Churchill Road, Kennedy Road, Dixie Road, The Gore Road, and Coleraine Drive.

Figure 5: Goods Movement Network



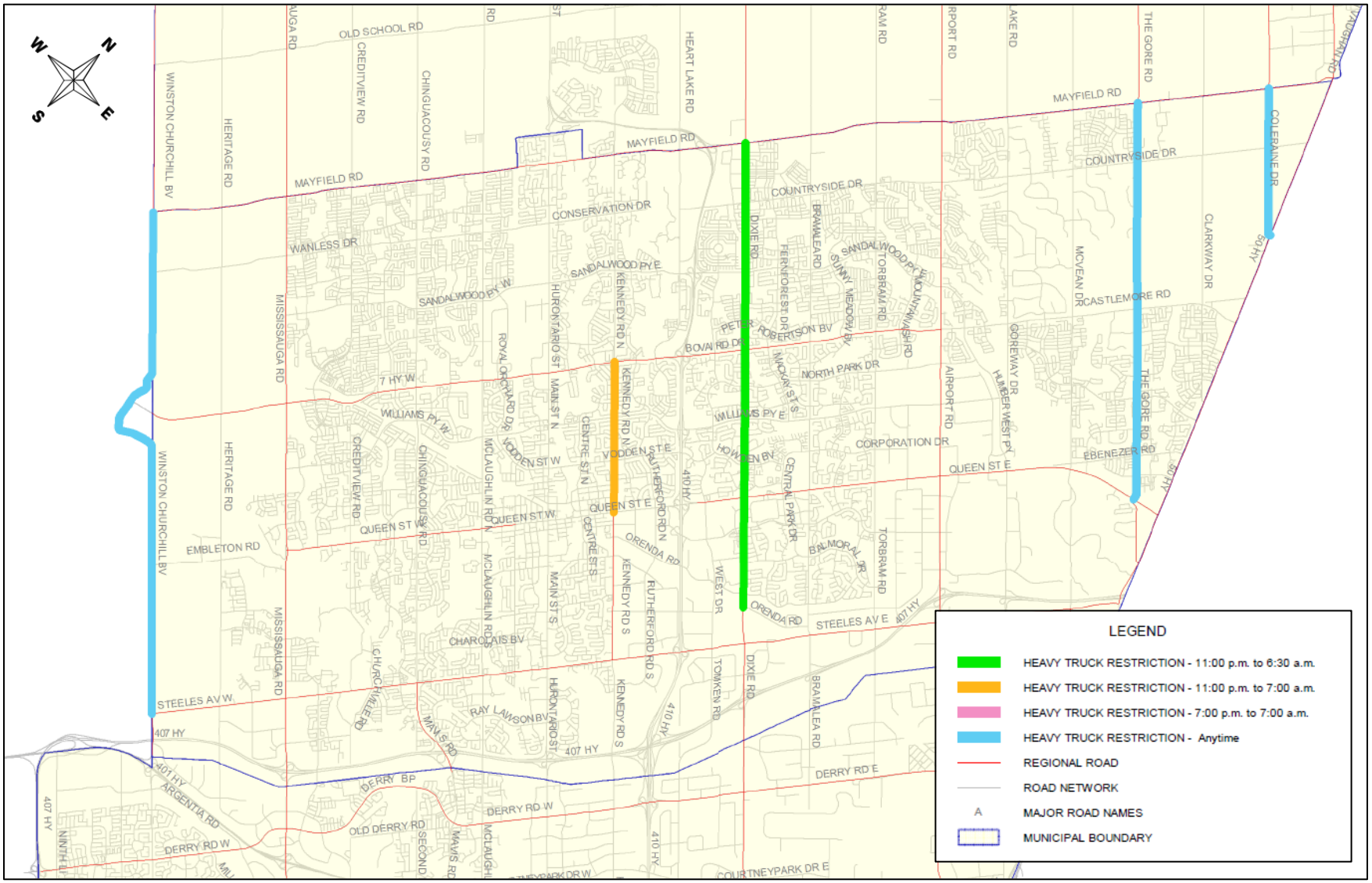
Source: City of Brampton 2015 TMP

Figure 6: Heavy Vehicle Restrictions



Source: City of Brampton

Figure 7: Heavy Vehicle Restrictions - Region of Peel



Source: Region of Peel

2.2.2 Rail

The freight rail network in Brampton is shown in **Figure 8**. CN is the only railway that operates in Brampton, with its Brampton Intermodal Terminal on the east side of the city. CN's Halton subdivision travels east/west through the city, providing connections further east and west, including to Montreal, Western Canada, and the US. The corridor is primarily grade separated with the major road network, with at grade crossings only remaining at Mississauga Road and Winston Churchill Boulevard. As volumes continue to increase, and the areas on northwestern Brampton development, grade separation of these crossings could become warranted in the future.

The Brampton Intermodal Terminal is CN's busiest intermodal terminals, with an estimated 60% of their containers travelling to/through the terminal at some point. It is also a large generator of truck trips, with an estimated 3,000 truck trips per day[5].

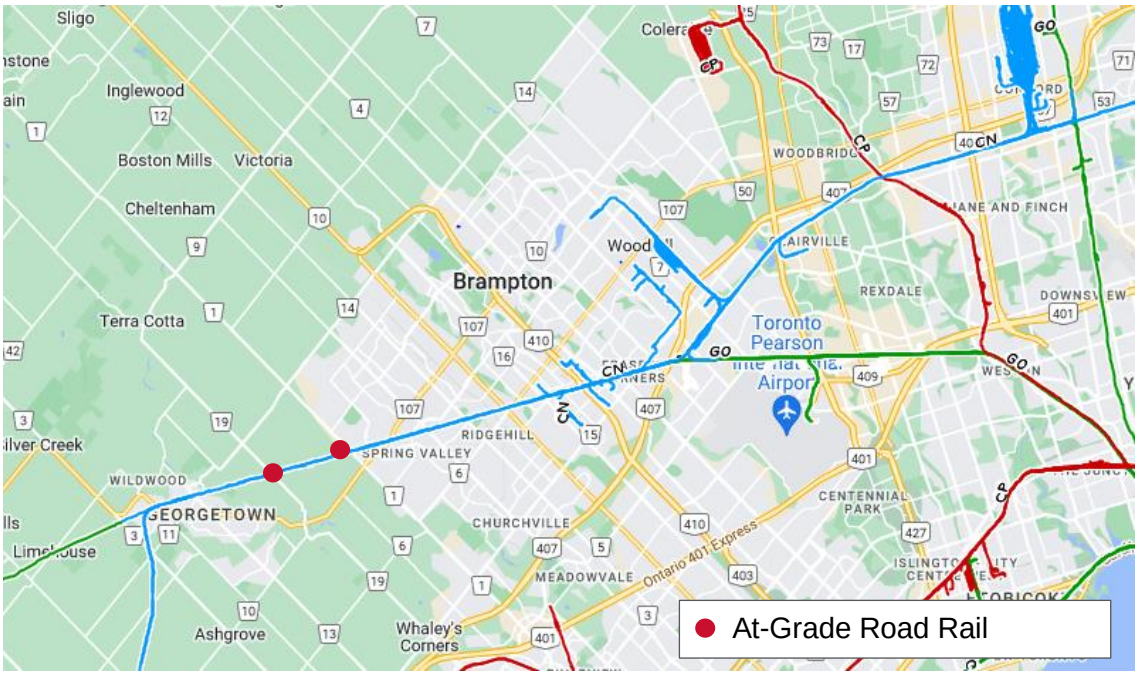
CN is currently upgrading the terminal through their Brampton Smart Terminal initiative, which includes on-site operational changes such as the introduction of new naming conventions, and the addition of aisles to improve the overall facility capacity and fluidity[6]. CN is also developing a new intermodal terminal in Milton, approximately 33 kilometers west of the current Brampton terminal. With Brampton Terminal currently operating at capacity, the new terminal is intended to relieve operations at Brampton. It is envisioned that both terminals will work together in the future, with Brampton remaining the primary intermodal terminal on CN's network[7].

CP's Vaughan intermodal terminal is located just east of Brampton in Vaughan. CN's Malport intermodal terminal and Misc yard are located just south of Brampton in Mississauga.

The Orangeville-Brampton shortline used to operate through Brampton but ceased operation recently when it was acquired by the regional and local municipalities. It is now slated to be developed as part of the Trans Canada Trail System[8]. Two at-grade crossing now remain in Brampton and are located across CN's mainline at Mississauga Road and Winston Churchill Boulevard.

[5] Goods Movement Long Term Plan, Peel Region, 2019
[6] https://www.cn.ca/en/our-services/trucking/brampton-smart-terminal/
[7] Goods Movement Long Term Plan, Region of Peel, 2019
[8] https://peelregion.ca/news/archiveitem.asp?year=2022&month=6&day=15&file=2022615.xml

Figure 8: Rail Network (Rail Atlas Canada)



Source: Rail Atlas Canada

2.2.3 Air

There are no airports in Brampton, but Toronto Pearson International Airport is located a few kilometers away from the city's southern boundary, and has a large effect on the movement of goods to/from the neighbouring business industrial areas.

In 2019 the Airport handled 466,000 tonnes of cargo, which was equivalent to 34% of all air cargo in Canada by tonne[9]. Much of this is international cargo, which excludes transborder US traffic. This air cargo is a critical component for two different parts of the supply chain, one being for low inventory businesses and the just-in-time delivery of supplies, and the second is for expensive, time sensitive or perishable goods, such as food or flowers.[10]

The Peel Region GMLTP forecasted that air cargo was likely to grow at a rate of 4.4% annually, significantly higher than other airports and higher than forecasted GDP and population growth. This is due to the airport's role in the international airline network as a major hub, which serves as a connection point for routes to/from locations are that not in the region.

While the airport and associated freight related businesses do generate some level of freight truck traffic to/from Brampton, major freight carriers including FedEx and UPS have facilities located directly on the airport lands. Other businesses often choose to locate near the airport for strategic reasons, even if they do not ship / receive high volumes of goods to/from the airport.

[9] Table 23-10-0254-01, Statistics Canada, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310025401
[10] Goods Movement Long Term Plan, Peel Region, 2019

3 Jurisdictional Scan

Jurisdictions from across North America and around the world were reviewed to understand best practices in the planning and management of urban freight. Based on discussions with City of Brampton staff and our understanding of the current context in Brampton and the GTA, the following areas are considered to be relevant and of interest, and have been explored in the following sections:

- Truck Prioritization
- E-commerce & Deliveries
- Complete Streets
- Truck Parking
- Planning Near Major Trip Generators
- Loading & Curb Space Management

3.1 Truck Prioritization

The City of Brampton is advocating for improved transit service, including the potential implementation of BRT on corridors including Steeles Avenue E and Queen Street E. These streets are also part of the SGMN as regional roads and they have high truck volumes. The implementation of BRT on these routes is expected to take away vehicular capacity, and this could have a negative impact on vehicle operations, including truck speed and travel time reliability. To minimize the impact that the addition of BRT would have on these routes, best practices for truck prioritization have been reviewed.

