Pickering Lands Aviation Sector Analysis

Supply and Demand Report

KPMG WSP MMM GROUP

1216053-000
December 2016

EXECUTIVE SUMMARY

KPMG LLP (KPMG), in partnership with MMM Group Limited (a WSP Company), was retained by Transport Canada to carry out an Aviation Sector Analysis of the Pickering Lands. This Supply and Demand Report is the first of three reports to be completed as part of this engagement and presents an up-to-date projection as to whether aviation capacity constraints will trigger the need for an additional airport in the southern Ontario airport system within the next 20 years.

In 1972, the Government of Canada acquired approximately 7,530 ha of land within the municipalities of Pickering, Uxbridge, and Markham known as the "Pickering Lands". Since acquiring the lands, several studies have been commissioned by Transport Canada to determine the need for an airport to support growing aviation demands in the Greater Toronto Area (GTA). The first of these studies concluded that an airport in Pickering would be required in the future and the lands should continue to be held by Transport Canada, while the most recent (The Pickering Lands Needs Assessment Study which was completed in 2010) identified a requirement for a new Pickering Airport as early as 2027, or as late as 2037.

More than 6 years have passed since the release of the 2010 Needs Assessment Study and the Government of Canada has requested updated forecasts of aviation demand and capacity within the southern Ontario airport system as well as an evaluation of a new Pickering airport's potential role within the existing system (if required). This study fulfills these requirements with the main objectives of confirming when an airport on the Pickering Lands might be required based on an assessment of capacity and demand; what type of airport would be needed; how it would integrate into the existing southern Ontario airports system; and, if an airport would be financially viable and provide sufficient economic benefit to warrant the investment. This study answers the first question: When might an airport on the Pickering Lands be required? Two additional reports will be completed to answer the remaining questions.

As a starting point, the current roles and service types of existing airports in southern Ontario were documented to gain a better understanding of the capabilities and capacities of the region's air transport system. The airports assessed as part of the southern Ontario airports system are those that were examined in the previous Pickering Lands Needs Assessment Study (Toronto Pearson International Airport (Toronto Pearson Airport), Billy Bishop Toronto City Airport (Billy Bishop Airport), Toronto Buttonville Municipal Airport (Buttonville Airport), Region of Waterloo International Airport (Waterloo Airport), Peterborough Airport, Lake Simcoe Regional Airport (Lake Simcoe Airport), Oshawa Executive Airport (Oshawa Airport), Burlington Executive Airpark (Burlington Airpark), John C. Munro Hamilton International Airport (Hamilton Airport), and Brampton Airport). For each airport, the project team profiled the airport role and location, runway facilities, activity history and destinations served, airport service types, passenger and cargo facilities, and ground access provisions. As demonstrated through these profiles, the southern Ontario airports system has a diverse range of airport service types and roles accommodating passenger, cargo, and general aviation activities.

Extensive stakeholder consultation was undertaken to gain a broad perspective of their opinions, concerns and needs. Stakeholders represented a diverse range of interested parties, including the ten airports that comprise the southern Ontario airport system, municipal representatives, industry associations and interest groups, and Canadian based air carriers operating from the system's passenger airports. There were several common opinions discovered during the consultation process, including the need for better communication with associations and the public regarding the future of the Pickering

Lands, the need for Transport Canada to make a decision in the near future regarding development of a new Pickering Airport, and the requirement to measure the economic impact and opportunities related to the potential development of the Pickering Lands. Air carriers were generally not in favor of a new airport on the Pickering Lands as they cited good working relationships with the Greater Toronto Airports Authority (GTAA) at Toronto Pearson Airport, and they were concerned about the cost of developing a new Pickering Airport if aeronautical fees collected at Toronto Pearson Airport were to subsidize the project. Airport operators were generally in favor of a new airport on the Pickering Lands, citing lack of general aviation capacity east of the GTA with the pending closure of Buttonville Airport. However, general aviation airports were concerned about the possibility of lost traffic to a new airport on the Pickering Lands, depending on the type and role of a new Pickering airport. All municipalities consulted indicated strong support for the development of an airport on the Pickering Lands. Industry organizations and local interest groups were also in favor of developing a new airport on the Pickering Lands.

The study identified several key regional developments in southern Ontario that could influence access to southern Ontario airports. Population growth in southern Ontario was examined and key road, rail, and transit infrastructure projects were identified along with the qualitative impact these developments might have on airports within the southern Ontario airport system. Although key regional developments are expected to improve overall access to the southern Ontario airports, these developments are not expected to result in dramatic shifts in passenger demand within the 20 year planning horizon of the study.

This report also describes aviation industry trends and requirements and how these trends might impact activity levels at the airports within the southern Ontario airport system in the next 20 years. Domestic, transborder, and international passenger trends were examined and it was determined that all three markets are expected to continue to grow in southern Ontario. Aircraft trends were also identified and discussed in terms of large ultra-long range, long range medium volume, medium, and short range aircraft including projections for fleet renewals and changes in regulatory policy that are currently promoting reduced greenhouse gas emissions. Trends in corporate aviation and flight training were also identified as they relate to operations at southern Ontario airports. Air cargo trends and requirements, aviation security, regulatory changes, industry growth limitations (pilot & aircraft maintenance engineer training) and overall airport congestion were also identified and described.

Forecasts of revenue passengers and aircraft movements were prepared in order to determine the potential levels of demand within the southern Ontario airport system over the 20 year study horizon. The study used two basic approaches for forecasting traffic: statistical patterns and scenarios. The study makes use of forecasts developed by Transport Canada, rather than developing new forecasts from first principles because of a lack of information about origin-destination traffic on domestic and international routes. Transport Canada's forecasts were developed using the Passenger Origin/Destination Model (PODM). Transport Canada prepared low and high forecasts to 2030, and medium forecasts to 2035 and interpolations were used to determine values for the intervening years. As part of the study Transport Canada's forecasts were validated and sensitized by constructing 5 alternate forecasts. The project team compared the assumptions used by Transport Canada to those of other sources, including the World Bank, International Monetary Fund, and airframe manufacturers. The growth rates presented by these sources were used to construct the new forecasts using the same key independent variables as provided in Transport Canada's PODM model. The independent low and high forecasts developed by the project team were found to be very similar to the Transport Canada forecasts and, most importantly, the Transport Canada low and high forecasts were found to bracket all other estimates, validating the overall forecast results. The forecasts were also adjusted to account for the introduction of high speed rail services in the Windsor-Quebec City Corridor for use in scenario considerations later in the report.

It was found that with the introduction of high speed rail services, passenger demand would be reduced by approximately 2.3 million Passengers Per Annum (PPA) at the southern Ontario airports in 2036. Forecasts for future air cargo activity were not prepared as part of this study.

The forecasts call for relatively little change in the roles of the airports within the southern Ontario airports system. In 2036, Toronto Pearson Airport will continue to serve as the region's leading gateway for commercial airlines, and Billy Bishop Airport will continue to serve intercity passengers. In addition, the forecasts suggest that neither Waterloo Airport nor Hamilton Airport will play a significant role in relieving Toronto Pearson Airport in 2036. Overall passenger demand at Toronto Pearson, Billy Bishop, Hamilton, and Waterloo airports is expected to reach almost 74 million PPA by 2036, and total aircraft movements within the southern Ontario airport system as a whole are expected to reach almost 1.3 million by 2036, with almost 50 per cent of the movements occurring at Toronto Pearson Airport. The Transport Canada medium forecast calls for more than 70 million PPA by 2036 at Toronto Pearson.

Capacities of each airport within the southern Ontario airport system were calculated to determine the overall supply for passengers and aircraft movements. The study differentiates between two distinct groups of airports: 1) passenger airports which provide frequent passenger air services to the traveling public (4 airports); and, 2) general aviation airports which support flight training, recreational, corporate and aviation related industrial roles (6 airports). Key infrastructure elements and operational practices were examined at the four passenger airports in order to estimate capacities, including: airfield infrastructure, terminal apron areas (number of aircraft stands), air terminal areas (available passenger processing space), and groundside parking facilities (number of vehicle parking stalls). The capacities of the six general aviation airports were estimated based on airfield infrastructure and operational practices only. The study considered both current infrastructure and operational practices, as well anticipated future capacity (in 2036) based on planned developments identified within the airports' master plans and development plans, and anticipated changes in aircraft mix and Air Traffic Control (ATC) practices and procedures. Cargo capacity was also estimated by examining cargo uplift capabilities at Toronto Pearson Airport and Hamilton Airport.

Calculation of airfield capacity considered multiple factors, including number and geometric layout of the runways, ATC practices and procedures, weather conditions, mix of aircraft types and other restrictions such as noise abatement, hours of operation and slot controls. Airfield capacity values were obtained from the GTAA for Toronto Pearson Airport, and the Prototype Airfield Capacity Model (PACM), developed by industry through the Airport Cooperative Research Program was used to determine airfield capacities at the remaining 9 study airports. Airfield capacity definitions were prepared for use throughout the study including maximum runway throughput capacity, hourly practical runway movement capacity, annual practical runway movement capacity, annual runway passenger capacity, and annual terminal apron passenger capacity. Annual air terminal building passenger capacity and annual groundside parking passenger capacity definitions were also employed when determining the capacities of air terminal buildings and parking facilities at the passenger airports within the southern Ontario airports system.

In evaluating the capacity of the airports within the southern Ontario airports system, three conditions were assessed: 1) Base Condition – 2016 airport infrastructure, 2016 aircraft mix, 2016 ATC practices and procedures, 2) Condition A – 2016 airport infrastructure, 2036 aircraft mix, 2016 ATC practices and procedures, and 3) Condition B – 2036 airport infrastructure, 2036 aircraft mix, and anticipated 2036 ATC practices and procedures. At Toronto Pearson Airport, it was found that the GTAA applies an hourly cap of 90 movements per hour in planning its operations. Considering the base condition, a runway passenger capacity of 53.1 million PPA was determined for Toronto Pearson Airport in 2016. Under Condition A, it was determined that Toronto Pearson Airport has the capacity to support 61.4 million runway PPA, and under Condition B, the airport can accommodate 73.7 million runway PPA.

When considering all of the capacity definitions and calculations, Toronto Pearson Airport's existing (2016) capacity and ultimate (2036) capacity was found to be most limited by terminal apron capacity (number of aircraft stands); however, it was determined that the GTAA has the ability to overcome these capacity shortfalls by undergoing facility expansions within the existing airport's property boundary.

Billy Bishop Airport's existing (2016) capacity was found to be most limited by terminal apron capacity (capacity of 2.5 million PPA) and by the number of commercial aircraft slots permitted under current noise restrictions and the Tripartite Agreement between the City of Toronto, Ports Toronto, and the Government of Canada limiting the runway passenger capacity to 4.3 million PPA. Billy Bishop Airport's future (2036) capacity was also found to be limited by terminal apron capacity (capacity of 3.0 million PPA). Waterloo Airport's existing (2016) and future (2036) capacity was found to be most limited by the air terminal facility with an ability to support only 250,000 PPA in 2016, and 2.3 million PPA in 2036. Hamilton Airport's existing (2016) capacity was found to be limited by the air terminal capable of supporting only 850,000 PPA, and the future capacity of Hamilton Airport was also found to be limited by air terminal capacity (3.1 million PPA).

Overall, based on 2016 infrastructure, operational practices and aircraft mixes, the southern Ontario airports system is projected to have the capacity to support 94.7 million runway PPA. Based on anticipated conditions in 2036, the system is expected to have the capacity to support 119.6 million runway PPA. The practical movement capacity of the general aviation airports within the southern Ontario airports system was determined to be 903,000 based on 2016 infrastructure and operational practices, decreasing to 761,000 in 2036 based on the anticipated closure of Buttonville Airport in 2019.

In order to compare the capacity of the southern Ontario airports system against the forecast demand, scenarios were developed examining various factors that have an influence on both the capacity of airport facilities, and the passenger and aircraft movement demands. Four (4) scenarios were developed as part of the study to determine if there will be an overall capacity shortage or surplus within the southern Ontario airports system within the 20 year planning horizon: 1) Scenario 1 – 2016 Airport Conditions, 2036 Demand, 2) Scenario 2 – 2016 Airport Conditions, 2019 Demand (Buttonville Airport Closure), 3) Scenario 3 – 2036 Airport Conditions, 2036 Demand, and 4) Scenario 4 – 2036 Airport Conditions, 2036 Demand (With High-Speed Rail).

Scenario 1 results demonstrate that demand in 2036 will surpass the annual runway passenger, terminal apron, terminal building, and groundside parking passenger capacities at Toronto Pearson Airport. In addition, demand is expected to marginally exceed terminal apron capacity at Billy Bishop Airport. When examining general aviation airports within the system, it was found that there will be a capacity surplus of approximately 404,000 annual practical runway movements in 2019. Nonetheless, while current (2016) airport capacities are not sufficient to fully accommodate 2036 demand, capacity improvements can be undertaken within existing passenger airport boundaries to meet the demand, and a new airport is not expected to be required in southern Ontario prior to 2036 from a capacity standpoint.

Scenario 2 results indicate that forecast passenger demand in 2019 will not exceed the estimated capacities of the majority of the passenger airports, with the exception of Toronto Pearson Airport where annual terminal apron passenger capacity and annual groundside passenger capacity will fall short of forecast demand, and at Billy Bishop Airport where terminal apron capacity was found to be in deficit. The closure of Buttonville Airport is expected to result in a system loss of 172,000 annual practical runway movements; however, a capacity surplus of 211,000 annual practical runway movements will still exist within the southern Ontario airports system under the parameters of Scenario 2. Provided capacity enhancements are undertaken at the existing passenger airports, it is anticipated that there will be sufficient capacity in the southern Ontario airports system in 2019 to support forecast demand, without the requirement to build a new airport.

Based on the medium forecast demand and considering the long term airport development plans incorporated in the parameters of Scenario 3, Toronto Pearson Airport is expected to experience a capacity deficit in terms of annual terminal apron passenger capacity and annual groundside parking passenger capacity. Billy Bishop Airport is also expected to have a capacity deficit in terms of terminal apron capacity. It is expected that these capacity deficits can be overcome by expanding facilities within the existing airport property boundaries. In terms of the general aviation airports, a surplus capacity of 262,000 annual practical runway movements was identified within the southern Ontario airports system, indicating adequate capacity to support general aviation activities to 2036.

Scenario 3 also considered the Transport Canada high demand forecast and it was determined that Toronto Pearson Airport is expected to experience a capacity deficit in terms of annual runway passenger capacity, annual terminal apron passenger capacity, annual terminal building passenger capacity, and annual groundside parking passenger capacity. This is the only instance identified within the study where runway passenger demand could exceed the estimated capacity for annual runway passengers at Toronto Pearson Airport. In addition, terminal apron capacity at Billy Bishop Airport was found to be lower than projected demand. However, it is expected that capacity shortfalls at Toronto Pearson Airport and Billy Bishop Airport can be overcome to support 2036 demand, indicating that there are no major capacity constraints, and a new airport providing additional capacity is not required in southern Ontario as per the parameters of Scenario 3 and as compared against the medium and high demand forecasts.

Scenario 4 results indicate that when accounting for a reduction in demand based on the introduction of high speed rail services in the Windsor-Quebec City corridor, annual terminal apron passenger capacity and annual groundside parking capacity are identified as capacity constraints for Toronto Pearson Airport. Similar to other scenarios, it is expected that these capacity shortfalls can be overcome through expansions within the existing passenger airport property boundaries. This suggests that adequate capacity exists within the southern Ontario airports system and an additional airport in southern Ontario would not be required (from a capacity standpoint) to meet 2036 demand, under the parameters of Scenario 4.

Although all four scenarios identify minor capacity deficits, these can be overcome with modest expansions in aircraft apron and air terminal facilities at the airports in the southern Ontario airport system. Therefore, a new airport is not expected to be required in southern Ontario prior to 2036 to meet the forecast demand. While the anticipated increases in the capacity of the southern Ontario airport system are expected to be sufficient to handle projected traffic demand within the 20 year planning horizon of this study, circumstances and industry trends can change. Also, the findings of this study do not preclude the need for a new airport in southern Ontario beyond the 20 year planning horizon.

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1.0 INTRODUCTION

KPMGLLP (KPMG), in partnership with MMM Group Limited (a WSP Company), has been retained by Transport Canada to carry out an Aviation Sector Analysis of the Pickering Lands, which will build upon the relevant elements of previous studies. The Supply and Demand report is the first of three reports to be completed as part of this engagement (see section 1.2). This Supply and Demand Report presents an up-to-date projection as to whether aviation capacity constraints will trigger the need for an additional airport in the southern Ontario airport system within the 20 year planning period of this study.

1.1 Study Background

In 1972, the Government of Canada acquired approximately 7,530 ha of land within the municipalities of Pickering, Uxbridge, and Markham known as the "Pickering Lands". The Government then issued an order declaring that the lands were to be used for the development of a future airport and expressed their interest in ensuring that development of surrounding lands remain compatible with the safe and viable operation of an airport, and associated aviation activity.

Simultaneously, three provincial Minister's Zoning Orders were enacted to ensure that land use in the vicinity of the Pickering Lands would remain compatible with aviation uses. Conceptual plans for the development of a new international airport on the Pickering Lands were completed by 1976, but further progress was halted in favor of expanding existing airports. The Government of Canada remains the owner of the Pickering Lands.

In the years since acquiring the Pickering Lands, Transport Canada has commissioned studies to determine the need for an airport to support growing aviation demands in the Greater Toronto Area (GTA). These reports include:

1. Southern Ontario Area Airports Study – 1995
2. Pickering Airport Draft Plan Report – 2004
3. Pickering Lands Needs Assessment Study - 2010

The Southern Ontario Area Airports Study and the Needs Assessment Study both concluded that an airport in Pickering will be required in the future and as such the lands should be retained. The Pickering Airport Draft Plan Report included preliminary planning for a future airport. These background reports are described in more detail in Section 1.7 of this report.

The development of greenfield airports is an intensive process, dealing not only with design and construction, but also environmental assessments and public consultations. From project initiation to commissioning, a new airport project could take up to 10 years to complete, depending on a multitude of factors. Additionally, aviation is an evolving industry with the development of new technologies, increased competition in the Canadian marketplace and more airlines serving smaller regional airports. The Canadian economy has also changed as a result of declining oil prices since the publication of the Needs Assessment in 2010, and as a result, Transport Canada has elected to reevaluate the need for a new airport in Pickering.

1.2 Study Objectives

One of the main findings of the 2010 Needs Assessment Study was that a new airport on the Pickering Lands could be required as early as 2027 or as late as 2037. However, precise timing remained unclear as this need would ultimately be event driven and not time driven. In essence, a new airport in Pickering will be required once the existing airports within the southern Ontario airport system are at or approaching capacity.

The Government of Canada has requested an updated forecast of aviation capacity within the southern Ontario airport system as well as an evaluation of the new Pickering Airport's potential role within the existing system. To understand the financial viability of a new Pickering Airport, an assessment of its revenue generating potential as well as a study of the possible economic impacts of the airport are also requested.

The main objectives of the Aviation Sector Analysis are to confirm:

- When an airport on the Pickering Lands may be required;
- What type of airport will be needed and how will it integrate into the existing southern Ontario airport system; and
- If the airport will be financially viable and provide sufficient economic benefit to warrant the investment.

The objectives listed above will provide the framework for the Aviation Sector Analysis of the Pickering Lands. Each objective will be addressed in separate reports. The three reports constituting the Aviation Sector Analysis are as follows:

1. **Supply and Demand Report** – Examining the current capacity of the southern Ontario airports system and comparing capacities with current and forecasted demand, within a 20-year planning horizon.
2. **Airport Type and Role Report** – Based on the results of the Supply and Demand Report, this report will evaluate the potential airport type and role required to address identified capacity shortfalls within the southern Ontario airports system.
3. **Revenue Generation and Economic Impact Report** – Assessing the revenue generating potential of a new airport, as well as identification of the economic impact of a new greenfield airport on the Pickering Lands.

The **Supply and Demand Report** presents an up-to-date forecast as to whether aviation capacity constraints will trigger the need for an additional airport in the southern Ontario airport system within the 20 year planning period of this study.

1.3 Study Assumptions, Limitations and Use of this Report

To maintain consistency throughout the study, fundamental assumptions regarding the regulatory environment, airline markets and trends, passenger services, air cargo services, general aviation and ground transportation have been made. These assumptions are applicable throughout the 20 year study period and are listed in Appendix B.

As is typical for supply and demand studies that examine a long planning period, the analysis presented in this report is preliminary, is subject to significant uncertainties and is derived using myriad assumptions, which may change based on a number of factors, including for example:

- Investments and other changes in the southern Ontario Airport system.
- Industry trends and requirements.
- Shifts in travel patterns.
- Economic conditions.

The estimates presented in this report incorporate information available as of the report date and many of the assumptions used in preparing the analysis will change. Accordingly, underlying ground rules, assumptions, and the resulting estimates and conclusions should be reviewed and potentially adjusted as major assumptions evolve.

KPMG and MMM's procedures consisted solely of inquiry, comparison and analysis of identified and provided information and relevant information from third party sources. The team relied on information provided by project participants without verification or audit. The information contained in this document does not constitute an audit. Accordingly, KPMG and MMM do not express an opinion on such matters.

This document should be considered in its entirety. Selection of, or reliance on, specific portions of this document could result in the misinterpretation of comments and analysis provided. KPMG and MMM will not assume any liability in connection with the reliance by any third party on this document.

KPMG and MMM reserve the right, but will be under no obligation, to review all findings, conclusions and calculations included or referred to herein and, if KPMG and MMM considers it necessary, to revise the findings, conclusions and calculations in light of any information which becomes known to KPMG and MMM after the date of this document.

1.4 Study Airports

The current roles of existing airports in southern Ontario are documented herein to gain a better understanding of the region's air transport system, capabilities, and capacities. For the purpose of this study, the airports selected are the same as those that were examined in previous reports identified in Section 1.1. Combined these airports are identified as the southern Ontario airports system. All of these airports are within approximately 100 km radius of downtown Toronto, have varying roles, and provide various contributions to the system as a whole.

The airports in the southern Ontario airport system are classified into 2 categories:

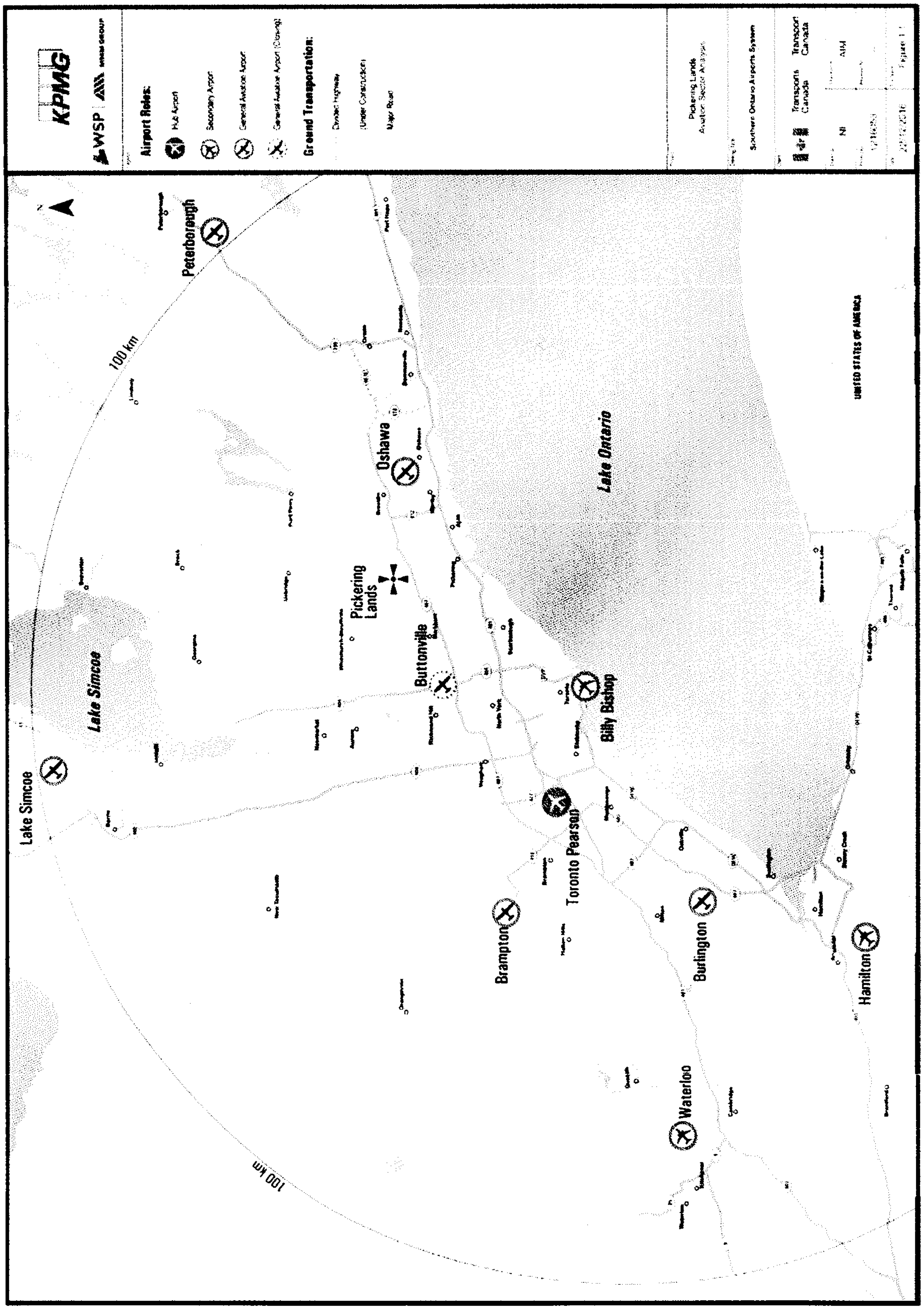
1. **Passenger Airports** - Airports that provide frequent passenger air services to the travelling public.
   - Hub Airport – A facility processing the highest number of passengers and offering the most destinations within an airport system.
   - Secondary Airport – A facility providing passenger air services within an airport system, at times complementing or supplementing the air services provided at the hub airport.
2. **General Aviation Airports** - Airports supporting flight training, recreational, corporate and aviation related industrial roles.

The airports that have been assessed as part of this study are shown in Table 1.1, and are illustrated in Figure 1.1.

Table 1.1 - Study Airports

Passenger Airports		General Aviation Airports
Hub Airport	Secondary Airports	
Toronto Pearson International Airport	Billy Bishop Toronto City Airport	Toronto Buttonville Municipal Airport
	John C. Munro Hamilton International Airport	Peterborough Municipal Airport
	Region of Waterloo International Airport	Lake Simcoe Regional Airport
		Oshawa Executive Airport
		Burlington Executive Airpark
		Brampton Airport

Figure 1.1 – Pickering Lands Aviation Study Airports



1.5 Airport Systems

Multiple airport systems typically exist within metropolitan areas with high volumes of passenger traffic. Within an airport system, several airports compete with each other for traffic and services. Sound planning of multi-airport systems requires a detailed understanding of the competitive market dynamics that favor airport growth, and potential opportunities that are available to shape future airport roles.

Many multi-airport systems are currently in operation, for example, around London, New York, San Francisco, and Tokyo, to name a few. For the purpose of this study, the multi-airport system (referred to herein as the southern Ontario airports system) is considered to be the set of significant airports that serve the population of the region, without regard to ownership or governance of individual airports. The southern Ontario airports system is centred within the region's metropolitan area (the GTA), including many distinct cities with varying population densities and demographic composition.

Although typical airport systems focus primarily on passenger service airports only, the southern Ontario airports system as defined herein considers all airport service types, including passenger services, cargo operations, and general aviation activities.

1.6 Comparing Toronto Pearson Airport to London's Heathrow Airport

For the purposes of this study, it is important to put the southern Ontario airports system in context in terms of their geographic position, the number of passengers the airports serve, air service characteristics, demand for airport infrastructure, and catchment areas served, with a specific emphasis on Toronto Pearson Airport.

Every airport has a unique mix of traffic, air services, and physical or environmental constraints notwithstanding the similarities in some characteristics. For example, many people draw comparisons between the southern Ontario airports and other airport systems throughout the world, including London, UK. The London airports system is comprised of 6 airports providing passenger air services including Heathrow, Stanstead, Gatwick, Luton, London City and Southend, with Heathrow being the predominant hub airport and the other facilities acting as secondary airports.

In 2015, London's Heathrow Airport served approximately 75 million passengers with about 475,000 aircraft movements on a two-runway configuration[1]. Passenger volumes have grown at an annualized rate of 0.99 percent since 2000.

In contrast, in 2015 Toronto Pearson Airport served just over 39 million passengers with approximately 444,000 aircraft movements on a configuration of 5 runways. Passenger volumes have grown by 2.36 percent annually since 2000. Additionally, in 2015, London Heathrow Airport processed 158 passengers per aircraft movement; and Toronto Pearson Airport processed 128 passengers per aircraft movement (refer to Table 7.2). Although both Toronto Pearson and London Heathrow airports act as the dominant hub airports within their respective airport systems, London Heathrow Airport does not provide a useful analogy for Toronto Pearson Airport in the context of how air services are provided at airports within a system, and how supply and demand are being balanced to maximize capacity.

[1] The UK government is in the advanced planning stages for a third runway at Heathrow. It is estimated to cost 18.6 Billion GBP.

In the context of this study, it is important to note that Toronto Pearson Airport and London Heathrow Airport are very different. In Particular:

- London Heathrow Airport serves a greater population than Toronto Pearson Airport and acts as the primary international gateway for the United Kingdom, with a population of more than 64 million residents. Although Toronto Pearson Airport acts as an international gateway for Canada, the airport serves the source origin-destination catchment area of southern Ontario with just over 11 million residents;
- Heathrow Airport is busy throughout the day. However, many long haul routes show strong daily peaks. For example, most North American flights arrive in the morning after 6:00 am, and depart before 1:00 pm. An airline seeking to offer a new flight must often purchase runway slots from an incumbent, and certain peak periods command a premium;
- There is a market for runway slots at London Heathrow Airport with strong competition amongst air carriers, whereby at Toronto Pearson, slots are assigned by the airport operator (GTAA). Due to London's strategic position in northern Europe, the Airport experiences high demand in the early morning hours supporting flight arrivals from both North America and Asia. Runway slots during this period are considered to be of very-high value, and air carriers have to pay large fees to other carriers who own the slots to gain access to the Airport. Runway slots at Toronto Pearson Airport are also considered to be of high-value to the air carriers; however, trading slots amongst carriers for financial gain is not permitted by Canadian law;
- London Heathrow Airport lacks the extensive domestic air services of Toronto Pearson Airport, and it does not play the role of a domestic hub. Its large proportion of wide-body aircraft reflects both its extensive long haul services and the shortage of runway slots;
- London Heathrow Airport has a simpler aircraft mix compared to Toronto Pearson Airport, meaning that air carriers are utilizing heavier aircraft with higher seating capacities. Smaller commuter-type, turboprop aircraft, and General Aviation (corporate) traffic are deterred from operating at London Heathrow Airport through high fees, allowing for reduced wake turbulence separation on approach to its runways and hence a higher maximum throughput capacity on an hourly basis, when compared to Toronto Pearson Airport;
- London Heathrow Airport's congestion and the high costs of slots are especially challenging to domestic feeder services by small (less than 100 seat) aircraft. Carriers must spread the cost of the slots over a small number of passengers, and ticket prices for short haul routes must rise by a larger proportion than for long distance travel. This has encouraged carriers to offer new international services from airports outside the London airports system (Manchester, Birmingham, Newcastle, Glasgow, Edinburgh, and other regional airports);
- London is a far stronger attractor for inbound passengers than Toronto. As the traditional financial center of Europe (and the former British empire), far more business and leisure travelers are attracted to London, compared to Toronto;
- London Heathrow Airport's geographic position allows air carriers to provide access to connecting flights to destinations virtually anywhere in the world.

