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Region of Peel

GOODS MOVEMENT

March 2019

Long Term Plan

Region of Peel
working with you

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Executive Summary

The Region of Peel has been established as an important component of the goods movement industry in Canada. Peel's well-established transportation network and proximity to the largest economic centre in Canada helps the region serve the Greater Toronto Area. Trends in population growth, transportation and warehousing activity, and freight trade indicate an expansion in the amount and value of goods transported to and from the region in the future. A goods movement team within Peel's transportation division was established in 2003 in order to improve efficiency, competitiveness, and sustainability of the goods movement system within Peel. A Goods Movement Strategic Plan (GMSP) was compiled to identify four strategic directions and 23 action items from 2012 to 2016. The trends identified in the GMSP are longer than a 5 year horizon, and therefore need to be planned out further to create a longer term framework for goods movement planning. As part of the broader planning context, a Goods Movement Long Term Plan (GMLTP) was identified as a need. The goals of the GMLTP include:

» Community and Environmental Sustainability
» Safety
» Economic Competitiveness
» Innovation and Technology
» Performance Management
» System Performance

In developing the GMLTP, stakeholder outreach was conducted. The first component of this involved industry interviews with fifteen private sector freight-intensive industries in the Region. The interview topics generally included discussion of: operations, geography, goods moved, volumes, transportation modes, performance, trends, and risks. Second, Peel's Task Force and Stakeholder Committee were consulted in order to collect feedback from the public and private sector regarding the study focus and content, as well as any concerns and issues. Finally, a public survey was conducted to gather broad, public input into the GMLTP. From this survey, it was understood that Peel residents were most concerned about the safety around goods movement as several respondents share the road with commercial vehicles and trucks on a daily basis, as well as several living in close proximity to roadways used heavily by trucks.

The Region of Peel can be thought of as the distribution hub of Canada. Retailers and manufacturers prefer Peel as the location from which to handle inventories and stage their operations. Peel's strategic advantage in the goods economy results in part because of its exceptional access to different freight transportation modes. Peel is intersected by 7 major provincial highways, contains rail intermodal yards operated by Canadian National (CN) and Canadian Pacific (CP), and is home to Canada's largest airport by passenger and cargo volumes. The freight transportation system highlights in the Region of Peel include:

Multi-Modal Network

» Peel is intersected by seven 400 series highways.

» It is estimated that Peel is involved in 9.5% of all for-hire intercity truck shipments in Canada, and is continuing on an upward trend.

» 35.9% of trucks surveyed in the Commercial Vehicle Survey (CVS) were found empty due to the proportion of major intermodal yards and distribution activity to serve consumption throughout the GTA.

» The top 3 commodities moved by tonnage are gravel (9.0%), mixed shipment (8.1%), and other food stuffs (8.0%). The top 3 commodities moved by value are motorized vehicles (12.8%), mixed shipments (10.9%), and electronics (9.8%).

» Truck trips in Peel are generated in the area surrounding the Toronto Pearson International Airport, the CN Brampton Intermodal Yard, and three 400-series highways.

» 54% of shipments originating in Peel and having destinations outside of Ontario are destined to the U.S., and 46% have destinations in Canada. For shipments destined to Peel from origins outside of Ontario, 65% have origins in the U.S. and 35% have origins in Canada.

» Long Combination Vehicle and Off-Peak Delivery options are available to mitigate congestion and maximize delivery services.

» There is $15M in capital projects planned in the next four years to increase roadway capacity and eliminate bottlenecks throughout the Region of Peel.

Air Cargo

» The Toronto Pearson International Airport is the largest airport in Canada that handles twice the volume of cargo and people as the next largest airport, and is situated in the Region of Peel.

» Toronto Pearson carried 356,000 tonnes of cargo in 2014 (approximately one third of all air cargo transported in Canada).

» Approximately 20.4% of tonnage handled at Toronto Pearson came from or was travelling to domestic destinations. The remainder was travelling internationally, with one third travelling to the U.S.

» Cargo volume at Toronto Pearson is expected to grow by 4.4% per year on average over the next 20 years.

Rail

» The Region of Peel is connected to the rest of North America through the Canadian National Railway and the Canadian Pacific Railway , as well as the Orangeville Brampton Railway (OBRY) that also operates in the Region.

» The CP line that stretches through Mississauga is estimated to carry 30 to 45 million gross ton-miles per track mile each year.

- Rail activity in Peel represents 18.6% of all rail tonnage flows involved in Canada. The largest rail shipment to Ontario is wheat, while other top commodities include automobiles, refined petroleum, waste/scrap, and etc.
- Intermodal shipments are one of the fastest growing markets for rail. The top growing commodities within these shipments include mixed loads and unidentified cargo.

Pipeline and Marine

- Pipeline infrastructure transports natural gas, crude oil, and petroleum products across Canada. The National Energy Board (NEB) estimates that $99.7 billion worth of energy was transported through Canada's pipeline network in 2015, though, pipelines play a relatively small role in goods movement in Peel.
- A natural gas pipeline is operated by TransCanada through western and northern Brampton.
- Trans-Northern and Enbridge operate oil pipelines that run through Mississauga. Trans-Northern's pipeline transports approximately 172,900 barrels of refined fuel products daily.

Much of Peel's employment lands for goods movement industries are located around the airport and intermodal yards, as well as along provincial freeways. With immense growth in population and employment, demand for freight movement and infrastructure has increased. With this in mind, effective land use management of these corridors is required to preserve the efficient movement of goods to and from freight facilities. It has been determined that the creation of land use designations to accommodate goods movement corridors are rare. However, in order to strengthen the presence of this industry in Peel, the Region has expressed interest in assessing a new designation within their official plan to promote these corridors. A special policy area or overlay introduced at the regional level is recommended in place of policies that direct local municipalities to create goods movement-specific land uses. By introducing a regional special policy area or overlay, the permitted uses of existing parcels along goods movement corridors could stay unchanged and an over-saturation of goods movement uses can be avoided. Additionally, this allows local municipalities to formulate customized goods movement policies that effectively work with local characteristics and needs.

The top ten commodities flowing through the Region of Peel were determined through the Ministry of Transportation's (MTO) Commercial Vehicle Survey. The importance of these commodities can be seen in the following Table.

Table 1: Commodity Flows through the Region of Peel

Commodity Name	Value Moved Though Peel (M CAD)	Tonnes Moved Through Peel (000')
Pharmaceuticals	$31,667	-
Mixed freight	$44,736	-
Electronics	$34,652	-
Motorized vehicles	$31,838	-
Other foodstuffs	$21,290	-
Machinery	$16,795	-
Chemical prods.	$14,630	-
Gravel	-	8,960
Waste/scrap	-	7,068

In order to draw a direct relationship between industries in Peel and commodity flows, an analysis was performed to develop a link between the Standard Classification of Transported Goods (SCTG) commodity grouping and the North American Industry Classification System (NAICS) industry grouping. This linking can be done at two levels – the propensity of industries to ship certain commodities and the proportion of industries shipping certain commodities.

The existing and future stress on the corridors was understood through a "hot spots" analysis. The analysis has focused on identifying corridors which are witnessing systemic tonnage, safety, and congestion issues due to commuter and truck volumes for the existing and future horizon year (2041). With the development of a long term plan, an understanding of where the future hot spots are, as well as key trends that impact the goods movement industry is necessary. The existing hotspots identified include Cawthra Rd, Dixie Rd, Mavis Rd, Courtney Park, Derry Rd, Erin Mills Pkwy Mississauga Rd, Steeles Ave, Airport Rd, Queen St, Goreway Dr, Steeles Ave, Mayfield Rd, Hwy 50, and Bovaird Dr.

The highest priority future hot spots include Airport Rd from Highway 427 to Derry Rd, Derry Rd from McLaughlin Rd to Airport Rd, Dixie Rd from Highway 401 to Derry Rd, Mayfield Rd from Highway 410 to The Gore Rd, Queen St from Airport Rd to Highway 27, and Steeles Ave from Winston Churchill to Highway 27.

Several economic, technological, operational, and policy trends and risks outlined below have a bearing on goods movement industries in Peel.

- **Population and Employment Growth:** Population and employment are forecasted to grow in the Region of Peel, which aids in strengthening the overall regional economy, but increases stress on the transportation network.
- **Labour Force Availability:** Labour force availability in Peel is currently not a concern for the trucking industry, but might be in the long-term. With the growth in goods movement, there is an availability of training and jobs for residents, but with a decrease in drivers entering this career, businesses might find an unmet need.
- **Long Combination Vehicles:** LCVs provide benefits to the transportation network in Peel by reducing the stress caused by peak period congestion and improve supply chain efficiency in the future. However, LCVs cannot be used for all goods and varying policies across provinces further limits this use of short-haul trips.
- **Off-Peak Delivery:** OPD, similar to LCVs, has the ability to help mitigate peak period congestion and increase local manufacturing in Peel. However, OPD is limited to businesses that ship at a larger scale, and by policies that vary across municipalities.
- **3D Printing:** As technology advances and adoption of 3D printing increases, we may see a shift towards local manufacturing and on-shoring. While this will contribute to Peel's local economy, manufacturers will still rely on the current model for the movement of raw materials.
- **Connected and Automated Vehicles:** Once fully implemented, CAVs will redefine the motor carrier industry with increased safety and efficiency which can result in less congestion on Peel's transportation network. However, this shift affects current business models and will impact labour income as the need for workers decreases.
- **E-Commerce:** E-commerce is a growing trend that has forced retailers to reconsider their supply chain and distribution structure. E-commerce has the ability to help grow local businesses, however, it increases overall vehicle-kilometers travelled (VKT) on Peel's network for last mile home deliveries.
- **Climate Change:** With the onset of climate change, we can see a shift in policies as well as advancements in technologies towards greener initiatives. However, if green technologies are not adopted in the goods movement industry, emissions will have an increasing impact on pollution and quality of life for residents.
- **Education and Outreach:** Various stakeholders involved with this study identified a gap where residents should be educated on goods movement and how it relates to Peel businesses and consumers. Education and outreach conducted by the Region of Peel shows leadership in freight planning.
- **CN Milton:** With a new intermodal yard proposed in Milton, Peel has raised concerns about potential business shifting away from the region. However, as a whole, the CN Milton facility will further strengthen the national rail network for freight.

- **Highway 407 ETR:** Highway 407 ETR operates through the Region of Peel and aids in the reliability of just-in-time product manufacturing. However, this reliability and convenience can be expensive for manufacturers and is used sparingly.
- **Trade Agreements:** Trade agreements can reduce or remove barriers for accessibility as it allows countries to make their goods available. Trade agreements however, can harm local businesses in Peel and increase economic interdependence.
- **Freight Data:** Reliable freight data is needed to evaluate the goods movement network. Currently, data availability has been identified as a gap that limits the full end to end fluidity of the supply chain.

Eleven long-term pathways were developed for goods movement in the Region of Peel. These pathways take into account the trends and risks faced by Peel over a long-term period. These pathways will help the region align itself to be at the forefront of goods movement.

Table 2: Goods Movement Long-Term Pathways

Long-Term Pathway	Desired Outcome
Promote and Sustain the National Economic Importance of Peel	Leverage and attract investment to make systematic improvements to Peel's road network.
Examine Special Policy Land Use Type for Goods Movement	Protect existing industrial lands and corridors, establish appropriate buffers with sensitive land uses, and plan for and accommodate future growth including new programs and trends.
Invest in Freight Data	Develop a publicly available Peel Freight Data Warehouse for planning purposes.
Encourage Off-Peak Delivery (OPD)	Increase the use of OPD through the removal of constraints and encouraging well-integrated companies.
Adapt to E-Commerce	Remain competitive as an e-commerce freight hub.
Invest in Infrastructure and Technology	Improve overall system efficiency and optimization by focusing on existing and future 'hot-spot' corridors.
Understand Labour Force Availability	Understand the current and future labour force availability for the goods movement industry.

Long-Term Pathway	Desired Outcome
Encourage Long Combination Vehicles	Encourage the use of LCV in the goods movement industry to optimize safety and improve business operations.
Adapt to the Connected and Automated Vehicle Shift	Apply and adapt infrastructure to CAV technology.
Combat Climate Change	Align with climate change initiatives and reduce overall GHG emissions.
Support Rail and Intermodal Expansion	Expand rail and intermodal infrastructure for future growth in the Region of Peel.

1 Introduction

In This Chapter:

outcome that the Region would like to achieve with this Term of Council Priority is to reduce congestion on high volume truck routes at peak hours.

1.5 Rationale

The purpose of the GMLTP is to understand the underlying context for goods movement activity in the Region and present a strategy towards reaching the long term vision of the Region of Peel.

1.1 Benefits of Goods Movement

The Region of Peel is a significant freight hub for Canada and has demonstrated leadership in this field. The growth in goods movement-related industries in Peel Region and the importance of these industries to the national economy has reinforced the need for continued planning in this area.

The Region of Peel has established itself as an important marketplace for goods moving industries, driven by a well-established transportation network and proximity to the largest economic centre in Canada, the Greater Toronto Hamilton Area (GTHA). Not only do the Region's goods movement functions serve the GTHA, but many companies choose to locate in Peel to serve national markets, demonstrating the national importance of the Region.

The agglomeration of multimodal goods movement hubs, goods moving industries, and access to transportation networks in the Region further reduce the business costs of moving goods in and out of the Region. This allows Peel, Ontario, and Canada to be more competitive and support international trade.

Goods movement is the backbone for high quality lives as it provides for the goods and services consumed every day. In a continually globalizing world, diverse and affordable goods are made available from the underlying activities of freight and goods movement. Now more than ever, the importance of freight is evident in the rise of online shopping and e-commerce. As our region grows, so too does consumption, driving the demand for more and faster freight movements.

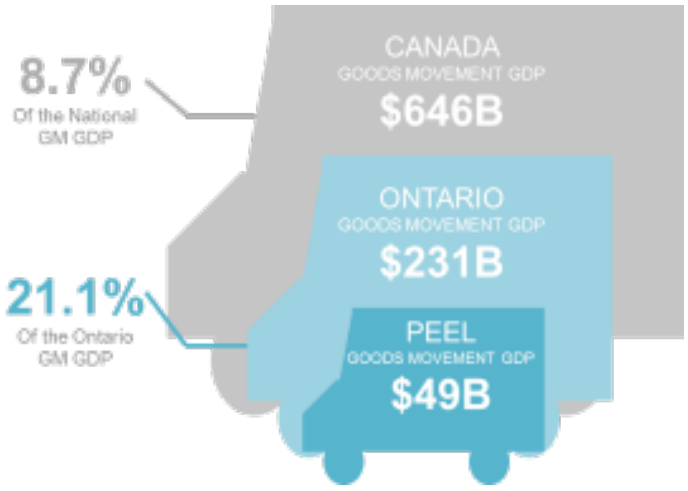
Consumption and commerce are the ultimate drivers of goods movement, which underpin the widespread economic benefits that impact Peel, Ontario, and Canada.

Goods movement-related businesses are key to Peel's economic vitality and Peel is a significant freight hub for the GTHA, Southern Ontario and the rest of Canada. Some indicators of Peel's role in the broader goods movement sector are that:

- Good moving-related industries in Peel contributed $49 billion of GDP to the Peel economy, which is 21% of all goods movement-related GDP in Ontario, and 8.7% Canada-wide.
- Goods movement-related industries account for 45.4% of jobs in Peel Region. These jobs create roughly $29 billion in labour income.
- It is estimated that in 2013, goods movement industries contributed $130.1 million in property tax revenue to the Region.
- Toronto Pearson International Airport handles more air cargo than the Vancouver and Montreal airports combined.
- There are over 2,000 trucking companies in Peel.
- The CN Brampton and CP Vaughan intermodal yards are two of the largest in Canada.
- Peel accounts for 15% of Ontario's exports.

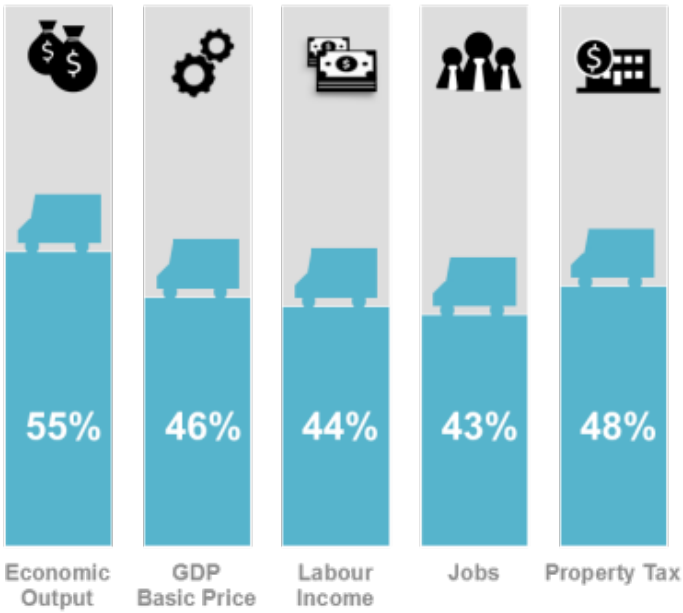
- Approximately $1.8 billion worth of goods move through Peel every day on the east-west highways.[1]
- Truck activity in Peel represents about 36% of all truck activity in Ontario.[2]
- Approximately 50% of Ontario's truck trips have either an origin or destination in Peel.

Figure 1: Goods Movement GDP



Note: Values shown include direct, indirect and induced economic impacts. Goods movement (gm) dependent Industries include: NAICS 11 – Agriculture, forestry, fishing and hunting; NAICS 21 – Mining, quarrying, and oil and gas extraction; NAICS 23 – Construction; NAICS 31,32,33 – Manufacturing; NAICS 41 – Wholesale trade; NAICS 48,49 – Transportation and warehousing

Figure 2: Goods Movement Impact in Peel

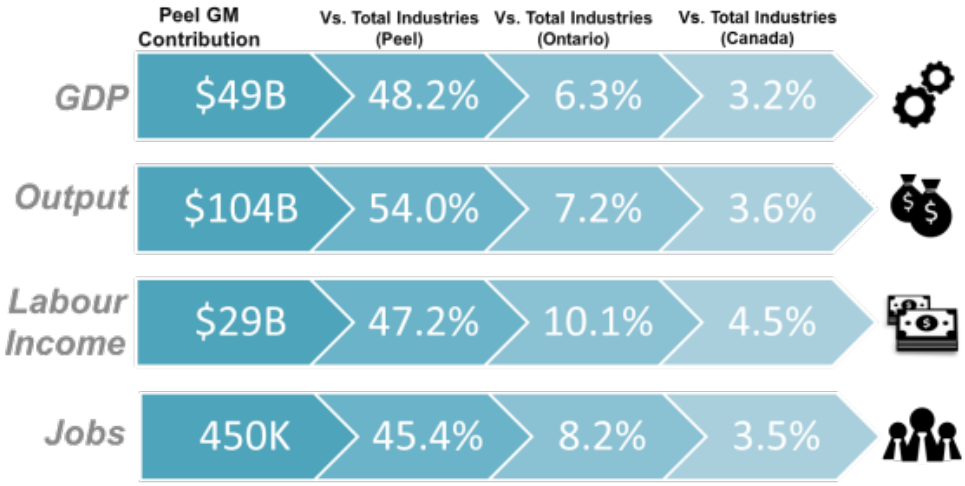


Note: Percentages shown are based on direct GDP, output, labour income and job values only.

1 Ministry of Transportation – Commercial Vehicle Survey 2015

2 MTO CVS (Peel Presentation)

Figure 3: Goods Movement Contribution in Peel



Note: Values shown include direct, indirect and induced economic impacts for goods movement-dependent industries in Peel. Percentages are based on the proportion of goods movement-dependent industry impacts in Peel against the impacts of all industries in the respective geographies.

Trends in population growth, transportation and warehousing activity, and foreign trade indicate a considerable expansion in the amount and value of goods transported within and through Peel Region in the future. The increase in population, for example, will require more food, clothing, and household goods; more homes, stores, and other buildings will have to be built; waste products have to be collected and transported to disposal yards. All of this involves an increased movement of goodswhich needs to be effectively planned for.

1.2 Project and Team Overview

The Goods Movement Team within Peel's Transportation Division has taken a leadership role in the area of goods movement across the Greater Toronto and Hamilton Area (GTHA). The team was established in 2003 with a mandate to improve the efficiency, competitiveness, and sustainability of the goods movement system in the Region. Since then, the team established the Goods Movement Task Force, completed innovative studies, established a Strategic Goods Movement Network, and released the 2012-2016 Goods Movement Strategic Plan.

The team's efforts include studies, inter-regional workshops, and advocacy campaigns covering issues such as congestion, legislative and regulatory impediments and barriers, operational barriers, comprehensive data collection, and strategic goods movement planning.

1.2.1 Rationale

The purpose of the GMLTP is to understand the underlying context for goods movement activity in the Region and present a strategy towards reaching the long term vision of the Region of Peel that is data driven and stakeholder informed. A Goods Movement Strategic Plan (GMSP) was compiled to identify four strategic directions and 23 action items from 2012 to 2016. The trends identified in the GMSP as longer than a 5 year horizon need to be planned out further to create a longer term framework for goods movement planning. Future GMSPs will be based off this document.

As per the Growth Plan for the Greater Golden Horseshoe (2017) requirements, the Region of Peel will grow during the 2017 to 2041 horizon, which will require an increase in the movement of goods and services, contributing to the overall growth of the regional economy. This increase in volume presents a need to reevaluate the current goods movement system. The Goods Movement Long Term Plan (GMLTP) is the Region's guide for goods movement initiatives that have been identified based on the current needs and long term vision for the goods movement system. To build upon the GMSP, the GMLTP includes a stakeholder outreach, profiles of the freight transportation system, supply chain analysis, existing and future hot spots identification, as well as trends and risks to the goods movement sector in the Region of Peel. This analysis enabled the development of long term pathways and an implementation plan as the long term framework for goods movement planning.

1.3 Goods Movement Policy Context

Recognition for goods movement is growing in Canada, which is evident in many government-led initiatives that have commenced since the release of the Region of Peel Goods Movement Strategic Plan in 2012.

At the provincial level, MTO released the Freight-Supportive Guidelines in 2016, which encourages the integration of goods movement into planning processes. Additionally, MTO oversaw the implementation of a two-phased pilot for off-peak deliveries in Ontario during the 2015 Pan/Parapan American Games.

Metrolinx is engaged in advancing goods movement planning through the development of a GTHA goods movement data collection framework. Goods movement is a component of Metrolinx's Draft 2041 Regional Transportation Plan (RTP).

Metrolinx, in partnership with municipalities across the GTHA, is implementing various transit initiatives to mitigate growth-related congestion. Rapid transit projects are being invested in across the GTHA to relieve congestion and move people more efficiently and reliably. Other actions to effectively plan for population and employment growth can be found in the Metrolinx's Draft RTP.

More locally, Peel Region has gained traction in goods movement initiatives thanks to the completion of many of the action items from the 2012-2016 Strategic Plan, such as the integration of goods movement in studies and reviews for traffic and road safety, ITS strategic planning, enforcement management, and incident management.

Recognizing its importance in the municipality, goods movement has been named as a Term of Council Priority to support the implementation of Peel Region's 2015-2035 Strategic Plan. In 2017, the Region of Peel released the Goods Movement Strategic Plan 2017-2021 which includes nine Action Items for the Region to undertake to continue its commitment to improving goods movement for the community and businesses in Peel.

1.4 Peel's Goods Movement Program

The GMLTP is part of a broader goods movement program in Peel. Peel has demonstrated leadership in this area with forward-thinking goods movement planning initiatives. The growth in goods movement-related industries in Peel Region and the importance of these industries to the national economy underscores the need for continued planning in this area.

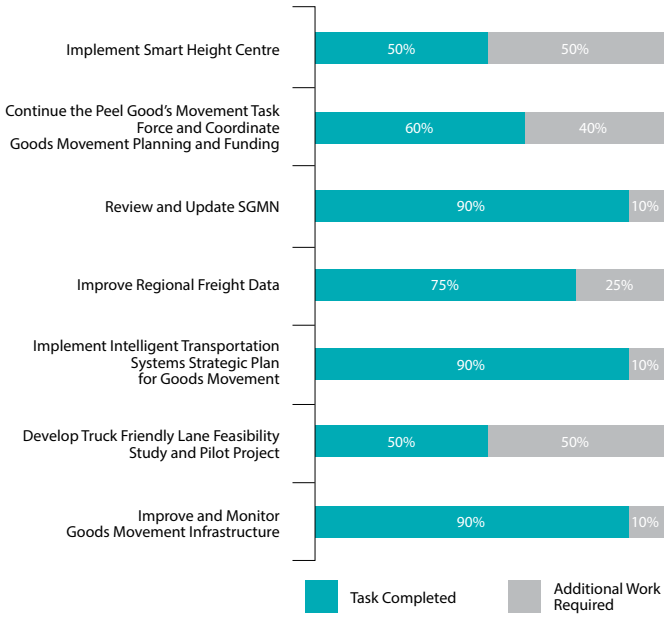
The Transportation Systems Planning Team within Peel's Transportation Division has taken a leadership role in developing and implementing goods movement strategies in the Greater Toronto and Hamilton Area (GTHA) and nationally. Peel's Goods Movement program was established in 2003. This was followed by the establishment of the public private Goods Movement Task Force in 2009. The Task Force's mandate is to improve the efficiency, competitiveness, and sustainability of the goods movement system in the Region.

Figure 4: Goods Movement Program and Strategy Timeline

In 2012, the Region released the 2012-2016 Peel Goods Movement Strategic Plan that established action items to be implemented over the next five-year period. These actions focused on improvements towards achieving the overall vision for the future goods movement system. The 23 action Items were prioritized over the five-year period of the Plan. While all 23 actions are complete, additional work on certain actions will continue into the 2017-2021 Plan update.

The GMLTP was developed in the context of work Peel has already completed. The analysis and conclusions of these studies form the foundation of the analysis complev ted for the GMLTP.

Figure 5: 2012-2016 Action Items with Additional Tasks



1.4.1 How Does the Long-Term Plan Differ from the GMSP

The Goods Movement Strategic Plan (GMSP) was released in March 2017 and outlines a five-year plan for the goods movement industry in Peel Region. The plan serves as an update to the 2012-2016 Goods Movement Strategic Plan. By identifying current gaps and needs, based on an understanding of the long-term vision and stakeholder input, the Strategic Plan suggests 9 new action items for the next five-year horizon between 2017 and 2021.

The Goods Movement Long-Term Plan (GMLTP) has been developed in conjunction with the GMSP with the understanding that several trends identified in the Strategic Plan require further planning and a longer-term framework. The GMLTP identifies 11 long-term pathways which build on the actions in the Strategic Plan while also identifying other long-term goals for the Region which will inform future Strategic Plans. The GMLTP is intended to be referenced every five years to support the development of subsequent Strategic Plans.

The following figures demonstrates how the action items in the GMSP relate to the long-term pathways developed in the GMLTP.

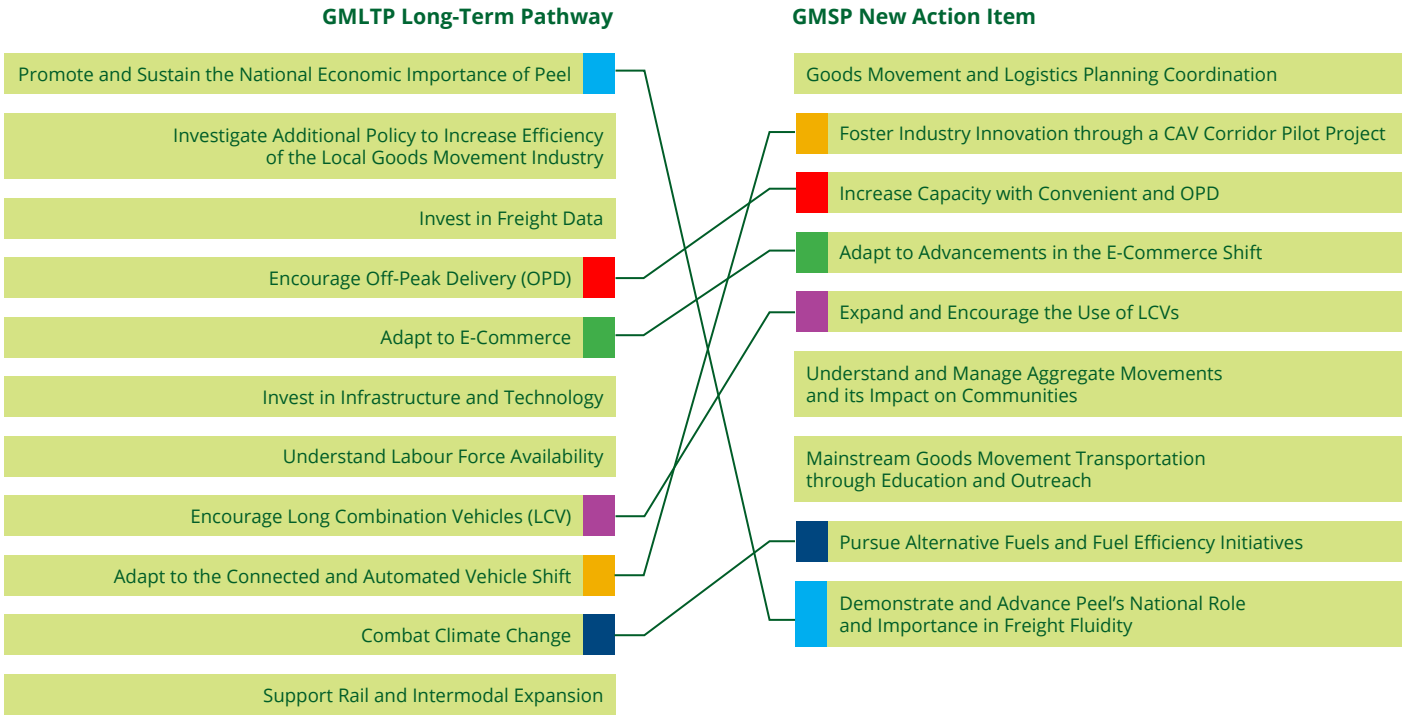
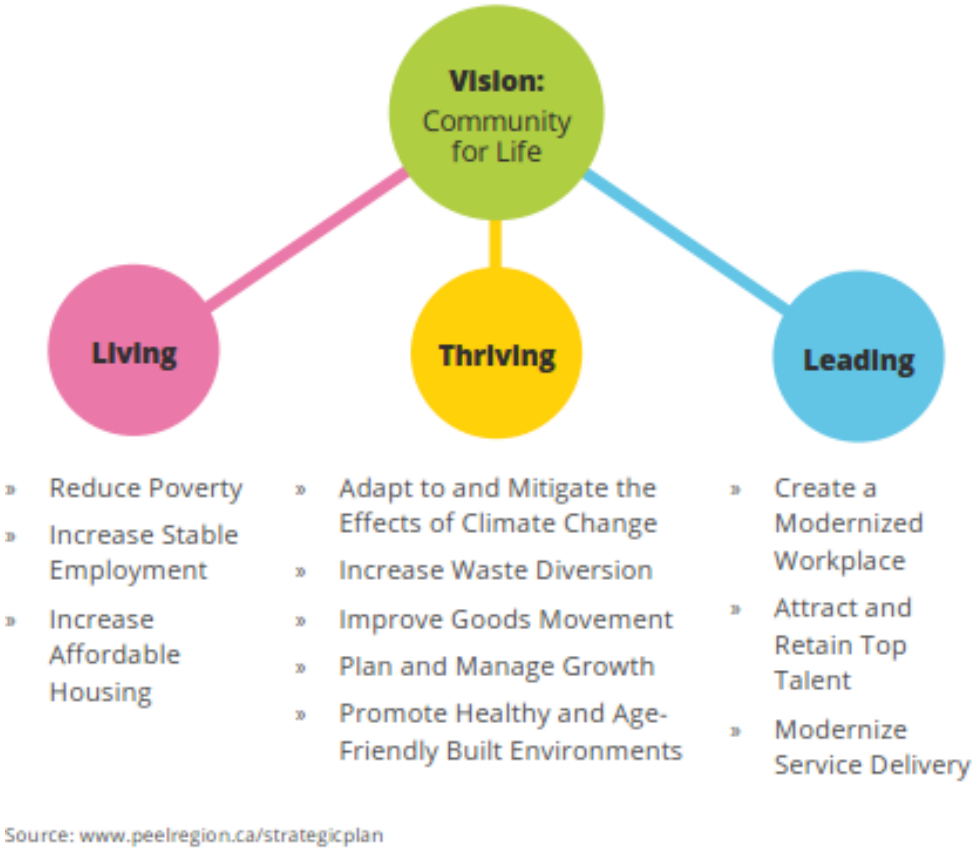


Figure 6: Relationship between the GMLTP and GMSP

1.4.2 Overarching Strategic Framework in Peel Region

The importance of addressing the impact of goods movement was highlighted in the Term of Council Priorities established by Peel Regional Council. Improving goods movement will be addressed through various strategies until the end of 2018. Term of Council Priorities represent what the Region is focused on for the current Council Term. With each new Term of Council, new four-year priorities will be set out that build off our past successes and further our progress towards our 20-year outcomes. "Improve Goods Movement" was identified as a Term of Council Priority. The outcome that the Region would like to achieve with this Term of Council Priority is to reduce congestion on high volume truck routes at peak hours.

Figure 7: Peel Region's Term of Council Priorities 2015-2018



Source: Region of Peel Strategic Plan

1.5 Organization of the Report

Chapter 1: Introduction
Chapter 2: Vision, Mandate, and Goals
Chapter 3: Stakeholder Outreach
Chapter 4: Profile of the Freight Transportation System in the Region of Peel
Chapter 5: Supply Chain Analysis
Chapter 6: Hot Spots
Chapter 7: Trends and Risks
Chapter 8: Long Term Pathways and Implementation Plan

2 Vision, Mandate, and Goals

In This Chapter:

2.1 Mission

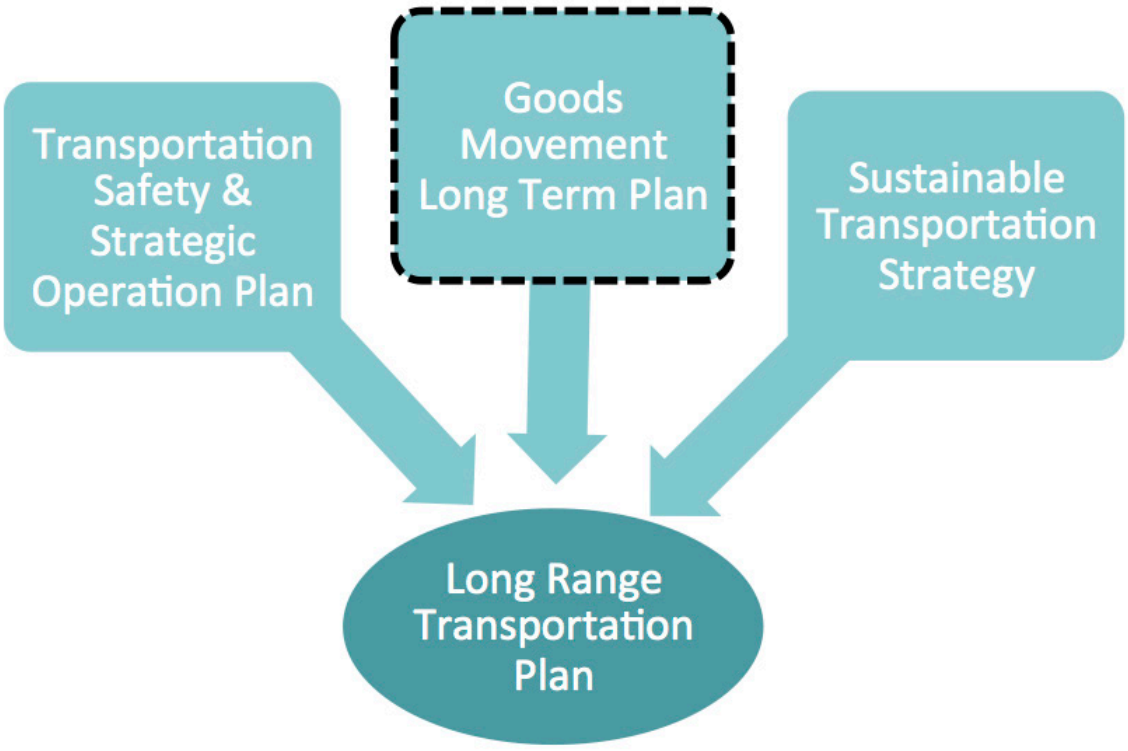
The mission for GMLTP in Peel conforms to the vision established by the Region's Long Range Transportation Plan that focuses on the desired future transportation system.

2.2 Freight Goals for the Region of Peel

The goals for GMLTP in Peel share the same themes as the objectives of the Provincial and regional planning policies – environmental quality, social vitality, and economic health. These goals allow Peel to strive for the same results while considering the unique needs of the goods movement transportation network.

The GMLTP is part of a broader planning context. Transportation planning goals and strategies are formulated in the Region of Peel's Long Range Transportation Plan (LTP).

Figure 8: GMLTP Planning Context

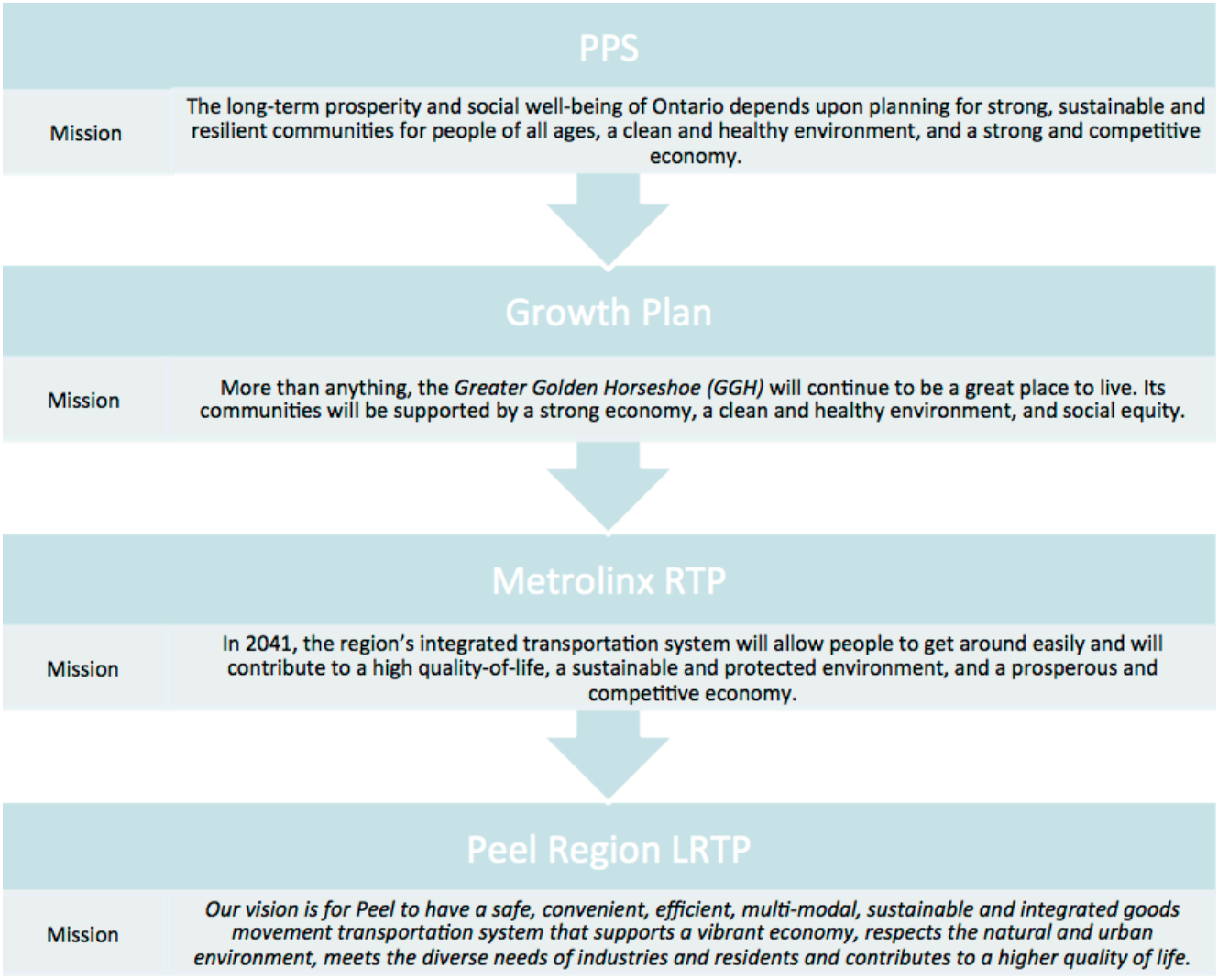


The LRTP, in turn, supports the planning goals of the Region of Peel's Official Plan, Metrolinx's Draft RTP , and the provincial policies set by the Growth Plan for the Greater Golden Horseshoe and the Provincial Policy Statement. Furthermore, the vision, mandate, and goals for both the Goods Movement Strategic Plan and Long Term Plan relied on input received from local businesses, stakeholders, and the public.

The vision, mandate, and goals identified in this section represent the road map that Peel Region will use to guide the planning, design, and engineering of the transportation network for goods movement.

The goods movement mandate and goals for Peel conforms to the long-term vision for Ontario, established by the Provincial Policy Statement, the Growth Plan for the Greater Golden Horseshoe (2017), the Metrolinx Draft 2041 Regional Transportation Plan, and Peel's Long Range Transportation Plan. These plans have been thoroughly reviewed to understand their contributions to developing a long term plan for goods movement. This review can be found in Appendix A.

Figure 9: Establishment Documents for the Long-Term Vision for Ontario



2.1 Mission

The mission for goods movement in Peel conforms to the vision established by the Region's Long Range Transportation Plan that focuses on the desired future transportation system. This vision has been carried over to the Goods Movement Long Term Plan and Strategic Plan to help guide the goals, pathways and strategies herein.

Peel's Transportation Vision:

Our vision is for Peel to have a safe, convenient, efficient, multi-modal, sustainable and integrated goods movement transportation system that supports a vibrant economy, respects the natural and urban environment, meets the diverse needs of industries and residents and contributes to a higher quality of life.

2.2 Freight Goals for the Region of Peel

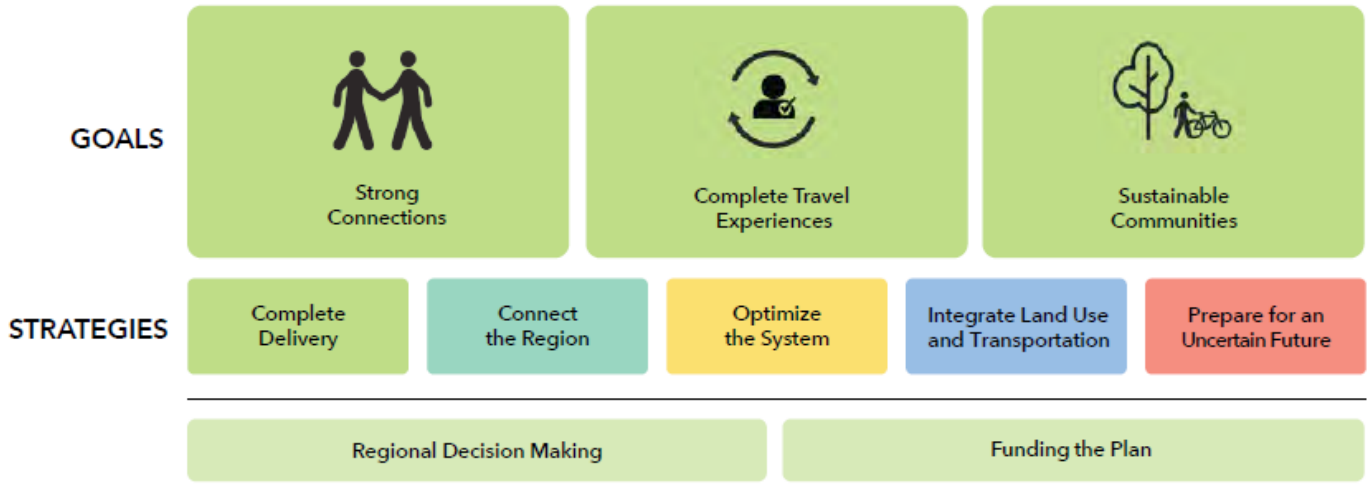
Goals and objectives are part of the critical foundation of any successful planning effort. Goals identify the strategic direction and outcome of goods movement initiatives in the Region. The defining of the Region's goals and objectives for goods movement is the first step in preparing a strategic plan and long term plan for the Region. The goals named below support the Region's goods movement mission, and provide a strategic focus for pathways and strategies presented in the Plan.

The GMLTP has six goals that reflect Provincial and regional planning policy goals and objectives. These plans are anchored by the three pillars for sustainability which focus on preserving environmental quality, social vitality, and economic health. The goals for goods movement in Peel share these same themes, along with specific goals for the transportation system identified in the Peel Long Range Transportation Plan.

2.2.1 Regional Transportation Goals

The regional transportation plan for the GTHA is outlined in the Metrolinx Draft 2041 Regional Transportation Plan. These goals and strategies are summarized below.

Figure 10: Metrolinx Draft 2041 RTP Goals and Strategies



Source: Metrolinx Draft 2041 Regional Transportation Plan

2.2.2 Peel's Transportation Goals

The Region of Peel Long Range Transportation Plan goals are listed below.

Table 3: Region of Peel LTP Goals

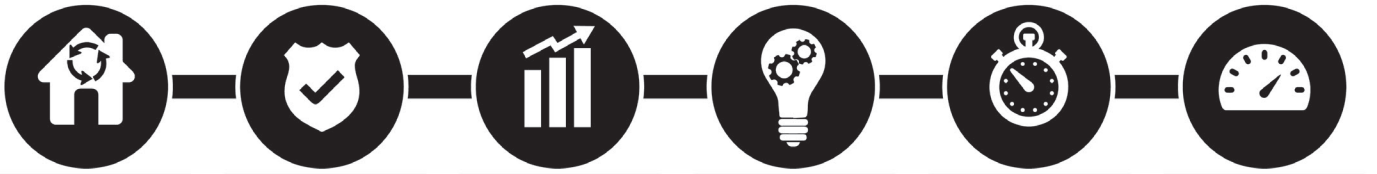
The Region of Peel needs transportation solutions that will:
A. Support and conform to the Ontario Provincial Policy Statement, the Provincial Growth Plan (Places to Grow), the Greenbelt Plan, and the Niagara Escarpment Plan
B. Support policies in the Regional Official Plan
C. Support planned growth in Peel
D. Protect the natural and agricultural resources of Peel
E. Minimize the negative impacts of transportation on the natural environment
F. Maintain the Region's economic competitiveness by facilitating goods movement in Peel
G. Provide an integrated transportation network that supports the urban structure of Peel and Provides access to a diverse range of land uses and activities in the Region
H. Meet the transportation needs of the elderly and those with disabilities
I. Encourage sustainable modes of transportation such as transit, carpooling, cycling and walking
J. Provide connected and balanced transportation network that supports all modes of travel and improves travel efficiency

Source: Peel Region Long Range Transportation Plan, 2012

2.2.3 Peel's Goods Movement Goals

The GMLTP goals are outlined below. The goals support the transportation policies of the province and region, but also considers the unique needs of the goods movement transportation network. The figure shows the goals identified to support the Region's goods movement mission, and provide a strategic focus for the action items presented.

Region of Peel's GMLTP Goals



Community & Environmental Sustainability	Safety	Economic Competitiveness	Innovation & Technology	System Performance	Performance Management
Manage and mitigate adverse community impacts of goods movement operations and support environmental stewardship.	Improve the safety and resiliency of the goods movement network and its users.	Sustain and promote invest-ments in the multimodal goods movement system for continued economic efficiency, growth and regional competitiveness.	Use advanced technology, innovation, and accountability in the operation and maintenance of the goods movement transportation system.	Enhance goods movement mobility through reduced delay, increased reliability and efficiency.	Ensure timely, accountable and transparent plan implementation and performance evaluation.

3 Stakeholder Outreach

In This Chapter:

3.1 Industry Interviews

Fifteen private sector freight intensive industries in the Region of Peel were interviewed as the first component of the stakeholder outreach process. The purpose of these interviews was to understand the needs and issues of both shippers and carriers throughout the Region.

3.2 Stakeholder Committee and Task Force

The Peel Goods Movement Task Force and Stakeholder Committee were consulted throughout the study for interaction and feedback from the public and private sector. This allowed the formation of the GMLTP to address any concerns and issues.

3.3 Public Survey

A total of 35 survey responses were received over a 9 month period that identified several respondents found goods movement as a high priority to support the economy, but were also concerned about safety of increases truck traffic.

Understanding the issues of industry, government and residents was critical to the development of the GMLTP. To ensure the voices of these parties were heard, an extensive stakeholder outreach process was carried out as part of this project. This section summarizes the stakeholder outreach process, which was instrumental in developing the research conducted as well as identifying risks and trends in the goods movement sector in the Region.

A project stakeholder committee was formed as part of the outreach process. There was also a outreach and engagement campaign broken into three components. The first component engaged goods movement industries in the Region of Peel through a detailed interview process. The second component focused on engagement of the Stakeholder Committee and Goods Movement Task Force. The third component included public engagement through development of a project website and online survey.

Figure 11: Stakeholder Outreach Components for the Long Term Plan

3.1 Industry Interviews

The first component of the stakeholder outreach process involved interviews with fifteen Peel-based private sector freight-intensive industries to understand their needs and issues throughout the Region. Industries included both freight shippers and carriers. Industries were identified based on the highest value and highest tonnage commodity groups moving through Peel. The highest value commodities were established as a proxy for important economic activity in the Region while the highest tonnage commodities were established as a proxy for wear and tear impact on Peel roadways. Further details on the industry identification process are provided in Appendix B.

The interview topics generally included discussion of operations, geography, goods moved, volumes, transportation modes, performance, trends, and risks. Key themes by industry are summarized below, while trends and risks for freight intensive industries in the Region are detailed in Section 7.

Pharmaceutical and Medicine Manufacturing (NAICS 3254)

Pharmaceuticals originating from and destined for Peel represent one of the highest value commodities that moves through the Region. This industry employs roughly 3,200 people and contributes $500 million in direct GDP to Peel's economy. This industry receives inputs to production from local suppliers as well as North American and European suppliers. Outputs of this industry are shipped to local markets, as well as the US, Asia, Europe, and elsewhere. Deliveries tend to be made-to-order and are time sensitive. The main advantages Peel holds for this industry is good access to all modes of transportation, a cluster of pharmaceutical companies located in the area, and proximity to a large local market. Many of these companies have been located in Peel for several decades. While volumes moved are generally lower than other industries, the modes of transportation required include truck, rail, and air depending on production need and market serviced.

Cement and Concrete Product Manufacturing (NAICS 3273)

The cement and concrete product manufacturing industry is a value-add industry which produces largely made-to-order products. This industry employs roughly 1,250 people and contributes $150 million in direct GDP to Peel's economy. This industry is relatively truck intensive; however, the unique characteristic is the need to move oversized and overweight loads. Oversize/overweight permits are required by companies moving loads on Regional roads which exceed the MTO accepted limits by

height, length, width, and/or weight[3]. Key issues with respect to industries which rely on oversize and overweight loads are the time of day restrictions through the Greater Toronto Area (GTA). These restrictions include oversize/overweight restrictions from 7:00 am to 9:30 am and 3:30 pm to 6:30 pm. A further consideration is the reduced load period which limits the oversize/overweight loads during the months of March and April when frost is coming off the ground. Time of day and time of year restrictions pose a logistical challenge to this industry which is highly sensitive to on-time performance and reliability

Motor Vehicle Manufacturing (NAICS 3361)

Motor vehicle manufacturing is one of the most complex freight intensive industries in the Region. This industry employs over 5,000 people in the Region. Facilities tend to operate 18 hours a day, six days a week, and receive a wide variety of Just-in-Time (JIT) shipments from parts suppliers in the Region, the rest of Ontario, and internationally (primarily from the US). Parts are sequenced to arrive simultaneously to construct each car, which may include over 2,000 parts. As a result, each plant typically only has a few hours of material on site. This industry if very freight intensive in terms of inbound truck shipments and also relies heavily on air freight as a backstop measure to ensure the production line is continually operating. Outbound shipments are finished cars which typically move by truck to local markets, rail to North American markets, and by rail to sea ports for shipment to international markets. The main advantages Peel holds for this industry is good access to all modes of transportation and a cluster of automotive parts suppliers located in the area.