Ontario's Freight Support Guidelines[11] (Section 4.2.1) provide a range of different improvement strategies that can be used to improve truck travel times and reliability. They include:

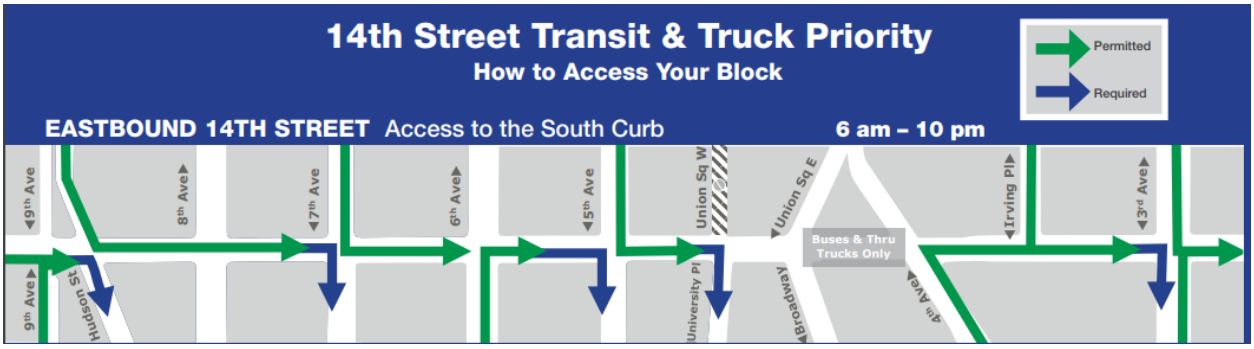
- Using truck priority logic at signalized intersections, where the detectors sense and prioritize trucks at the signals to reduce stopping. These sensors detect on-going trucks based on their length, and can then extend the green time to allow an on-coming truck to pass through the interested (instead of having to abruptly stop as it would have if it the extension were not provided) [12]
- Pave road shoulders to enable truck off-tracking, increased truck turning speeds, and reduce the impact of stopped vehicles on vehicle flow in the outside lane
- Upgrade intersections to provide better truck turning
- Implemented incident management systems with variable message signs and/or dynamic route guidance to show route travel times. This enable trucks to avoid routes that are congested or slow (such as due to a collision).

[11] Freight Supportive Guidelines, Ministry of Transportation Ontario, 2016
[12] A good resource for the criteria need for truck signal priority is the Transportation Systems Management and Operations website developed by Washington State Department of Transportation. It provides detail on why, where and how truck signal priority can be implemented, and what needs to be considered. https://tsmowa.org/category/signal-operations/freight-or-truck-signal-priority

An example of an intensive truck and transit priority scheme is the New York City 14th Street Transit and Truck Priority Pilot Project[13], which was implemented in 2019 and was made permanent in 2020 after 18-month pilot project that was deemed successful.

Through travel on 14th Street is limited to only transit and trucks (vehicles with 6 wheels or more) between 6 am to 10 pm. Passenger vehicles are allowed to turn onto 14th Street for local access only, and are then required to turn right to exit the road at the next intersection. Left turns from 14th Street are prohibited for all vehicles, except for transit at select intersections. These measures discourage passenger vehicles from using the street unless they need to access a specific block face on the street. The restricts were developed to improve transit and truck speeds on the corridor, and bus speeds increased 24% since the launch of the initiative. The project also reduces truck traffic on the side streets which benefits the adjacent residential communities.

Figure 9: Sample of Routing Restrictions on 14 Street



Source: New York City

This type of initiative could be explored for the more urban segments of the SGMN routes in Brampton, where there is a desire to prioritize transit and truck operations there are alternative routes for passenger vehicles.

A different approach to accommodating BRTs on busy truck routes is to adjust either the proposed BRT alignment or truck route so that they do not overlap. In some instances, a parallel route may be available that can be selected and upgrade to be the primary truck route, enabling the current truck route to be converted to a transit priority corridor. It is acknowledged that this may only be feasible in a few select areas, and that the redesignation of such as corridor would require a thorough review and stakeholder engagement with both the public and major trucking firms and businesses.

3.2 Truck Parking

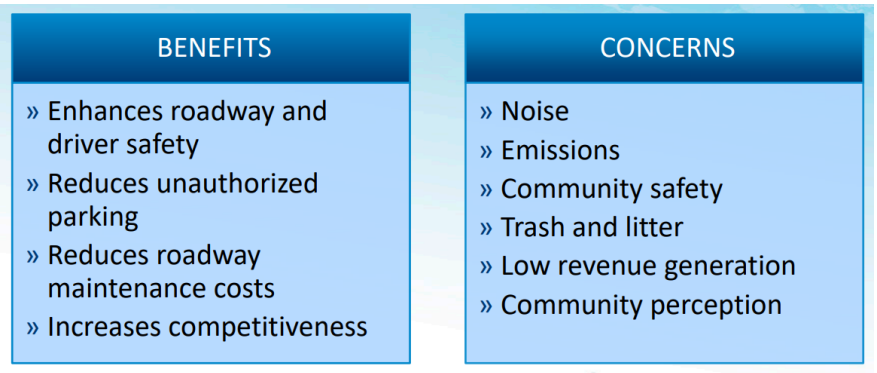
The City of Brampton is currently developing a parking plan, and a portion of this plan will look at how to better manage truck parking. Brampton is home to hundreds of trucking companies, and many of these are sole proprietor operations. Many of these truck owners do not have their

[13] https://www1.nyc.gov/html/brt/html/routes/14th-street.shtml#background

own sites or properties to park their trucks and trailers when they are not in use, and instead have to resort to parking them in private off-street locations, and occasionally on-street. This parking can have un-intended consequences, such as noise and emissions impacts on local businesses and residents near the parking sites. The City will be looking at how to manage and regulate this parking activity. This challenge is not unique to Brampton. There is a reported shortage of truck parking in Southern Ontario, and MTO has studied the problem and added off-street parking spaces recently[14].

In the US, the Federal Highway Administration (FHWA) has set up a National Cooperative on Truck Parking, and is currently preparing a Truck Parking Development Handbook, which can be used by municipalities and public agencies to plan for truck parking. A presentation[15] on the Draft version of the Handbook identifies many of the same challenges that Brampton is currently facing, and summarizes the benefits and concerns that community may have when it comes to developing designated truck parking areas.

Figure 10: Community Impacts of Truck Parking



Source: FWHA

Providing an adequate supply of safe, convenient and regulated truck parking will benefit both truck operators and the public, and as it will reduce the burden on truckers to find a suitable space and result in lower community impacts than the alternative.

The draft Brampton Parking Plan identifies management strategies to accommodate and improve truck parking conditions. These include constructing new facilities, exploring shared parking opportunities, developing a system to share the available and utilization of truck parking lots, further study of truck parking strategies, and enhanced enforcement of truck parking. Further details can be found in the report and accompanying documents.[16]

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[14] https://www.trucknews.com/transportation/ontario-truck-parking-initiatives-an-insult-says-study-author/1003151984/

[15] Workshop on the Draft Truck Parking Development Handbook, U.S. Department of Transportation, Federal Highway Administration, December 2021, https://ops.fhwa.dot.gov/Freight/infrastructure/truck_parking/docs/PPT_TruckParkingHandbook_Workshop.pdf https://ops.fhwa.dot.gov/Freight/infrastructure/truck_parking/index.htm

[16] Brampton Parking Plan – Phase 1 Report, Draft Final Report, Parking Management Plan,

3.3 E-commerce and Deliveries

The prevalence of E-commerce and deliveries have grown significantly over the past decade, and this growth was accelerated significantly due to the COVID-19 pandemic. In 2020, Canada had the second highest growth of e-commerce in the world at 75%. This rapid growth in e-commerce can have unintended consequences on traffic growth and safety in communities. Implications of E-commerce include:

- More trucks and vans delivering in residential and commercial areas.
- Larger delivery vehicles in residential areas.
- Growth in trucks and vans on highway networks as interregional and last mile delivery trips increase.

3.3.1 Residential Deliveries

The relatively lower density residential neighbourhoods in Brampton enable convenient parking and access for delivery trucks and vans. Streets are typically wide enough to allow local traffic to maneuver around a parked van or truck, and local street traffic volumes is typically low enough for this activity to occur without major issues. However, as residential areas redevelop and become denser, such as through the addition of townhomes and condo buildings, new measures may need to be implemented reduce demand for deliveries or better incorporate the activity in the design of the streetscape.

In addition to package deliveries, there has been substantial growth in grocery home deliveries services. This growth is expected to continue, at least in the short term, with Ocado opening its first automated warehouse in North America in Vaughan recently, which will fulfill orders for Sobeys[17].

3.3.2 Neighbourhood Loading Zones

New York City's Department of Transportation's (NYC DOT) Neighborhood Loading Zone (NLZ) program[18] aims to reduce double parking on narrow residential streets by providing space at the curb for activities such as:

- Package deliveries by commercial vehicles
- Taxi and car service pick-up and drop-off
- Active loading and unloading of personal vehicles

[17] https://www.grocerydive.com/news/ocado-launches-first-fulfillment-center-in-north-america/576939/
[18] https://www1.nyc.gov/html/dot/html/motorist/nlz.shtml

While loading zones are typically focussed in commercial and business districts, the increase in package deliveries to residential areas has increased the demand for curbside space, including during evening hours.

3.3.3 Parcel Delivery Lockers

A common issue with e-commerce deliveries is the impact of failed deliveries. In the US, 8% of first-time deliveries fail, at an average cost of $17.20. In Germany, 7% of deliveries go wrong in the first instance, costing on average €14.69 each. In the UK, the failure rate is 6% representing an average cost of £11.60 each.[19] In addition to increasing costs, these failed deliveries add unnecessary vehicle miles and emissions.