To appropriately examine and determine future capacities for the southern Ontario airports, it is important to note that although some similarities exist between other airport systems (such as London, UK), each system has its own unique characteristics that need to be examined in order to determine an appropriate strategy to provide the required capacity and levels of service to support passenger travel demands.

1.7 Previous Studies

The Pickering Lands Aviation Sector Analysis will review and update the findings from previous studies assessing the need for airport development on the Pickering Lands. Historical context as well as a brief overview of the findings of each report is provided below.

Since the Government of Canada acquired the Pickering Lands in 1972, numerous studies have been completed, including:

- Southern Ontario Area Airports Study (1995) [2]
- Pickering Airport Draft Plan Report (2004) [3]
- Pickering Lands Needs Assessment Study (2010) [4]

1.7.1 Southern Ontario Area Airports Study

The Southern Ontario Area Airports Study was prepared by Transport Canada and was made public in March 1995. The purpose of the study was to perform a broad analysis and determination of the roles of 19 airports within approximately 100 km of downtown Toronto. The objectives of the study were to examine:

- The capacities and traffic volumes of the 19 airports and determine if the current and future traffic volumes could be accommodated by them;
- The potential of other airports in south central Ontario to supplement Toronto Pearson International Airport; and
- The need for continued retention of the Pickering Lands.

The study concluded that, at the time, there was sufficient capacity in the southern Ontario airport system to handle the aviation demand until as early as 2012 or as late as 2025. It was therefore recommended that the Pickering Lands be retained for future airport development.

1.7.2 Pickering Airport Draft Plan Report

The Pickering Airport Draft Plan Report was commissioned by Transport Canada and prepared by the GTAA to undertake preliminary planning and provide options for a potential commercial regional airport on the Pickering Lands. The report was published in late 2004.

[2] Transport Canada Airports, Ontario Region, 1995
[3] Greater Toronto Airports Authority (GTAA), 2004.
[4] Greater Toronto Airports Authority (GTAA), 2010.

The Pickering Airport Draft Plan report highlighted key aspects of airport planning and forecasting as they relate to southern Ontario, including:

- Travel demand forecasts for the GTA and potential demand for a new airport on the Pickering Lands;
- Providing siting alternatives for a three runway (two parallel and one crosswind runway) airside configuration for a new Pickering Airport;
- Preliminary identification of environmental constraints and potential mitigations on the Pickering Lands;
- Preliminary identification of the requirements for non-airside infrastructure such as parking, airport access roads, rail connections, cargo terminals and other airport support businesses; and
- Recommendations of preferred site layout and measures to preserve the site for future airport and commercial development.

The report concluded that there would be a demand for 11.9 million passengers in 2032 at a new Pickering Airport. The report was completed as a draft, and subsequent detailed design of the facility was not undertaken. The report identified that the decision to build an airport on the Pickering Lands rests with Transport Canada and the draft airport development plan for the facility would be subject to review once a decision to proceed further develop the new Pickering Airport is made.

1.7.3 Pickering Lands Needs Assessment Study

The Pickering Lands Needs Assessment Study (Needs Assessment Study) is the most recent study of the Pickering Lands. The Needs Assessment Study was commissioned by Transport Canada with the intention to:

- Coordinate further study regarding whether the airports serving the Greater Golden Horseshoe area have capacity to accommodate future air traffic demand; and
- Conduct a comprehensive due diligence review to determine the next steps for the Pickering Lands.

The GTAA was retained to complete the Needs Assessment Study and the fundamental tasks undertaken to complete the study were:

- A review of past studies relevant to the need for an airport on the Pickering Lands;
- Demand and capacity analysis for ten airports in the Greater Golden Horseshoe;
- Traffic demand forecasts and capacities in the passenger, corporate, cargo and general aviation segments; and
- Potential airport expansion opportunities within existing airport boundaries.

The Needs Assessment Study encompassed numerous scenarios with the intention of establishing a timeframe when a second major commercial airport on the Pickering Lands might be required. Five main scenarios were described:

1. A base case with no secondary airports (Pickering, Hamilton and Waterloo) being developed or improved;
2. A case where secondary airports are developed to their most likely capacities, and compared with the baseline forecast;
3. An enhanced airport capacity case compared with baseline forecasts;
4. A case where pessimistic airport forecasts were developed with most likely secondary airport capacities; and
5. A final case where pessimistic demand forecasts were developed and compared with enhanced secondary airport capacities.

The study concluded that the most likely time for an airport to be required on the Pickering Lands would be as early as 2027 and as late as 2037. The study also concluded that from a corporate and general aviation perspective there was no need for a new Pickering Airport to be built.

Like the Southern Ontario Area Airports Study, the Needs Assessment Study ultimately recommended the Pickering Lands be retained for future aviation use as travel demand increases. The Needs Assessment Study demonstrated strong evidence that a commercial airport in Pickering would be required at some point in the future to supplement and relieve Toronto Pearson Airport.

2.0 AIRPORT PROFILES

To gain further context into the airports that make up the southern Ontario airport system, each of the ten airports considered in the airport system are profiled and include the following information:

- **Airport role and location**

  Airport role and location describes the principal role that the airport plays in the southern Ontario airport system. Location of the airport is based on straight line air distance to downtown Toronto. Location relative to other population centers may be included to provide additional context.

- **Runway facilities**

  Runway facilities outlines the airside infrastructure of the airport. Described in this section is runway length, width, surface type, instrument procedure level of service, typical aircraft and associated taxiway infrastructure.

- **Activity history and destinations served**

  The activity history shown in this section represents the past 15 years of aircraft movements and passenger activity (if any) at the ten study airports. The aircraft movements are displayed in air carrier, local and general aviation movements (refer to Appendix A for definitions). Passenger enplanements and deplanements are displayed in domestic (travelling within Canada), transborder (travelling to the United States) and international (travelling elsewhere in the world). Historical activity data from 2000 to 2014 was sourced from Transport Canada's Publication TP577, produced jointly with Statistics Canada. Activity data from 2015 was sourced from Statistics Canada's CANSIM database. It is important to note that aircraft movements and passenger activity data held by the individual airports may vary from the values sourced from Transport Canada and Statistics Canada. Historical and forecast passenger traffic levels presented herein are reported on a revenue passenger basis, according to Transport Canada's definition. It is noted that individual airports may report passenger traffic on the basis of revenue and non-revenue passengers. An airport's passenger activity records may be higher as they record both revenue and non-revenue passengers. Typical air service destinations are also identified for each passenger service airport to provide context to the airport's role and service type.

- **Airport service types**

  Airport service types are different services provided at each airport in the southern Ontario Airport System. There are 2 service types - Primary and secondary. Primary service types are the airport's focus service and secondary service types are of lesser priority to the operator. These service types are further broken down into the domestic, transborder and international markets. The airport service types were determined based on the project team's understanding of the airport's objectives, and through consultations with the airport operators. The Table 2.1 shows examples of service types incurred at the study airports.

- **Passenger and cargo facilities**

  Airport terminals are the interface between the groundside and the airside for the travelling public. This section studies the existing terminal facilities at the passenger airports in the southern Ontario airport system. The cargo facilities of Toronto Pearson and Hamilton airports are also examined.

- **Ground access**

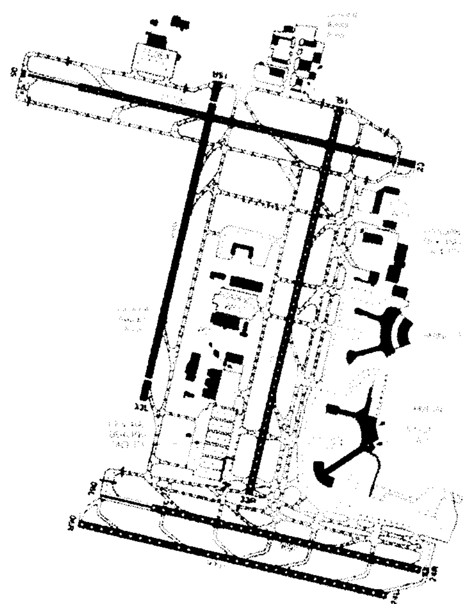
  Existing ground infrastructure including roads and highways are catalogued, as well as any multi-modal transit access provided to the airport.

Table 2.1 – Airport Service Types

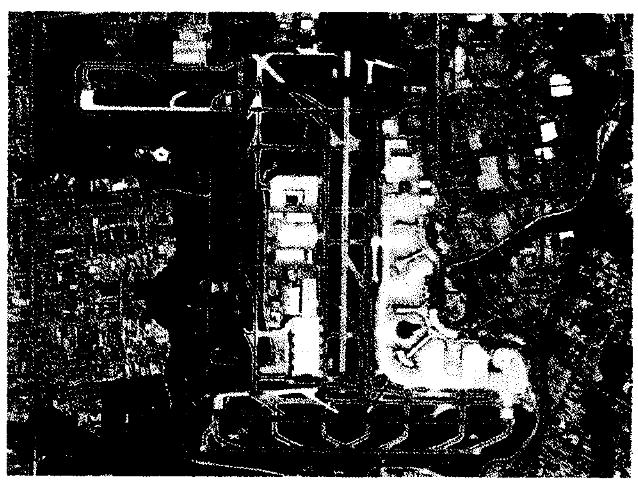
	Passenger		Cargo		General Aviation		
	Scheduled	**Charter**	**Scheduled**	**Charter**	**Commercial**	**Industrial**	**Other**
Domestic	Major Airlines, Regional Airlines, Low Cost Carriers (LCC)	Seasonal Destinations, Leisure Airlines, Planned Tours, Air taxi	Integrators (All Cargo Flights), Forwarders (Belly Cargo)	Just in Time Express Delivery, Unique One-Time Cargo Shipments	Business Aviation, Corporate aircraft, Corporate Charter	Maintenance Repair and Overhaul (MRO), Avionics, Manufacturing, Aircraft Parts and Supplies	Flight Training, Recreational, Education, Private Aircraft
Transborder							
International							

In summary, the capacity of an airport could be constrained by its airside facilities (runways, taxiways and aprons), terminal facilities (terminal sizing and number of gate positions) and groundside access (access roads and parking). Therefore, it is important to understand the current status of each portion of the study airports as a starting point for future analysis of capacity.

2.1 Toronto Pearson International Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

2.1.1 Airport Role and Location

Toronto Pearson Airport is the GTA's main passenger and commercial freight service airport and is the primary international gateway for southern Ontario. The airport lands are owned by Transport Canada and the management and operation of the facility lies with the GTAA. Toronto Pearson Airport is an integral part of Ontario's airport infrastructure, serving 39 million passengers in 2015, facilitating 1,200 flights daily and employing 40,000 people. In the context of the southern Ontario airports system, Toronto Pearson Airport serves a role as the **primary hub airport**.

Toronto Pearson Airport is located approximately 20 km to the north-west of downtown Toronto in an urban industrial setting within the City of Mississauga. The Airport occupies an area of 1,867 ha.

2.1.2 Runway Facilities

Toronto Pearson Airport consists of 5 operational runways with characteristics as illustrated in Table 2.2.

Table 2.2 – Toronto Pearson Airport Runway Characteristics

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
05-23	05	11,120 ft. (3,400 m)	200 ft. (61 m)	Asphalt	Precision	A380-800 B747-400 B777-300ER A340-600 B737 family A320 family	Yes
	23						
06L-24R	06L	9,697 ft. (2,956 m)					
	24R						
06R-24L	06R	9,000 ft. (2,745 m)					
	24L						
15R-33L	15R	9,088 ft. (2,770 m)					
	33L						
15L-33R	15L	11,050 ft. (3,368 m)					
	33R						

2.1.3 Activity History and Destinations Served

Toronto Pearson Airport has emerged as an international airport of importance. Despite declines in air travel post 2001 terrorist attacks and during the 2008 financial crisis, growth in both passenger and aircraft movements has been strong. In 2008, International travel exceeded the transborder market. This can be attributed to the maturity and slow growth of the transborder market and low demand during the 2008 financial crisis. The Airport's activity consists mostly of air carrier movements, a smaller share of general aviation movements and insignificant local movements. Air carriers and their passengers are the primary users of Toronto Pearson Airport with a small fraction of general aviation operations.

Figure 2.1 – Historical Passenger Activity – Toronto Pearson Airport

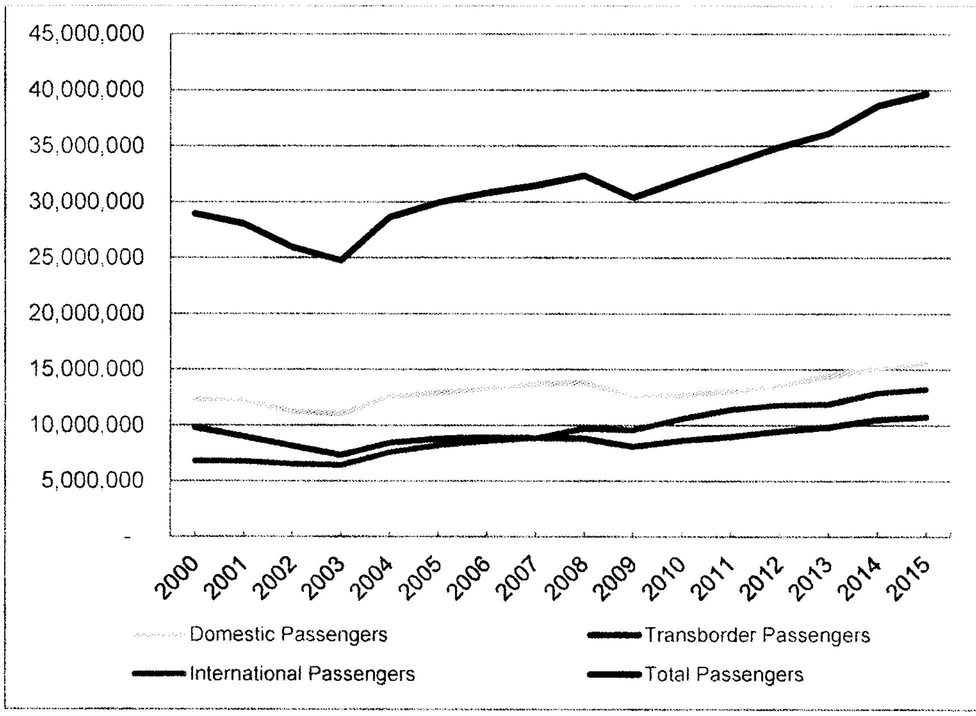
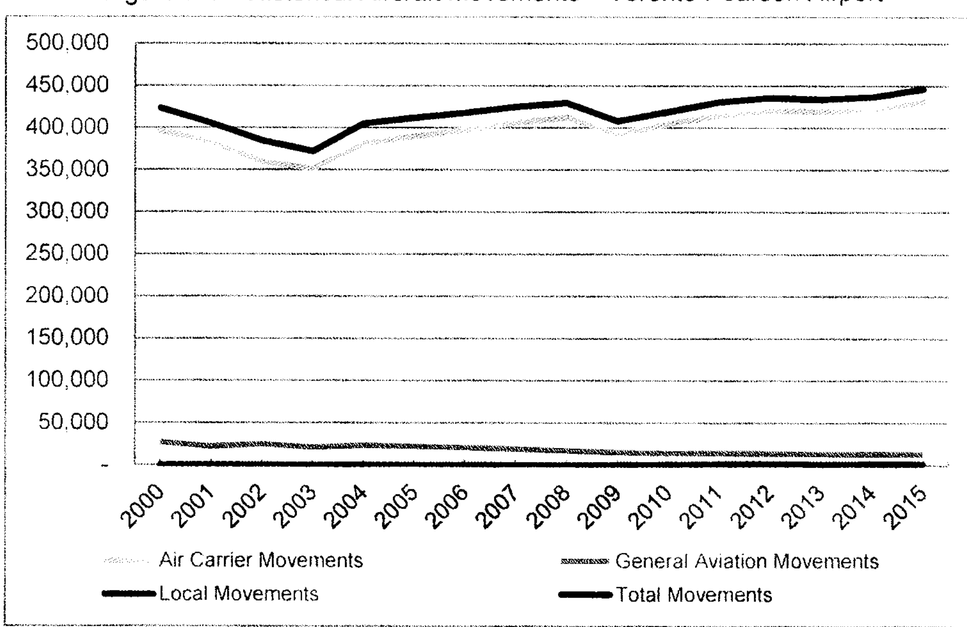


Figure 2.2 – Historical Aircraft Movements – Toronto Pearson Airport



Toronto Pearson Airport accommodates 65 commercial air carriers operating at its facilities with 184 destinations on all inhabited continents of the world. The list below is a breakdown of the number of destinations per region served by direct, non-connecting flights from Toronto Pearson Airport:

- Canada 31
- United States 51
- Mexico 12
- Caribbean 34
- Central America 6
- Middle East 5
- Asia 12
- Africa 2
- South America 7
- Europe 23
- Australia 1

Source: Toronto Pearson Winter Schedule 2016/2017

2.1.4 Airport Service Types

Table 2.3 – Toronto Pearson Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	**Charter**	**Scheduled**	**Charter**	**Commercial**	**Industrial**	**Other**
Domestic	●	●	●	○	○	○	○
Transborder	●	●	●	○	○	○	○
International	●	●	●	○	○	○	○

● Primary Service Type
○ Secondary Service Type

2.1.5 Passenger and Cargo Facilities

Terminal 1 and Terminal 3 are the two primary passenger processing facilities at Toronto Pearson Airport. Terminal 1 has a passenger floor area of over 339,000 m^2 and was completed in 2004. Terminal 3 opened in 1991 and has undergone significant expansion since it became operational, including a major renovation in 1997.

Terminal 3 has a total passenger floor area of over 178,000 m^2. Both terminals feature CATSA security screening check points, baggage claims and passenger amenities (shopping, restaurants, airline kiosks etc.) and are capable of processing domestic, international, and transborder passengers. Canada Border Services Agency (CBSA) provides customs and immigration inspection services at both Terminals 1 and 3, and on other areas of the airport to support clearance of general aviation, cargo, and other charter aircraft entering Canada from other countries. U.S. preclearance services are also provided to outgoing transborder passengers by the U.S. Customs and Border Protection Agency (CBP).

Toronto Pearson Airport also possesses an infield passenger terminal that was utilized during the construction of Terminal 1, and is currently not in regular use. The GTAA utilizes this facility to accommodate seasonal increases in passenger demand, to provide additional capacity during construction, or for special purposes such as television and film production. The infield terminal has a floor area of over 126,000 m^2.

Toronto Pearson Airport is home to extensive air cargo operations, processing 45% of Canada's air cargo, 1 million metric tonnes of cargo each year, with 1.2 million square feet of on-airport warehouse space on dedicated cargo aprons. In 2001, new cargo facilities were opened within Toronto Pearson Airport's infield development area occupying approximately 30.4 ha of land. Cargo West, also referred to as the Infield Cargo Area includes three cargo buildings, associated cargo aprons, vehicle parking and truck manoeuvring areas.

Cargo East, also referred to as the Vista Cargo Terminal, is a privately owned and operated cargo complex located on 11.5 ha on the east-side of the Airport. Cargo North, operated entirely by Fedex as its Canadian cargo hub, is located on the north side of the airfield. Several forwarders operate off-airport cargo warehouses.

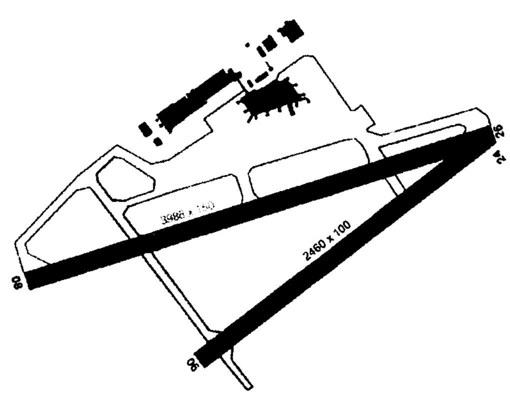
2.1.6 Ground Access

Toronto Pearson Airport is accessed by three major provincial highways (Highway 401, 427 and 409) and a surrounding municipal roadway network. In ideal traffic conditions, the trip from downtown Toronto to Toronto Pearson Airport can be made in approximately 25 minutes by car; however, during peak periods, drive times are often well in excess of an hour due to traffic congestion.

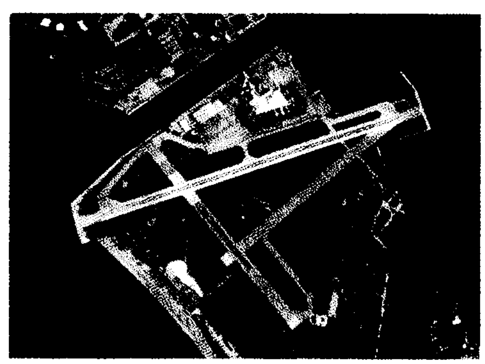
In 2015, the Union Pearson Express rail link began providing service to Toronto's downtown Union Station. This rail link provides 25 minute end-to-end service from the Airport to Union Station, thus connecting the Airport to the subway, GO commuter train system, and regional VIA rail service.

The Toronto Transit Commission (TTC) operates four bus routes to the Airport. Route 192 "Airport Rocket" is the primary express bus operating between Toronto Pearson Airport and Kipling Subway Station. The City of Mississauga's MiWay service operates two bus routes providing access to Westwood Mall and Square One in Mississauga. Brampton Transit operates an airport express route between Terminal 1 at Toronto Pearson Airport and the Bramalea Bus Terminal. In addition to the local municipalities providing transit connections to Toronto Pearson Airport, regional transportation provider GO Transit provides bus transportation to North York, Mississauga, Oakville, Hamilton and Richmond Hill.

2.2 Billy Bishop Toronto City Airport



Source: AIP Canada (ICAO) Supplement 21/16



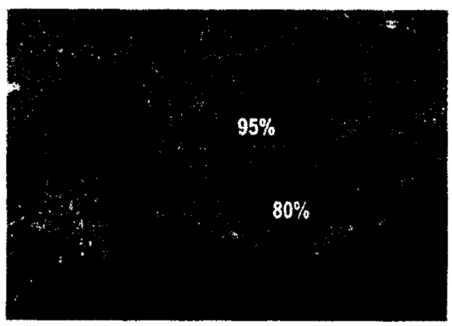
Source: Google Earth, 2016

2.2.1 Airport Role and Location

Billy Bishop Toronto City Airport (Billy Bishop Airport) is located on Toronto Island approximately 2 km south-west of downtown Toronto. Formerly known as Toronto City Centre Airport and Toronto Island Airport, the facility is operated by Ports Toronto. The Airport is located in a parkland-island setting and is in close proximity to dense urban condominium and office developments along the mainland shore of Lake Ontario. Due to the conditions of a tripartite agreement between The Corporation of the City of Toronto, Ports Toronto and Transport Canada, only propeller-driven aircraft are permitted to operate at Billy Bishop Airport. The agreement also stipulates a limitation on the number of movements that may be permitted in any given year. This limitation is linked to a cumulative noise metric and maximum noise contour that evaluated against using Transport Canada's Noise Exposure Forecast (NEF) model to determine a measurement of the forecasted aircraft noise in the vicinity of the airport. In the context of the southern Ontario airports system, Billy Bishop Airport serves the role of a **secondary airport**.

Billy Bishop Airport serves passengers in the City of Toronto with regional air travel destinations. It is also an important location for smaller propeller corporate aviation and flight training activities. The Airport serves a dense catchment area of passengers where 80% of passenger traffic is originating from Downtown Toronto and 95% of passenger traffic is originating in the area bound by Highway 401, the Humber River, and the Don Valley Parkway. Figure 2.3 identifies the catchment areas for Billy Bishop Airport.

Figure 2.3 – Billy Bishop Airport Catchment Area



2.2.2 Runway Facilities

Table 2.4 – Billy Bishop Airport Runway Characteristics

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
08-26	08	3,988 ft. (1,216 m)	150 ft. (46 m)	Asphalt	Precision	DHC8-400 B100 C172	Yes
	26						
06-24	06	2,460 ft. (750 m)	100 ft. (31 m)		Non Instrument		No
	24						

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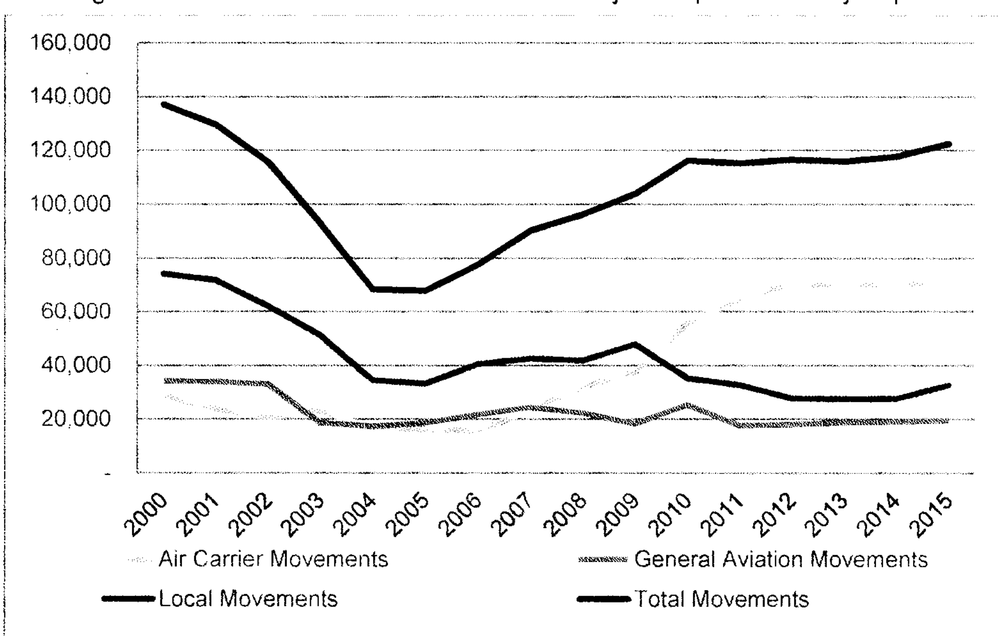
2.2.3 Activity History and Destinations Served

The aircraft movement and passenger activity history at Billy Bishop Airport have been subject to significant change in recent decades, with the most notable change in 2007 when Porter Airlines began operations at the airport, utilizing 70-seat DHC8-400 aircraft. Increasing scheduled commercial service demand has led to a decline in local movements. Local movements at Billy Bishop Airport consist of mainly recreational and flight training activities, which have been in decline since the early 2000's. Air carrier movements now make up the majority of activity at the Airport.

[redacted]

Figure 2.5 – Historical Aircraft Movements – Billy Bishop Toronto City Airport



Billy Bishop Airport currently offers regular scheduled passenger air services provided by Porter Airlines and Air Canada Express with 15 Canadian destinations and 8 destinations in the United States.

2.2.4 Airport Service Types

Billy Bishop Airport provides airport service types as illustrated in Table 2.5

Table 2.5 – Billy Bishop Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	•				○		•
Transborder	•				○		
International						○	

• Primary Service Type
○ Secondary Service Type

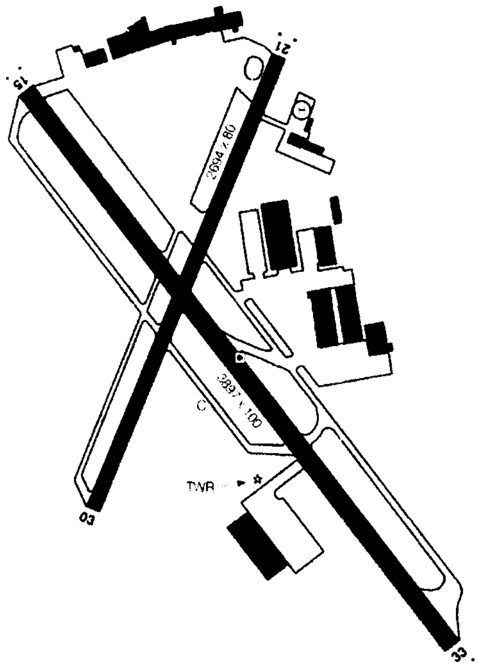
2.2.5 Passenger and Cargo Facilities

Passenger processing facilities at Billy Bishop Airport consist of an air terminal building with a passenger floor area of approximately 14,000 m^2. The air terminal building underwent significant expansion leading up to the start-up of operations by Porter Airlines in 2007, and has been progressively expanded to provide additional capacity. The air terminal is connected to mainland Toronto by way of sea ferry running every 15 minutes and since 2015 by fixed-link pedestrian tunnel. Billy Bishop Airport's air terminal building features typical amenities such as check in desks, CATSA security screening, baggage claims and passenger holdrooms. The Airport is a designated Aerodrome of Entry (AOE) and CBSA provides customs and immigration inspection services for aircraft with up to 90 travellers, during published operational hours. Customs and immigration services are also available for recreational and corporate general aviation aircraft at Billy Bishop Airport.

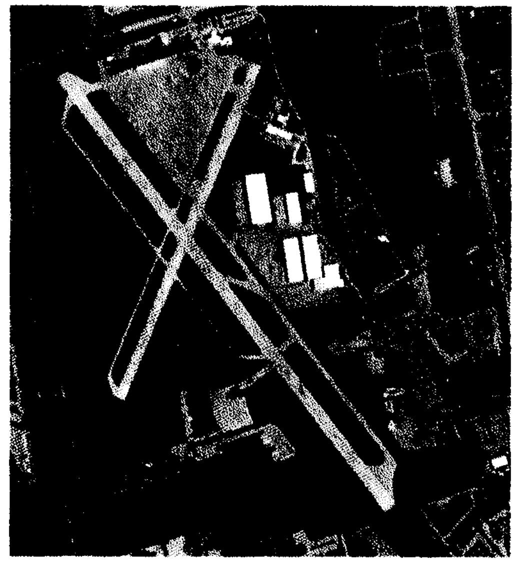
2.2.6 Ground Access

Billy Bishop Airport's location makes it a unique airport for business travelers, as it is close to the downtown business district of Toronto and is well connected to Toronto's public transit network of subways, street cars, busses, GO commuter trains and VIA rail regional train service. A shuttle bus service is provided by Porter Airlines offering free transportation from the mainland ferry and tunnel terminal, to Union Station and other parts of downtown Toronto. Driving time from the mainland ferry and tunnel terminal to downtown Toronto is approximately 9 minutes. The Airport's strategic location also allows for quick access to the Gardiner Expressway and areas east and west along the lakeshore.

2.3 Toronto Buttonville Municipal Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

2.3.1 Airport Role and Location

Toronto Buttonville Municipal Airport (Buttonville Airport) is located adjacent to provincial Highway 404 in the City of Markham and is surrounded by suburban industrial and residential developments. At a distance of approximately 24 km north of downtown Toronto, it is the closest general aviation airport in the GTA to downtown Toronto. In the context of the southern Ontario airport system, Buttonville Airport's role is a **general aviation corporate and training airport**.