Motor Vehicle Parts Manufacturing (NAICS 3363)

Motor vehicle parts manufacturing companies produce a wide array of motor vehicle parts and ship to assembly plants in the Region, the rest of Ontario, and the US. This industry employs roughly 4,500 people and contributes $430 million in direct GDP to Peel's economy. These companies typically have inputs of raw metal materials and other components and output parts and sub-assemblies used in auto manufacturing. Facilities operate 18-24 hours a day, six days a week. Inputs to production come from Peel, elsewhere in Canada and the US and internationally. Most auto parts are shipped by truck on specialized racks which limit the ability to load match for return trips. Roughly 95-97% of auto parts shipments require specialized racks. Typically parts manufacturers have agreed on appointment windows with their customers to ensure JIT delivery. Road construction, congestion, and inclement weather are factors in meeting appointment windows.

3 MTO. A Guide to Oversize/Overweight Vehicles and Loads in Ontario. March 2015.

Food Merchant Wholesalers (NAICS 4131)

Food merchant wholesalers ship a wide range of foodstuffs to large grocers, small grocers, convenience stores, education institutions, and other distribution centres. This industry employs roughly 6,800 people and contributes $765 million in direct GDP to Peel's economy. These industries ship food and beverage products to customers in the GTHA and the rest of Canada who require JIT deliveries. Many of these industries have on distribution centre (DCs) servicing the country and are located in Peel. Similar to the auto sector, food merchant wholesalers operate on delivery windows with most delivery times expected prior to noon. Routes are scheduled by time of day to avoid congested hours and are optimized based on delivery locations. In some cases, resident drop yards are used to access the Toronto market and to avoid congestion by shuttling trailers in the overnight hours and having local drivers do the remaining trips during morning hours. These industries are freight intensive in terms of volumes. They rely on trucking as the primary mode using a wide variety of truck configurations and a limited amount of intermodal rail for inbound shipments.

Other Miscellaneous Merchant Wholesalers (NAICS 4189)

The category of other miscellaneous merchant wholesalers interviewed for this study consisted primarily of large retailers with dedicated DCs. This industry employs roughly 8,300 people and contributes $725 million in direct GDP to Peel's economy. Products shipped include mixed freight, books, sports and leisure equipment, and home products. Inbound shipments for these industries is by truck and rail from the rest of Canada, US, Asia, and Europe. Shipments from Asia and Europe arrive in Peel by intermodal rail, while shipments from Canada and the US are a mixture of rail and truck. Outbound shipments are destined to retailers across Canada. Many of these large retailers rely on one DC to service the country which is located in Peel. Truck fleet for these industries are primarily 53 foot trailers which provide truckload (TL) service, however courier and less than truckload (LTL) is also provided. Rail is serviced by the CP Vaughan and CN Brampton intermodal yards.

General Freight Trucking (NAICS 4841)

General freight trucking industries provide carrier services to ship goods. These companies provide TL, LTL, courier and dedicated logistics to a wide range of industries including many of the shipper industries interviewed for this study. This industry employs roughly 11,150 people and contributes

$735 million in direct GDP to Peel's economy. These carriers primarily service local GTHA industries, but also provide long haul trucking across Canada and the US. These carriers provide service to the CN and CP intermodal yards in Brampton and Vaughan, providing TL and LTL pick-up and delivery. The fleet operated by these carriers includes a wide range of trailers, including but not limited to: reefers, heaters, dry vans, tandems, and tris. Tractors are primarily owner-operator. Deliveries typically occur in the mornings and pick-ups are in the afternoon. Carriers are very sensitive to missed or late deliveries, and strive for near perfect, on-time delivery. To achieve this, a buffer time is built in to deliveries to compensate for congestion, road maintenance, and other delays. To avoid congestion, carriers stage deliveries by time of day, with outbound deliveries leaving as early as possible and inbound cycle back late in the evening. A main advantage to carriers in Peel is that the road network has good attributes in terms of roadway speeds, geometries, and access to 400-series highways.

Support Activities for Air Transportation (NAICS 4881)

The Toronto Pearson International Airport is Canada's largest air freight hub. There are many domestic and international carriers who ship air cargo through Toronto Pearson. Support activities for air transportation employ roughly 2,650 people in Peel. This includes air freight carriers and passenger airlines with belly freight. Most Canadian and US air freight is completed by air freight carriers, while international air cargo movements are primarily belly freight. The catchment area for freight arriving by truck to Toronto Pearson runs east to Nova Scotia and west to Manitoba. There are also many trucks from New York City and Chicago. Toronto Pearson receives a lot of the spill over freight from Chicago. There are three main cargo areas at Toronto Pearson, which include: FedEx, Air Canada, and Vista. Freight forwarders are off-airport lands and exist throughout Peel.

Warehousing and Storage (NAICS 4931)

The warehousing and storage industry includes many of the DCs in Peel not otherwise categorized by industry. This industry employs 10,500 people and contributes $680 million in direct GDP to Peel's economy. These DCs receive goods to the region by truck, rail, and air, and often service all of Canada. It is not uncommon for major Canadian companies to have one DC which is located in Peel. Goods arrive by rail from the Ports of Vancouver and Halifax, are sorted in DCs in Peel and are shipped by truck to markets within hours from the Region while other goods are put back onto intermodal rail for transport to markets across the country. The main advantages Peel holds for this industry is proximity to the 400-series highways, CN Brampton intermodal yard, CP Vaughan intermodal yard, Toronto Pearson International Airport, and Hamilton International Airport.

3.2 Stakeholder Committee and Task Force

Throughout this study, the Peel Goods Movement Task Force and Stakeholder Committee were consulted. This provided the opportunity for interaction and feedback from the public and private sector regarding study focus and content as well as any concerns and issues.

The Peel Goods Movement Task Force, which includes members from the public sector andprivate sector, and elected officials, was a primary component of the outreach effort. Task Force meetings were held in April and October 2016. The Task Force participation included:

» Participation in the Vision, Mandate, and Goals Charrette
» Participation in the Online Survey
» Review and Validation of Strategic Plan 2017-2021 Action Items
» Review and Input into Study Components

The GMLTP Stakeholder Committee was established at project initiation to provide regional perspectives from industry, all levels of government, and the community. Stakeholder Committee meetings were held in April and October 2016. The Stakeholder Committee focused on:

» Study Focus and Goals
» Identification of Key Study Considerations
» Review and Prioritization of Strategic Plan 2017-2021 Action Items
» Review and Input into Study Components

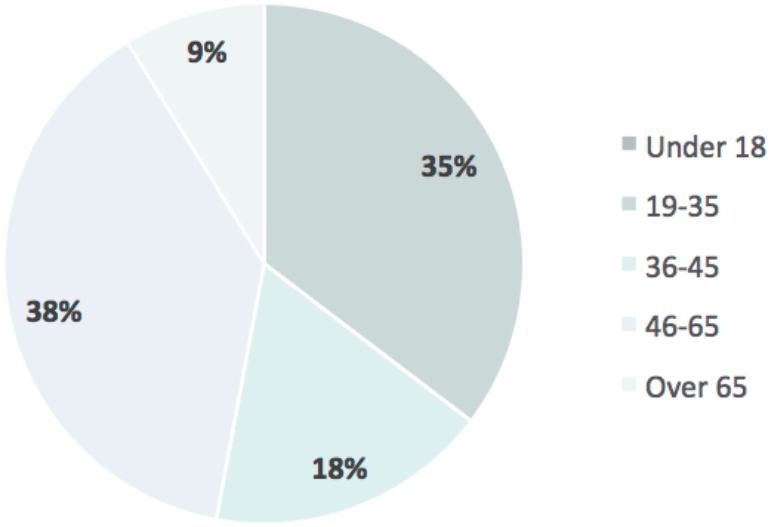
3.3 Public Survey

To gather broad public input into the GMLTP, a project website was created with information about the objectives of the study. A public survey was created with eleven questions focused on the following goods movement themes:

» Public Definition of Goods Movement
» Public Importance of Goods Movement
» Daily Interaction with Goods Movement
» Safety and Traffic Considerations
» Concerns and Issues that the GMLTP Study Should Address

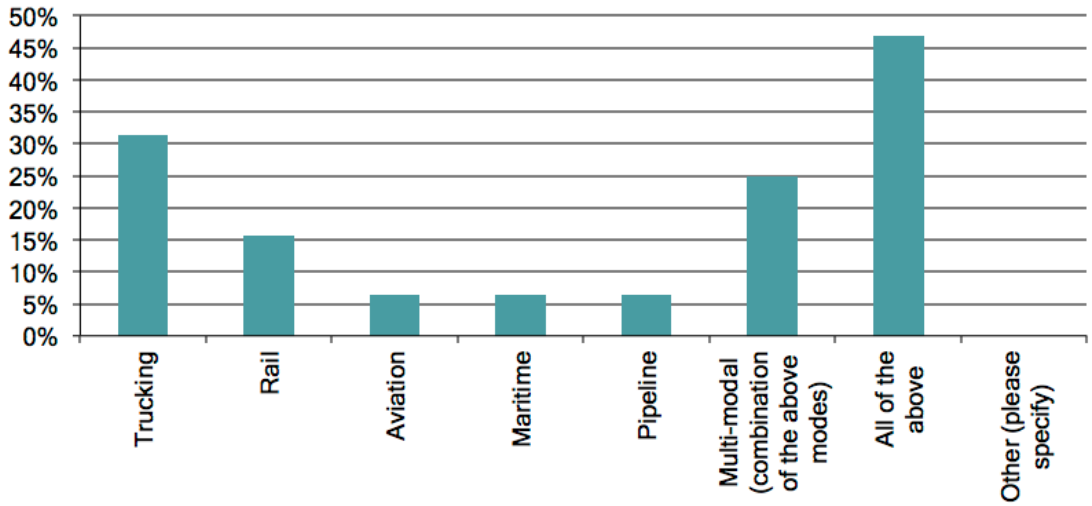
A total of 35 survey responses were received over the period of October 2016 to June 2017. The survey questionnaire is provided in Appendix D. From the responses received, 82% were Peel residents, 12% were Peel business owners, and 15% were other Peel stakeholders including academic institutions, associations and persons employed in Peel. Respondents had the ability to categorize their participation in more than one category. Most respondents were in the 46-65 age range, however all age categories are well represented with exception of the under 18 category, for which there were no responses. The breakdown of responses by age category are provided in Figure 10.

Figure 12: Survey Respondents by Age Categories



The survey allowed respondents to characterize what they considered to be goods movement. The majority of responses characterized trucking as goods movement or a combination of all modes, including trucking, rail, air, marine, and pipeline. Few respondents characterized air, maritime, and pipeline as goods movement in the context of Peel. This suggests the major goods movement modes impacting residents in Peel are trucking and to a lesser extent, rail. The interaction with other goods movement modes is minimal. The following figure displays how respondents characterize goods movement.

Figure 13: Survey Respondent Categorization of Goods Movement



The issues of goods movement in Peel were a very high priority for survey respondents. Over 60 percent of respondents considered goods movement to be a very important priority, 25 percent considered it to be somewhat important, and 15 percent were either neutral on the issue or did not consider goods movement to be an important issue. The reasons why goods movement was considered a priority were focused on the importance of goods moving businesses in supporting the economy. However, there were several responses indicating a need to balance trucking in the Region with a community that is liveable, urban, and one where residents can walk and bike safely for mobility.

The majority of respondents share the road with commercial vehicles and trucks in their daily life, while several also live in close proximity to roadways used by lots of trucks. Roughly, one third of respondents interact with goods movement in their daily life through purchase of online goods, as transit users, and as employees of industries that move goods or are heavily reliant on goods movement.

Respondents ranked several issues related to goods movement in the Region. The most important issue identified by respondents was safety. The safety concerns included: trucks in residential areas, the interaction between trucks and automobiles, and lack of proper infrastructure to accommodate the volume of trucks. Respondents felt the Region should focus on improving safety and enforcing truck routes.

Other important issues included quality of life, the environment, and traffic congestion. Key concerns on these issues were: traffic congestion during the day, pollution, and improper signage. Respondents felt the region should focus on encouraging nighttime deliveries, better roadway design to accommodate trucks, autonomous freight policies, incentives to reduce emissions and creating better signage. Interestingly the importance of goods movement on jobs and the economy was ranked as the lowest issue of importance.

4 Profile of the Freight Transportation System in the Region of Peel

In This Chapter:

4.1 Multi-Modal Network

Peel's freight system is entirely dependent on the fluidity and operating conditions of its seven 400-series highways and arterial roads that traverse the Region. In 2012, it was estimated that 16.3 million truck trips had an origin or destination in Peel, carrying cargo valued at $313 billion. These trips accounted for 286 million kilometers of vehicle travel in Peel. In order to enhance the operations of trucks throughout the Region of Peel, there is $15 million in capital projects planned for the next four years to increase roadway capacity and eliminate bottlenecks.

4.2 Air Cargo

The Toronto Pearson International Airport resides in the Region of Peel and serves as an important hub for international trade with the most goods moved, both in value and tonnage. Cargo volume through this airport is expected to grow at 4.4% annually as international trade continues to expand with both the US and other countries.

4.3 Rail

The CN Brampton intermodal yard serves a large goods movement purpose for the Region of Peel and the GTA. Both the CN, CP and OBRY rail lines represent 18.6 percent of all rail tonnage flows in Canada. Additionally, intermodal shipments represent one of the fastest growing markets for rail.

4.4 Marine

The Region of Peel has two private port facilities. While Peel does not import or export cargo through the port, some freight moving through the Region originated from a port.

4.5 Pipeline

Pipelines play a small role in goods movement in Peel, with major pipelines through this region transporting oil and natural gas.

4.6 Analysis of Goods Movement Specific Land Uses

In general, the employment density of goods moving industries are concentrated around the airport, intermodal yards, and along the 400-series highways, particularly at major interchanges. With tremendous growth in both population and employment, demand for freight movement and infrastructure is increasing. The Region of Peel chooses to promote the establishment and preservation of goods movement corridors and goods movement-related businesses through supporting policies.

The GTHA is the economic centre of Canada. Besides being a world-class metropolis with a large market for consumer goods, it is also the main manufacturing and distribution hub for Canada. It has been estimated that metropolitan Toronto currently contributes to 20 percent of the Gross Domestic Product in Canada[4]. Its strategic position midway along the Quebec City-Windsor Corridor – Canada's principal population band - and prime access to multimodal transportation choices gives it a unique advantage for companies seeking to serve local or North American markets.

A significant proportion of manufacturing and distribution activities in the GTHA occur in the Region of Peel. According to supply chain managers and logisticians interviewed, this Region can be thought of as the main distribution hub of Canada. Retailers and manufacturers who use a single DC to serve the nation often prefer Peel as the location from which to handle inventories and stage their operations. Even shippers that use several facilities often have the primary facilities in Peel. National trucking data corroborates these findings, showing that few other locations in Canada receive more truck trips than Peel.

Peel's strategic advantage in the goods movement economy results in part because of its exceptional access to different freight transportation modes. Peel is intersected by seven 400-series highways, is served by intermodal yards operated by Canadian National and Canadian Pacific, and contains Canada's largest airport by passengers and cargo volumes. This section focuses on describing freight movement andproviding an overview of current conditions and patterns in Peel. This section is intended to serve as an extended introduction into Peel's freight transportation system, providing the context that is used in other sections of this Plan.

4.1 Multi-Modal Network

4.1.1 Summary

- Peel is intersected by seven 400-series highways that provide Peel unrivaled connectivity throughout Canada.
- It is estimated that Peel is involved in 9.5% of all for-hire intercity truck shipments in Canada, and this proportion is continuing on an upward trend.
- In 2012, it was estimated that 16.3 million truck trips had an origin or destination in Peel, carrying an estimated 88 million tons of cargo valued at $313 billion. These trips accounted for 286 million kilometers of vehicle travel in Peel.
- 35.9% of trucks surveyed in the Commercial Vehicle Survey (CVS) were found to be empty. This proportion of empty travel is driven by the existence of major intermodal yards and urban distribution activity to serve consumption throughout the Greater Toronto Area (GTA).
- One truck activity survey shows truck trips increasing by 50% from 2011 to 2014. This finding is corroborated by cordon count data showing an 87% increase in truck trips over this time period. While it is unlikely that truck trip generation increased as fast as both of these data sets suggest, the underlying trend points to the strengthening of Peel's logistic position in recent years.

4 http://investtoronto.ca/InvestAssets/PDF/Reports/2014-annual-report.pdf

- The top 3 commodities moved by tonnage are gravel (9.0%), mixed shipment (8.1%), and other food stuffs (8.0%). The top 3 commodities moved by value are motorized vehicles (12.8%), mixed shipments (10.9%), and electronics (9.8%).
- The area surrounding the Toronto Pearson International Airport and the adjacent CN Brampton Intermodal Yard, intersected by the 407, 410, and 401 highways, is the primary location forattracting and generating truck trips in Peel.
- For shipments originating in Peel and having destinations outside of Ontario, 54% have destinations in the U.S. and 46% have destinations in Canada. For shipments destined to Peel from origins outside of Ontario, 65% have origins in the U.S. and 35% have origins in Canada.
- Long Combination Vehicle (LCV) Pilot Program allows motor carriers to obtain permits to operate longer trailer configurations if they meet several requirements, including that the origin and destination need to be within 2 km of a 400-series highway. Even though the program has been underutilized so far, participation appears to be increasing.
- The Off-Peak Delivery (OPD) initiative was introduced for the Toronto 2015 Pan Am & Parapan Am Games that encouraged 100 businesses to make deliveries at night when congestion is not an issue. This had the effect of reducing travel times while not significantly contributing to the noise felt by communities.
- In addition to these efforts designed to enhance the operations of trucks throughout the Region of Peel, there are $15 million in capital projects planned for the next four years to increase roadway capacity and eliminate bottlenecks.

4.1.2 Road Profile

The backbone of Peel's freight transportation system is the network of highways and arterials that traverse the region. These roads are used by various types of trucks in connecting producers and consumers, and providing access to intermodal infrastructure throughout the region. Everything that is consumed or produced in Peel has to be transported on these roads, potentially on several different trucks. Therefore, the fluidity and operating conditions of these roads have a direct impact on the vitality and competitiveness of the local and national economy.

For these and other reasons, the road network is one of Peel's (and Canada's) most important assets. Peel seeks to target investments and implement policies that improve the operations of freight on these roads, and to preserve the long-term value of these assets. This requires an understanding of how the freight community uses these roads, and the constraints faced during day-to-day operations.

The roadway network in Peel is classified into:

- **Provincial Roads:** Peel is intersected by 7 major provincial highways. These are the 401, 403, 410, 409, 427, the 407 Express Toll Route (ETR), and the QEW (Queen Elizabeth Way). With the exception of the 407, these roads are owned and maintained by the Province of Ontario. The 407 ETR was

privatized in the 1990s and is currently operated by a consortium on a 99-year lease. Tolls on this highway vary by vehicle size, time of day, and segment. The Province also owns and operates Highway 9 and Highway 10 in Peel.

» **Regional Roads:** The Region of Peel owns and operates 26 regional roads that total 1,555 lane-kilometers. This includes 409 signalized intersections, 110 bridges, and 35 major culverts. Regional roads are the main arterials used by motor carriers to access provincial roads. Truck volumes on these roads are high and they are a crucial part of the freight network.

» **Local Roads:** The Region of Peel also contains a wide range of local roads that are owned and maintained by the three lower-tier municipalities of Mississauga, Brampton, and Caledon. They are a vital part of the freight system because most truck routes require at least some travel on them, either entering or exiting carrier or customer facilities, or delivering to homes. Essentially all of the first, last, and transfer miles in Peel occur on some combination of regional and local roads.

The roadway network is shown in Figure 14. Most of the highways pass-through the City of Mississauga, providing connectivity throughout the Region. The City of Brampton is crossed by Highway 410 and Highway 407 ETR. Highway 407 ETR is a tolled road, leading motor carriers to use it only selectively. A large proportion of motor carriers take Highway 410 to connect to the 407 ETR or Highway 401. The Town of Caledon is connected primarily by regional roads.

Truck travel is restricted on many roads in Peel. Bylaws have been introduced over the years that restrict trucking in the following ways:

» maximum truck weight,

» minimum number of axles,

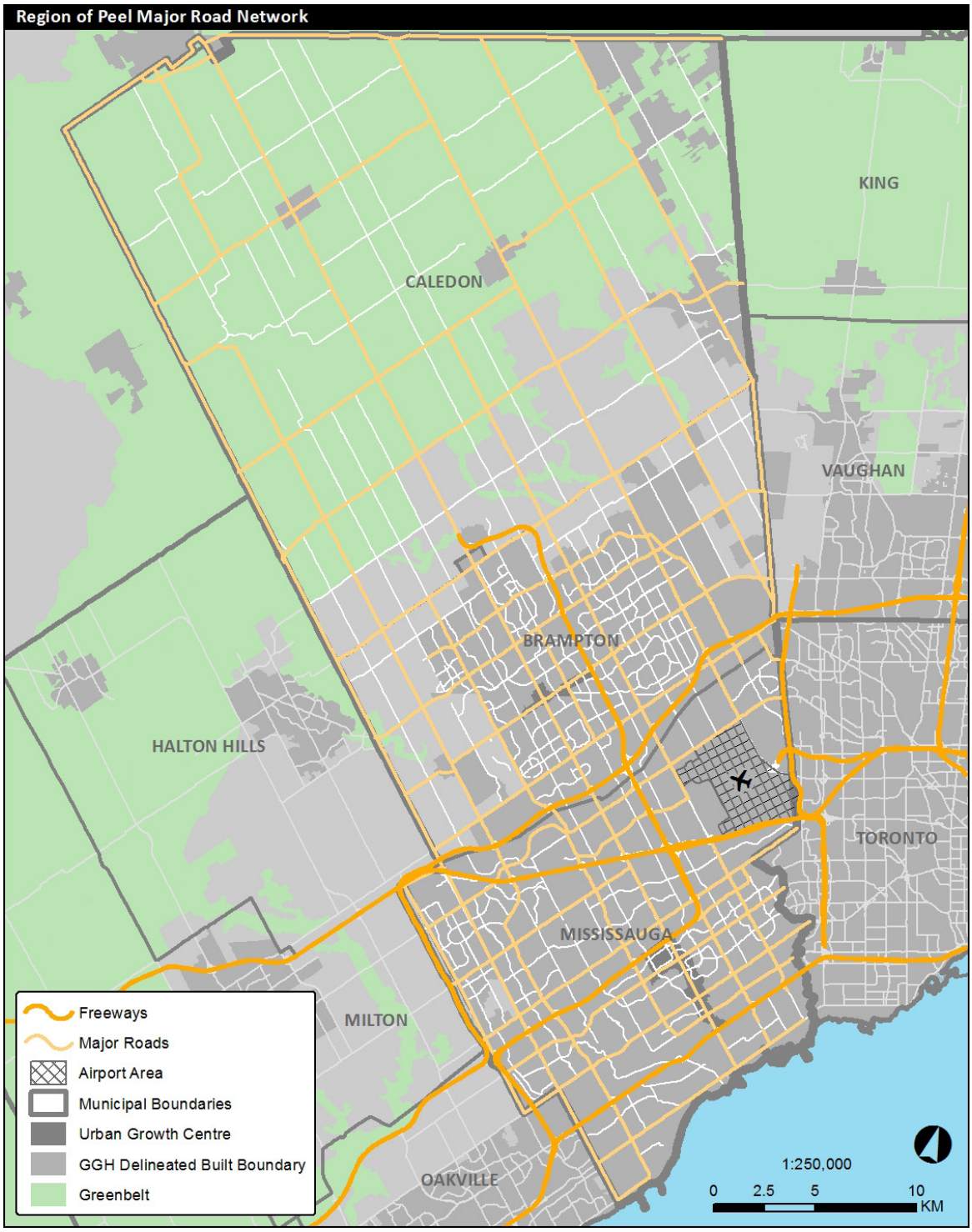
» time of day, and

» season of the year.

These bylaws have been introduced for a variety of reasons, primarily to reduce the impacts of trucking on local communities by reducing noise or congestion during sensitive hours, or by controlling wear and tear on infrastructure.

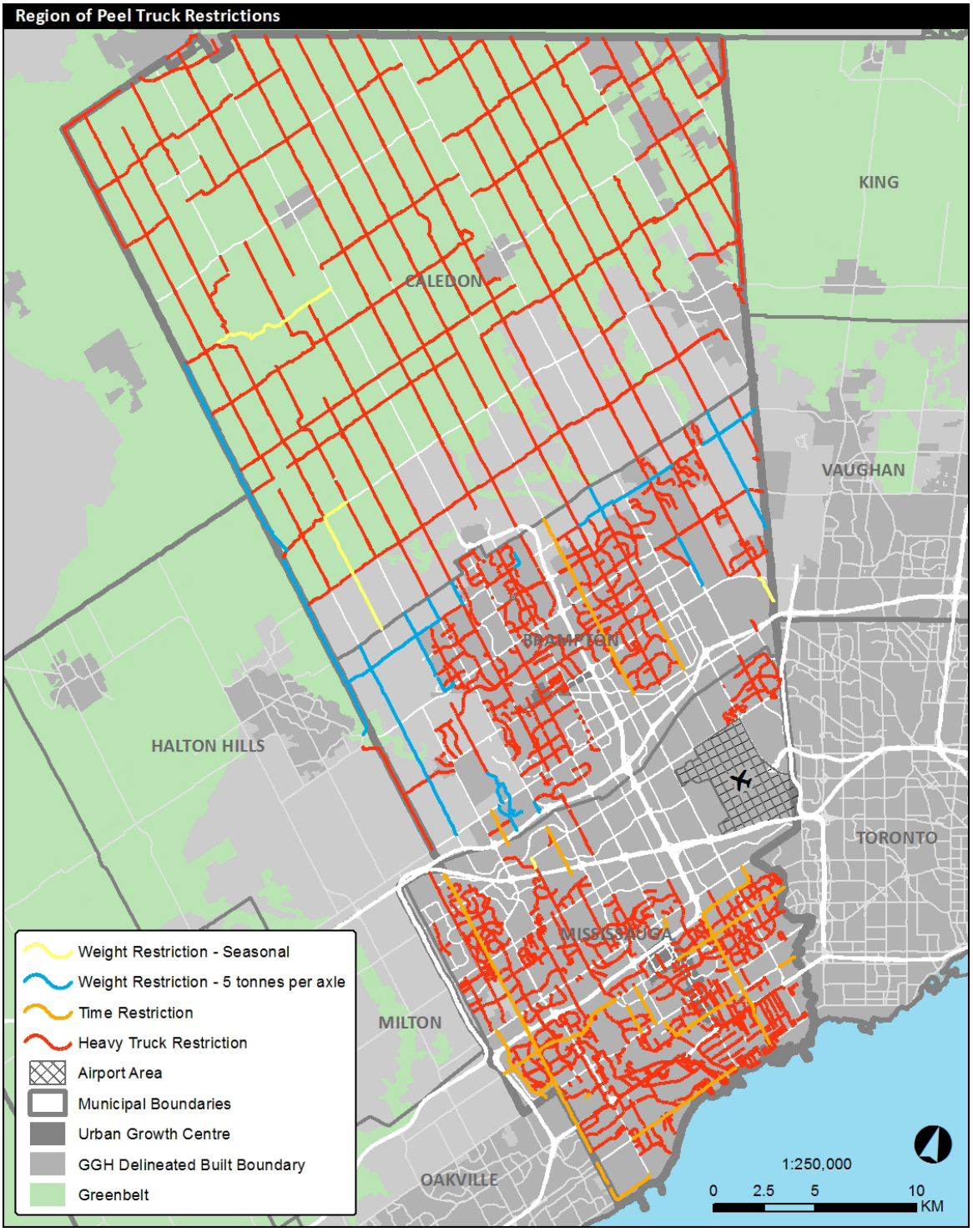
The truck restrictions currently in place are shown in Figure 15. These restrictions have the effect of concentrating truck traffic along certain regional roads, which has the positive effect of concentrating impacts to just along these roads , allowing the government to target improvements and maintenance to accommodate truck traffic specifically. However, this comes at the cost of constraining motor carriers, potentially increasing congestion impacts and driving up costs of operation.

Figure 14: Region of Peel Major Road Network



Data Source: Region of Peel

Figure 15: Region of Peel Truck Restrictions

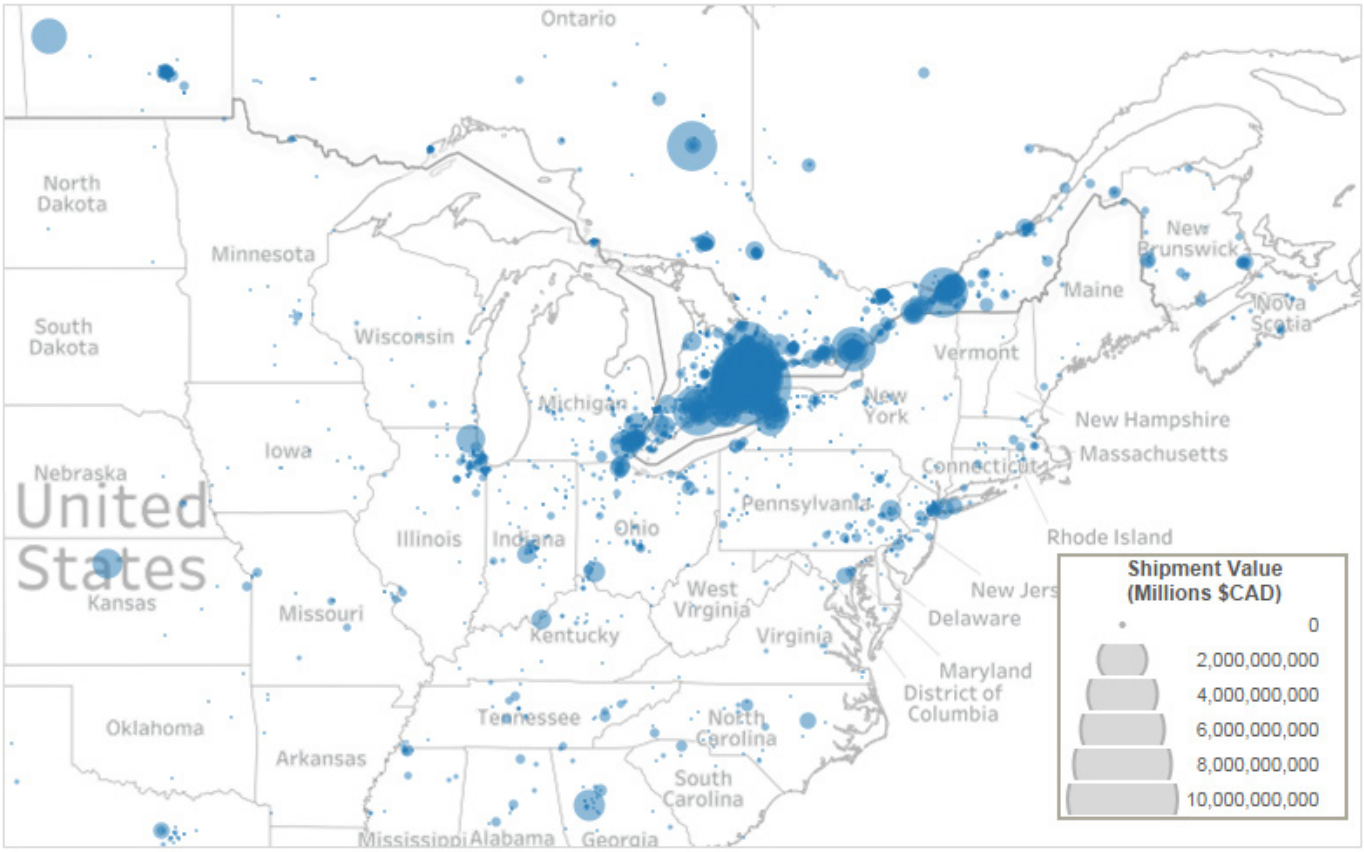


Data Source: Region of Peel

4.1.2.1 Importance of Peel

As described, Peel is a major logistics hub for Canada and an important distribution centre for North America. As seen in Figure 16, Peel originates truck shipments reaching almost all of Canada and the US. Most of these shipments are concentrated along the Quebec City-Windsor corridor, with extension into several border US states. More details are provided below about the commodities and geography served by these shipments.

Figure 16: Reach of Shipments Originating from Peel

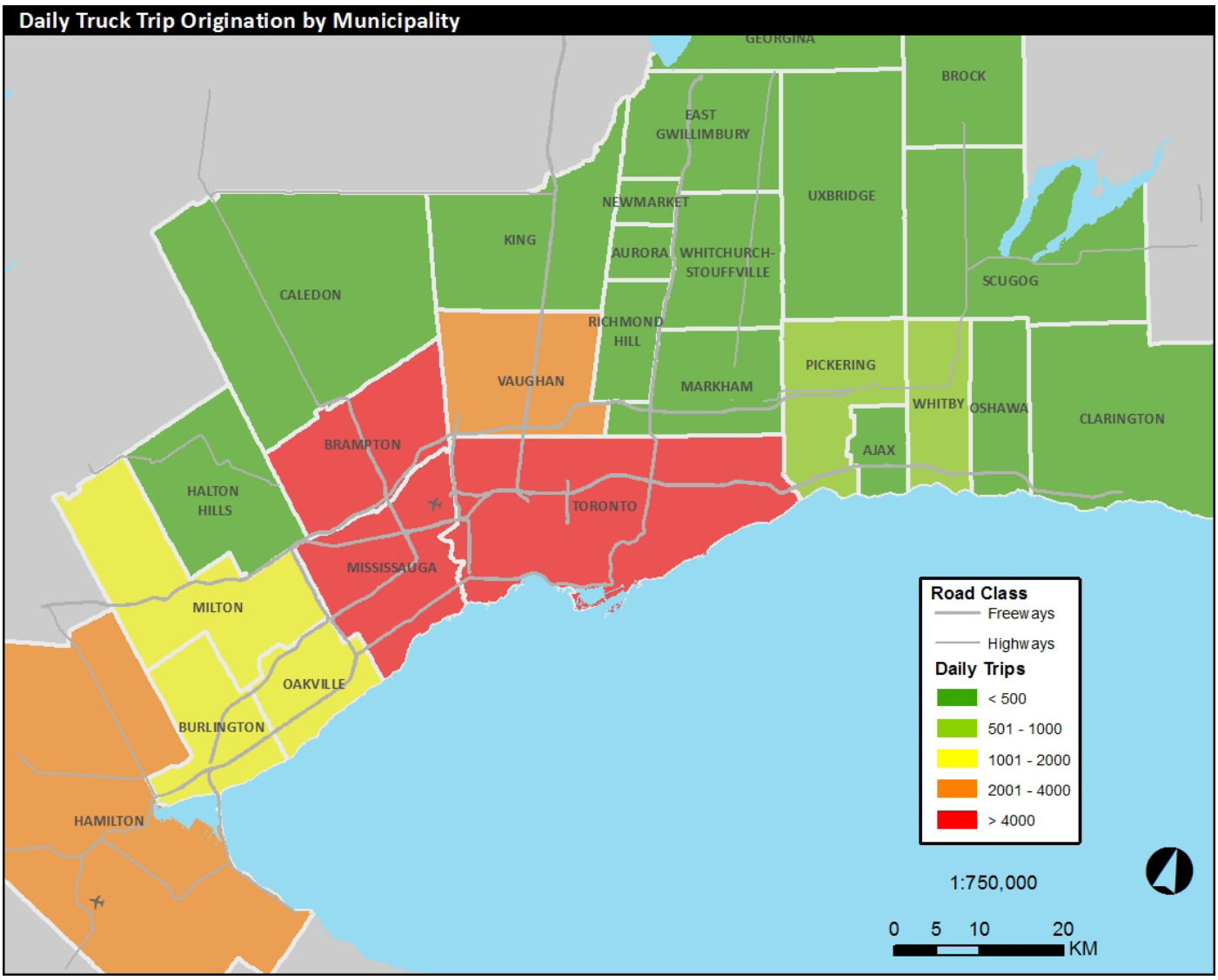


Data Source: MTO Commercial Vehicle Survey 2012

In 2014, the Region of Peel was the start or end of 9.5% of all of Canada's truck shipments, accounting for 5.4% of all tonnage moved in Canada.[5] This is an impressive figure given the size and population of the Region, but expected given the amount of businesses with nationwide operations that have distribution facilities there. Peel's proportion of total trucking activity might be even larger as this survey does not fully consider urban trips, which are particularly important for Peel as it is a main staging point for supplying the GTHA. As can be seen from Figure 17, Brampton and Mississauga originate the most truck trips in the GTHA.

5 Statistics Canada. Truck Commodity Origin Destination Survey. 2014.

Figure 17: Daily Truck Trip Origination by Municipality



Data Source: Truck Freight Generators & Attractors in the Province of Ontario, MITL, 2014

4.1.2.2 Overview of Truck Shipments

In 2012, there were an estimated 16.3 million truck trips that had either an origin or destination in Peel according to the CVS and is displayed in Table 4. Of this volume, 54.9% were tractors pulling one trailer and 37.3% were straight trucks. The remainder was composed of tractors pulling 2 trailers (1.3%), straight trucks pulling one trailer (1.7%), and tractors only (4.8%).

Trucks are estimated to contribute 286 million kilometers of travel on Peel's roads, at an average of 17.5 kilometers per trip. The CVS data estimated these kilometers travelled by routing each shipment based on its declared origin and destination. This survey found that 35.9% of trucks were empty, ccounting for 32.7% of kilometers driven by commercial vehicles in Peel (excluding tractors only). This fraction of empty travel results from: (1) several key logistics facilities being located in or adjacent to Peel, such as the intermodal yards at CN Brampton and CP Vaughan, which generate many empty back-haul truck trips, and (2) Peel being a major centre for staging deliveries to the GTA.

The CVS estimates that trucks carried over $312 billion in cargo in 2012 to, from, and within the Peel Region. This represents a critical conveyor system for the area's economy, providing valuable connectivity for shippers. While tractors pulling 1 trailer represented 54.9 % of trips, they carried 83.2% of value and 77.6% of tonnes because of their larger cargo capacities. Tractors moving 2 trailers accounted for $7.8 billion in cargo.

Table 4: Trucking Activity with Origins or Destinations in Peel in 2012

(A) Region of Peel Vehicle Classification

	Tonnes (000')	Value (M CAD)	Trips (000')	KMs in Peel (M)
 (8) (9) (10) Tractor & 1 Trailer	68,220.9	260,515.9	8,955.8	153.0
 (11) (12) (13) Tractor & 2 Trailers	3,026.1	7,848.8	204.8	3.6
 (6) (7) Straight Truck	14,397.2	35,968.2	6,093.1	111.5
 (N/A) Straight Truck & Trailer	2,248.2	8,631.7	282.3	6.6
 (6) Tractor Only	-	-	784.6	11.3
Total	87,892.4	312,964.5	16,320.6	286.0

Data Source: MTO Commercial Vehicle Survey 2012

Peel has a large proportion of pass-through trucking for shipments with origins and destinations

outside of Peel (see Table 5). Around 34% of the truck kilometres assigned to Peel in the CVS correspond to pass-through trucks, with the remainder corresponding to shipments with origins or destinations in Peel. The CVS used a vehicle routing model to assign truck shipments to the roadway network given their origins and destinations, providing an estimate of the kilometres accrued in different municipalities. Most of the kilometres accrued by pass-through trucks are on provincial highways. On average, each pass-through truck was estimated to drive 18.8 km in Peel. These pass-through trucks are critical to the regional and national economy, carrying almost $190 billion in cargo and totalling almost 67 million tonnes. The majority of these trucks are tractors pulling a single trailer.

Table 5: Trucking Activity Passing Through Peel in 2012

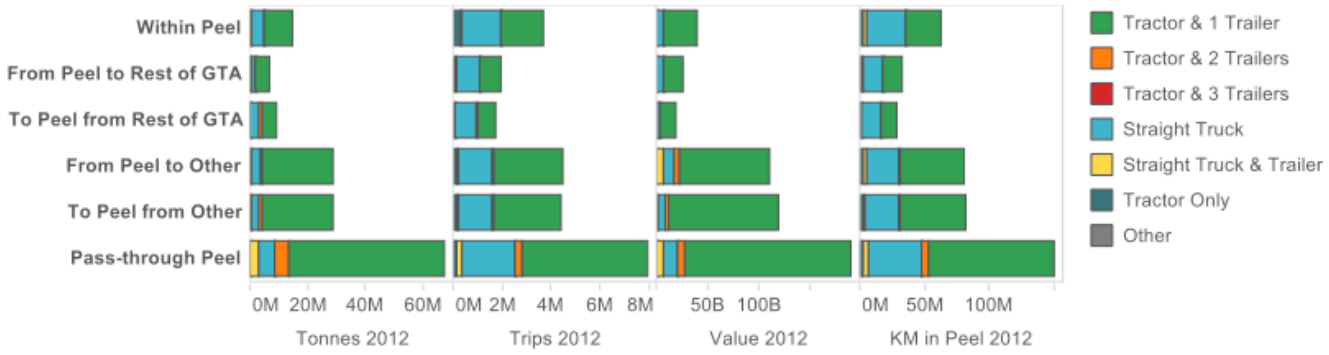
(A) Region of Peel Vehicle Classification

	Tonnes (000')	Value (M CAD)	Trips (000')	KMs in Peel (M)
 8 9 10 Tractor & 1 Trailer	53,420.9	161,017.6	5,116.1	96.7
 11 12 13 Tractor & 2 Trailers	4,730.6	7,441.7	236.4	4.3
 N/A Tractor & 3 Trailers	-	96.2	0.3	0.0
 6 7 Straight Truck	5,654.7	13,050.8	2,205.8	41.4
 N/A Straight Truck & Trailer	3,164.1	7,573.7	228.6	4.7
 6 Tractor Only	1.3	21.3	0.3	0.0
Total	66,971.5	189,252.9	7,917.7	149.2

Data Source: MTO Commercial Vehicle Survey 2012

Figure 18 provides an overview of the origins and destinations of truck trips in relation to Peel, by four key metrics. As can be seen from this figure, the largest category of truck trips are pass-through shipments. The second and third highest categories are trips with origins and destinations outside of the GTA, including the rest of the Canada and the US. In other words, Peel generates many more intercity truck trips than urban trips, reflecting its position as a regional and national distribution hub. Approximately 3.6 times more tonnes are sent to or received from outside the GTA than within.

Figure 18: Truck Freight in Peel



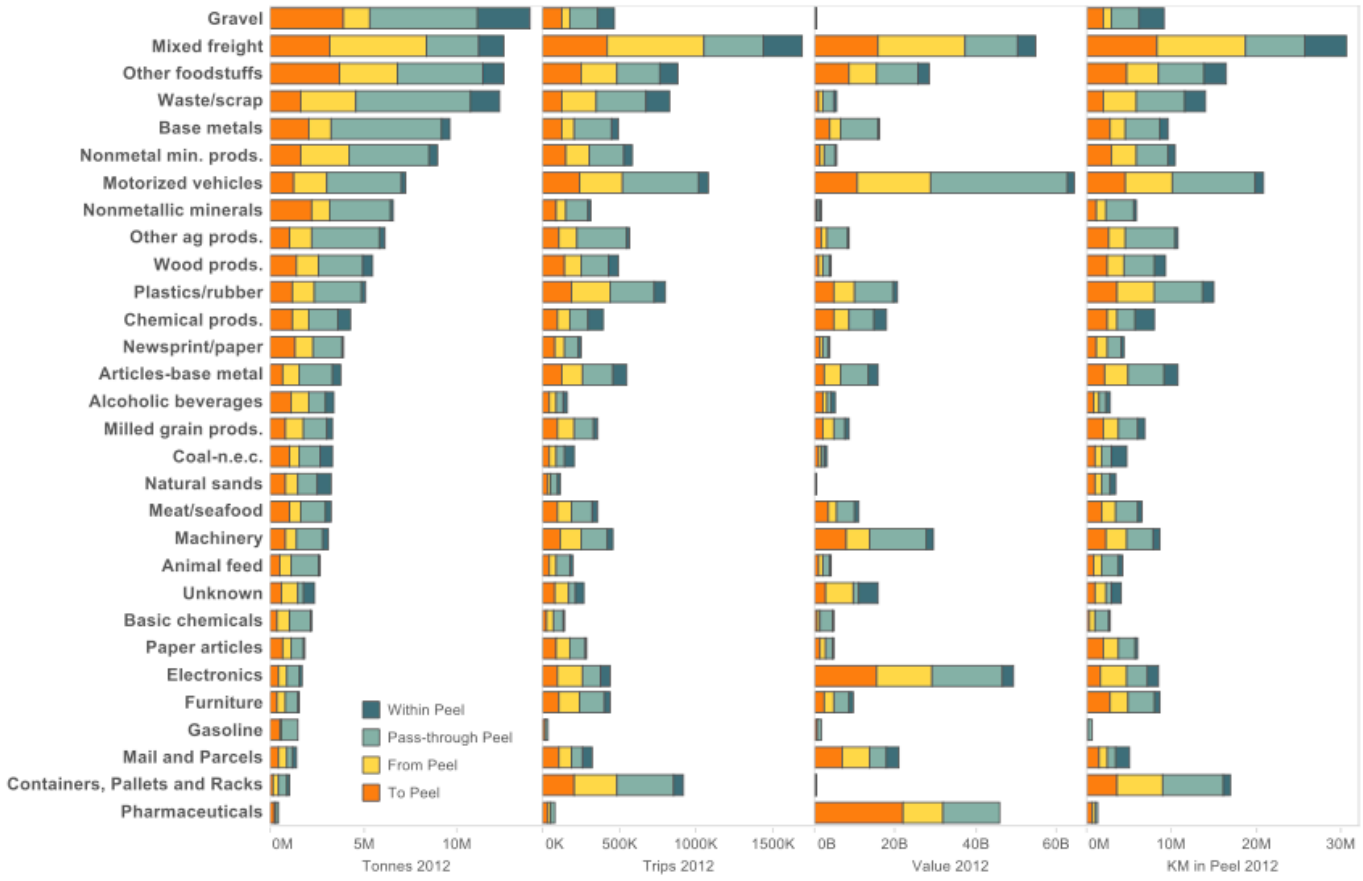
Data Source: MTO Commercial Vehicle Survey 2012

Peel appears to generate as much trucking activity as it receives, reflecting both a strong consumption base and the existence of the regionally important manufacturing and logistics operations. The fourth highest category of truck trips are shipments that have both origins and destinations within Peel. It is observed that these types of shipments are more frequently completed by straight trucks, likely on urban delivery tours. Finally, shipments between Peel and the surrounding GTHA represent a smaller, but still important source of trucking activity. Despite the GTHA being the largest consumer market in Canada, distribution to the GTHA accounts for fewer trips than shipments to other parts of North America. Thi reflects Peel's regional and national importance serving as a distribution hub for the whole country and indicates that Peel operates semi-independently from the GTHA. Another key finding from this data is that Peel generates as many 'within' trips as trips to and from the GTHA. Shipping within Peel is important because of the large air and rail terminals located there and the existence of both manufacturing and distribution activity, all of which require substantial cargo repositioning.

4.1.2.3 Commodities Moved

Figure 19 shows the top commodities moved by tonnage, with the color of the bars showing the origins and destinations in relation to Peel. The top freight movements by tonnage were pass-through shipments of gravel, waste/scrap, base metals, and non-metal mineral products. These are the primary inputs used in construction and some types of manufacturing. At the same time there were significant flows to and from Peel of mixed freight and other foodstuffs. In terms of value, the most important flows were: mixed freight, motorized vehicles, electronics, pharmaceuticals, and machinery. These tend to be consumer goods for regional or North American markets.

Figure 19: Top Commodities Moved by Truck in Peel



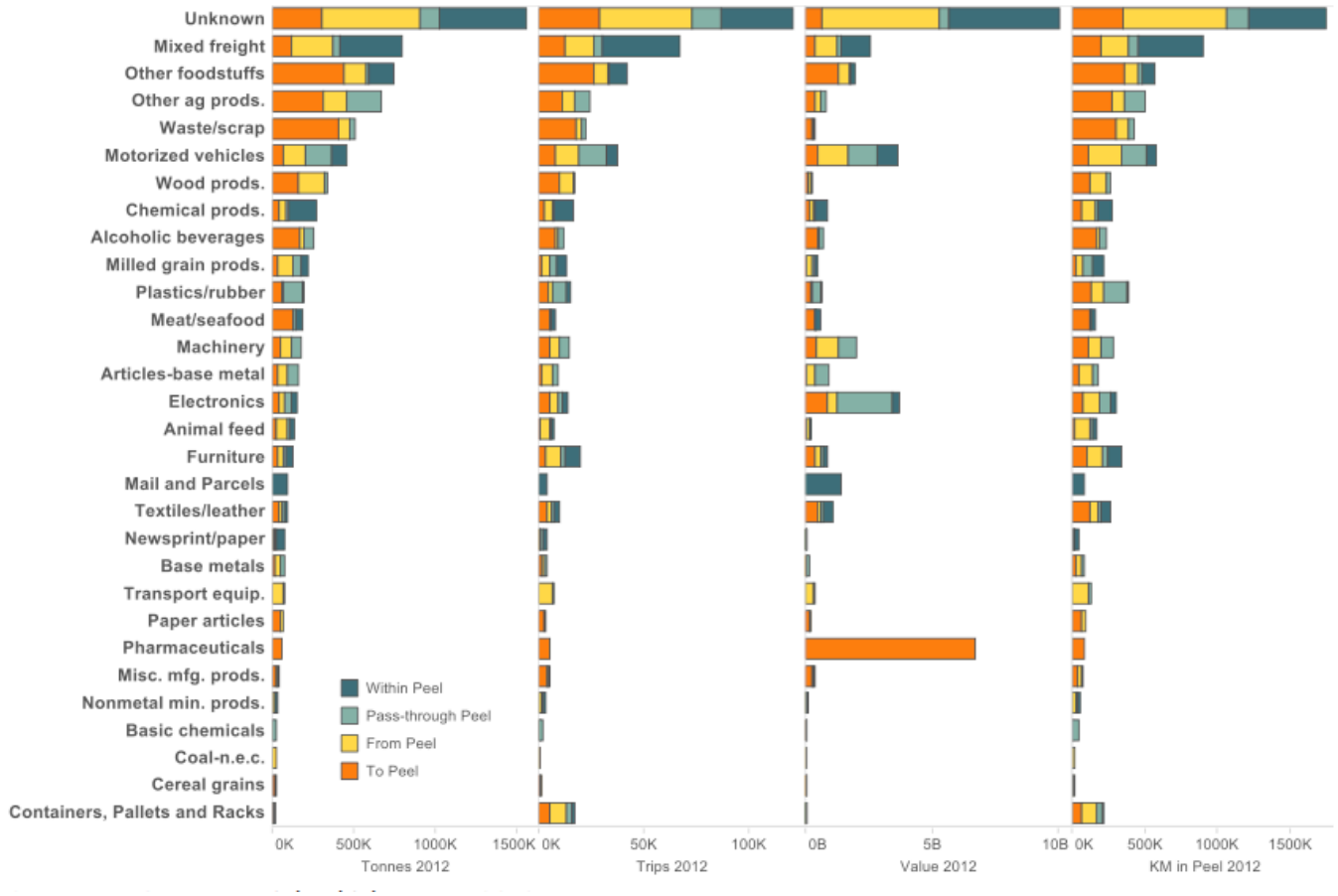
Source: MTO Commercial Vehicle Survey 2012, excludes empties.