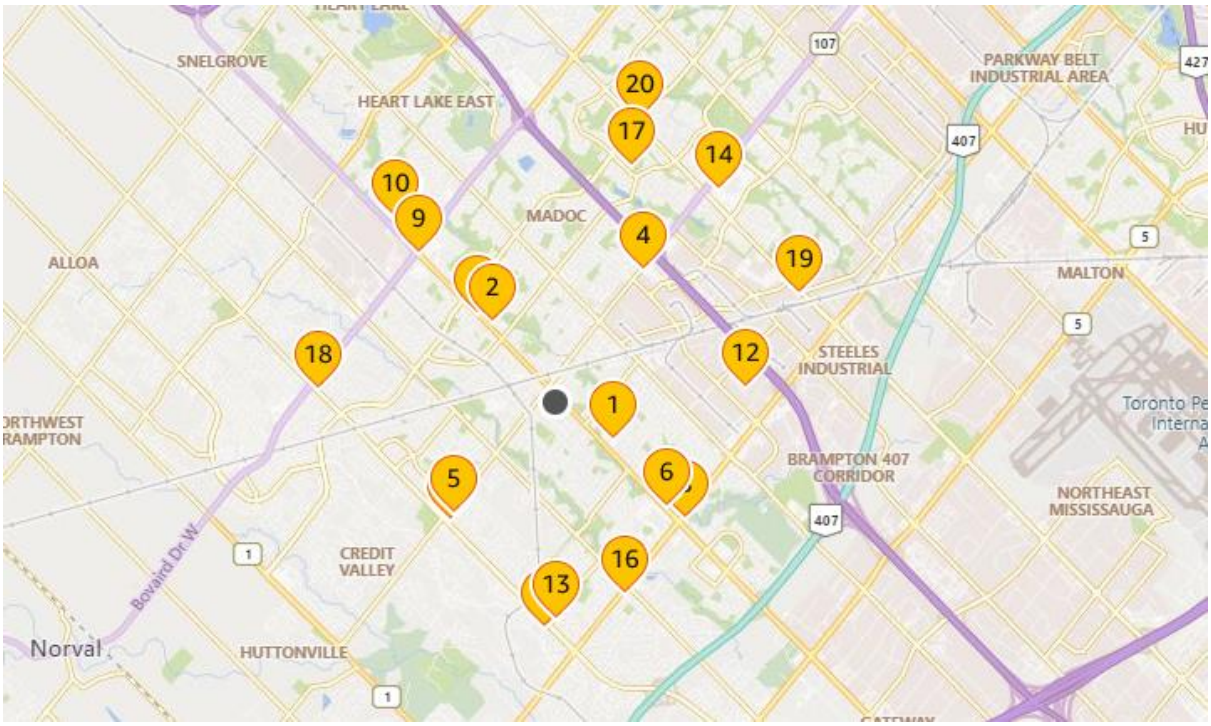
There are several reasons for failed delivery, but some of the most common issues include:

- Parcel recipient is not available to receive the delivery
- No suitable location to leave delivery item
- Item cannot fit into post box

One solution that Amazon has adopted is the use of parcel lockers. Rather than shipping a package directly to a home or business address, the recipient identifies a convenient locker location where the parcel is delivered to. Recipients then collect the package from the locker using a barcode and unique number to access the item. There are currently 20 Amazon storage lockers in Brampton, and their locations are shown in **Figure 11**. Lockers can be installed in shops, office lobbies and residential locations. Storge lockers are available from other provides as well, such as Snaile Lockers[20].

[19] Loqate.com
[20] https://snailelockers.com/

Figure 11: Amazon Storage Lockers in Brampton



Source: Amazon.ca

In the UK, lockers have also been installed in transit hubs and train stations (**Figure 12**). This allows passengers to pick up their items as part of their journey. UPS has also developed UPS Access Point™ and UPS Access Point™ Lockers. These locations are typically comprised of neighborhood retail locations such as independently owned and operated stores. They benefit the retailer by driving foot traffic to their location. In Brampton, such lockers have potential to be installed at transit hubs, in intensification zones and potentially in other public or community facilities such as libraries.

Figure 12. Amazon Locker

Source: Govia Thameslink

3.4 Planning Near Major Trip Generations

The intermodal rail yards of Brampton and Vaughan, Toronto Pearson Airport, and the business parks in Brampton are all major truck trip generators. Planning around generators like these needs to consider truck access, employee access (such as through transit), and how the impacts of the high volume of truck trips can be mitigated on the surrounding communities and land uses.

Two of the jurisdictions in Canada who are working with similar contexts include the Lower Mainland and Winnipeg.

3.4.1 Lower Mainland & Translink

The Lower Mainland is the urban area surrounding the City of Vancouver. Translink is the regional planning body in the Lower Mainland, and they developed the Regional Goods Movement Strategy[21] (RGMS) in 2017. The strategy defines a Major Road Network (MRN), and also provided a number of policies that were focused on reducing the impacts of truck traffic and freight transportation on the urban and residential areas in the region. The Port of Vancouver and its 29 terminals is spread throughout the Lower Mainland. It is the largest port in Canada[22], and generates high volumes of marine, rail and truck freight traffic. Significant generators of truck traffic include the Centerm and Vanterm container terminals which are located next to downtown Vancouver and near to dense commercial and residential areas. Together the have the capacity to handle 1.7 million TEUs each year, and an estimated ~30% of these intermodal containers are drayed to transloading facilities in the region[23].

The RGMS includes a wide range of policies to reduce the impact that these truck trips have on the surrounding communities. They include:

- Making travel safer for all users
- Implement system management solutions to improve travel time reliability
- Balance intra-regional goods movement with community livability
- Integrate goods movement considerations into community planning and development.

[21] https://www.translink.ca/-/media/translink/documents/plans-and-projects/roads-bridges-and-goods-movement/rgms_moving_the_economy.pdf
[22] https://www.portvancouver.com/about-us/
[23] Port of Vancouver data

Figure 13: Urban Delivery

Source: Translink Regional Goods Movement Strategy

Each of these policy areas includes specific actions and policies to pursue. As an example, the major policy statements under “integrating goods movement considerations into community planning and development” include:

- Work to minimize unnecessary conflict between a development’s users and other road users by fully considering the development’s impacts and needs, including goods movement, loading/unloading, and servicing.
- Prepare Freight-Supportive Community Design Guidelines (as a reference for municipalities), that include guidance on particularly challenging issues, including complete street designs, integrating loading/unloading spaces with bicycle lanes, and using appropriate goods movement design vehicles in urban contexts.
- Where a municipality approves new medium or higher density development along higher volume goods movement corridors, encourage the developer to incorporate noise, vibration, and traffic mitigation measures, including using sound barriers and floor plans to reduce noise intrusion.

The strategy and policies provide Brampton with a good reference on the type of measures that can be taken to reduce the impact of goods movement on the community, and can be considered in both the dense commercial / urban areas in Brampton, and around the business areas and transportation nodes.

3.4.2 CentrePort & City of Winnipeg

Figure 14: CentrePort Area

CentrePort[24] [25] is a major freight hub and generator of truck trips in Northwest Winnipeg, and is home to Winnipeg Richardson Airport, an international trucking hub, and has access to three Class I railways (CP, CN and BNSF). CentrePort is classified as one of nine Foreign Trade Zones[26] in Canada, which enables importers to ship goods to the area without paying taxes or tariffs initially, allowing goods to move within the trade zone, be warehoused, or used for another process, before the tariffs or taxes are due. The only FTZ currently in Ontario is in the Niagara region.

The City of Winnipeg is currently conducting planning for the area through a TMP update[27]. The update will include a separate goods movement study, and one of the engagement tools that they will be using for the study is the creation of neighbourhood specific advisory groups. These groups will act as ambassadors for their communities, providing insight into specific topics and feedback on the plan.

The City of Calgary operates a similar concept, with community members invited to sit on boards that inform transportation and urban planning. The provide a community perspective on specific topic areas for a four-year term, and the different boards including a board on Technology, Transit, and Urban Design.

A similar concept could be considered in Brampton, where a standing committee or topic specific neighbourhood groups are formed to provide feedback on goods movement planning and/or the community perspectives in areas near the major business parks / transportation nodes. The group could also be formed from key stakeholders and businesses in Brampton that rely on goods movement. More discussion on this topic is provided in **Section 4.6**.

Groups such as these could help guide planning and the development of policy, such as around the mitigation of the impacts of goods movement in their neighbourhoods, or in improving goods movement to local businesses and organizations.

[24] https://centreportcanada.ca/about-centreport/
[25] https://centreportcanada.ca/wp-content/uploads/2022/03/CPC-Rail-Park-Location-in-CentrePort.jpg
[26] https://www.canada.ca/en/department-finance/programs/international-trade-finance-policy/foreign-trade-zone.html
[27] https://engage.winnipeg.ca/transportation-master-plan-2050

3.5 Complete Streets

The concept of Complete Streets encompasses many approaches to planning, designing, and operating roadways. The goal is to plan with all users in mind when it comes to transportation system safety and efficiency. As the demand for street space in urban areas is high, freight activities, both in terms of freight movement and loading/unloading, need to be considered when designing a street to balance the needs and demands of the various users.

Organizations such as the National Association of City Transportation Officials (NACTO) do incorporate elements of freight activity into design guidelines[28], and are a good place to start when considering how an urban street can be designed to accommodate all users. However, additional steps can be taken to proactively accommodate freight activity into a streetscape. It is recognized that if loading spaces are not adequately sized and are not available at appropriate times of day, then trucks may park in unsafe locations and use infrastructure designed for other uses, such as the example in **Figure 15**. While parking tickets or citations can be used to discourage this, their impact in behaviour is often not significant, as their cost is often absorbed into the cost of doing business by delivery companies.

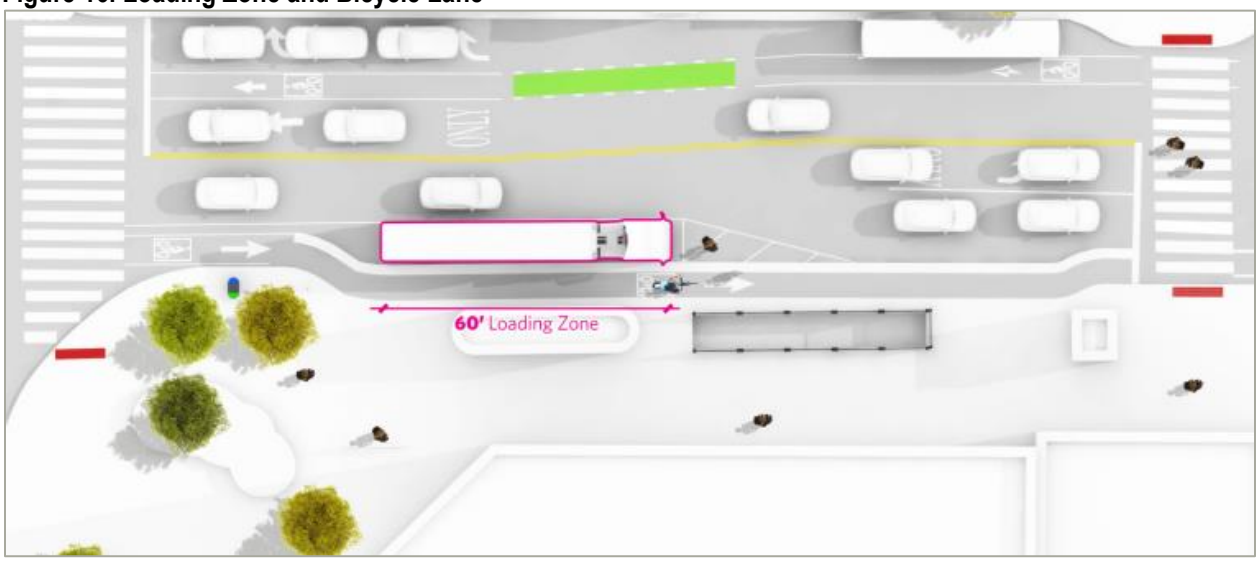
[28] Urban Street Design Guide, NACTO, 2013

Figure 15: Truck In Bicycle Lane and Parking Zone

Source: HDR

HDR developed a truck loading study for the City of Cambridge, MA that identified a number of measures that can improve on-street truck loading while reducing the risk associated with trucks encroaching into bicycle lanes. The example in **Figure 16** illustrates how a bicycle lane can be rerouted around a tractor trailer-sized loading zone to better accommodate urban deliveries. This design removes the conflict of a truck having to cross the bicycle lane when it emerges back into traffic, largely due to the blind spots associated with a truck and the visibility of bicyclists travelling alongside the truck.