Buttonville Airport is the GTA's busiest and primary general aviation airport and scheduled passenger services are not provided at the facility. Owned and operated privately by Toronto Airways, it is a public airport available to all general aviation and corporate aviation users. The Airport is currently designated by CBSA as an AOE 15 and customs and immigration services are provided for up to 15 travellers during published operational hours.

The future of the Airport has been in question for many years due to the expansion of urban development around the airport boundaries and the high value development potential for the airport lands. In the past the provincial government and the GTAA provided financial assistance in the form of an operating subsidy; however, financial support is no longer provided to the Airport. Recent consultations with the Airport owner suggest that the Airport is scheduled to close near the end of the 2017 calendar year.

2.3.2 Runway Facilities

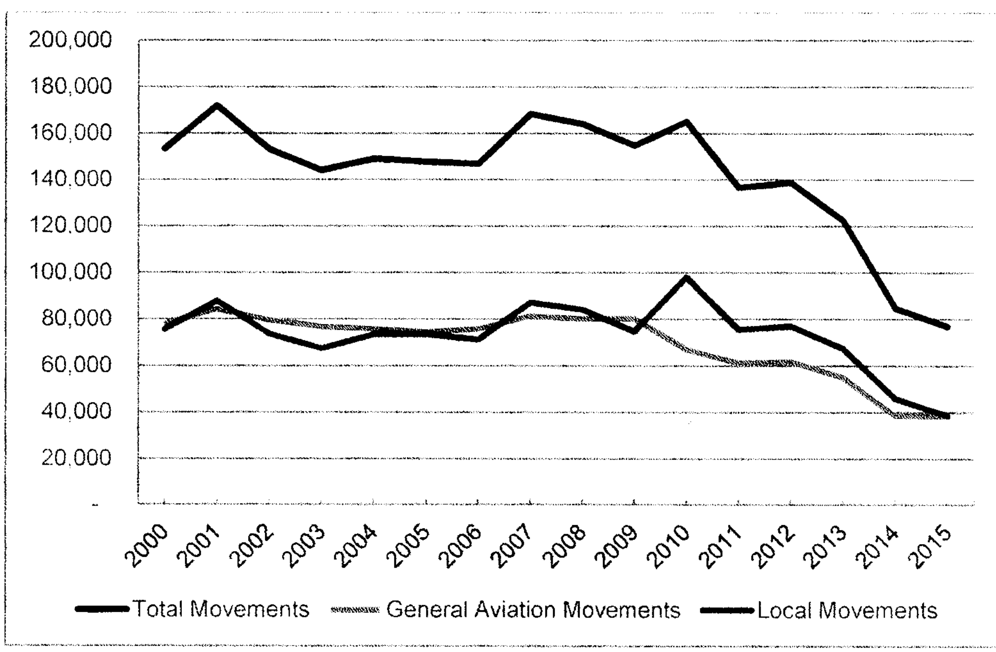
Table 2.6 – Buttonville Airport Runway Characteristics

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
15-33	15	3,897 ft. (1,188 m)	100 ft. (31 m)	Asphalt	Non Precision	C550 BE20 BE55 C172	Yes
	33						
03-21	03	2,694 ft. (821 m)	80 ft. (24 m)				Yes
	21						

2.3.3 Activity History

Buttonville Airport has seen fairly steady activity levels in the past with approximately equal distribution between local and general aviation movements. In the late 2000's the Airport was one of the busiest general aviation facilities in Canada in terms of total aircraft movements. In 2009, Toronto Airways announced that the Airport would be closed as part of a mixed use urban redevelopment program. The Airport closure announcement has caused a decline in movements as local operators have commenced relocation to other airports. The largest decline in movements occurred in 2013-2014 when Seneca College relocated the core of their Aviation Technology program's curriculum from Buttonville Airport to Peterborough Airport.

Figure 2.6 – Historical Aircraft Movements – Buttonville Airport



2.3.4 Airport Service Types

Buttonville Airport provides airport service types as illustrated in Table 2.7.

Table 2.7 - Buttonville Airport Service Types

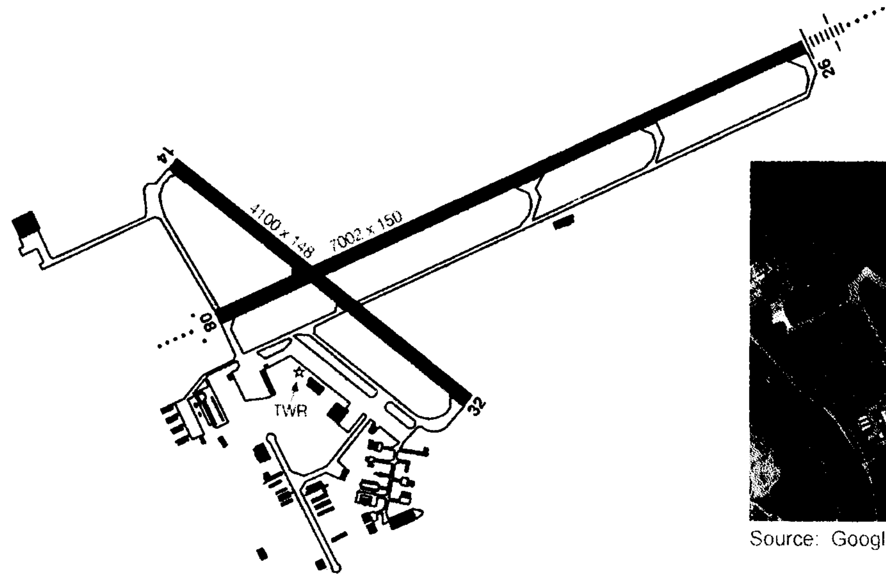
	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic					•		•
Transborder					•		•
International							

• Primary Service Type

2.3.5 Ground Access

Buttonville Airport is located adjacent to provincial Highway 404 and is well connected to local and regional road networks. The site is also serviced by North York's Viva bus service which provides rapid service to Toronto's subway lines.

2.4 Region of Waterloo International Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)

Source: Google Earth, 2016

2.4.1 Airport Role and Location

The Region of Waterloo International Airport (Waterloo Airport) is owned and operated by the Regional Municipality of Waterloo and serves the cities of Waterloo, Kitchener, Cambridge and Guelph and surrounding communities. In general, the airport's primary catchment area extends a radius of 35 km around the Airport. Its secondary catchment area extends a further 55 km drawing passengers from Hamilton, London, Owen Sound and points further in southwestern Ontario. The Airport is located on a

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364 ha parcel of land near Breslau, Ontario in a mostly rural setting with suburban residential development to the west. The facility is approximately 10 km east of the city of Waterloo, 8 km east of Kitchener, and 83 km distance west of downtown Toronto. The Airport supports scheduled passenger air service, charter air services, general aviation flight training and corporate aviation activities. Waterloo Airport is home to the Waterloo Wellington Flight Centre. In the context of the southern Ontario airports system, the Waterloo Airport serves the primary role **of a secondary airport, and as a general aviation training airport**.

2.4.2 Runway Facilities

Table 2.8 – Waterloo Airport Runway Facilities

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
08-26	08	7,002 ft. (2,134 m)	150 ft. (46 m)	Asphalt	Non Precision	B737 ERJ-145 DHC8-400 BE55 C172	Yes
	26				Precision		
14-32	14	4,100 ft. (1,250m)	148 ft. (45 m)		Non Precision		Yes
	32						

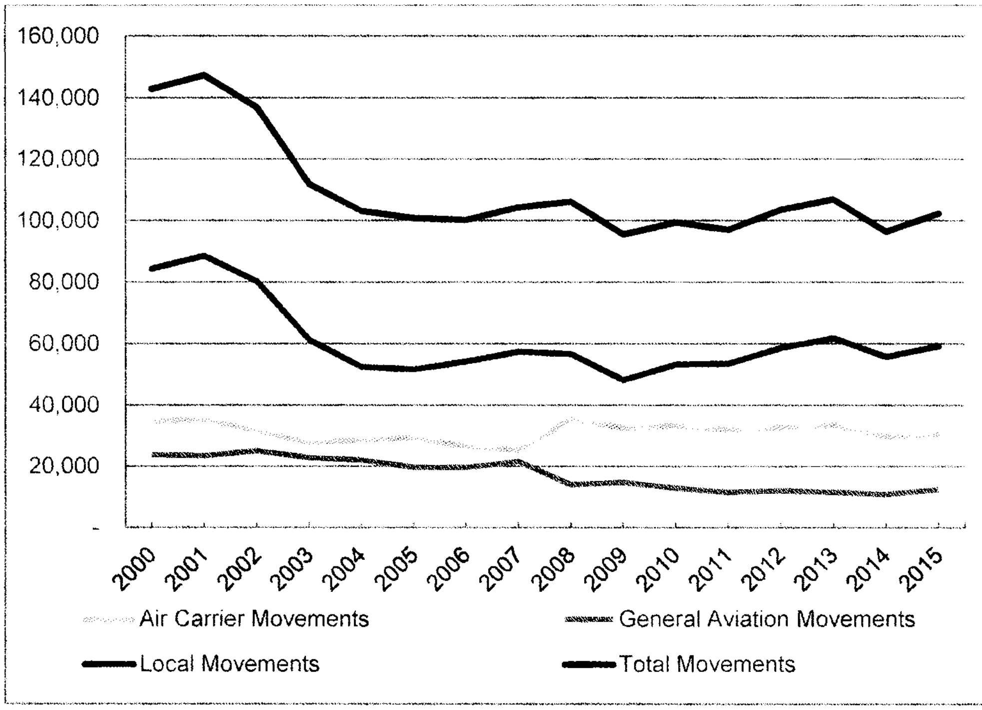
2.4.3 Activity History and Destinations Served

Waterloo Airport has seen decreasing aircraft movements since 2000. Since 2014 the majority of the Airport's movements were local and attributed to flight training activities. Local movements at Waterloo Airport have remained fairly steady. General aviation movements have been in decline. Air carrier movements have remained fairly constant with modest growth. Passenger movements have shown consistent growth in the domestic market while the international market at Waterloo Airport consists of sun destination charters.

[redacted]

Transborder service at Waterloo Airport has been volatile in recent years and although transborder passenger volumes increased in 2011 with American Eagle's twice daily service to Chicago O'Hare, this service was discontinued in October 2016.

Figure 2.8 – Historical Aircraft Movements – Waterloo Airport



Waterloo Airport provides direct scheduled air services to Calgary on a daily basis, with weekly seasonal service to Orlando. Both services are provided by WestJet operating B737-type aircraft. Sunwing Airlines also offers seasonal weekly service to various sun destinations, depending on the year. For the 2016-2017 winter season, Sunwing will be offering weekly services to Punta Cana, Dominican Republic. In addition, in the summer of 2016 Nextjet offered occasional air services to Peterborough, Ottawa-Gatineau and Montreal using a 9-seat BE20 aircraft; however, this service had start-up difficulties and has been suspended until further notice.

2.4.4 Airport Service Types

Waterloo Airport provides airport service types as illustrated in Table 2.9

Table 2.9 – Waterloo Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	•			○	○		•
Transborder	•				○		•
International	○	○			○		

- Primary Service Type, ○ Secondary Service Type

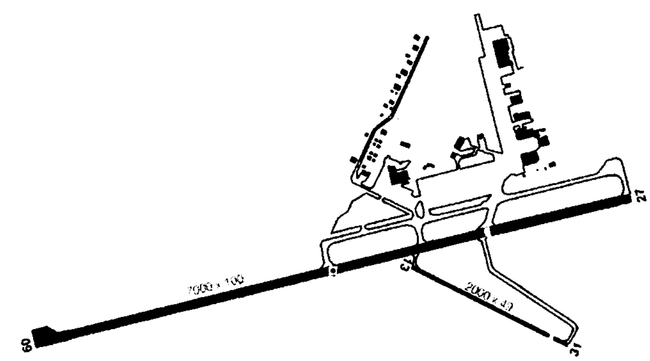
2.4.5 Passenger Facilities

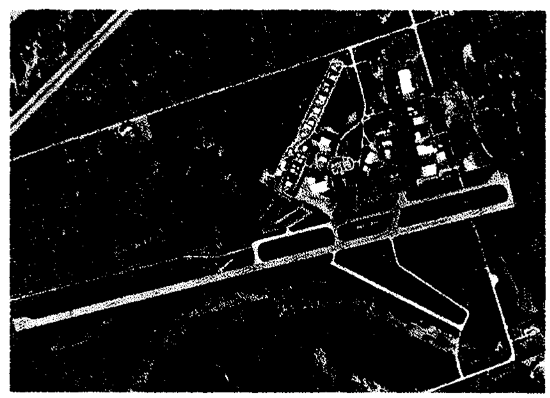
Passenger processing facilities at the Waterloo Airport consist of a single two-story air terminal building with a passenger floor area measuring approximately 2,600 m^2. The terminal is used for both international and domestic air travelers. The facility features typical amenities such as check-in desks, CATSA security screening, holdrooms, refreshment areas, and baggage claim facilities. Waterloo Airport is designated by CBSA as an AOE 180 whereby customs and immigration inspection services are provided for scheduled passenger, charter, and general aviation aircraft, provided the number of travellers does not exceed 180 per flight.

2.4.6 Ground Access

Waterloo Airport is easily accessed by the local road network, and is only 6 km away from Highway 401. There is currently no public transportation access to the Airport; however, the region is currently served by GO Train, which is planned to be expanded to provide more frequent service between the region and downtown Toronto. The Ontario Government announced that a new GO station will be built in Breslau, immediately adjacent to the Airport. A date for the construction and commissioning of the new GO station has not yet been announced.

2.5 Peterborough Municipal Airport





Source: Google Earth, 2016

2.5.1 Airport Role and Location

Peterborough Municipal Airport (Peterborough Airport) is located approximately 5 km southwest of the City of Peterborough, within the Township of Cavan Monaghan. The Airport is conveniently positioned adjacent to Highway 115 and is approximately 105 km northeast of downtown Toronto. Peterborough Airport serves aviation industrial, general aviation, flight training, and corporate aviation activities. Peterborough Airport is home to Seneca College's School of Aviation, which relocated from Buttonville Airport in January 2014. The Airport also supports occasional and seasonal passenger charter air services utilizing B737-300 aircraft. In the context of the southern Ontario airports system, Peterborough Airport serves the primary role as a **general aviation industrial airport**.

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Peterborough Airport is owned by the City of Peterborough and operated by The Loomex Group. Recently, the Airport has undergone a significant expansion effort including a runway extension to 7,000' to encourage job creation and economic development in the region. This plan was supported jointly by the municipality, the Province of Ontario and the Government of Canada.

2.5.2 Runway Facilities

Table 2.10 – Peterborough Airport Runway Facilities

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
09-27	09	7,000 ft. (2,134 m)	100 ft. (31 m)	Asphalt	Non Precision	B737 CL60 CRJ-700 BE55 C172	Partial
	27						
13-31	13	2,000 ft. (610 m)	49 ft. (15 m)		Non Instrument		Partial
	31						

2.5.3 Activity History and Destinations Served

Peterborough Airport's total aircraft movements have been fairly volatile in the past years following changes in local movements. General aviation movements have remained fairly steady with modest increases over the past 15 years. Movements began increasing at the Airport after 2009 when an airport expansion initiative was announced, along with the pending closure of Buttonville Airport. Aircraft movements further increased with the relocation of Seneca College's campus from Buttonville Airport to Peterborough Airport in 2014. This increase is clearly visible in Figure 2.9.

[redacted]

Peterborough Airport offers occasional and seasonal charter air services through a local tour operator – Stewart Travel. Charter destinations offered include Boston, New York, Nashville, St. John's, and various other destinations which can vary on a yearly basis. In the summer of 2016, Nextjet offered occasional air services to the Waterloo Airport, Ottawa-Gatineau, and Montreal using a 9-seat BE20 aircraft; however, this service had start-up difficulties and has been suspended until further notice.

2.5.4 Airport Service Types

Peterborough Airport provides airport service types as illustrated in Table 2.11.

Table 2.11 – Peterborough Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	**Charter**	**Scheduled**	**Charter**	**Commercial**	**Industrial**	**Other**
Domestic	○	○			○	●	●
Transborder		○			○	●	○
International					○	●	○

● Primary Service Type
○ Secondary Service Type

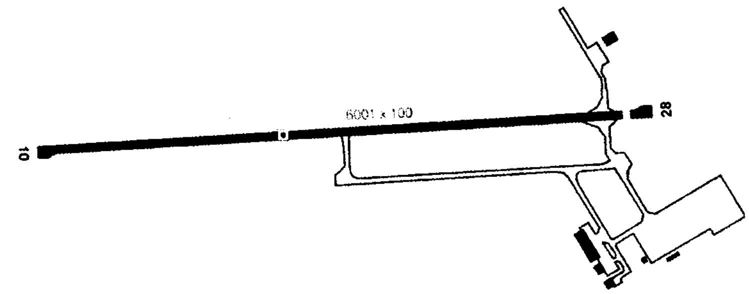
2.5.5 Passenger and Cargo Facilities

Dedicated passenger processing facilities at Peterborough Airport are limited to a small air terminal building with the capability of supporting a 19-seat commuter air service. To support B737-300 charter air services, The Loomex Group provides space within the ground floor of their operations building to accommodate arriving and departing passengers, including baggage processing and security screening. Passengers are transported via bus to and from the Loomex building to Apron II where passenger enplaning/deplaning occurs. The Airport is designated as an AOE 15 by CBSA, where recreational and corporate general aviation aircraft are provided with customs and immigration inspection services, up to a maximum of 15 travellers per flight, and during normal business hours. CBSA also provides ad-hoc services on a cost recovery basis to support B737-300 charter air services. Peterborough Airport does not currently support dedicated air cargo facilities.

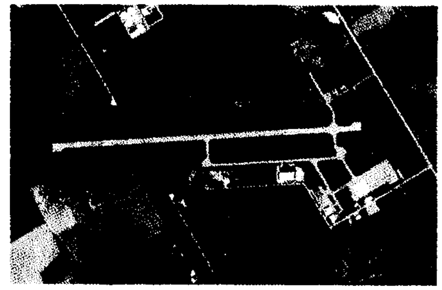
2.5.6 Ground Access

Peterborough Airport is located adjacent to provincial Highway 115, which is a four lane divided highway providing access to Highway 401. Work is also underway to extend Highway 407 to Highway 115 which is expected to provide a favourable alternate east-west route within Durham Region to avoid congestion on Highway 401 during peak periods.

2.6 Lake Simcoe Regional Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

2.6.1 Airport Role and Location

Lake Simcoe Regional Airport (Lake Simcoe Airport) is owned and operated jointly by the City of Barrie, the County of Simcoe and the Township of Oro Medonte. The facility is located adjacent to Highway 11, approximately equidistant between Barrie and Orillia, and is situated on 235 ha of land surrounded exclusively by agricultural and rural forest lands. Lake Simcoe Airport is approximately 94 km north of downtown Toronto. In the context of the southern Ontario airports system, Lake Simcoe Airport serves a primary role as a **general aviation corporate airport**.

Lake Simcoe Airport primarily serves the cities of Barrie and Orillia and surrounding communities and is a gateway to the north cottage country. The Airport supports flight training, recreational aviation, and corporate aircraft services. Lake Simcoe Airport is designated by CBSA as an AOE 24 where customs and immigration inspection services are provided for up to 24 passengers per flight, during published operational hours.

2.6.2 Runway Facilities

Table 2.12 – Lake Simcoe Airport Runway Facilities

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
10-28	10	6,001 ft. (1,829 m)	100 ft. (31 m)	Asphalt	Non Precision	B737-800 G550 C172	Partial
	28						

2.6.3 Activity History

Lake Simcoe Airport has seen decreasing movements in the past 15 years. The number of general aviation movements has risen with increased corporate GA activity; however, local movements have decreased. Even with the increases of general aviation traffic, local movements still make up the majority of movements at Lake Simcoe Airport, suggesting that flight training and recreational aviation is contributing to a large portion of the aircraft movements at the facility.

[redacted]

2.6.4 Airport Service Types

Lake Simcoe Airport provides airport service types as illustrated in Table 2.13.

Table 2.13 – Lake Simcoe Airport Service Types

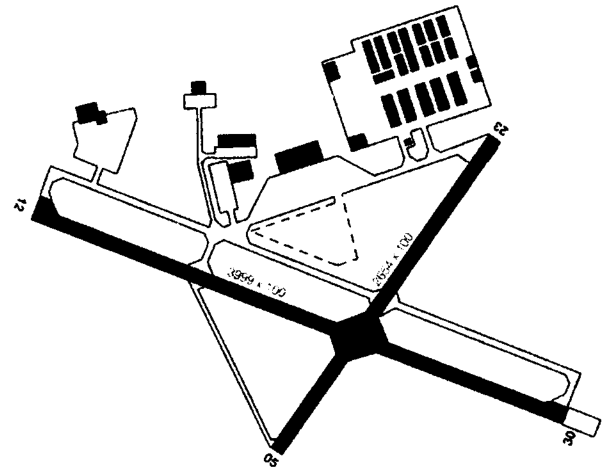
	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic				○	●		○
Transborder					●		
International					●		

- Primary Service Type
○ Secondary Service Type

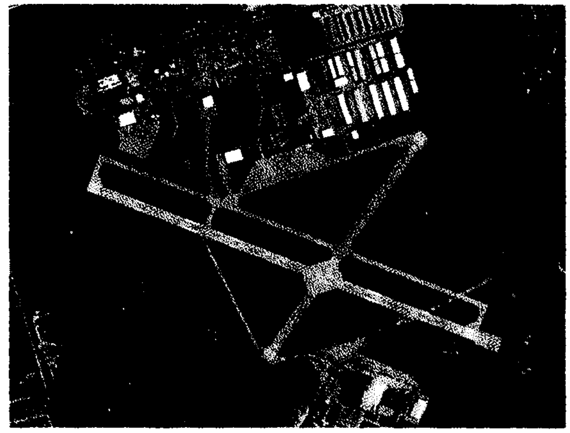
2.6.5 Ground Access

Lake Simcoe Airport is served by provincial Highway 11, a four lane divided roadway connecting to points north such as Orillia, Muskoka and North Bay, and to points south such as Highway 400, Barrie, and the GTA. The Airport is not currently accessible by public transportation. However, the City of Barrie is served by GO Transit rail and bus service providing access to Toronto's Union Station.

2.7 Oshawa Executive Airport



Source: Canada Air Pilot [CAP 4]. (15 SEPT 2016)



Source: Google Earth 2016

2.7.1 Airport Role and Location

Oshawa Executive Airport (Oshawa Airport) is located in the City of Oshawa in the regional municipality of Durham, approximately 50 km northeast from downtown Toronto. The City of Oshawa owns and operates the Airport, and the facility is managed under contract by Total Aviation and Airport Solutions. The Airport site occupies 196 ha of land surrounded by mostly residential development to the east, south and west, and mixed agricultural/industrial to the north. In the context of the southern Ontario airports system, Oshawa Airport serves a primary role as a **general aviation corporate airport**.

Oshawa Airport is a general aviation/corporate airport serving the eastern communities of the GTA, primarily within Durham Region. The Airport's focus is on all aspects of general aviation and the facility has undergone significant growth in the corporate segment as a result of the pending closure of Buttonville Airport. The City of Oshawa has indicated that they have no intention of initiating scheduled passenger service at the Airport, and the primary focus is on its general aviation role as centre for corporate aviation and base for flight training activities. Oshawa Airport is designated by CBSA as an AOE 50 facility where customs and immigration inspection is available during operational hours, provided the number of travellers does not exceed 50. The Airport also supports ad-hoc cargo shipments, although there are no dedicated cargo facilities at the site.

2.7.2 Runway Facilities

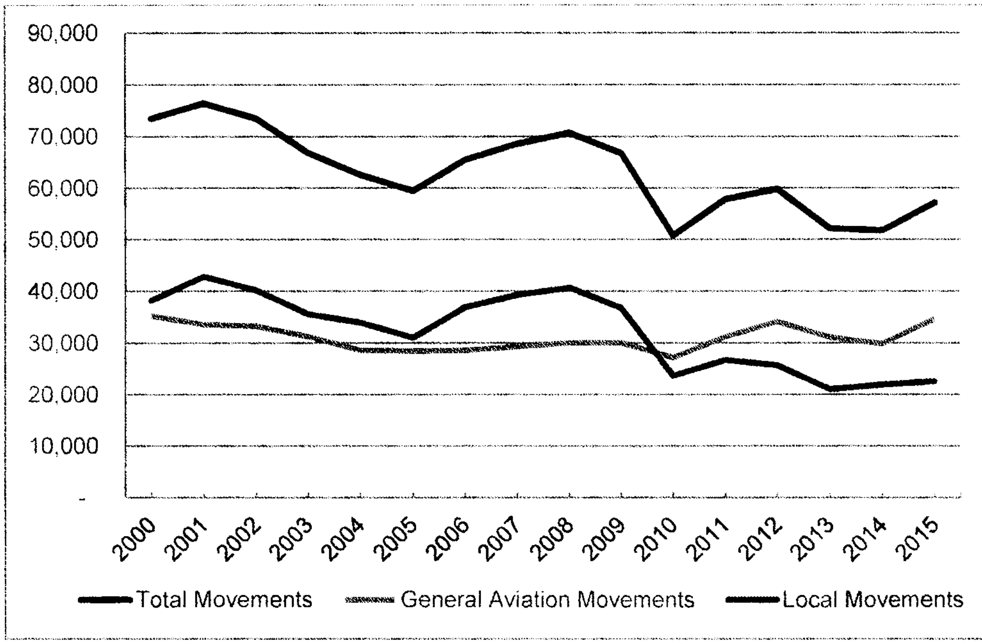
Table 2.14 – Oshawa Airport Runway Facilities

Runway		Length	Width		Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
12-30	12	3,999 ft.	100 ft.		Asphalt	Non Precision	C550 BE20 C172	Yes
	30	(1,219 m)	(31 m)					
05-23	05	2,654 ft.	100 ft.					Partial
	23	(809 m)	(31 m)					

2.7.3 Activity History

Oshawa Airport has seen decreasing traffic over time. In the past, local movements made up the majority of the activity based on flight training and recreational activity but with the increase of corporate GA traffic relocating from Buttonville Airport, general aviation movements surpassed local movements in 2010.

Figure 2.11 – Historical Aircraft Movements – Oshawa Airport



2.7.4 Airport Service Types

Oshawa Airport provides airport service types as illustrated in Table 2.15.

Table 2.15 – Oshawa Airport Service Types

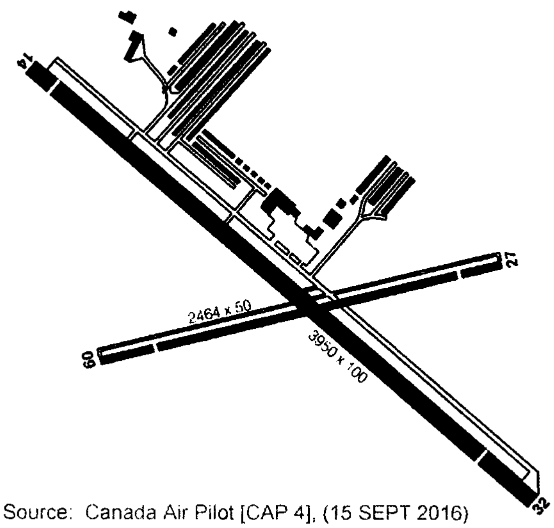
	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic				○	●	○	●
Transborder				○	●	○	●
International							

● Primary Service Type
○ Secondary Service Type

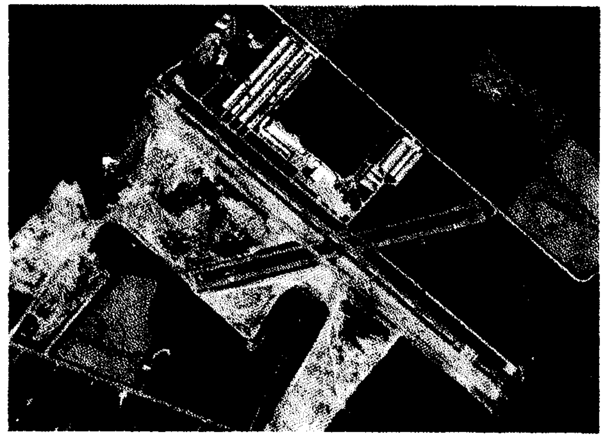
2.7.5 Ground Access

Oshawa Airport is located adjacent to Durham Regional Road 4 (Taunton Road) with nearby connections to the newly constructed Highway 412, and expanded Highway 407. Access to Highway 401 to the south is provided via Taunton Road and Highway 412, or via Durham Regional Road 2 (Simcoe Street). The Oshawa Airport is approximately 35 minutes driving time from downtown Toronto during off-peak periods. The Regional Municipality of Durham also operates a bus route from the Airport to Ajax GO Station, which provides frequent rapid train and bus service to Toronto's subway system.

2.8 Burlington Executive Airpark



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

2.8.1 Airport Role and Location

Burlington Executive Airpark (Burlington Airpark) is a general aviation aerodrome occupying 81 ha of land approximately 10 km north of Burlington and 44 km south-west of downtown Toronto. The Aerodrome is situated within a rural agricultural setting and serves the western communities in the GTA including but not limited to Mississauga, Oakville, Milton, Burlington and Hamilton.

The Aerodrome's primary focus is to be a multi-service general aviation aerodrome, by optimizing its current facilities for flight training, aircraft maintenance, corporate and recreational flight activities. The Aerodrome is privately owned and operated and is classified as an AOE/CAN designed for private and corporate CANPASS permit holders only. In the context of the southern Ontario airports system, Burlington Airpark serves a primary role as a **general aviation training aerodrome**.

2.8.2 Runway Facilities

Table 2.16 – Burlington Airpark Runway Facilities

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
14-32	14	3,950 ft. (1,204 m)	100 ft. (31 m)	Asphalt	Non Precision	BE20 BE55 C172	Yes
	32						
09-27	09	2,464 ft. (751 m)	50 ft. (15 m)		Non Instrument		Yes
	27						

2.8.4 Activity History

NAV CANADA does not measure or collect data regarding aircraft movements at Burlington Airpark; therefore, there is no statistical movement data available for this facility. However, aircraft movements in 2015 were estimated to be 65,000 by the Aerodrome operator.

2.8.5 Airport Service Types

Burlington Airpark provides airport service types as listed in Table 2.17.