4.1.2.4 Intermodal Market

Information about whether truck shipments were going to or coming from rail intermodal yards is of particular importance in Peel because of the location of the CP Vaughan and CN Brampton rail intermodal yards, which are the two largest intermodal yards in the GTHA.

Figure 20 provides an overview of the commodities carried by trucks with intermodal containers. Commodity information is not available for the majority of these shipments, which is expected because truck drivers often do not know what is carried in these containers, they simply deliver them without actually seeing or unloading the content. Mixed freight, other foodstuffs, other agricultural products, waste/scrap, and motorized vehicles represent the top commodity groups in terms of tonnage. In terms of value, motorized vehicles, electronics and pharmaceuticals are most prominent

Figure 20: Top Intermodal Commodities Moved by Truck in Peel

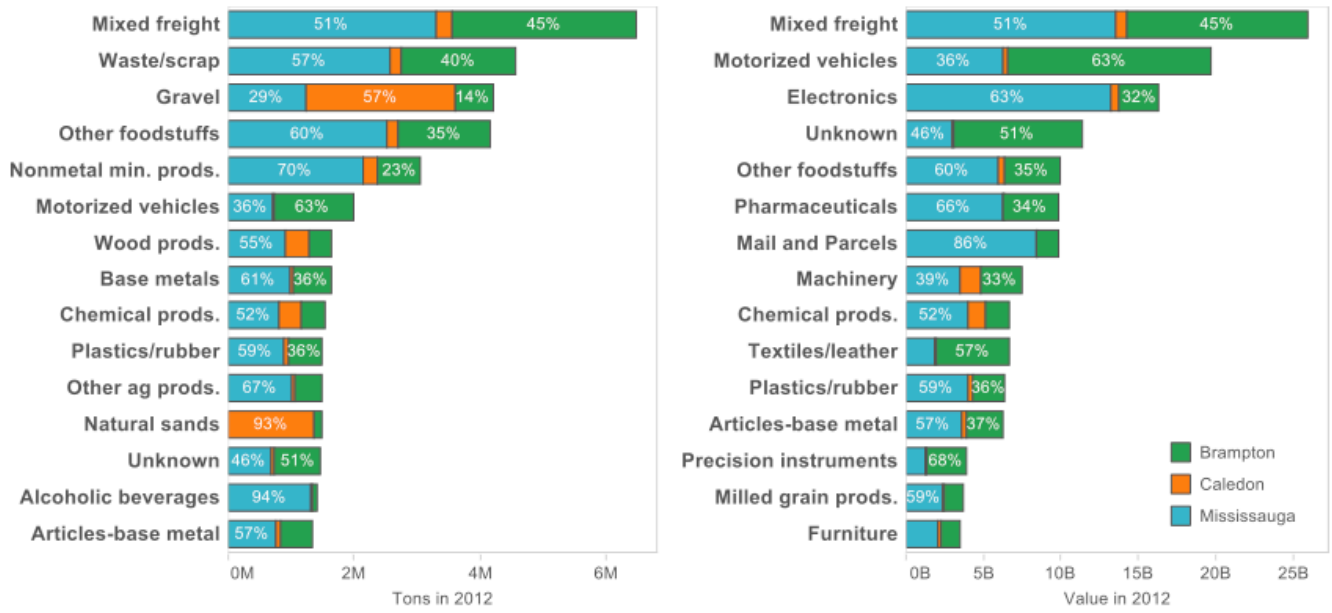


Source: MTO Commercial Vehicle Survey 2012

4.1.2.5 Shipment Geography in Peel

Figure 21 shows which municipality the top commodities that originated in Peel come from. Overall, both Brampton and Mississauga originate a wide variety of commodities, while Caledon focuses primarily on gravel and natural sands. In terms of tonnage, Mississauga originates a majority of waste/scrap, other foodstuffs, non-metal mineral products, wood products, and other agricultural products. Brampton originates a majority of motorized vehicles and about the same amount of mixed freight as Mississauga. In terms of value, Mississauga originates a majority of electronics, other foodstuffs, pharmaceuticals, and mail and parcels. Brampton originates a majority of motorized vehicles, precision instruments, and textiles/leather.

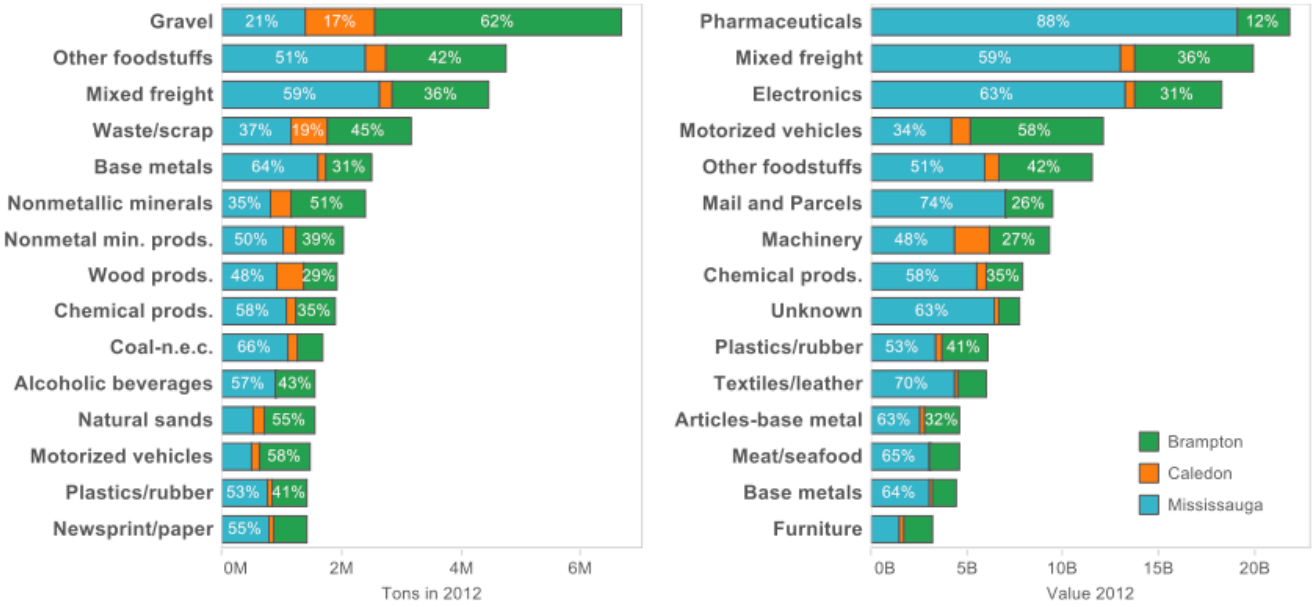
Figure 21: Top Truck Commodities Originated in Peel by Municipality



Source: MTO Commercial Vehicle Survey 2012

Figure 22 shows where commodities are being delivered within Peel. Gravel represents the largest commodity in terms of tonnage, with a high proportion heading to Brampton. In terms of value, Mississauga receives the majorityof pharmaceuticals, mixed freight, electronics, mail and parcels, and chemical products, primarily because of the municipality's larger population. In terms of value, Brampton receives the majority of motorized vehicles.

Figure 22: Top Truck Commodities Delivered to Peel by Municipality



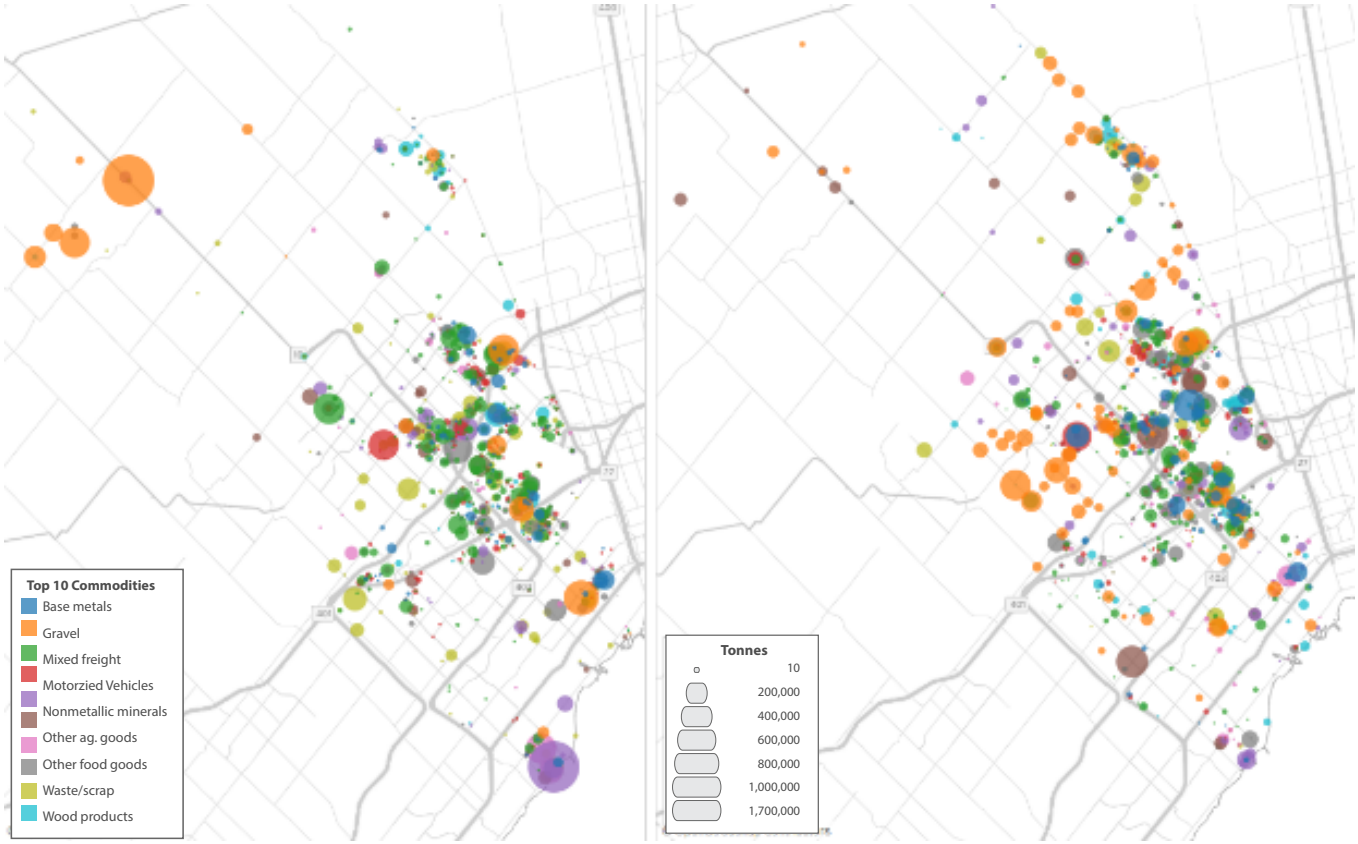
Source: MTO Commercial Vehicle Survey 2012

Figure 23 shows the origins and destinations of the top commodities by tonnage. Truck trip generation is concentrated along the 400-series highways, primarily in Brampton and Mississauga. The area surrounding the airport, adjacent to 407, 410, and 401, sees substantial freight generation. This region provides good access to Toronto Pearson, provincial highways, and the CN Brampton Intermodal Yard.

Many distribution centres are located in this area because of the transportation choices available and proximity to the rest of the GTHA. Pockets of substantial truck trip attraction are also located in Caledon, particularly along Hurontario St. and in the community of Bolton.

Gravel, the largest commodity by tonnage, originates primarily in the northeast of the region, and is destined to sites all over the region. Mixed freight in particular is concentrated around the provincial highways surrounding the Toronto Pearson International Airport and the CN Brampton Intermodal Yard. Non-metal mineral products originate primarily at a large site in Mississauga near the waterfront, and are received at various sites throughout the region. In other words, shipments of these top commodities are originated and terminated within the region without much agglomeration. Some agglomeration occurs at the municipal level, with Caledon focusing on gravel and other raw material inputs, Brampton focusing on manufacturing and distribution activity, and Mississauga focusing on goods consumption.

Figure 23: Origins (left) and Destination (right) of top 10 Commodities in Peel by Tonnage

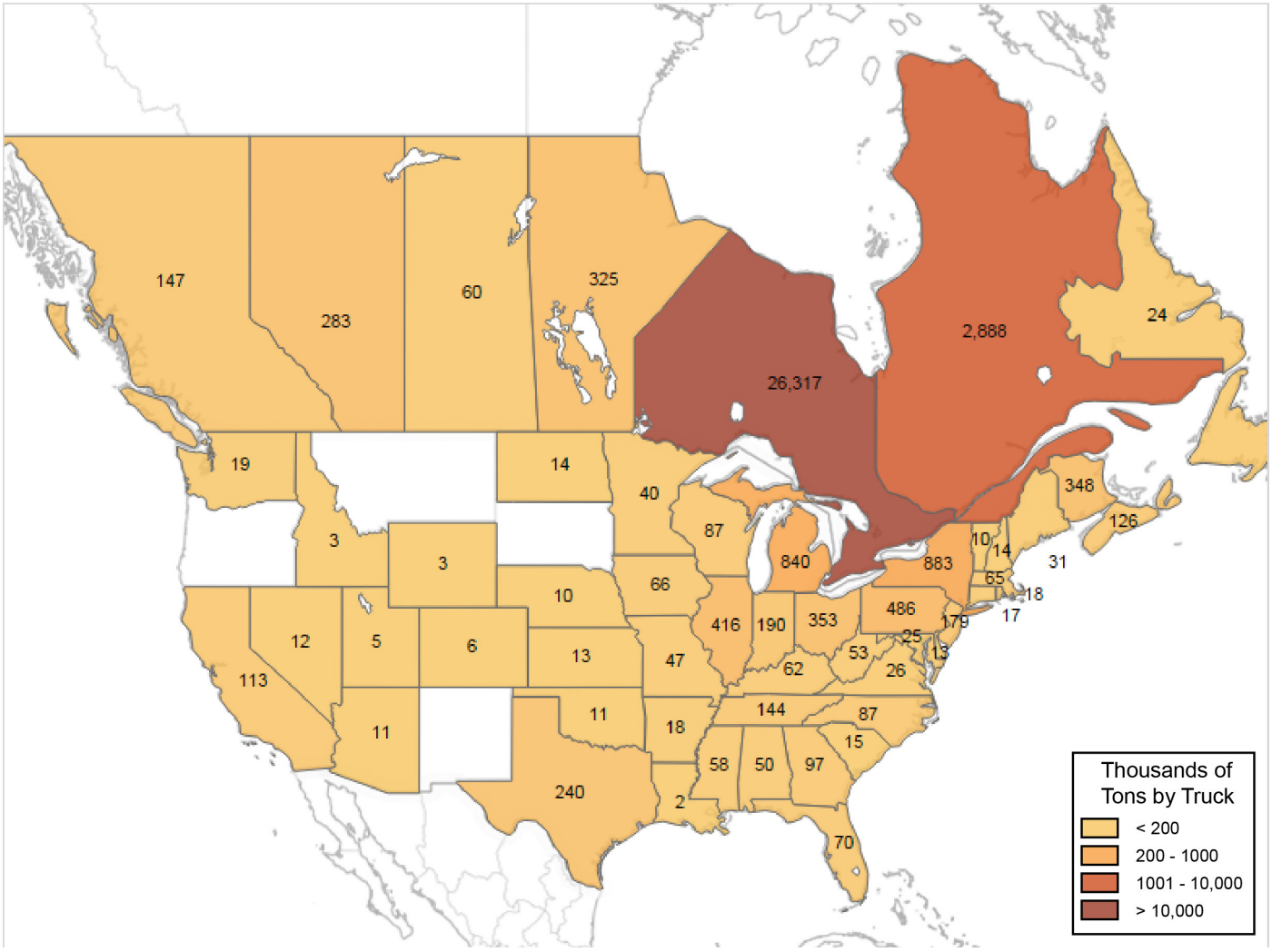


Source: MTO Commercial Vehicle Survey 2012

4.1.2.6 Shipment Geography Outside of Peel

Three-quarters of truck shipments that originate in Peel have destinations in Ontario as seen in Figure 24. Within Canada, the next largest destination is the Province of Quebec, receiving 2.9 million tons in 2012. The following top destinations of shipments are in the US. States neighbouring the Great Lakes, along the border, such as New York, Pennsylvania, Michigan, Ohio, and Illinois receive several hundred thousand tons each year for shipments originating in Peel and having destinations outside of Ontario; 54% have destinations in the U.S. and 46% have destinations in Canada. This highlights the importance of cross-border trade to Peel. Issues such as delays at the border affect Peel-based shipping. It also highlights the fact that companies in Peel ship to almost everywhere in North America

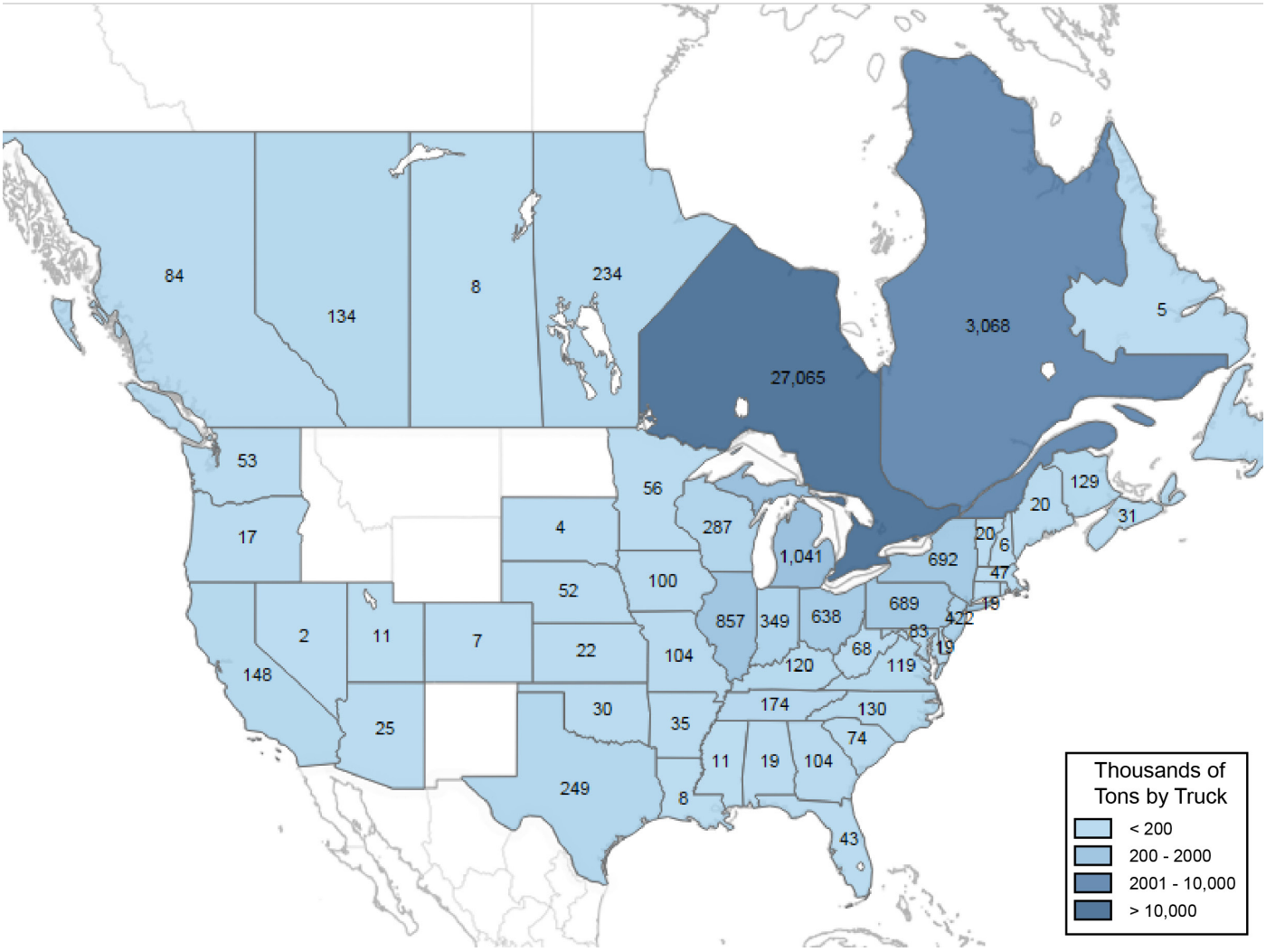
Figure 24: Destinations of Shipments from Peel, 2012 Thousands of Tons by Truck



Source: MTO Commercial Vehicle Survey 2012

Nearly three-quarters of truck shipments to Peel originate in Ontario. The next largest source of trips to Peel is from the Province of Quebec, at 3.1 million tons. As with destinations, Peel receives more goods from nine US states than other provinces in Canada. For shipments destined to Peel from origins outside of Ontario, 65% have origins in the US and 35% have origins in Canada. From this data it is clear that trucking primarily provides a regional service throughout Ontario and Quebec. Beyond these distances rail becomes more competitive, especially for reaching the Pacific or the Atlantic. Significant tonnages are being shipped by truck from places as far away as California, Texas, and Georgia.

Figure 25: Origins of Shipments to Peel, 2012 Thousands of Tons by Truck



Source: MTO Commercial Vehicle Survey 2012

4.2 Air Cargo

4.2.1 Summary

- Peel is home to the Toronto Pearson International Airport, the largest airport in Canada, handling twice the volume of cargo and the number of people as the next largest airport.
- Three dedicated cargo facilities are located within or adjacent to Toronto Pearson.
- Toronto Pearson loaded and unloaded 356,000 tonnes in 2014, representing one-third of all air cargo tonnages in Canada.
- Only 20.4% of the tonnes handled at Toronto Pearson came from or were going to domestic destinations, the rest involves international trade, where approximately 1/3 involves the U.S.
- Hamilton International Airport had a larger share of domestic service, at 70.9%, and almost all the international service was for trade with the US.
- At Toronto Pearson, more tonnage comes from or goes to the US than any other country, including the rest of Canada.
- Many of the largest freight forwarders and integrators in Canada are located adjacent to Toronto Pearson.
- Over the next couple of decades, cargo volume at Toronto Pearson is expected to grow at 4.4% per year on average, while cargo growth at Hamilton International Airport is projected at a smaller 1.6% per year, according to forecasts by both airports.[67]

4.2.2 Existing Infrastructure

The Region of Peel is home to the Toronto Pearson International Airport (Toronto Pearson), which is the largest airport in the country by passenger and cargo volumes. As seen in Figure 26, Toronto Pearson is located in the area intersected by Highways 407, 427, 401, and 410, roughly 25 km from downtown Toronto. This strategic location has led the airport to move roughly twice as many people and twice as much freight as the second largest airport in Canada, Vancouver International Airport.

Toronto Pearson boasts three dedicated cargo facilities: The Cargo West Facilities, the Vista Cargo area, and the FedEx cargo area. The FedEx cargo area, located just north of the airport, is the Canadian air hub for FedEx. This site comprises of several warehouses and cargo handling facilities. The Vista Cargo area and Cargo West Facilities are warehouses and distribution centres are rented out to multiple tenants, providing unique access to the airport. The Cargo West Facilities are currently used by Air Canada Cargo and American Airlines, among other companies. This complex of facilities is on the airfield between two runways, and is connected to the terminal through a dedicated multi-lane tunnel.

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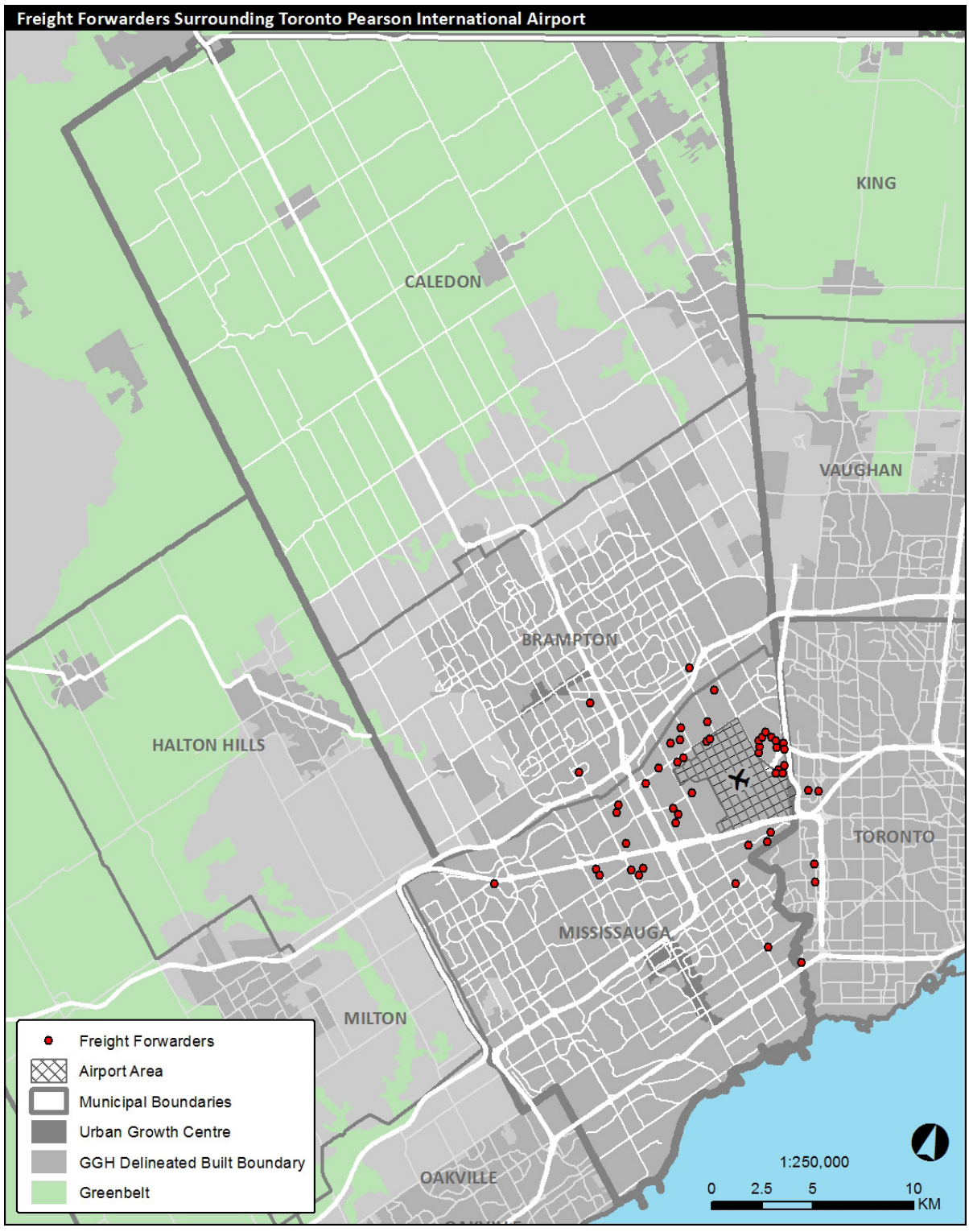
6 GTAA 2015 Annual Report

7 John C. Munro Hamilton International Airport Air Traffic Forecast, InterVISTAS Consulting Inc. 2008

Figure 26: Freight Forwarders Surrounding the Toronto Pearson International Airport



Data Source: Toronto Pearson International Airport, Taking Flight: The Airport Master Plan 2008 – 2030.

The Region of Peel is also served by the John C. Munro Hamilton International Airport; while not located in Peel, it provides a valuable air cargo service for many companies in the Region. In fact, this airport is the third largest in Canada in terms of tonnage handled. Hamilton Airport is located roughly 60 kilometers southwest from Mississauga, and is connected to Peel by the 403 and 407 highways. Hamilton is the main airport for the GTHA operations of UPS and Purolator.

4.2.3 Use and Operations

Air freight is a critical component of many shippers' supply-chains, serving two primary functions. The first is to act as a fail-safe for low-inventory operations widely used in manufacturing and distribution. If the supply chain breaks down and goods cannot arrive as planned, air transport is called upon to expedite the shipments. Freight shippers strive to minimize their use of such service because of costs, yet it is an important component of their risk management, and access to it is vital. The auto industry in particular depends on it because of their low levels of inventory that are typical.

The second function is carriage of expensive, perishable or otherwise time-critical goods for which the value of rapid and certain delivery offsets the higher cost of transportation. Electronics are an example of high-value goods, and flowers are an obvious example of goods that are perishable. Perishability extends as well to fashion seasons or holiday gifts in mid-December. Online retailers also offer fast air-delivery options as a way to compete with the immediacy of in-store purchases. Shippers serving national or international markets from Canada benefit from being located in Peel or adjacent areas because of ready access to Toronto Pearson, which provides unrivaled air cargo service in the country.

Toronto Pearson loaded and unloaded 356,000 tonnes in 2014, representing 32.4% of all air cargo tonnages in Canada. The position of Toronto Pearson appears to be stable, seeing tonnages grow at the national growth rate since 2010, keeping its share of total air cargo tonnage. Pearson accounts for 77% of all air cargo tonnage handled in Ontario.

In 2015, Toronto Pearson was involved in 443,000 flights that reached 180 destinations worldwide[8]. This global reach has led Toronto Pearson to be used extensively for shipping high-value Canadian exports around the world. It is estimated that flights departing this airport carry 6% of all Canadian exports by value, which represents 15% of all exports from the Province of Ontario[9].

While much smaller, Hamilton International Airport also handles considerable air cargo tonnages, accounting for 8.1% of all air cargo activity in Canada. Unlike Toronto Pearson, which has limited nighttime cargo operations, Hamilton International Airport offers 24-hour operations. Many shippers in Peel use Hamilton International Airport because it is smaller and less congested, where freight can transfer quickly from truck to air, and vice versa. Hamilton's share of Canadian air cargo appears to be stable from 2010 to 2014 as shown in the table below.

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8 Toronto Pearson International Airport, Growing Canada with a Mega Hub Airport, December 2016.

9 Toronto Pearson International Airport, Growing Canada with a Mega Hub Airport, December 2016.

Table 6: Loaded and unloaded tonnes of Cargo

	2010	2011	2012	2013	2014
Canada Total	1,052,699	1,055,282	1,057,327	1,072,875	1,101,473
Ontario subtotal	446,088	449,304	443,158	452,621	463,166
Toronto Pearson International Airport	340,410	344,305	345,732	346,352	356,448
Hamilton International Airport	81,850	85,349	81,331	86,542	88,984
Canada Total %	100.0%	100.0%	100.0%	100.0%	100.0%
Ontario % of Total	42.4%	42.6%	41.9%	42.2%	42.0%
Toronto Pearson International Airport % of Total	32.3%	32.6%	32.7%	32.3%	32.4%
Hamilton International Airport % of Total	7.8%	8.1%	7.7%	8.1%	8.1%

Source: Statistics Canada, Table 401-0045.

Both Toronto Pearson and Hamilton International Airport serve a diverse set of markets. The majority of Toronto Pearson trade occurs with other countries (at 53.9%), not including the US. Transborder trade with the US through Toronto Pearson accounts for 25.8% of air cargo while 20.4% is with domestic markets. Hamilton International Airport had a larger share of domestic service, at 70.9%, and almost all its international service was for trade with the US. This led Hamilton International Airport to handle almost as much domestic tonnage as Toronto Pearson in 2014.

Table 7: Air Cargo by Market

	Tonnes 2014				% of Tonnes 2014			
	Domestic	International (non US)	Transborder (with US)	Total	Domestic	International (non US)	Transborder (with US)	Total
Canada Total	483,295	389,684	228,494	1,101,473	43.9%	35.4%	20.7%	100%
Ontario Total	149,546	195,448	118,172	463,166	32.3%	42.2%	25.5%	100%
Toronto International	72,682	191,961	91,805	356,448	20.4%	53.9%	25.8%	100%
Hamilton International Airport	63,134	465	25,385	88,984	70.9%	0.5%	28.5%	100%

Source: Statistics Canada, Table 401-0045.

At Toronto Pearson, more tonnage comes from or goes to the U.S. than any other country, including the rest of Canada. Trade with the US is the main market served by this airport, making Peel the key gateway for air cargo between Canada and the US. The Bureau of Transportation Statistics in the US collects detailed data on air cargo operations at all their airports. Figure 27 was generated using this data, looking at all cargo flows between U.S. airports and Toronto Pearson. The data distinguishes belly cargo (goods moved in the baggage hold of passenger aircraft) from cargo moving in freighters (dedicated all-cargo aircraft). From 2000 to 2008, until the economic recession, freighter shipments at Toronto Pearson had been increasing at a rapid rate, more than off-setting decreases in belly shipments[10]. After 2008, tonnages between the Toronto Pearson International Airport and the US decreased quickly in response to the recession, but have since stabilized. Inbound shipments from the US saw the quickest correction.

Overall cargo volumes at Toronto Pearson and Hamilton International have not fully recovered since the US economic recession of 2008. From 2006 to 2009, tonnages at both these airports declined by almost 20%. From this low in 2009, tonnages have rebounded quickly, although pre-2007 values have not yet been reached[11].

Over 50% of shipments handled by Toronto Pearson come from airports that are not in Canada or the US. Most of these shipments come from Asia, which has seen rapid increases in air freight tonnage since 2000. There exists a strong imbalance with these shipments, with inbound cargo greatly outnumbering outbound cargo.

The main airlines that provide cargo service at the Toronto Pearson International airport include:

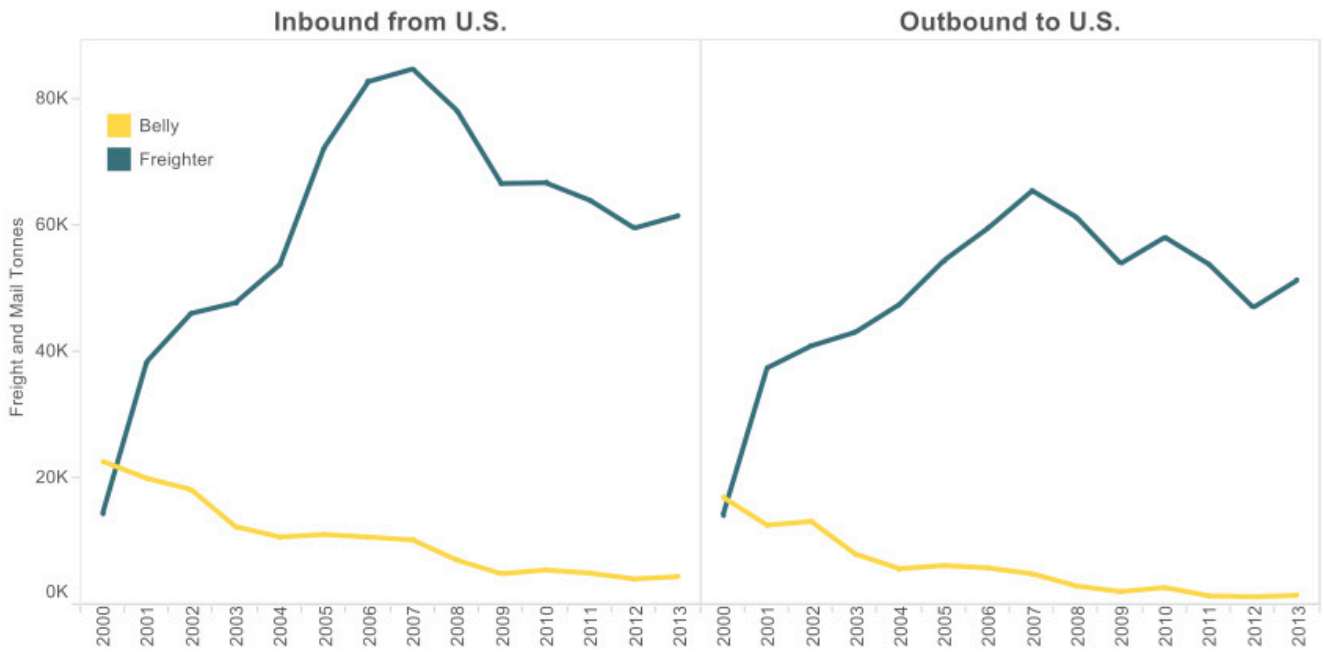
» **Belly:** Air France/KLM, Air Canada, Air India, Alitalia, American Airlines, Austrian Airlines, British Airways, Cathay Pacific, Continental Airlines, Delta Airlines, Korean Air, Lufthansa, Northwest Airlines, Westjet

» **All-Cargo:** Air Canada Cargo, Cathay Pacific Cargo, Cubana Cargo, Korean Air Cargo, DHL, FedEx, UPS, Volga Dnepr.

10 The replacement of belly cargo by freighters occurred across North America and was due to continental passenger flights moving to narrow-body aircraft, which limited capacity in the baggage hold. Overseas passenger flights use wide-body aircraft that offer ample belly capacity for cargo.

11 Metrolinx, 2016, Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement

Figure 27: Air Cargo Tonnages between Toronto Pearson and U.S. Airports



Source: U.S. Bureau of Transportation Statistics, T-100 Reports Segment Data.

As the largest airport in Canada, Toronto Pearson will have superior flight frequency for a range of destinations, and businesses will ship long distances by road to connect to it. Truck connection and drayage generally should be a key performance focus for Peel as every air shipment is initiated and completed by a truck, and the Region can affect this critical aspect far more than it can air operations.

4.2.3.1 Freight Integrators and Forwarders

Freight integrators provide complete door-to-door service for a variety of markets around the world. These integrators own or control aircraft and trucks, allowing them to streamline their supply channels and optimize for speed and reliability. The distribution strategy most commonly employed is to rely on a network of airport hubs to increase asset utilization and service frequency. Many of the largest freight integrators have their Canadian headquarters in the Region of Peel because of access to Toronto Pearson. These include DHL, UPS, and FedEx, among others. FedEx currently operates from a two building complex adjacent to the airport, totalling 325,000 square feet of distribution space. UPS also has operations through Hamilton International Airport.

Freight forwarders coordinate the movement of freight along supply-chains, by linking shippers with carriers. Forwarders help shippers line up airlines, motor carriers, waterborne carriers, and railroads in order for shipments to be delivered smoothly. Many of these freight forwarders are located in the Region of Peel, such as Agility, DHL Global Forwarding, UPS Global Solutions, Eagle Global Logistics, Expeditors, Kuehne & Nagel, and Nippon Express among others.

4.2.4 Future Conditions

It is expected that freight tonnages handled at Toronto Pearson will increase considerably in the coming decades. The 2015 Greater Toronto Airports Authority targets increasing passenger traffic from 41 million in 2015 to 69 million in 2034. This represents an average increase of 2.8% per year. Growth in passenger traffic, particularly on international routes, represents a benefit for freight because it increases the frequency of belly freight service that is potentially available. This gives shippers greater flexibility in scheduling shipments by air, especially on express service. Cargo volumes are expected to increase even faster, at 4.4% per year, leading to a doubling of tonnages from 2015 to 2034.

Table 8: Toronto Pearson's Medium and Long Term Targets

Goals	2014	2015	2020 (projected)	2034 (projected)	Average Annual Growth Rate 2015 to 2034
Passenger Traffic	38.6 million	41 million	51 million	69 million	2.8%
Aircraft Movements	434,600	444,000	501,000	599,000	1.6%
Cargo Volume (tonnes)	448,600	434,600	590,000	990,000	4.4%

Source: GTAA 2015 Annual Report

Hamilton International Airport is expected to see passenger aircraft movements increase by 2.7% per year on average. Freight is expected to increase at a slower rate than at Toronto Pearson

Table 9: Hamilton International Airport Forecast

Aircraft Movements	2015	2027	Average Annual Growth Rate 2015 to 2034
Passenger	11,800	16,200	2.7%
Cargo	15,900	19,200	1.6%
Total (includes other)	54,900	67,200	1.7%

Source: John C. Munro Hamilton International Airport Air Traffic Forecast, InterVISTAS Consulting Inc. 2008

4.3 Rail

4.3.1 Summary

- The Region of Peel is connected to the rest of North America through the Canadian National Railway (CN) and the Canadian Pacific Railway (CP). Additionally, the Orangeville Brampton Railway (OBRY) also operates in the Region.
- The GTHA is served by two main intermodal yards, CN Brampton and CP Vaughan. CN Brampton is located within Peel. 60% of CN's intermodal containers go through the CN Brampton terminal.
- The CP line that runs through Mississauga is estimated to carry from 30 to 45 million gross ton-miles per track mile each year while the CP line that runs through Caledon carries, on average, over 45 million gross ton-miles per track mile each year.
- For the segment of the CN rail that crosses Peel through Brampton is estimated to carry over 50 million gross ton-miles per track mile per year.
- Rail activity in Peel represents 18.6% of all rail tonnage flows involved in Canada. The largest rail shipment to Ontario is wheat, while other top commodities include automobiles, refined petroleum, and waste/scrap.
- Intermodal shipments represent one of the fastest growing markets for rail. Top growing commodities within these shipments include mixed loads and unidentified cargo. Declining commodities include coal as well as basic chemicals, phosphate rock, nickel ores, and wood pulp.
- A proposed development project called "The Missing Link" involves the creation of a new rail corridor connecting the CN bypass line with the CP railroad to separate freight traffic from GO Rail passenger services.

4.3.2 Existing Infrastructure

4.3.2.1 Track

The Region of Peel is connected to the rest of North America by the Canadian National Railway (CN) and the Canadian Pacific Railway (CP), Canada's two Class-1 railroads. The Region is also home to the Orangeville Brampton Railway (OBRY), which is a short-line railroad that connects several shippers to the broader CP network. Below is a short description of these three railroads that operate in Peel:

- **CN** is Canada's largest railroad, using over 32,800 kilometres of track to provide connectivity to communities and production centres throughout Canada, and in the US throughout the Midwest all the way to the Gulf Coast. In 2011, around 26% of CN cargo came from trade with Asia, 22% came from domestic shipments in Canada, 28% came from trans-border trade with the US, and 18% came from domestic shipments in the US[12]. The remainder involved shipments from trade with South America and Europe. CN owns and operates over 200 kilometres of track in Peel, primarily through Brampton (the Halton Subdivision). This is the main trunk line that CN uses to traverse Ontario.
- **CP** is Canada's second largest railroad, using over 23,000 kilometers to provide rail service to most of Canada's population and consumption centres. In Peel, it operates two lines, one crossing Mississauga (the Galt Subdivision) and another one entering and exiting the eastern part of Caledon. The line that crosses Mississauga heads into the US providing service to Buffalo, Detroit, and Chicago; it also connects to the OBRY short-line. The CP line that passes through Caledon forms part of the trunk line that heads inland to Thunder Bay and Winnipeg.
- **OBRY** is a short-line railroad that operates primarily in Peel between Streetsville Junction in Mississauga and Orangeville north of Caledon. At the Streetsville Junction interchange, the OBRY line connects to the CP network. OBRY primarily provides freight service for shippers throughout Peel, and also provides limited passenger service. The industrial users who use the OBRY are part of a collective called the Orangeville-Brampton Rail Access Group (OBRAG). Cando Rail Services Company is the company that operates freight trains currently. Cando was contracted through an agreement with OBRAG. The OBRY was established in 2000 when CP (who originally owned the track) deemed the line to be redundant. Currently, OBRY is owned by the Town of Orangeville through the Orangeville Railway Development Corporation.

In addition to the three freight railroads described above, Peel also has passenger rail service provided by GO Transit. GO Transit operates three lines through Peel. The Lakeshore West line in Mississauga is owned by GO Transit, the Milton line in Mississauga is operated on track owned by CP, and the Georgetown line in Mississauga and Brampton is operated on track that is partially owned by GO and partially owned by CN. This overlap between passenger and freight rail service creates several operational conflicts, which has led to the proposal of the 'Missing Link' project described later in this section.

12 CN, CN's Role in Goods Movement, 4 May 2012.

4.3.2.2 At-Grade Crossings

There are currently 12 at-grade rail crossings in the Region of Peel. The majority of these crossings are located on the OBRY short-line, spanning all three lower tier municipalities. The CP and CN railroads each have two at-grade crossings within Peel.

A study was conducted in 2014 to evaluate the need for separating the at-grade crossings[13]. This study found that only the two at-grade crossings on the CP network at Coleraine Dr. and King St. should be considered for separation. These crossings had both relatively high vehicular traffic (over 8,000 annual average daily traffic (AADT)) and train volumes (on average 16 per day), leading to relatively frequent and costly delays for passenger vehicles. In addition to delaying vehicles, the high volumes at these at-grade crossings also posed an elevated accident and safety risk. The Coleraine Dr. crossing is currently in the feasibility and environmental assessment process. During the preparation of this Plan, the King Street crossing is being evaluated through the Region's capital planning and development charge background study process.

On the other hand, the study found that the at-grade crossings on the CN lines did not merit being upgraded, because even though this line carries on average 31 trains per day, vehicular traffic is significantly less. The study also concluded that none of the at-grade crossings on the OBRY currently require separation, because even though vehicular traffic can be high in some locations (up to 46,700 AADT on Bovaird Dr. W), on average only 1 train traverses the railroad per day.

13 Region of Peel (2014) Improvements to At-grade Rail Crossings: Prioritizing Crossings for Grade-Separation. Action item 4.

Figure 28: Rail Network

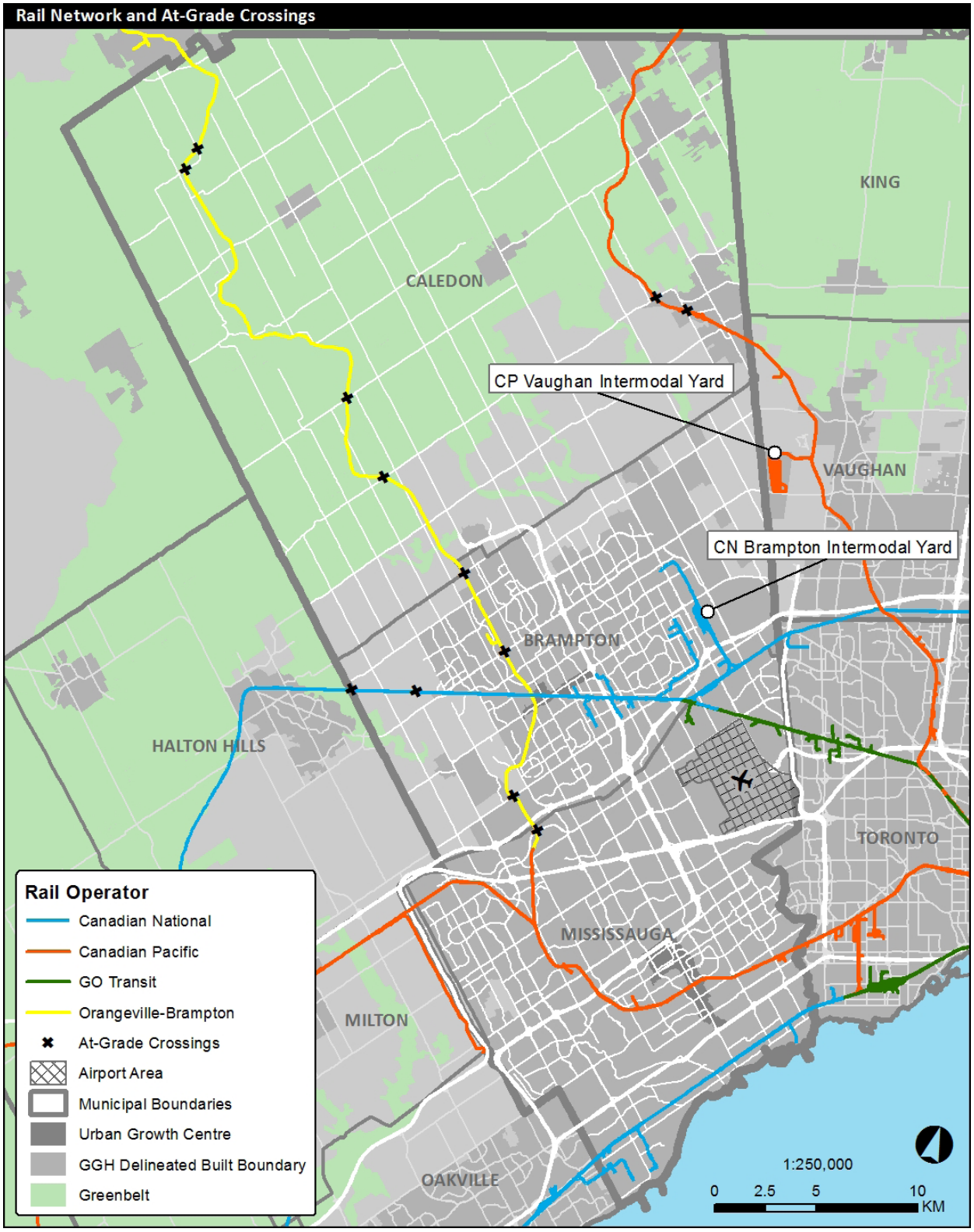


Table 10: At-Grade Crossings

Regional Road	RR #	Municipality	Trackage Owner	Track Use
Coleraine Dr	–	Caledon	Canadian Pacific Railway	Freight
Mississauga Rd	1	Brampton	Canadian National Railway	Freight & Passenger
Winston Churchill Blvd	19	Brampton	Canadian National Railway	Freight & Passenger
Derry Rd West	5	Mississauga	Orangeville-Brampton Railway	Freight & Tourist
Steeles Ave W	15	Brampton	Orangeville-Brampton Railway	Freight & Tourist
Bovaird Dr W	10	Brampton	Orangeville-Brampton Railway	Freight & Tourist
Mayfield Rd	14	Brampton	Orangeville-Brampton Railway	Freight & Tourist
King St	9	Caledon	Orangeville-Brampton Railway	Freight & Tourist
Olde Base Line Rd	12	Caledon	Orangeville-Brampton Railway	Freight & Tourist
Queen St. E. (Caledon)	6	Caledon	Orangeville-Brampton Railway	Freight & Tourist
Porterfield Rd	136	Caledon	Orangeville-Brampton Railway	Freight & Tourist
King St	9	Caledon	Canadian Pacific Railway	Freight

Source: Region of Peel

4.3.2.3 Intermodal Yards

Intermodal is a service provided by railroads with the intention of competing for shipments that would have otherwise been transported by truck. The service is designed to offer competitive travel times, reliability and costs, particularly between large metropolitan centres and key port infrastructure. Intermodal containers are drayed from the surrounding area to the intermodal yards by truck, and are transferred onto specialized trains operating on fixed schedules.

The Greater Toronto Area is currently served by the two main intermodal yards of CN Brampton and CP Vaughan. CN Brampton is located in the Region of Peel while CP Vaughan is located just outside Peel in the York Region. In addition, CP operates an Expressway Terminal in Milton (located in Halton Region to the east of Peel) that provides daily short-haul service to Montréal. It is estimated that intermodal yards in the GTHA handle a combined 2 million containers each year[14]. Below is a short description of these key freight assets:

CN Brampton Intermodal Yard

The CN Brampton Intermodal Yard is located 5 kilometres northwest of the Toronto Pearson International Airport, adjacent to Highway 407. Around 60 % of CN's intermodal containers touch CN Brampton, leading it to be the most important terminal in their network[15]. It is estimated that international traffic accounts for 43% of outbound containers and 69% of inbound containers at this terminal[16]. Recent growth in intermodal markets has put pressure on CN Brampton to expand operations. In 2011 CN made several investments to increase capacity at the terminal. It purchased five new cranes, installed additional track, and improved access to the terminal, all of which increased the capacity of the terminal by about a quarter. The terminal is in a prime location for goods movement in the GTHA area, counting with extensive access to major arterials, main highways, and adjacent industrial and warehousing development. However, there is indication that the CN Brampton terminal is approaching capacity. CN Brampton has significant impacts on the surrounding area. It is estimated that on an average day it generates 3,000 truck trips per day[17] as containers are delivered to be placed on trains, or taken off arriving trains to be distributed throughout the region. CN operates drayage trucks in addition to the independent trucks that serve the facility.