Figure 16. Loading Zone and Bicycle Lane



Source: HDR

Accommodating large trucks is a common barrier to developing complete streets designs, specifically large tractor trailers, as their dimensions and turning characteristics require significantly more space than a typical passenger vehicle.

Other cities have worked to define certain locations / routes where smaller trucks are required to operate and have evaluated their own fleets and identified opportunities to reduce truck sizes and improve visibility where possible. The City of New York's recent Start Truck Management Plan[29] includes policies on reducing truck sizes and/or improving conditions for smaller trucks. These include allowing smaller commercial vehicles to travel on certain roadways that are restricted to general truck traffic to helps to reduce the burden on primary truck corridors, and the evaluating and integrating smaller equipment into the City owned fleet.

NACTO's Optimizing Large Vehicles of Urban Environment's[30] report includes further information on how truck dimensions influence manoeuverability, blind spots and ultimately effect street design / the ability to implement complete street improvements.

The City of Brampton may wish to evaluate their fleets and the design vehicles that are used, particularly for higher density urban areas, and areas where large tractor trailers may not need to access on a regular basis.

3.6 Loading and Curb Space Management

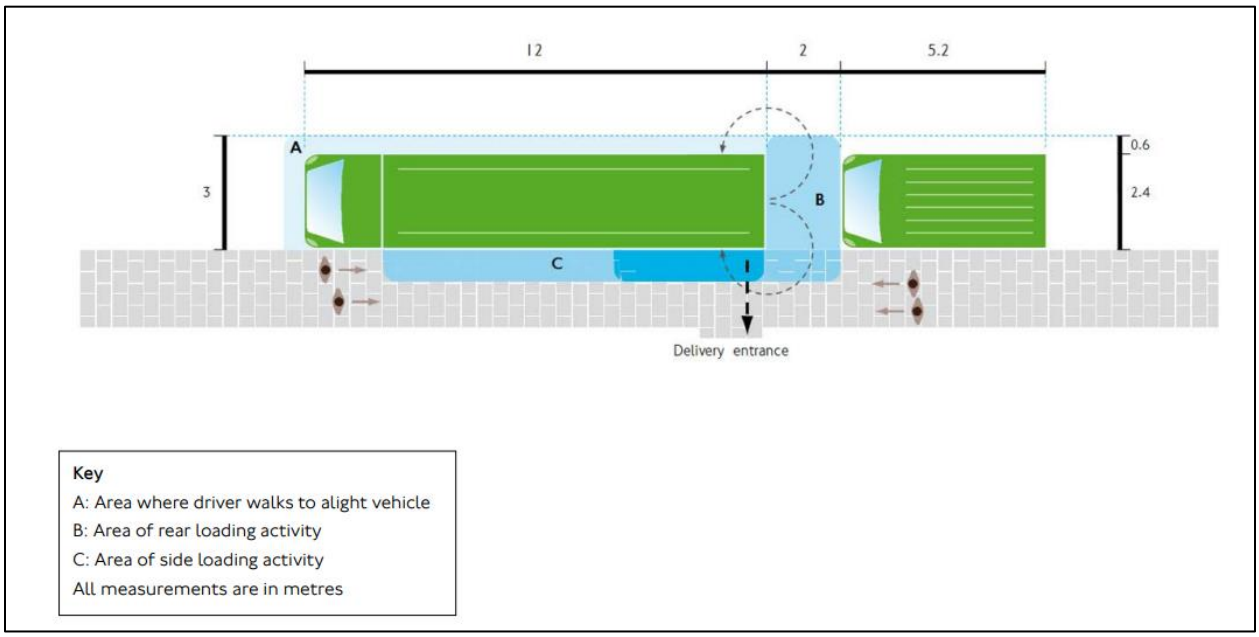
Similar to the need of balancing space between users in an urban street, allocating curb space is also an important in urban environments where curb space is limited and in high demand. Several organizations have compiled guidelines to assist planners with better managing truck activity and curbside loading/unloading.

3.6.1 Kerbside Loading Guidance

Transport for London (London, UK transport authority) produced its second version of Kerbside Loading Guidance in 2017. The guide aims to ensure appropriate kerbside loading facilities are included on London's highways and streets to facilitate effective loading. The document identifies key planning attributes associated with loading, such as the typical space requirements around a vehicle to enable efficient loading/unloading, as shown in **Figure 17**. While trucks are typically 2.6 metres wide or less, additional space is needed on either side of the vehicle and behind to enable efficient loading so that the truck and its operator don't conflict with other users / areas.

[29] https://www1.nyc.gov/html/dot/downloads/pdf/smart-truck-management-plan.pdf
[30] https://nacto.org/wp-content/uploads/2018/12/2018USDOTVolpe_Downsizing_FINAL_updated12-21-18.pdf

Figure 17. Kerbside Loading Design Considerations[31]



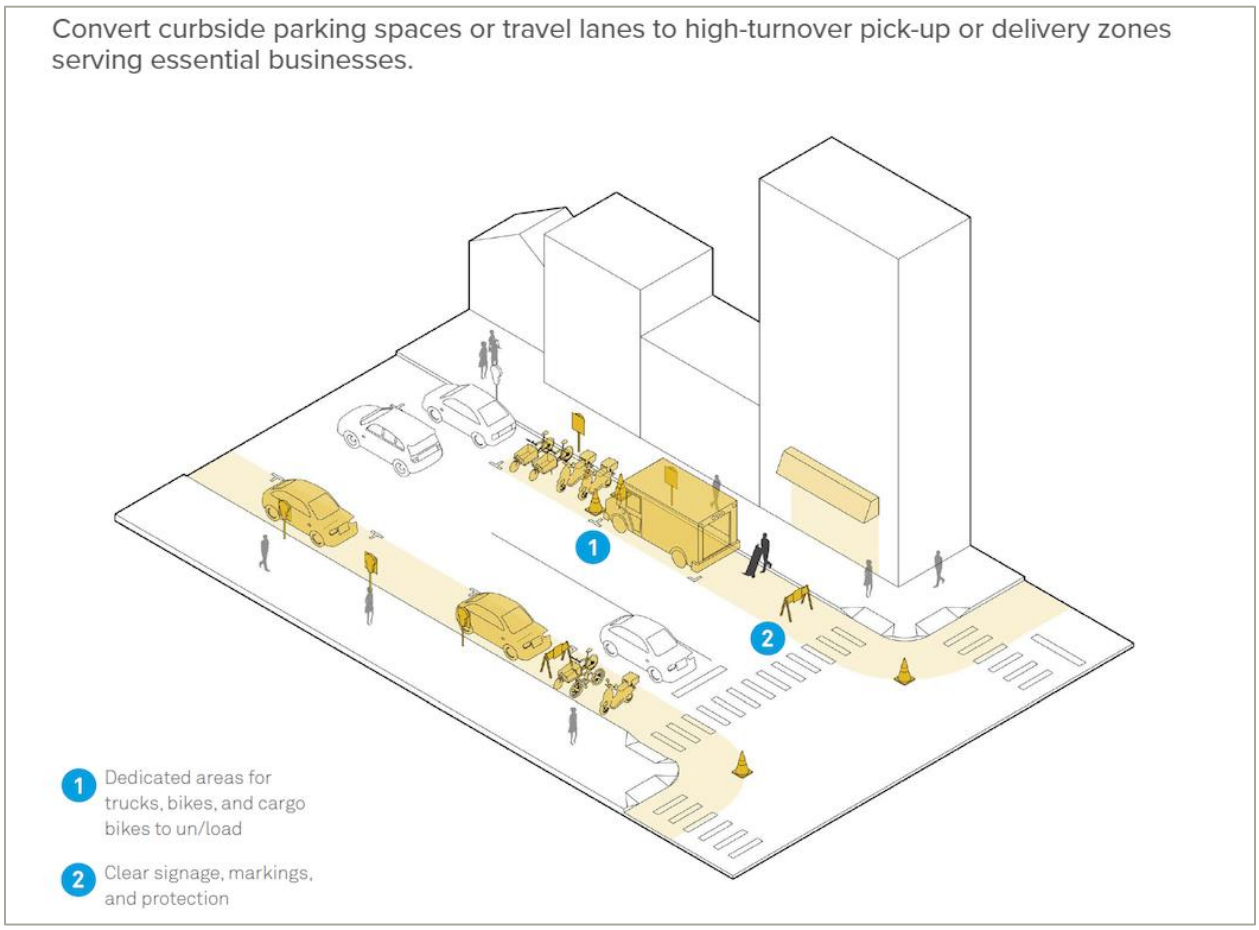
Source: Transport for London

3.6.2 NACTO

NACTO also provides guidance on the space required for truck loading / unloading, including in their Urban Street Design Guide and the recent Streets for Pandemic Response and Recovery. The pandemic and associated restricts significantly increased the number of at-home deliveries and e-commerce, and the Streets for Pandemic Response and Recovery guide includes a section on pick up or delivery zones, which an image shown in **Figure 18**.

[31] Transport for London (2017). Kerbside Loading Guidance, Second Edition. [Online]. Available: http://content.tfl.gov.uk/kerbside-loading-guidance.pdf

Figure 18. NACTO Streets for Pandemic Response and Recovery Guide



Source: NACTO

3.6.3 Brampton Parking Management Plan

Brampton's on-going Parking Management Plan includes a section on curbside management – specifically a framework that the city can use to identify the needs and objectives of a corridor, and then accordingly prioritize and balance the curb space between the different users and functions. The section defines five distinct functions of curb space: movement, deliveries, access for people, parking and placemaking. It then provides guidance on how these functions can be balanced and prioritized based on corridor classification. Further detail can be found in the Parking Management Plan32.

[32] Brampton Parking Plan – Parking Management Plan, Section 5.

4 Future Considerations & Trends

There are a many new freight trends and technologies that will change how goods move in Brampton. This section describes some of the major potential drivers of change.