Table 2.17 – Burlington Airpark Service Types

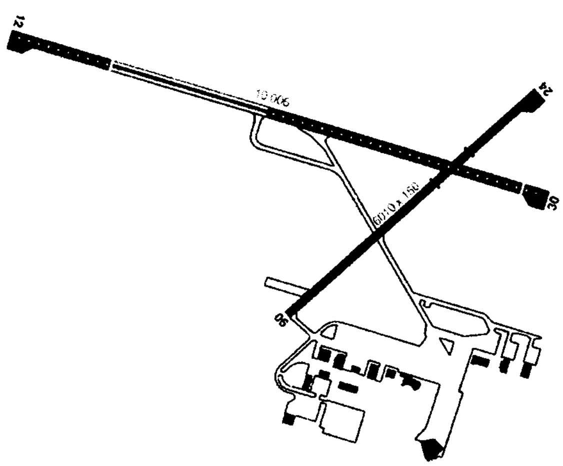
	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic					•		•
Transborder					•		
International							

- • Primary Service Type
- ○ Secondary Service Type

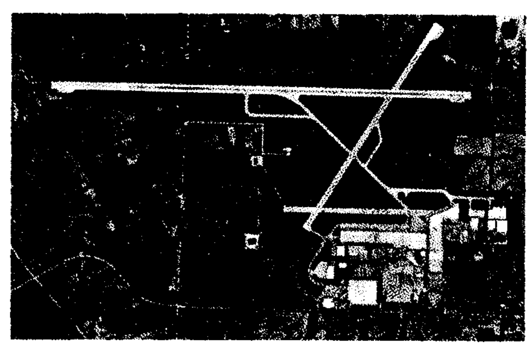
2.8.6 Ground Access

Burlington Airpark is adjacent to Appleby Line which provides direct access to Highway 407 (toll route) to the south, and indirect access to Highway 401 to the north. The Aerodrome is not currently accessible by public transportation.

2.9 John C. Munro Hamilton International Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

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2.9.1 Airport Role and Location

John C. Munro Hamilton International Airport (Hamilton Airport) is owned by the City of Hamilton and operated under contract by Tradeport International Corp., a member of Vantage Airport Group. The airport is located on 555 ha of land in a mainly rural setting. It is located 14 km south of downtown Hamilton and approximately 69 km southwest of downtown Toronto. In the context of the southern Ontario airports system, Hamilton Airport serves a primary role as a **secondary (passengers and cargo) airport**.

Hamilton Airport is a major cargo hub for southern Ontario. As a result of its liberal flight restrictions and low cost as opposed to Toronto Pearson Airport it is an attractive location for new low and ultra-low cost air carriers. It is also served by established air carriers providing transborder and international scheduled and charter passenger services. General aviation activities include flight training, aircraft maintenance and corporate aviation.

2.9.2 Runway Facilities

Table 2.18 – Hamilton Airport Runway Facilities

Runway		Length	Width	Surface Type	Level Of Service	Typical Aircraft	Parallel Taxiway
12-30	12	10,006 ft. (3,050 m)	200 ft. (61 m)	Asphalt	Precision	B767 B737 B727 C550	Partial
	30				Non Precision		
06-24	06	6,010 ft. (1,832 m)	150 ft. (46 m)		Non Precision		No
	24						

2.9.3 Activity History and Destinations Served

Air carrier and cargo movements make up the majority of operations at Hamilton Airport. The decline of general aviation movements can be attributed to the reduction of private aviation at Hamilton Airport and the decline in local movements are as a result of flight training facilities ceasing operations. WestJet used Hamilton Airport as its primary gateway to southern Ontario in the early 2000's as an emerging low cost carrier. [redacted] WestJet has since transitioned the core of its eastern Canada operations to Toronto Pearson Airport. [redacted]

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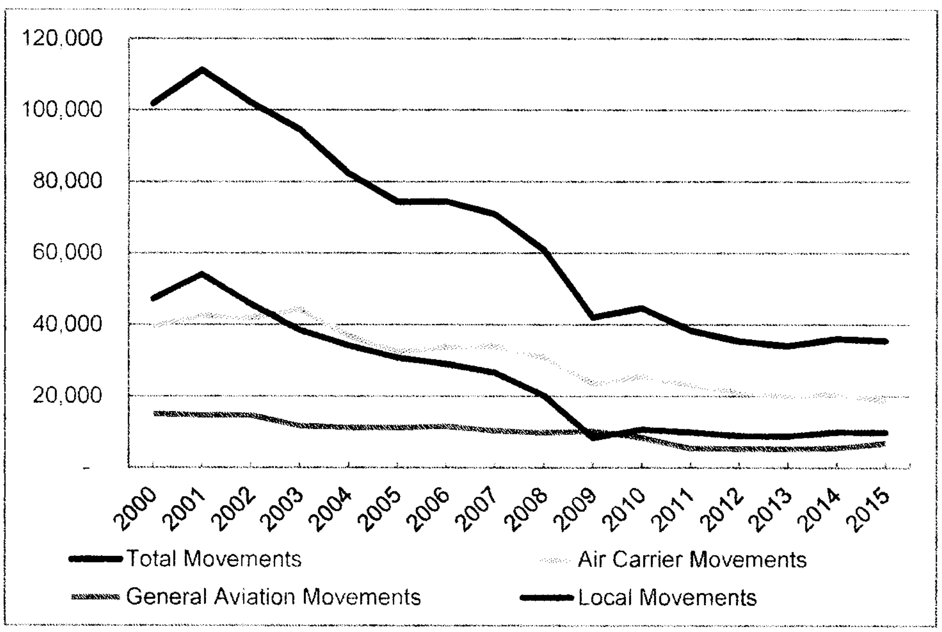
[redacted]

Figure 2.13 – Historical Aircraft Movements – Hamilton Airport



Hamilton Airport supports both scheduled passenger and charter air services. WestJet operates daily direct flights three times per day on a year-round basis to Calgary utilizing B737-type aircraft, and Air Canada operates a three times daily service to Montreal utilizing CRJ-200 aircraft Sunday through Friday, with one flight on Saturday.

WestJet also provides seasonal daily scheduled passenger air services from Hamilton Airport to Edmonton, Halifax and Moncton (May-October), and weekly charters to Cancun, Orlando and Punta Cana (November-April), all utilizing B737-type aircraft.

Air Transat offers direct weekly air charter services to Cancun, Puerto Plata, Punta Cana, Cayo Coco, and Varadero during the winter months utilizing B737-800 aircraft types. Sunwing Airlines also provides weekly seasonal B737-800 flights to Varadero and Punta Cana from Hamilton Airport.

New ultra-low cost ticket vendor NewLeaf began providing air services from Hamilton Airport in the summer of 2016 with direct services to Abbotsford (once per week), Edmonton (4 times per week), Halifax (3 times per week), Moncton (3 times per week), Saskatoon (once per week) and Winnipeg (5 times per week) utilizing B737-400 aircraft types.

2.9.4 Airport Service Types

Hamilton Airport provides airport service types as listed in Table 2.19.

Table 2.19 – Hamilton Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	●	○	●	○	○	○	○
Transborder	○	○	●	○	○	○	○
International	○	○	●	○	○	○	

● Primary Service Type
○ Secondary Service Type

2.9.5 Passenger and Cargo Facilities

Passenger traffic at Hamilton Airport is handled by a single terminal building. It was expanded in 2003 to support the Airport's new role as WestJet's eastern Canadian hub, which has since been relocated to Toronto Pearson Airport. The single level air terminal facility provides approximately 8,500 m^2 of passenger floor space and supports domestic, transborder, and international passengers. The terminal features typical amenities such as check in desks, CATSA security screening, baggage claims and restaurants. Hamilton Airport is designated by CBSA as an AOE 220 facility, providing customs and inspection services for up to 220 travellers per aircraft during normal operational hours. This number can be increased to 440 travellers per aircraft when staged passenger deplaning procedures are employed.

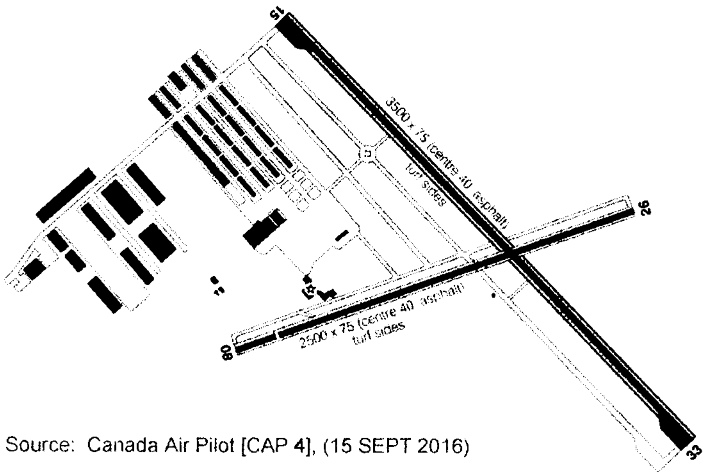
Hamilton Airport is a major air cargo gateway for southern Ontario. Unlike Toronto Pearson Airport, Hamilton Airport can accommodate air cargo flight operations 24 hours a day and does not have time slot restrictions like Toronto Pearson Airport. In 2014 Statistics Canada reported that a total of 88,984 tonnes of cargo was handled at Hamilton Airport. In 2015, the Airport opened a 77,000 square foot cargo logistics centre. Cargojet is the anchor tenant of the facility and additional space is operated under a common-use model. Hamilton Airport's cargo catchment area is 150 million people within a one day trucking radius of the Airport.

The Airport is also home to the fixed base operator Jetport which provides service to itinerant corporate and general aviation traffic. Additionally, the Canadian Warplane Heritage Museum has a hangar on the south side of the field and maintains a large collection of vintage wartime aircraft.

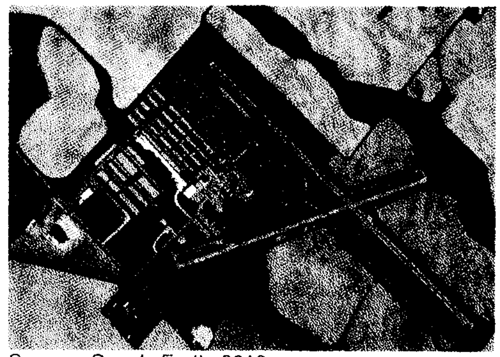
2.9.6 Ground Access

The Airport is connected to the provincial highway network via Provincial Highway 6, an undivided two lane rural highway, which connects the Airport directly to Highway 403. Hamilton Transit operates a bus route connecting the Airport to downtown Hamilton, as well as to Hamilton GO Transit station, which provides connections to Toronto's Union Station and points beyond.

2.10 Brampton Airport



Source: Canada Air Pilot [CAP 4], (15 SEPT 2016)



Source: Google Earth, 2016

2.10.1 Airport Role and Location

Brampton Airport is a certified general aviation airport located 15 km north-west of the City of Brampton and approximately 42 km northwest of downtown to Toronto. Brampton Airport is located in a rural agricultural setting on a 100 ha site in the town of Caledon. The Airport is privately owned and operated by the Brampton Flying Club, a registered not-for-profit organization.

The Airport serves general aviation providing flight training, recreational flying and maintenance services for the benefit of the flying club's members.

The Airport also serves ad hoc charters, general aviation operators and medevac operations. Aircraft operations at Brampton Airport are restricted to aircraft with a weight of less than 12,500 lbs. CBSA classifies the Brampton Airport as an AOE/CAN where entry into Canada is restricted private and corporate CANPASS permit holders. In the context of the southern Ontario airports system, Brampton Airport serves a primary role as a **general aviation training airport**.

2.10.2 Runway Facilities

Table 2.20 – Brampton Airport Runway Facilities

Runway		Length	Width	Surface Type	Level of Service	Typical Aircraft	Parallel Taxiway
15-33	15	3,500 ft. (1,067 m)	75 ft. (Asphalt 40 ft. centre)	Asphalt/Turf	Non Precision	BE20 BE55 C172 C152	Yes
	33						
08-26	08	2,500 ft. (762 m)	75 ft. (Asphalt 40 ft. centre)	Asphalt/Turf	Non Precision		Yes
	26						

2.10.3 Activity History

Brampton Airport is a busy flight training center. Over the past 15 years general aviation movements at the Airport have remained relatively stable. The majority of movements at the Airport are estimated to be local flight training movements. The Airport operator estimates that 2015 movements at the Airport totalled 110,000. The operator claims it is the busiest uncontrolled airport in Canada. Local movement statistics are not formally reported by NAV CANADA.

2.10.4 Airport Service Types

Brampton Airport provides airport service types as listed in Table 2.21.

Table 2.21 – Brampton Airport Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic					•		•
Transborder					○		○
International							

• Primary Service Type
○ Secondary Service Type

2.10.5 Ground Access

Brampton Airport is adjacent to Highway 10, a four-lane undivided rural highway connecting to Highway 410, a major freeway providing access to Highway 401 and the rest of the GTA. The Airport is not currently accessible by public transportation.

s.24(1)

2.11 Summary

To gain regional context for the Pickering Lands Aviation Sector analysis, a summary of airport profiles is provided below. Each airport that is significant to the southern Ontario airports system is catalogued including geographic location relative to downtown Toronto, longest runway, number of runways, number of destinations, and 2015 activity. Table 2.22 summarizes the profiles of passenger airports within the southern Ontario airport system, and Table 2.23 identifies the characteristics of the system's general aviation airports.

Table 2.22 - Passenger Airport Summary

Airport	Air Distance From Downtown Toronto	Longest Runway	Number of Runways	Number of Destinations	Passengers (2014)*
Toronto Pearson Airport	20 km Northwest	11,120 ft. (3,400 m)	5	180	38,600,000
Billy Bishop Airport	2 km Southwest	3,998 ft. (1,216 m)	3	23	[redacted]
Waterloo Airport	83 km West	7,002 ft. (2,134 m)	2	8	[redacted]
Hamilton Airport	69 km Southwest	10,006 ft. (3,400 m)	2	11	[redacted]

* Revenue Passengers only. 2014 is the most recent year with complete data set. Much of 2015's data is not available due to confidentiality.

Table 2.23 - General Aviation Airports Summary

Airport	Air Distance From Downtown Toronto	Longest Runway	Number of Runways	Principal Roles	Movements (2015)
Buttonville Airport	24 km North	3,897 ft. (1,188 m)	2	**Closing by 2019** Flight Training Small Corporate	76,750
Peterborough Airport	105 km Northeast	7,000 ft. (2,134 m)	2	MRO Industrial Flight Training	[redacted]
Lake Simcoe Airport	94 km North	6,001 ft. (1,829 m)	1	Government Large Corporate Flight Training	[redacted]
Oshawa Airport	50 km Northeast	3,999 ft. (1,219 m)	2	Medium Corporate Recreational Flight Training	57,103
Burlington Airpark	44 km Southwest	3,950 ft. (1,219 m)	2	Recreational Flight Training	[redacted]
Brampton Airport	42 km Northwest	3,500 ft. (1,067 m)	2	Recreational Flight Training	[redacted]

3.0 STAKEHOLDER CONSULTATIONS

3.1 Approach & Objectives

A major part of the Pickering Lands Aviation Sector Analysis was to conduct an extensive consultation program to gain a broad perspective of the opinions, concerns and needs of the GTA's aviation stakeholders. The stakeholder groups were diverse in nature and included the ten study airports, municipal representatives, industry associations & interest groups and Canadian air carriers.

In 2015, stakeholder consultations were undertaken by Dr. Gary Polonski, Independent Advisor on the Development of the Pickering Lands under a separate initiative with no relationship to the Pickering Lands Aviation Sector Study. These detailed consultations were made available to the project team for further background information and provided a basis for many of the consultations undertaken as part of this study.

The ten study airports were visited and interviewed by the project team. The consultations provided insight into the daily operations of each airport, as well as the opportunity to assess the airport's level of congestion and expansion opportunity in the context of the southern Ontario airports system. Industry associations were invited to meet with the project team in person or by telephone; municipalities were consulted by teleconference. The major Canadian air carriers were consulted by a written consultation opportunity.

The consultation program undertaken was successful with good response rates. All ten study airports participated and provided input, while 70% of municipalities, 60% of air carriers and 80% of industry associations that were invited, participated in the consultation process. In addition, many industry interest groups reached out to the project team with a desire to participate in the consultation process and each were provided with the opportunity to comment on the study.

3.2 Stakeholder Groups

A complete list of stakeholders contacted during the consultation process is provided in Appendix C.

3.3 Findings

The findings of the consultation process are the opinions and views of the consulted parties. It is important to note that the views and opinions of stakeholders do not necessarily represent the opinions or view of the project team, or Transport Canada. In addition, it was observed that various stakeholder groups had different perspectives and opinions on the future development of the Pickering Lands, and not all positions were similar. To respect the privacy and discretion of the parties consulted; the specific comments received by each stakeholder are not identified. The consultation findings represent common themes observed by the project team during the consultation process.

General trends related to the development of a new Pickering Airport expressed by nearly all parties included:

- The need for better communication with associations and the public:
  - Many stakeholders expressed concern towards the lack of communication and transparency regarding the government's intentions on developing the Pickering Lands. Should an airport be developed on the Pickering Lands, stakeholders indicated that it would be important to make the ultimate size and role of the airport well communicated with industry and the general public.
- The need for Transport Canada to make a decision regarding the development of a new Pickering airport soon, regardless if the decision is to develop the new airport, or to not build the new facility.
- General aviation needs have been overlooked in previous studies and there is demand for general aviation activities at a new Pickering Airport.
- The economic impact and opportunities related to the development of the Pickering Lands has been overlooked in previous studies and should be addressed to assist in future decision making.
- Most stakeholders agreed that development of an airport on the Pickering Lands should begin with a large runway which makes a statement that the government is committed to allowing for the development of a full-scale commercial airport, even if it extends beyond the 20 year planning horizon of this study.

3.3.1 Air Carriers

Air carriers were consulted by the distribution of a written consultation opportunity. The consultation opportunity consisted of a questionnaire provided to the major Canadian airlines operating at Toronto Pearson Airport, and Billy Bishop Airport. The questionnaires were addressed to network planning managers inquiring about their concerns with the capacity at Toronto Pearson Airport in 2015 and in 2036. Air carriers were given a period of 10 days to respond to the request. Out of the 5 Canadian air carriers given the opportunity to provide input, 3 air carriers responded to the request.

In general, air carriers plan their operations in the short term, allowing flexibility and ability to adapt their services and operations on short notice to changing market conditions. As a result, the findings from the air carrier's responses revealed that current expansion plans are for the near term and do not fully extend into the 20 year planning horizon of the study.

Generally, the respondents were not in favour of a new airport on the Pickering Lands. They cited good working relationships with the GTAA and have not reached any major capacity constraints limiting their ability to grow. In the opinion of the airlines, there is considerable underutilized capacity at Hamilton Airport, Waterloo Airport and Billy Bishop Airport to support their current and future air services.

Some air carriers expressed concerns regarding the cost of a future airport on the Pickering Lands. If a new Pickering Airport were to be owned and operated by the GTAA (one potential governance model to be discussed in subsequent reports), air carriers noted that the cost to develop and operate the new Pickering Airport should not be recovered through higher air carrier fees at Toronto Pearson Airport.

3.3.2 Airports

The ten study airports were consulted individually, each at their respective facilities. The consultations with the study airports included profiling current facilities, reviewing future expansion within the 20 year planning horizon as shown within master and strategic plans, and determining the role that each airport plays in the southern Ontario system. The vision of each operator and their views on the development of an airport on the Pickering Lands was also discussed.

In general, airport operators were in favour of a new airport on the Pickering Lands, citing a lack of general aviation capacity east of the GTA with the pending closure of Buttonville Airport. The general aviation airports were concerned about the possibility of lost traffic to a new airport on the Pickering Lands, depending on the identified type and role of the facility. In addition, consultations indicated that airports are willing to accept future general aviation traffic that may be transferred from Toronto Pearson Airport in the next decade as the GTAA moves towards increasing their passenger capacity.

During the consultation process it was observed that a new model for large corporate GA is emerging as an alternative to operating at Toronto Pearson Airport. Historically high-end corporate aviation traffic has operated at Toronto Pearson Airport, providing connections to downtown Toronto via surface transportation. The new model consists of the large corporate aircraft operators utilizing secondary and general aviation airports in the southern Ontario airport system (as an alternative to Toronto Pearson Airport), and connecting to downtown Toronto via helicopter. This type of operation is currently occurring at Lake Simcoe Airport, and the trend is expected to continue within the southern Ontario airport system throughout the 20 year planning horizon. As a result, airports which were initially discounted as a corporate general aviation gateway to downtown Toronto (due to excessive ground transportation times) are now potential options for operators in these markets. In some cases, the helicopter flight from the secondary and general aviation airports to downtown Toronto is faster and more reliable compared to ground transportation from Toronto Pearson Airport to downtown.

3.3.3 Municipalities

All municipalities consulted showed strong support for the development of an airport on the Pickering Lands and stated the critical need for the federal government to make a decision on the Pickering project as soon as possible. Many councillors expressed strong support for the development of a new Pickering Airport. In addition, municipalities claimed to have lost opportunities for growth and economic development as a result of the inaction and absence of clear direction on the development on the Pickering Lands. In their opinions, the local economic impact of an airport on the Pickering Lands could be substantial and the benefits would far outweigh the cost of development of a new Pickering Airport.

The municipalities stated that commercial developers are not prepared to make large investment in the region without a major policy commitment from the federal government towards the development of an airport on the Pickering Lands.

The Province of Ontario and Region of Durham have spent $60-80 million to oversize the municipal infrastructure (water, sewer, storm water and natural gas) serving the Seaton lands area (adjacent to the southern boundary of the Pickering Lands) to ensure a large scale regional airport would be well serviced in the future.

The area surrounding the Pickering Lands is forecast to grow by 70,000 residents in the next 8 to 10 years. Municipalities voiced concern that public perception and resistance to a new airport could increase once these new residents move to the area and become established. The consulted municipalities stated that the growth of the surrounding area supports the argument that a decision on the Pickering Lands is time critical.

Municipalities surrounding the Pickering Lands stated that the Pickering Lands are well situated for current and future ground transportation connections. Chapter 4 describes the current and future ground transportation networks in the region, and connectivity potential for the region.

3.3.4 Industry Organizations and Interest Groups

Industry Organizations and local interest groups were generally in favour of a new airport on the Pickering Lands. Most industry organizations and local interest groups identified a new Pickering Airport as the most suitable replacement for the closing of Buttonville Airport. Many stakeholders within this group expressed the need for a runway with a length of between 8,000 and 10,000 feet in length as a basis for regional airline and general aviation operations.

The consulted parties agreed that a new Pickering Airport should have its own governance entity and should be operated independently from the GTAA. Industry stakeholders noted that development and operation of a new Pickering Airport should be financially independent of Toronto Pearson Airport (e.g. fees collected at a new Pickering Airport should not be used to finance operations and development at Toronto Pearson Airport). Overall, industry organizations and interest groups are supportive of developing a new airport on the Pickering Lands and welcome the opportunity to provide more airport competition to the southern Ontario airports system.

4.0 IMPACT OF KEY REGIONAL DEVELOPMENTS

Several key regional developments in southern Ontario have been identified that could influence access to the southern Ontario airports identified within this study. This section assesses the groundside infrastructure serving the study airports, and the qualitative impact these developments will have on the airport facilities within the southern Ontario airports system. The regional developments of the study area identified herein are not inclusive of all regional developments. As the GTA continues to grow and become more congested the need for multi-modal airport access will increase in importance. As a result, key road, rail, and transit infrastructure projects have been identified. Consultations with municipalities and the Ontario Ministry of Transportation provided valuable insight into the long term plans for regional transportation development in the area, beyond the information collected from public sources. In the context of future demand at passenger airports within the southern Ontario airport system, the key regional developments identified herein are not expected to result in dramatic shifts in passenger demand within the 20 year planning horizon, as this demand is driven by the air services offered by air carriers, not airport ground access times.

4.1 Population

In 2011, the Greater Toronto Area (City of Toronto, municipalities of Durham, Halton, Peel and York) had a population of 6,054,191[5]. The Toronto Pearson Airport draws from a much larger area, including Hamilton, the Niagara region and large parts of Ontario. The Government of Ontario expects the GTA to be the fastest growing part of the province, absorbing 68 percent of Ontario's net population growth through to 2041. By 2025, it will account for 50% of the provincial population[6]. The Ontario Ministry of Finance expects Halton to grow faster than any other census division, with a growth of 63.6 percent to 2041. Between 2015 and 2041, net migration will account for 89 percent of Ontario's population increase and the GTA will have a population of almost 9.5 million by 2041.

The Statistics Canada National Household Survey of 2011 reported that Toronto had the largest foreign-born population of any Canadian Census Metropolitan Area whereby 46 percent of the population were immigrants. Major source countries included India, China, the Philippines, Italy, United Kingdom and Sri Lanka. In 2011, 41.2 percent of the 545,535 immigrants from China settled in the Greater Toronto Area.

The GTA's growing population will help maintain a strong demand for air travel. The large immigrant population will strengthen the GTA's community of interest with many overseas destinations, and will ultimately create two-way intercontinental demand for air travel.

4.2 Road Infrastructure

Road infrastructure and access is important for the development and growth of airport facilities. In fact, 92% of travelers using Toronto Pearson Airport arrive by personal vehicle[7]. Given this fact, the improvement of road infrastructure positively impacts the traveler, but also employees of the airport, the goods moving through it and the industrial services that support it.

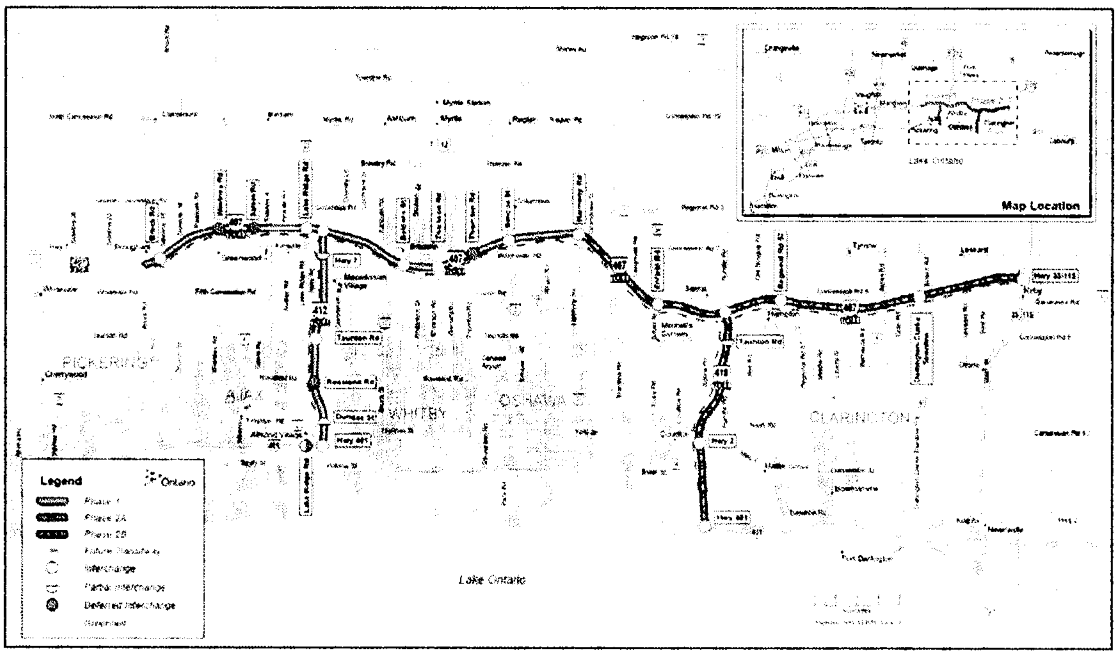
[5] Source: Census of 2011
[6] Source: Ontario Ministry of Finance "Ontario Population Projections Update, 2015-2041"
[7] Source: Pearson Connects: A Multi-Modal Platform for Prosperity, February 2016

With the GTA growing in population and with the highways network becoming more congested, the following road infrastructure projects are expected to positively impact accessibility to the study airports.

4.2.1 Highway 407 East Extension

The Highway 407 East expansion is 65 km of new Provincial toll highway that extends east from the existing eastern-end of 407 Express Toll Route (ETR) to Highway 115 in the Durham Region. The first phase of the project was completed mid-2016 when the highway was extended from Brock Road to Harmony Road. Ultimately in phase 2A and 2B, the 407 will extend to Highway 115 where it will provide an alternate 4-lane divided highway access between the GTA and Peterborough, as an alternative to the congested Highway 401. Another part of the 407 East project are two north-south "connector" highways, between the new 407 and the well-established and parallel Highway 401. Highway 412 is located in between the towns of Ajax and Whitby and was opened in 2016. Highway 418 will be located between Oshawa and Bowmanville and is expected to be completed by 2020.

Figure 4.1 – Highway 407 East, 412, and 418 Developments



Source: Ministry of Transportation Land Information Ontario, 2016

In the regional context, the 407 east expansion has reduced travel times to/from the eastern GTA, to the southern Ontario airports, including Toronto Pearson, Oshawa, and Billy Bishop airports. With the next phase of 407 east extension, access to Peterborough Airport will be improved, with significantly shorter travel times to/from the GTA. Travel times during peak periods to/from Toronto Pearson Airport from Durham Region and points further east have been, and will be continually reduced as Highway 407 is further extended.

The 407 is also of unique importance to the Pickering Lands. The Pickering Lands are adjacent to Highway 407 which is located on the southern boundary of the lands.

A future airport on the Pickering Lands would have excellent access to Highway 407, with connections to other 4-line divided highways such as Highways, 412, 418, and 401 connecting to points east and west, and Highways 404, 400, and 427 connecting to the north of the GTA.

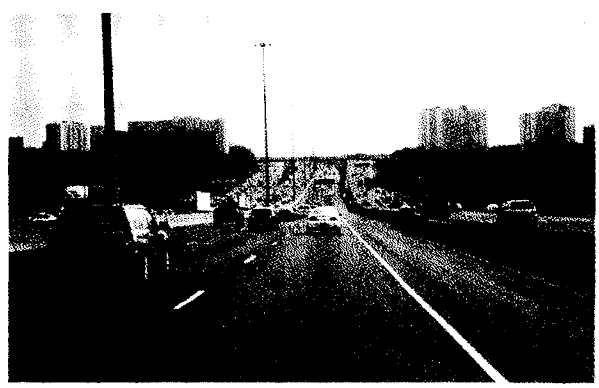
4.2.2 Highway 427 Expansion

Highway 427 is a north-south freeway in the western side of the GTA. The Highway begins at its southern terminus with the Queen Elizabeth Way and runs north where it currently ends at Highway 7. Highway 427 is an important link between points to the southwest of Toronto (Hamilton, Burlington, Oakville, Port Credit, etc.) and Toronto Pearson Airport. Work is underway to improve the highway in various ways. The highway will first be extended north 7 km to Major Mackenzie Drive. Other improvements include widening of the Highway to add high occupancy vehicle/toll lanes. The improvements to Highway 427 could directly benefit users of the airport with potential reduced travel times during peak periods, and additional capacity for automobiles and truck traffic. Expansion work on Highway 427 is scheduled to be complete by 2021.

4.2.3 Highway 401 Expansions

Highway 401 is a major east-west transportation corridor that spans from Windsor in the west to the Ontario-Quebec border in the east. It is known as one of the busiest highways in North America as it passes through the GTA and also one of the widest as it passes to the south of Toronto Pearson Airport. Highway 401 is an important transportation corridor for residents of the GTA, and Ontario. It functions both as a key intra-regional link, and a long haul artery between Montreal, Toronto, southwestern Ontario and the United States. Highway 401 is of particular importance to the southern Ontario airports system as it is the major feeder for Toronto Pearson and Waterloo airports. Highway 401 also provides indirect connections to Peterborough Airport, Oshawa Airport, Billy Bishop Airport, Brampton Airport, and Burlington Airpark.