CP Vaughan Intermodal Yard

The CP Vaughan Intermodal Yard is located just north of the Region of Peel, where Route 50 intersects Rutherford Road. It is estimated that this terminal generates around 2,000 truck trips per day in an average weekday[18]. Background information about CP Vaughan shows that it receives roughly 8 intermodal trains each day, each carrying approximately 100 to 120 containers each. Over a year this amounts to around 350,000 to 400,000 containers handled[19]. More recent information indicates that this terminal handles more than700,000 containers each year[20]. Uncertainty in terminal level volumes is common as this information changes from year to year and it is considered to be confidential by operating railroad. International cargo is estimated to represent 40% of outbound containers and 60% of inbound containers at this terminal[21]. CP used to operate another terminal in the region, CP Obico, however in 2012 it was closed and intermodal operations were consolidated at CP Vaughan.

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14 METROLINX, 2016, Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement

15 https://www.cn.ca/en/news/2011/05/media_news_bit_increases_capacity_20110517

16 METROLINX, 2016, Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement

17 Region of Peel

18 Region of Peel

19 Metrolinx, 2011. GTHA Urban Freight Study, Final Draft. Toronto, Ontario February 2011.

20 METROLINX, 2016, Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement

21 METROLINX, 2016, Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement

CP Milton Expressway Terminal

The CP Milton Expressway Terminal is located just southwest of Mississauga along the 401 highway. This terminal specializes in providing daily between Milton and Montreal, for any truck trailers, not just intermodal containers. This service is designed to compete with trucking on the Highway 401 corridor, providing quick pick-up and drop-off of trailers by truckers.

The intermodal yard in Vaughan and Brampton represent the only full service intermodal connections in Southern Ontario. The closest terminals outside the GTHA are located in Buffalo, NY across the border, or CP Sudbury over 400 kilometres north. CN's closest intermodal station is located in Detroit across the US border, over 370 km away.

4.3.2.4 Main Carload Yards

Carload traffic also represents an important freight rail market for Peel. Carload service is used to transport bulk commodities, such as grains and energy products, or general merchandise. The following are the major carload yards in or around the Region of Peel:

- **CN MacMillan Yard** is located northeast of the Region of Peel in Vaughan close to the interchange between Highway 400 and 407 ETR. This is the largest classification yard in Canada, switching full and empty cars between trains on parallel tracks. CN MacMillan handles freight with origins and destinations all over Canada, serving as a hub to reroute traffic on the CN network. The facility counts single and dual hump switching capabilities as well as flat switching capabilities. While detailed traffic levels at this facility are confidential, it is estimated that it handles in excess of 1 million loaded or empty rail cars per year. In addition to handling cargo, the facility is also set up to maintain and service rail assets.
- **CP Lambton Yard** is located just east of Region of Peel.
- **Willowbrook Yard** is located east of the Region of Peel. In the 1970s, GO Transit purchased this facility from CN and it is now used to repair and service transit trains.
- **CN Oakville** is located west of the Region of Peel, and is another classification yard.

4.3.3 Use and Operations

4.3.3.1 CP

The rail network in Peel serves both local shippers and through traffic. The CP line that runs through Mississauga is estimated to carry from 30 to 45 million gross ton-miles per track mile each year[22], with most of this freight moving along the important Detroit/Windsor, Buffalo, Toronto, and Montréal corridor (see Figure 29). At Detroit, freight can continue on the Norfolk Southern or CSX networks towards destinations all over the US; however, the entry into Detroit is through an antiquated tunnel that cannot accommodate double-stack intermodal trains, representing a bottleneck on the system (double stack shipping is more efficient and cost effective than traditional single stack shipping).

22 Gross ton-miles per track mile is a metric used in the rail sector to report the average tons for a given rail corridor

Until an improved tunnel is financed and built, CP intermodal trains run via Buffalo and use CSX lines through Ohio to travel west.

The second CP line in Peel, through Caledon, carries even higher freight volumes. CP estimates that on average it carries over 45 million gross ton-miles per track mile each year, collecting freight from the Detroit/Windsor-Toronto-Montréal corridor westward over Sudbury to the rest of Canada. This is also the line that is used to ship intermodal containers from the west coast ports of Canada to inland consumption centres such as Toronto.

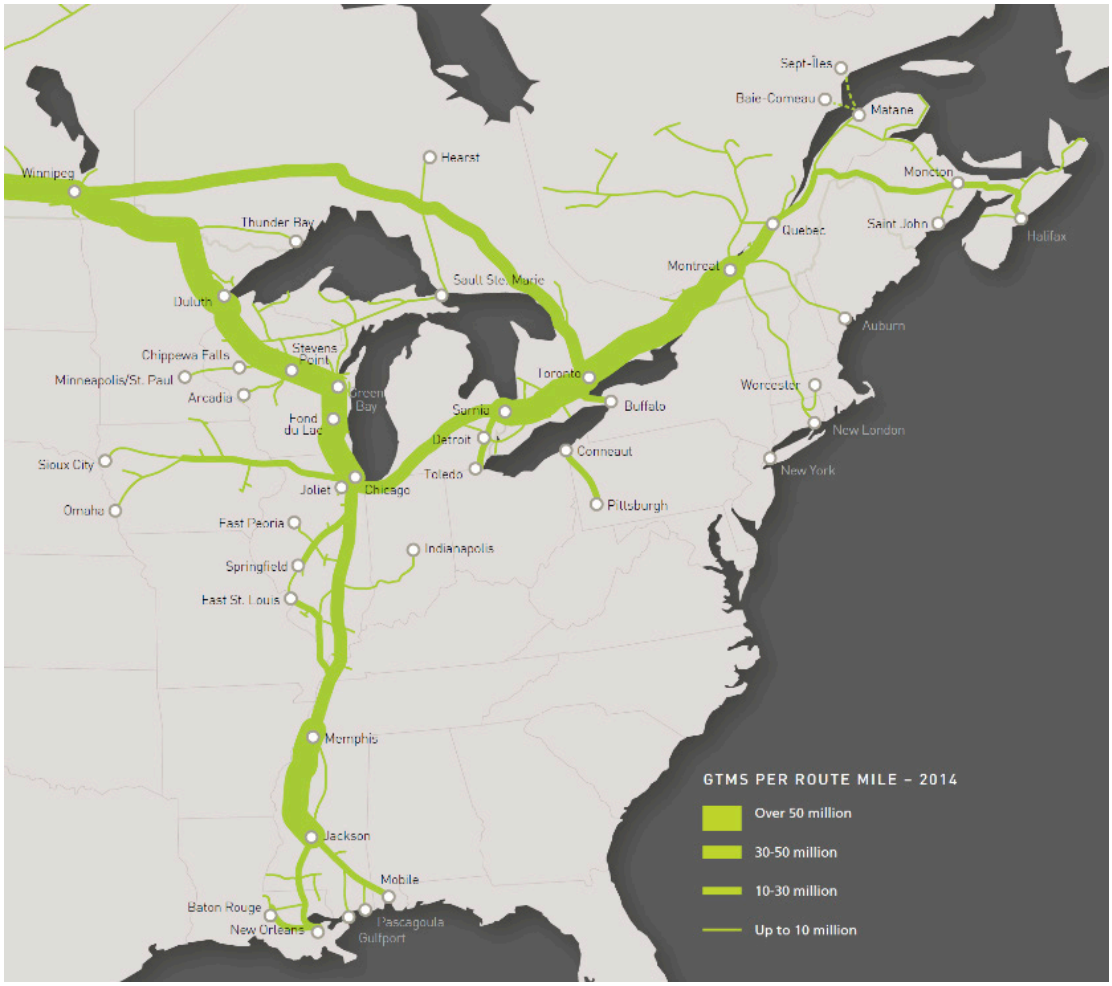
Figure 29: Average Density on CP's Network

Source: Canadian Pacific Investor Fact Book, 2014

4.3.3.2 CN

CN also depends critically on its line that crosses Peel through Brampton. As can be seen in Figure 30, over 50 million gross ton-miles per track mile on average cross this part of the network. In contrast to CP's network, CN moves more freight on the Detroit-Toronto-Montréal corridor than on its line heading westward through Canada. This is caused by the CN system being more geared towards serving markets in the US, such as Detroit, Chicago, and even down to New Orleans, which naturally increases the importance of Toronto as a key hub for US-Canada trade. Moreover, CN owns track that connects Detroit to Chicago, while CP does not, further increasing freight flows along this corridor. CN enters Michigan via a recently built tunnel at Sarnia that can accommodate double-stack intermodal trains. Finally, CN has an exclusive port operation in Prince Rupert, BC that can feed Asian import containers directly into Chicago via Winnipeg, or continue east from Winnipeg to Toronto on north of the great lakes.

Figure 30: Average Density on CN's Network



Source: Canadian National Investor Fact Book, 2015

4.3.3.3 OBRY

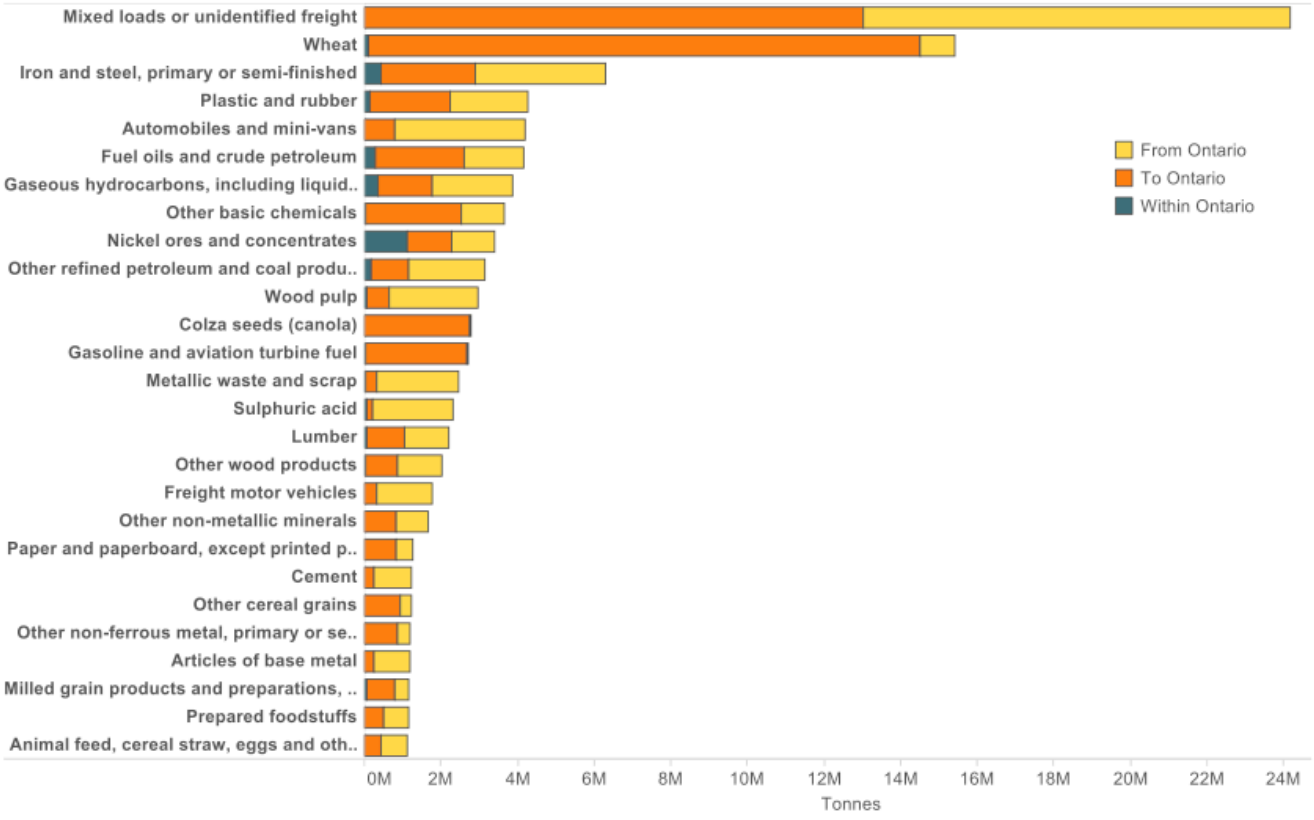
Even though the OBRY railroad carries much lower freight volumes than CP and CN, it is nonetheless an important option for several shippers in Peel. This line currently operates freight trains twice a week, with each train carrying 8 to 12 cars. This service is used by about 6 to 7 customers to access the CP mainline in Mississauga. The main commodities carried are plastics and raw materials. In addition to moving freight, the OBRY also operates a tourist train called the Credit Valley Explorer.

4.3.3.4 Commodities Moved

While detailed information about rail volumes and operations through Peel Region are collected by Statistics Canada, this information is confidential and cannot be published in this report. However, from this data, Statistics Canada publishes totals at the provincial level, which can be useful in describing aggregate trends in the sector. This data shows that, in 2014, Ontario received by rail 23.8 million tonnes of cargo and originated 30.2 million tons of cargo destined elsewhere in Canada and the US. The same year, there were 3.4 million tons of cargo shipped by rail within Ontario. This rail activity represents 18.6% of all rail tonnage flows involved in Canada.

As can be seen in Figure 31, the largest rail shipment to Ontario is wheat. The other top commodities are iron and steel, plastic and rubber, automobiles, and fuel oils and crude petroleum. For automobiles, refined petroleum, wood pulp, and waste/scrap, Ontario originates considerably more tonnes than it receives. On the other hand, basic chemicals, canola seeds, and gasoline are commodities that Ontario receives in greater quantities than it originates.

Figure 31: Rail Tonnes to, from, and within Ontario in 2014

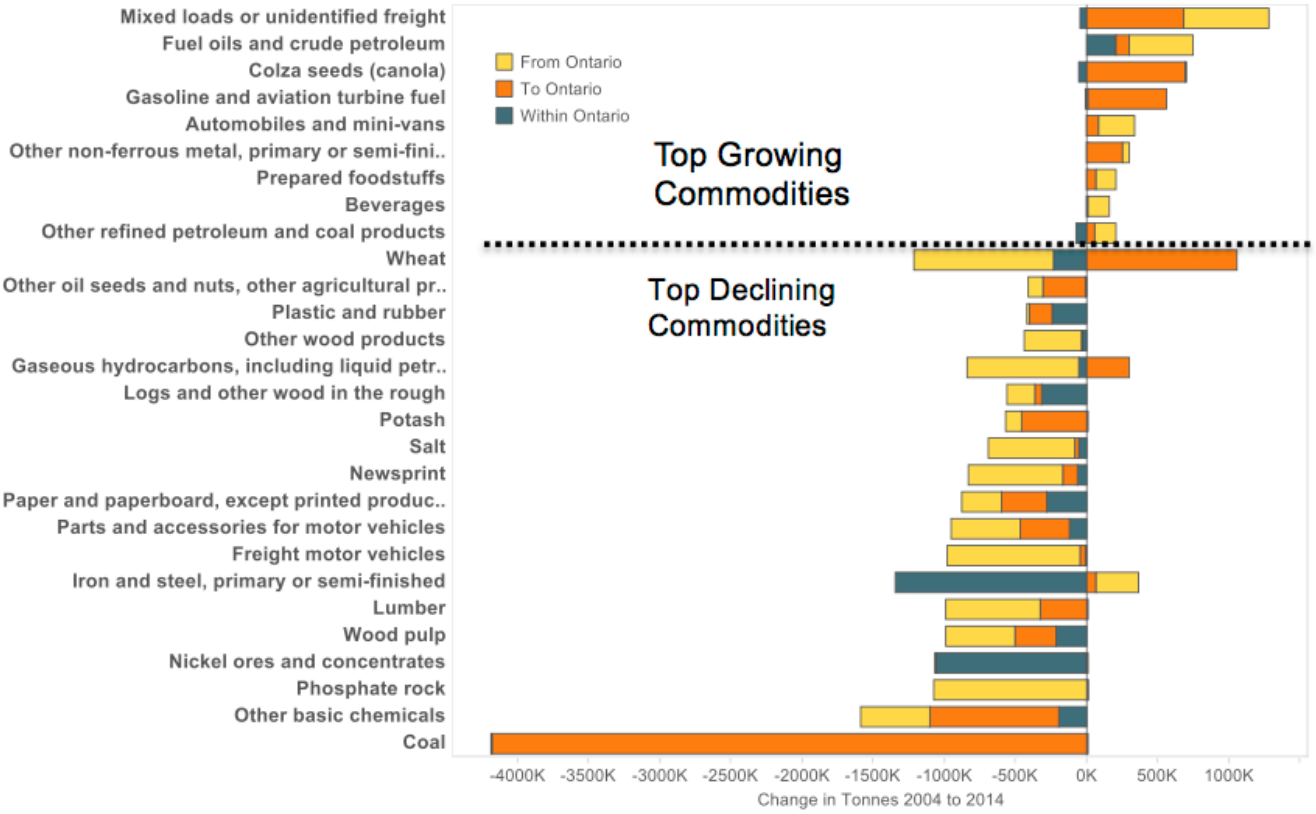


Source: Statistics Canada

Understanding changes in the underlying commodities moved by rail can help explain this trend. Figure 32 shows the top growing and declining commodities in Ontario since 2004. The top growing commodities are mixed loads and unidentified cargo, which likely involve intermodal shipments. Intermodal shipments represent one of the fastest growing markets for rail. The other commodities that are growing substantially are fuel oils and crude petroleum, canola seeds, gasoline, and automobiles. On other hand, as can be seen in Figure 32, the top declining commodity is clearly coal. In 2004, coal shipments to Ontario totaled 4.6 million tons, while in 2014 they amounted to only 385,000 tones. This is due to the closure of Ontario's last coal-fired generating station in April 2014, and mirrors the shift in the US from coal to lower cost and cleaner natural gas fuel. Other significant traffic declines can be found in basic chemicals, phosphate rock (of which none were shipped in 2014), nickel ores, and wood pulp.

Figure 32 shows that over the last decade containers on flat cars (intermodal rail) has increased the fastest, particularly for shipments heading to Ontario.

Figure 32: Top Growing and Declining Commodities for Ontario Rail, 2004 to 2014



Source: Statistics Canada

4.3.4 Proposed Developments: The Missing Link

The 'Missing Link' project involves building a new rail corridor connecting 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 GO Transit lines of Milton and Kitchener. In addition to the new rail connector, this project would also require improvements to other CN and CP lines.

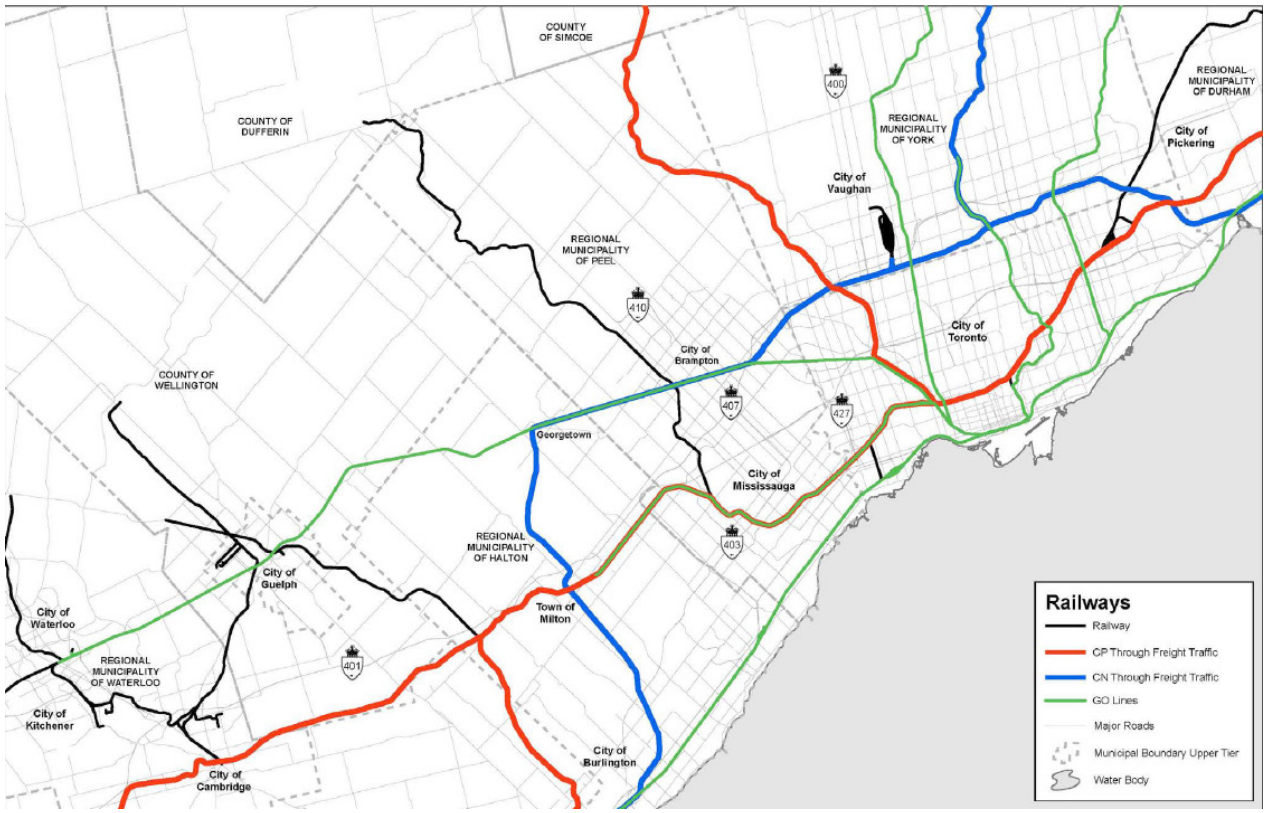
As can be seen from Figure 33, two GO Transit lines currently operate in Peel through rail track that is part of the core CN and CP network. This generates conflicts as freight and passenger rail operations are very different. As shown in Figure 34, by creating a rail connector through Peel (and neighboring regions) it would be possible to separate freight and passenger operations. A feasibility study of this project conducted in 2015 found that the project has the potential to generate substantial positive

outcomes for the region and recommends further study of the project. Some of the positive benefits could include:

1. Eliminating the impacts of the widening of Milton and Kitchener GO Transit routes
2. Permitting the electrification of GO Transit rail lines by removing freight service
3. Allowing more frequent and reliable two-way passenger service on GO Transit
4. Re-routing freight traffic away from central areas of Toronto, Mississauga, Brampton, and Georgetown
5. Improving the speeds and reliability of GO Transit, and improving the operations of freight through traffic, which is a priority for the Province.

In mid-2016 the province of Ontario reached an agreement with CN to further study technical and planning aspects of the proposed new corridor. Both parties also agreed to seek the support of the Federal government[23].

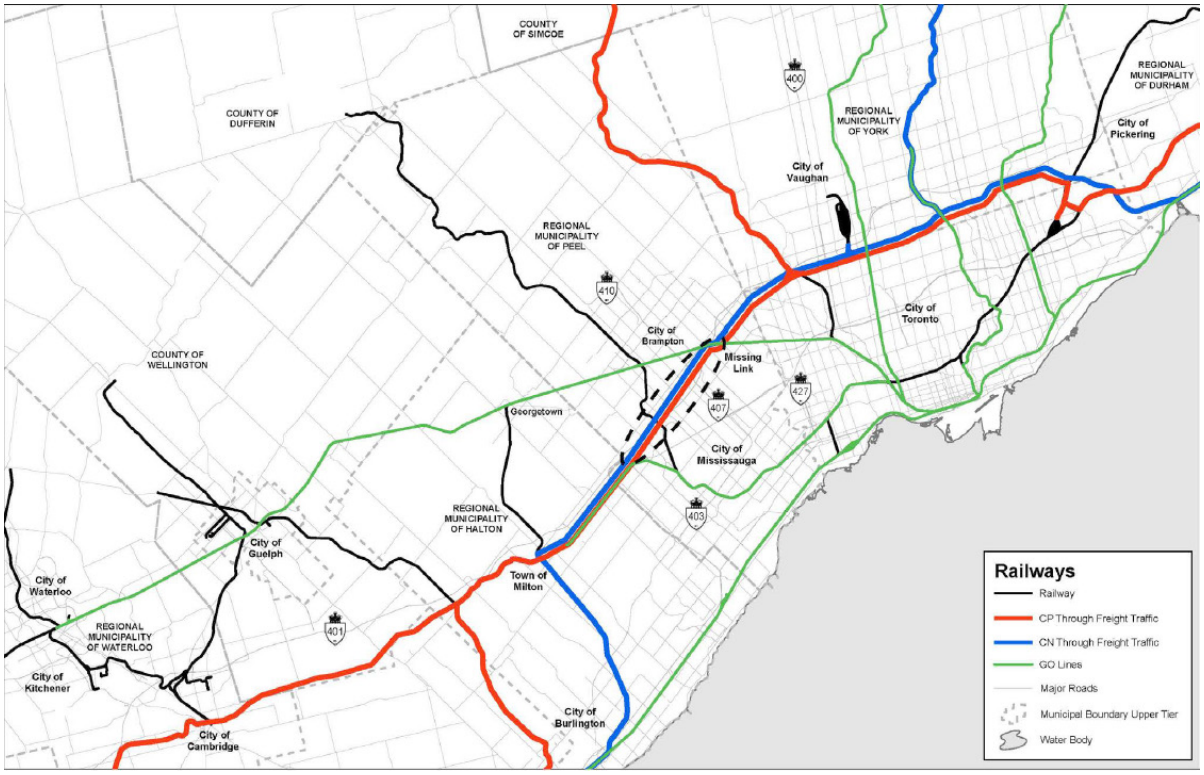
Figure 33: Existing Rail Network without Missing Link



Source: The Corporation of the Town of Milton, Report ENG-020-15

23 http://www.progressiverailroading.com/passenger_rail/news/Ontario-inks-pact-to-clear-way-for-expanded-commuter-rail-service-between-Toronto-Waterloo--48541

Figure 34: Proposed Missing Link Connection



Source: The Corporation of the Town of Milton, Report ENG-020-15

4.3.4.1 Proposed Developments: CN Milton Intermodal Yard

Currently a third intermodal yard is being proposed by CN in Milton. The project is currently progressing through the federal environmental assessment. It would be located on 400 acres of land between Britannia Road and Lower Base Line, just west of the Region of Peel. CN is building this terminal because CN Brampton is approaching capacity. If built, this project could increase truck volumes on 407 and 401 heading into the Region of Peel. However, there exists the potential for this terminal to be used to remove volume pressure from CN Brampton. This project is called the Milton Logistics Hub Project.

4.4 Marine

The Region of Peel has limited marine facilities that handle goods. Peel has two private port facilities: the refinery in Mississauga, and the cement plant in Clarkson for petrochemicals and limestone respectively. Although Peel doesn't import or export cargo directly through a local port, some of the freight moving through the Region had originated from or was destined to a port for international markets.

Cargo ports handle various types of goods including container cargp, liquid bulk (cruide oil), dry bulk (gain, coal), breakbulk (paper, wood, steel), roll-on/roll-off (motorcars). Canada's largest cargo ports are listed below:

1. Port of Vancouver (138 Million Tonnes, 2015)
2. Port of Montreal (32 million Tonnes, 2015)[24]
3. Port of Prince Rupert (20 Million Tonnes, 2015)[25]
4. Port of Halifax (7.5 Million Tonnes)

Hamilton Port Authority is the largest port in Ontario handling 9.2M Tonnes of cargo in 2015.

4.5 Pipeline

Pipeline infrastructure is used to transport natural gas, crude oil, and petroleum products across Canada. This movement is important for energy production for both consumers and trade. The pipelines are regulated by the National Energy Board (NEB), a federal agency that oversees companies operating interprovincial and international pipelines. The NEB estimates that, in 2015, $99.7 billion worth of energy products were transported through Canada's pipeline transportation system[26]. This figure is down from 2007 when approximately $121 billion worth of products were moved through NEB regulated pipelines[27]. Pipelines play a small role in the movement of goods to and from Peel. The major pipelines running through Peel move oil and natural gas.

4.5.1 Natural Gas

The natural gas pipeline through western and northern Brampton is operated by TransCanada and ranges in age from 3 to 35 years. The latest extension was completed in 2013 when TransCanada completed construction on the Parkway West pipeline project. TransCanada's King's North Connection Project is underway for construction of a new pipeline mainly through the City of Vaughan, with a small portion of the line running through eastern Brampton.

Enbridge's GTA Project received approval in 2014 for the construction of a natural gas pipeline through Mississauga and Brampton.

4.5.2 Oil

Enbridge and Trans-Northern operate oil pipelines that run through Mississauga. Trans-Northern's Ontario-Quebec line moves refined petroleum products through Mississauga with branch lines connecting to Toronto Pearson International Airport and a pump station located near Lake Ontario.

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24 http://www.acpa-ports.net/industry/cpafacts.html

25 http://www.acpa-ports.net/industry/cpafacts.html

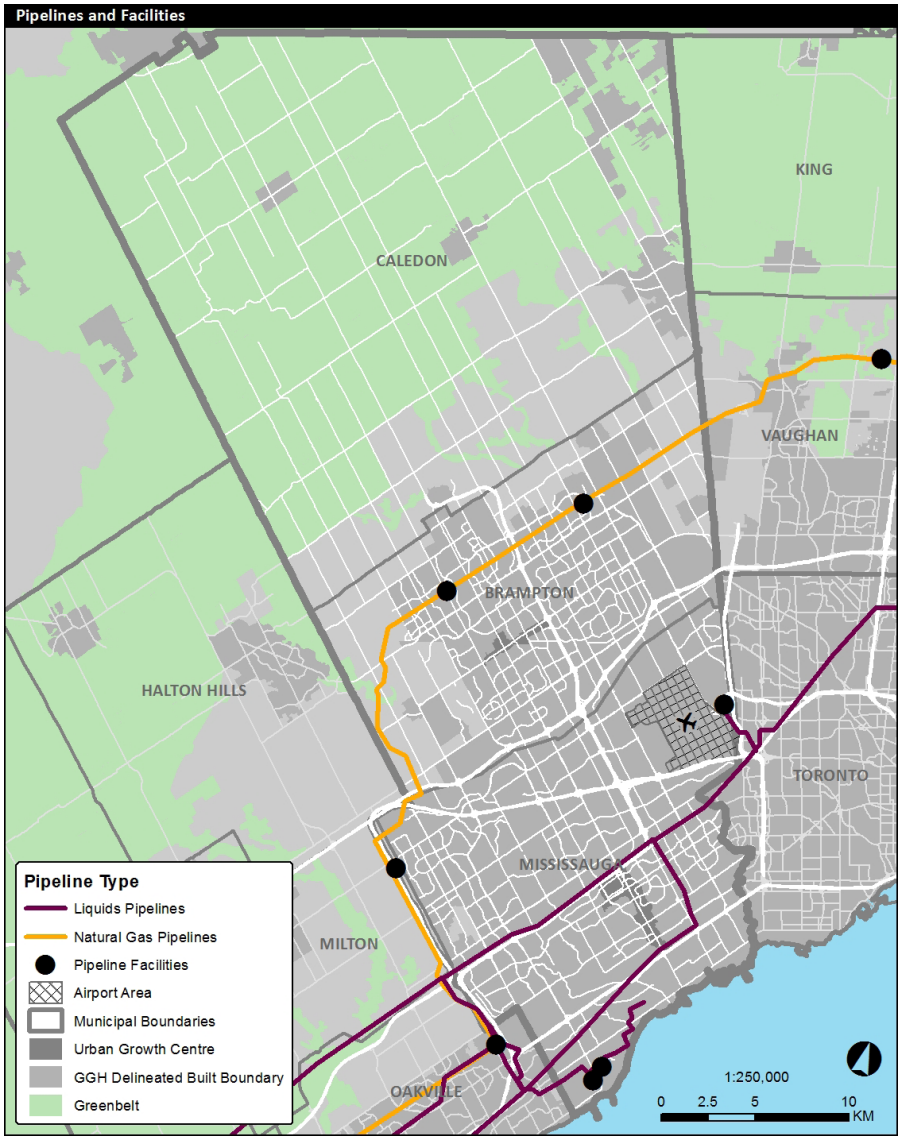
26 National Energy Board. Canada's Pipeline Transportation System 2016, Energy Market Assessment. https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprttn/2016/cnds-ppln-trnsprttn-systm-eng.pdf

27 National Energy Board. Canada's Pipeline Transportation System 2008, Energy Market Assessment . https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprttn/archive/2008/2008trnsprttnssssmnt-eng.pdf

This pipeline transports an average of 172,900 barrels of refined petroleum products daily[28]. Enbridge's Line 9 is a crude oil pipeline from Sarnia to Montreal moving an average of 300,000 barrels per day[29].

Major refineries that serve the petroleum needs of the GTA are located in Nanticoke (Imperial Oil), Sarnia (Imperial Oil, Suncor, Nova, Shell), Montreal QC (Suncor), Levis QC (Ultramar). Suncor has the only refinery location in the Region of Peel. This Mississauga Petro-Canada refinery produces oil lubricants, with an annual capacity of over a billion litres[30].

Figure 35: Pipelines and Facilities



Data Source: http://aboutpipelinesmap.com

28 Tnpi.ca/our-pipelines

29 Enbridge.com/map

30 http://lubricants.petro-canada.ca/en/about/204.aspx

4.6 Land Use Evaluation

Land use and transportation planning are intrinsically linked as each largely affects the other. This section examines how land use in Peel supports goods movement in the Region. More specifically, land use will be examined as it impacts corridors and access to major freight facilities in the region. Land use planning is managed by lower tier municipalities which need to conform with Regional and Provincial planning policies (Region of Peel Official Plan, the Growth Plan for the Greater Golden Horseshoe (2017), and the Ontario Provincial Policy Statement). A full review of the land use planning policies can be found in Appendix E.

4.6.1 Location of Major Goods Movement Facilities

Goods movement industries in Peel thrive due to its prime location near important freight infrastructure which includes seven 400-series highways, Toronto Pearson International Airport, and CN's Brampton Intermodal Yard. These facilities are large long-term investments in the freight transportation network. These facilities were developed and are the foundation for the growth in goods movement businesses and activities in the Region. These large investments are stable features of the network for which planning should accommodate as these facilities are not easily relocated.

Much of Peel's employment lands are well located around the areas of the airport, intermodal yards, and along the provincial 400-series highways, particularly at major interchanges. In 2014 there were over 9,000 goods movement-dependent businesses in the Region of Peel[31]. Generally speaking the employment density of goods moving industries are concentrated around the airport, intermodal yard, and along the provincial freeways, particularly at major interchanges (see Figure 36).

The Region of Peel, along with the entire GTHA, has experienced tremendous growth in both population and employment. This growth increases the demand for freight movement and also the infrastructure that supports the movement of both people and goods in and around Peel's communities. Keeping in line with provincial policies, it is important that key freight corridors are preserved for the movement of goods which requires effective land use management along these corridors. The following sections examine the land uses around major freight facilities.

31 NAICS 11 – Agriculture, forestry, fishing and hunting; NAICS 21 – Mining, quarrying, and oil and gas extraction, NAICS 23 – Construction, NAICS 31,32,33 – Manufacturing, NAICS 41 – Wholesale trade, NAICS 48,49 – Transportation and warehousing

Figure 36: Foods Movement Industry Employment Density

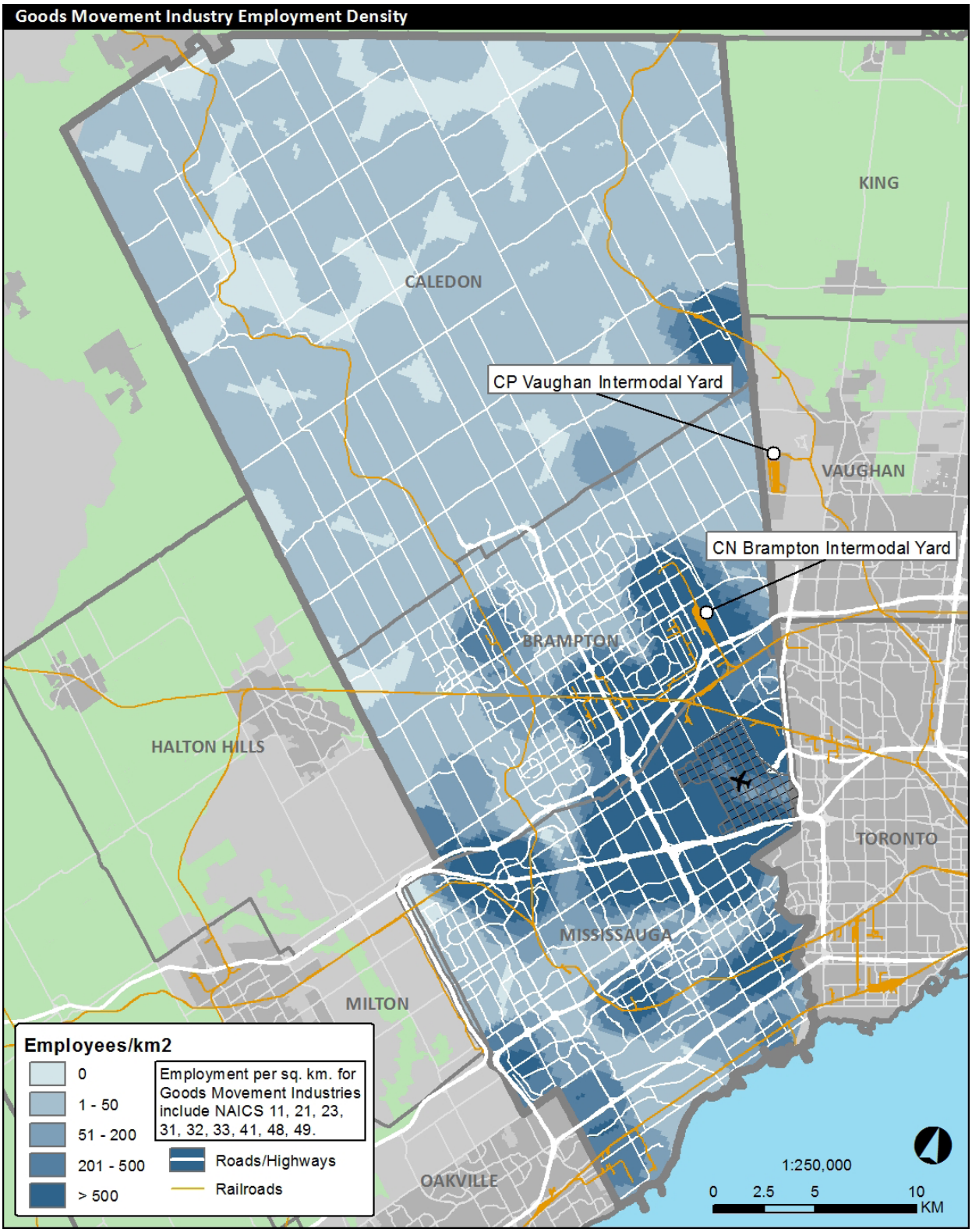
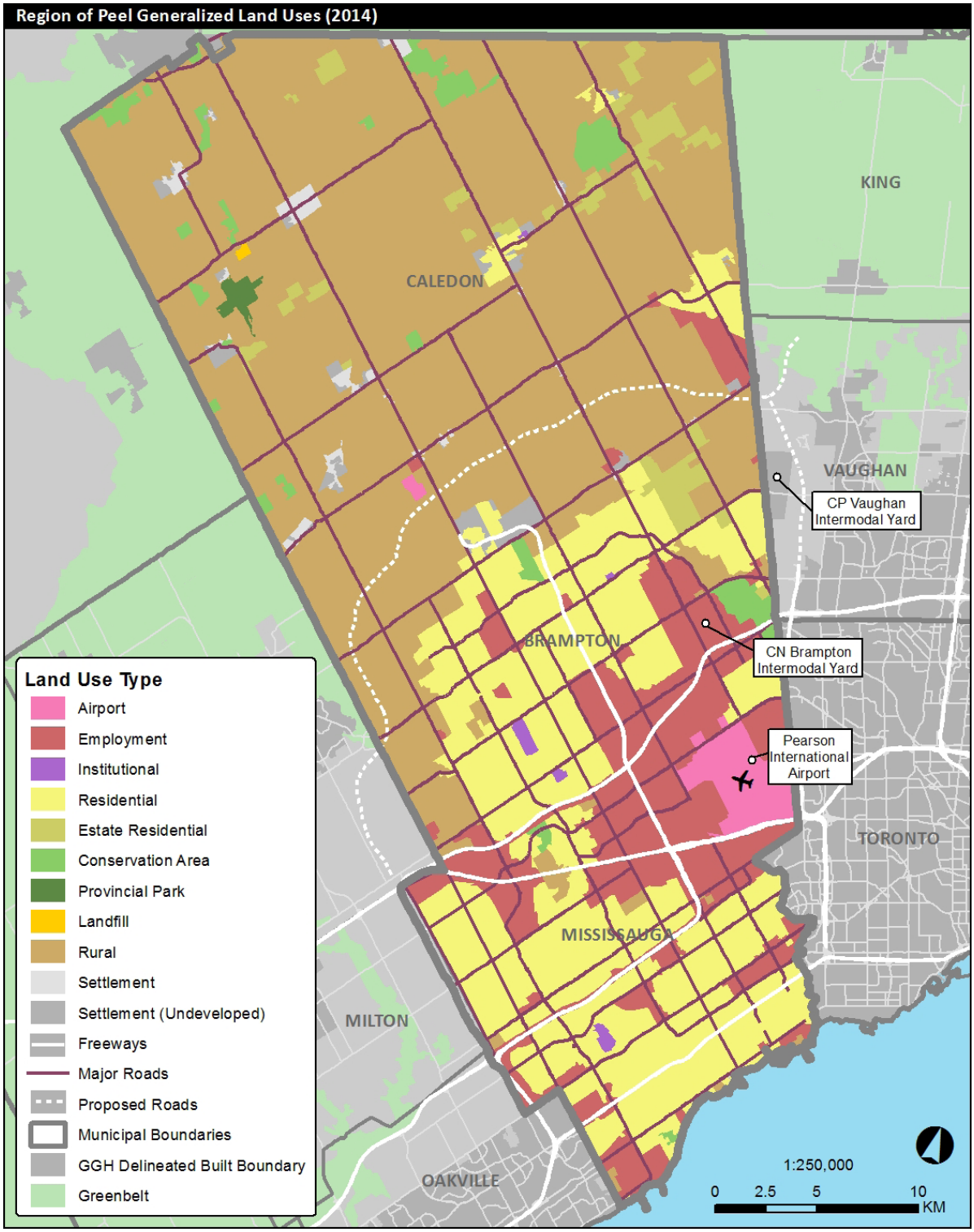


Figure 37: Peel Region's Developed Land Uses



Data Source: Region of Peel

CN Brampton Intermodal Yard

The CN Brampton Intermodal Yard is located between Queen Street and Steeles Avenue to the north and south, and Airport Road and Goreway Drive to the east and west. Along with Intermodal Drive, these roads are designated as primary truck routes on the Peel Region Strategic Goods Movement Network. The terminal is in close proximity to two interchanges on highway 407, and within 10 kilometres to both highways 427 and 410.

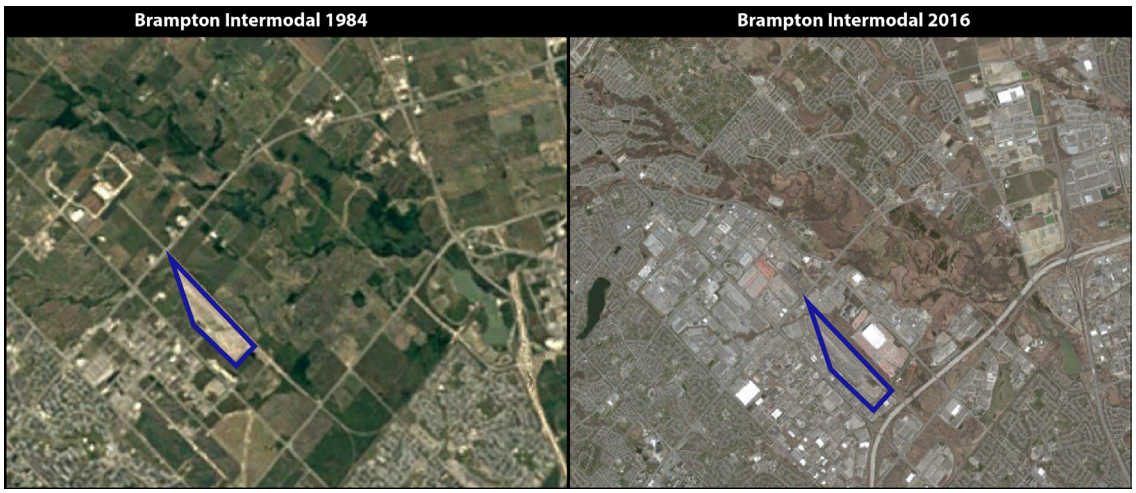
Based on the existing developed lands in Peel (Figure 37) the terminal is well-positioned within lands designated for employment, which consist of many DCs, warehouses, and transportation companies. Many regional roads can be used to access the terminal including Airport Road, Dixie Road, Steeles Avenue, Derry Road, Finch Avenue, and Queen Street.

Some of these corridors are adjacent to residential neighbourhoods: northeast of Derry and Airport Road, along Queen Street east of Torbram Road. This can cause conflict due to increased demand on the roadways and with the impact of heavy vehicles near residential areas, parks, and schools. A commercial plaza near the terminal provides services to employees in the area, but is also a destination for residents, further increasing demand on the corridors and reducing the effectiveness of the arterial roads as a thoroughfare for freight movement.

Encroachment Trends

As the region experiences tremendous growth in population and employment, Mississauga, Brampton, and Caledon are becoming increasingly developed. This development has slowly encroached on employment lands that would otherwise have buffer space. Development encroachment of nonemployment land jeopardizes the functionality of freight corridors as the roadway needs to accommodate more users and functions. Satellite photos derived from Google Earth show the agricultural nature of the lands surrounding the terminal in 1984. Over time, as the City of Brampton grew, the amount of industrial and residential uses were developed, with industrial uses concentrated around the terminal. As the need for freight increases with regional growth, activities at Brampton Intermodal have reached capacity with limited opportunity to expand. CN is expanding their intermodal operations with a new terminal to be located in Milton.

Figure 38: Urbanization surrounding Brampton Intermodal Yard



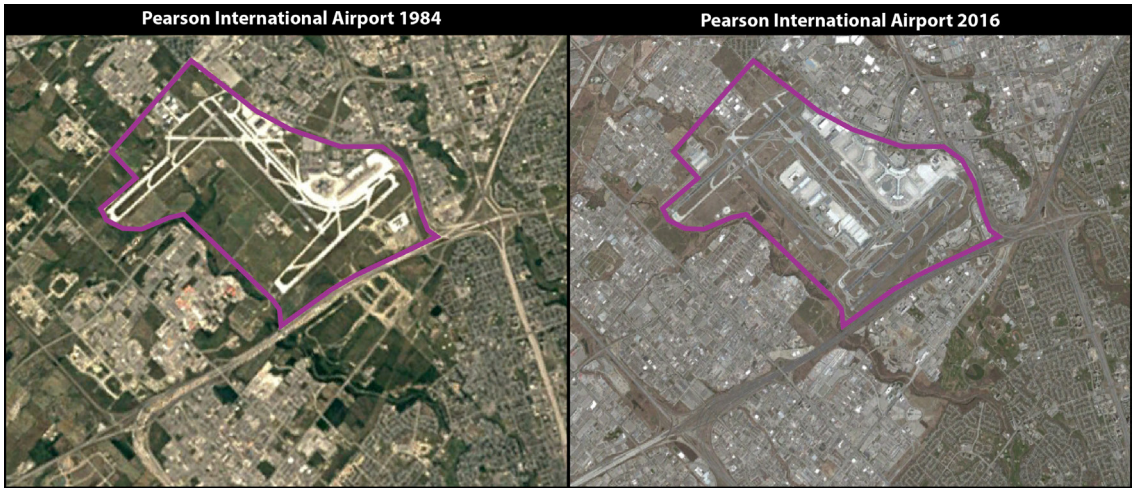
Source: Google Earth Imagery

Toronto Pearson International Airport

The Toronto Pearson International Airport is located northwest of the Highway 401-427 junction. It is well served by five 400-series highways and the following regional roads: Derry Road, Airport Road, Dixie Road, Kennedy Road, and Steeles Avenue. The lands around the airport include warehousing, transportation, distribution businesses, conference centres, and commercial properties.

Residential neighbourhoods are located in close proximity to the northeast of the airport along Derry and Airport Road. These are established neighborhoods as suggested in the Google Earth satellite imagery from 1984.

Figure 39: Urbanization surrounding the Toronto Pearson International Airport



Source: Google Earth Imagery

4.6.2 Land Use Impacts for Freight Trends

GM TRENDS/RISKS	LAND USE IMPACT
OFF-PEAK DELIVERY	Off-delivery delivery is beneficial to the distribution of traffic flow throughout the day and can help mitigate congestion during peak periods. Noise restrictions and noise issues are often viewed as a central limitation to OPD, especially in proximity to residential areas. Noise issues may also depend on the type of good shipped. For example, shippers of foodstuffs requiring a cold-chain require the use of refrigerated trucks that are often much louder than non-refrigerated trucks. To support OPD, zoning and site area plans should ensure sufficient buffer space between residential areas and commercial loading docks. Site area approvals should also take into consideration the designing of loading docks to be shielded from residential areas. Zoning by-laws for noise and lighting should be consistent across Peel and with neighbouring municipalities.
LONG COMBINATION VECHILES	Currently in Ontario, there are regulations for the operating of LCVs including proximity to major freeway interchanges. Proximity regulations set by the MTO are currently two kilometres of highway interchanges and on routes that have been assessed and approved. This buffer may be extended to five kilometres in 2017. Shippers and carriers already seek lands near highways for ease of moving goods, however the LCV regulations will increase the importance for certain industries to locate near interchanges and along 'approved' LCV routes. It will be important to preserve area around these approved routes for industrial and goods movement employment uses in the long terms.
CONNECTED AND AUTONOMOUS VEHICLES	Connected and autonomous vehicles (CAV) have the potential to completely change how goods are moved in the long-term. With full automation, this can reduce the cost of goods movement and increase efficiency, therefore reducing the importance of rail and increased use of the road network to move goods. With increased network efficiency and reduced travel costs (due to less labour costs), this may lead to increased sprawl of goods movement industries as businesses are willing to move goods further distances, especially if land is cheaper farther away from urban centres. Cheaper goods movement due to CAV technology will also increase the demand of e-commerce. Smaller and more Distribution Centres (DCs) are likely to be automated facilities spread across urban areas.