4.1 Automated Trucks

In March 2021, Canadian Tire, start-up NuPort Robotics Inc. and the government of Ontario announced an investment to test automated heavy duty trucks. The approach is to retrofit two trucks with high-tech sensors and controls, a touchscreen navigation system, and other advanced features such as obstacle and collision avoidance. These trucks, which will initially be operated with a driver, will shuttle containers on fixed routes between rail intermodal yards and Canadian Tire warehouses in Ontario. In 2020, Gatik, another technology start-up partnered with retailer Loblaw Companies, to deploy five autonomous box trucks in the Toronto region.

The initiatives are made possible thanks to a 10-year pilot project that the Ontario Government launched in 2016 to enable the testing of autonomous vehicles on public roads under certain conditions[33].

Volvo Trucks and DFDS, a European logistics operator, are trialing a vehicle called “Vera” in Gothernburg, Sweden (**Figure 19**). This is a fully autonomous electric vehicle without a drivers cab. It shuttles containers between a port and a DFDS logistics centre. The port terminal is being equipped with automatic gates to allow Vera to enter and exit the terminal without stopping.

Figure 19. Volvo Autonomous Vehicle

Source: Volvo Truck

[33] https://betakit.com/nuport-robotics-receives-1-million-from-ontario-for-autonomous-trucking-project-with-canadian-tire/

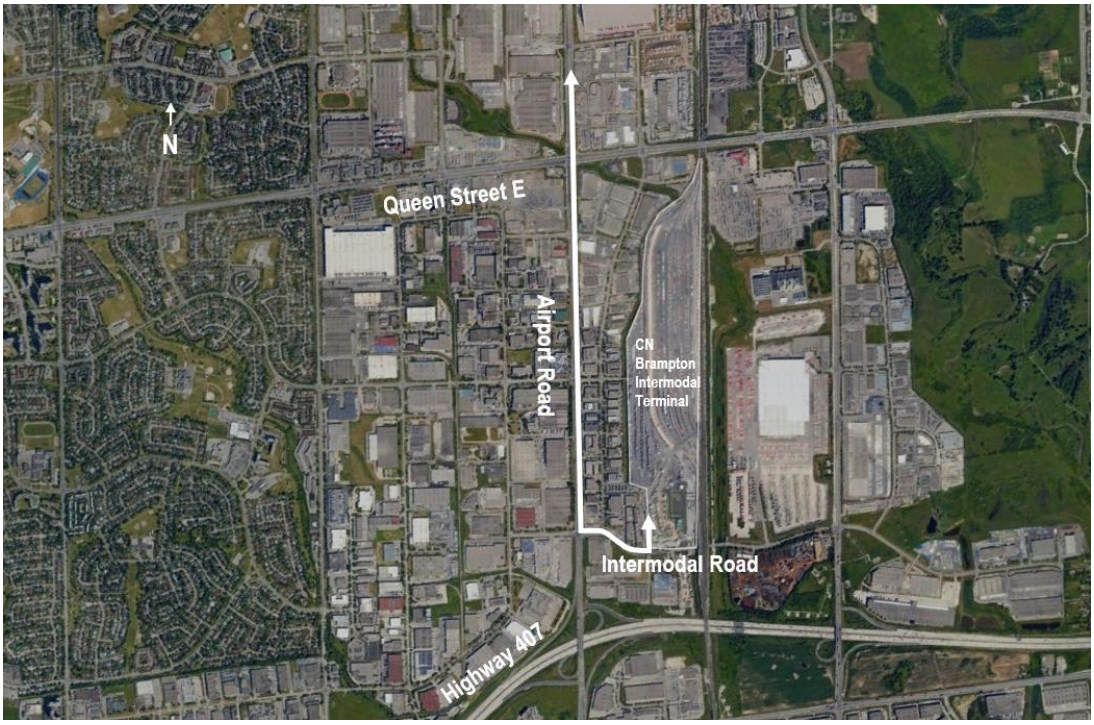
The operations described above are focused on the so called “middle mile” which applies to the movements of goods between intermodal facilities, suppliers, warehouses, and distribution centres, as opposed to the commonly cited “last mile”. The middle mile is said to be an “easier”, less complex environment in which to deploy autonomous trucks for a variety of reasons such as pre-determined, repetitive, and regular routes, access to and from industrial areas and using predominately multi-lane primary routes.

Large scale uptake for last mile deliveries using fully autonomous trucks to locations such as retail outlets, business locations or retail locations is likely to be implemented later, although pilots and trials in other jurisdictions may be ongoing.

Given the major freight generators in Brampton and the concentration of related uses and businesses including, it is probable that autonomous trucks either are currently operating on some of these roads as part of the pilot projects discussed above, or they will operate on these roads in the near future. **Figure 20** shows a potential corridor that could accommodate autonomous delivery routes, due to the proximity and relatively simple route between CN’s Brampton Intermodal Yard and the high concentration of warehouses and related businesses on Airport Road.

These advances in autonomous vehicle technology provide Brampton and the region with an opportunity to either incentivize the use of autonomous vehicles in certain locations and contexts for the purpose of businesses development, plan to mitigate impacts of this activity, or both.

Figure 20. Conceptual Autonomous Delivery Route



Source: HDR

4.2 Alternative Delivery Vehicles

4.2.1 Cargo Bikes

Cargo bikes are increasingly being seen as a viable vehicle to deliver packages and groceries in urban areas as an alternative to traditional delivery vans. A key requirement associated with cargo bike operations is electrical assistance due to payload weight, trip distances and varying terrains. An electric cargo bike is shown in **Figure 21**.

Figure 21. Cargo Bike

Source: Gnewt Cargo

London, New York, and Toronto have all had to amend legislation to allow electrically assisted cargo bikes to operate on their respective streets.

Given the limited range and payload, cargo bikes may need to be operated from micro distribution facilities. In London, Paris, and New York there are cargo bike operations that use vehicle parking lots to transload packages from larger vehicles to a fleet of cargo bikes. Other solutions have involved a mobile depot, such as the TNT parcel delivery company trial in Belgium, where cargo bikes operated from a tractor trailer (**Figure 22**).

Figure 22. TNT Mobile Depot

Source: TNT

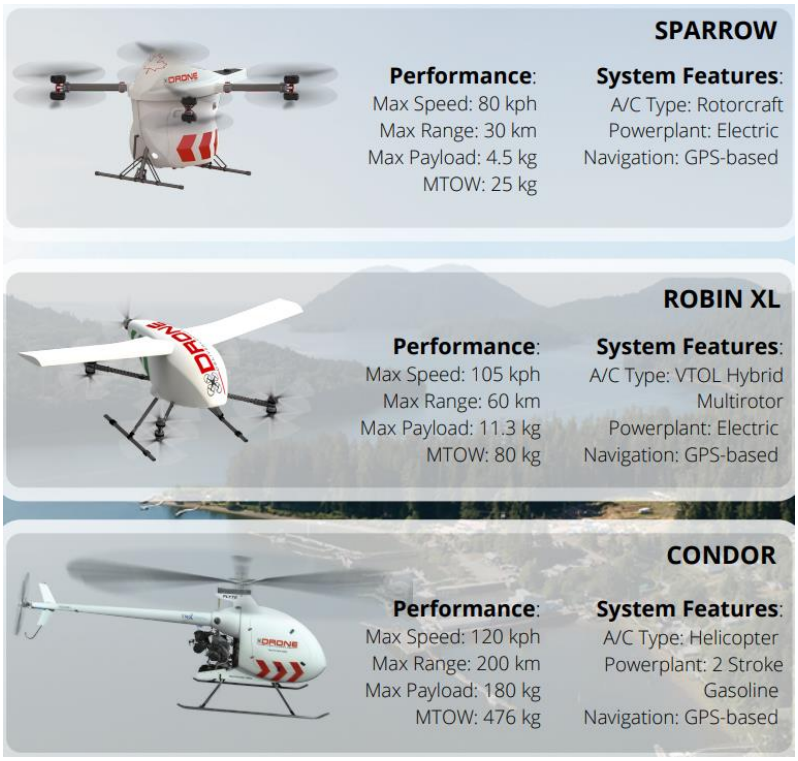
Cargo bikes could be applicable within the urban growth areas in Brampton where there will be higher densities and short trip distances. Micro distribution facilities may be needed to support the transloading of goods and cargo bike storage, as well as a high-quality bicycle network. The use of cargo bicycle deliveries could be one tool in reducing truck and traditional vehicle deliveries in urban areas to improve livability and could also be one tool to help reduce the geometric requirements for deliveries in urban areas.

4.2.2 Drones

In recent years, delivery drones have captured headlines as various companies have sought to develop drone technology for the delivery of packages and supplies. While use of drones as a delivery vehicle is still in its relative infancy, there are niche operations currently underway, predominately focused on lightweight, urgent, high value items such as blood and medical samples. The ultimate aim of most drone operators is for drones to be operated autonomously. Eliminating the human operator removes cost, but to do so requires the drones to be capable of safely flying delivery routes.

Other considerations include payload weight. Drone Delivery Canada has developed a series of drones that can carry payloads from 4 kg up to 180 kg, with a range of 200 km. **Figure 23** shows a number of available drone models from Drone Delivery Canada[34].

Figure 23. Drone Delivery Canada Product Models



Source: Drone Delivery Canada

[34] https://dronedeliverycanada.com/

Weather may also influence drone use and some drone operations have experienced conflicts with wildlife. A significant challenge to more widespread drone use in urban areas is delivery density and cost competition with other forms of delivery transport. While niche markets, focused on lightweight, urgent, high value items would appear to be suitable for drone operations, the more run of the mill, day to day deliveries may prove harder for drone operations to capture, due to high delivery density in urban and metropolitan areas, where more traditional van and multi drop operations are very cost effective. The City of Brampton may want to monitor advancements in technology and changes in regulations so that it is prepared for when drone deliveries do become more economically viable and occur at a larger scale.

4.2.3 Street Robots

Small autonomous vehicles are also being used for last mile deliveries. Starship has developed autonomous street robots that can deliver goods within a 6-kilometer radius. The majority of its operations are on college campuses, but in the UK pilot projects have also been undertaken in town center environments as shown in **Figure 24**.

Figure 24. A Street Robot

Source: Starship

Pennsylvania State law now allows delivery drones to operate on city streets and also classifies them as pedestrians. This law identifies legal limits for autonomous delivery robots such as a maximum top speed of 12 mph in a pedestrian area, 25 mph on a roadway, and a load limit of 250 kg.

The left side of **Figure 25** shows a robot employed in a pilot scheme in Singapore that can carry 20 kg of groceries. While smaller robots are being designed to operate on sidewalks, some companies are also developing larger robots which would operate exclusively on-street, as shown on the right side of the figure.