High traffic volumes make the highway susceptible to delays caused by adverse weather, routine maintenance, accidents or short term surges in traffic. Passengers driving to flights at Toronto Pearson Airport must consider, not the average driving time, but the possibility of lengthy delays. Any expansion of Highway 401 will positively impact travel times within the GTA. Currently there are a number of expansion projects underway that will further improve the capacity of Highway 401.



Highway 401 through the City of Toronto

Through the City of Mississauga, Highway 401 is being widened from its current six lane configuration to a twelve lane express-collector configuration. Ultimately, the highway will be expanded to express-collector configuration further west to Milton. This particular area of the highway is a known bottleneck and the expansion will improve travel times to Toronto Pearson Airport, downtown Toronto, and points further north and east. The current highway widening project is scheduled to be complete in 2019.

Further west in the Regional Municipality of Waterloo, Highway 401 is being expanded from its current six lane configuration to 10 lanes on a 4.2 km section between Highway 8 and Hespeler Road. This expansion will provide additional capacity on this busy section of Highway. This expansion project will benefit residents of the Waterloo Region with improved access to both Toronto Pearson and Waterloo airports. Work on the highway expansion through the Waterloo Region is expected to be complete in 2019.

4.3 Rail Infrastructure

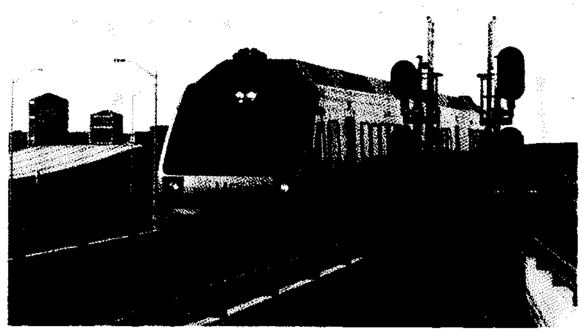
In the context of the southern Ontario airports system, rail service is primarily provided to support efficient access for passengers and airport employees, and occasionally to support freight transportation for aeronautical and non-aeronautical-related businesses at the Airport. Rail access for passengers is especially popular during peak travel times to provide an alternative to transportation on congested roadways.

Several new rail developments have been identified in southern Ontario, some that will have impacts on passenger connectivity to the southern Ontario airports system. The primary key rail developments relevant to the southern Ontario airport system are the Union Pearson (UP) Express, GO Train Expansion & Electrification and the Havelock Rail Corridor.

4.3.1 Union Pearson (UP) Express

The UP Express is an airport express train operating between Toronto Pearson Airport and downtown Toronto's Union Station. Opened in the summer of 2015, the UP Express provides consistent and reliable 25 minute service from the airport to downtown. The train operates at frequent 15 minute service intervals providing a high level of service to its riders. On opening day, the one-way UP Express fare was as high as $27.50 making it one of the most expensive airport express trains in North America. The fares were later reduced to a maximum of $12.00 per trip. After the fare reduction ridership on the UP Express increased threefold.

The UP Express operates on shared track with the GO train system and provides more than just express service to downtown Toronto with connections to the Bloor-Danforth TTC subway line, and to the regional GO Train commuter system via the Bloor and Weston stations, as well as Union Station. Connections to the TTC network and the VIA Rail system are also provided via the UP Express link to Union Station. In the future, the UP Express will also connect to the new east-west Eglinton Crosstown LRT system at the new Dennis Station, expected to be completed by 2021.



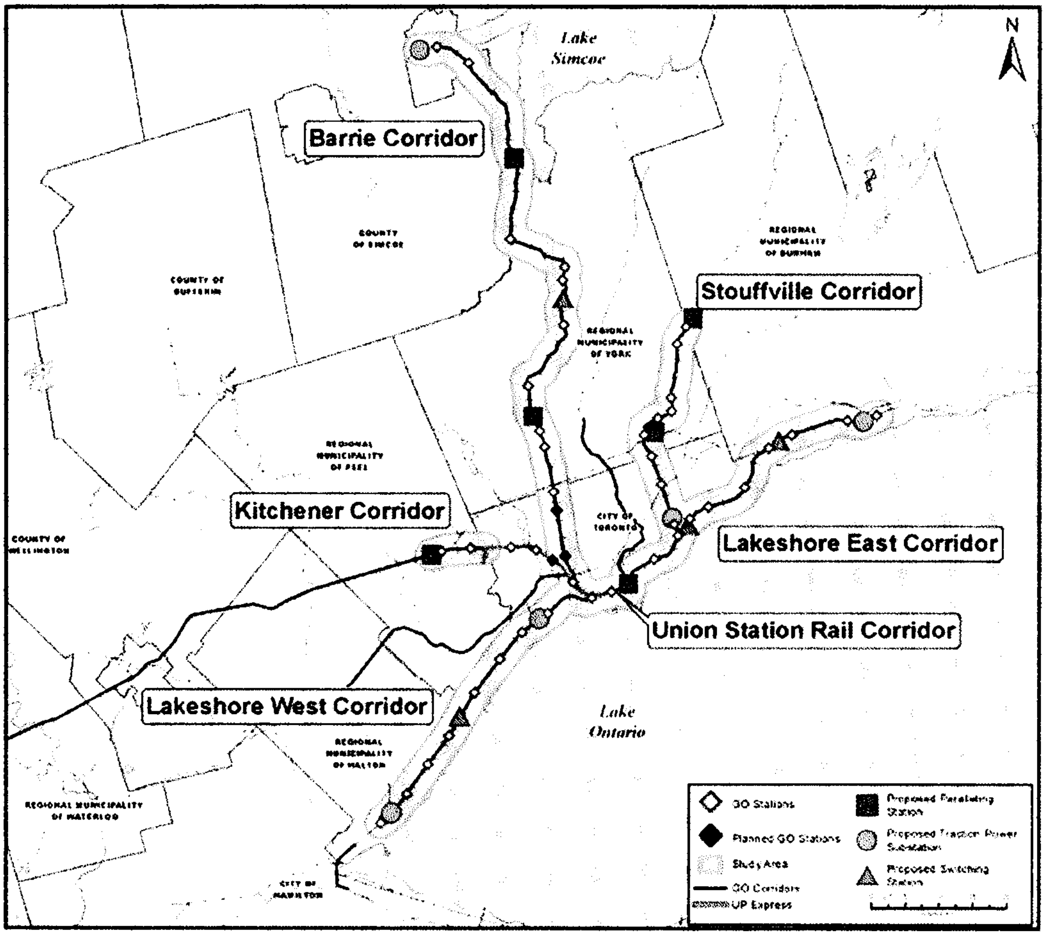
UP Express operating at Toronto Pearson

Mt.

4.3.2 GO Electrification and Expansion

GO Transit is a regional transportation service provider in the Greater Golden Horseshoe (GGH). GO Transit operates commuter train service to the communities in and around the GTA, with 7 rail lines and over 400 km of trackage. GO Transit serves customers as far east as Peterborough, as far north as Barrie and westerly to Kitchener/Waterloo and the Niagara Region. On the average work day, over 250,000 commuters make use of GO Transit.

Figure 4.2 – GO Transit Electrification Project



Source: GO Transit 2016

GO Transit is owned and operated by the Province of Ontario under the crown corporation Metrolinx. The agency has purchased most of the track that its trains use. In recent years it has been announced that most lines will be electrified with greatly increased service intervals (15 minute frequency) on the routes with the highest ridership. This increased service frequency will provide improved access to Billy Bishop Airport. In addition, with the UP Express connecting to the GO Network at 2 locations, travel to Toronto Pearson Airport via the GO network could be an attractive alternative to road transportation during peak periods. The electrification will initially involve the Georgetown, Lakeshore East, Lakeshore West, Stouffville, Barrie and Georgetown/Kitchener routes. The Milton and Richmond Hill corridors pose challenges.

The Canadian Pacific Railroad still owns the Milton lines which carries heavy freight traffic creating potential conflicts with passenger train service. The Richmond Hill corridor is subject to high water in the Don Valley presenting construction difficulties and may need a grade separation over a Canadian National freight line. Funding was announced for GO electrification in 2015; however, a timeline for the project has yet to be determined.

In addition to adding capacity and frequency with the electrification of GO lines, the introduction of service to other locations may provide improved access to some of the airports within the southern Ontario airports system. With the expansion of the GO Kitchener line to double-track operations, frequent trips to the Kitchener/Waterloo region will provide improved access to Toronto Pearson and Billy Bishop airports.

4.3.3 Havelock Rail Corridor

The Havelock Line is a rail corridor extending from the GO East Lakeshore Line to the northeast through the Pickering Lands. The line was formerly owned by the Canadian Pacific Railway as their Havelock subdivision extending through Peterborough to the small town of Havelock. The future development of the Havelock Line will have significant impacts on the accessibility of the future Pickering Airport for both the travelling public and for cargo and industrial rail users. Should GO Transit establish a service to the Pickering Lands via the Havelock rail corridor, rail connectivity could be provided to the existing GO network, providing excellent connections to southern Ontario. GO Transit now operates a bus between Peterborough and the Oshawa rail station. Many residents of Peterborough are seeking direct rail service past the Pickering Lands to the Toronto Union Station.

4.4 Transit Infrastructure

Like rail, transit connections to airports can improve access for passengers and employees, especially during periods of congestion. Transit aims to move large numbers of people within dense population centers. In the GTA, congestion is severe on roads and highways during peak hours. As time goes on and traffic continues to worsen, the travelling public will seek alternative modes of transit to access airports.

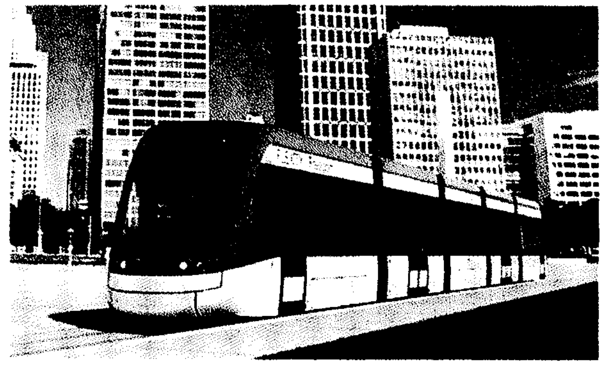
4.4.1 Renforth Gateway

This GO Transit bus station will enter service in 2017. The initial service will include bus rapid transit on the Mississauga Transitway and TTC local bus routes. Land has been reserved for dedicated bus lanes to the Toronto Pearson Airport.

4.4.2 Finch West LRT

The Finch West LRT is a proposed transit line in North York within the City of Toronto. The Finch West LRT will extend along Finch Avenue between its eastern terminus at the Finch West TTC subway station and Humber College. There are future provisions to extend this line to Toronto Pearson Airport. If the Finch West LRT is extended to Toronto Pearson Airport, improved connectivity will be provided between the airport and North York, Richmond Hill, Markham and Vaughan.

4.4.3 Eglinton Cross-Town LRT



Bombardier Flexity Freedom, light rail vehicle proposed for the Finch West and Eglinton LRT. Source: Bombardier, 2016

The Eglinton Cross-Town LRT is a 20 km long east west light rail line in the City of Toronto. Phase 1 of this line will run under Eglinton Avenue for approximately half of its distance and at grade for the remainder. The Eglinton Avenue corridor is densely populated. The line will have 25 stations as part of its Phase 1, and provisions for up to 61 total stations in the future. These future plans also include an extension to Toronto Pearson Airport from its western terminus at Mount Dennis Station. In the near term, connectivity to Toronto Pearson Airport will be fulfilled by the UP Express connecting to the Eglinton LRT at Mount Denis Station. The Eglinton LRT will potentially become an important transit asset for Toronto Pearson Airport as it will provide connections to GO Transit and TTC subway lines within the City of Toronto. The Eglinton LRT is expected to begin operation of Phase 1 in 2021.

4.4.4 Transit Connectivity

Transit Connectivity is important for Billy Bishop Airport. Billy Bishop Airport has a condensed passenger catchment area, with 85% of trips originating within downtown Toronto. Billy Bishop Airport differs from Toronto Pearson Airport as it does not have much groundside parking capacity. This suggests that passengers who are travelling to and from Billy Bishop Airport are using alternate modes of transportation, such as public transit. With the improved transit services identified herein, the level of service provided to passengers and airport employees will increase, providing better access to Toronto Pearson Airport and Billy Bishop Airport. As transit connectivity becomes better centralized around Toronto Pearson Airport, it is expected that the number of passengers and employees making trips to the airport will increase.

4.5 Multi-modal Airport Connectivity

Multi-modal connectivity is commonplace among the world's major airports. Multi-modal hubs provide transportation alternatives for the travelling public, airport employees and freight. Transportation alternatives include car, taxi, bus, light rail, regional/national rail, and commuter rail services. Toronto Pearson Airport is a major air transportation destination, yet it operates without an established multimodal transportation hub. In fact, only 8% of travellers at Toronto Pearson Airport use public transit, and 90% of employees within the airport employment area drive to work. Current alternative ground transportation methods are not well integrated with the rest of the GTA's public transit infrastructure. The only dedicated and effective ground transportation option at the Airport is the UP Express.

The airports in the southern Ontario airport system are typically not well connected with multi-modal options, the exception being Billy Bishop Airport, due to its close proximity to downtown Toronto and Union Station.

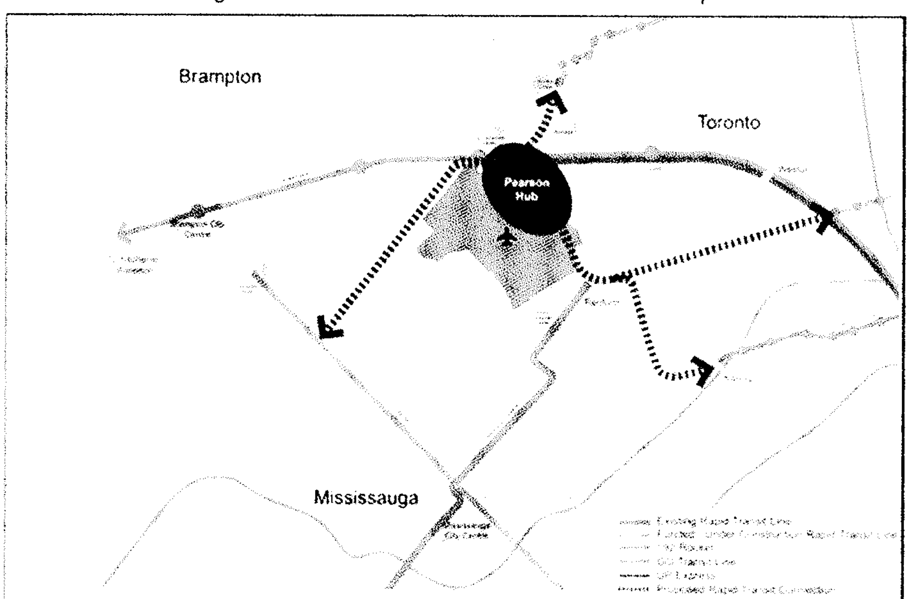
In an international context, Toronto Pearson Airport's 8% transit mode share is low compared to other major international airports. For example, London Heathrow, Frankfurt, Amsterdam Schipol and Hong Kong airport are all served by a multi-modal transit hub with direct access to municipal rapid transit systems and regional trains. These airports have transit mode share values well in excess of 35%. Most of the transit projects discussed above in Section 4.3 are planned to approach Toronto Pearson Airport in the near term, but will not connect directly as part of their initial implementation.

A multi-modal transit hub at Toronto Pearson Airport would fill the gap of all the region's public transit systems that end short of the Airport. Just as Union Station is identified as an important transportation hub for the GTA, Toronto Pearson Airport should be regarded as a location of significance transportation-wise, as it connects the GTA to the rest of the world. The GTAA is currently planning for a multi-modal facility called the Pearson Hub, or 'Union Station West'. This will bring all the transit systems that terminate near the Airport and intercity rail services to a central hub at the Airport, completing the "last mile". The Pearson Hub will require the cooperation of all levels of government and the general public.

Passenger travel demand at Toronto Pearson Airport is expected to grow into the future, with forecasts indicating that Toronto Pearson Airport could surpass more than 70 million passengers annually by 2036. As the number of passengers increase, groundside facilities such as access roadways and parking and will become congested leading to delays and decreased levels of service. The addition of a multi-modal hub increases the percentage of passenger transit mode share thus reducing the demand for road facilities at the Airport.

The shift to encouraging multi-modal transit use benefits the environment. Single occupant vehicle trips are contributors to greenhouse gas (GHG) and other particulate emissions. GHG emissions are not only damaging to the earth's climate, but also attributed to reduced air quality, posing health risks to the residents of the GTA and surrounding areas. A multi-modal hub would bring more energy efficient transportation alternatives to air passengers and employees utilizing Toronto Pearson Airport.

Figure 4.3 - Pearson Multi-modal Hub Concept



Source: Pearson Connects: A Multi-model Platform for Prosperity, 2016

4.6 Summary

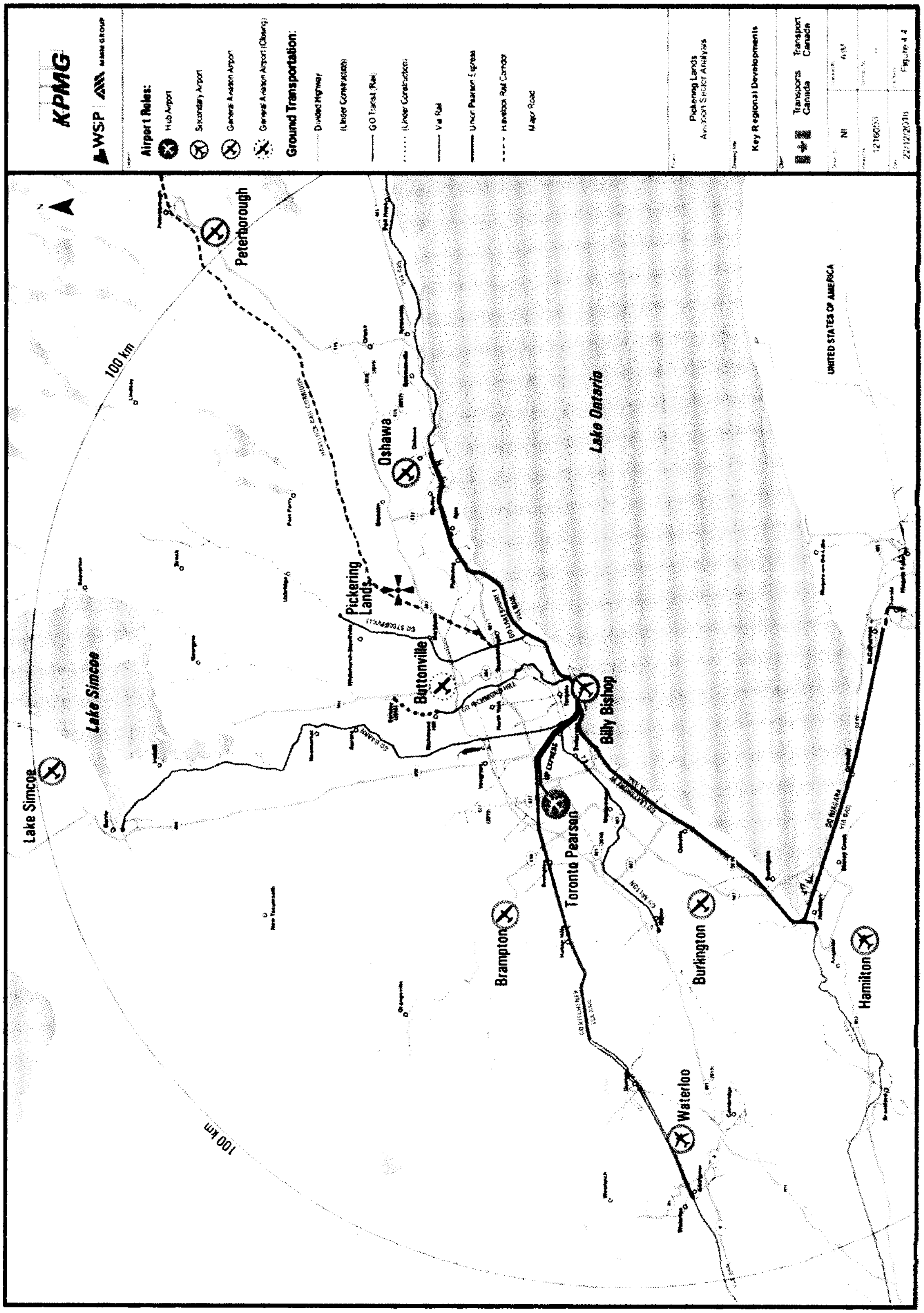
Population and economic growth within the GTA and Ontario will continue to increase Toronto Pearson Airport's traffic. The GTA's robust economy has demonstrated its ability to withstand economic challenges, such as the transformation from a manufacturing to a service-oriented economic base.

The key regional developments identified herein are summarized in Table 4.1, and illustrated in Figure 4.4.

Table 4.1 – Key Regional Developments

Type	Project	Location	Description of Work	Timing	Airport Access Benefits
Road	Highway 407E	Phase 1: Brock Rd., Pickering to Harmony Rd., Oshawa	Highway Extension	Completed 2016	- Direct highway connections to Pickering Lands and access to major divided highways (412, 418, 400, 401, 404, 427, etc.) - More direct routes from Durham region to downtown, Toronto Pearson Airport, and points further. - Improved Peterborough Connection.
Road	Highway 407E	Phase 2A: Harmony Rd., Oshawa to Taunton Rd., Clarington	Highway Extension	2017	
Road	Highway 407E	Phase 2B: Taunton Rd. to Hwy 115, Hwy 418 from Hwy 407E to Hwy 401	Highway Extension	2020	
Road	Highway 427	Hwy 409 to Hwy 407 & Hwy 407 to Hwy 7 (HOV lanes); Hwy 7 to Major Mackenzie Dr.(Highway Extension)	HOV Expansion, Highway Extension	2018-2020	- Improved access to Toronto Pearson Airport.
Road	Highway 401	Mississauga: Highway 410 to Credit River Kitchener/Waterloo: Hespeler Road to Highway 8	Highway widening, HOV/HOT lanes.	2019 2019	- Increased roadway capacity. - Reduced travel times to southern Ontario airport system airports.
Rail	Union Pearson (UP) Express	Union Station (downtown Toronto) to Toronto Pearson Airport	Rail Connection from Toronto Pearson Airport to downtown Toronto	Completed 2015	- Improved connections to/from Toronto Pearson Airport and downtown Toronto. - Connects airport to Go Transit, Via Rail, TTC and future Eglinton Crosstown LRT.
Rail	GO Transit Electrification and Expansion	Georgetown (Kitchener), Lakeshore East, Lakeshore West, Stouffville, Barrie	Electrification of existing lines	2019	- Improved frequency of service to Toronto Billy Bishop Airport, and Toronto Pearson Airport via UP Express.
Rail	Havelock Rail Corridor	Havelock, Peterborough, Pickering Lands, Toronto	Potential GO Transit Line	unknown	- Principal rail line that could provide rail service the Pickering Lands
Transit	Finch West LRT	Finch West TTC subway station west to Humber College along Finch Ave.	11 kilometers of new transit	2021	- Improved transit access for residents of North York. Conceptual extension to Toronto Pearson Airport.
Transit	Eglinton Crosstown LRT	Weston Road to Kennedy Station	19 km LRT Corridor	2021	- New light rail connections from central Toronto to Toronto Pearson Airport (via UP Express). - Within Toronto City Airport catchment area. 95% of PAX.
Transit	Renforth Gateway	Renforth Dr. and Eglinton Ave.	New transit hub.	2017	- Provisions for dedicated bus lanes to Toronto Pearson Airport. - Hub connecting TTC, GO and Mississauga Transit Busses

Figure 4.4 - Key Regional Developments



5.0 INDUSTRY TRENDS AND REQUIREMENTS

This chapter is intended to provide background information to the reader regarding current and future trends in the air transport industry and how these trends will impact activity levels at the airports within the southern Ontario airport system in the next 20 years. The contents of this chapter are based on current observed trends and the project team's opinion of how the industry will continue to evolve. The observations noted herein should not be considered as a definite description of how the industry will grow within the next 20 years and should be considered only as commentary on the air transportation sector as a whole.

5.1 Domestic, Transborder and International Trends

Between 2000 and 2015, domestic passenger traffic for all Canadian airports grew by 53 percent or 2.9 percent per year. Toronto Pearson Airport's domestic traffic grew by 34 percent during the same period, or 2.9 percent per year. The slower growth at Toronto Pearson Airport results from new services at Billy Bishop Airport and new point-to-point direct air services to and from other destinations that now overfly Toronto, reducing the need for passengers to connect through Toronto Pearson Airport. Domestic services are intensively competitive, with three airlines (Air Canada, WestJet and Porter) serving intra-Canada routes from hubs in the GTA.

Transborder passenger traffic for all of Canada grew by 27 percent, or 1.6 percent per year for the 2000-2015 period. At Toronto Pearson, this component grew by 11 percent, or 0.6 percent per year. Traffic loss to Billy Bishop Airport accounted for over half of the difference between Toronto Pearson's growth and the nationwide performance.

Boeing has predicted that these trends domestic and transborder air service trends will continue through to 2035 and its Current Market Outlook predicts a 2.6 percent annual growth rate for traffic within North America.

International routes have been very dynamic, particularly at Toronto Pearson Airport. Since 2000, international traffic for all Canadian airports has more than doubled, with a growth of 108 percent. This represents an annual increase of 5.0 percent. In 2000, international traffic accounted for just over 15 percent of total Canadian passenger airport enplanements. By 2015, international routes comprised over 20 percent of total passenger traffic for Canada and Toronto Pearson Airport's international traffic grew by 122 percent, or 5.5 percent per year. In 2000, international traffic accounted for 22 percent of Toronto Pearson Airport's total traffic and by 2015, over 33 percent of the Airport's enplaned-deplaned traffic involved international routes. International traffic exceeded transborder traffic by 23 percent.

Toronto Pearson Airport's international services have changed, both in scale and in the carriers and destinations. The "traditional" routes to Europe and the Caribbean continue to grow, with more competition, new routes, new airlines such TAP Portugal (returning to Toronto Pearson Airport in 2017) and WOW's air service to Iceland, that launched in 2016. Air Canada has introduced many new seasonal flights to Prague, Budapest, Berlin (starting 2017) and other destinations. Flights to the largest destinations operate multiple times daily.

The growth of "non-traditional" services has been particularly dramatic. Many airlines have recently started serving the airport; Hainan and Eva Air in 2010, Ethiopian and Philippine in 2012, Saudia and Egyptair (2013), China Eastern (2014) and China Southern (2016). Air Canada now offers nonstop flights to Dubai, New Delhi, Beijing, Seoul and Shanghai, and will begin a nonstop flight to Mumbai in 2017. The new international services benefit from Toronto's large immigrant communities, economic growth in Canada and particularly the destination countries. Toronto Pearson Airport's extensive North American feeder network and new types of aircraft of 200-300 seats are capable of serving ultra-long routes.

Boeing expects these international services will grow rapidly over the 2015-2035 period. Its forecasts call for North America-Europe traffic to grow by 2.9 percent annually. Trans Pacific and North America-Latin America traffic will grow by 4.5 percent and 5.4 percent annually, respectively.

The new international flights often have operational needs that are very different from than Toronto Pearson Airport's established older services. Most operate on a once-daily basis or less and use wide body aircraft. The low frequencies make relatively modest demands on Toronto Pearson Airport's runways. However, they do require high volume terminal facilities. Many of the foreign carriers belong to alliances such as SkyTeam or OneWorld. They require terminal facilities that are close to those of other alliance members.

Most international flights will continue to require extensive feed from North American services. Airlines entering a new market are usually very risk-averse, and will choose an airport that has already proven successful as an international gateway. Inertia will strongly favor Toronto Pearson Airport over other potential gateways such as Waterloo Airport and Hamilton Airport. However, any growing market creates new segments with specialized needs. Charter flights to the Caribbean and U.S. Sunbelt already operate from many smaller airports in Ontario and Canada. They serve locally originating, point-to-point travelers, usually on a seasonal basis. The charter flights allow low risk, incremental growth without the longer term commitment for scheduled services.

5.2 Aircraft Trends

Aircraft fleets have shown robust growth over the past 5 years. In 2011, the commercial jet fleet consisted of 15,800 active units compared to 19,000 active units in 2016, representing an increase of 3,200 aircraft or 20%. Aircraft fleets are categorized into 6 distinct segments: ultra-long range, long range, medium range, short range, corporate and flight training. Aircraft of all segments follow market conditions such as technological advancements in efficiency and regulatory policy in the evolution of their fleets.

Technological improvements in efficiency affect the evolution of all aircraft segments. In high fuel price conditions, air carriers adopt more efficient aircraft to lower operating costs and gain a competitive advantage over other airlines. The geared turbofan engine of some next generation aircraft reduces fuel burn by more than 10%, not only benefiting the operational costs of the airline but also reducing the environmental impact of aviation. Some other efficiency improvements to aircraft include:

- Use of lightweight materials such as carbon fibre, titanium and composite plastics.
- Improved aerodynamics through winglets and raked wingtips.

- Area Navigation (RNAV) and Global Navigation Satellite System (GNSS) routing optimize flight paths for efficiency benefits.

Regulatory policies implemented by governments or airport operators also promote aircraft development. Stricter environmental regulation by governments will require engine and aircraft manufacturers to improve emissions performance to comply with standards. As part of Transport Canada's *Action Plan to Reduce Greenhouse Gas Emissions from Aviation*, the Canadian airlines have committed to implement measures in order to reduce greenhouse gas emissions from Canada's aviation sector[8]. One of these measures is targeting "faster" fleet renewals which would speed up the implementation of fuel saving technologies in the fleet of Canadian commercial aircraft. Canadian air carriers expect to achieve an average annual fuel efficiency improvement of 0.7 percent for both domestic and international flights between 2005 and 2020 through further fleet renewals.

Airport operators also set policies on aircraft noise and slot restrictions which influence the trends of aircraft. For example, airports that are nearing their aircraft movement capacity can increase overall passenger throughput by encouraging larger aircraft with more seats. This results in a general trend of aircraft increasing in size and passenger capacity.

5.2.1 Large Ultra-Long Range

Ultra-long range aircraft are used on long-haul flights connecting major airline hubs having flight durations of more than 12 hours. The Airbus A380, Airbus A340-600, Boeing 777-300ER and Boeing 747-400 are some examples of the ultra-long range aircraft in service today, many of which are operating at Toronto Pearson Airport.

From 2011 to 2015, the in service fleet of ultra-long range aircraft has increased from 831 to 1,168 aircraft, an increase of 40%. The Boeing 777-300ER accounts for 55% of the ultra-long range aircraft segment. The growth of the segment will rely on the current types that remain in production in addition to the introduction of next generation aircraft such as the A350-1000 and B777X (-8,-9) that promise greater engine, airframe and aerodynamic efficiency. The future growth of the segment is robust with 785 ultra-long range wide-body aircraft on order in 2015.

Takeoff and landing slot limitations at major international airports have been especially important in driving route concentration and demand for ultra-long range aircraft. The A380 is a particularly valuable aircraft in a carrier's fleet on well-established routes, where traffic volumes are very high, passenger departure time preferences are concentrated in a small interval, and the airline faces a physical, institutional or regulatory constraint on operational frequency. Toronto Pearson Airport's sole A380 operator, Emirates, is limited to three flights a week under the Canada-United Arab Emirates air services agreement. Emirates operate a large fleet of A380 aircraft as a result in part of movement limitations at its hub airport.