EDUCATION & OUTREACH	Education and outreach related to trucking and goods movement activities among residents is beneficial to increase awareness of its importance to quality of life and economic opportunity. Related to land use, in Region of Peel, there are increasing areas where industry and residential communities share roadways. Education and outreach activities can contribute to safer driving behavior to mitigate truck-car, and truck-pedestrian incidents. Outreach can also help to manage expectations for residents that move into neighborhoods located in close proximity to goods movement facilities and/or major truck routes.
E-COMMERCE	As e-commerce strategies grow across all markets, there are a few expected implications for land use as there will be a shift in the size, number and location of DCs. As consumers order increasing volumes of goods online, including staple goods such as groceries and clothing, the frequency of small-scale deliveries will continue to increase, necessitating an increase in the number and distribution of DCs closer to urban centres. As DC automation increases, DCs will also be able to grow more vertically, requiring smaller footprints from the traditional layout of DCs.
LABOUR FORCE AVAILABILITY	Labour force availability has many complex factors including economic trends, demographic trends, and skills training to name a few. Specifically related to land use, labour force availability for a specific geography is impacted by access. As housing prices increase, people are moving further away from urban centres for more affordable living. This places greater challenges to accessing jobs that match the skills of an available labour force. The implication for land use planning is to ensure diversity in the housing market and to encourage transit-oriented development. This is supported by targets and strategies in the Growth Plan for the Greater Golden Horseshoe (2017).
CN MILTON	CN has announced plans for the development of a new intermodal yard in Milton to supplement the Brampton Intermodal Yard that restricted from further expansion. Once open, some volume is expected to shift from Brampton to Milton as Brampton is currently pushing on capacity. Due to the close proximity of the two intermodal yards, existing businesses already located in Peel are unlikely to relocate to Milton. Exceptions could be from businesses with aging facilities or lacking expansion opportunities. The new hub will decidedly spur additional businesses in both municipalities from the increased rail service accompanying the new facility.

4.6.3 Analysis of Goods Movement Specific Land Use Designations

Major transportation corridors and associated goods movement can create significant conflicts with sensitive land uses including, but not limited to, residential areas, institutional uses, day cares, and recreational spaces. As a result, population-serving industrial, commercial, office, warehousing, and fuel-related uses in proximity to major transportation corridors and associated goods movement corridors, shall be directed away from these sensitive land uses. The grouping of freight-related and freight supportive uses away from sensitive lands has been known to enhance goods movement corridors, by increasing the opportunities for freight related businesses to take advantage of shared facilities, equipment and services, and overall logistics.

To take advantage of the efficiencies listed above, the Region wants to encourage growth of the local goods movement industry by separating freight related uses from sensitive land uses. Simultaneous to this separation, the Region is also interested in the grouping of freight related uses to maximize the efficiencies gained from the relationships formed between freight related businesses located in close proximities. The growth of the local goods movement industry, through these initiatives is desired by the Region because the goods movement industry is recognized as an integral component of a well performing regional economy. Therefore, it would be in the best interest of the Region of Peel, and its goods movement industry, to encourage its goods movement businesses to cluster.

4.6.3.1 Region of Peel Policy Framework

The Region of Peel is a Regional Municipality that consists of three lower-tier municipalities which are Brampton, Mississauga, and the Town of Caledon. The Region establishes a Regional Official Plan to describe how lands within should be used. The Regional Official Plan relies on direction from Provincial documents such as the Growth Plan for the Greater Golden Horseshoe and the Provincial Policy Statement to provide consideration of the Provincial Planning Interests, when the Region establishes policies within it's Regional Official Plan. Similar to how Provincial documents provide general planning direction to the Regional Official Plan, the Regional Official Plan also guides the development of policies within Local Official Plans, which are created and implemented by the Region's lower-tier municipalities.

4.6.3.2 Growth Plan for the Greater Golden Horseshoe, 2017

The Growth Plan for the Greater Golden Horseshoe 2017 has an established policy direction which supports the Region's intent to improve the local goods movement industry. Section 3.2.4 Moving Goods, instructs municipalities to work with agencies and transportation service providers to "co-ordinate, optimize, and ensure the long-term viability of major goods movement facilities and corridors." Co-ordination and optimization of the Region's goods movement industry will be an integral component in the creation of the Region's policies to encourage the grouping of freight related uses, as relationships between freight related uses are not achievable without these two actions. Achieving the long-term viability of major goods movement facilities and corridors will result from the successful implementation of the first two actions described by Section 3.2.4.

4.6.3.3 Provincial Policy Statement, 2014

The Province of Ontario, through the Provincial Policy Statement (PPS), supports Peel Region's desire to increase the efficiency of its local goods movement industry by grouping freight related uses. Section 1.8.1 d) for example, instructs planning authorities to develop land use patterns which "focus freight-intensive land uses to areas well served by major highways, airports, rail facilities, and marine facilities." Although, the PPS's main intent with this policy is to provide freight related businesses with ample mobility between their main base of operations and destinations, it inadvertently encourages the grouping of freight related businesses as well, which support the Region of Peel's freight related goals of growth and improved efficiency. Furthermore, the PPS also identifies that focusing freight-intensive land uses to areas well served by major highways will support energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions, as well as climate change adaptation. Thus, the PPS provides additional incentives for the Region to pursue the implementation of policies that will encourage the grouping of freight related businesses.

4.6.3.4 Regional Official Plan, 2016

To identify the necessary policies required to encourage the grouping of freight related uses, a review of the existing Regional policy framework is required. Section 5.9.7 of Regional Official Plan is the principal section which identifies the Region's objectives and policies for the local movement of freight within Peel. The two objectives of this section are as follows:

» *5.9.7.1.1 - To facilitate the development of a safe and efficient goods movement network within Peel and between Peel and adjacent municipalities that supports the regional economy and that minimizes impact to the environment.*

» *5.9.7.1.2 - To optimize the use of existing goods movement infrastructure and capacity.*

Through policies which encourage the grouping of freight related uses, and by undertaking a long term plan for goods movement, the Region of Peel is attempting to optimize the performance of the local goods movement industry. A mandatory component of this optimization will be to improve efficiency within the local goods movement industry by capitalizing on the efficiencies gained from synergistic relationships formed between freight related businesses that are located in close proximities. This is one element of the study currently being undertaken.

The goods movement policies in Section 5.9.7 of the Regional Official Plan generally focus on the following perspectives:

» *Multimodality*

» *Private public partnership*

» *Goods movement Network Definition*

» *Collaboration between authorities*

» *Development and Implementation of Freight Supportive Guidelines*

All of these policies greatly support the local goods movement industry. However, only two of the Section's policies speak to the optimization of the local goods movement industry through the grouping of freight related uses. These two policies are:

» *5.9.7.2.6 – Work with private and public sectors to plan for growth in goods movement activity. When doing so, consider ways to optimize the use of existing and planned goods movement infrastructure and capacity.*

» *5.9.7.2.13 – Encourage the location, where possible, of activities generating substantial goods movement traffic near highways, major roads, rail yards, Toronto – Lester B. Pearson International Airport and inter-modal facilities.*

The first policy indirectly encourages the grouping of freight related uses and provides direction to proactively determine the use of existing and planned goods movement infrastructure and capacity. Policy 5.9.7.2.13 of the Regional Official Plan, more simply encourages the location of all activities which generate substantial goods movement traffic near major infrastructure facilities. These policies provide the Region with a sound position to begin encouraging further efficiency of the local goods movement industry through the grouping of freight related uses. They do, however, lack the direction required for lower-tier municipalities to conform to the intent and purpose of the grouping of freight related uses.

4.6.3.5 Suggested Policy Additions to the Regional Official Plan

To enable lower-tier municipalities to identify areas with the potential for efficient grouping of goods movement uses, new goods movement policies introduced into the Regional Official Plan should consider including the following criteria and distance mechanisms:

» *Cross-jurisdictional Partnering Opportunities (collaboration opportunities between local municipalities)*

» *Coordinated Access to Road and Rail Infrastructure*

» *Proximity to Major Transportation Corridors*

» *Proximity to Major Commercial Centres or Clusters*

» *Availability of Land Supply*

» *Ability to Operate Across Various Shifts*

» *Proximity to Areas of High Demand for Goods/Freight*

» *Intermodal Transportation Capacity*

» *Information Technology Infrastructure*

The above mentioned criteria and distance mechanisms can be translated into policies in the same

fashion as below.

Direct the area municipalities, in cooperation with the Region, to include in their Official Plans a Goods Movement Coordination Strategy which includes:

a) Identification of areas near Major Transportation Corridors that exhibit the following characteristics:

i) Availability of Information Technology Infrastructure

ii) Availability of Land Supply

iii) Ability to Operate Across Various Shifts

iv) Proximity to Areas of High Demand for Goods/Freight

v) Proximity to Major Commercial Centres or Clusters

vi) Availability of Intermodal Transportation Capacity

b) Prioritization of areas with opportunities for Cross-Jurisdictional Partnering along Major Transportation Corridors for Goods Movement Uses

c) Coordination of Goods Movement Land Uses to maximize access to road and rail infrastructure.

4.6.3.6 Conclusion

In addition to the list of policy recommendations above, it is further advised that the Region of Peel review the Region of Peel Goods Movement Long Term Strategy in its entirety with the local municipalities to ensure the intent of the policies that are planned to be integrated into the Regional Official Plan are palatable at the local level. It should also be noted that these strategies are proposed for both existing development areas with goods movements areas as well as new areas.

Once the suggested update of policy is accepted by the Region, a Regional Official Plan Amendment would need to be undertaken to implement the policies suggested in this section. The newly adopted policies in the Regional Official Plan would then prompt the local municipalities to further implement the intent and purpose of the Region's new policies within their local Official Plans.

Consideration of topics discussed in this Region of Peel Goods Movement Long Term Strategy, such as enhancements to the long-combination vehicle, and adoption of off-peak deliveries, for example, will assist in implementing the grouping of freight related uses in a coordinated manner.

5 Supply Chain Analysis

In This Chapter:

5.1 Commodity Selection

The top ten commodities in Peel were selected based on the highest commodity value and tonnage. These included pharmaceuticals, mixed freight, electronics, motorized vehicles, other foodstuffs, machinery, chemical products, gravel, and waste/scrap.

5.2 Overview of Key Commodity Groups

Detailed level analysis aids in identifying and associating the proportion of these commodity flows that are related to consumer demand within Peel. It also allows a direct relationship to be drawn between industries in Peel and commodity flows to understand the number of employees and output of industries generating the commodity shipments, which serve an importance in Peel.

Peel Region is the distribution hub of Canada, according to supply chain managers and logisticians: for retailers and manufacturers who use a single DC to serve the nation (which is common), Peel is the preferred location; for those using several facilities, Peel will have one and probably the largest. This means that facilities in Peel not only command the supply lines to population and industry in greater Toronto, but throughout Ontario and often everywhere in Canada. The supply chain analysis undertaken is a bridge between Vision and Mandate and the fluidity performance and land use assessments, because it substantiates the strategic role of the Region and explains the performance expectations and facility demand that Peel will face from users.

Supply chains from a transportation perspective are the characteristic sequence of stages by which goods move to market for various classes of commodities, along with their distinctive modal usage and delivery patterns. Analysis requires first-hand interviews with managers representing a cross-section of the industrial inventory of Peel. Supply chain profiles differ between commodities but tend to be consistent within industries which ship these commodities.

5.1 Commodity Selection

The supply chain analysis was completed for the 10 most important commodity groups for Peel Region. This section describes the approach that was taken to select and analyze the supply chains for the Long Term Plan.

Top commodities originating from and delivered to the Region of Peel were identified based on the Ministry of Transportation Ontario (MTO) Commercial Vehicle Survey (CVS). CVS data was collected in 2012, supplemented by additional data points in Peel in 2014, and provides a detailed understanding of commercial vehicle travel to, from, and within Ontario. The highest prevalence of intra-Ontario trucks can be seen within the Greater Golden Horseshoe, with 18% of truck trips in Ontario originating from Peel Region[32]. Nearly a quarter of total commodity value for truck trips originating in Ontario has a trip origin in Peel Region.

The CVS data provides commodity value and tonnage by Standard Classification of Transported Goods (SCTG) code. Commodity value and tonnage have been used to select which commodity groups are taken forward for further assessment. Total value of commodities originating from and delivered to Peel is important in determining which supply chains to assess. This is because commodity value provide an indication of the economic impact (output, GDP, jobs, and taxes) that can be attributed to each commodity group. Commodity value is estimated based on the weight of the cargo and the average value of goods per-kilogram which is provided by Statistics Canada.

Total commodity tonnage is also important in determining which supply chains to assess. Total tonnage is important due to the impact this tonnage has on the road network infrastructure which can be measured using the Equivalent Single Axle Loading (ESAL).

Eight of the top ten commodities in Peel Region were selected based on highest value, while two commodities were selected based on highest tonnage. The top ten commodities for assessment are provided in Table 11.

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32 MTO. Provincial Commercial Vehicle Travel Profile. February 13, 2015.

Table 11: Top 10 Commodities for Supply-Chain Assessment

SCTG	Commodity Name	Value Moved Though Peel (M CAD)	Tonnes Moved Through Peel (000')
21	Pharmaceuticals	$31,667	-
43 and 46	Mixed freight	$44,736	-
35	Electronics	$34,652	-
36	Motorized vehicles	$31,838	-
7	Other foodstuffs	$21,290	-
34	Machinery	$16,795	-
23	Chemical prods.	$14,630	-
12	Gravel	-	8,960
41	Waste/scrap	-	7,068

Source: MTO Commercial Vehicle Survey, 2012 and 2014

5.2 Overview of Key Commodity Groups

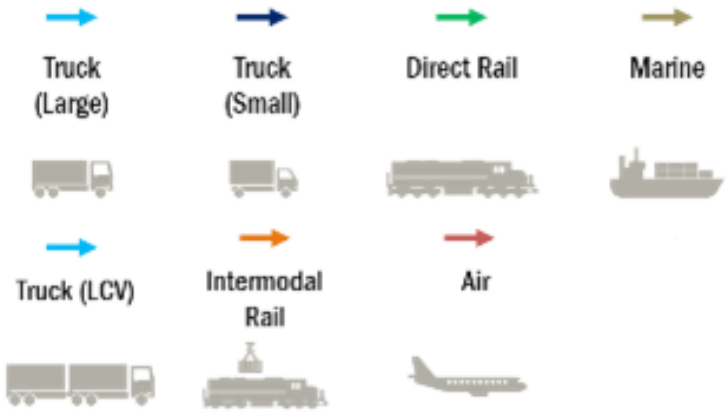
This section provides a more detailed description of the supply chain activity associated with the top 10 commodity groups identified previously. Information is provided about how these commodities are shipped to, from, or within Peel at a 5-digit SCTG level. This more detailed information helps identify the largest subgroups within each commodity group, which can be associated more directly with specific industries and economic activities. Also, making a distinction between inbound and outbound shipments helps identify the proportion of these commodity flows that are related to consumer demand within Peel as opposed to industrial production for exporting outside of Peel.

To draw a more direct relationship between industries in Peel and commodity flows, an analysis was performed to develop a correspondence between SCTG commodity grouping and NAICS industry groupings. This correspondence does not yield perfect results, because the commodity groupings in the CVS do not match up exactly with groupings in the correspondence analysis. It is nonetheless helpful in identifying the types of industries most closely associated with specific shipments. Using data from Peel's employment survey it was then possible to estimate the number of employees and output of industries generating the commodity shipments which are important in Peel.

Linking commodities to industries can be done at two levels: the propensity of industries to ship certain commodities and the proportion of industries shipping certain commodities. The distinction between these two perspectives is nuanced but important. Take motorized vehicles for example. The former looks at what percent of shipments from each industry are motorized vehicles. The industries that have a higher percent in this measure would be those that ship most frequently by motorized vehicles. On the other hand, the latter measure indicates the industries that are responsible for the majority of shipments of motorized vehicles. A small industry that only ships motorized vehicles would rank highly in the first measure—its propensity would be 100%—but might rank low in the second measure if there are much larger industries that also ship motorized vehicles. The full ranking of industries shipping the top 10 commodities in provided in Appendix B.

The technical analysis of the commodity supply chains are further supplemented by the consultation activities that included one-on-one interviews with private sector industry representatives. These interviews provided a more in-depth understanding of commodity supply chains, their modal uses, and performance. Supply chain infographics illustrate the supply chain process for many of these commodities where sufficient information to do so was available.

Figure 40: Supply Chain Modes of Transport Legend



5.2.1 Pharmaceuticals (SCTG-21)

Pharmaceuticals are the highest valued commodity moving through Peel Region by weight. The top ranking is due to the high value nature of the commodity rather than the volume of goods being shipped.

Pharmaceutical drugs have a complex supply chain with active ingredients originating across the globe and locally. Peel Region has an advantageous location for Pharmaceutical manufacturing based on the proximity to local customers, suppliers, and competitors. Active ingredients are transported to multiple facilities for manufacturing, processing, and packaging, before shipment to customers. Each step of this chain requires careful handling, processing and storing of the commodity. Wholesale distributors typically deliver products to retailers and institutions, such as hospitals or government, with the US being the largest market for Region of Peel distributors.

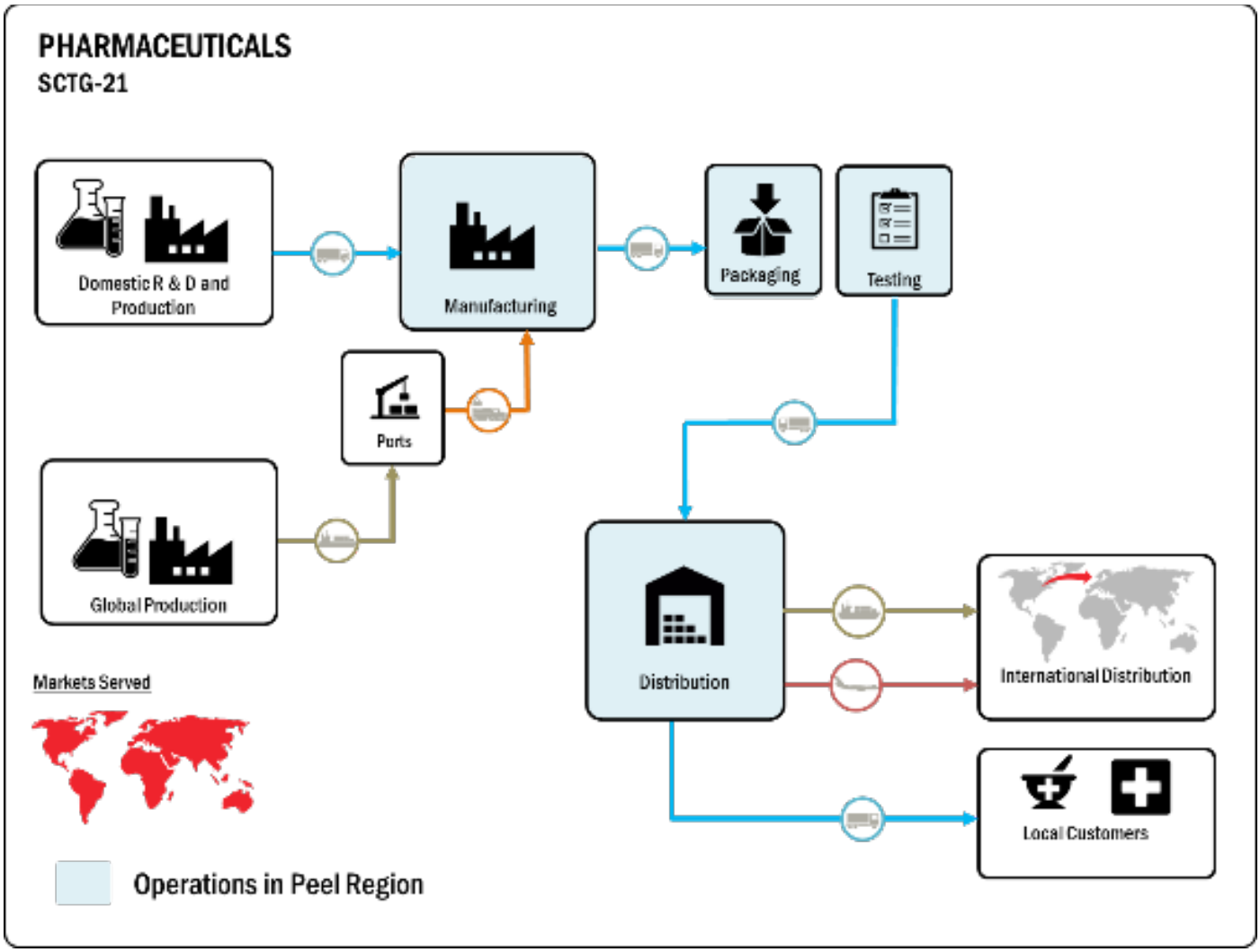
Due to the high-value nature of pharmaceutical commodities, performance on the supply chains is of high importance. Deliveries are time sensitive and made-to-order, putting pressure on the performance of all the freight networks relied upon. Distribution relies on air freight, truck, marine, and intermodal for outbound distribution. Using air transportation expedites shipments, which minimizes risk due to extended exposure. Trucks also facilitate the intermodal drayage between plants and DCs, and for final delivery to retailers and institutions. Marine and air is used for external distribution of goods. The ultimate mode choice is largely determined by the customer requirements and the need for temperature control. Most of the goods shipped are sensitive to external conditions and need temperature controlled containment and secure delivery.

The value of all pharmaceuticals moving in and out of Peel Region is over $31 billion with the largest shippers from the chemical manufacturing industry. However, druggist sundries wholesales is the industry most likely to ship pharmaceutical products.

Table 12: Top 3 NAICS Industry Sectors for Pharmaceuticals

	Propensity to Ship (Most Likely to ship)	Top Shippers, Proportionally (Largest Shippers)
1	Drugs and druggists' sundries merchant wholesalers	Chemical manufacturing
2	Electronic shopping and mail-order houses	Drugs and druggists' sundries merchant wholesalers
3	Chemical manufacturing	Electronic shopping and mail-order houses

Figure 41: Pharmaceutical Products Supply Chain



5.2.2 Mixed Freight (SCTG 43 and 46)

Mixed freight commodities include those items that supply grocery stores and convenience shops. It also includes supplies for hardware, plumbing, offices, and items classified as miscellaneous. Industries with the highest propensity to ship and largest include grocery wholesalers, food manufacturing, and general warehousing and storage facilities. Many consumer items fall under this category making this commodity group a high rank in total value of goods being moved in Peel due to the sheer volume of goods.

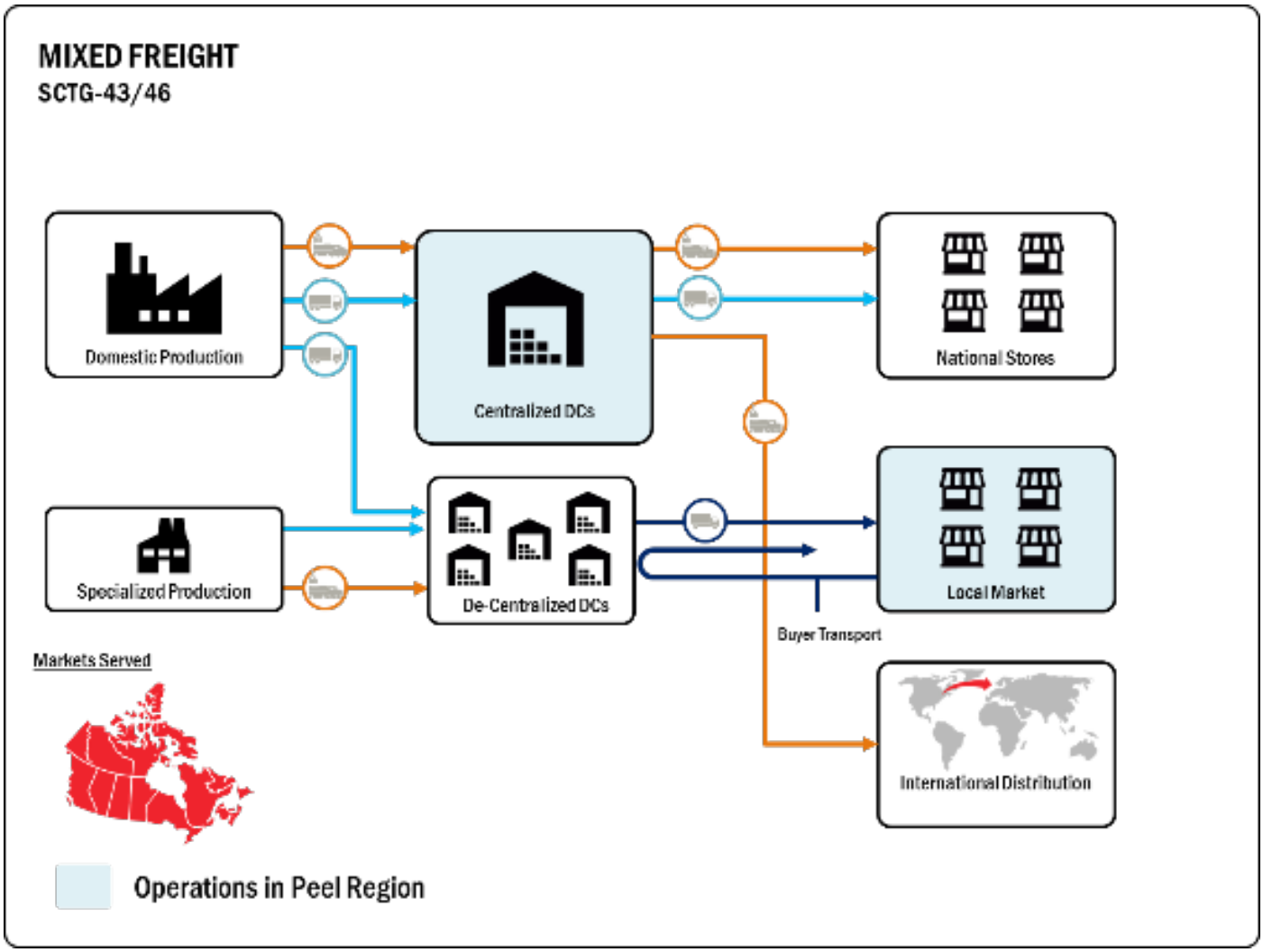
Despite the variety of goods being moved, the mixed freight supply chain is straight forward, with a centralized DC commonly used. A mix of modes is used to move commodities from domestic or international production facilities to DCs. Products produced abroad typically enter through ports and moved by rail intermodal or by truck via cross dock assembly to a central DC or a regional DC. Some mixed freight supply chains will use both a centralized and regional DCs, with products first arriving at the central DC, and then reassembled for delivery to the regional DCs. DCs will sort then delivery products directly to stores either with in-house or a for-hire fleet.

Trucking performance is importance for mixed freight. Increasing deliveries to stores while reducing vehicle kilometres travelled and vehicle hours as the main goal. Large retailers will often utilize opportunities for off-peak delivery to better optimize their deliveries – these retailers are more likely to have the labour resources to accommodate this model. LCV use is also prevalent for the mixed freight supply chains, particularly for goods that are bulky yet light, ideal for LCVs. However, Ontario's LCV rules limit the full utilization in operation and create an additional logistical layer (i.e. LCV time-of-day restrictions means industry has always have back up single trailers). With the increase in e-commerce activities, mixed freight products are also sometimes shipped straight from the DCs to consumers, homes and/or offices, through courier services or in-house vehicles.

Table 13: Top 3 NAICS Industry Sectors for Mixed Freight

	Propensity to Ship	Top Shippers, Proportionally
1	Grocery and related product merchant wholesalers	Warehousing and storage(CF1)
2	Warehousing and storage(CF1)	Food manufacturing
3	Miscellaneous nondurable goods merchant wholesalers	Grocery and related product merchant wholesalers

Figure 42: Mixed Freight Products Supply Chain



5.2.3 Electronics (SCTG-35)

Electronics, electrical components, and office equipment are a high value commodity group that includes a range of items including appliances, phones, computers, computer parts, software, televisions, lighting, and batteries. This commodity group can be categorized largely under retail distribution of consumer products through wholesale facilities and stores, but also under industrial production as electronic components feed into manufacturing processes. The largest industry shipping electronics are computer and electronics manufacturing and component manufacturing.

In response to fast technological innovations, electronic products are becoming more and more complex, compounded by a large global supply chain and short product lifecycles, exposing the supply chain to a lot of risk. This puts a lot of pressure on the performance of its supply chains in order to adapt to the fluctuations in consumer demands.

Electronics manufacturing typically occurs internationally. Peel's role in the supply chain is as a centralized location for warehousing and distribution through specialized supply chains or apart of mixed freight retail distribution. This commodity group would rely on a full range of freight modes from marine, truck, and air. Many electronics parts and finished products come into the country through the western ports and transported to warehouses through rail intermodal. Trucks are used for drayage trips and final delivery to stores and/or consumer homes with the increasing rise in e-commerce/home delivery.

Delivery is particularly important for office equipment as it is very ingrained in the policy of the retail businesses. These businesses will often have their own truck fleet that is supplemented with third party fleets during high volume seasons.

Due to limitations on information from interviews, it was not possible to develop a supply chain graphic for electronics products.

Table 14: Top 3 NAICS Industry Sectors for Electronics

	Propensity to Ship (most likely to ship)	Top Shippers, Proportionally (Largest Shippers)
1	Electrical and electronic goods merchant wholesalers	Computer and electronic product manufacturing
2	Electrical equipment, appliance, and component manufacturing	Electrical equipment, appliance, and component manufacturing
3	Computer and electronic product manufacturing	Electrical and electronic goods merchant wholesalers

5.2.4 Motorized Vehicles (SCTG-36)

The manufacturing of motorized vehicles is part of an important economic sector that relies on complex supply chains and sub-assemblies for the many components of vehicle production. This includes a range of suppliers such as bulk suppliers, tier one suppliers, synchronizing facilities, and 3PLs.

Tier one suppliers are the direct supplier of component to the assembly process and an important role in the tiered automotive supply chain. Second and third tier companies are those that supply the tier one companies. In many automotive manufacturing processes, there is high reliance on tier one suppliers to provide main manufacturing services, leaving the final automotive company to concentrate on assembly of the parts. Tier one suppliers can either deliver parts direct to the automotive plant or through 3PLs and synchronizing facilities. With parts and components with global origin, synchronizer facilities are key for cross docking and sequenced inventory strategies on assembly line production. Synchronizers manage the timely delivery of parts and components to the production line when they are scheduled for assembly at the automotive plant.

With the focus on the final assembly, automotive companies are highly dependent on reliable transportation performance, where transportation issues on just one component will halt production for the whole facility. For this reason, many companies that deliver directly to the plant may choose a facility site in close proximity to reduce their risk exposure from the transportation system. If issues do arise further down the supply chain, parts or components may be transported by air in order to ensure their on-time arrival to the plant. Otherwise, intermodal and trucks are used for inbound parts. In Peel Region, outbound movement of final vehicles use rail. Two supply chain infographics depict the supply chains for motorized vehicles – one for the final assembly and another to show the supply chain for a tier one supplier.

Table 15: Top 3 NAICS Industry Sectors for Motorized Vehicles

	Propensity to Ship	Top Shippers
1	Motor vehicle and motor vehicle parts and supplies merchant wholesalers	Transportation equipment manufacturing
2	Transportation equipment manufacturing	Machinery manufacturing
3	Machinery, equipment, and supplies merchant wholesalers	Motor vehicle and motor vehicle parts and supplies merchant wholesalers

Figure 43: Motorized Vehicles Supply Chain – Assembly

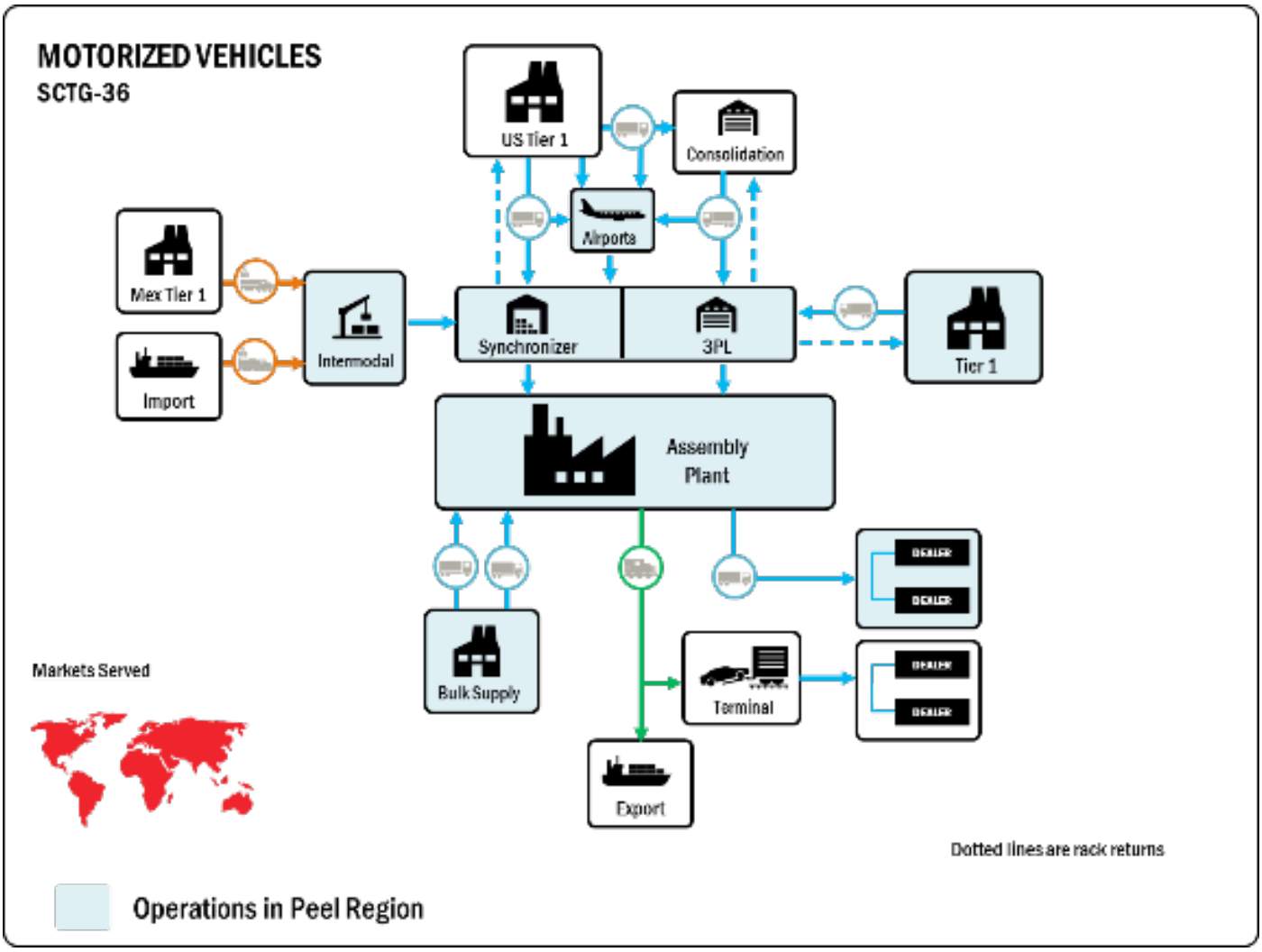
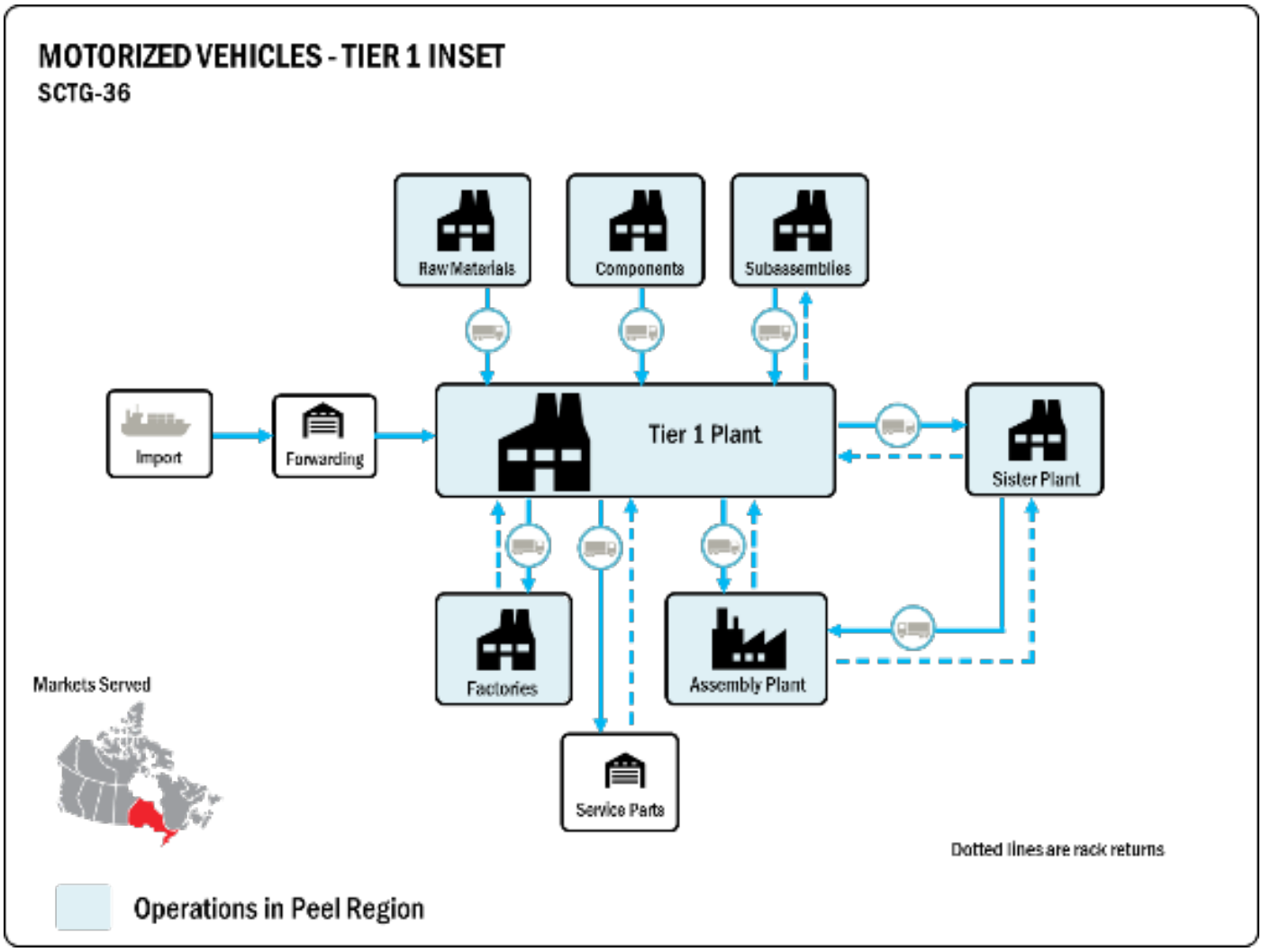


Figure 44: Motorized Vehicles Supply Chain - Tier 1 Supplier



5.2.5 Other Foods2tuffs (SCTG-7)

There are a number of food wholesalers and manufacturers in Peel Region whose freight shipments are categorized under foodstuffs. The largest subcategories of foods stuffs include chocolate confectionary, potato chips, cheese, and carbonated soft drinks. The food manufacturing, beverage, and tobacco manufacturing industries are both the most likely to ship and are the largest shippers.

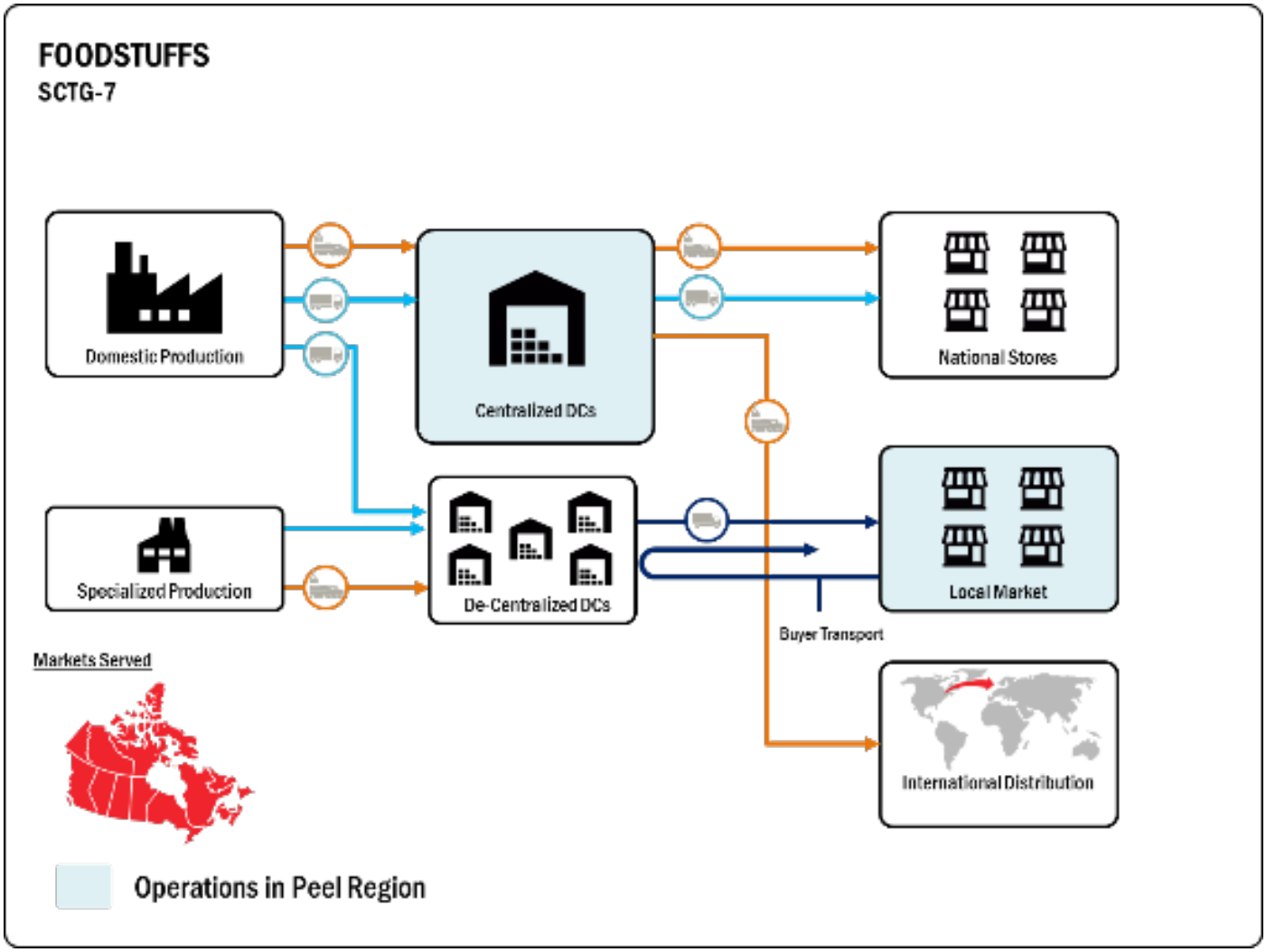
Foodstuff supply chains are typically simple linear operations involving production, distribution, and delivery. Production will vary for each product. Food supply chains are becoming increasingly globalized, with food being sourced from a wide variety of countries. Production typically involves the manufacturing, packaging and branding. This company will also be responsible for branding and marketing of products.

From production, finished goods typically go through regional distribution that will serve a variety of customers. Truck vehicle size and frequency of delivery are based on customer demands. Customers can range from restaurants, grocery stores, convenience stores, or vending machines. Whenever possible, distributors will do off-peak deliveries, typically to larger grocers who have labour availability and/or space to store goods before being stocked on shelves.

Table 16: Top 3 NAICS Industry Sectors for Other Foodstuffs

	Propensity to Ship	Top Shippers
1	Food manufacturing	Food manufacturing
2	Beverage and tobacco product manufacturing	Beverage and tobacco product manufacturing
3	Grocery and related product merchant wholesalers	Chemical manufacturing

Figure 45: Foodstuffs Supply Chain



5.2.6 Machinery (SCTG-34)

Machinery commodities include engines, turbines, boilers, reactors, pumps, fans, refrigerating equipment, excavating/boring equipment, and other mechanical equipment. These commodities are part of the industrial production channel of goods movement. These goods can be sold to consumers as a finished product or other businesses to feed into their manufacturing process (i.e. engines for automotive manufacturing). The largest shippers of machinery are manufacturers of machinery, transportation equipment, and fabricated metals.

Machinery manufacturers have a global market particularly those that produce specialised equipment. As a manufacturing and goods movement hub, the Region of Peel is home to many third party companies that manufacture, repair, sell, and broker machinery equipment to local businesses, or those that take advantage of the range of freight distribution channels available in the Region.

Machinery parts come into the Region of Peel from all over the globe but primarily from Asia, Europe, and the US. The movement of machinery equipment is demand-responsive and will often use air freight, based on its size. Larger equipment will use marine transport for international supply via ports in the east and west along with ground transportation.

Table 17: Top 3 NAICS Industry Sectors for Machinery

	Propensity to Ship	Top Shippers
1	Machinery manufacturing	Machinery manufacturing
2	Machinery, equipment, and supplies merchant wholesalers	Transportation equipment manufacturing
3	Hardware, plumbing and heating equipment and supplies merchant wholesalers	Fabricated metal product manufacturing

5.2.7 Chemical Products (SCTG-23)

This commodity class is for other chemical products and preparations, and includes a range of products such as paints, extracts, inks, oils, perfumery, soaps, glues, water treatment compounds, and insecticides. These commodities include goods for consumer use (e.g. paints and soaps) or for industrial production (e.g. dyes, inks and tannins). The largest category moving through/from/to Peel is for perfumes, cosmetics, or toilet preparations, making up almost half of the chemical product goods.

Businesses that handle chemical products are chemical manufacturers or ancillary warehousing operations to other manufacturing products. The Region of Peel provides an opportune location for businesses handling chemical products due to the production conglomeration that exists in the Region and its location to distribution channels.

Table 18: Top 3 NAICS Industry Sectors for Chemical Products

	Propensity to Ship	Top Shippers
1	Drugs and druggists' sundries merchant wholesalers	Chemical manufacturing
2	Chemical manufacturing	Warehousing and storage(CF1)
3	Chemical and allied products merchant wholesalers	Chemical and allied products merchant wholesalers

5.2.8 Gravel (SCTG-12)

Gravel and other aggregate commodities in Peel Region have a particular importance to planning for goods movement. The primary reason for this is due to the relatively high tonnage of the commodities, which in turn place a higher proportion of wear-and-tear on roadways from a value per tonne perspective. The performance of the gravel supply chain is highly dependent on the location of facilities and the performance of the transportation links between facilities. The Region of Peel is an opportune location for the entire gravel supply chain as many quarries and extraction pits are located in the Region and nearby surrounding areas. Moving high weight-to-volume goods is very costly; therefore aggregate suppliers are strategically located near end consumers. Furthermore, aggregate is often an important input for concrete, which is highly perishable. Therefore concrete batching plants must be in close location to construction sites. Again, Peel Region is aptly located to serve the booming construction markets around the GTHA.

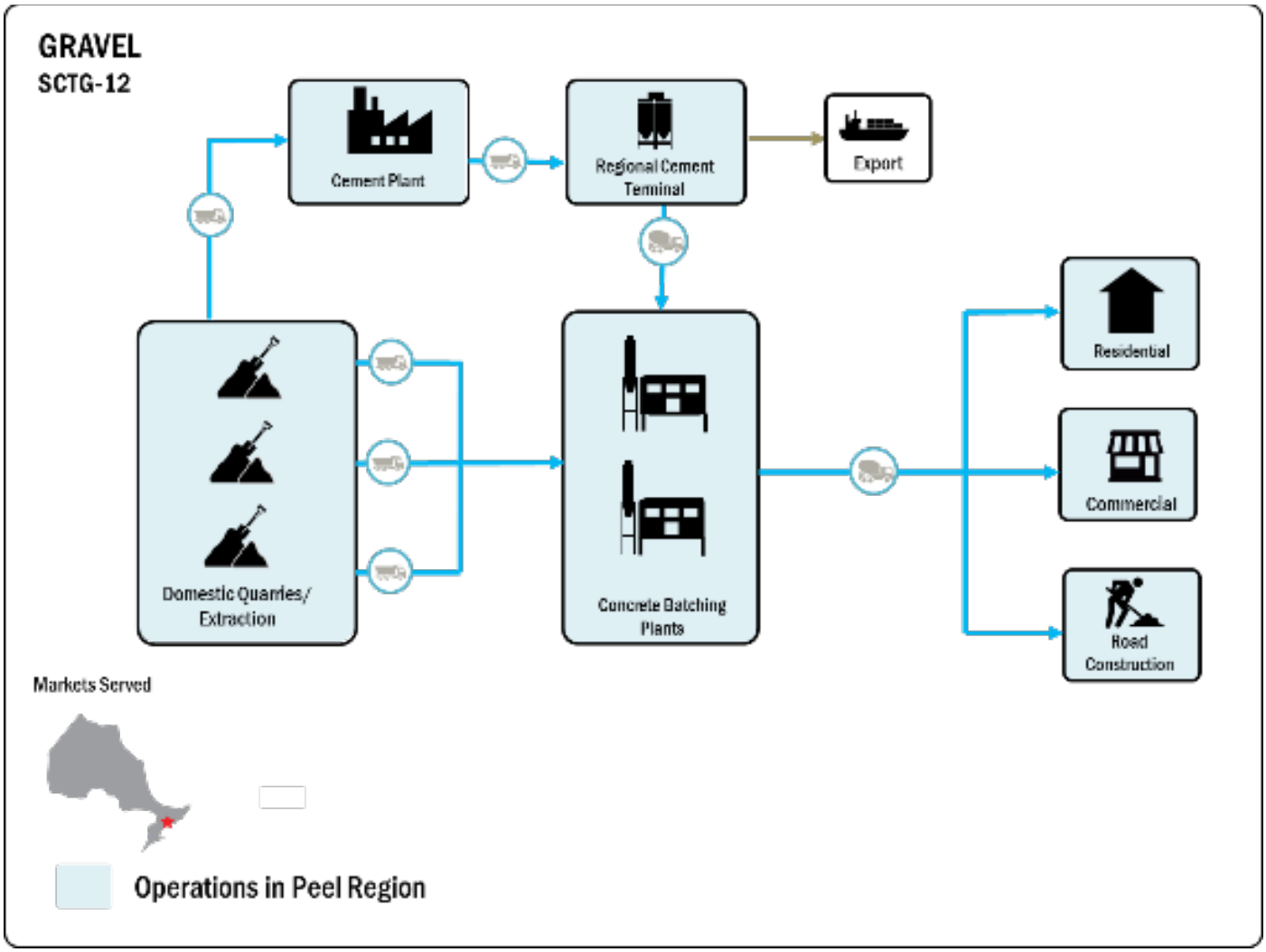
Due to the time-sensitive nature of this commodity, its supply chain performance is degraded from network delays due to bottlenecks, accidents, and general congestion on the transportation network.

The close proximity of the facilities allows the supply chain to function using aggregate trucks in Peel Region. This puts much of the performance reliability on the road networks.

Table 19: Top 3 NAICS Industry Sectors for Gravel Products

	Propensity to Ship	Top Shippers
1	Mining (except oil and gas)	Mining (except oil and gas)
2	Lumber and other construction materials merchant wholesalers	Nonmetallic mineral product manufacturing
3	Nonmetallic mineral product manufacturing	Petroleum and coal products manufacturing

Figure 46: Gravel Supply Chain



6 Hot Spots

In This Chapter:

6.1 Existing Hot Spots

Both the TTI and BTI hot spots were identified to isolate corridors that indicate delays and congestions as well as reliability of the transportation network. The TTI hot sports indicate areas where increase labour and trucks will be needed and the BTI hot spots indicate areas with less travel time reliability. The existing TTI hotspots include Dixie Rd, Mavis Rd, Courtney Park, Derry Rd, Mississauga Rd, Steeles Ave, Airport Rd, Queen St, Hwy 50, and Bovaird Dr. The BTI hot spots include Cawthra Rd, Dixie Rd, Erin Mills Pkwy, Derry Rd, Airport Rd, Goreway Dr, Steeles Ave, and Mayfield Rd.