Figure 25. A Grocery Robot in Singapore | A Street Robot

Source: OTSAW | Nuro

4.3 Alternative Fuels

According to the Pembina Institute, 10.5% of Canada's greenhouse gas emissions come from freight transportation and a majority of these come from diesel trucks. Diesel powered trucks also produce air pollutants, but newer trucks with emission control equipment, such as particulate filters, have reduced this over time. Despite this, there is an increasing desire to further reduce emissions. Electric heavy-duty trucks are proven technology and would be able to replace conventional fueled trucks on some duty cycles that take place within the city, namely regional and delivery trips that are less than 240 kilometers and which can return to base at the end of trip to recharge. Longer distance trips where the truck does not return to the same location, such as a depot at the end of the day, are a more operationally challenging operational, as they require large batteries, charging infrastructure on the route, and charging times may conflict with the drivers work / rest schedules.

An increasing number of global and domestic truck manufacturers are now producing electric versions, including Lion, a manufacturer based in Quebec. A key challenge with electric trucks is that the capital cost is typically significantly more than a traditional fueled vehicle (potentially double the cost of a new traditional fueled truck), however overall operating costs can be much lower, for example maintenance costs are reduced by 60%.

Renewable diesel (RD) is also gaining traction as an alternative fuel for trucks. RD is a broad term that refers to any diesel fuel that is produced from a renewable feedstock such as vegetable oils or animal fats and is chemically identical to conventional (fossil) diesel fuel but contains no fossil carbon. This makes RD a "drop in" replacement for ultra-low sulphur diesel (ULSD). RD's primary environmental benefit is that it provides a compelling greenhouse gas (GHG) reduction (predominately CO2) strategy for diesel engines. The net result is that, depending on the specific feedstock and pathway, RD can provide GHG reductions ranging from about 35 to 80 percent when used as a substitute for ULSD to power heavy-duty vehicles and equipment. Animal tallow, which is currently the most prevalent feedstock used to make RD consumed in North America, provides GHG reductions of about 65 percent compared to ULSD. While most of the focus for RD is in US West Coast states, largely driven by California's Low

Carbon Fuel Standard (Oregon and Washington are considering similar schemes), Canada is expected to launch its own Clean Fuel Standard in 2022. Investments in canola processing plants in Saskatchewan, which would supply feedstock to RD plants, have recently been announced.

Hydrogen is another alternative truck fuel that can be used to cut carbon emissions. When hydrogen burns it produces water and no carbon dioxide. In heavy trucking it would be used to operate fuel cells that generate electricity. The Alberta Zero-Emissions Truck Electrification Collaboration project is developing two heavy-duty, 64-tonne hybrid trucks with hydrogen fuel cells that will haul freight between Calgary and Edmonton[35].

Fleets will gradually transition to cleaner fuels, though the speed of uptake will be driven by economics (capital and operational cost comparison with traditional fueled trucks), national and provincial legislation, company's green commitments, and incentivization. Incentives are offered in both BC and Quebec – up to $100,000 in B.C. for medium- and heavy-duty trucks, and $175,000 per vehicle in Quebec for heavy-duty trucks. New York City also has a rebate incentive funding program to reduce diesel exhaust emissions by replacing older, heavy polluting diesel trucks with new battery electric or EPA emission compliant alternative fuel (compressed natural gas, diesel-electric hybrid, and plug-in hybrid electric) and diesel trucks. The scheme also places restrictions on applicants to ensure the City and adjacent region receives the benefits of cleaner trucks. These include requirements that the vehicle is registered in the region, operates for 70% of time within NYC's neighboring three states and is also operated within the city's industrial zones at least twice per week.

There is significant potential for trucks based in Brampton to be fueled by cleaner, alternative means. For some alternative fuels, infrastructure such as electric charging facilities will be necessary. This could have implications on local power networks, which may need to be upgraded to accommodate any significant increase in power consumption. Alternatively, RD could be sold and distributed through existing outlets, while the use of hydrogen would require dedicated infrastructure including pipelines and fueling stations.

The City of Brampton and its residents will undoubtedly benefit from the uptake of alternative / cleaner fueled trucks. However, influencing the speed of the uptake would require collaboration with Peel Region and the Province of Ontario to develop incentives or programs to encourage uptake.

There are numerous priorities for improved sustainability and emissions reduction as part of MTO's plans, including the GGH. Some of these initiatives will include developing a strategy for low and zero-carbon charging or fueling stations and supporting businesses to install electric charging infrastructure in their depots and distribution centres alongside the adoption of low and zero-carbon truck options. These may be electric or hydrogen-powered.

[35] https://www.eralberta.ca/projects/details/alberta-zero-emissions-truck-electrification-collaboration-azetec/

Another approach to incentivizing freight carriers to update their fleets and take advantage of new technologies is through recognition and awards. In Dallas, TX, the Dallas-Fort Worth Clean Cities (DFWCC) coalition has instigated a fleet recognition award program to recognize fleets that are making extra efforts to reduce fuel use and improve air quality in North Texas. This is based on an annual survey, and the criteria for the award are shown in **Table 1**.

Table 1. DFWCC Fleet Recognition Award Program

Partnership with DFWCC	Emissions Reduction	Fuel Consumption Reduction
20 Points Maximum	55 Points Maximum	25 Points Maximum
• Attendance and Presentation or Speaking at any DFWCC Sponsored Event/Webinar • General Involvement with DFWCC	• Amount and Composition of On-Road and Non-Road Alternative Fuel Vehicles • Implementation and Enforcement of Idle Reduction Policy • Time Idling Reduced	• Overall Fleet Efficiency Improvements • Smaller Vehicles, Lightweight Materials, etc. • Practices to Reduce Vehicle Miles Traveled

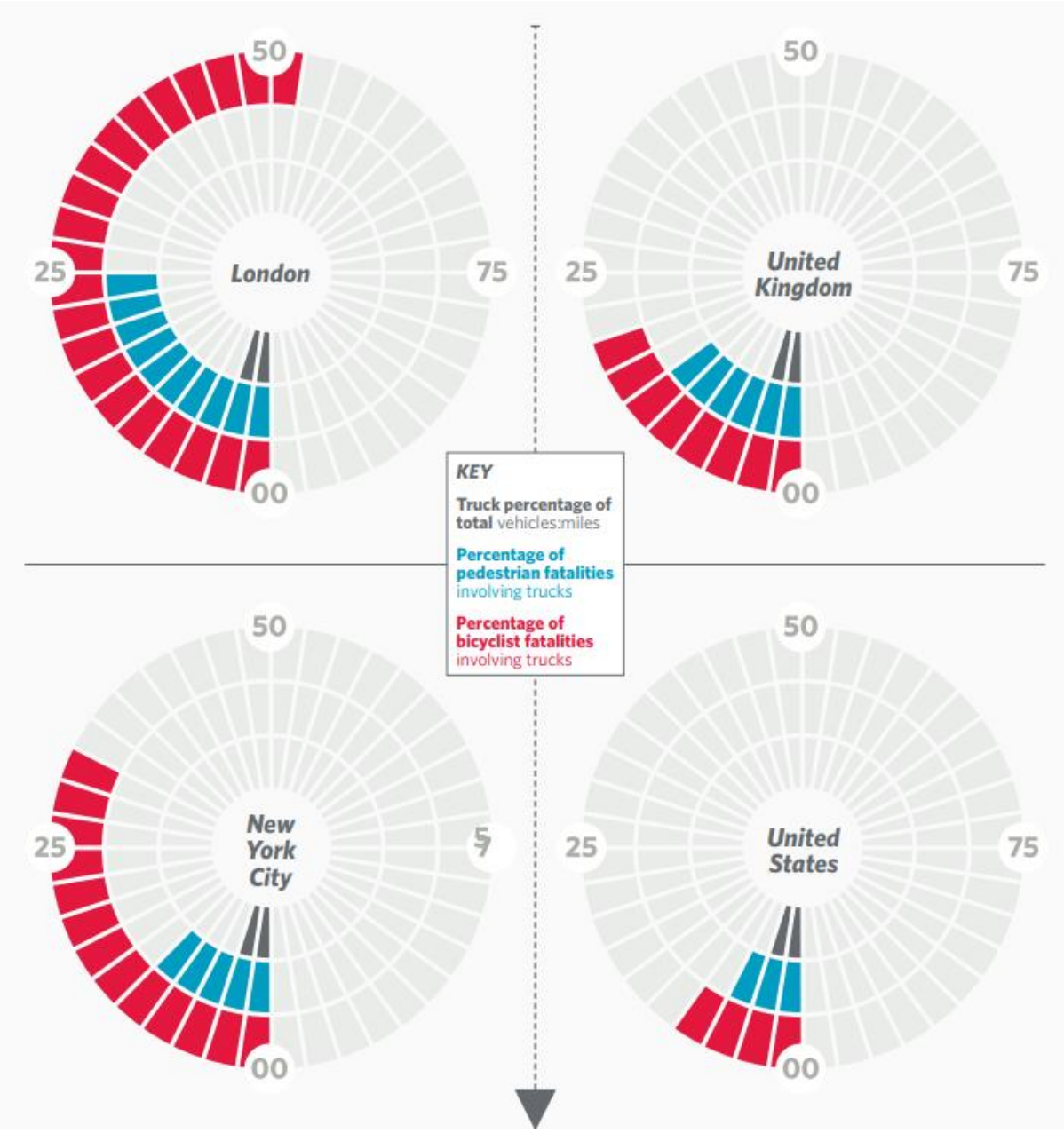
Source: DFWCC

While the DFWCC scheme is focused on public fleets, such a scheme could be developed to reward and promote private businesses that are taking the lead when it comes to reducing the emissions associated with freight transportation in the city.

4.4 Improving Urban Truck Safety

The design of large truck presents inherent challenges for pedestrian and bicyclist safety, especially in urban areas. A previous HDR analysis of truck involved crashes in New York City and London, UK highlighted the disproportionate impact of trucks on pedestrian and bicyclist fatalities (**Figure 26**). As walking and cycling volumes in cities increase, so does exposure to trucks, which can lead to more fatal outcomes without interventions.

Figure 26. Comparison of Truck Involved Bicyclist and Pedestrian fatalities in NYC and London



Source: HDR

Many cities are now taking active steps to reduce and eliminate truck involved fatalities. Some of the solutions and activities are described in the following sections.

4.4.1 Safer Truck Design

SIDEGUARDS

Sideguards are standard equipment in the European Union, UK, Japan, and Brazil, where they are mandated by legislation. UK studies show side-guards are an effective countermeasure to reduce the number of vulnerable road user fatalities and severity of injuries. Fatality rates for cyclists and pedestrians colliding with a side of a truck decreased by 61% and 20% respectively after side-guards were required in 1986. **Figure 27** shows examples of sideguards installed on trucks.

Figure 27. Examples of Sideguards

Source: NYC

In 2010, the National Research Council Canada produced a report on truck side guards. The study points out that the height, strength, and location of side guards affect their effectiveness in minimizing incident severity[36].