Emirates serves Toronto Pearson Airport with an A380-800 supporting their Toronto-Dubai air service.

[8] Transport Canada. *Canada's Action Plan to Reduce Greenhouse Gas Emissions from Aviation*. 2012.

It is expected that ultra-long range aircraft types will continue to operate at Toronto Pearson Airport and the volume of these aircraft types is expected to increase as the GTAA continues to market the airport as an international connecting hub.

The A380 faces an uncertain future as Airbus is reluctant to build a second-generation aircraft with improved engines. The current fleet entered service in 2007, and will become dated in the next decade. However, traffic growth will ultimately require larger aircraft than the 777 which operates on many of Toronto Pearson Airport's long haul routes. The 777X could allow an expansion of Toronto Pearson Airport's long haul capacity without changes in runway activity.

5.2.2 Long Range Medium Volume

These wide-body aircraft operate intermediate volume long distance routes of 6 to 12 hours in duration. This segment is dominated by the Boeing 767, 787 and Airbus A330 series. In 2016 there were 2,371 long range aircraft in operation with the Boeing 767 and 787 accounting for 1,153 units and Airbus's A310 and A330 at 1,194 units. Airbus and Boeing have always demonstrated fierce competition for market share and maintain their respective philosophies.

While Airbus has adopted a route concentration model, Boeing favours fragmentation. Boeing believes that there will be a rapid growth of demand for nonstop services on very long, trans-ocean sectors on non-traditional routes. Its B787 family of aircraft can operate economically on ultra-long sectors having insufficient traffic for larger wide-body aircraft such as the B777. The Airbus A350 is designed to replace the Airbus A340-600 and compete with the Boeing 777-300ER and Boeing 777X.

Air Canada is the first Canadian airline to operate B787 aircraft. Source: Air Canada

Boeing has suggested that the B787 will duplicate on the Pacific the route fragmentation caused by the B767 in the 1990s on the Atlantic. During the same period, the B767 allowed many low volume North America-Europe city-pairs to obtain nonstop services. Most could not have supported flights by the 747 and DC-10 that dominated the Atlantic. The new routes included Ottawa-London, Toronto-Warsaw, Atlanta-Stuttgart, Toronto-London daytime flight, Chicago-Stockholm, Newark-Istanbul and Philadelphia-Brussels. It is expected that this fragmentation will spread, offering long distance non-stop destinations to travelers at airports that would otherwise not receive such a service. The B787 has its greatest opportunity in facilitating new, long distance routes. However, they have also allowed airlines to strengthen their traditional routes. For example, Air Canada offered a second nonstop Vancouver-London service using the B787 during the summer of 2016. Its competitor British Airways upgraded its B747-400 flight to an A380. The process of fragmentation has affected both high volume and newly emerging international gateways.

Most new fragmentation services operate between a large gateway (e.g. Beijing) and a secondary point (e.g. Calgary) thus diverting traffic from primary routes such as Toronto/Vancouver-Beijing. Other examples include London-Austin, San Francisco-Chengdu and New York-Baku. The large gateways themselves obtain nonstop flights to secondary points overseas. The emerging secondary gateway airports benefit, but the new services have mixed consequences for the established hubs.

5.2.3 Medium Range

Narrow-body jets dominate the medium range, high frequency air travel segment. The medium range segment includes aircraft that have flight duration between 3 to 6 hours. The majority of intra-North American services operate at high frequency using 120-180 seat narrow body aircraft rather than less frequent departures of two aisle wide-body aircraft. The narrow-body aircraft group is a highly competitive market of the Airbus A320, Bombardier C-Series and Boeing 737 families. These aircraft are responsible for the largest commercial aircraft segment with 11,406 active units in service in 2015. In 2011 there were 7,521 narrow-body aircraft in service representing a 5 year increase of 3,885 active units or +34%.

Air Canada operates a fleet of A320 family aircraft supporting domestic and transborder flights.

The majority of long, non-regional flights in Canada are operated using narrow-body jets, as well as most cross border trips. WestJet operates a fleet of Boeing 737 family aircraft for their narrow-body operations and Air Canada operates a fleet of Airbus A320 family aircraft. The narrow-body jet market is not as volatile as the other segments, in regards that no major airframe redesign has happened, but improvements on previous models especially in efficiency are made. The Boeing 737 MAX and Airbus A320neo are greatly improved iterations of the previous aircraft offering greater efficiency, range, payload and passenger comfort. In addition, extended range editions of these narrow body aircraft will also be available, to allow trans-Atlantic and other potential long range routes.

The airlines are replacing their existing fleets with new generation of aircraft which have more capacity than those they replace. Airports such as Toronto Pearson Airport will obtain additional seat capacity with no corresponding increase in runway use.

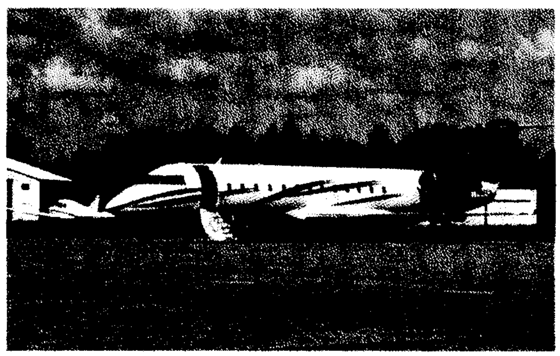
5.2.4 Short Range

Regional aircraft are operated to efficiently serve short routes less than 3 hours in duration. They typically have a passenger capacity of 50-100 people and are used to feed larger airline hubs with passengers. The regional aircraft segment consists of two major manufacturers being Bombardier with its CRJ and Dash 8 lines and Embraer with its E jet line. The large regional jet market has seen the fastest growth out of all aircraft segments in recent years. In 2011 there were 950 active large RJ's and by the end of 2015 there were 1,970, a 52% increase over the 5 year period.

The current trend in short range aircraft is increasing size and seat capacity. All of the new short range aircraft have 70 to 100 seat passenger capacity and 70 seats has become the de facto minimum size for domestic short range aircraft. The smaller short range aircraft, for example, the 50 seat Regional Jet (CRJ-100, 200) have become economically obsolete. Although some still serve short, high yield routes, their airframes are approaching the end of their useful lives and any increase in fuel prices will accelerate their retirement. Turboprop aircraft in the 19-50 seat range face similar problems of high operating costs and obsolescence.

The Bombardier Dash 8 Q400, a short range turbo prop aircraft has replaced 50 seat Regional Jets on many routes. Its 70+ seat capacity and turboprop engines give it low operating costs and an ability to serve a wider range of airports than many jet aircraft. The Bombardier Dash 8 Q400 uses 30% less fuel and produces 30% less emissions than a comparable capacity jet aircraft on short haul routes. This makes the Q400 extremely popular on frequency-sensitive routes with variable passenger traffic where there are times when seat vacancy is high.

5.2.5 Corporate Aviation


Bombardier's CRJ and Challenger aircraft are among the many types of corporate general aviation aircraft operating at southern Ontario airports.

The business aviation segment involves transporting small groups of people for corporate purposes. The business aircraft segment encompasses the full spectrum of ranges, from short to ultra-long. Business aircraft are either solely-owned by a business, chartered from an aircraft operator, or operated under a fractional (timeshare) ownership. The business aviation fleet includes corporate jets, turbo props and piston aircraft. In the corporate jet group, the Cessna (Citation family), Bombardier (Challenger and Global Express), Gulfstream, Embraer (Phenom) and Dassault (Falcon family) fleet totalled just over 21,000 aircraft worldwide. These aircraft types are commonly seen at many of the southern Ontario airports identified within this study, including Toronto Pearson Airport.

A recent entrant into the corporate jet market is the very light jet (VLJ). The VLJ category was created to develop personal jet aircraft that could have lower operating costs than their conventional counterparts and be operated by a single pilot and to be able to operate from small GA airports. It is a growing category of aircraft, aimed at competing with turbo props, pistons and larger jets. It is important to consider the VLJ segment of business aircraft in the Greater Toronto Area context as these aircraft are capable of operating at the smaller airports which are inaccessible to larger corporate jets.

The remainder of the segment is made up of turbo props and piston aircraft ranging from the Beechcraft King Air to the smaller twin-engine aircraft such as the Piper Seneca. The turbo prop and piston corporate aircraft segment are significant in the GTA airport system context as these aircraft are capable of operating out of Billy Bishop Airport as well as the other small general aviation airports in the GTA.

Bombardier expects the business aviation segment to endure strong growth as the global economy recovers. Most of the growth will be led by emerging markets such as South America and Asia with the majority of new growth in the segment being in the large corporate jet segment. As the corporate general aviation market is expected to grow, so will the demand for airport facilities supporting this service type.

An effective and efficient airport system must provide sufficient capacity for corporate general aviation traffic. Since many corporate aircraft owners and operators require access to urban centers to conduct business (such as downtown Toronto), they are competing to obtain landing slots at the same airports where passenger air services are operated.

Toronto Pearson Airport's corporate general aviation traffic has slowly migrated to other airports, such as Oshawa Airport, Waterloo Airport, Lake Simcoe Airport and others due to high landing and service fees at Toronto Pearson Airport. Although these airports are much farther from downtown Toronto, consultations suggest that corporate helicopters are being used to transfer passengers from these secondary and general aviation airports to Billy Bishop Airport, or private helipads within downtown Toronto.

It is important that capacity be provided for corporate general aviation traffic within an airport system; however, the requirement to provide this capacity in close proximity to urban centres is becoming less important as more and more corporate aircraft operators utilizing secondary and general aviation airports, and connecting to urban centres via helicopter. This has been seen in other large metropolitan centres with diverse airport systems, such as New York City, and is expected to become a more popular trend in the southern Ontario airports system.

5.2.6 Flight Training

Flight training is an important element in terms of supporting the future growth in aviation. More specifically, as worldwide demand for air travel continues to grow, so will the demand for pilots. Flight training in Canada has undergone a transformation in the past few decades.

There are still many small flight training organizations in operation in Canada supporting ad-hoc flight training in local communities; however, as demand has increased more high-volume flight training organizations have established operations at Canadian airports, some at the southern Ontario airports identified within this study. As of the summer of 2016, the following southern Ontario airports were supporting general aviation flight training:

- Billy Bishop Airport
- Buttonville Airport
- Waterloo Airport
- Peterborough Airport
- Lake Simcoe Airport
- Oshawa Airport
- Burlington Airpark
- Hamilton Airport
- Brampton Airport

The Cessna 172 is a popular general aviation training aircraft operated by many flight training units in southern Ontario.

Flight training is expensive and is continuing to increase in cost due to rising fuel and insurance costs. Many flight training candidates are enrolling in professional flight training programs offered by educational institutions. This method of training is preferable for many candidates as governments subsidize many programs. These training programs can create a substantial demand for airport infrastructure. The lightweight aircraft used in the training do not mix efficiently with the larger aircraft used in commercial services and at some airports, their operation could create potential capacity constraints.

Other countries (such as India and China) are experiencing high levels of demand for pilots, and are seeking overseas schools to support their flight training requirements. Many organizations in Canada have established flight training units to support international flight training requirements utilizing existing airport infrastructure. Toronto Airways is currently in the process of establishing facilities at Oshawa Airport to support international flight training through an agreement with Beihang University in China. This program is currently being moved from Buttonville Airport.

Flight training operations (both at an ad-hoc and high-volume level) need acceptable facilities for the future training of pilots to meet future aviation demands. Candidates wishing to pursue flight training need reasonable access to airports that provide these training programs. Growing commercial aviation demands on GTA airports are forcing candidates to make lengthy commutes; (sometimes up to an hour or more) to access airports with suitable training programs.

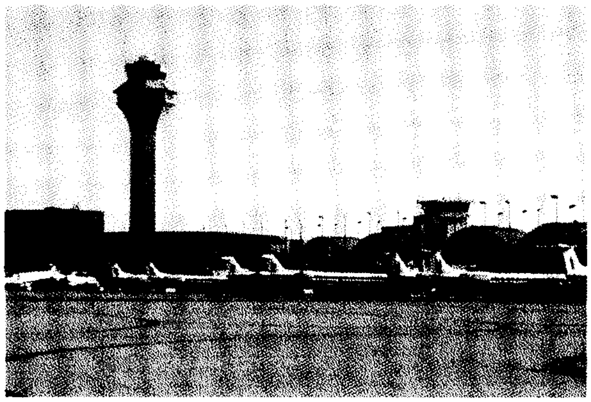
Few airports are developed specifically to support general aviation flight training. Flight training is usually conducted at general purpose airports; however, there are exceptions. Peterborough Airport was recently expanded to support high volume flight training activities. This study recognizes the need for general aviation flight training facilities within the southern Ontario airport system. Most flight training activities will likely occur at airports having an abundance of capacity.

5.3 Air Carrier Trends

5.3.1 Hub and Spoke Model

The hub and spoke model has traditionally been the model of choice for many large-scale legacy air carriers in North America. Air carriers favour the hub and spoke model as they can consolidate passenger traffic from small markets to larger domestic and international destinations. Overall, hubs allow air carriers to provide connectivity between multiple city pairs, while consolidating their operations to reduce costs.

Air carriers operating at a hub airport typically arrange their hub-and-spoke services around a series of "banks." Flights converge on the airport from 100 or more origins at the beginning of each bank. After a connecting period, the aircraft then depart in large groups to many destinations. An airline may use all of its available gates during the bank, and the entire Air Traffic Control (ATC) process may switch to favour departures or arrivals. Sometimes, the banks operate on a directional basis, with arrivals from the east connecting primarily to departures for the west. During the inter-bank periods, the airport may see relatively little activity.


American Airlines' hub and spoke operation at Chicago O'Hare International Airport.

At some highly congested airports, a new entrant may encounter difficulties obtaining suitable timings for its proposed flights. While the circumstances vary widely, the new entrant might obtain timings that are close to its original requests. At some airports, it must purchase the allowable timings at great expense. These problems are compounded when an airline wants to establish multiple daily flights. The carrier would also require cost-effective gates and handling services. Should it be unable to obtain a satisfactory accommodation, the community could forego a valuable service. The airport would also suffer a revenue loss. These circumstances would point to a capacity shortfall, whatever the airport's physical throughput.

Typically, many large hubs have higher fares as compared to smaller regional airports. The dominant carrier has considerably higher market power through its greater choice of nonstop destinations, flights and total capacity. New entrants may be reluctant to offer a challenge and may be unable to obtain suitable gates or slots. Hub airports are often capacity constrained during peak periods. New entrants can have varying degrees of difficulty beginning services, and may face market domination from incumbent carriers. However, capacity constraints at hub airports can indirectly increase demand at secondary airports within a system as they have lower fees and fewer barriers to entry for carriers introducing a new air service.

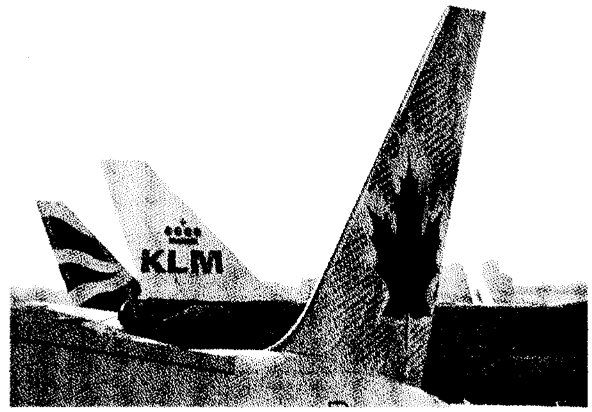
5.3.2 Connecting Traffic

Air carriers are continuing to expand their networks to provide superior service offerings when compared to their competitors. Seamless, high quality connections are vital to a self-feeding network. Most airlines operate one or more hubs to optimize connection opportunities.

Toronto Pearson Airport is a large hub for WestJet and Air Canada. However, Canada's linear geography allows other airports such as Winnipeg and Ottawa to serve small quantities of connecting traffic. At Billy Bishop Airport, Porter Airlines operates a fleet of DHC8-400 turboprop aircraft, serving regional markets in eastern North America which offers some connection opportunities.

Consultations with Air Canada and the GTAA suggest that Toronto Pearson Airport will continue to grow its passenger markets by leveraging its position as a North American hub for connecting international traffic.

This suggests that Air Canada will be putting more focus towards building their high-volume international markets using wide-body aircraft, and seeking flight timings that maximize traffic feed from connecting flights operating smaller aircraft.



Toronto Pearson Airport will continue its role as a primary hub, with a focus on attracting more connecting passengers.

Research, consultations and analysis suggest that connecting traffic will continue to grow at Toronto Pearson Airport, with a modest increase at Billy Bishop Airport. Traffic at the other secondary airports supporting passenger service within the system (Hamilton and Waterloo) is expected to grow on an Origin/Destination (O/D) basis. Most passengers will begin or end their trip at these airports, rather than transiting through the airport to connect to another flight. These passengers may make onward connections at more distant hubs, such as WestJet's large selection of flights at Calgary.

5.3.3 Industry Consolidation

The airline industry has seen extensive consolidation, especially since the industry became deregulated in the United States, in the late 1970's. In order to protect from anti-competitive air carrier behaviors and pricing, air carrier mergers are closely examined by governments before they can approved. Air Canada's 1999 absorption of Canadian Airlines International saved the latter from insolvency, but greatly increased market concentration.

Canada has three relatively large (Air Canada, WestJet, Porter) and many small carriers. A merger involving a small carrier would be unlikely to trigger widespread monopoly concerns, although it might create issues for specific routes. A merger involving two or more of the larger carriers would likely be prevented as it would be seen as anti-competitive practice. Only if one party were at risk of imminent failure would such a transaction be approved. In the absence of a Canadian partner, any merger involving either two major airlines would likely involve a foreign airline. However, Canada currently limits foreigners to holding no more than 25 percent of any air carrier. Most bilateral agreements require that Canada designate an airline that is under substantial ownership and effective control by Canadian nationals. Other nations might reject Canada's designations if a merger created an airline that violated these conditions.

In November 2016, the Government of Canada announced that it would exempt two airlines from the 25 percent foreign ownership rule. Enerjet of Calgary and Canada Jetlines of Richmond, B.C had previously sought exemptions to simplify the development of low cost carriers. The government will develop a new policy applying to all carriers whereby the maximum foreign ownership ceiling would be raised to 49 percent. Until now, foreign investors could not own more than a 25 percent share of a Canadian airline. The new change in foreign ownership will give Canadian carriers wider access to foreign capital markets. However, the greatest obstacles for airline financing are the low profits and high risks. These problems particularly apply to new entrants.

The airline industry is still far from a truly multinational structure. The Lufthansa/Swiss/Austrian, British Airways/Iberia and Air France/KLM mergers have created international holding companies, but within the framework of the European Union. Each original entity has retained its autonomy and national identification. The component airlines participate in joint marketing initiatives such as code sharing. They have adjusted their schedules and share many ground facilities; however, these arrangements are far less comprehensive than true operating mergers.

There is no evidence of the "internationalization" of Canada's airlines. A foreign entity purchasing Air Canada or WestJet would require a management that is fully familiar with the Canadian market. The new entity would likely emulate the Canadian carrier's routes and schedules. Greatly relaxed ownership rules, considerably more permissive than Canada's new policy, would allow foreign airlines to operate Canadian domestic "cabotage" services, meaning they would be permitted to carry passengers from one Canadian city to another, with a foreign-registered aircraft. This is currently not permitted. In addition, if a foreign air carrier were to operate cabotage services in Canada, they would likely require an isolated pool of aircraft for intra-Canada services, which would prove to be a major expense.

As a large and prosperous nation, Canada can offer more cabotage opportunities than most other partners. An exchange of domestic rights would likely have a greater appeal to a foreign than a Canadian airline. Canadian carriers would likely oppose such an exchange. The U.S. industry is also firmly against an exchange of domestic traffic rights.

Any radical changes to ownership, right of establishment, or cabotage rules would be strenuously opposed by Canada's airlines. There are no precedents for such liberalization and, for this reason, airline industry consolidation is not expected to dramatically impact capacity or demand at the southern Ontario airports, throughout the 20 year planning horizon of this study.

5.3.4 Charter Carriers

Aircraft charter operators have been providing lower-cost air travel alternatives to passengers for many decades, and are operated in different forms:

- Some charter carriers are established similar to mainline legacy air carriers in such a way that they operate their own aircraft and have scheduled departure times that are consistent, usually on a week-to-week basis, depending on the season. Under this operational model charter carriers sell individual aircraft seats through their internal reservations systems.
- Alternatively, air charter carriers can sell 'blocks' of seats to tour operators, who then sell vacation packages to their customers that could include hotels, car rentals, etc.
- Thirdly, and similar to the operational model identified above, charter operations can be viewed as a group of individuals or a single entity renting an entire aircraft, complete with crew, fuel, and all necessities required to fly a specific route.

Several air charter operators provide air services to the traveling public through many of the airports included within this study. For example, Air Transat provides wide-body aircraft charter services to Europe using A310-300 and A330-100, 200 aircraft types, and seasonal narrow body services (B737-

800) to sun destinations from Toronto Pearson and Hamilton airports. Sunwing operates B737-800 aircraft and provides seasonal narrow-body air charter services from Toronto Pearson, Hamilton and Waterloo airports serving sun destinations (e.g. Mexico, Jamaica, Florida, the Dominican Republic, etc.). Sunwing also provides a few domestic charter services to Vancouver, Gander, and other cities, and ad-hoc charters upon request. Condor Airlines, a member of the Thomas Cook Group, offers discount flights to Frankfurt. Air Canada Rouge provides both low frequency seasonal and daily year-round flights to leisure destinations.

Air Transat offers charter air services from Toronto Pearson to many points in Europe, as well as to sun-spot destinations.

Canada now allows any company that is "fit, willing and able" to operate scheduled services. This has largely eliminated the distinction between charter and scheduled flights. The "charter" airlines can now sell flight-only services, in addition to their all-inclusive packages. The scheduled airlines sometimes operate flights on behalf of charter companies, and can offer charter-type inclusive tour packages. Both the scheduled and the charter airlines operate low frequency, seasonal services. Other ad-hoc charter air services (such as those currently provided by Canadian North utilizing B737-300 aircraft) are offered through airports like Peterborough, where local tour operators purchase all seats on an aircraft and sell tour packages to destinations like New York, Boston and St. John's. These services are continuing to grow at Peterborough Airport, and could become more popular at designated secondary or general aviation airports within the southern Ontario airports system.

It is expected that air carriers will continue to provide air charter services through the southern Ontario airports. If an airport were to be developed at Pickering, it is likely that air charter carriers will initiate low frequency services at the new airport, provided the appropriate, cost-effective facilities are provided.

5.3.5 Low Cost/Ultra Low Cost Carriers

Low Cost Carriers (LCCs) and Ultra Low Cost Carriers (ULCCs) have greatly stimulated traffic in the United States, Europe, South America, and other markets. LCCs and ULCCs have had a well-documented impact on traffic growth at many airports where passenger activity was historically low or non-existent, and since the inception of LCC/ULCC air services activity levels have increased dramatically. They frequently select secondary airports as bases for their operations, as they are provided with considerable flexibility in terms of flight timings. Establishing operations at secondary airports also partially insulates the LCCs and ULCCs from entrenched competition.

Traditionally, LCCs and ULCCs establish a 'focus city' and offer dozens of daily flights to multiple destinations (e.g. EasyJet has an extensive ULCC operation at London's Luton Airport, whereas Ryanair offers several ULCC flight destinations from London's Stanstead Airport). These airports are classified as secondary-type airports within the London airports system. LCCs and ULCCs prefer to establish operations at lower-cost secondary airports where they have the ability choose from many different inception dates, flight schedules, aircraft types, and fares. By choosing a secondary airport, they avoided the entrenched competition from established carriers. If a similar operation were to be established in southern Ontario, ULCCs would select a 'focus city' with a secondary airport offering low user fees.

Hamilton Airport has frequently been cited as a gateway to southern Ontario for low cost carriers. Between July 1996 and September 1997, Greyhound Air operated a low fare domestic service to Hamilton Airport, using leased 727-200s. The expected synergies between bus services and the airline never materialized, and flight loads were disappointing. A condition of Air Canada's 1999 acquisition of Canadian Airlines International was that the newly merged entity could not serve Hamilton Airport for an initial period. This created a "window" for a low cost carrier to become established.

WestJet (originally formed as a Canadian LCC) originally chose Hamilton Airport as its gateway to southern Ontario. In 2002, it started serving Toronto Pearson Airport, using slots from the bankrupt Canada 3000 airline. In 2004, WestJet shifted most of its flights from Hamilton Airport to Toronto Pearson Airport. LCC Virgin America flew from Toronto Pearson to Los Angeles and San Francisco in 2010-2011.

WestJet valued Toronto Pearson Airport's revenue advantage more than Hamilton Airport's cost advantage. WestJet retains a presence at Hamilton Airport, and also serves the Waterloo Airport.

In some cases, a LCC or ULCC at a secondary airport may draw passengers from the airport system's hub airport, and stimulate only a modest quantity of 'new' traffic. In addition, established air carriers may respond to an LCC or ULCC start-up with selectively lower air fares and a higher frequency of air services.

NewLeaf began operations in July, 2016 utilizing B737-400 aircraft types. NewLeaf provides LCC air services from Hamilton, to destinations in eastern and western Canada. Source: CBC News.

This response by established carriers can occur at the secondary airport where the LCC or ULCC initiates air services, or at another airport within a system. This is the recent case with the start-up of NewLeaf, a new ULCC ticket reseller for flights operated by Flair Air. NewLeaf began flight operations from Hamilton Airport in late July 2016 with direct services to Moncton, Halifax, Winnipeg, Edmonton and Saskatoon. Until recently, Canada was lacking a low cost carrier since the failure of JetsGo and CanJet, and the repositioning of WestJet into an established full service airline.

The established air carriers have proven hostile to new LCC and ULCC entrants. ULCC and LCC carriers typically require higher load factors (usually 85% or more) to recover costs and make a particular air service profitable. The yield management systems of the legacy air carriers and the few empty seats on most flights enable them to offer ultra-discounted seats on selected departures. By providing these lower fares on competing flights, they can essentially take passengers away from the ULCC/LCC service, and lower overall load factors below the break-even level. The new low cost entrants are inherently risky and suffer high rates of business failure.

There is no direct evidence that WestJet and Air Canada have added capacity and lowered their fares to compete with NewLeaf at Hamilton Airport; however, it is likely that these established carriers will selectively offer lower fares on flights competing with the new ULCC, especially on flights operating from Toronto Pearson Airport.

The established carriers have emulated their low cost competitors. They no longer provide free meals for low fare passengers, and charge for checked luggage, assigned seats and other benefits. Through their yield management systems, they can offer ultra-low fares on selected flights. By accommodating several premium passengers, a flight by a established airline can reach its profitability target. The airline can then offer the remaining seats at a deep discount. This has greatly reduced the impetus for low cost carriers in Canada.

In summary, it is expected that LCCs and ULCCs will become more popular in the Canadian market and will continue to attempt to provide air services to residents in southern Ontario, including the potential for a trans-Atlantic ULCC or LCC air service. LCCs and ULCCs are not expected to seek runway slots at Toronto Pearson Airport (because of the high user fees and the strong Air Canada/WestJet presence); however, it is expected that they will continue to operate from designated secondary airports within the southern Ontario airport system (such as Hamilton Airport, and potentially Waterloo Airport), and possibly at the new Pickering Airport, once established.

5.4 Air Cargo Trends and Requirements

Air cargo is typically classified in three major categories:

1. Air Mail;
2. Air Express; and
3. General Air Freight.

Each of the three classifications of air cargo are discussed herein including how trends in the air cargo industry may impact activity and demand for airport facilities within the southern Ontario airports system, within the 20 year planning horizon.

5.4.1 Air Mail

In the context of air cargo, air mail is defined as the delivery of letters, packages and other goods shipped via traditional mail delivery (i.e. Canada Post). Air mail is typically shipped within the cargo holds of scheduled passenger service aircraft, and through contracted agreements with air freight operators. Air Canada currently holds a contract with Canada Post to deliver air mail to a multitude of destinations within their route network; other smaller carriers may have similar contracts, supporting smaller communities outside the larger Air Canada route network. Foreign airlines carry inbound mail. In addition, CargoJet provides contracted air mail delivery services for Canada Post as an air freight provider.

The post offices sort the mail and consolidate items for each destination in large cloth bags. The airline can either assemble the bags in unit load devices or bulk load the mail in the aircraft belly holds. Ground handling resources are minimal to support these types of operations. It is expected that current air mail delivery services will continue to be supported by air carriers between city pairs within their route networks, and by air freight air operators. Air mail does not introduce any major issues of clear relevance for the airports within the southern Ontario airports system.

5.4.2 Air Express

Air express is defined as cargo shipments by dedicated air cargo couriers, such as FedEx, UPS, DHL and Purolator. Most items are small and have very high values, including contract documents, legal documents, and medical supplies and are often time-sensitive. Under an air express operation, organizations consolidate and all of their shipments at dedicated facilities (usually on-airport property or in close proximity to the airport), before being loaded on to dedicated aircraft and transported to another city. Air express operators typically consolidate all of their shipments and transport cargo to major sorting hubs (e.g. FedEx has sorting hubs in Memphis, TN, and Indianapolis IN and UPS has a sorting hubs at Louisville KY, Ontario CA, Rockford IL, Philadelphia PA and Columbia SC), where shipments are sorted and flown to their final destination, placed on a truck, and then delivered to the recipient(s). Flights supporting air express typically operate at airports during off-peak periods (usually late at night), where runway slot times are more available (especially at hub airports). Nighttime departures are crucial for any next-day service. The operator owns the equipment and manages each step (pickup, delivery, transportation, tracing, insurance, customs brokerage, etc.) of the delivery process. This integration permits them to offer a highly reliable product that can command a premium price. These companies are called "integrators" in the terminology of air cargo.

Air express operators have greater requirements for facilities at airports compared to air mail in order to support the sorting, loading and unloading of air cargo onto dedicated all-freight aircraft. In the context of the southern Ontario airports system, FedEx has established a sorting facility at Toronto Pearson Airport, and UPS, DHL, Fedex, and Purolator have dedicated facilities at Hamilton Airport to support air express operations.

The integrators offer a premium, door-to-door product that can command very high rates. However, their aircraft are not necessarily filled with high yield express traffic, and have a lengthy idle time during the day. The integrators sometimes offer a daytime service, directed primarily to low yield general air freight and large items. They make extensive use of trucks, even for intercity services.

It is expected that air express cargo requirements will remain relatively constant throughout the 20-year planning horizon identified within this study. Based on research and consultations, it is expected that air cargo operators supporting air express operations will continue to operate from their existing facilities at Toronto Pearson Airport and Hamilton Airport. Other airports within the study have expressed an interest in establishing air express sorting and processing facilities. However, the decisions will rest primarily with the integrators. Since they required late night and early morning runway operations, they will not be affected by even very high levels of passenger congestion. It is therefore expected that air express services will remain at Toronto Pearson Airport and Hamilton Airport.