6.2 Future Hot Spots

The future hot spots analysis involved evaluating the base year flows for 10 various commodities in terms of TTI and congested time. The forecast year traffic conditions and commodity shipments in 2041 were determined and evaluated based on four metrics - state of good repair, safety, economic competitiveness, and congestion. The results of this analysis were ranked to determine future hot spots for monitoring. The highest priority hot spots include Airport Road from Highway 427 to Derry Road, Derry Road from McLaughlin Road to Airport Road, Dixie Road from Highway 401 to Derry Road, Mayfield Road from Highway 410 to The Gore Road, Queen Street from Airport Road to Highway 27, and Steeles Avenue from Winston Churchill to Highway 27.

This section presents the results of the 'hot spots' analysis conducted to assess existing and future corridors of interest, in the Region of Peel, which experience systemic issues. While the focus of the analysis is within the Region of Peel, hot spots in the system are a function of commodity flows which do not adhere to jurisdictional boundaries. For the forecast years, we have used commodity flow data which provides origins and destinations outside the Region. Our reporting of the hot spots has been limited to roadways within the boundaries of the Region of Peel.

The analysis has focused on identifying corridors which are witnessing systemic tonnage, safety, and congestion issues due to commuter and truck volumes both now and for the future horizon year (2041). This analysis is presented as a package of information, in the form of maps and data tables which highlight corridors of interest to invest in for the future safe, efficient, and reliable movement of goods.

6.1 Existing Hot Spots

An analysis of Travel Time Index (TTI) and Buffer Time Index (BTI) was conducted to assess existing 'hot spots' on the road network in Peel. Data from the 2014 Travel Time Study was used to conduct the TTI and BTI analysis[33].

» **Travel Time Index (TTI):** Is a measure of typical travel time, which can be used to indicate locations of corridor delay and congestion. TTI represents the ratio of the travel time during the peak period to the time required to make the same trip at free-flow speeds. A value of 1.3, for example, indicates a 20-minute free-flow trip requires 26 minutes during the peak period.

What does this mean? TTI will have a greater impact to carriers. Increased travel times impact fuel cost, wages, number of vehicles required, which are costs borne by carriers and passed on to shippers. Because preak travel times can be anticipated, supply chains are generally not impacted because shippers can build additional time into calculating theiry delivery window.

» **Buffer Time Index (BTI):** Is a measure of travel time variability. BTI represents the reliability of the transportation network, which is an important measure to shippers and carriers. BTI is calculated as the percentage difference between the 95th percentile travel time and the average travel time divided by the average travel time. Greater percentages represent corridors with higher variance in travel time and therefore less reliability.

What does this mean? BTI is a measure of how bad can things get 1/20 times. It's a measure of how much worse travel times can get beyond the peak. Reliability impacts shippers through greater supply chain risk. Poor reliability can lead to missed delivery windows, intermodal transfers, and greater risk for slim inventory systems.

The 2014 a.m. peak period was used to map TTI and BTI. Since the 2014 Travel Time Study is a reflection of the performance of the road network for all modes (automobiles and trucks), the TTI and BTI values have been presented only for routes which have no truck restrictions. The TTI and BTI hot spot corridors are presented below.

33 MTO, City of Toronto, Region of Peel, Region of Durham, and Region of York. 2014 Travel Time Study. IBI Group. October 2015.

Figure 47: Travel Time Index (2014 a.m. peak period)

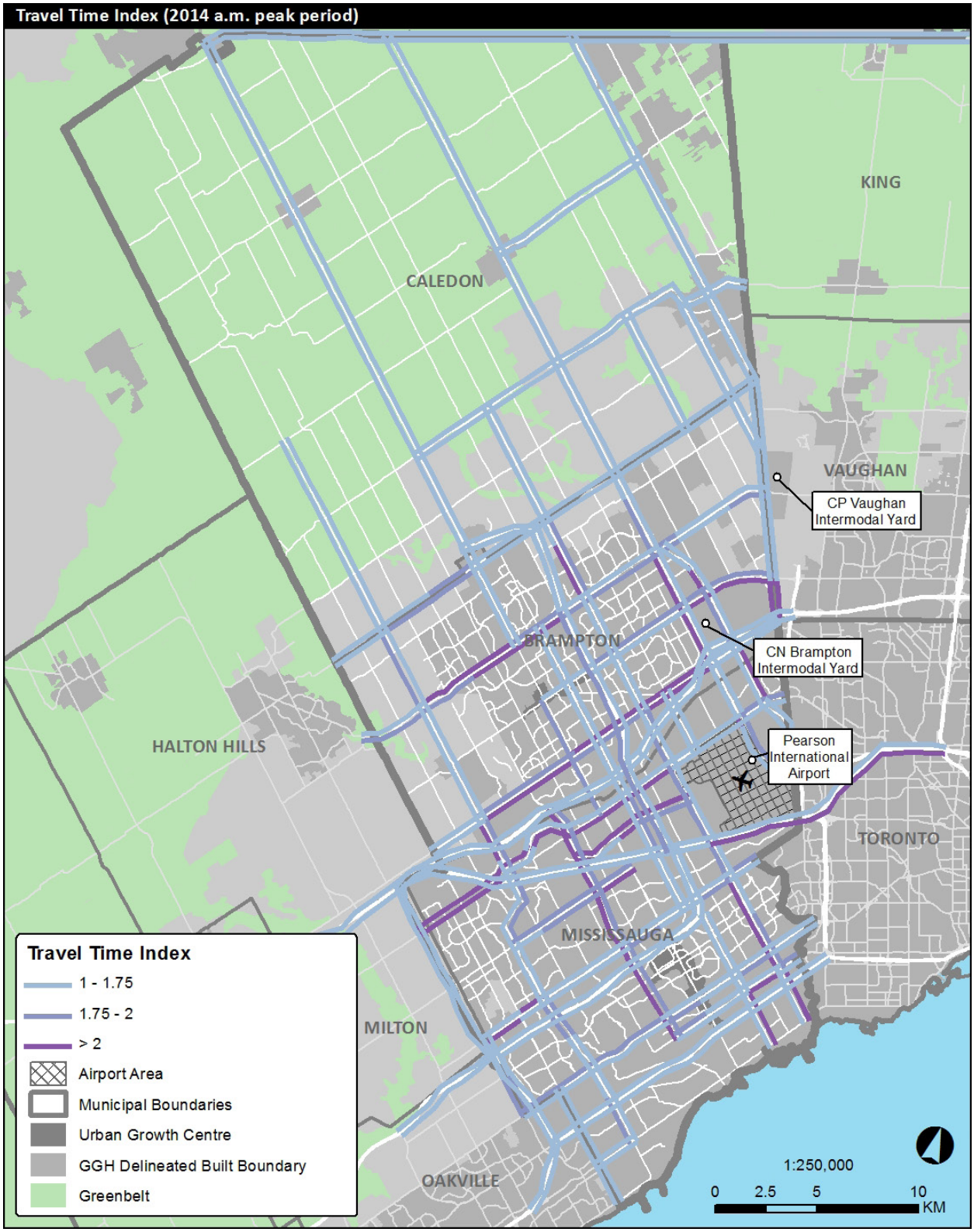


Figure 48: Buffer Time Index (2014 a.m. peak period)

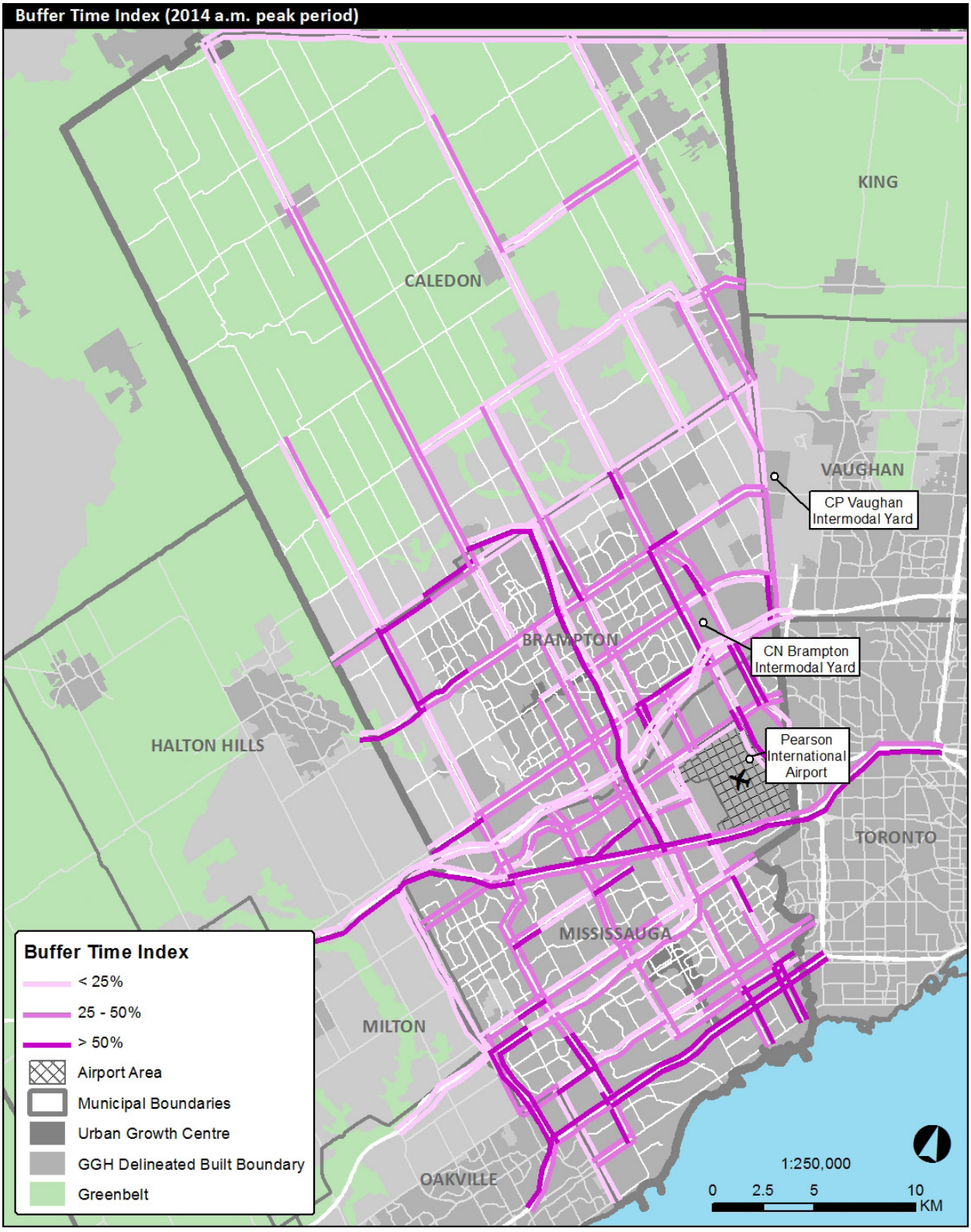


Table 20: TTI Existing Hot Spots Corridor End Points

Corridor	End Points
Dixie Rd	Lakeshore Rd to Hwy 407 Bovaird Dr to Mayfield Rd
Mavis Rd	Dundas W to Hwy 407
Courtney Park	Mavis Rd to Dixie Rd
Derry Rd	Hwy 407 to Dixie Rd
Mississauga Rd	Derry Rd to Steeles Ave
Steeles Ave	Mississauga Rd to Airport Rd
Airport Rd	Steeles Ave to Mayfield Rd
Queen St	Airport Rd to Hwy 50
Hwy 50	Steeles Ave to Queen St
Bovaird Dr	Winston Churchill Blvd to Airport Rd

Table 21: BTI Existing Hot Spots Corridor End Points

Corridor	End Points
Cawthra Rd	Lakeshore Rd to Queensway
Dixie Rd	Lakeshore Rd to Eglinton Ave Hwy 407 to Mayfield Rd
Erin Mills Pkwy	Lakeshore Rd to Hwy 403
Derry Rd	Hwy 407 to Goreway Dr
Airport Rd	Hwy 409 to Bovaird Dr
Goreway Dr	Derry Rd to Castlemore Rd
Steeles Ave	Winston Churchill Blvd to Airport Rd
Mayfield Rd	Winston Churchill Blvd to Airport Rd

6.2 Future Supply Chain Hot Spots Analysis

6.2.1 Objectives

The objective of this work is to assess the reliability and resiliency of the road supply chain network within the Region of Peel forecast to the year 2041 by addressing the following three questions:

1. What are the primary corridors of travel for the key commodities?
2. What types of delays are these commodities facing under congested conditions?
3. Are there network "hot spots," known as road segments that are important for freight transportation within the Region of Peel that are also predicted to experience considerable delays?

A fluidity analysis was used to develop specific measures that could be used to evaluate these three questions. Two particular sets of measures were developed, the first measuring the commodities carried along a particular road segment and the second measuring the potential for recurring and non-recurring delays.

On the commodity side, the following three measures were analyzed on all Peel roads:

» **Commodity tonnage (State of good repair):** It is well understood that pavement damage increases with axle weight. The commodity tonnage measure shows the roads carrying the heaviest vehicles, and hence the roads that are likely going to need additional repairs or that need to be built to withstand these higher impacts.

» **Commodity values (Economic competitiveness):** Roads that ship high value goods are extremely important to the region's economy. Delays in shipments on these high-value commodities can incur large economic penalties to firms relying on these shipments.

» **Number of truck trips (Truck congestion):** Roads that carry large numbers of trucks experience higher truck congestion, delaying both trucks and passenger road users.

In conjunction with the above freight measures, the following two measures show the expected concern of traffic delays that would impact the supply chains:

» **Traffic congestion:** Roads operating at or near their carrying capacity operate more slowly and with much higher variability than roads carrying less traffic.

» **Incident probability (Safety):** Incidents are extremely disruptive to the travel network, both for those immediately involved in the incident and also to others due to large delays caused as lanes or entire roads are closed for the cleanup and investigations.

The focus of this the hotspot study was to analyze the traffic congestion, incident probabilities, and the above freight measures in a base year of 2011 to validate and interpret the base year results when other data is available. To follow, the traffic and commodity shipments were forecasted to 2041, showing the expected hotspots – and their severity – in the medium-to-long-term future.

6.2.2 Introduction to Traffic Congestion and Freight Inputs

The Greater Golden Horseshoe Model (GGHMv4) is the fourth generation of the MTO's flagship passenger travel demand model. In the context of the Region of Peel study, the GGHM V4 model was used to predict traffic patterns throughout the GGH region of southern Ontario. These travel patterns show the routes taken between origin-destination pairs, and the volumes and travel times on each road segment.

The traffic volumes out of the GGHMv4 were used for two purposes in this project. The first was to identify highly congested roads by comparing the link volume-to-capacity ratio (v/c), defined as:

$$\frac{v}{c} = \frac{volume}{lanes \times lane\ capacity}$$

In this equation, the volume is the number of (passenger car equivalent) vehicles travelling on the road over the course of an hour, divided by the capacity of the road (defined by the number of lanes and the hourly carrying capacity of each lane.

6.2.3 MTO Commercial Vehicle Survey Data

As outlined in Section 5.1, the MTO Commercial Vehicle Survey (CVS) is a roadside truck intercept survey that collects information from truck drivers about the truck trip that they were travelling on when intercepted. The most recent CVS – branded as the 2012 CVS – was conducted between the years 2010 and 2014. The data collected by the CVS that are of most interest for this study include the trip origin and destination, the commodity Standard Classification of Transported Goods (SCTG) code, the commodity weight and an estimate of its value.

Aside from the truck intercept surveys, hourly vehicle classification counts are also collected at each of the CVS sites for a 14-day period. Using the truck counts, the CVS survey records were expanded by MTO to represent the best available estimate of truck travel, shipped commodity tonnage, and shipped commodity value on Ontario roads.

The MTO provided a subset of CVS data showing commercial vehicle travel to, from, and within the Region of Peel, including 400-series highways, major arterials, and the Toronto Pearson International Airport. Survey data from the CN Brampton and CP Vaughan intermodal yards were not provided by MTO and as a result not included in the analysis. The Region of Peel also commissioned additional surveys at data collection stations within Peel to better characterize truck travel within the Region.

6.2.4 Incident Probability Model

While congestion levels are an extremely important cause of delay in the road system, road incidents are another large concern as they can cause disruptions when lanes and/or entire roads are closed for accident cleanup and investigation. Additionally, the occurrence of road incidents are unpredictable and cannot be accounted for by shippers and carriers, causing a cascading effect throughout the supply chain.

Data from the Peel accident database was geocoded to the GGHMv4 and mined to facilitate the development of the collision model, which was estimated using the software R. Figure 49 shows the results from the collision model overlaid with a density plot of observed collisions in the network.

Figure 49: Collision Probability

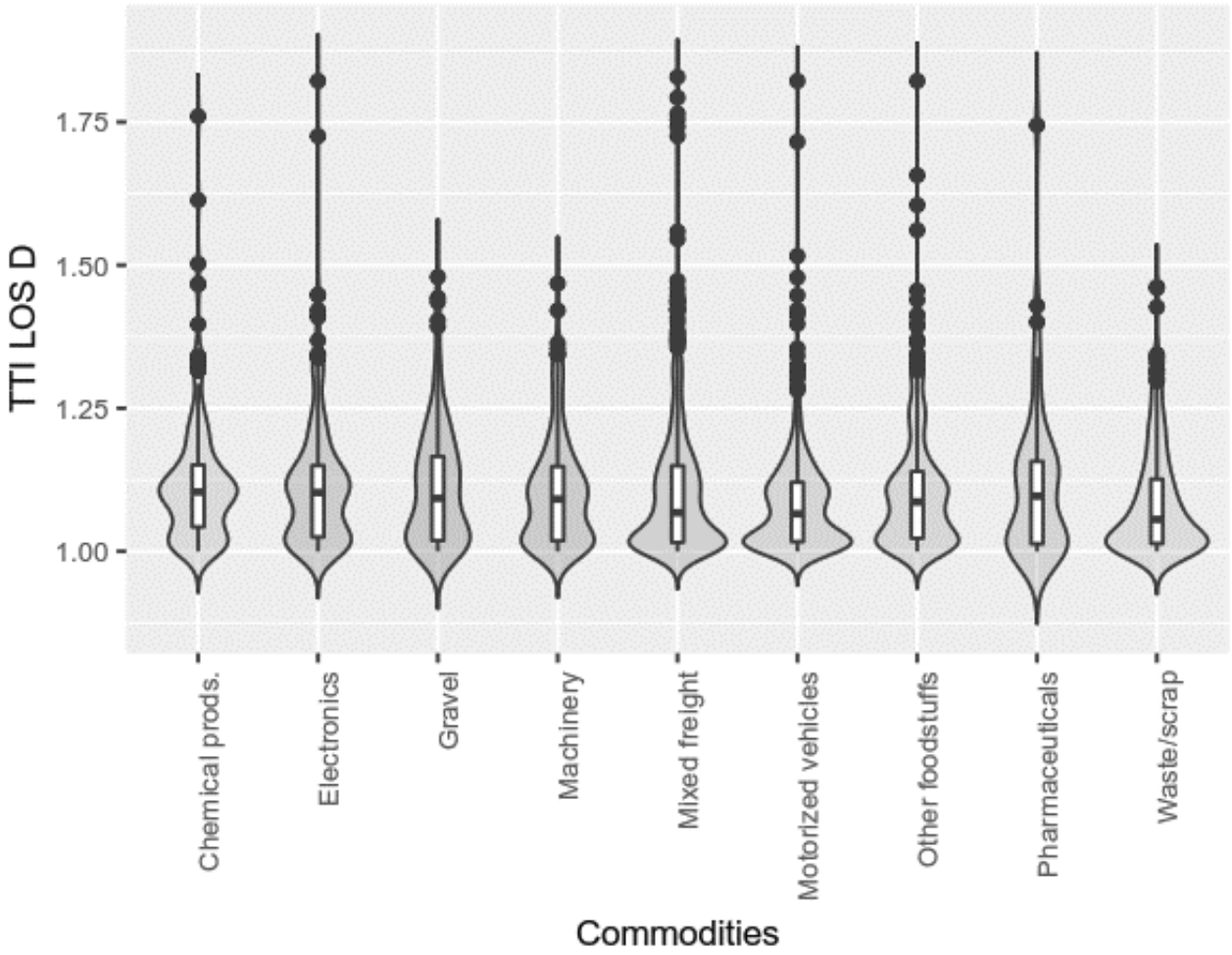
6.2.5 Analysis of Base Year Supply Chain Conditions

6.2.5.1 Commodity Delays

Commodity delay was estimated using the TTI. This definition was modified for the purposes of this analysis by replacing the free flow time with LOS D time, as LOS D times provide a better representation of expected travel metrics in an urban area of this scale.

Specifically, the LOS D TTI values were calculated by dividing the congested times between an observed commodity origin-destination pair to the LOS D network travel times for the pair in question. Figure 50 below shows the TTI for each of the 10 commodities (Mixed Freight is a combination of SCTG2 43 and SCTG2 46) under level of service (LOS) D conditions. Disaggregated data, individual commodity movements in the 2012 CVS, were used to generate the violin plot. The plot shows the minimum, mean, and maximum LOS D TTI values and the probability density of the data at different LOS D TTI values.

Figure 50: Travel Time Index for Congested vs. LOS D



Of the 10 commodity groups, the Gravel, Machinery, and Waste/Scrap CVS observations (trips) experienced the lowest spread between minimum and maximum TTI values under LOS D conditions. The remaining commodity groups saw a significant spread in the minimum and maximum TTI values, with some trips witnessing a value greater than 1.75. Minimizing the spread in TTI greatly improves the value of reliability, which is an extremely important consideration for freight movement.

The violin plot used disaggregates the 2012 CVS data, which was unfiltered for any outliers. Another measure of TTI was obtained by calculating an average LOS D TTI (summed across all trips within a commodity group), as shown in Table 22. The travel times were calculated using the GGHM V4 model's AM peak hour network.

Table 22. Network Travel Times by Commodity (minutes)

SCTG	Commodity Group	LOS D Time	Congested Time	LOS D TTI
21	Pharmaceuticals	4,823	5,356	1.11
43 and 46	Mixed freight	90,704	99,040	1.09
35	Electronics	20,194	22,451	1.11
36	Motorized vehicles	37,663	40,889	1.09
7	Other foodstuffs	48,486	53,765	1.11
34	Machinery	22,366	24,637	1.10
23	Chemical prods.	20,309	22,638	1.11
12	Gravel	7,237	8,201	1.13
41	Waste/scrap	18,865	20,482	1.09

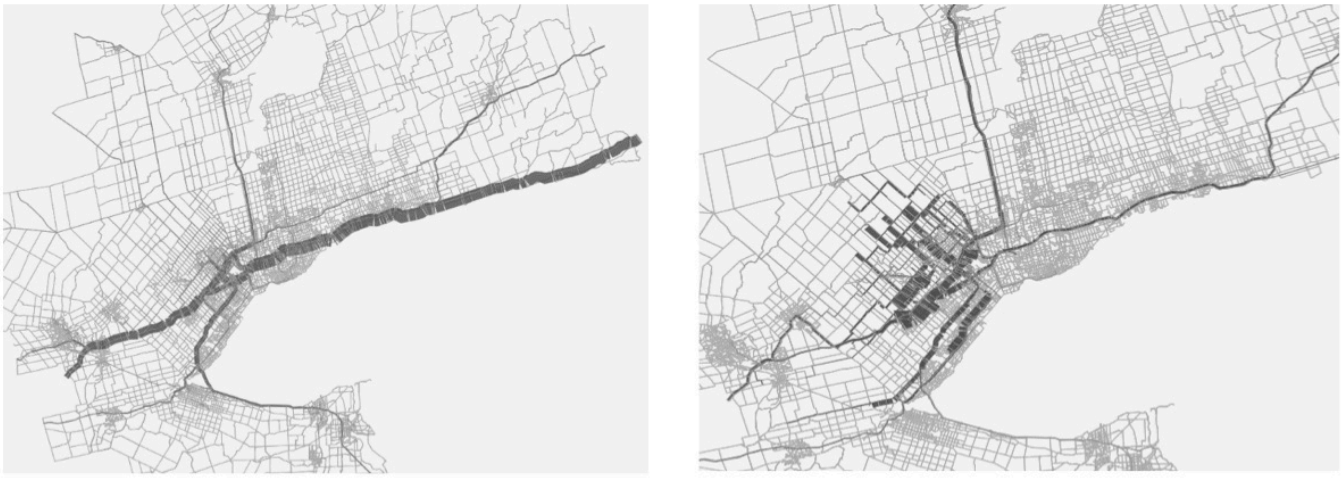
6.2.5.2 Commodity Assignment Results

The commodity assignment outputs the following for each of the commodities of interest:

- Annual tonnage of the commodity carried on the link (tonnes)
- Annual value of the commodity carried on the link ($)
- Number of trucks using the link

These results were then summed together to produce the total tonnage, value, and number of trucks for all of the studied commodities on each link. In order to give an example of the results output from the commodity-specific outputs, Figure 51 compares the annual tonnage carried on roads for two different commodities, SCTG2-43 (Mixed Freight) and SCTG2-12 (Gravel and Stone). These two commodity groups are very spatially diverse in terms of their origin-destination patterns and consequently route choice. The Mixed Freight group is primarily focused along the major highways with very long trip movements, while the Gravel and Stone commodity group has more of a local economic concentration and consequently, shorter trip flows.

Figure 51: Annual Tons by SCTG-43 (Mixed Freight) and SCTG2-12 (Gravel and Stone)



SCTG2-43 **SCTG2-12**

6.2.6 Forecast Year Supply Chain Projections

6.2.6.1 Forecast Year Traffic Conditions and Commodity Shipments in 2041

2041 traffic conditions were predicted by running aGGHMv4 AM peak traffic assignment using projected 2041 population and household forecasts generated by the MTO using the LUAS land-use model based on Metrolinx policy scenarios. 2041 external (either originating or ending outside the GGH region) trip estimates were also provided by MTO staff.

The Provincial Passenger and Freight Multimodal model, a passenger and freight travel of all of Ontario, was used to estimate the commodity flows in 2041. This model is referred to by its acronym TRESO (Transport and Regional Economic Simulation of Ontario) moving forward.

The TRESO macro-economic model provides employment and GDP forecasts segmented by industry classification and census subdivision. Forecasts are also available for every year between 2011 and 2071. It should be noted that the stability of such long-term horizon forecasts of economic trend prediction is speculative.

6.2.6.2 Hotspot Identification

The following forecast data is available:

» Volume on each link (from the GGHMv4 model run)

» Probability of incidents (this model can be rerun using the forecast traffic volumes)

» Commodity value, tonnage, and number of trucks from the 2041 commodity assignment model

These different model outputs can be plotted together in order to identify hotspots. The the Region of Peel, the following four figures were produced to identify hot spots:

» **Figure 52 – State of Good Repair:** This figure shows the sum of the projected 2041 tonnage for the studied commodities. Roads that are identified in this figure show the primary freight corridors for the heavy commodities. The roads that are subjected to heavy tonnage are expected to experience more pavement damage due to heavier axle loadings, and hence need to be monitored and maintained more frequency.

» **Figure 53 – Safety:** This figure outlines the projected probability of incidents over a five-year period. Roads that are coloured in medium and dark orange have a higher probability of accidents occurring causing non-recurrent delays.

» **Figure 54 – Economic Competitiveness:** Showing an overlay of both congestion levels and the value of commodities carried on each road, this figure shows roads that carry high-value goods on Peel roadways that also experience delays due to high traffic volumes. The roads overlaid with the thick dark blue bands show the primary freight corridors for the high-value commodities.

» **Figure 55 – Congestion:** This figure shows two indications of congestion. The first is the congestion (in passenger car equivalents) of all vehicles from an AM peak GGHMv4 forecast. This is overlaid with the truck congestion calculated from the forecasted CVS, via the commodity assignment model. The roads overlaid with thick dark blue bands show the primary truck corridors, which have the heaviest truck volumes.

While a particular road may be identified as a hotspot by one measure (e.g. safety), it may or may not be identified on the basis of other measures. Hence, a method to combine the results into a single measure is required. These figures were analyzed in order to visually identify freight hotspots using each measure, and then combined the results together into a single table, which is shown Table 23. This table outlines 16 corridors that were flagged for further study by being identified by at least one of the measures defined above. The corridors were then ranked by the number of measures that identified the road as a hotspot.

Table 23 depicts roads found as hotspots by all four of the measures marked in red, roads found as hotspots by three of the measures marked in orange and outlined in red, roads found as hotspots by two of the measures marked in orange, and roads found as hotspots by one of the measures marked in green and outlined in yellow.

Figure 52: Forecast 2041 Commodity Tonnage (State of Good Repair)

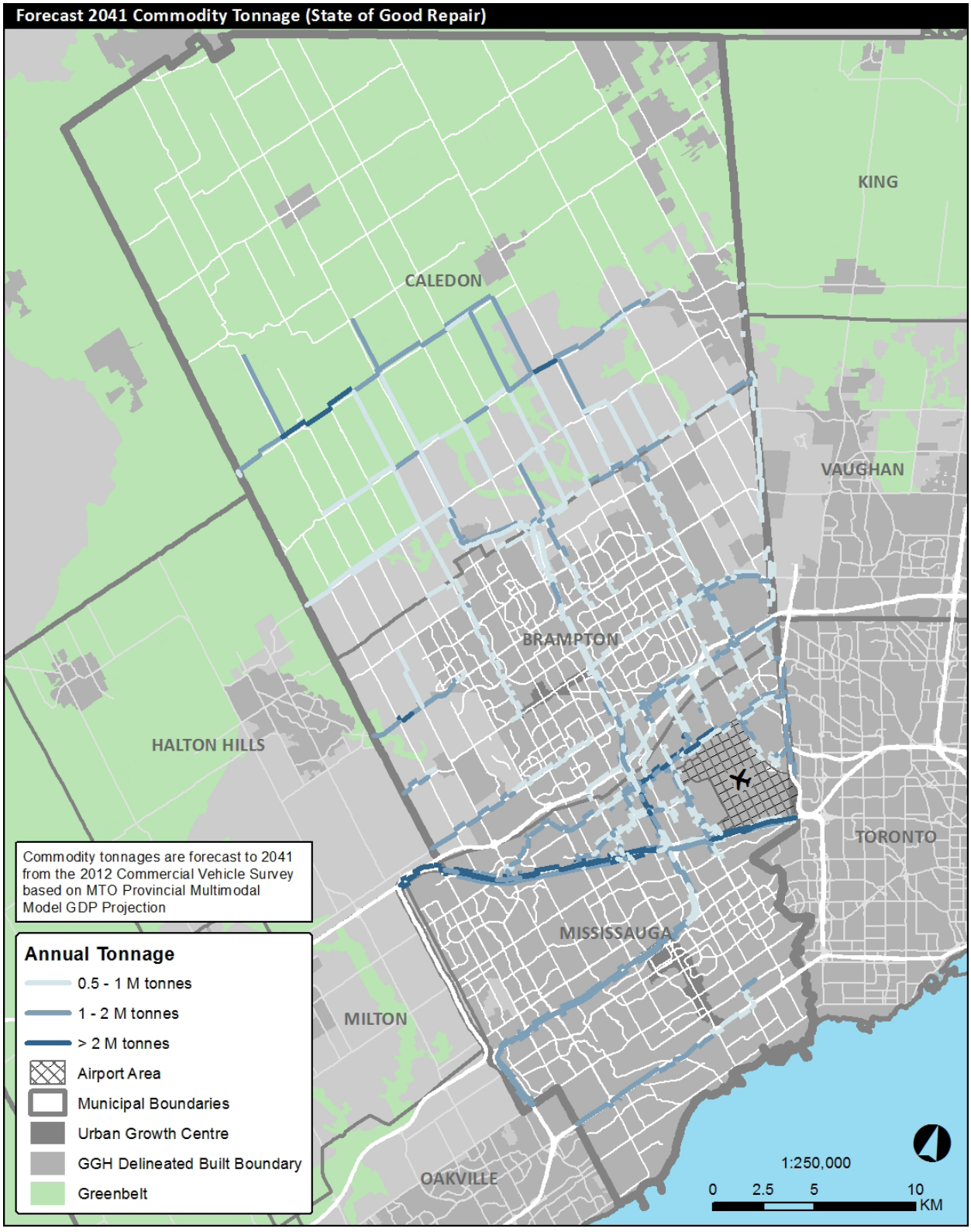


Figure 53: Forecast 2041 Incident Probabilities (Safety)

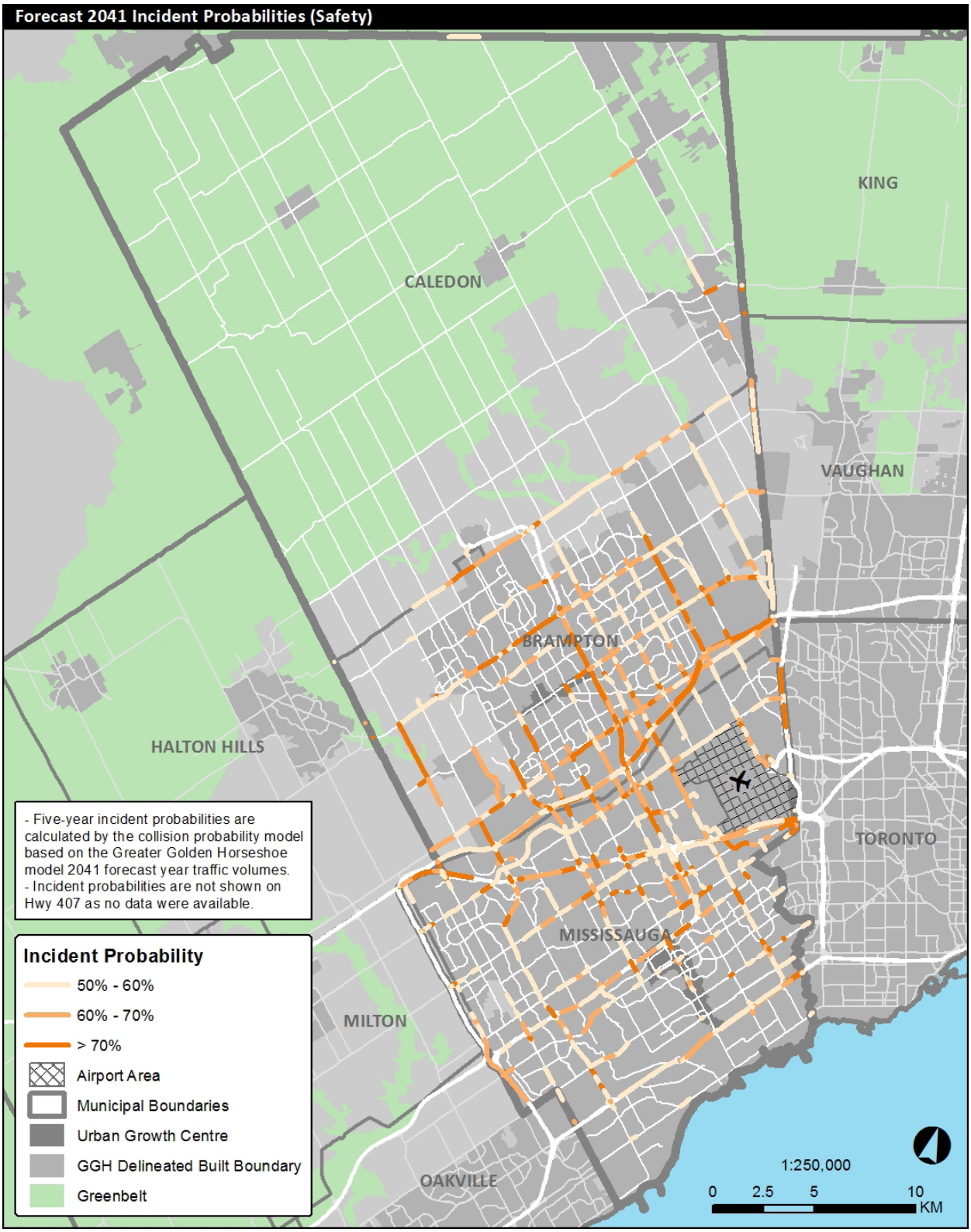


Figure 54: Forecast 2041 Link V/C Ratios and Commodity Value Carried (Economic Competitiveness)

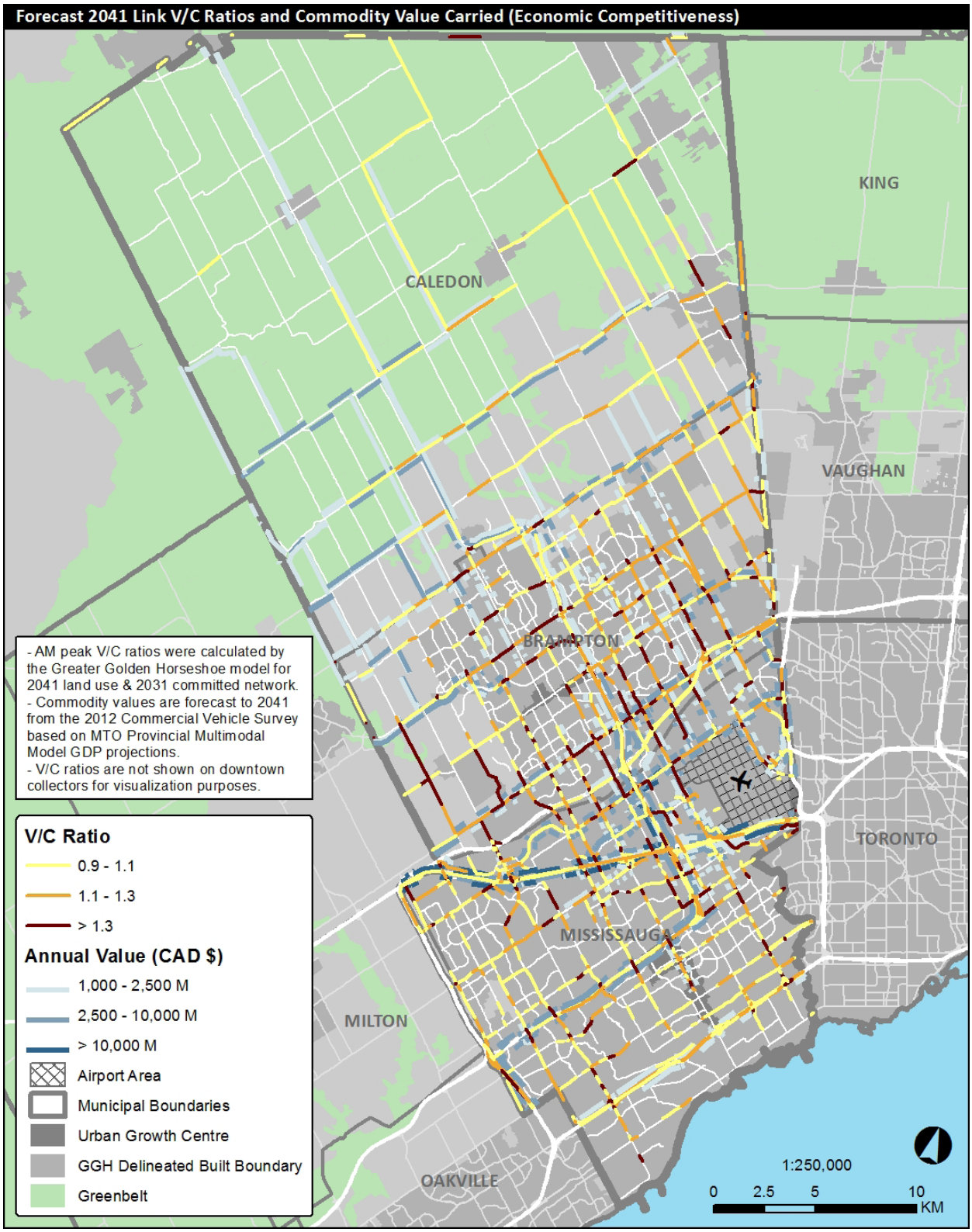


Figure 55: Forecast 2041 Link V/C Ratios and Number of Truck Trips (Congestion)

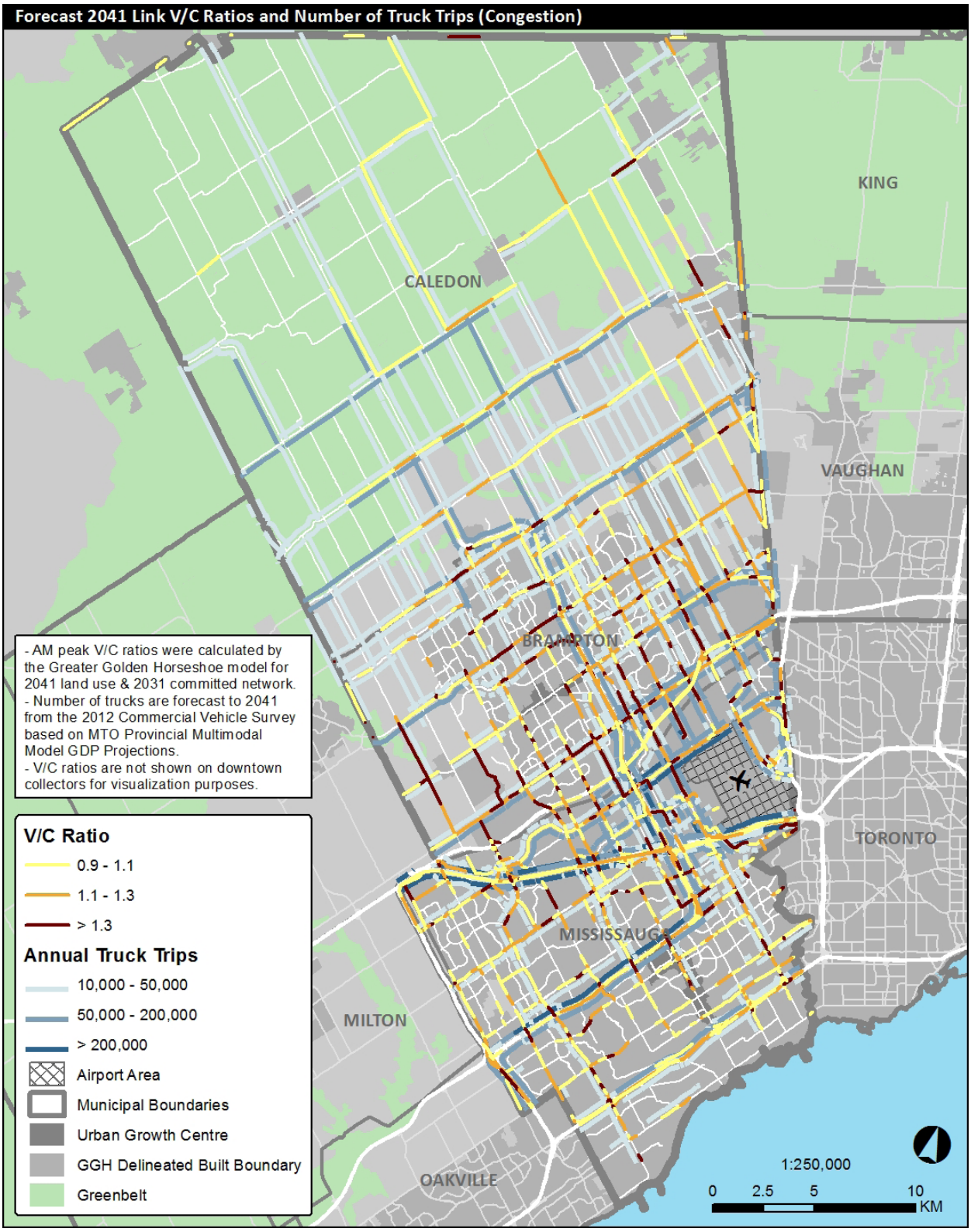


Table 23: Corridor Scenarios

Corridor	End Points	"Commodity Tonnes – Hots Spots (State of Good Repair)"	"Incident Probability – Hot Spots (Safety)"
Airport Rd	Hwy 427 to Derry Rd	●	●
	Derry Rd to Castlemore Rd		●
	Castlemore Rd to Mayfield Dr		●
	Mayfield to King St.	●	
Bovaird Dr	Winston Churchill to Chinguacousy	●	
	Chinguacousy to Hwy 410		●
Bramalea Rd	Derry Rd to Steeles Rd	●	
Courtney Park	Hwy 401 to Dixie Rd	●	
Derry Rd	Hwy 401 to McLaughlin Rd	●	
	McLaughlin Rd to Airport Rd	●	●
	Airport Rd to Hwy 427	●	
Dixie Rd	QEW to Hwy 401		●
	Hwy 401 to Derry Rd	●	●
	Derry Rd to Steeles Ave		●
	Steeles Ave to Queen St.		●
	Queen St. to Old School Rd.	●	
Drew Rd	Dixie Rd. to Torbram Rd	●	
Erin Mills Parkway	QEW TO Hwy 403		●
Goreway Dr	Derry Rd to Steeles Rd		
	Steeles Rd to Queen St.	●	
Heritage Rd.	Embleton to Bovaird Dr.		●
King St	Hwy 10 to The Gore Rd.	●	
Mayfield Rd	McGaughlin Rd to Hwy 410		●
	Hwy 410 to The Gore Rd.	●	●
	The Gore Rd. to Hwy 50	●	
Old Base Line Rd	Winston Churchill to Torbram Rd	●	
Queen St	Bramalea Rd. to Airport Rd.		
	Airport Rd to Hwy 27	●	●
Steeles Ave.	Winston Churchill to Hwy 27	●	●
Torbram Rd.	Derry Rd. to Steeles Ave.	●	

"V/C and Commodity Value – Hot Spots (Economic Competitiveness)"	"V/C and Number of Truck Trips – Hot Spots (Congestion)"	Number of Identified Scenarios
●	●	●
●	●	●
		●
		●
		●
		●
●	●	●
		●
●	●	●
●	●	●
●	●	●
		●
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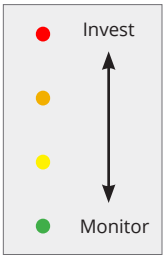


7 Trends and Risks

In This Chapter:

7.1 Population and Employment Growth

Population and employment are forecasted to grow in the Region of Peel, which aids in strengthening the overall regional economy, but increases stress on the transportation network.

7.2 Labour Force Availability

Labour force availability in Peel is currently not a concern for the trucking industry, but might be in the long-term. With the growth in goods movement, there is an availability of training and jobs for residents, but with a decrease in drivers entering this career, businesses might find an unmet need.

7.3 Long Combination Vehicles (LCV)

LCVs provide benefits to the transportation network in Peel by reducing the stress caused by peak period congestion and improve supply chain efficiency in the future. However, LCVs cannot be used for all goods and varying policies across provinces further limits this use to short-haul trips.

7.4 Off-Peak Delivery (OPD)

OPD, similar to LCVs, has the ability to help mitigate peak period congestion and increase local manufacturing in Peel. However, OPD is severely limited to businesses that ship at a larger scale, and by policies that vary across municipalities.

7.6 3D Printing

As technology advances and adoption of 3D printing increases, we can see a shift towards local manufacturing and on-shoring. While this will contribute positive to Peel's local economy, manufacturers will still rely on the current model for the movement of raw materials.

7.7 Connected and Automated Vehicles (CAV)

Once fully implemented, CAVs will redefine the motor carrier industry with increased safety and efficiency which can result in less congestion on Peel's transportation network. However, this shift affects current business models and will impact labour income as the need for workers decreases.

7.8 E-Commerce

E-commerce is a growing trend that has forced retailers to reconsider their supply chain and distribution structure. E-commerce has the ability to help grow local businesses, however, it increases overall VKT on Peel's network for last mile home deliveries.

7.9 Climate Change

With the onset of climate change, we can see a shift in policies as well as advancements in technologies towards greener initiatives. However, if green technologies are not adopted in the goods movement industry, emissions will have an increasing impact on pollution and quality of life for residents.

7.10 Education and Outreach

Various stakeholders involved with this study identified a gap where residents should be educated on goods movement and how it relates to Peel businesses and consumers. Education and outreach conducted by Peel shows leadership in freight planning.

7.11 CN Milton

With a new intermodal yard proposed in Milton, Peel has raised concerns about potential business shifting away from the region. However, as a whole, the CN Milton facility will further strengthen the national rail network for freight.

7.12 Highway 407 ETR

Highway 407 ETR operates through the Regional of Peel and aids in the reliability of Just-In-Time product manufacturing. However, this reliability and convenience comes at a pricey toll for manufacturers and is used sparingly.

7.13 Trade Agreements

Trade agreements reduces or removes barriers for accessibility as it allows countries to make their goods available. Trade agreements however, can harm local businesses in Peel and increase economic interdependence.

7.14 Freight Data

Reliable freight data is needed to evaluate the goods movement network. Currently, data availability has been identified as a gap that limits the full end to end fluidity of the supply chain.

Developing a long term plan requires an understanding of how current industry trends and risks will shape the goods movement sector in the short and long term. This section presents several economic, technological, operational, and policy trends and risks which have a bearing on goods movement industries in Peel. The trends and risks presented in this section were identified through industry interviews conducted for this study and as described in Section 3.1 and through document reviews.

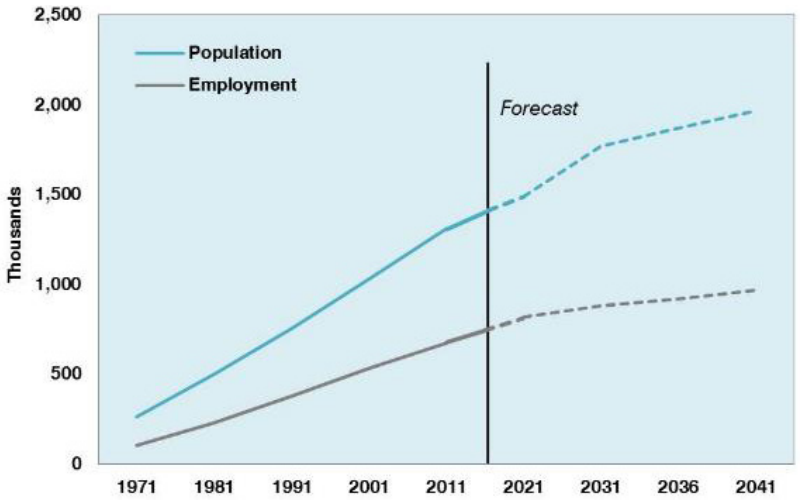
7.1 Population and Employment Growth

Population and employment in Peel have both seen strong growth over the past four decades. Population has increased by over 400% between 1971 and 2011 (to 1,323,000 people). This is forecast to grow to 1,970,000 by 2041[34]. Employment increased at an even stronger rate, growing by over 530% from 1971 to 2011 (to 665,000 jobs). Employment in Peel is forecast to grow to 970,000 by 2041.

The strong growth puts increasing pressure on the transportation system in Peel. The transportation system has grown over time to accommodate the increases in population and employment, and now is at the stage where opportunities to construct new transportation infrastructure are limited, placing greater emphasis on improving and optimizing the efficiency of the system which is a major focus of the Metrolinx Draft 2041 RTP for the GTHA.

On the people moving side, more emphasis is being placed on transit and other transportation demand management measures (such as carpooling) to improve efficiency and sustainability. For goods movement, private sector companies and agencies have placed a greater emphasis on efficiency and supply-side improvements. More will need to be done by both public and private sector interests to ensure that the effects of congestion are mitigated and that people and goods are moved efficiently and safely in the future.

Figure 56: Region of Peel Growth Forecasts



Source: Peel Data Centre; Growth Plan

34 Peel Data Center; Growth Plan

7.2 Labour Force Availability

The growth and success of the goods movement sector in Peel is largely dependent on the available pool of labour as one of the key inputs to production. A recurring theme encountered in stakeholder interviews was a concern about the future labour force availability for goods moving industries. The main focus was on professional truck driver shortages, but also included the broader transportation and warehousing industries and other goods moving industry jobs. A professional truck driver shortage is not an issue of concern for Peel, but is an issue for the Canadian for-hire trucking industry in general. A recent report for the Conference Board of Canada suggests that nationally the gap between the supply and demand for drivers by 2020 is expected to be 25,000 and could exceed 33,000 under a lower rate of productivity growth scenario[35]. There are currently over 300,000 truck drivers across all industries in Canada, with approximately 180,000 truck drivers in the for-hire trucking industry. The Canadian Trucking Alliance (CTA) estimated there were 13,115 vacancies for truck drivers in Canada in 2015, representing 3.3% of the total vacancies for all occupations.