IMPROVING DRIVER VISION

Truck drivers often must rely on multiple mirrors to observe what is happening around their vehicle, but despite this, there are often blind spots as shown in **Figure 28**.

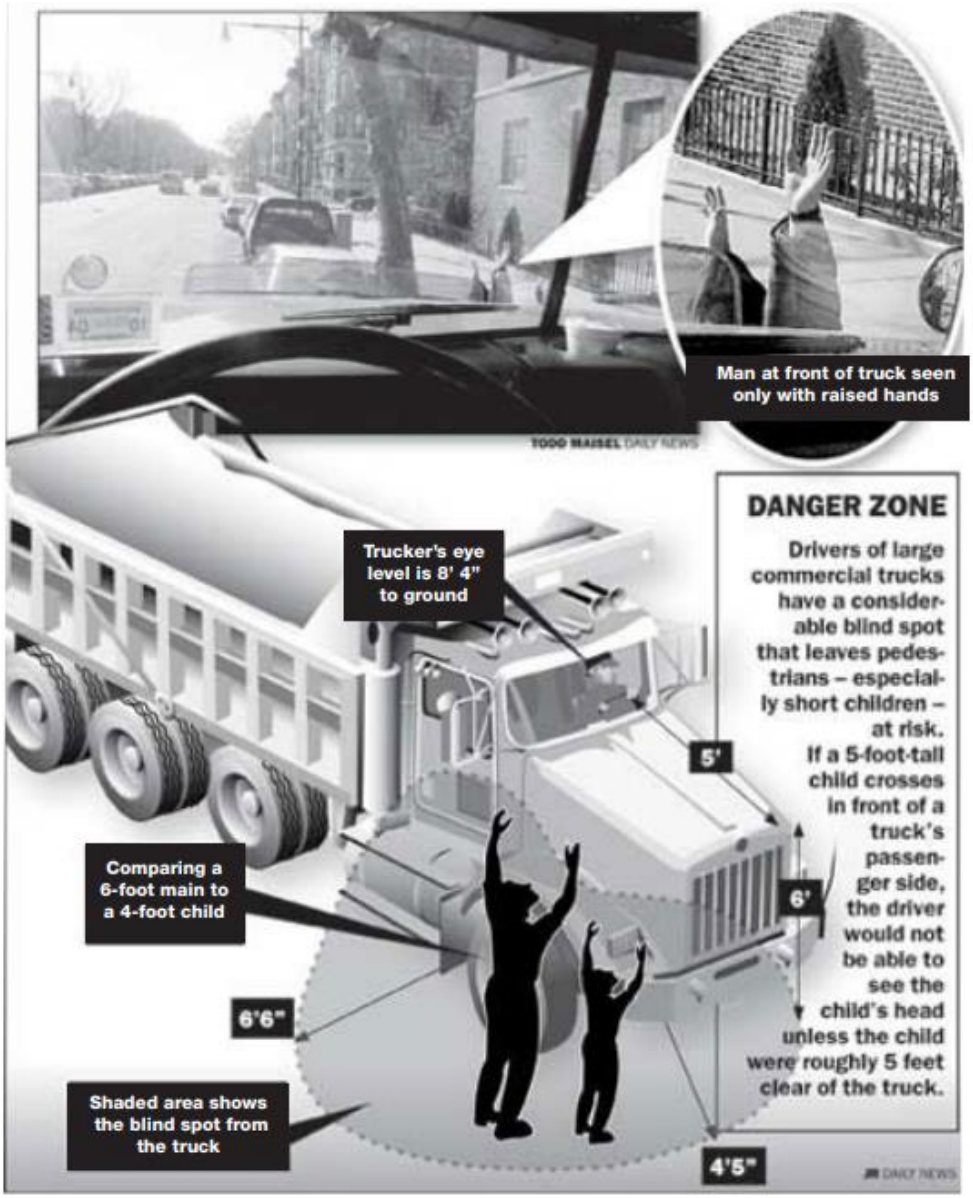
Figure 28. European Type Truck Driver Vision

Source: Transport for London

[36] J. D. Patten, C. V. Tabra (2010). Side Guards for Trucks and Trailers Phase 1: Background Investigation. *Centre for Surface Transportation Technology*. Available: https://www.volpe.dot.gov/sites/volpe.dot.gov/files/docs/side-guards-for-trucks-and-trailers-phase-1-background-investigation-jd-patten-canada.pdf

While this is a European style cab over engine truck, North American trucks also have a significant blind spot in the front as shown in **Figure 29.** New York City enacted a requirement for cross over mirrors, which provide visibility to the front blind spot, to be installed on trucks operating in the city.

Figure 29. Blind Spot of a North American Type Truck



Source: NYC

Some truck manufactures are now building truck cabs with improved driver vision, and these are specifically targeted for use in urban locations. The left side of **Figure 30** shows an example of a high visibility truck that is now available in North America, and the right side shows the improvement in the drivers' direct vision.

Figure 30. Hi-vision truck cab | Vision Cone from Hi-vision cab

Source: Dennis Truck Manufacturer

Other solutions to improve driver vision and awareness include:

- Blind Spot mirrors e.g., the crossover mirror used in NYC
- Blind spot cameras
- Fresnel lenses
- Turn alarms including visual and audible methods
- External sensors such as ultrasonic and radar.

4.4.2 City Leadership

Many cities operate their own fleets or contract trucks for a variety of services they supply to their residents. This includes waste collections, street maintenance, etc. Some cities have led by example and sought to better integrate safer trucks into their contracted trucks and their own fleet operations.

In 2012, the City of Boston engaged Volpe to volunteer as a test bed city, initiating the truck side-guard technology demonstration and evaluation process in the US.[37] Volpe and Boston launched a side-guard pilot of 19 city owned trucks in May 2013 and collaborated in 2014 to develop the nation's first side-guard ordinance requiring the adoption of this safety technology on private truck fleets; the "Ordinance requiring city vendors to safeguard unprotected road users" was enacted in October 2014 and took effect in May 2015, effecting up to 230 trucks.

The City of Cambridge, MA, also engaged Volpe in 2014 to retrofit its city-owned truck fleet, while the University of Washington held a sideguard press event in Seattle for its fleet of 31 retrofitted trucks. Additional side-guard adoption is underway in Portland, OR, Washington, D.C., San Francisco, and Somerville and Newton, MA.

New York City operates over 30,000 owned and leased vehicles, the largest municipal fleet in the United States. The City's fleet operator, the Department of Citywide Administrative Services (DCAS) has installed over 60,000 safety systems on city vehicles including the largest truck

[37] https://www.boston.gov/streets-and-sanitation/vehicle-side-guards

sideguard program in North America and one of the largest singular telematics programs. It has also started to introduce hi-vision trucks into its fleet.

In July 2022, the City of Vancouver mandated the use of side guards or lateral protection devices on all trucks owned or contracted by the municipality.[38] The cities of Halifax and Montreal also now require side guards to be used on certain trucks[39] [40]Education

TRUCK DRIVERS

Transport for London's Safe Urban Driving module is a one-day course designed for both truck and bus drivers. Aspects of the course include hazard recognition, defensive driving techniques, driver attitude and what to do in the event of an incident. It combines a half day classroom exercise with a half day on the road practical module. This gives truck drivers firsthand experience with the issues faced by vulnerable road users and has proved transformative in truck and bus driver behavior. Truck driving simulators have also been used to train drivers to operate trucks on different types of roads (urban, rural, motorways), traffic conditions and weather conditions.

Ontario-based driving school CHET (Commercial Heavy Equipment Training Ltd., and subsidiary of Musket Transport Ltd.), recently partnered with the Smart Freight Centre on the City Logistics for Urban Economy research project[41]. The project includes 24 separate research topics, including one on driver training.

EXCHANGING PLACES

Both New York and London have programs that give cyclists the opportunity to sit in a truck and share the perspective as to what a truck driver can see and more importantly what they cannot see. Authorities utilize good relations with the local trucking industry to provide a truck, so that cyclists and pedestrians can be invited to sit in a truck and see the road from the perspective of a truck driver. **Figure 31** shows the Exchange Places event in New York City.

[38] https://www.trucknews.com/regulations/city-of-vancouver-to-require-side-guards-on-its-trucks/1003167611/#:~:text=The%20City%20of%20Vancouver%20will,unanimous%20council%20vote%20last%20week.
[39] https://signalhfx.ca/council-approves-side-guards-on-solid-waste-vehicles/
[40] https://montreal.ctvnews.ca/montreal-makes-side-guards-on-snow-removal-trucks-mandatory-1.5285627
[41] https://uttri.utoronto.ca/news/chet-selected-as-training-partner-for-city-logistics-for-the-urban-economy-research-project/

Figure 31. Exchanging Places event in New York City

Source: NYC

4.5 Managing Demand

4.5.1 Out of Hour/Off Peak Deliveries

One solution that has been trialed by several municipalities and authorities is actively promoting the retiming of deliveries to less busy periods of the day. This includes early morning, typically prior to the weekday peak hours, or during the night or late evenings. Benefits of Off-Peak Deliveries (OPD) can include higher travel speeds for commercial vehicles off hours (compared to daytime or peak hours), reduce traffic demands during peak hours, improved shelf-restocking for businesses, reduced truck emissions, and improved pedestrian and bicycle safety due to fewer conflicting trucks.

Peel Region and the Smart Freight Centre conducted a pilot study on Off-Peak Deliveries in 2019[42]. The pilot project tested off-peak deliveries with three firms, LCBO, Loblaws Incorporated and Walmart. The pilot lasted for six months in 2019, and during that time 30% of deliveries to participating retail stores were made off-peak, between 7:00 pm to 7:00 am. The average speed of off-peak trips were 18% faster than those that happened during the day.

All three firms that participated in the study supported the continuation and expansion of the OPD program. The Region is currently working to develop a OPD program and expand it to include other municipalities in the Greater Toronto and Hamilton Area.

Researchers from the Smart Freight Centre and University of Toronto also recently estimated the potential impacts of OPD. They found that OPD provides the largest benefit to smaller light delivery vehicles, as these vehicles have similar route patterns to that of passenger cars. The

[42] https://www.peelregion.ca/transportation/goods-movement/_media/pdf/pilot-off-peak-delivery-program-report.pdf

study found that trucks that shifted to OPD in Peel Region could achieve travel time savings between 15 to 25%.[43]

Other cities around the world have also adopted or piloted OPD, including the City of London for the London 2012 Olympics, and Toronto for the 2015 Pan-Am games. New York City has also introduced an off-hours program which actively seeks participants. It has developed online materials to help inform communities and operators of the program – ohdnyc.com – and includes toolkits associated with How to Guides and Noise Management.