5.4.3 General Air Freight

A passenger airliner with every seat occupied will usually have empty space in the belly. The airlines generate incremental revenue by filling the space with air freight. Air freight is a diversified product, which includes machinery, pharmaceuticals, perishable goods, live animals, cut flowers, automotive parts and literally anything else. The shipment sizes vary from a few kilograms to several full aircraft. Some items travel on low priority schedules, while others travel on strict Just-In-Time (JIT) standards to support a production process.

Freight forwarders and integrators act as an intermediary between the shipper and various transportation carriers (e.g. trucking companies, airlines, air cargo operators, ocean shippers, etc.) and utilize established relationships to negotiate the best price and process to move the shipper's goods. Freight forwarders and integrators have long-standing relationships with air freight carriers and are typically located in close proximity to airports that support air freight operations.

Cargojet's all-cargo B767-200 aircraft at Hamilton Airport.

Some airlines such as CargoJet work directly with shippers. Some work directly with customers, while others rely entirely on freight forwarders. Cathay Pacific, Lufthansa and Korean Air fly all-cargo aircraft to Toronto Pearson Airport to supplement to belly capacity of their passenger flights. The abundant supply of containerized capacity on wide-body passenger aircraft has depressed general cargo rates on many world trade lanes. Empty backhauls, such as from North America to Asia, further weaken the economics of pure freighter aircraft for general air freight. It is therefore expected that Toronto Pearson Airport's all-cargo flights will be limited mostly to air express.

Consultations suggest that Just-in-time (JIT) shipments are occurring at all of the airports included within the southern Ontario Airport System (excluding Billy Bishop Airport) using various aircraft types, depending on the type of shipment. Air freight moved via freight forwarders and integrators is primarily processed through existing facilities at Toronto Pearson Airport and Hamilton Airport.

The wide diversity of airlines and the abundant wide-body capacity make Toronto Pearson Airport ideal for forwarder "gateways." These facilities at or close to Toronto Pearson Airport have extensive networks of road feeder services. Forwarders consolidate and de-consolidate shipments for many destinations. The forwarders have agreements with the airlines that often stipulate the use of flights at Toronto Pearson Airport. Thus a hypothetical Montreal-Paris shipment might be first trucked to Toronto Pearson Airport or New York, even if nonstop capacity were available from Montreal. Similarly, large volumes of cargo traveling to or from Toronto Pearson Airport may be handled through airports in the United States, and trucked to and from Toronto.

It is expected that current trends in air freight will continue throughout the 20-year planning horizon of this study. There will be no fundamental changes to southern Ontario's requirements for air freight infrastructure. JIT shipments are expected to continue at all of the airports identified within the defined system identified herein (excluding Billy Bishop Airport), and air freight operations supported by freight carriers and freight forwarders will continue to operate at Toronto Pearson and Hamilton airports. Due to the critical mass of freight forwarders, freight operators, and other air freight support services (such as Canada Border Services inspection and bonded warehouses) currently operating in close proximity to Toronto Pearson Airport and Hamilton Airport, migration of these facilities to other airports within the system is considered to be unlikely within the 20-year planning horizon.

5.5 Regulatory Changes

The international airline industry can be best understood in the context of the changing regulatory environment in which air carriers operate. Regulations governing foreign ownership and freedoms of the air are constantly changing, and can have an impact on an air carrier's ability to provide international air services between multiple countries, or even between specific city pairs. These regulatory changes may have an impact on international air services provided to the southern Ontario airports.

The regulatory framework for commercial airlines changes slowly. While many nations have liberalized their bilateral agreements, there remains a strong association between every airline and its nationality. The structure of the industry is unlikely to change significantly during the 20-year horizon of this study. Any changes are unlikely to affect recommendations on the development of the Pickering airport.

5.5.1 Globalization Impacts

The airline industry has a unique mix of global and national characteristics. The framework for international aviation, as specified in the Chicago Convention, calls for a close identification between each airline and a specific nation state. The airline is generally owned and controlled by nationals, and the national government conducts negotiations on its behalf for new international routes. However, multilateral agreements set standards for air traffic control, ticket revenues reconciliation and travel involving several airlines. Multinational airline alliances provide many of the attributes of a "true" global airline.

Southern Ontario itself is becoming increasingly affected by global trends. The City of Toronto's ethnic diversity and continued immigration have expanded the importance of overseas communities. Ontario's universities educate students from many nations, and foster long term economic ties. Toronto Pearson Airport's diversity of air services reflects southern Ontario's increasingly cosmopolitan society. Airlines from China, Korea, Pakistan, Saudi Arabia, Ethiopia, Panama, Egypt, Turkey, Taiwan, the Philippines and other nations now serve Toronto Pearson Airport.

The globalization of southern Ontario has important implications for its airports. The region will likely experience a proliferation of new entrants. New long haul flights may have a limited flexibility in operating times, and will likely require comprehensive domestic connections. The airlines will likely insist on serving Toronto Pearson Airport.

As it transforms from a manufacturing base to a knowledge base, southern Ontario will require high quality and attractively priced air transportation. A shortage of capacity at Toronto Pearson Airport could be manifested in many ways. If carriers cannot obtain suitable timings for one or even multiple new flights, the incumbents may raise their fares accordingly. As the hub for two airlines, Toronto Pearson Airport may be especially vulnerable to monopolistic or duopolistic pricing. These problems will materialize long before other symptoms of congestion.

5.5.2 Air Service Liberalization

Many nations have been relaxing the constraints posed by bilateral agreements. They recognize the economic benefits of international air services. Rather than a fragile but essential pillar of military strength and national sovereignty, commercial airlines are increasingly viewed as robust entities, able to withstand and benefit from foreign competition.

The Chicago Convention of 1944 outlines the framework for international air service agreements. It allows a wide range of bilateral air service agreements, affording different ranges of protection and opportunity. Each agreement stipulates the eligible points of service (airports) in each nation, the allowed capacities, pricing provisions, the number of authorized airlines and other conditions. It usually involves two nations, although a group of nations (e.g. the European Union) may negotiate together. A liberal "open skies" regime allows any fit, willing and able airline of either nation (subject to the approval of its home government) to serve any city-pair involving the two countries. The airlines can offer whatever capacity they consider appropriate and can charge prices of their own choosing. The airlines of either signatory nation can serve third countries in conjunction with any flight linking the two countries. This provision requires the explicit approval of the third country.

Canada has open sky agreements with sixteen nations, including the United States, New Zealand, Barbados, Jamaica and Brazil. A comprehensive agreement governs air services between Canada and the European Union's 28 member states. Other agreements vary widely. The agreement with China has been amended on several occasions. It specifies a limited number of frequencies available to airlines of China and Canada.

Sometimes, an airline of one nation perceives an opportunity in serving a second nation. However, the airlines of the second nation may see no reciprocal opportunity. Since a bilateral agreement involves an exchange of rights with a "balance of benefits," there can be no basis for a successful negotiation. This stalemate has often prevented carriers from starting new international services.

The Foreign Carrier Access provisions of Canada's 1994 international air service policy address this problem. If no relevant bilateral agreement exists, and no Canadian carrier perceives a reciprocal opportunity, then Canada will grant a foreign airline the unreciprocated rights to serve a Canadian city with up to two flights per week. Toronto, as by far Canada's most attractive market, was specifically excluded. Canada has a long history of restricting foreign carrier access to Toronto. The 1995 liberalization with the United States stipulated a phase-in period for U.S. carrier access to Toronto, Montreal and Vancouver.

The Blue Sky Policy of November 2006 announced the goal of open skies agreements when in Canada's "best interests." It included provisions for a limited exchange of rights for situations in which "the foreign carrier is not behaving in accordance with rational business principles," or that might "competition in some markets would be significantly reduced or effectively eliminated"

Canada now grants foreign carriers limited access even if there are no reciprocal advantages for Canadian airlines. However, it often constrains frequencies. The foreign carrier can then offer enough capacity to meet the demands between Canada and its own nation, but cannot aggressively develop "sixth freedom" markets (to third countries, via the other signatory country). The agreement with the United Arab Emirates allows two UAE carriers each to offer three weekly flights between Canada and the Arab Gulf, plus reciprocal rights for Canadian airlines. The agreement with Singapore allows an unlimited choice of destinations and no capacity restrictions, but only for nonstop Canada-Singapore flights.

Canada will likely continue to liberalize its air service agreements. However, any such changes will be selective, and will depend on equivalent advantages for Canadian carriers. It is expected that foreign air carriers will continue to seek additional access to Toronto Pearson Airport as Canada's premier gateway. Canada will continue to negotiate access to Toronto Pearson Airport (and other large Canadian international airports) with foreign carriers and states. Foreign air carriers and states may request access to other airports within the southern Ontario airports system that provide the required services to support international passenger service, but it is more likely that demand for access to Toronto Pearson Airport will dominate within the 20-year planning horizon of this study.

5.5.3 Aviation Security

5.5.3.1 Passengers and Baggage

Aviation security is an important element to consider when discussing demand for air travel, and infrastructure requirements and capacities of air terminal and air cargo facilities. Following the September 11, 2001 terrorist attacks, there has been a heighted awareness for aviation security by many governments, including Canada. As a result, the Canadian Air Transport Security Authority (CATSA) has directed significant investment to improve passenger and baggage screening services.. All passengers boarding flights at the 89 designated CATSA airports are screened using metal detectors, and carry-on baggage is examined using x-ray machines. Checked baggage at all 89 airports is also screened using x-ray equipment to ensure no dangerous or unlawful goods are placed on aircraft.

Both passenger and baggage screening services are vital to ensure public safety, and airports must provide the required space and infrastructure to support the screening equipment and personnel. As demand for air services continues to grow, so will the demand for additional aviation security screening facilities at airports.

Toronto Pearson, Hamilton, Waterloo, and Billy Bishop airports are all designated CATSA facilities with the systems in place to screen both passengers and baggage. Peterborough Airport offers passenger charter services, up to 6 times per year using B737-300 aircraft. Although not a designated CATSA airport, the airport contracts a security company to screen both passengers and baggage prior to boarding the flight.

It is expected that as demand for air services grows at the CATSA designed airports, so will demand for additional passenger screening positions and baggage x-ray systems. Consultations suggest that although aviation security measures can be viewed as a capacity constraint during peak periods, airports and CATSA are continually in discussions to improve levels of service to provide additional throughput capacity. For the purpose of this study, it is assumed that aviation security measures can continue to be expanded (provided there are no unforeseen events that will require new methods of passenger and baggage screening) at the southern Ontario airport system's CATSA designated airports (Toronto Pearson, Hamilton, Waterloo, and Billy Bishop airports), within the existing or future expansions of air terminal facilities.

5.5.3.2 Air Cargo

Air cargo is not required to be 100% screened by Transport Canada regulations; however, air cargo being placed on passenger flights is required to be 100% screened. To meet this requirement, air carriers can elect to screen the cargo themselves prior to aircraft loading. In addition, Transport Canada has a voluntary Air Cargo Security (ACS) Program where companies participate voluntarily to obtain the ability to screen and make cargo shipments 'secure' early in the supply chain. Starting in late October 2016, Transport Canada regulations will allow shippers to deem cargo 'secure' as early as the time shipments are packed and up until the time the shipment is tendered to an air carrier for transport.

The key principles of Transport Canada's ACS are:

- Participants in the ACS are 'trusted', meaning applicants must go through a comprehensive application process, be thoroughly vetted by Transport Canada, and are subject to ongoing inspection and enforcement activities;
- Cargo must be screened and made secure by authorized participants using Transport Canada-prescribed methods to enter the Secure Supply Chain; and
- Program participants ensure cargo maintains its secure status through verifiable chain-of-custody procedures.

In the context of the southern Ontario airports system, it is not expected that air cargo security requirements will impede the ability of air operators to ship goods from the airports within the system. Although future requirements may stipulate a need for additional screening facilities, it is assumed that the airports (and related freight forwards, integrators and shippers) within the system will be able to respond to the changing regulations and will have the ability to provide the required air cargo processing capacity throughout the 20 year planning horizon of this study.

5.6 Industry Growth Limitations

5.6.1 Training

Many industry organizations have cited future pilot and aircraft maintenance personnel shortages as a potential limitation for overall aviation industry growth. As public demand for air travel increases, the demand for pilots and aircraft maintenance personnel is also expected to increase and it is important that appropriate airport facilities be provided to support training activities.

Although discussions around airport systems typically focus on providing airport facilities to support aviation activities such as passenger, cargo, and industrial and corporate general aviation, a comprehensive airport system should include airports with the capability to provide pilot and aircraft maintenance personnel training.

In the context of the southern Ontario airports system, several general aviation airports are currently supporting flight training activities, some with high volumes of students. Although there are no dedicated aircraft maintenance training institutions established at the airports within the southern Ontario airport system, aircraft maintenance personnel training is occurring within existing Aircraft Maintenance Organizations (AMOs) and through educational institutions that are based at off-airport locations.

Provided that the airports within the southern Ontario airports system continue to operate within their current general aviation training and roles, airport system infrastructure is not considered to be a growth limitation in terms of pilot and aircraft maintenance personnel training.

5.6.2 Airport Congestion

Congestion at airports can limit the ability of air carriers to provide desired flight timings. The purpose of this system is to prevent a surge in demand for runway use that will exceed an airport's runway capacity, and cause unreasonable amounts of delay. Major hub airports with high levels of demand for runway use typically implement a slot control system where specific times for runway operations are designated to specific carriers. Slots during peak times are generally more difficult to secure than for off-peak times. The timing of the peaks depends on the specifics of the airport and the air services provided. In general, as levels of airport congestion increase it becomes more difficult for air carriers to obtain desired slots.

The International Air Transport Association (IATA) sometimes acts as a mediator in assisting airports when multiple requests for arrival and departure times are made by numerous air carriers. IATA's slot committee negotiates with the air carriers to shift requested arrival and departure times to avoid scheduled conflicts. The air carriers are not permitted to coordinate their schedules amongst themselves, as this is violation of U.S. antitrust laws; however, IATA can act as a mediator after the slot requests have been made to the airport.

In addition, IATA holds biannual slot conferences as a voluntary assembly of both IATA and non-IATA airline members for the allocation of slots at airports with slot controls. During the conferences, slots are adjusted primarily through bilateral discussions between airlines and airports, or between airlines wishing to exchange slots. As slot changes at one airport can affect operations at other airports, IATA holds the slot conference so all major slot changes can be quickly and efficiently processed, and all parties can work together to achieve mutual objectives. Slot allocation policies and processes are detailed in IATA's Worldwide Slot Guidelines (WSG).

Once slots are secured at a particular airport by an air carrier, they are sometimes viewed as an asset and are sometimes sold or leased to other operators. Slots during peak periods at airports like London Heathrow and New York LaGuardia have been sold or leased amongst competing air carriers, sometimes for millions of dollars.

In the context of the southern Ontario airports system, Toronto Pearson Airport and Billy Bishop Airport are the only two facilities that have implemented slot controls. Slot controls are in place at Toronto Pearson Airport to ensure demand does not exceed capacity, and similar controls are in place at Billy Bishop Airport to control the total number of aircraft movements, as per the terms of the Tripartite Agreement between the City of Toronto, Ports Toronto, and Transport Canada.

As demand for air services is expected to increase, especially at Toronto Pearson Airport, it is expected that slot controls will continue to be in effect throughout the study's 20-year planning horizon. It is also assumed that the current terms of the Tripartite Agreement will remain the same, and slot controls will remain in place at Billy Bishop Airport. It is not expected that the other passenger airports within the southern Ontario airports system will implement slot controls within the 20-year planning horizon.

6.0 DEMAND FORECASTS

Airport activity forecasts are an important part of airport planning. Forecasts of passenger and aircraft movements inform airport operators and industry as to when capital improvements may be required to increase capacity or improve levels of service. In this case, forecasts play an important role in forming any decision regarding the development of a new Pickering Airport.

The ultimate decision of when to undertake a particular airport expansion project usually depends on the realized level of traffic, rather than on forecasts that may have been prepared several years previously. Most projects are sufficiently small and the lead times are short enough that the airports can use current traffic as true indicator of facility needs. The forecasts play a subordinate role to current volumes in directing short term airport infrastructure investment decisions.

The proposed Pickering Airport will require large investments in aviation and surface transportation infrastructure and many levels of government and private businesses could participate in the project. More than a decade could be required for planning and construction of any major airport project on the Pickering Lands. Under these conditions, a decision to develop a new Pickering Airport may need to be made even before the catchment area has met the required threshold of traffic to justify the new airport. Any errors in timing could result in premature and unnecessary expenses or leave the southern Ontario airports system with a capacity deficit.

6.1 Approach

This study uses two basic approaches for forecasting traffic: statistical patterns and scenarios. Toronto Pearson Airport has a well-developed traffic base and a lengthy history of orderly, organic growth clearly shown by the stable nature of aircraft traffic and air services; passenger and aircraft movements are sufficiently large to follow broad statistical patterns and growth. This section focuses on statistical forecasting with scenarios detailed in Chapter 8.

Toronto Pearson Airport's statistical data shows clear relationships between aviation activity and socioeconomic variables such as GDP and personal income. The socioeconomic variables play a crucial role in measuring the vitality of an economy. Forecasts can be developed for government budgeting as measures of national prosperity and indicators of future exchange rates, equity markets and corporate profitability. These forecasts, when incorporated into the airport statistical models, can readily generate high quality estimates of future airport activity.

The second, and less structured, approach uses scenarios. Each scenario is a hypothetical series of future events, usually involving one specific organization (e.g. airline, air freight forwarder, fixed base operator, shipper, etc.). They usually involve some form of fundamental change and cannot be deduced from current operations at the airport in question. The actions of this organization will be assumed to have a large impact on aviation activity. The precise impact, in passengers, runway operations and other metrics, cannot be determined from formal modelling techniques. Any analysis of an individual business or an altogether "new" operation must use "reasonable" values chosen from case studies of similar situations, market trends and experience.

For example, a seller of package tours might decide to offer charter flights from a new airport. We cannot predict the existence, market characteristics, scale or timing of such an operation from any formal statistical models. Furthermore, charter flights could form a large proportion of the activity at the new airport. We are then forced to rely on scenarios - a series of reasonable and informed guesses of the key metrics. As mentioned, such scenarios will be employed in Chapter 8.

6.2 Transport Canada Forecasts

This project required a choice of forecasting methodologies at the very outset. The project team had to choose between developing new forecasts from first principles or using forecasts already available from Transport Canada.

Initially, several preliminary models were developed. These models lacked information about origin-destination traffic on domestic and international routes. Changes in airline networks could significantly affect Toronto Pearson Airport's connecting traffic, and the team had no model of current and future passenger routing patterns. These deficiencies undermined the usefulness of these customized forecasts.

Transport Canada produces annual forecasts of traffic and runway movements at the major Canadian airports. The Passenger Origin/Destination Model (PODM) uses extensive socioeconomic data on GDP, personal disposable income, population and immigration patterns to predict passenger flows by origin and destination. Transport Canada's forecasts are not exclusive to Toronto Pearson Airport but one of a national forecasting process. Their methodologies and resources would not be economical for forecasting a single airport alone and Transport Canada obtains extensive data on domestic and international passenger flows. This information is comprehensive and prior to 2014, no organization could match Transport Canada's resources for forecasting activity at Canadian airports.

Transport Canada began developing the current set of forecasts in 2015. The forecasts developed by Transport Canada include low, medium and high forecasts; low and high forecasts are limited to 2030 with the medium forecast out to 2035. Since the planning horizon for this study is to 2036, demand values were extended beyond 2035 using extrapolation of the 2014-2035 growth rates. Transport Canada forecasts aircraft movements as well; however, the data is limited to forecast general aviation movements. Local movements were forecast by the project team using historical growth rates and the expectations of the airport operators during the consultation process. Transport Canada's forecasting staff had knowledge of renewed interest of this Pickering evaluation. The Transport Canada forecasts also had valuable insights into other airports, such as Waterloo and Hamilton. Transport Canada's forecasts themselves have proven highly accurate after extensive validation. Thirteen year old forecasts of enplaned-deplaned passengers deviated by less than 6 percent from the actual values. Forecasts of Toronto Pearson Airport's enplaned-deplaned traffic commissioned in 2007 deviated by only 4 percent from the 2015 actual.

Before 2014, most Canadian airports used Transport Canada forecasts for their long term planning. While some major airports develop forecasts in-house, the Transport Canada forecasts were the de facto gold standard in predicting future passenger and aircraft movements when they were being produced.

Transport Canada has used the PODM to produce its air traffic forecasts. PODM is a gravitational model driven by socioeconomic variables and supply factors. It is a three-sector econometric model designed to predict origin destination (OD) passenger forecasts of the domestic, transborder and international sectors by taking into account socio-economic factors as well as industry supply factors believed to influence travel demand. The level of air traffic activity is driven by the interaction of demand and supply factors. While demand for air travel in Canada is largely a function of demographic and economic activity, supply factors consisting of airline costs and competition considerations in the industry also come into play. Each of three-sector model forecasts OD traffic using air travel fares forecasts. The Cost and Fares Model assumes direct correlation between airfares and carriers' cost components (fuel, labour, equipment, capital, airport fees, purchase of services and profit). Once OD forecasts are estimated, the model converts OD passengers by sector in enplaned/deplaned (ED) passengers using ED/OD ratios and estimates aircraft movements by sector using specific sector's load factor and average aircraft size. In 2012, Transport Canada's method in forecasting enplaned deplaned passengers was simplified, however, these modifications did not reduce the forecasting performance of the model. Refer to Appendix D for Table of Assumptions and Model Inputs.

6.3 Airports

6.3.1 Toronto Pearson International Airport

6.3.1.1 Forecast

Toronto Pearson Airport has emerged as one of North America's leading international gateways. As a hub for Air Canada and the Star Alliance, it supports a highly diversified range of nonstop services and airlines. In 2014, Toronto accounted for fully 33 percent of all transborder origin-destination traffic in Canada. Toronto Pearson Airport has become a well-established gateway to Asia, with nonstop flights to China, the Arab Gulf, Northeast Asia and the Subcontinent. Transport Canada has prepared Low and High forecasts to 2030, and Medium forecasts to 2035. The graphs include interpolations for intervening years. As shown in Figure 6.1, growth in total passenger demand at Toronto Pearson Airport is expected to remain strong. Subsequent Figures 6.2, 6.3 and 6.4 breakdown Toronto Pearson Airport's total passenger forecast into the 3 market sectors: domestic, transborder and international.

Figure 6.1 - Toronto Pearson Airport Total Passenger Forecast

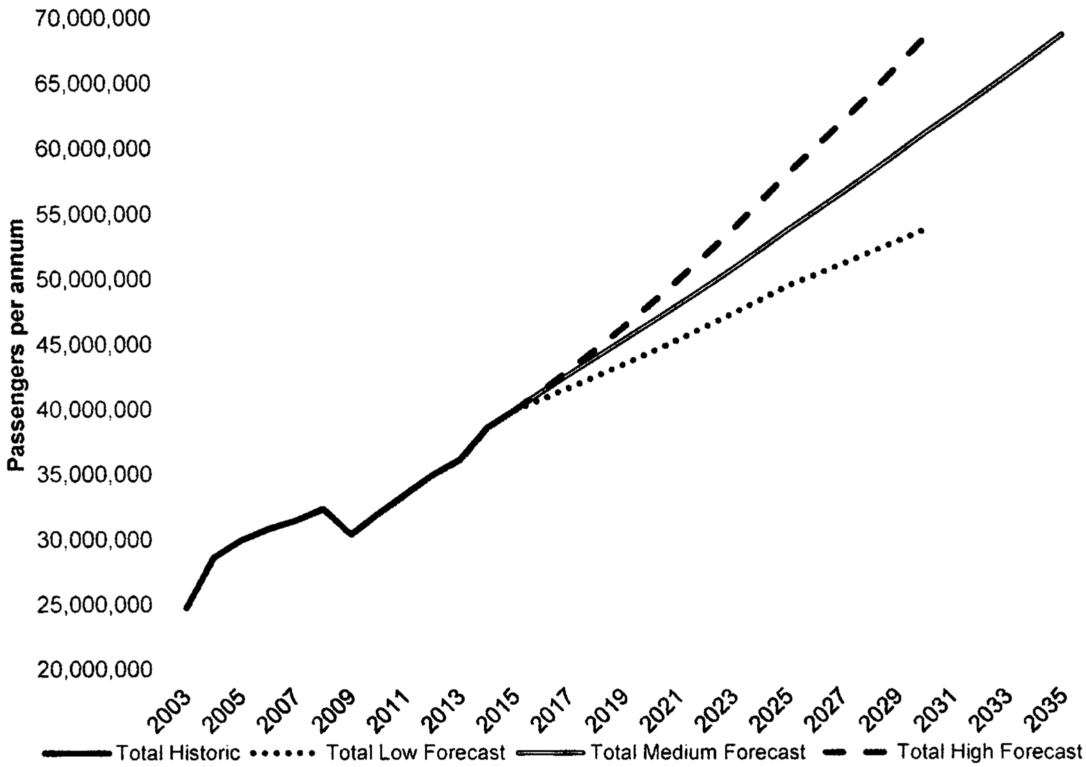


Figure 6.2 – Toronto Pearson Airport Domestic Passenger Forecast

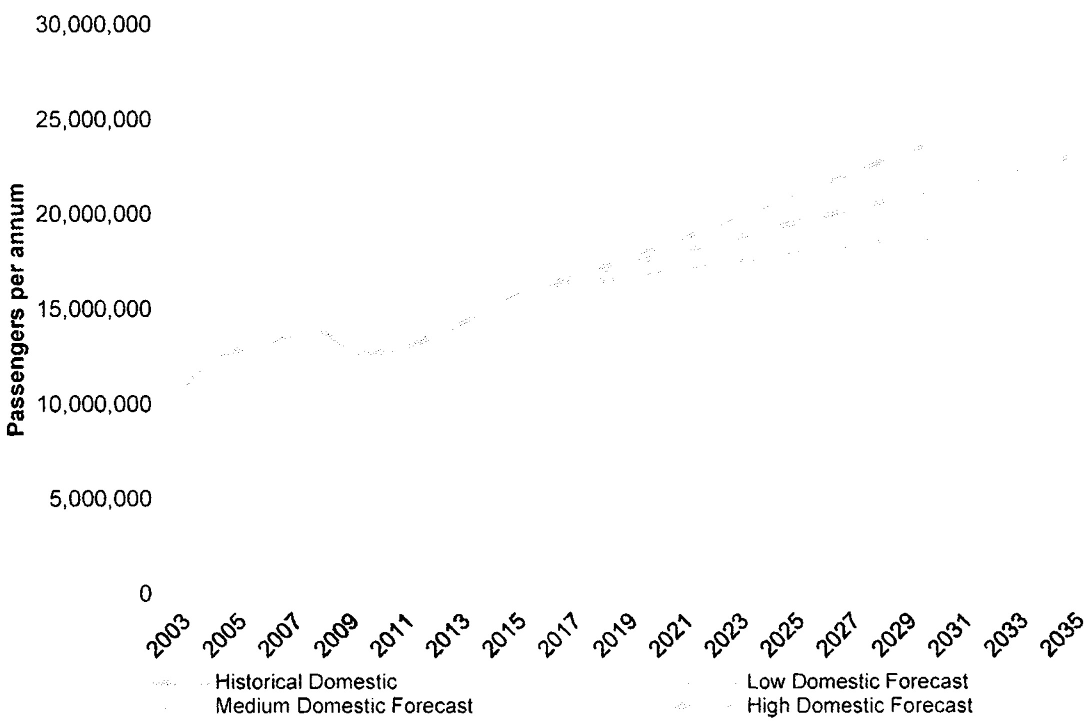


Figure 6.3 – Toronto Pearson Airport Transborder Passenger Forecast

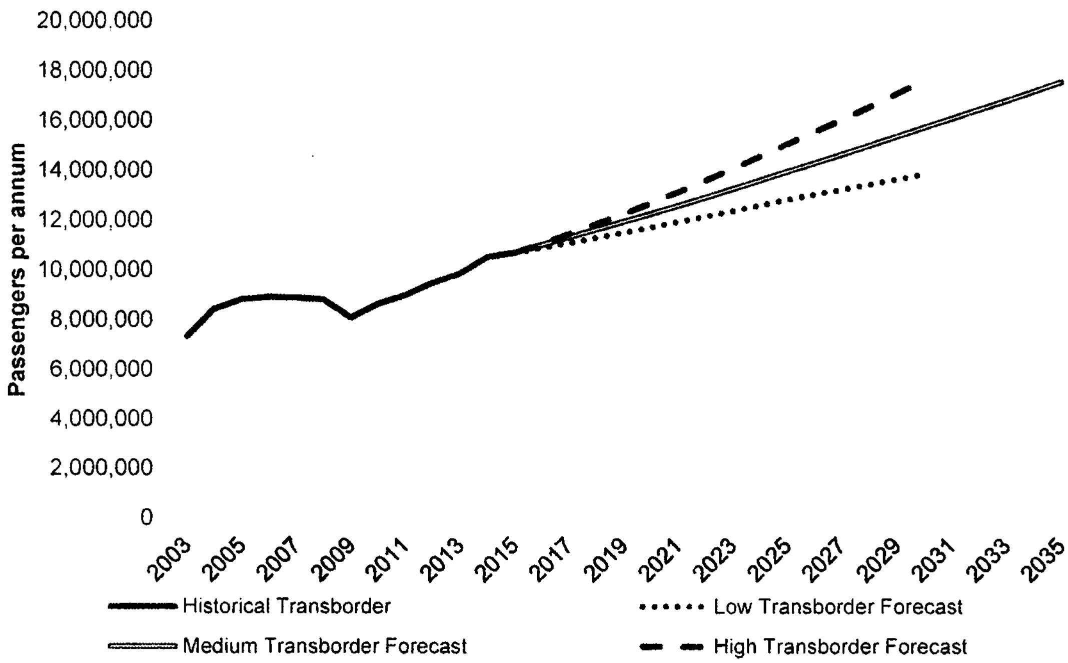
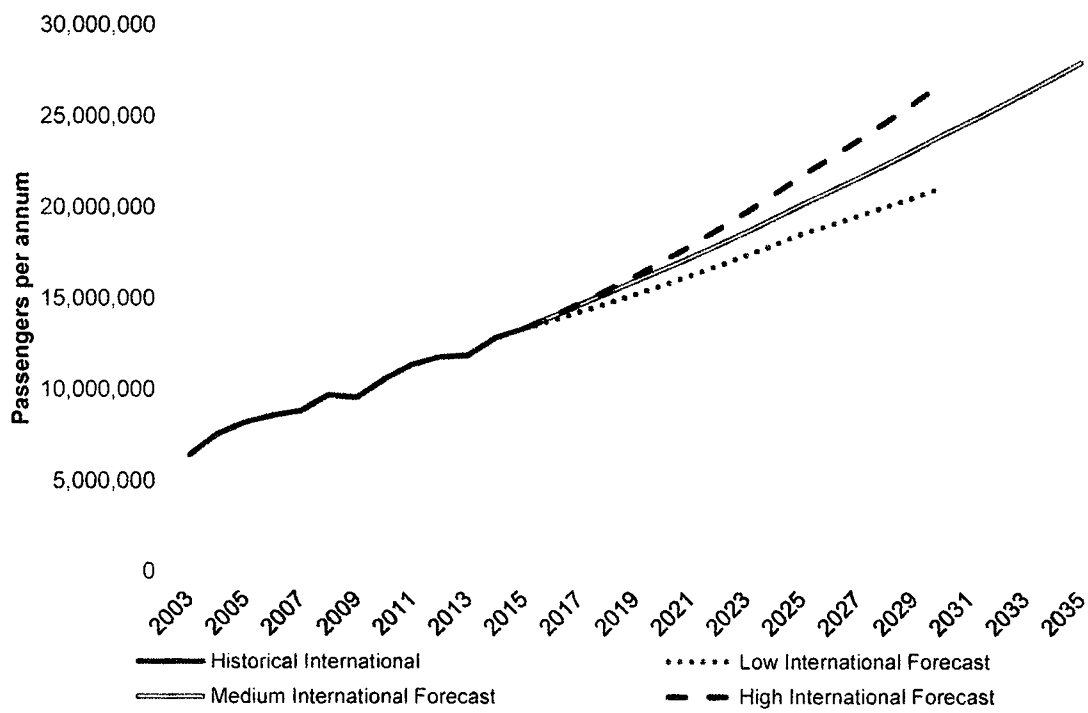


Figure 6.4 - Toronto Pearson Airport International Passenger Forecast



The 2001 terrorist attacks on New York and Washington, the SARS virus of 2003, and the financial crisis of 2007-2009 caused temporary traffic declines in all three markets. International traffic showed the smallest impact. Since it includes Europe, Caribbean/Latin America and the rapidly growing Asia/Pacific destinations and it is arguably the most diversified and the least sensitive to temporary economic disturbances.