The average age of truck drivers has been following an increasing trend, while the entrance into the driver workforce for individuals under 30 has decreased. The Wall Street Journal estimates the average age of truck drivers is nearing 50 in the US. This difficulty in attracting younger drivers is posing an issue for the industry as older drivers start to retire. The CTA estimated the average hourly wage for tractor-trailer drivers was $23/hour, which is higher than the national average. However, the strain on long-haul drivers, who are required to work long and unpredictable hours to earn these wages, offsets the higher than average wage rates.

The Conference Board of Canada Report suggests a number of factors which could help match the supply and demand for truck drivers, which includes:

- An overall contraction of the trucking industry
- Increases in trucking industry productivity
- Improvements in industry working conditions or wages
- Marketing of the truck driving occupation
- Driver training/licensing
- Policy change for truck driving to be recognized as a skilled trade

Fully automated trucks are not likely to be operational in the near term. However, Connected and Automated Vehicle (CAV) technology has the potential to fill some or all of this shortage by enabling driverless operation in the long-term (possibly leading to a scenario where a workers are shifted from operating vehicles to loading and unloading goods at DCs and other fixed locations).

35 The Conference Board of Canada. Understanding the Truck Driver Supply and Demand Gap and Its Implications for the Canadian Economy. February 2013.

7.3 Long Combination Vehicles (LCV)

The MTO currently has a long combination vehicle (LCV) program to encourage the sensible use of LCVs throughout the province. The program allows MTO to regulate as well as collect information and feedback regarding LCVs in the province and determine whether LCVs fit the province's goals for the environment and economy. LCV cases can be found in Appendix G.

There are several regulations and qualifications required to obtain LCV permits. Permitting is not industry-specific. These companies are given permits to operate on specific roads, primarily during off-peak hours and not in the months of December, January and February. Trucks are defined as LCV if they are 25-40 meters and haul two full-size trailers. A key provision of the Ontario program is that LCVs cannot have a gross vehicle weight in excess of the limit set for a regular truck pulling a multi-axle trailer (63,500 kgs). Therefore, LCVs are beneficial for cube-limited cargo, meaning that the lading is constrained by the physical volume of the trailers and not the weight rating of the trucks. Consumer packaged goods are typically bulky and fall into this category, as are some other manufactured products. Qualifying motor carriers need to be part of the Ontario Trucking Association or the Private Motor Truck Council of Canada, and have significant trucking experience and an exemplary safety record. The trucks themselves need to meet certain performance and technological requirements to ensure safety.

In January 2017, the MTO LCV Program Conditions were modified to include the following:

- Updates to reflect harmonization agreements with adjacent jurisdictions, relationships with various trucking associations, and allowable LCV configurations.
- Removal of permit and carrier limits.
- Updates to include a requirement for speed reports to be submitted with reportable collision information.
- Updates the requirement for an Ontario LCV Driver Certificate.
- Includes a new provision regarding LCV training, advisory, and monitoring services.
- Includes requirements regarding Twin Stinger-Steer LCV combinations.
- Updates for holiday restrictions on Canada Day.
- Addition of an appendix detailing an update to allow for 12.2 (40 foot) semitrailers.
- Addition of an appendix to reflect LCV Twin Stinger-Steer Auto Carrier description, dimensions, and weights.

This MTO program was implemented with the objective of improving the efficiency of trucking by lowering costs and reducing fuel consumption per ton shipped. In addition to benefiting motor carriers and shippers, this program also generates societal benefits by lessening emissions of greenhouse gasses and air pollutants, decreasing truck vehicle kilometres travelled (VKT), and reducing accidents per ton shipped (although the safety record qualifications contribute to this result). In 2014 there were 36,000 LCV trips as part of the Ontario program, totaling over 11 million kilometers of travel. Many of these trips were between Ontario and Quebec, because Quebec has allowed these types of vehicles for over 20 years.

The companies interviewed for this study had contrasting perspectives regarding use of LCVs: those who did not use it nor see it as beneficial for their business, and those who did use them and would like to increase their participation. Generally the industries that had permits, through the LCV program shipped high cube products (i.e. trucks reaching capacity by volume rather than by weight), and had deliveries with high concentration of flows (i.e. major customers with high volume demand) including, but not limited to, foodstuffs to larger grocers and mixed freight to major retailers. Some of these industries held the maximum number of permits and would like the ability to access more permits. There are currently 1,600 permits available from MTO, however not all permits are held suggesting there is a mismatch between total number of permits which can be held by a single organization, regulations and costs to obtain a permit and the operational benefit of using LCVs.

Several carriers interviewed held unused LCV permits because demand and revenues generated from using LCVs was not sufficient to cover costs. Revisiting permit restrictions and costs to qualify for permits may incentivize greater usage of the program. These include:

- Direct administrative and reporting costs
- Insurance costs
- Ontario Trucking Association (OTA) driver training
- Route application engineering assessment costs
- 2 kilometre origin-destination restriction from highway interchange
- Peak travel time restrictions in the GTHA and Ottawa

7.4 Off-Peak Delivery (OPD)

OPD in the context of this study refers to the last-mile trip from DCs to retail outlets. Several of the companies interviewed for this study expressed interest in off-peak shipping and receiving of their goods as part of their day-to-day operations. Many of these companies participated in the MTO pilot project during the Pan Am / Parapan Am Games in the summer of 2015, which sought to manage congestion during the games and assess the feasibility of OPD in the GTHA. Other companies expressed interest in OPD, but were unsure how nighttime restrictions differed between municipalities. Moreover, these firms also viewed the coordination of unattended deliveries and route planning as key challenges in the implementation of OPD.

In general, the companies with the greatest appetite for OPDs were shippers with large, high volume customers who had the ability to receive goods at night. Other industries did not see OPD as fitting within their business model for reasons relating to increased cost and scheduling of shipping and receiving staff for off-peak windows.

A key consideration for OPD is coordinating customers to receive deliveries. Receipt of nighttime shipments generally takes two forms: having overnight staff to receive deliveries or using technology to enable deliveries without staff being present. Overnight staff are typically more suitable for large

establishments because of the costs involved. For smaller establishments, customers can provide a key and/or alarm codes for direct delivery to their establishment, avoiding the need for overnight staff. The customer does not need to be present. The key drop delivery option requires establishing a good relationship between the carrier and customer and may be more appropriate for certain goods than others. For instance foodstuffs, which have the potential for spoilage and require a specific cold chain policy to be followed, may be more complicated to arrange direct-to-freezer instructions than for non-perishable products.

A major current issue with OPD is the ability to incentivize customers to receive shipments during off-peak hours. Several companies expressed interest in OPD both as a new business practice and expansion of existing OPD. However, OPD expansion was generally seen as limited by not having large enough stores where local bylaws allowed OPD and where an efficient delivery route could be established. Using Municipal and Regional policy tools, such as bylaw amendments and land use planning, were suggested as a way to incentivize OPDs. These could include:

» Establishing common nighttime truck restriction bylaws in the GTHA and even throughout Ontario
» Establishing categories of bylaw exemptions for specific industry groups
» Considering future zoning that enables greater use of OPD

Noise restrictions and noise issues are often viewed as a central limitation to OPD, especially in proximity to residential areas. Shippers are encouraged to use routes that mitigate issues related to noise. Noise issues may also depend on the type of good shipped. For example, shippers of foodstuffs requiring a cold-chain require the use of refrigerated trucks that are often much louder than non-refrigerated trucks. OPD cases can be found in Appendix G.

7.5 3D Printing

Automation is the use of automatic equipment during the production process. Automation in manufacturing flourished due to the ability to produce economies of scale. The increasing use of 3D printing technology is an extension of automated manufacturing, however technological advancements allows the manufacturing process to be both economical and small scale.

3D printing, or additive manufacturing, is a process that creates physical, three dimensional objects from a digital design. 3D prints start with a design of the object that acts like a blueprint. This design file is then translated into triangulated surfaces and vertices. This file is then sliced into several two dimensional layers which act as building blocks to form the three dimensional solid object.

Figure 57: 3D Printing Process[36]

McKinsey Global Institute research estimates that the 3D printing market can have an impact of up to $550 billion by the year 2025[37]. This growth and adoption can be attributed to new 3D printing services and changes to traditional manufacturing techniques. Some key advantages associated with 3D printing include:

» Shorter lead times;
» Freedom to design and manufacture complex and customizable products;
» Lower number of production steps in design, prototyping, and manufacturing;
» Faster delivery times due to on-demand and decentralized production;
» Reduced logistics and production costs; and
» Lower environmental costs as production is efficient in material and energy usage.

Current 3D Printing Applications

Though 3D printing offers many advantages, adoption has been slow. An Ernst & Young report found that 11% of companies are experimenting with 3D printing, while 3% claim to have significantexperience with the technology[38]. Currently, 3D printing has mainly been adopted by companies for the purposes of:[39]

» Consumer goods
» Customized healthcare
» Manufacturing of complex products
» Decentralized and on-demand manufacturing
» New services and business models such as fabrication shops and tech-shops

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36 http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/dhl_trendreport_3dprinting.pdf
37 http://www.mckinsey.com/business-functions/operations/our-insights/3-d-printing-takes-shape
38 http://www.ey.com/Publication/vwLUAssets/ey-global-3d-printing-report-2016-full-report/$FILE/ey-global-3d-printing-report-2016-full-report.pdf
39 http://www.dhl.com/content/dam/downloads/g0/about_us/logistics_insights/dhl_trendreport_3dprinting.pdf

Impact of 3D Printing on Supply Chains

There are four main areas in which 3D printing will have an impact on supply chains. These are summarized below:

- **On-Demand:** 3D printing has the potential to eliminate the need to store spare parts, as manufacturing of these components can take place on-demand. It is estimated that the actual share of excess inventories can exceed 20%[40]. It is costly and inefficient for companies to store unused inventory. 3D printing eliminates this issue as spare parts can be printed on-demand and where required. This helps achieve coverage and efficiency in lead-times and would only require the storage of raw materials and CAD design files.
- **Individual Direct Parts Manufacturing:** As various markets begin to adopt 3D printing, they can take advantage of the flexibility to produce individualized parts. This provides a competitive advantage for organizations as well as the efficiency of short lead times and quick delivery as manufacturing can occur in regional warehouses or local distribution centres.
- **Customization/Postponement Services:** Postponement strategies are unique to 3D printing technology as it can offer increased customization on individual items and storage efficiency. This allows local distribution centres to hold stock of almost-finished goods, along with 3D printers, and delay final assembly to the final point of demand.
- **End-of-Runway Services:** End-of-runway services are logistics solutions that are located at specific warehouses close to important airport hubs. 3D printing can be incorporated with this service to enable fast production of critical parts that need to be put into operation in a short timeframe. Additionally, 3D printing can help enhance repair operations by immediate delivery to improve customer satisfaction.

Impact of 3D Printing on Goods Movement

The potential impacts of 3D printing on goods movement are wide ranging. This technology will force mass manufacturers to move up the value chain as production of these products will take place with both cost and logistic advantages. Specialized products that are unable to be manufactured with the use of this technology will still, therefore, be transported using the existing infrastructure network. Additionally, the need for raw materials for 3D printing purposes will still be prevalent. These materials will still need to be transported through existing freight networks, however, the transfer of actual goods will be minimized through localized manufacturing of goods. While this won't eliminate the need for goods movement, it will likely result in a significant reduction in commercial VKT as well as tax benefits for retailers.

7.6 Connected and Automated Vehicles (CAV)

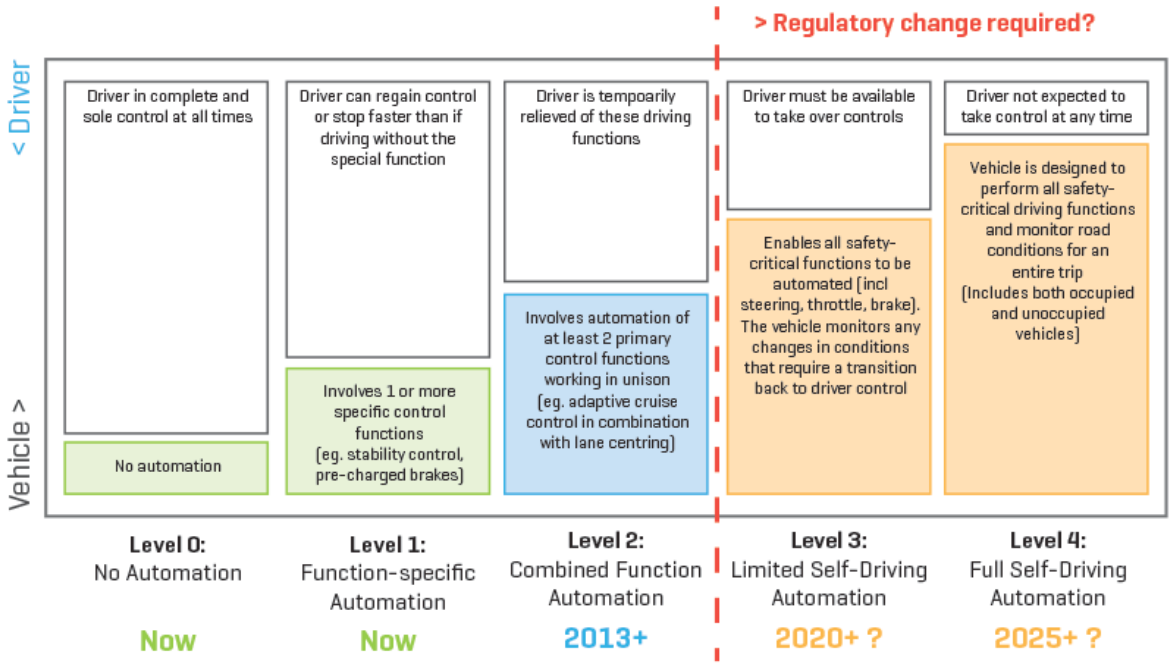
The adoption of connected and automated vehicles (CAVs) has the potential to greatly change the freight industry in Peel along with the rest of the world North America. These technologies are still nascent and their impact on the industry is uncertain. However, there are early indications of how these technologies may impact the industry with safety, regulatory, financial, environmental, and

40 http://www.industrialsupplymagazine.com/pages/Management---Value-of-excess-inventory.php

security implications. Full CAV implementation would redefine the motor carrier industry and would require the public sector to respond quickly with regulations and policies that evolve as quickly as the technology itself. Anticipating these challenges and opportunities should be a priority of the public sector, to avoid being unprepared in the face of rapid technological gains being made in CAV.

Having said this, the general input provided by the industries interviewed was that there are no ongoing private-sector initiatives to utilize fully automated CAV technology in the immediate future. A general forecast of driving automation for automobile and truck developed by the NHTSA is provided in the figure below. Most industries felt CAV technology was not well suited for freight due to vehicle size and pick-up/drop-off staffing requirements. There was a perception that CAV technology is a long way from being operational and the most likely near-term technology might involve adaptive cruise control and automatic braking, while still requiring a truck operator. Nonetheless, the lack of interest or awareness in CAV technologies could be the result of the sector's short planning horizons. Motor carriers typically only consider new technologies if they are available off-the-shelf and can be demonstrated to provide a return with a year or two. The thin margins of most motor carriers do not permit experimentation with new technologies—the sector is currently structured to reduce risks.

Figure 57: Levels of Driving Automation, National Highway Traffic Safety Administration



Technology, Propulsion, and Mode Shift

There are numerous short- and long-term technology implications of increasing vehicle automation and connectivity. As vehicles become safer, more fuel efficient, and capable of platooning, the cost of trucking will decrease. Alternate fuels – chiefly electricity[41] and, to a lesser degree, natural gas – may compound this improvement by making trucks cheaper, quieter, and less polluting, making them a

41 Siemens and Scania are currently trialing a 1.2-mile stretch of highway with overhead wires to enable freight vehicles to operate under electric propulsion using a pantograph, with vehicles reverting to a conventional internal combustion engine when leaving the pilot area.

more attractive mode of transportation. This improvement in trucking has the potential to reduce the costs that consumers pay for goods at stores. Almost all goods are transported by truck for at least some portion of their supply-chain. In addition to decreasing logistic costs, these technological improvements for trucking are also likely to generate mode-shifts from rail to truck. Rail's rate and environmental advantages will become less pronounced, unless equally ground-breaking technologies are implemented in moving freight by rail, including automated freight trains.

Numerous freight carriers around the world are currently exploring the possibility of delivering goods using unmanned aerial vehicles (UAVs, or drones). Flirtey, an Australian start-up, uses drones to deliver mail, medicine, and other small-capacity packages quickly and cheaply. Matternet, a Californian logistics start-up, builds drones for transport of lightweight items, and has recently partnered with Mercedes-Benz to pilot a combined van/drone delivery system to address last-mile challenges.

Impacts on Safety

Virtually all literature discussing CAV technology emphasizes the potential for improving safety by reducing or eliminating human error, potentially leading to dramatic decreases of collisions, injuries and fatalities. The U.S. National Highway Traffic Safety Administration (NHTSA) estimated in 2011 that "human causes" are the primary factor responsible in 93% of collisions[42]. In the US in 2012 there were approximately 330,000 collisions involving large trucks, resulting in roughly 4,000 fatalities, most of whom were passenger vehicle victims[43]. Minimizing this loss of human life is a key objective of Peel and the province.

Collision reduction can also reduce freight industry costs associated with vehicle damage, human injury, lost productivity, damaged goods, higher insurance premiums, and corporate liability. While driverless vehicles offer the best long-term potential for collision reduction, technologies that exist today such as automatic braking, driver attention and drowsiness warning, impaired driver detection have the potential to significantly reduce collisions. Eventually, level 4 CAV technology will allow for increased speed limits on highways , increasing freight vehicle productivity.

Reducing collisions will also serve to reduce congestion: according to the US Federal Highway Administration, one quarter of congestion is caused by traffic incidents, of which roughly half are collisions[44]. Reducing congestion will lead to further reduction in accident rates—secondary collisions from suboptimal traffic flow are a common occurrence.

Even though the potential safety benefits of mature CAV technologies are endless, transitioning to a driverless world will be fraught with safety challenges. Developing CAV technologies that work in a mixed traffic stream, with non-driverless vehicles, is significantly more challenging than if all vehicles were driverless. CAVs need to successfully predict and respond to human drivers in order to operate vehicles safely. The difficulty of this task is likely to cause safety concerns in the short-run. Accidents might occur from software or hardware malfunctions, especially in challenging driving conditions

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42 Insights & Publications: Ten ways autonomous driving could redefine the automotive world, McKinsey & Company

43 The World's First Self-Driving Semi-Truck Hits the Road, WIRED

44 Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers, and Policy Recommendations, Eno Center for Transportation

such as during heavy rains and snow fall. The public sector needs to anticipate how CAVs might change the profile of accidents in Peel, at least in the short run, and respond with evolving regulations that ensure that CAV technologies are not misused. Implementing these technologies too fast, or without adequate precautions, has the potential to cause accidents, reducing the appetite of society or technologists for further developments. Caution at these early stages will pay dividends once the technologies become robust.

Impacts on Operations, Routing, and Road Networks

The impact of CAVs on trucking operations is hard to anticipate. On one hand, eliminating drivers will reduce some of the costs of freight shipments, making it more economical to ship smaller loads at a higher frequency, particularly in urban areas[45]. At the extreme this results in unmanned aerial vehicles (UAVs) where deliveries are made individually, reducing inventory costs and providing customers a better service. On the other hand, improvements in CAVs could increase the safety of operating LCVs. This could result in cheaper and more efficient long-haul shipping. Delivery routing will transform as CAV technologies develop. With use of different vehicle sizes and types (potentially including drones or other off-road vehicles for last-mile solutions), modified routing algorithms, potential for increased off-peak delivery, changes to traffic and land-use patterns, and, eventually, evolution of the size and shape of road networks, freight delivery will have both the opportunity and need to adapt accordingly.

CAV technologies will impact both urban and long-haul freight operations. With the introduction of vehicles such as Daimler's Freightliner Inspiration Truck, the first licensed automated commercial truck operating on public US highways, freight and logistics firms may choose to rent or lease vehicles rather than own them.

Changes to road networks and airspace are already being proposed. The Central North American Trade Corridor Association stated in 2015 that its members were already engaged in designing a driverless truck corridor from Mexico to Manitoba along US Route 83 which would expedite travel and border crossings[46]. Amazon has proposed standards and a regulatory framework for creating tiers of airspace in which slow drones, or those with minimal connections to pilots or infrastructure, would fly below 200 feet (60 m), while faster and better connected drones capable of communicating with other aircraft would fly at an altitude of 200-400 feet (60-120 m)[47].

Dispatch[48], a freight start-up piloting a small, driverless vehicle on California university campuses which delivers packages of up to 100 lbs (45 kg), allows customers to retrieve packages from one of the vehicle's compartments using a mobile app. Dispatch operates its driverless vehicle on sidewalks and paths, avoiding road use (and vehicle traffic) altogether. Customers receive a message when the robot is nearby, which they then text 'Open' when they are ready to receive their delivery.

Impacts on Land Use and Facilities

CAV technologies have the potential to relocate and reduce the need for parking facilities. However,

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45 Insights & Publications: Ten ways autonomous driving could redefine the automotive world, McKinsey & Company

46 http://www.cbc.ca/news/technology/driverless-truck-corridor-from-mexico-to-manitoba-proposed-1.3086215

47 Amazon provides new details on its plan for a drone superhighway in the sky. Popper, Ben

48 http://dispatch.ai/

the freight industry is likely to experience other land use changes, including a shift in the size, number, and location of DCs. As consumers continue to order increasing volumes of goods online, including groceries, clothing, and other staple goods, small-scale deliveries will become more frequent. Demand for fast and frequent deliveries of everyday purchases is skyrocketing, with Amazon driving this trend: Amazon now offers free same-day delivery in 27 US cities; free one-hour delivery from Amazon Restaurants in 17 US cities; and two-hour delivery of chilled beer, wine, and cider in the U.K., for example[49]. Such widespread and fast delivery is likely to necessitate an increase in the number and distribution of DCs, many of which are likely to be small facilities spread across urban areas.

DCs and other freight facilities will also be affected by both CAV technology, and automation trends generally. Facility layout and organization may change to accommodate new loading mechanisms, new sizes and shapes of both road and in-facility vehicles, and reorientation of labour and other non-automated tasks[50].

Impacts on Productivity

An increasing number of start-ups entering the goods movement industry may cause significant labour turnover, particularly in urban settings. Cargomatic and Convoy, US-based start-ups, provide Uber-like apps linking customers who require on-demand goods movement with available carriers. Such entities compete directly with freight-industry brokers (who charge significant premiums to pair shippers with one or more carriers), and have the potential to significantly drive down costs. For individual consumers, UberEats, Foodora, and similar services offer goods delivery (typically food) for restaurants and other commercial entities which previously did not offer delivery services.

In the long term, former General Motors executive Larry Burns anticipates freight industry costs to drop by as much as 40% as a result of switching to driverless CAV technology[51]. Though such efficiency gains will take years or decades to fully realize, significant savings will begin to accrue sooner and should be taken into consideration.

Challenges to the Region of Peel

CAV technology is unlikely to pose a threat to the Region of Peel's freight industry in the next couple of decades. In the long term, however, CAV-related changes to the freight industry could impact Peel's viability and its competitive advantage as Canada's national freight hub. New entrants or existing competitors – regions looking to grow their goods movement industry – could capitalize on opportunities presented by CAV technology, such as the proposed driverless truck corridor from Mexico to Manitoba (discussed above). Further, if increased safety and reduced costs of CAV truck-based freight cause some rail-based freight activities to shift to trucks. This might cause Peel to lose market share relative to other regions in Canada because of the high levels of roadway congestion found in the GTHA and reduced importance of rail intermodal infrastructure. Decentralization of goods movement, such as direct supplier-to-consumer shipments, or a trend towards having a large number of small DCs located across an urban area in place of a single large DC, Canada's freight industry may choose to ship fewer goods to the existing large, centralized DCs in the Region of Peel.

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49 https://www.amazon.com/b?node=8729023011 and https://primenow.amazon.com/onboard?sourceUrl=%2F and https://www.amazon.co.uk/Prime-Now/b?ie=UTF8&node=6584642031

50 Insights & Publications: Ten ways autonomous driving could redefine the automotive world, McKinsey & Company

51 Realising the benefits of autonomous vehicles in Australia, Accenture Digital

Finally, as automation reduces the need for manual labour, Peel's freight industry may be unable to sustain its employment levels, leading to job shortages or other labour disruptions in the region. The Region of Peel should monitor these CAV trends carefully over the coming decade, and begin to consider strategic responses accordingly.

7.7 E-Commerce

The rise of online shopping (or e-commerce) has forced retailers to reconsider their logistics and distribution of their products. While brick and mortar stores are not disappearing, the need to rapidly deliver goods to both individuals and stores for pick-up in response to online shopping necessitates a reappraisal of supply chain dynamics. This section discusses how e-commerce has impacted supply chain structures, logistics related to warehousing and shipping, as well as the real estate/land use implications of 'omnichannel' shopping.

Historically, consumers would visit physical stores to view, compare, and purchase goods. While consumers could shop around for best deals and service quality, the advent of online shopping has enabled quick comparative shopping, so that consumers are able to view the prices of similar items across multiple retailers. In essence, for retailers, this means that to compete with one another, retailers distinguish from one another by offering competitive delivery solutions, such as next-day shipping. Moreover, omnichannel shopping is now expected by consumers, meaning that consumers can shop from any device and that the shopping experience is consistent and seamless across devices and platforms. As a result of this 'on-demand' shopping experience, retailers have been forced to reconsider shipping and supply chain structures.

Traditionally, brick and mortar retailers would receive products when low on stock through regional in a unidirectional, simple flow of merchandise (Figure 59)[52].

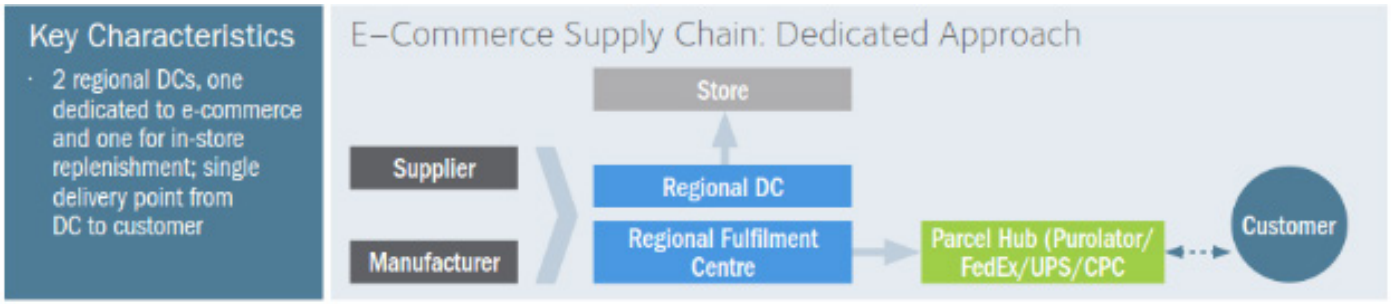
52 GWL Realty Advisors (July 2014). Digital Shift: Understanding the Emerging Impact of E-Commerce in Canadian Industrial Real Estate. Vancouver, BC.

Figure 58: Traditional store supply chain

Source: GWL Realty Advisors (July 2014). Digital Shift: Understanding the Emerging Impact of E-Commerce in Canadian Industrial Real Estate. Vancouver, BC.

Now, with consumers shopping from anywhere and at any time, traditional boundaries related to shopping have disappeared; consumers can disregard seasonality and there is no limit to the number of customers able to shop at an online store at any one time. As such, retailers require flexibility in warehouse space and logistics[53]. One approach is for retailers to have two types of DCs, one dedicated stocking physical stores, and another dedicated to supplying fulfillment centres that are the online of retailers. These fulfillment centres, which tend be larger than DCs, are typically occupied by a single retailer and used to assemble and ship orders (usually composed of various individual products) via carriers directly to customers (Figure 60). An alternate approach used by some retailers is to combine both in-store and e-commerce stock in the same warehouses, albeit under different divisions given the divergent sorting and inventory requirements (Figure 61). Finally, one approach used by some big-box retailers in the US involves a blended approach, whereby stores, given their large stock, can be used as fulfillment centres so that customers receive or pick up their orders from local stores, in addition to having dedicated supply chains from distribution and fulfillment centres (Figure 62).

Figure 59: Dedicated supply chain



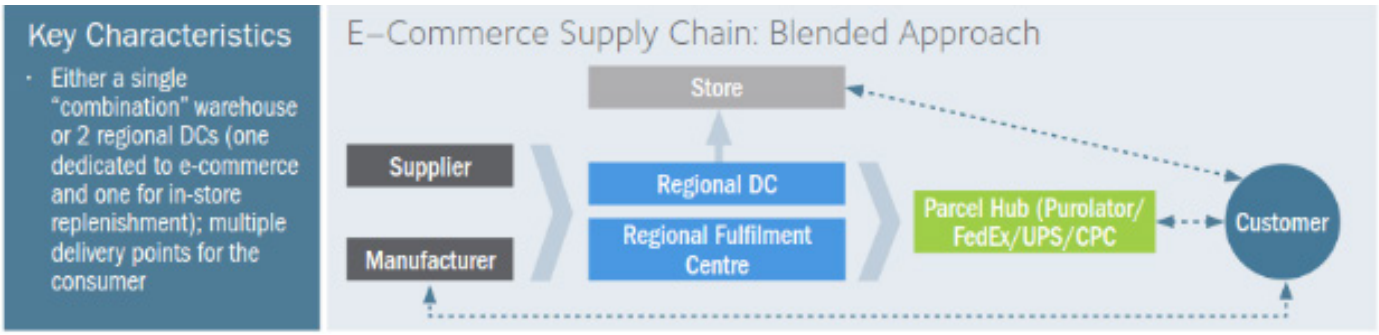
Source: GWL Realty Advisors (July 2014). Digital Shift: Understanding the Emerging Impact of E-Commerce in Canadian Industrial Real Estate. Vancouver, BC.

53 Deloitte Real Estate (2014). The shed of the future. E-commerce: its impact on warehouses. A Deloitte Insight Report. London, UK.

Figure 61. Combined approach supply chain

Source: GWL Realty Advisors (July 2014). Digital Shift: Understanding the Emerging Impact of E-Commerce in Canadian Industrial Real Estate. Vancouver, BC.

Figure 60: Blended approach supply chain



Source: GWL Realty Advisors (July 2014). Digital Shift: Understanding the Emerging Impact of E-Commerce in Canadian Industrial Real Estate. Vancouver, BC.

In Canada, many retailers use third party logistic (3PLs) to handle fulfillment and distribution functions. 3PLs, by managing distribution functions of many retailers, capitalize on economies of scale, particularly when direct retailer fulfillment is not cost effective.

The next section describes how e-commerce has impacted warehousing and siting choices related to new supply chain considerations.

E-Commerce requires multiple locations with different purposes and flexible warehousing

As customers desire shorter wait times between purchase and delivery, retailers and carriers are looking for ways to minimize delivery wait times. This can involve locating DCs closer to customers (individuals and businesses) to reduce delivery time and address the 'last mile' problem. One potential issue with facilities moving into urban areas is how land is zoned for allowing light industrial uses, and conflicts that may arise between the needs of logistic facilities, such as parking, movement of heavy trucks, etc., and the surrounding land uses (e.g. residential). Moreover, online shipments tend to be prepared over night for delivery the following day, and shipping/receiving functions may lead to noise conflicts if these centres are located in residential neighbourhoods. Finally, with the growing popularity of grocery e-commerce, food distribution will require more local distribution facilities as oppose to a few, large centres.

With the growth of the omnichannel approach, it is likely that retailers will continue to have large regional DCs located outside of cities, with a network of smaller facilities located within cities. Mega-sheds, that is, large warehouses, will likely be avoided given the need to avoid a single point of supply chain failure. Consolidation centres, where a single warehouse deals with a number of retailers, can help efficient urban deliveries by limiting road congestion, pollution and noise. These centres can be a solution for off-peak deliveries by permitting deliveries to a central location that may be staffed or unstaffed.

As alluded to previously, the need to locate closer to clients will require locations that are well-connected to roads and highways, as well as to receive goods from suppliers and be accessible to employees. Moreover, due to reasons like growing road congestion and environmental concerns, firms increasingly desire connections to alternative transport modes, namely rail, air and sea.

Beyond locational concerns for retailers, the evolving nature of deliveries and thus the processing of goods at DCs and fulfillment centres requires flexibility in warehouse design. For instance, reverse logistics, i.e. returns from customers, has particular staffing requirements. In addition, parking consideration is needed not only for employees, but customers as well if on-site pick-ups are provided at the warehouse. Consideration is also needed for a variety of vehicle types, and small vehicles used in deliveries may require particular layouts for efficient loading/unloading of fragmented orders. As well, green vehicles will also require charging equipment.

Taken together, while the Canadian e-commerce market is still in its infancy but growing at a fast rate, retailers need to strike a balance between the large distribution and fulfillment centres that require flexible designs, with the need to locate closer to clients, typically in dense urban areas. The section below discusses the implications of e-commerce on industrial land and real estate.

E-commerce is likely to increase the demand for industrial land

E-commerce will have a profound impact on industrial real estate, given that e-commerce depends on storing, moving and managing products at various spatial and temporal scales. Indeed, as distribution and fulfillment centres become larger in order to deal with greater volumes of products, these centres generally have low site coverage due to truck/vehicle requirements. In addition to requiring flexible design and programming, the large consumption of space suggests that industrial real estate will grow in demand along with e-commerce. As mentioned above, these facilities will require excellent connectivity to roads and highways in particular and as such, retailers are more likely to seek out and develop new sites, rather than fit supply chains around existing buildings. As a result of the need for space for supply chain and fulfillment centres, the expansion of industrial real estate may become more indicative of retail growth and success than expansion of retail stores.

Nevertheless, certain risks are borne by the novelty of e-commerce and its small footprint (about 5% in 2014) in total Canadian retail sales. In addition, about two-thirds of Canadian online shoppers purchased goods from websites based outside of Canada (in 2014). For these and other reasons, 3PLs play a large role in Canadian e-commerce, particularly in product returns (reverse logistics). Related

to risks in real estate, shorter lease deals (three to five years) are typical for e-commerce groups for warehousing space. Moreover, after a lease expires, spaces that are inflexible risk becoming vacant if future clients cannot adapt the spaces to their needs.

Home delivery supply chains are designed to be highly responsive and flexible to the demands of consumers. Online and store-front retailers and truck delivery companies who serve them are constantly finding ways to optimize their supply chains to deliver goods as quickly and cheaply as possible. The driving performance factor is more speed than price, especially when shipping is offered free to consumers. Nevertheless, costs have to support the price, which means the competition for delivery economies and productivity is a matter of commercial survival. While consolidation of next day and same day deliveries can be achieved through the networks of the major package carriers, the smaller time windows associated with faster speeds reduce the opportunity for it.

There are at least two implications for transportation planning in the Region of Peel. First, traffic access and parking conditions affect the ability to meet time commitments and thus influence the number of staging points required. Second, these same conditions affect the productivity and thus the cost of delivery operations, suggesting that the intense pressure on retailers and carriers to improve those costs will be conveyed to public agencies and elected officials. It is important to recognize that these are new developments: same day delivery is a recent phenomenon and e-commerce is by far the fastest growing segment of retail. The effects of this have only begun to be felt, and the opportunity is to anticipate effects with appropriate transportation and land use planning.

In addition, there is an effect on neighborhoods. More trucks will deliver more goods. Vehicles like UPS package cars are not especially large, but as a greater variety of household goods enter the home delivery stream, larger vehicles may be required – and LTL carriers (typically operating 28' delivery trucks) are already reporting significant growth for home deliveries. Safety will be an overriding concern, and adoption of the sensing and driver-assist technologies associated with connected and autonomous/automated vehicles will offer a solution. Emissions will matter, so that natural gas powered and hybrid-electric trucks will be more desirable. Finally, consumers will be directly exposed to the consequences of delay: the household ordering pet food for tonight will notice when it is not delivered. In a traditional store-front model, the retailer buffers the customer from delivery problems; withhome delivery, the consumer contends with them face-to-face. The long-standing assumption that "freight doesn't vote" may be upended by this change, and lead to citizen demands on elected officials for transportation improvements.

In summary, e-commerce and the omnichannel shopping approach allows people to shop for nearly any product from any electronic device at any hour. As a result, retailers, shippers and the industry as a whole require new approaches for receiving, processing, shipping, and delivering orders. This new framework brings about new challenges related to transportation, land use, and regulatory policies for governments.

7.8 Climate Change

Over the past couple decades, governments and private industry have been working together to help mitigate contributions to climate change, with a large focus on reducinggreenhouse gas (GHG) emissions. Climate change has environmental impacts such as increased rainfall, more severe storms, and more volatile temperatures. This affects the transportation network with impacts to infrastructure maintenance and travel time reliability.

In Ontario, the transportation sector is the largest contributor to GHG emissions[54]. Combating climate change impacts all presents economic opportunities through expansion of the global green economy. Clean technology solutions have an opportunity to innovate and grow the operations of goods movement.

This green evolution is already present in freight industries from green freight programs to the advancement of technologies such as electric commercial vehicles and alternative fuels. Ontario's Climate Change Action Plan has named transportation as a strategic action area with a vision towards the use of more low-carbon trucks and buses, increased use of electric vehicles, and supporting active and sustainable transportation. Through this Plan, a new Green Commercial Vehicle Program would provide incentives to businesses that want to update their fleet.

7.9 Education and Outreach

Education and outreach is critical to engage citizens and businesses to better understand and interact with the goods movement sector in Peel. Stakeholders engaged in this study felt there was a need for residents and industry to know more about goods movement, the sector, and how goods are directly related to the lives of residents, consumers, businesses, and other community participants. More needs to be done to mainstream freight through education and information distribution. Various benefits can be achieved through targeted education, including increased road safety, ensuring labour force availability, garnering appropriate support for freight infrastructure investments, and providing industry with information about capital works impacting the Peel Strategic Goods Movement Network (SGMN).

Some of the key outcomes of providing goods movement education and outreach are:

- Raising the profile of freight among citizens to increase safety on shared roads
- Raising awareness of freight jobs, tools, and resources to ensure a sustainable labour force
- Disseminating aggregated industry information on recent initiatives and advancements
- Garnering public support for freight supportive infrastructure investments
- Improving industry interaction with the truck network by providing construction notices

54 Ontario. Ontario's Five Year Climate Change Action Plan 2016-2020.

An Outreach and Communications plan was developed to disseminate the information developed in this study. Examples of other jurisdictions who have developed freight-related education and outreach programs are described below.

CargoM – Montreal, Quebec

Started in 2012 within the economic development strategy of Greater Montreal, CargoM's mission is to bring together all players in the logistics and freight of Greater Montreal, whose activities promote the hub of Montreal, around common goals and concerted actions to increase cohesion, competitiveness, growth and expansion[55]. CargoM acts to initiate projects which promote Montreal's position as a hub for transportation of goods, ensure the sharing of best practices and technologies, influence the harmonization and simplification of regulations, and to promote attraction and retention of labour in different sectors of the industry. On a 10-year horizon, CargoM's vision is to make Greater Montreal recognized and sought after for its operational and environmental performance, for its contribution to the competitiveness of its business partners' multimodal platform for the economic development metropolitan region and Quebec.

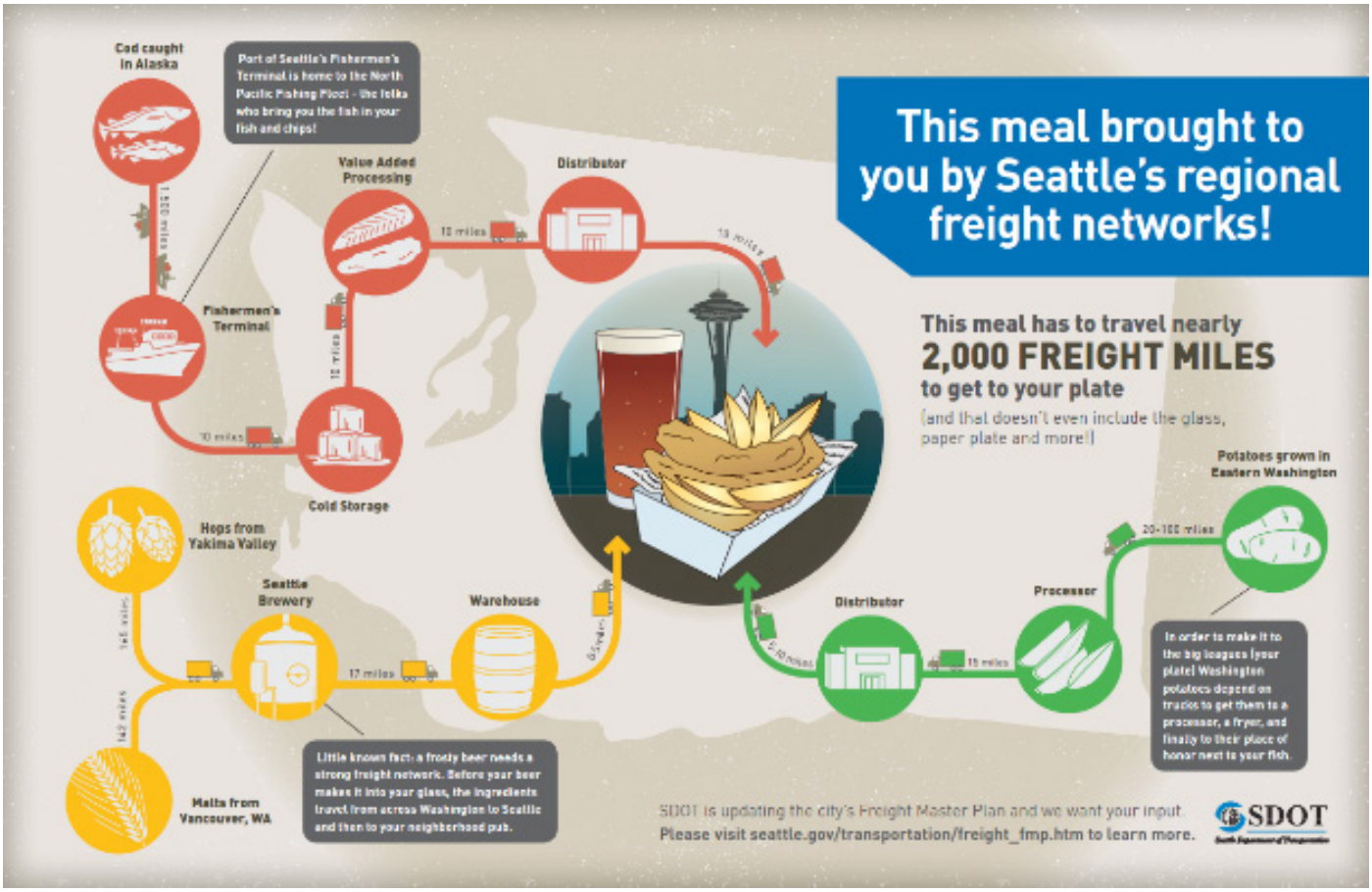
CargoM has seven working groups which are dedicated to advancing thinking and actions to support Montreal's freight cluster. These working groups cover a variety of topics, including Communication and Outreach. The communication and outreach working group has a mandate to establish effective and ongoing communication between all levels of government, the general public and stakeholders, on issues related to freight in Greater Montreal. This working group aims to provide the freight community with communication and outreach tools that will create a positive portrait of the economic impacts of the transport and logistics sector as well as raise awareness of the freight transport sector among the general public and internationally. A main objective of the Communication and Outreach working group is to counter the negative image of the transport and logistics sector by highlighting the innovations of local industries.

Freight Mobility Program – Seattle, Washington

The Seattle Department of Transportation (SDOT) has a Freight Mobility Program, not dissimilar to Peel's Goods Movement program. Seattle's Freight Mobility Program website provides information on the program, the freight advisory board and travel and traffic information impacting goods movement. Seattle has also developed community friendly info-graphics to illustrate, in simple terms, the intricacy and importance of freight in the daily lives of Seattle residents. An example of this type of info-graphic is provided in Figure 63.

55 CargoM. Logistics and Transportation Metropolitan Cluster of Montreal. 2016.

Figure 61: Seattle Freight Supply Chain Infographic



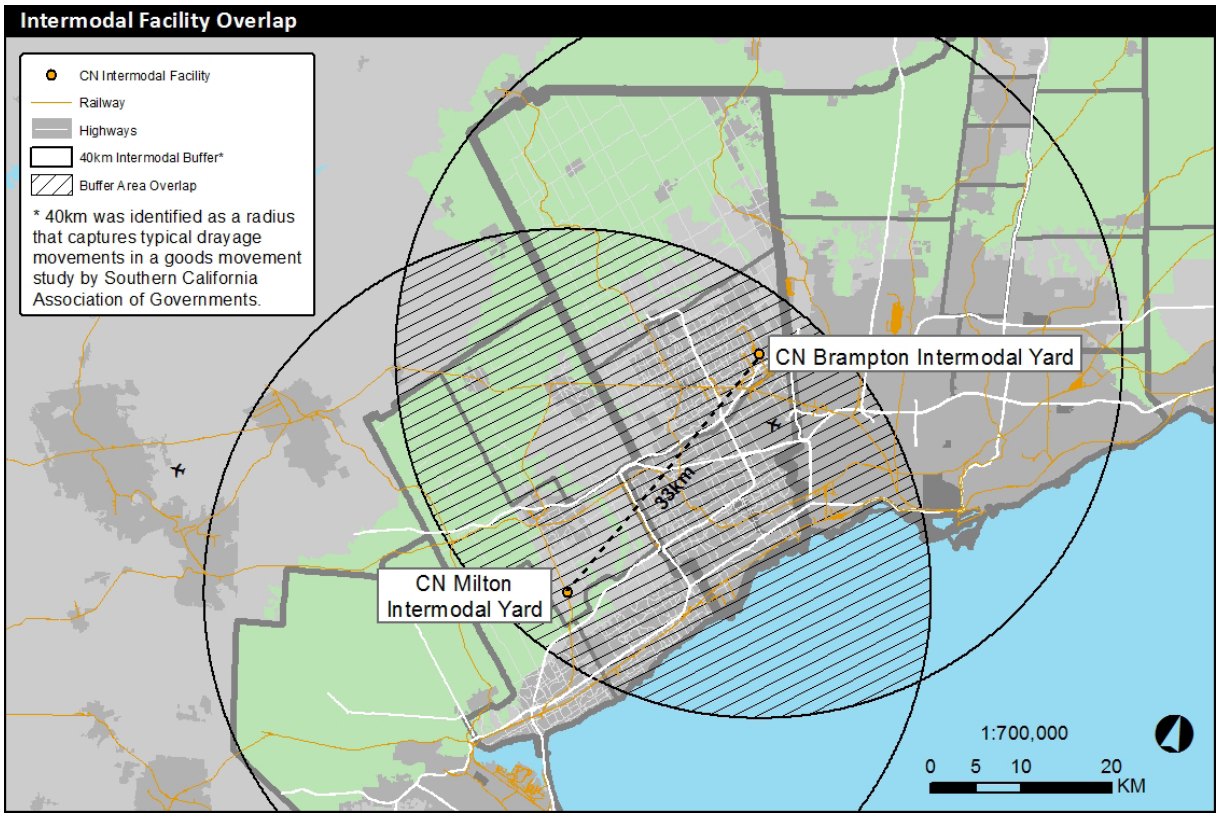
Source: City of Seattle Freight Master Plan (2016)

7.10 CN Milton

CN has recently announced plans for the development of a new intermodal yard in Milton, Ontario. As CN's current intermodal yard is in Brampton, Peel Region is concerned about the potential impacts this new hub will have on goods movement in the Region. The current CN Brampton Intermodal Yard located in Peel Region touches 60% of CN's intermodal business and handled nearly 1 million containers in 2014. Intermodal is one of CN's fastest growing business segments. However, expansion in Brampton is limited due to the rapid growth of logistics facilities and DCs immediately surrounding the terminal. To meet the demands of their growing intermodal services, CN states it will proceed with a two-facility strategy for the GTHA in Brampton and Milton[56]. The two facilities would be approximately 33 kilometres apart.

56 Canadian Environmental Assessment Agency Project Description for Milton Logistics Hub

Figure 62: Map of CN Intermodal Yards in Brampton & Milton



The planned Milton Logistics Hub is estimated to cost $250 million and create more than 1,000 direct and indirect local jobs. The development will comprise of six yard tracks and is expected to handle 4 trains daily, 450,000 containers, and 800 trucks per weekday at full operation[57]. With the new hub and mainline track extension, CN is planning for two additional trains to be used on the mainline each day between Brampton and Milton, raising rail traffic to 27-32 trains per day along the Halton Subdivision, up from current levels of 25-30 trains.

Based on the proposed size of the new facility, it is unlikely that it will have the capacity to replace the Brampton Intermodal Yard. Instead, it will complement the Brampton Terminal in growing CN's intermodal services in the region. CN confirmed that Brampton Intermodal will remain CN's main intermodal yard[58]. The new Milton hub plans to handle 4 trains daily while Brampton currently handles 17 a day.

The CN Brampton Terminal will have to contend with some growth pressures as it will be a few years before Milton will be in operation[59]. Once open, some volume is expected to shift from Brampton to Milton as Brampton is currently close to full capacity. CN could arrange to have different types of traffic at each terminal (i.e. domestic vs. international) but at the moment it is difficult to foresee how this will impact trucking and land use patterns in the surrounding area. In the short term, some truck drayage activity is expected to shift from Brampton to Milton.

57 By 2020

58 Keith Reardon. Toronto Railway Club Luncheon, May 22, 2015.

59 Projected end of Q4 2017

Peel may not benefit from many of the direct local jobs that will be created by CN's decision to locate in Halton over Peel (however, some Peel residents should benefit from the direct jobs created at the hub). Despite this, the majority of contributions will come from indirect impacts – those that benefit from the additional rail service, such as third party logistics firms, transportation providers, and DCs. Many of these indirect impacts will accrue in Peel. The new Milton hub's proximity to Peel will only contribute positively to Peel's goods movement growth because CN's market area goes beyond that of municipal boundaries. The benefits of the new Milton hub will expand into Peel with much of the drayage trips overlapping across the two municipalities (see Figure 64). The map outlines a 40 kilometre radius from the intermodal yards. It has been assumed for the figure that this distance from an intermodal rail yard will encompass the majority of truck drayage trips. However, drayage distance is dependent on many factors and the radius from the intermodal yard may be in the range of 8 km to 800 km.

Due to the close proximity of the two intermodal yards, existing businesses already located in Peel are unlikely to relocate to Milton. Exceptions could include businesses with aging facilities or lacking expansion opportunities. The new Milton hub will attract businesses, perhaps those that would otherwise locate in Peel in the future. But the new hub will decidedly also spur additional businesses in both municipalities from the increased rail service accompanying the new facility.

In summary, the established logistics centres, distribution centres, manufacturers, and transportation network in the Region all contribute to Peel's competitive advantage for national goods movement. CN's investment to expand intermodal facilities near the Region should work to further solidify Peel's market position as Canada's DC for the long term.

7.11 Highway 407 ETR

Highway 407 Express Toll Route (ETR) is one of seven provincial 400-series highways in the Region of Peel. The 407 ETR was privatized in the 1990s and is currently operated by a consortium on a 99-year lease. Tolls on this highway vary by vehicle size, time of day, and location. Vehicle classes include light vehicle, heavy single unit, and heavy multi-unit. Charges vary per kilometer and by time of day. Peel is considered to be in the 407 ETR light zone, which reflects lower charges per kilometer as shown in Figure 65.