HDR's experience with OPD programs and its staff's work in NYC and London is that retiming can be a significant challenge. Not all delivery activity can be retimed – package deliveries are good examples, while deliveries to commercial establishments such as offices are timed when staff are there. Retail establishments, particularly those associated with vertically integrated and consolidated distribution operations present more opportunities, as there is often a benefit in getting product into store early and placed on the shelves, when customers are not in the store. Some companies also employ unattended delivery solutions, where the driver can access the store and leave the product when no staff are present. Getting companies to think about retiming and what the benefit is for them is critical.

4.5.2 Urban Consolidation Centres

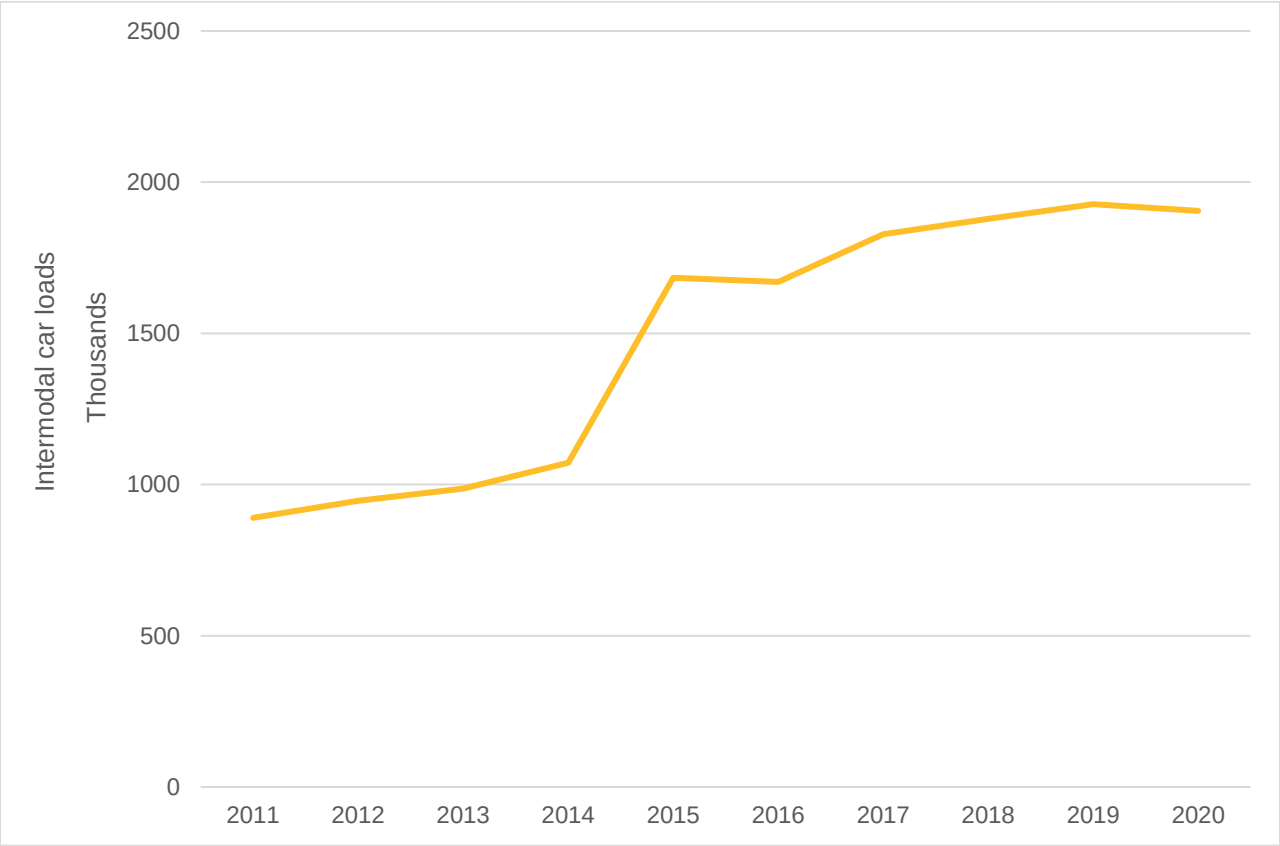
Urban freight consolidation centers (UCC) are warehouse facilities located near a city center, town or other service area, which collect large truckloads of freight. Goods are then distributed according to the most efficient route on smaller vehicles. UCCs also facilitate the usage of alternative vehicles, whether electric or human powered and their role in cargo bike operations was discussed in an earlier section. UCCs have been implemented in various capacities over the last few decades, mostly as publicly run endeavors in Europe. A mini boom of consolidation center planning occurred in the 1990s, but many that were planned were never implemented, and those that were implemented did not last long due to financial issues when public subsidies were stopped. Identifying a sustainable business case is one of the critical challenges associated with the wider deployment of shared user, UCCs.

4.5.3 Growth in Rail Intermodal Traffic

As shippers and logistics companies seek to respond to changing supply chain dynamics, reduce their costs, improve their environmental performance, and respond to truck driver shortages in the long-haul trucking market, it is expected that intermodal rail traffic growth will continue to rise for both domestic and export/import journeys. As shown in **Figure 32**, the number of intermodal railcars moved on Canadian railways has significantly increased from 2011.

[43] Chowdhury, T., Vaughan, J., Saleh, M., Mousavi, K., Hatzopoulou, M., Roorda, M.J. (2022). Modeling Impacts of Off-peak Delivery in the Greater Toronto and Hamilton Area. Transportation Research Record: Journal of the Transportation Research Board. doi.org/10.1177/03611981221089552.

Figure 32. Intermodal rail cars moved by railways in Canada – 2011 to 2020.



Source: Railway Association of Canada

The growth of intermodal traffic is believed to have increased truck trips in the city and region, specifically to the Brampton, Vaughan and Malport intermodal terminals. The vast majority of intermodal containers that enter these intermodal terminals are destined locally, and are drayed from the terminals to warehouses and distribution centres. Brampton Intermodal Terminal was recently operating near capacity due to a rapid influx of intermodal containers and insufficient warehouse space in the region. Intermodal volumes to the region are expected to continue increasing, as much of the traffic is related to consumer consumption, which is tied to population growth.

CN's planned Milton Logistics Hub[44], which will be located in the adjacent Halton Region, is expected to provide some relief to CN's busy intermodal yards. It is not expected to be complete for a number of years.

Despite the future Milton terminal being located outside of Brampton, the City's significant concentration of warehousing and distribution space will continue to attract containers (truck trips) from the new terminal. Once in operation, it is expected that CN will ship intermodal traffic from a certain set of origins to Milton, while Brampton will receive intermodal traffic from a

[44] https://www.cn.ca/en/about-cn/milton-logistics-hub/

different set of origins. This means that shippers will likely not have a say in which terminal their goods/containers are shipped to. Therefore, shippers will not be able to minimize drayage distance by shipping their containers to the rail terminal that is closest to their warehouse / distribution facility. Therefore, the addition of the Milton terminal is not expected to remove significant volumes of intermodal truck trips form Brampton, but instead result in long drayage trips from the new terminal to the existing warehouses and distribution centres throughout Brampton and the rest of the region.

As they are implemented, autonomous and electric trucks may begin to mitigate some of the impact of truck trips, but other improvements may have to be made to local infrastructure to accommodate truck traffic growth. As truck volumes entering and exiting these yards change, there will likely be a need to further manage traffic to address safety and efficiency concerns, and interventions such as traffic signal optimization or laning changes may be needed.

4.6 Partnerships, Public and Industry Engagement and Education

Public and industry education and engagement can be a critical component for successful freight projects, initiatives, and strategies. Many freight projects and plans across North America include public engagement as a distinct workstream to solicit input and create awareness from key users and the wider public. Methods of engagement include surveys and questionnaires, online and in person meetings and videos. Some departments of transportation in North America establish Freight Advisory Committees (FAC) to assist in the development of statewide freight plans. Establishing a FAC is recommended in US federal regulations. Freight quality partnerships (FQP) have been established in some parts of the UK to provide a forum for the freight industry to engage with local authorities and provides a method for two-way information exchange on particular issues and seeking solutions to complex situations. Examples of freight forums in Canada include:

- The GTHA Urban Freight Forum that was established for the development of the Urban Freight Action Plan.
- In April 2009, Peel Regional Council directed that a Peel Goods Movement Task Force be created to promote and advocate for efficient goods movement in the Region.

5 Summary & Key Opportunities

This discussion paper identified a range of opportunities and future trends that the City of Brampton can pursue to improve goods movement and livability. Based on this review, key opportunities for further consideration include:

Define a goods movement strategy. Brampton has been part of a proactive strategy to improve goods movement through its own transportation planning, and the work that the Region of Peel has done over the past two decades. The city could further define its role in goods movement planning by identifying goals and developing a strategy that compliments the work of Peel Region, such as improving livability in certain neighbourhoods or along corridors owned and operated by the city. This work could also define Brampton's advocacy positions towards the Goods Movement Task Force and regional planning efforts, including those done by Peel or the Province.

Identify the primary impacts of good movement on residents. There are many approaches that can be taken to reduce the impact of goods movement in urban environments. To determine which approach(es) should be taken, it is recommended that the public and key stakeholders are asked to identify the top impacts of goods movement through the TMP public consultation, and that the findings from this exercise are used to guide which areas are pursued in more detail, either through the TMP, or through a separate livability/goods movement planning exercise. Freight or Neighbourhood Advisory Committees could also be developed to continue the consultation beyond the TMP.

Similarly, the impact of freight transportation can also be quantified, such as by reviewing collision data and associations with truck traffic. This information can be used to identify collision hot spots and/or routes that have high occurrences of truck related collisions, and these could be areas that are focused on for improvement.

Mitigate the impacts of goods movement on livability and enable transit improvements. Informed by a goods movement strategy and understanding of the public's perception of impacts, the City of Brampton can pursue changes, such as those covered in this document, to reduce the impact of goods movement on communities and along key corridors. This includes balancing the need for space between transit and trucks, managing truck parking, and developing complete streets that balance and accommodate the needs of all users.

Goods movement planning collaboration. Mississauga and Brampton face many of the same challenges when it comes to goods movement, such as balancing the needs of goods movement with general passenger travel and community livability. It may be beneficial to collaborate on these challenges, as this would reduce the effort of both parties and would create a more uniform approach in the region. This could be done in a bi-lateral method or organized as a sub committee through the Goods Movement Task Force.

Improve goods movement to support further business development and growth. Businesses decide where to locate and grow based on a range of factors, including

transportation costs and the ease of doing businesses. There are many strategies that are currently available to improve the attractiveness of Brampton, such as improving truck operations through prioritization, ITS, geometric design, or expansion of the LCV network. There are also many new areas to be explored and championed to improve the attractiveness for prospective businesses, such as through piloting future technologies including autonomous vehicles or drones. Other strategies to be considered include the creation of a Foreign Trade Zone, such as around Pearson Airport.

Similar to the livability initiatives, it is recommended that the City of Brampton collaborate with key stakeholders and the business community to define a goods movement strategy, goals, and areas for improvement.