In the peak weekday AM hours, the total charge through Peel is $17.37 and $26.05 for heavy single unit and heavy multi-unit respectively using a transponder. Without a transponder, the toll charge increases from $67.37 to $76.05 for heavy single unit and heavy multi-unit vehicles. Heavy vehicles over 5,000 kg must be equipped with a valid transponder. If these trucks use the 407 ETR without a valid transponder the trucks are subject to a camera charge plus tolls per trip and may be stopped by the Ontario Provincial Police and/or Ministry of Transportation Enforcement Officers and fined.

Table 24: 407 ETR Rate Chart by Time of Day Through Peel

Period	Heavy Single Unit Through Peel (per km)	Heavy Multi Unit Through Peel (per km)
Peak Period (AM) Mon-Fri: 6am-7am, 9am-10am	62.74¢	94.11¢
Peak Hours (AM) Mon-Fri: 7am-9am	71.34¢	$1.07
Peak Period (PM) Mon-Fri: 3pm-4pm, 6pm-7pm	65.10¢	97.65¢
Peak Hours (PM) Mon-Fri: 4pm-6pm	73.94¢	$1.11
Midday Rate Weekdays 10am-3pm	56.66¢	84.99¢
Midday Rate Weekends & Holidays 11am-7pm	51.90¢	77.85¢
Off Peak Rate Weekdays 7pm-6am, Weekends & Holidays 7pm-11am	43.24¢	64.86¢

Figure 65. 407 ETR Map of Light and Heavy Zones

Source: 407 ETR Concession Company Limited

Due to the significant toll rates, the 407 ETR is only used by select motor carriers. Industries that use the 407 ETR are typically large manufacturers requiring reliability of delivery times for Just-In-Time (JIT) product manufacturing. These companies ensure their trucks are equipped with transponders. However, the majority of the shipper and carrier companies interviewed for this study replied they either did not use the 407 ETR at all or in a limited use for urgent situations because of the expense.

As a result of the limited use of the 407 ETR by shippers and carriers in Peel, there is an opportunity to assess whether there are policy options available to encourage the use of the 407 ETR and alleviate volumes primarily on Highway 401. These policy options may include ensuring carriers operating in the Region of Peel have access to transponders for use of the 407 ETR through an incentive program or regulating that carriers servicing certain companies and industries in Peel with freight-intensive requirements have transponders.

7.12 Trade Agreements

Free trade agreements (FTA) play a crucial role in generating freight activity both within and between countries. By reducing or removing various barriers to trade, countries are able to increase the accessibility of their own goods for other countries, as well as increase access to foreign market

products for local consumers. The opposite is true for increasing or creating trade barriers.

7.12.1 Existing Trade Agreements

Canada is currently party to a number of bilateral and multilateral FTAs, which are both regional and international in scope. The largest of which is the World Trade Organization's (WTO) Marrakesh Agreement which entered into force on January 1st, 1995 as successor to the 1948 General Agreement on Tariffs and Trade (GATT). The WTO currently has 164 member states from all regions of the world, and serves as the base model for global trade regulation and tariff levels, with 99% of product lines in developed countries bound at, or less than, 5% (73% in developing countries)[60].

The next most influential FTA is the North American Free Trade Agreement (NAFTA). An agreement that built upon the former Canada-US FTA, NAFTA entered into force on January 1st, 1994 and eliminated most tariffs and non-tariff barriers to trade over its first 15 years[61]. As the first large, multilateral agreement of its type, NAFTA helped set the standard for free trade that the WTO agreement solidified globally[62]. Since its inception, NAFTA has helped increase trilateral trade between its members by 125.2%, as seen in Table 25 below.

Other FTAs currently enforced that Canada is party to include the Canada-European Free Trade Association FTA (CEFTA) which entered into force July 2nd, 2009, and the Canada-Korea FTA (CKFTA) which entered into force January 1st, 2015. The CEFTA is a goods-only agreement which was negotiated over 8 years and seeks to eliminate barriers and promote trade between Canada and EFTA member states. It is a first-generation treaty and can be updated in the future to include new obligations in other areas such as services, intellectual property, and investment. The CKFTA is Canada's first bilateral FTA in the Asia-Pacific region and as such can help set the standard for future FTAs with other Asian countries. The goal of this agreement is to remove virtually all duties for bilateral trade, touching on 99.75% of goods by 2032 at full implementation, while increasing Canadian exports to South Korea by 32%, boosting GDP by $1.7 billion[63].

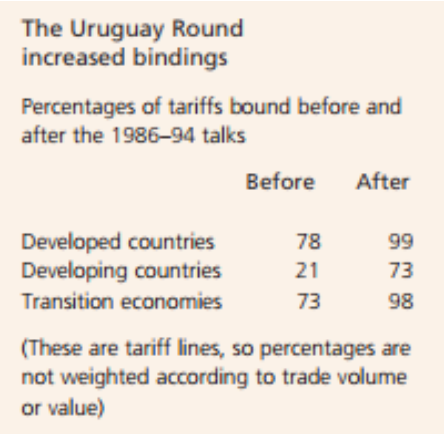
60 https://www.wto.org/english/thewto_e/whatis_e/tif_e/understanding_e.pdf

61 https://fas.org/sgp/crs/row/R42965.pdf

62 http://international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/nafta-alena/fta-ale/facts.aspx-?lang=eng

63 http://international.gc.ca/trade-agreements-accords-commerciaux/agr-acc/korea-coree/pt.aspx?lang=eng

Figure 63: Uruguay Round Increased Bindings



The Uruguay Round increased bindings

Percentages of tariffs bound before and after the 1986–94 talks

	Before	After
Developed countries	78	99
Developing countries	21	73
Transition economies	73	98

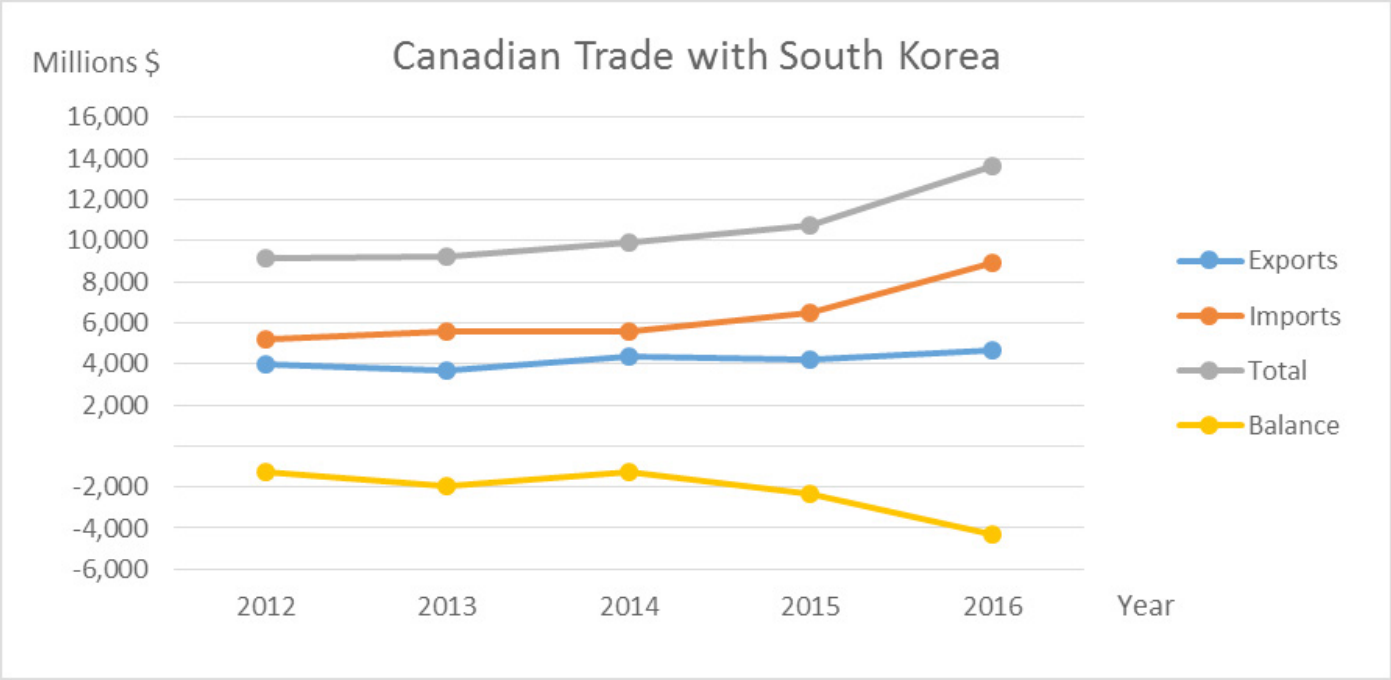
(These are tariff lines, so percentages are not weighted according to trade volume or value)

Source: wto.org

Table 25: Trade Volumes (million $USD)

Channel	2015	1993	Nominal increase	Real increase*
U.S.-Canada	$518,217	$199,184	160.2%	63.5%
U.S.-Mexico	$481,543	$85,224	465.0%	255.0%
Mexico-Canada	$34,344	$4,052	747.6%	432.5%
Trilateral	$1,034,104	$288,460	258.5%	125.2%
*Adjusted for inflation using BLS core CPI; source: Mexican Embassy in Canada				

Figure 64: Bilateral Product Trade Canada - Korea



Source: Statistics Canada

7.12.2 Future Potential Trade Agreements

In addition to the implemented FTAs mentioned above, there are currently (as of month of submission, 2017) a number of agreements either awaiting entry into force or under negotiations. The signing of new agreements will increase freight activities as both imports and exports increase, and puts greater demand on international points of entry such as border crossing, ports, and airports.

The Canada-Ukraine FTA (CUFTA) was signed July 11th, 2016, and entered into force August 1st, 2017. The goal of this agreement is to drastically reduce or eliminate tariffs and other barriers to trade over a maximum period of 8 years after entry into force, as well as to adopt simplified customs procedures to speed up processing times[64].

There is also the Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union (EU), signed October 30th, 2016, 30 and is awaiting ratification. This treaty is poised to set new standards with regards to the areas it covers, including most importantly trade, where duties are expected to be eliminated for 98% of EU tariff lines on Canadian goods upon entry into force, ultimately covering 99% of tariff lines 7 years after ratification[65].

64 http://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/ukraine/text-texte/toc-tdm.aspx?lang=eng

65 http://international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/ceta-aecg/overview-apercu.aspx-?lang=eng

Canada is currently negotiating with a number of Asian countries including India, Japan, and Singapore. If concluded, these future FTAs could drastically increase Canadian access to Asian markets, including the second and third largest world economies in China and Japan respectively[66].

7.12.3 Internal Agreements

In addition to the FTAs signed with other countries, Canadian premiers and the federal government jointly implemented the Canadian Free Trade Agreement (CFTA) on July 1st, 2017, to enhance the internal flow of goods, eliminate technical barriers to trade, and promote regulatory cooperation through creating a regulatory reconciliation process[67]. This agreement, according to Ontario's Minister of Economic Development and Growth, could raise Ontario's GDP by more than $9 billion by 2025[68]. This comes at a time where global trade has slowed down in comparison to the pre-2008 global financial crisis, increasing the importance of internal trade[69]. Figure 68 below shows the global trade trend in merchandise exports from 1960-2016.

Figure 65: Global Trade Trends in Merchandise Exports

Data Source: World Bank Data

66 https://www.weforum.org/agenda/2017/03/worlds-biggest-economies-in-2017/

67 https://www.cfta-alec.ca/canadian-free-trade-agreement/

68 https://news.ontario.ca/medg/en/2017/04/statement-from-minister-duguid-on-completion-of-the-canadian-free-trade-agreement.html

69 http://www.international.gc.ca/economist-economiste/performance/state-point/state_2016_point/index.aspx?lang=eng#1.0

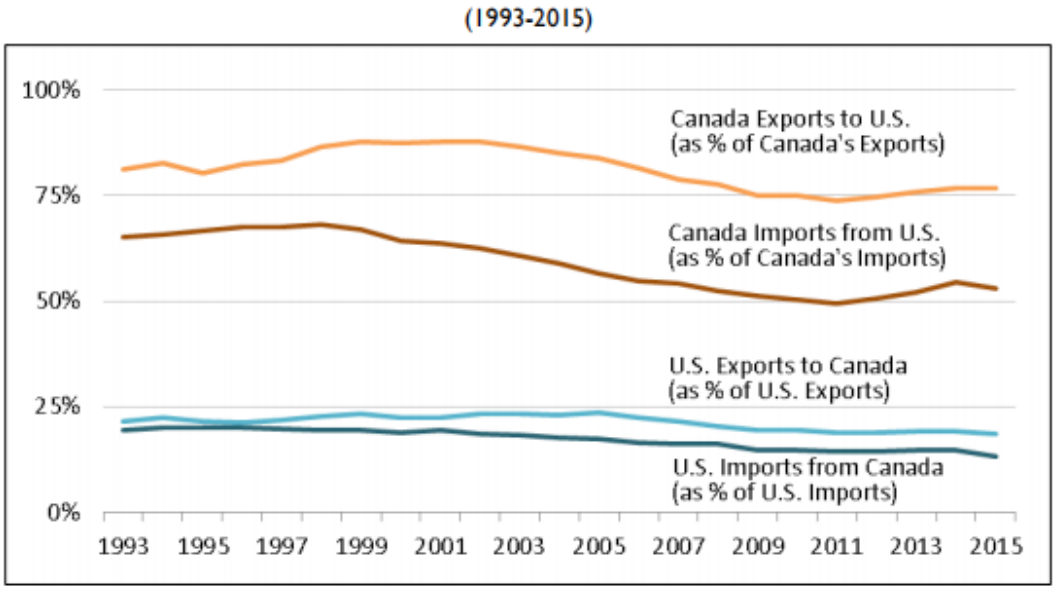
7.12.4 Risks

Although there are a wide range of benefits associated with FTAs, there are also a number of disadvantages that arise. Firstly, there is the risk that high reductions/eliminations of tariffs can harm local producers or businesses if foreign goods become cheaper than local goods. Secondly, as international agreements between countries, FTAs are always at risk of being renegotiated (more or less favourably), or repealed whenever there is a change in government in a member party. US President Trump's rhetoric regarding renegotiating or eliminating NAFTA altogether are a prime example of the precarious nature of FTAs. Thirdly, increased economic interdependence can produce negative results when one or multiple countries enter recessionary periods or political instability, as trade may suffer due to fear or uncertainty.

7.12.5 Opportunities

Overall, increased trade between Canada and other countries, as well as internally, will have a generally positive impact on the Region of Peel as there will be more goods arriving to and departing from the province that need to be transported through the region. In addition to this, as Canada enters into more FTAs with other countries, competition and opportunities for more goods to flow through the region are increased, and reliance on the US market diminishes, diversifying where goods are coming from and going to. This helps to protect against any potential shocks that may occur in the US which would decrease the amount of goods transported through the Region of Peel. The figure below shows the downward trend in Canadian trade with the US.

Figure 66: Market Share as Percentage of Total Trade: Canada and the US



Source: Economic Intelligence Unit, from IMF International Financial Statistics
Note: Represents exports to and imports from other country as percentage of country's total trade.

7.13 Freight Data

Supply chain fluidity is an end-to-end process. The competitiveness of Peel as a goods movement hub is a function of the roadway network's ability to efficiently and reliably service industry supply chains. Although there is currently sufficient data to estimate industry supply chain network attributes by commodity, the current fluidity models lack data which link observed network performance and commodity flows. This results in an incomplete picture of supply chains and at best, an estimate of performance.

To support Peel's critical role to the Canadian economy as a national and international hub for goods movement, data is required to assess the performance of the goods movement network. Peel is ahead of most municipalities with its data collection efforts and currently has the following data and tools available to develop goods movement network assessments:

Table 26: Existing Region of Peel Goods Movement Related Data

Data Type	Data Use
Travel Time Data	TTI and BTI data used to assess network performance and reliability
AADT and Traffic Data	Used to assess daily traffic volumes
Airport Counts	Access and egress counts by truck type and time of day used to assess profile of trucking demand generated by the airport
Collision Data	Used to assess historical truck related collisions in the Region
Cordon Count Data	Used to assess inter-regional and inter-municipal truck trips
Employment Survey Data	Used to assess goods moving industry employment attributes by NAICS categories
GPS Speed Data	Used to assess travel run metrics on specific Peel Region roadway corridors
Truck Commodity Origin-Destination (TCOD) Data	Used to assess commodity flows within, to and from Peel by commodity type, weight and number of shipments
Commercial Vehicle Survey (CVS) Data	Used to assess a variety of shipment attributes for truck movements to, from and within Peel including truck type, commodity type, value and weight
Greater Golden Horseshoe Model (GGHM V4)	Network model used to assess current and future network performance of goods movement corridors within Peel

Insufficient data impedes the development of full end-to-end fluidity measures, even though the first, last, and transfer miles prevalent in Peel are commonly the higher-risk stages in supply chain performance. In particular, GPS data which includes commodity information and origin-destination pairs, is needed for in-depth analysis of buffer time indices, bottle necks, and ultimately the travel times in and out of Peel and the surrounding metro area.

The commodity projections used in this work were derived from MTO's Commercial Vehicle Survey (CVS). We consider the CVS to be an invaluable resource as it is the only data set that provides all of the information about a truck trip, including the truck type and configuration, the commodity carried, the origin and destination, and the route taken. The CVS, however, is understood to intercept a reasonably low proportion of truck trips and it is also known to under-represent local truck travel.

The first identified data gap, however, is that the CVS data used in this work did not include the data records at intermodal facilities such as the nearby CN and CP railyards and Toronto Pearson International Airport; a better understanding of shipments to and from these facilities is important. This could either be through arranging access to the CVS surveys of these establishments, or through separate surveys if those data cannot be released for similar studies.

There are additional data sources that can supplement the CVS data. The first supplement is Statistics Canada's Trucking Commodity Origin and Destination Survey (TCOD). The TCOD uses a different sampling procedure to the CVS. Where the CVS is an intercept survey, the TCOD surveys carriers and requests commodity information (such as the shipment origin and destination, commodity type and shipment weight) about a subset of their shipments. Note that the TCOD only surveys Canadian trucking establishments with at least $1.3 million in annual revenue, and hence has no data from private fleets and from foreign carriers. We see the TCOD as providing strong complementary data to the CVS that can be used to build a fuller picture of commodity flows in the region.

With the advent of increased penetration of fleet and vehicle monitoring technologies, "big data" sources such as GPS fleet tracking providers (such as Shaw and Xata Turnpike) and aggregators of vehicle tracking equipment (such as StreetLight and INRIX) can provide origin-destination information and travel times for a large proportion of the truck fleet. These data contain no information about the commodities carried by the trucks, but they are useful as they aggregate the information from a much larger subset of vehicles than are available from the survey data. Hence they can be used to better expand the intercepted CVS and the TCOD commodity flow information to produce a better picture of trucking freight flows and to identify gaps in the survey data that can be targeted in future data collection efforts.

7.14 Trends Summary

Table 27: Trend Summary - Impacts to Peel

Strengths	Weaknesses
Population and Employment Growth: Increase in labour availability to attract businesses to the region.	**Population and Employment Growth:** Increase demand on transportation network and increased congestion
Labour Force Availability: Local job availability for residents.	**Labour Force Availability:** Unmet need of local businesses.
Long Combination Vehicles: Can help to mitigate peak period congestion.	**Long Combination Vehicles:** Not a viable option for all businesses as weight capacity is the same for single trailers.
Off-Peak Delivery (OPD): Can help to mitigate peak period congestion.	**Off-Peak Delivery (OPD):** Not a viable option for all businesses, particularly those that are smaller in scale.
3D Printing: Manufacturing locations taking place close to consumers.	**3D Printing:** Still relies on the supply chains for raw materials.
Connected and Automated Vehicles: Improved safety and efficiency on the local network.	**Connected and Automated Vehicles:** Loss in market share if long-haul trucking becomes competitive with rail, businesses may relocate is they are less dependent on Peel's intermodal yards.
E-Commerce: Technology advancements and strategies to help local businesses grow.	**E-Commerce:** Increase of VMT for last mile home deliveries.
Climate Change: Green technologies becoming more affordable/cost-effective.	**Climate Change:** Increasing impact of emissions on pollution and quality of life.
Education and Outreach: Shows leadership in freight planning.	**Education and Outreach:**
CN Milton: Further establishes Peel and the GTA as the primary hub for goods movement in Canada.	**CN Milton:** Potential for businesses to leave Peel for better proximity to the new intermodal yard.
Highway 407 ETR: Certainty on the reliability of delivery times for Just-In-Time (JIT) product manufacturing.	**Highway 407 ETR:** Tolls are very costly for more manufacturers.
Trade Agreements: Increases competition and trade among businesses.	**Trade Agreements:** Can harm local businesses and increases economic interdependency.
	Freight Data: Current data availability limits the development of full end to end fluidity.

Opportunities	Threats
Population and Employment Growth: Strong regional economic growth opportunity.	**Population and Employment Growth:** Population growth hinders efficiency of the transportation network for freight movement.
Labour Force Availability: Opportunity for training and skills development.	**Labour Force Availability:** Risk in a potential shift in labour needs in the long-term.
Long Combination Vehicles: Improves supply chain efficiency and travel times for participating businesses.	**Long Combination Vehicles:** Varying policies across provinces can hinder the implementation of LCV for long-haul use.
Off-Peak Delivery (OPD): Improves supply chain efficiency and travel times for participating businesses.	**Off-Peak Delivery (OPD):** Varying policies across municipalities can hinder the implementation of OPD as most businesses serve beyond the borders of a single city/town.
3D Printing: Increase in local manufacturing and on-shoring.	**3D Printing:** Increased use can place less dependence on the current model for goods distribution and make transportation investments more dispersed.
Connected and Automated Vehicles: Increased efficiency and productivity for the industry.	**Connected and Automated Vehicles:** Labour force and labour income impacts if CAV/ automation reduces the need for workers.
E-Commerce: Increase consumption for strong economic growth and quality of life.	**Climate Change:** More severe storms and volatile temperatures and its impact on global supply chains.
Climate Change: Businesses to flourish with green transportation technologies.	**Trade Agreements:** Economic risk for political or economic instability in partnered nation. Potential for renegotiation or withdrawal.
Education and Outreach: Broadens the general understanding of freight issues across the country.	
CN Milton: Strengthens the national rail network for freight.	
Trade Agreements: Greater access to foreign markets and Canadian markets.	
Freight Data: Potential to increase the full end-to-end fluidity of the supply chain with sufficient data.	

8 Long Term Pathways and Implementation

In This Chapter:

8.1 Long-Term Pathways and Implementation

Eleven long-term pathways were developed for goods movement in the Region of Peel. These pathways take into account the trends and risks faced by Peel over a long-term period, as well as the missions identified in the background material presented earlier. These pathways will help the region align itself to be at the forefront of goods movement.

8.2 Performance Measures

Five performance measures were developed that include goods movement economic impacts, freight tonnage and volumes, industrial land availability and development, state of goods repair, truck network performance, and greenhouse gas emissions. These performance measures were designed to measure the performance of the pathways over a long-term horizon period.

8.3 Performance Tracking

The five performance measures have been associated with each of the long-term pathways for Peel in order to track the implementation progress.

8.1 Long-Term Pathways and Implementation

1. Promote and Sustain the National Economic Importance of Peel

Rationale

The Region of Peel plays a critical role to the Canadian economy by acting as a national and international hub for goods movement. Peel is home to the CN Brampton Intermodal Yard and resides adjacent to the CP Vaughan Intermodal Yard, two of the largest Canadian intermodal rail yards. Peel is also home to the Toronto Pearson International Airport, the largest Canadian cargo airport. Peel is intersected by seven 400-series highways which provide Peel unparalleled connectivity throughout Canada.

It's estimated that roadways in Peel are involved in 9.5% of all for-hire intercity truck shipments in Canada, and it appears that this proportion is on an upward trend[70]. As a result of Peel's role in supporting the national movement of goods, Peel's roads bear a disproportionate amount of wear and tear due to demand from trucking. There is strong argument for provincial and federal funding for roadway infrastructure in Peel due to this national importance.

Pathways

» **Pathway 1:** Use data and analysis tools to showcase the importance of Peel roadways at a national level to attract investment. This will enable Peel to leverage and attract investments by showcasing the importance of Peel's roadways, specifically hot spots that bear a disproportionate cost due to trucking activity which serves the nation.

Desired Outcome

Leverage and attract investment to maintain and improve the road network in the Region of Peel.

Performance Measures:

» Measure 1: Goods Movement Economic Impacts
» Measure 2: Freight Tonnage and Volumes
» Measure 3: Industrial Land Availability and Development
» Measure 4: State of Good Repair
» Measure 5: Truck Network Performance

70 Statistics Canada. Truck Commodity Origin Destination Survey. 2014.

2. Investigate Additional Policy to Increase Efficiency of the Local Goods Movement Industry

Rationale

The grouping of freight-related and freight supportive uses away from sensitive lands has been known to enhance goods movement corridors, by increasing the opportunities for freight related businesses to take advantage of shared facilities, equipment and services, and overall logistics. To take advantage of the efficiencies listed above, the region should encourage local and lower tier municipalities to develop land use policies that best enhance the goods movement industry and employment areas within their jurisdiction. Tools and resources such as maps of new and existing areas that are appropriate for goods movement land uses as well as the inclusion of goods movement in official plans, master and secondary plans, and freight supportive guidelines will enable these municipalities to develop goods movement planning policies and employment areas.

Pathways

» **Pathway 2:** Region of Peel to provide land use policy resources and tools to encourage and enable regional and lower tier municipalities to cluster freight related uses within their jurisdictions. Lower tier municipalities will have the ability to formulate customized goods movement policies which work more efficienty with local characteristics and needs to strengthen the presence of the goods movement industry.

Desired Outcome

Protect existing industrial lands and corridors, establish appropriate buffers with sensitive land uses, enhance the efficiency of the local goods movement industry, and accommodate future growth including new programs and trends.

Performance Measure:

» Measure 1: Goods Movement Economic Impacts

» Measure 3: Industrial Land Availability and Development

» Measure 5: Truck Network Performance

3. Invest in Freight Data

Rationale

The competitiveness of Peel as a national goods movement hub is a function of the road network's ability to efficiently and reliably service industry supply chains. Although there is currently sufficient data to estimate industry supply chain network attributes by commodity, including CVS and TCOD data, the current fluidity models lack data which link observed network performance and commodity flows. This results in an incomplete picture of supply chains and, at best, an estimate of performance. In particular, GPS data, which includes commodity information and origin-destination pairs, is needed for in-depth analysis of buffer time indices, bottle necks, and ultimately the travel times in and out of Peel and the surrounding metro area.

With the advent of increased penetration of fleet and vehicle monitoring technologies, "big data" sources such as GPS fleet tracking providers (such as Shaw and Xata Turnpike) and aggregators of vehicle tracking equipment (such as StreetLight and INRIX) can provide origin-destination information and travel times for a large proportion of the truck fleet. This data contains no information about the commodities carried by the trucks, but they are useful as they aggregate the information from a much larger subset of vehicles than are available from the survey data. Hence, they can be used to better expand the intercepted CVS and the TCOD commodity flow information to produce a better picture of trucking freight flows and also to identify gaps in the survey data that can be targeted in future data collection efforts.

Pathways

» **Pathway 3:** Develop a publicly available Peel Freight Data Warehouse for planning purposes. The Peel Freight Data Warehouse should include CVS, TCOD, time of day truck counts, GPS fleet tracking and aggregate vehicle information. The Peel Freight Data Warehouse should have a dedicated staff to keep data up-to-date and respond to queries.

» **Pathway 4:** Provide ongoing support to MTO and Transport Canada for the continual improvement of CVS, TCOD, and fluidity measure data.

» **Pathway 5**: Work with TC and railways to allow for better availability of rail data at the regional and municipal level.

Desired Outcome

Develop a publicly available Peel Freight Data Warehouse for planning purposes.

Performance Measure:

» Measure 2: Freight Tonnage and Volumes

» Measure 5: Truck Network Performance

4. Encourage Off-Peak Delivery (OPD)

Rationale

Off-peak delivery (OPD) is a strategy to alleviate congestion during peak periods, and to expand the utilization of infrastructure capacity. This win-win solution reduces the number of trucks on the roads during periods of congestion and can offer greater efficiency to delivery companies. There are various challenges to OPD. Inconsistent bylaws across municipalities make it difficult for business to coordinate their deliveries. Greater intensification and the increase in sustainable transportation have made corridors less conducive to trucks, particularly for deliveries in urban areas. Residential noise complaints due to a lack of buffering between loading docks and housing units also inhibit the full potential of OPD.

OPD may work for some business types, but may be incompatible with the needs of other businesses without adequate resources for its implementation. A key consideration for OPD is coordinating customers to receive deliveries. Receipt of night shipments generally takes two forms: having overnight staff to receive deliveries or using technology to enable deliveries without staff being present. Overnight staff was typically more suitable for large establishments because of the costs involved. For smaller establishments, customers can provide a key and alarm codes for direct delivery to their establishment, avoiding the need for overnight staff.

Pathways

- **Pathway 6:** Remove constraints for OPD. This includes working with municipalities on establishing consistent bylaws related to nighttime truck restrictions in the GTHA and throughout Ontario. This may include establishing categories of bylaw exemptions for specific industry groups and considering future land use zoning that enables greater use of OPD.
- **Pathway 7:** Target well-integrated companies with attributes compatible for OPD. This may include large establishments having overnight staff to receive deliveries, companies able to accept unstaffed key drop deliveries and companies shipping non-perishable goods.
- **Pathway 8:** Implement pilot projects for OPD.

Desired Outcome

Increase the use of OPD through the removal of constraints and encouraging well-integrated companies.

Performance Measure:

- Measure 2: Freight Tonnage and Volumes
- Measure 5: Truck Network Performance

5. Adapt to E-Commerce

Rationale

There has been an industry-wide shift in the retail landscape with omnichannel strategies offering multiple opportunities for customers to shop, including in-store and online. This has pushed an upward trend of e-commerce and home deliveries, and with it, more and more delivery trucks penetrating residential communities on ever-tighter schedules. Same day delivery is a recent phenomenon and e-commerce is by far the fastest growing segment of retail. The competitive retail landscape has put great pressure on the road networks to serve customers faster and better. There has also been a change in how companies position and operate distribution centres and their inventory, and in the delivery function of stores.

Peel needs to be prepared for this change which may have significant infrastructure and land use implications. Retailers are more likely to seek out and develop new sites, rather than fit supply chains around existing buildings. As a result of the need for space for supply chain and fulfillment centres, the expansion of industrial real estate may become more indicative of retail growth and success than expansion of retail stores. Related to risks in real estate, shorter lease deals (three to five years) are typical for e-commerce groups for warehousing space.

Pathways

» **Pathway 9:** Ongoing tracking and understanding of industry trends related to e-commerce will inform Peel's planning process and potential land use impacts.

» **Pathway 10:** To remain competitive as an e-commerce freight hub, Peel will work closely with delivery companies to identify impediments and bottlenecks for e-commerce deliveries.

Desired Outcome

Remain competitive as an e-commerce freight hub.

Performance Measure:

» Measure 1: Goods Movement Economic Impacts

» Measure 2: Freight Tonnage and Volumes

» Measure 3: Industrial Land Availability and Development

» Measure 5: Truck Network Performance

6. Invest in Infrastructure and Technology

Rationale

The transportation system has grown over time to accommodate the increases in population and employment, but is at the stage where opportunities to construct new transportation infrastructure are becoming more costly, placing greater emphasis on improving and optimizing the efficiency of the existing system. For goods movement, private sector companies and agencies have placed greater emphasis on efficiency and supply-side improvements. More will need to be done, however, by both public and private sector interests to ensure that the effects of congestion are mitigated and that people and goods are moved efficiently in the future.

Pathways

» **Pathway 11:** Improve efficiency and optimization through demand management, system management, and intelligent transportation systems (ITS).

» **Pathway 12:** Focus monitoring and investment on 'hot-spot' corridors with high risk for future issues related to state of good repair, safety, economic competitiveness, and congestion.

Desired Outcome

Optimize overall system efficiency by focusing on existing and future 'hot-spot' corridors.

Performance Measure:

» Measure 2: Freight Tonnage and Volumes

» Measure 5: Truck Network Performance

7. Understand Labour Force Availability

Rationale

The growth and success of the goods movement sector in Peel is largely dependent on the available pool of labour as one of the key inputs to production. A recurring theme encountered in Peel was a concern about the future labour force availability for goods moving industries. The main focus was on professional truck driver shortages, which is consistent with a recent report for the Conference Board of Canada which suggests a growing gap between the supply and demand for drivers by 2020. The Conference Board of Canada Report suggests a number of factors which could help match the supply and demand for truck drivers, which includes:

- An overall contraction of the trucking industry
- Increases in trucking industry productivity
- Improvements in industry working conditions or wages
- Marketing of the truck driving occupation
- Driver training/licensing
- Policy change to all the truck driving occupation to be recognized as a skilled trade

Fully automated trucks are not likely to be operational in the near term. However, Connected and Automated Vehicles (CAV) technology has the potential to fill some or all of this shortage by enabling driverless operation in the long-term.

Pathways

- **Pathway 13:** Survey major goods moving employers in the Region to track and assess labour force availability and to establish a regional Strategy to match the supply and demand for truck drivers.
- **Pathway 14:** Through peer-to-peer programs (e.g. Smart Freight Centre), establish a freight professional development training and licensing program for workforce planning, technical training, and information sharing.

Desired Outcome

Understand the current and future labour force availability for the goods movement industry.

Performance Measure:

- Measure 1: Goods Movement Economic Impact

8. Encourage Long Combination Vehicles

Rationale

Long-combination vehicles can be a safe and efficient way to move goods across supply chains more economically and environmentally. There are a number of requirements and restrictions for LCVs in Ontario, including permit limitations, licensing, approved routing, and proximity to highway interchanges. These restrictions allow the MTO to track and monitor LCVs while ensuring the safe operation of these vehicles. As a major origin and destination for freight movements, Peel Region's advocacy for an enhanced LCV program will be to the benefit of business operations and improved safety. Support for the LCV program will also better position Peel and the Province of Ontario for the advancements and piloting of future truck platooning.

Pathways

- **Pathway 15:** Increase the uptake of LCV permitting in Peel by working with businesses within the radius from the MTO Primary Network to understand if they can utilize LCV.
- **Pathway 16:** Review and streamline the LCV permitting and regulation process by expanding the LCV primary network.
- **Pathway 17:** Work with MTO and other provinces to develop consistency in LCV permitting across the country, as well as, agencies in the U.S. to develop regulations that apply to cross-border trips.
- **Pathway 18:** Explore the influence CAV technology will have on the future of LCV vehicles and operations including advances in platooning and the impact on goods movement in the Region and on national supply chains.
- **Pathway 19:** Engage goods movement stakeholders to identify additional challenges and impediments to LCV use in their operations.

Desired Outcome

Reduce barriers and encourage the use of LCV in the goods movement industry.

Performance Measure:

- Measure 2: Freight Tonnage and Volumes
- Measure 4: State of Good Repair
- Measure 5: Truck Network Performance

9. Adapt to Connected and Automated Vehicles

Rationale

Connected Automated Vehicles (CAV) technology is here and will have huge impacts on the transportation industry. CAV technology offers potential for greater productivity, safety, and efficiency. As the nation's primary freight centre, Peel Region needs be forward thinking in understanding how best to integrate CAV into the activities and operations of its businesses. Doing so will enable Peel to secure the benefits of having CAVs on the road and provide a strategic location for industrial competitive advantage. Similarly, it is in the interest of the national government to engage with this technology, and for freight applications, Peel is the critical place to do so.

Pathways

» **Pathway 20:** Track and understand industry trends related to CAV to inform Peel's planning process and identify potential land use impacts.

» **Pathway 21:** Implement a CAV pilot corridor, including identifying the best location for a pilot corridor location, collection of data to identify best CAV technologies to deploy, and installation of appropriate CAV infrastructure.

Desired Outcome

Apply and adapt infrastructure for CAV technology.

Performance Measure:

» Measure 1: Goods Movement Economic Impacts

» Measure 3: Industrial Land Availability and Development

» Measure 5: Truck Network Performance

10. Combat Climate Change

Rationale

Transportation is the leading contributor to GHG emissions in Canada. Peel Region, along with municipalities across the province, are focused on building sustainable communities that are resilient to the peril of climate change impacts. Because Peel serves the region and nation as well as itself, risks of disruption to Peel supply chains also are provincial and national risks of broad consequence. Goods movement industries have a responsibility to address climate change concerns, and many companies are realizing not just the environmental, but also economic benefits that accompany investments towards this end. Being at the frontier of climate change initiatives can help position Peel as an even more strategic location for industries and maintain their competitive advantage.

Pathways

» **Pathway 22:** Align sustainable freight efforts with Ontario's Climate Change Action Plan and other climate change initiatives in the province. Seek coordinated funding at the regional, provincial, and federal level for freight-related climate change initiatives.

» **Pathway 23:** Use existing relationships with industry to help develop, demonstrate, and market technologies that reduce GHG emissions.

» **Pathway 24:** Create a public recognition program to acknowledge businesses that are making changes to mitigate for climate change impacts.

Desired Outcome

Align with climate change initiatives and reduce overall GHG emissions.

Performance Measure:

» Measure 6: Greenhouse Gas Emissions

11. Support Rail and Intermodal Expansion

Rationale

CN has recently announced plans for the development of a new intermodal yard in Milton, Ontario. To meet the demands of their growing intermodal services, CN states it will proceed with a two-facility strategy for the GTHA in Brampton and Milton[71]. Once open, some volume is expected to shift from Brampton to Milton as Brampton is currently pushing on capacity. Peel businesses have the potential to benefit from the additional rail service, such as third party logistics firms, transportation providers, and DCs. The new Milton hub's proximity to Peel should contribute positively to Peel's goods movement growth because CN's market area extends far beyond municipal boundaries.

Pathways

- **Pathway 25:** Support increased intermodal capacity by focusing on attracting industries to Peel which require intermodal services to operate their business.
- **Pathway 26:** Coordinate land use planning with municipalities and adjacent regions to ensure existing facilities remain well served and future facilities have suitable and available land for growth.
- **Pathway 27:** Monitor and invest in the primary road network corridors which service intermodal facilities.

Desired Outcome

Improve the efficiency of existing intermodal infrastructure and corridors that facilitate movement between these facilities.

Performance Measure:

- Measure 1: Goods Movement Economic Impacts
- Measure 2: Freight Tonnage and Volumes
- Measure 3: Industrial Land Availability and Development
- Measure 5: Truck Network Performance

71 Canadian Environmental Assessment Agency Project Description for Milton Logistics Hub

8.2 Performance Measures

The list of selected performance measures are described below. These performance measures have been mapped to each Long-Term Strategy to develop a basis for ongoing performance assessment.

Measure 1: Goods Movement Economic Impacts

Description:

This indicator will measure the GDP and the number of jobs in goods movement industry sectors in Peel Region.

Growth domestic product (GDP) is an economic indicator commonly used across all industries. It represents the aggregation of total economic production for the goods movement industry and directly translates into how the industry is impacting the economy. GDP is the most comprehensive indicator for measuring the overall economic performance of the industry and the broadest indicator of output and growth. GDP is an output measure whereby it will be used as an indicator of industry activity or performance. In economic terms, GDP is a coincident indicator, whereby changes to this figure will approximately coincide with the whole economy. The benefit to which is providing a snapshot to the current state of the economy.

The number of goods movement industry jobs is a good indicator of the goods movement industry on labour market conditions. This indicator will report the number of jobs categorized by the different sectors of goods movement industry by NAICS code – i.e. Agriculture, manufacturing, wholesale trade. This indicator will provide an overview of how the industry is contributing to the economy through supplying jobs. Changes in job rates move closely in line with GDP, but will provide an important proxy to determine the health of the job market for the Region. Employment is a lagging economic indicator as growth changes occur sometime after events in the general economy.

Specification:

» An annual update to the Input-Output model. The primary variable to be updated in the Input-Output model is the annual employment surveys conducted by each area municipality.

» The data collected in the annual employment surveys conducted by each area municipality. This is the most reliable employment data for the Region and will provide consistency year over year. This indicator can be presented as a high-level summary of job numbers, but also broken down by NAICS code and municipality for a more detailed understanding of trends.

Measure 2: Freight Tonnage and Volumes

Description:

This is a measure of the gross tonnage of freight broken down by freight mode (truck, rail, air cargo), as well as the level of origin-destination truck trips.

Gross tonnage of freight is a widely used measure in the industry and provides a breakdown of goods movement mode split based on weight. Tonnage is an indicator of the demand that goods movement activities place on transportation infrastructure. Freight volumes aren't just a good indicator for how the goods movement industry is functioning, but is also closely correlated with changes in the wider economy.

The level of goods movement activity in Peel includes trips within Peel, trips destined to Peel, trips originating in Peel, and trips through Peel. This measure was originally noted in the Peel Long Range Transportation Plan 2012 Update as a recommended performance measure. Level of goods movement activity provides a good indication to the vitality of goods movement businesses and also provides a context for how it plays out on the road network.

Specification:

» Gross tonnage of freight to be measured based on corridor, commodity, distance, domestic movements, and international trade. Freight modal shares can be forecasted using market segmentation, modal elasticity, and mode choice modelling. Performance reporting for rail and air modes will require coordination with private-sector partners – namely the Toronto Pearson International Airport, CN, and CP. In light of data unavailability, an alternative measure would be truck volume using AADT data from Peel's Cordon Count Study for major routes on the goods movement network. Alternatively, rail volumes can be estimated using number of lifts at intermodal facilities, but this too may be proprietary information. Air cargo weights are reported in the GTAA's annual financial reports and should be available. Air cargo should be differentiated between belly hold and all-cargo transportation. The latter better able to reflect the true demand of air cargo shipments, where the former is more reflective of passenger demand.

» The LRTP proposed data be retrieved from MTO data and the University of Toronto Shipper Survey to track the number of truck trips originating or terminating in the Region of Peel.

Measure 3: Industrial Land Availability and Development

Description:

This indicator will report the number of industrial building permits issued in the past year to ensure that the amount of industrial land available does not decrease. This is an important leading economic indicator adopted from a current economic indicator used by the Region's finance department, which measures the number of building permits issued for all property types. Building permit data is

widely used as a leading indicator as an early measure of development activity and offers foresight into future industrial activity levels. Increased levels of building permits for non-residential buildings can forecast more jobs offered by growing businesses and an increase in GDP. Building permits are inclusive of both new buildings and expansion renovations.

Specification:

Track geocoded building permit data categorized by sector and delineated to be new construction versus expansions. This data will be used in accordance with land use development permit applications for any variance in land use type to or from industrial land. This can be done by tying permit data to spatial parcel boundaries to determine the increase or decrease of industrial lands. This measure should be tracked on an ongoing basis.

Measure 4: State of Good Repair

Description:

This performance measure reports on the existing pavement and bridge conditions along the Peel strategic goods movement network, measuring the proportion in good condition.

Roadway condition along the goods movement network is necessary for supporting and encouraging trucking activities for a healthy freight business climate. Poor pavement condition creates added costs to shippers and can inhibit economic development. Performance reporting for roadway condition will help to target key improvement areas that to ensure the transportation infrastructure is able to support the safe mobility of freight users. Network condition is not entirely a sufficient condition for economic growth, but it is a necessary condition. Roadway and bridge condition measures how well the Region is prepared for growing trucking demands.

Similar to roadway condition, bridge condition supports trucking activities. Poor bridge condition can jeopardize the safe movement of vehicle. Bridge condition is one component of the overall condition of the transportation network responsible for attracting and retaining goods movement businesses.

Specification:

» This indicator will rely on existing pavement and bridge conditions collected by the Region of Peel along key goods movement corridors. This was also a recommended performance measure related to freight system condition in the Peel Strategic Goods Movement Network Study. This performance measure can be integrated into the Region's Road Network Condition Assessment Program and into the existing Peel Bridges and Major Culverts Inspection Program. Detailed pavement inspections are completed every three years and detailed bridge inspections every two years.

Measure 5: Truck Network Performance

Description:

Annual hours of truck delay and truck reliability index tracks the travel time deviation above the congestion threshold, or ideal travel times and speed for trucks on the strategic goods movement network. Additionally, the efficiency of the traffic flow along major truck routes measures the overall level of service of the network.

Travel time delays impact all road users but are particularly costly for goods movement. Delays greatly impede the productivity of the goods movement industry and detract from an industry's competiveness and economic viability. Tracking delay therefore is important for targeting network improvements to reduce delay costs, crucial for the long term economic development of the Region. Truck speeds and delay, along with network reliability, are an important factor for the productivity of goods movement industries, and is directly linked to the economic growth and vitality of the Region. The two proposed reliability and productivity measures provide indicators to measure how well the Region of Peel is positioned for future growth.

This indicator will also measure BTI, or, the reliability of the transportation network. Variability and uncertainty in trip travel times is a chief concern across all segments of the goods movement industry. What is the likelihood of certain travel times and/or speeds and how stable are they. Greater volatility in travel times is hard for the private sector to manage. This indicator essentially captures the amount of buffer time shippers must build into their delivery schedules to guarantee on-time delivery. This has a big economic impact due to the direct link with industry productivity. This measure will also benefit the Region by better understanding recurring congestion.

Specification:

» The Region of Peel participates in MTO's Travel Time Study that is completed every two years. This study collects information for travel time, speed and delay on select main roads. This survey focuses on passenger vehicles; therefore coordination will be required to tracking commercial vehicles, for example, the use of ATRI data do complement data from Peel's traffic counting programs. Utilization of mobile-based probe data for trucks will improve the data quality of tracking trucks speeds and delay on specific goods movement corridors.

» The truck reliability index will use the BTI measure the percentage difference between the 95th percentile travel time and the average travel time divided by the average travel time. The larger percentages represent corridors with higher variance, therefore, less reliability. Reliability should be modelled for core strategic goods movement network routes and for major truck origins and destinations in the Region of Peel. This would measure how far a carrier can travel within a specific time frame by using travel speeds and travel times as inputs.

Measure 6: Greenhouse Gas (GHG) Emissions

Description:

This indicator will report the Region of Peel's contribution to GHG emissions from trucking activities. While there are currently GHG emissions contributed by the goods movement sector in the Region of Peel, much of them are through trips which the Region has no contribution to. An understanding of the current technologies used by the goods movement sector, and the change facilitated by the region to cleaner technology trucks offers insight into the Peel's efforts to combat climate change.

Specification:

» Total VKT related to trucking by trips originating and destined for the Region of Peel will be collected through GPS data. Through an understanding of fleet distribution (diesel, gas, electric, hybrid and etc.) from MTO's CVS data as well as standardized fuel consumption and GHG emissions standards from Environment Canada, the region's contribution of total GHG emissions from trucking activities may be tabulated. This metric will be developed every five to six years, based on CVS data availability.

8.3 Performance Tracking

The economic impact analysis provides a starting point for the recommended performance measures. Once all measures have been calculated, Peel will have a comprehensive snapshot of the health of the goods movement industry in the Region and a tool to track this performance. Through future iterations of the performance measurement, the Region will be able to track trends over time and create a forward-looking outlook of performance.

To best utilize the performance measures, the Region should establish reasonable short- and long-term targets. This will help identify and prioritize remedial actions to better improve the economic health of the industry. In order to understand and track the progress for each long-term strategy, presents the correlation between each strategy and performance measure. Tracking the progress of the associated performance measures will enable the region to track the implementation progress of each strategy.

To support the application and use of the recommended performance data, the Region must establish a data collection and management system. Responsibility for the data collection and reporting of these measures must be assigned. This responsibility entails the coordination of the required data collection and reporting of the measures on an annual (or regular) basis.

Table 28: Long-Term Pathway Performance

	Long-Term Pathway										
Long-Term Performance Measure	**Promote and Sustain the National Economic Importance of Peel**	**Examine Special Policy Land Use Type for Goods Movement**	**Invest in Freight Data**	**Encourage OPD**	**Adapt to E-Commerce**	**Invest in Infrastructure and Technology**	**Understand Labour Force Availability**	**Encourage LCVs**	**Adapt to the CAV Shift**	**Combat Climate Change**	**Support Rail and Intermodal Expansion**
Goods Movement Economic Impacts	●	●			●		●		●		●
Freight Tonnage and Volumes	●		●	●	●	●		●			●
Industrial Land Availability and Development	●	●			●				●		●
State of Good Repair	●							●			
Truck Network Performance	●	●	●	●	●	●		●	●		●
Greenhouse Gas Emissions										●	

9 Conclusion

The Region of Peel has been established as an important component of the Canadian goods movement industry. This is due to its established transportation network, particularly its proximity to the CN and CP intermodal yards, intersection of several 400 series highways, containing Canada's largest airport, and proximity to the largest economic centre in Canada. A broad Goods Movement Long Term Plan (GMLTP) was needed to complement the Goods Movement Strategic Plan that was compiled to identify four strategic directions and 23 action items from 2012 to 2016. The goals of the GMLTP include:

» Community and environmental sustainability
» Safety
» Economic competitiveness
» Innovation and technology
» Performance management
» System performance

Peel's role as an important distribution hub in Canada can be seen through its multi-modal network, volumes of air cargo through the Toronto Pearson International Airport, its network of three rail lines and intermodal yard, as well as the pipeline and marine infrastructure that is situated within the region. Much of Peel's employment lands for goods movement industries are located around the airport, intermodal yard, and along freeways. Effective land use planning has shown to be an important task as the population and employment has been growing, consequently increasing the demand for freight movement. In order to plan for infrastructure spending and investments, a "hot spots" analysis was used to help identify current or existing "hot spots" based on the TTI and BTI during the 2014 AM peak. The future hot spots were identified along with key trends that impact the industry for the development of the GMLTP. Several economic, technological, operational, and policy trends, and risks outlined below have a bearing on goods movement industries in Peel. These include:

» Population and employment growth
» Labour force availability
» Long combination vehicles
» Off-peak delivery
» 3D printing
» Connected and automated vehicles
» E-commerce
» Climate change
» Education and outreach
» CN Milton
» Highway 407 ETR
» Trade agreements
» Freight data

Through the evaluation of the freight transportation system, commodity flows, current and future hot spots, as well as key trends and risks to the industry, the following long-term pathways were determined.

- **Promote and Sustain the National Economic Importance of Peel:** Leverage and attract investment to make systematic improvements to Peel's road network.
- **Examine Special Policy Land Use Type for Goods Movement:** Protect existing industrial lands and corridors, establish appropriate buffers with sensitive land uses, plan for and accommodate future growth including new programs and trends.
- **Invest in Freight Data:** Develop a publicly available Peel Freight Data Warehouse for planning purposes.
- **Encourage OPD:** Increase the use of OPD through the removal of constraints and encouraging well-integrated companies.
- **Adapt to E-Commerce:** Remain competitive as an e-commerce freight hub.
- **Invest in Infrastructure and Technology:** Optimize overall system efficiency by focusing on existing and future 'hot-spot' corridors.
- **Understand Labour Force Availability:** Understand the current and future labour force availability for the goods movement industry.
- **Encourage Long Combination Vehicles:** Encourage the use of LCV in the goods movement industry to optimize safety and improve business operations.
- **Adapt to Connected and Automated Vehicles**: Apply and adapt infrastructure to CAV technology.
- **Combat Climate Change:** Align with climate change initiatives and reduce overall GHG emissions.
- **Support Rail and Intermodal Expansion:** Expand rail and intermodal infrastructure for future growth in the Region of Peel.

The various performance measures that were developed to monitor and assess the progress of the longterm pathways include:

- Goods movement economic impacts
- Freight tonnage and volumes
- Industrial land availability and development
- State of good repair
- Truck network performance
- Greenhouse gas emissions

With the successful implementation and tracking of the performance measures associated with each of the pathways, the Region of Peel will be aligned as based on its current needs and long term vision for goods movement.