International volumes overtook transborder traffic in 2008 at Toronto Pearson Airport. The low value of the Canadian dollar and the relative maturity of transborder services have suppressed growth. Weak growth is expected to continue due to the fact that going forward, average aircraft size in the transborder market is expected to continue going up, as Air Canada, which has a 40% market share, plans to continue its fleet renewal. This includes replacing the Embraer 190 jets (97 seats) with the bigger C Series (135 seats), and replacing their Airbus A320 (146 seats) with Boeing B737 MAX (166 seats). WestJet, with a market share of 16%, is expected to expand in the transborder sector using the Q400 (78 seats) and Boeing 737s (130 seats). However, vacation-oriented travel to Florida, Nevada and other areas has remained robust. The Transport Canada medium forecasts call for international enplaned-deplaned passengers to exceed domestic traffic by 2024. Under the Medium case, total passenger volumes in 2030 would be 48.8 percent greater than in 2015. Table 6.1 summarizes the forecasts for enplaned-deplaned traffic.

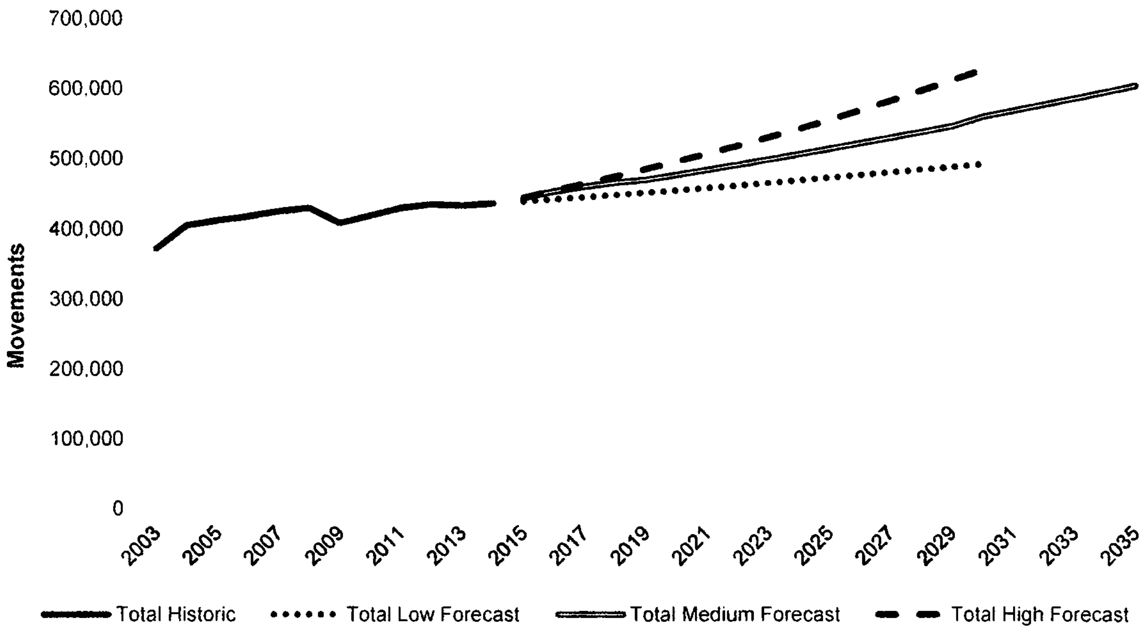
Table 6.1 – Summary of Passenger Activity Forecasts, Toronto Pearson Airport

	2015	2030			2036
		Low	Medium	High	Medium
Domestic	15,859,289	18,801,500	21,366,000	23,930,500	23,443,000
Transborder	11,154,435	13,832,000	15,718,000	17,604,000	17,945,000
International	14,023,123	21,087,000	23,962,000	26,837,000	28,862,000
Total	41,036,847	53,720,500	61,046,000	68,371,500	70,250,000

Source: Transport Canada and project team forecasts.

Aircraft movements at Toronto Pearson Airport are expected to grow into the next 20 years. Figure 6.5 shows total historical and forecast runway activity at Toronto Pearson Airport. The breakdown of the total movements into domestic, transborder, international, non-reporting and general aviation can be found in Appendix D.

Figure 6.5 – Toronto Pearson Airport Total Aircraft Movement Forecast



General aviation activity has declined steadily at Toronto Pearson Airport. In 2014, general aviation operations were less than half of their 1997 value and the forecasts call for a continuing decline.

International operations have climbed steadily since 2003 and tend to use relatively large aircraft. New ultra-long range aircraft such as the B777 and B787 have stimulated the growth of flights to Asia, the Middle East and the Subcontinent. New transatlantic services by legacy carriers and Air Canada's low cost subsidiary Air Canada Rouge have expanded European services. Air Canada, WestJet and foreign carriers have increased their services to the Caribbean and Latin America. The international services use relatively large aircraft. Wide-body aircraft operate almost all flights to Europe and Asia. Narrow body aircraft such as the A320 and B737 operate most flights to the South with the exception of flights to Sao Paulo, Santiago, Bogota and Lima which use wide-body equipment.

The Ontario and Quebec flights include many short haul feeder flights from Kingston, London, North Bay and other points. Many of these flights use small turboprop aircraft such as the 19-seat Beechcraft 1900D. Both WestJet and Air Canada offer high frequency services to Ottawa and Montreal.

Transborder flights generate a large quantity of movements in proportion to their traffic. Many transborder services make extensive use of 19-90 seat turboprop aircraft and regional jets. These aircraft have high direct operating costs per seat-kilometer, and necessitate correspondingly high fares. This may contribute to the weak growth of transborder traffic. Table 6.2 summarizes aircraft capacity patterns for Toronto Pearson Airport in the summer of 2016.

Table 6.2 – Average Aircraft Capacity at Toronto Pearson Airport

Route	Average Seats	Route Description
Ontario and Quebec	86	Domestic short haul
Other Canada	137	Domestic long haul
U.S. Carrier routes to Hubs	79	Services by a U.S. airline to its hubs
U.S. Sunspots	164	Florida, Las Vegas, other leisure destinations
U.S. Intercity, Long haul	81	Services to non-hub cities, short/long haul (west coast)
International – South	160	Caribbean and Latin America
International – Atlantic	279	Europe, Iceland and Israel
International – Asia	304	Far East, Subcontinent, Arab Gulf

Source: Published airline schedules for July 2016, GTAA

6.3.1.2 Validation and Sensitivity

This study relies on forecasts provided by Transport Canada. Future traffic levels at Toronto Pearson Airport are the greatest source of uncertainty, and arguably the most important factor influencing any decision to trigger the development of a new Pickering Airport.

The vital importance of the Toronto Pearson Airport forecasts to this study requires validation of the Transport Canada forecasts. The project team constructed 5 alternate sets of forecasts to test the validity of the Transport Canada models.

First, the project team studied the Transport Canada models and data in depth and prepared alternative "Low" and "High" forecasts. These alternative forecasts are developed using Transport Canada's PODM model independent variables but with revised input assumptions. Revised input assumptions on the independent variables were developed based on information from Transport Canada, World Bank, International Monetary Fund and the airframe manufacturers. A table of the independent variables utilized in the forecast validation and sensitivity are provided in Appendix D.

In addition, the project team used forecasted traffic growth rates from Boeing's Current Market Outlook, Airbus and Federal Aviation Administration (FAA) forecasts and applied to Toronto Pearson Airport 2014 traffic base data to provide comparable forecasts for reference. These alternative sets of traffic forecasts provide points of reference for the Transport Canada forecasts.

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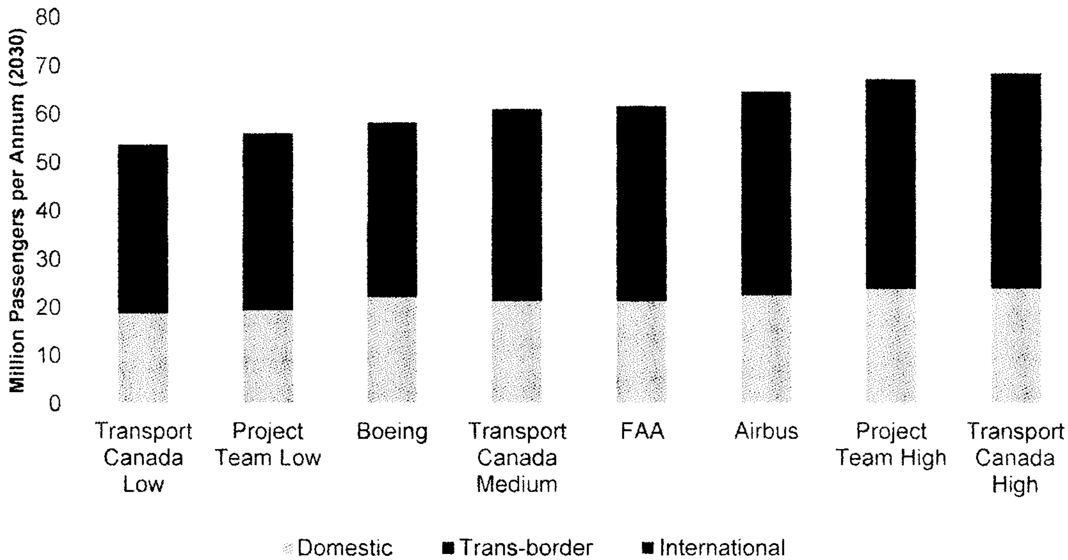
Figure 6.6 – Toronto Pearson Airport 2030 Forecast Comparison



This analysis proved the forecasts are consistent. Despite the different methodologies and data sources, the Boeing, Airbus and FAA forecasts are comparable to those of Transport Canada. The independent Low and High forecasts developed by the project team are very similar to the respective Transport Canada forecasts. Most importantly, the Transport Canada Low and High forecasts bracket all other estimates. The graph supports the decision to use the Transport Canada Medium case as the primary forecast of activity for Toronto Pearson Airport and the rest of the airports within the southern Ontario airport system.

6.3.2 Billy Bishop Toronto City Airport

Porter Airlines and Air Canada serve the Billy Bishop Airport. Many of the passengers using the airport would likely utilize Toronto Pearson Airport if no services were available at Billy Bishop Airport. The new pedestrian tunnel under the Western Gap has made the City Airport more convenient to downtown passengers. However, the UP Express train has similarly increased the attractiveness of Toronto Pearson Airport. The airport is encumbered by short runways, environmental controls and slot constraints and thus has few growth opportunities. Billy Bishop Airport plays a genuine but modest role in relieving Toronto Pearson Airport. [redacted] Although the airport absorbs some of the GTA's domestic and transborder traffic, it could play a modest role in serving international passengers. Air Canada's services to Montreal connect with transatlantic and southern flights. Porter has alliances with JetBlue, Singapore Airlines, Qatar Airways, El Al Airlines, Emirates and other carriers.

Figure 6.7 shows recent historical and forecast enplaned-deplaned passengers at the Billy Bishop Airport.

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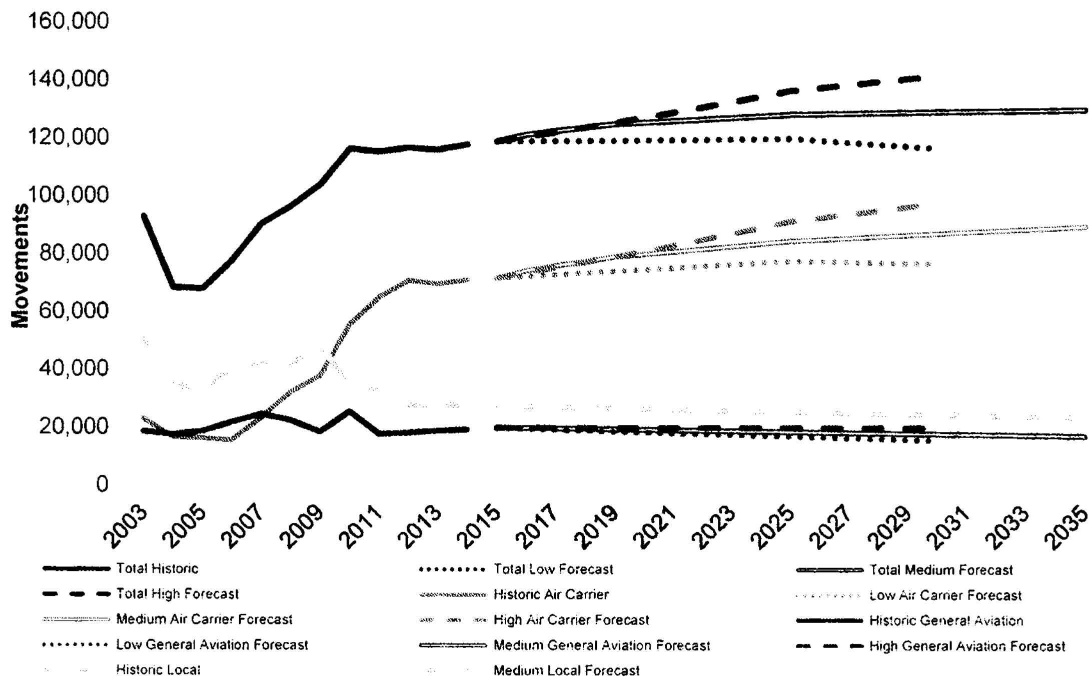
[redacted]

The 1983 Tripartite Agreement between the City of Toronto, Transport Canada and Ports Toronto bans jet operations and precludes any changes in the airport's footprint. Slot controls restrict the number of air carrier operations at Billy Bishop Airport. General aviation activity has been declining at most major airports in Canada. The forecasts call for just under 130,000 runway operations in 2035 (Figure 6.8).

Figure 6.8 – Aircraft Movement Forecast at Billy Bishop Airport

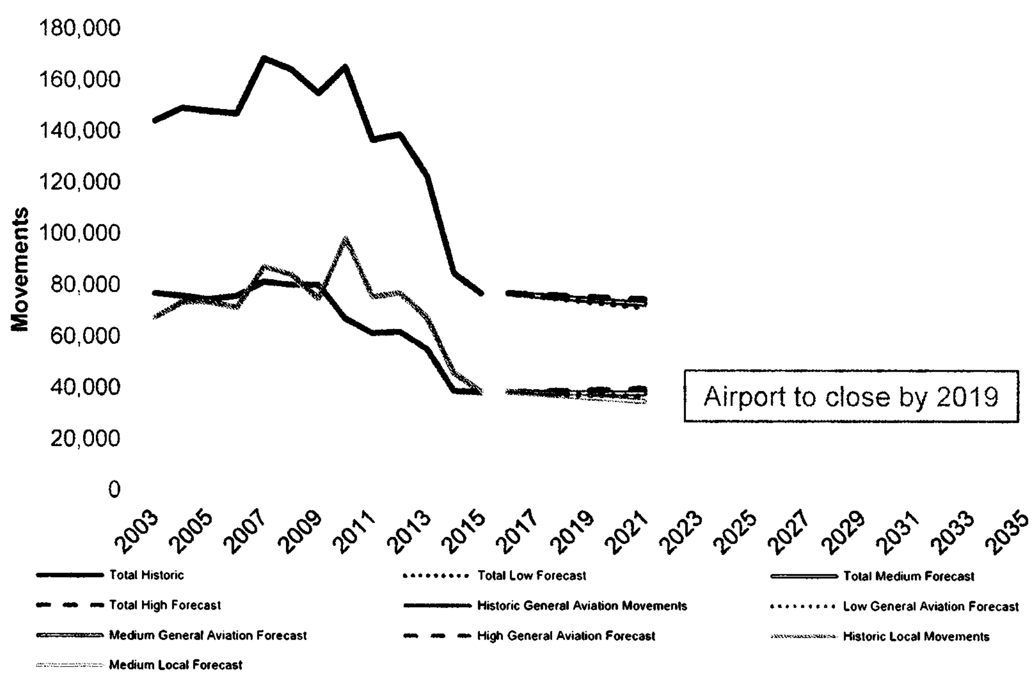


6.3.3 Toronto Buttonville Municipal Airport

Buttonville Airport, located in rapidly growing Markham, will be closed as early as 2017 to be redeveloped for non-aviation purposes. The airport is assumed to close by 2019 at the latest and this reality is portrayed in the forecasts.

Figure 6.9 shows recent and forecast general aviation activity at Buttonville Airport. The recent decline reflects both the uncertainty at the airport and the broader trend of declining general aviation. The large decline of local movements in 2013-2014 can be attributed to the closure and relocation of Seneca College's flight training program to Peterborough Airport.

Figure 6.9 – Aircraft Movements at Buttonville Airport



6.3.4 Region of Waterloo International Airport

Waterloo Airport serves a large, high income urban region. The University of Waterloo and several technology-focused corporations generate considerable travel. Growing congestion on Highway 401 could help this airport capture a growing share of the community's traffic. However, it might impede efforts to divert Toronto Pearson Airport traffic generated by the GTA. Passengers use many attributes to choose an airport, including availability of carriers, nonstop destinations, frequencies and fares. Airport congestion is a relatively minor criterion as airlines have proven tolerant of high levels of congestion and delay.

WestJet operates a daily nonstop flight to Calgary, and a weekly seasonal flight to Orlando. Sunwing Vacations offers winter flights to Punta Cana in the Dominican Republic. Small airports with limited scheduled services that compete with large and nearby facilities often experience volatile air services. Bearskin Airlines discontinued services to Ottawa in 2014 and in the spring of 2016. American Airlines announced that it would eliminate its twice daily regional jet service to Chicago O'Hare.

s.24(1)

The American flights generated significant traffic through the airport, as shown in Table 6.3.

Table 6.3 - Passenger Traffic on American Eagle Flights (Waterloo<->Chicago O'Hare)

Year	Passengers
2012	19,509
2013	29,681
2014	44,180
2015	48,665

Source: United States Department of Transportation Database

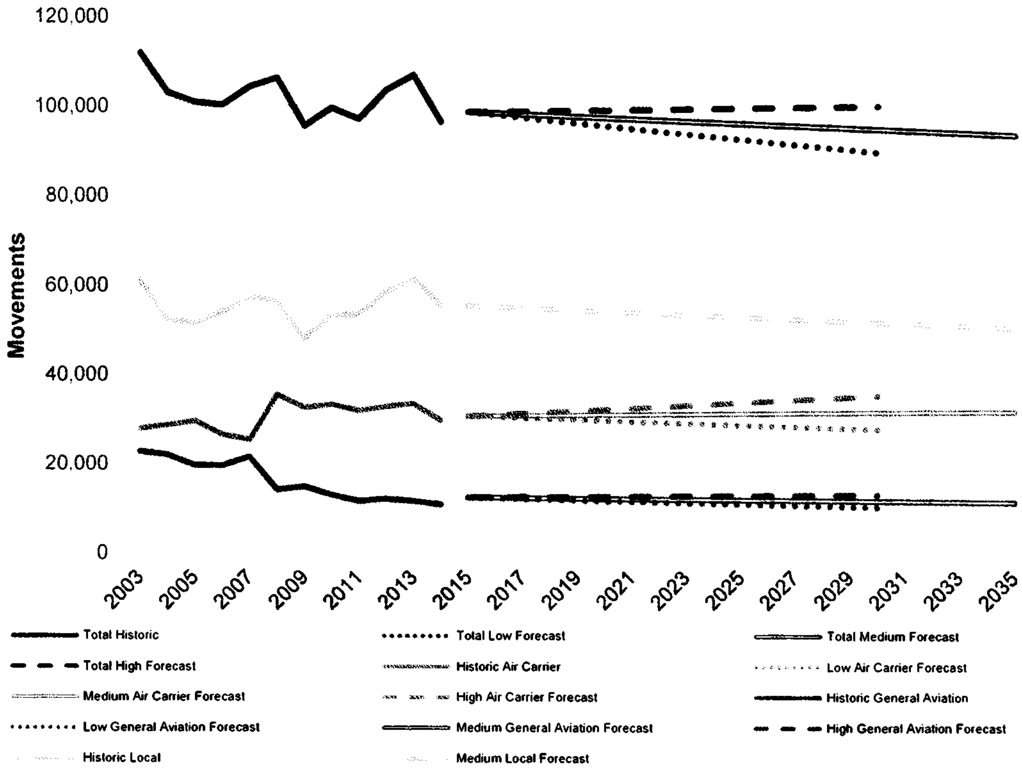
The Transport Canada forecasts assume that the American Eagle service will continue to operate. American Airlines announced the cessation of the flight well after Transport Canada prepared the forecasts. Figure 6.10 shows recent historical and forecast enplaned-deplaned passengers at the airport.

[redacted]

Transport Canada has forecast a modest but increasing level of passenger activity at the airport. Runway activity by scheduled services is forecasted to grow slowly, and may, under the Low case, even decline.

General aviation activity has fallen steadily since 2003 and according to Transport Canada, will continue to decline (Figure 6.11).

Figure 6.11 – Aircraft Movement Forecast at Waterloo Airport



6.3.5 Peterborough Municipal Airport

Peterborough Airport has seen growth in the recent years. With the addition of Seneca College's flight training program in 2014 and the overall development of the airport since its expansion in 2011 aircraft movement volumes have increased. Transport Canada forecasts general aviation movements to have modest increases. Overall, total aircraft movements at the airport will increase into the future. Figure 6.12 shows Transport Canada's forecast for future movements at Peterborough Airport.

s.24(1)

[redacted]

It is important to note that occasional passenger charter flights to leisure destinations operate from Peterborough Airport; however, forecasts for these activities have not been developed nor included as the facility is categorized as a general aviation airport within the southern Ontario airport systems. [redacted]

6.3.6 Lake Simcoe Regional Airport

Lake Simcoe Airport has seen volatile aircraft movements in the past. The forecasts show the declining trend in local movements to continue. The airport has aligned itself away from intensive flight training to serve more corporate aircraft. As a result, Transport Canada forecasts modest growth in general aviation movements at Lake Simcoe Airport moving into the future. These trends can be seen in Figure 6.13.

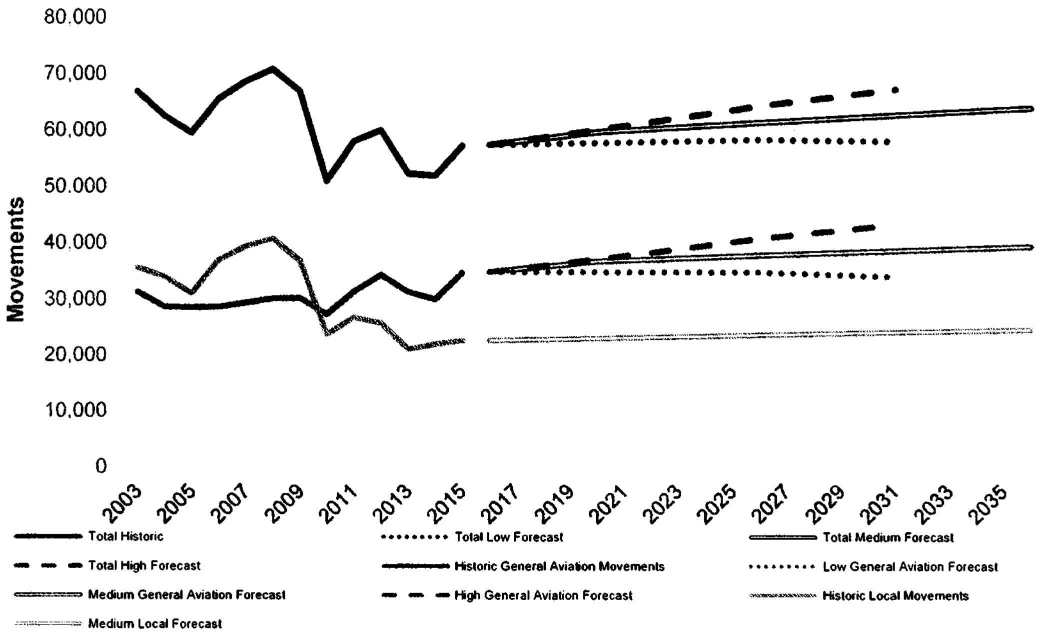
s.24(1)

[redacted]

6.3.7 Oshawa Executive Airport

General aviation at the Oshawa Airport has been relatively constant since 2003, albeit with a pronounced dip in 2009 and significant peaks in 2007 and 2012 (Figure 6.14). The overall trend at Oshawa Airport is expected growth in both general aviation and local movements. General aviation movements will be mostly influenced by an increase in corporate general aviation activity as operations at Buttonville Airport relocate to Oshawa Airport. Similarly, local movements are forecast to increase as a result of flight training and recreational operators relocating to Oshawa Airport.

Figure 6.14 – Aircraft Movement Forecast at Oshawa Airport



6.3.8 Burlington Executive Airpark

Burlington Airpark does not have NAV CANADA facilities on site, nor does the airport track or report its movements. Transport Canada had one (1) year of historical general aviation data and no local movement data. Transport Canada forecasts indicate a modest decline in general aviation movements into the future. The airport operator estimated that there were 65,000 total movements at the airport in 2015. With future expansions it could be expected that traffic at the airport could increase modestly.

6.3.9 John C. Munro Hamilton International Airport

Hamilton Airport could absorb much of the traffic generated by Greater Hamilton, Brantford and the Niagara region. It could, in principle, serve as a secondary to Toronto Pearson Airport. However, passenger traffic volumes remain well below the airport's potential. It has, like many secondary airports in metropolitan areas (e.g. Chicago-Gary, Los Angeles-Palmdale, London-Stanstead, etc.), a history of short-lived and volatile air services. WestJet used Hamilton Airport as its primary gateway to Southern Ontario, until shifting most of its flights to Toronto Pearson Airport in 2004. Both Air Canada and WestJet now operate token services. Charter flights serve a modest number of passengers. The airport continues to serve a small clientele of passengers, and is far from serving as a true secondary for Toronto Pearson Airport.

Hamilton Airport is an important node for all-cargo services. It is the primary hub for Cargojet's all-cargo flights. Three integrators, United Parcel Service (UPS), DHL and Purolator operate all-cargo flights to the Hamilton Airport.

Figure 6.15 shows recent historical and Transport Canada forecasts of enplaned-deplaned passengers at the Hamilton Airport.

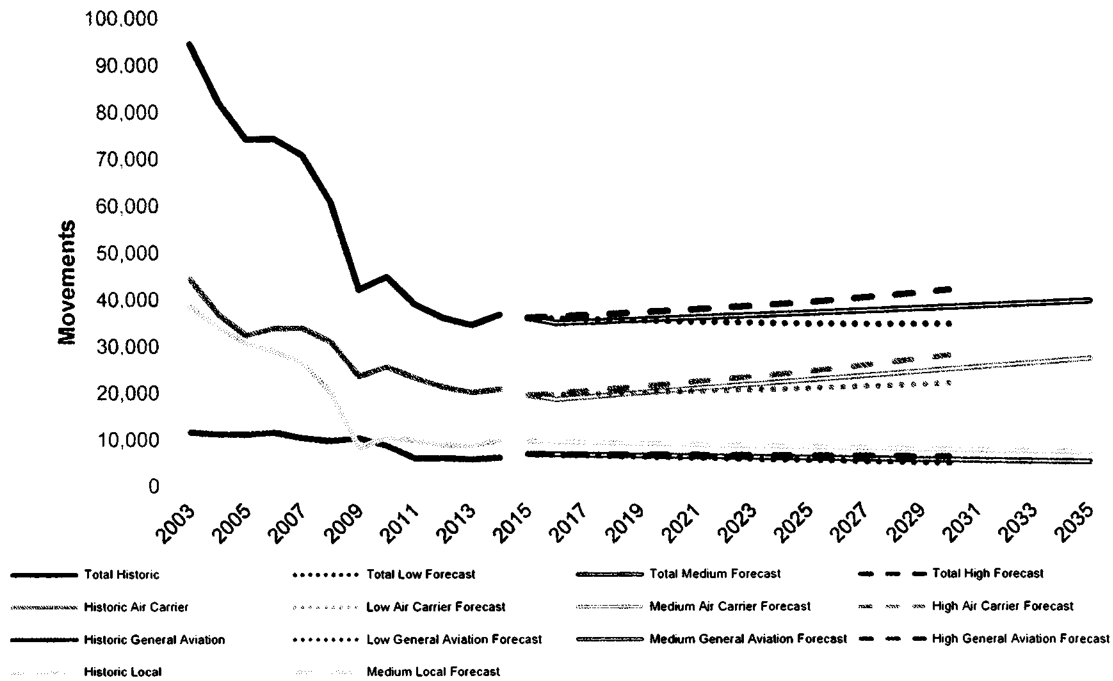
s.24(1)

[redacted]

The airport has been the focus of attempts to launch low cost carriers. Its proximity to large urbanized regions, its low (in comparison to Toronto Pearson Airport) landing costs and the lack of congestion are major inducements. By serving Hamilton, a low cost carrier might distance its service from Air Canada, and hopefully avoid aggressive retaliation. In July 2016, NewLeaf started discount services from Hamilton to cities in Western and Atlantic Canada.

The Transport Canada forecasts do not include low cost carrier activity at Hamilton Airport. New entrant airlines are inherently risky as both WestJet and Air Canada would oppose any start-up carrier. Furthermore, statistical models cannot accurately predict the actions of any single entity, such as the ultimate scale of the NewLeaf operation. A low cost carrier is therefore modeled most effectively through a scenario-based process.

Figure 6.16 – Aircraft Movement Forecast at Hamilton Airport



Aircraft movement forecasts at Hamilton Airport show a continuation in the decline of general aviation movements. The corresponding forecasted increase in air carrier movements shows that total movements at the airport will remain fairly stable, or they may experience a slight increase.

6.3.10 Brampton Airport

Brampton Airport does not have NAV CANADA facilities present at the field and therefore does not track or report local aircraft movements. Forecasts based on estimated activity levels at the airport have been produced for local movements. The airport operator estimated that in 2015 there were 110,000 aircraft movements a year. Transport Canada has history and forecasts for general aviation movements, but local movements were determined by subtracting the general aviation movements by the operator's estimate of total movements. Transport Canada's forecasts show general aviation movements at the airport to be stable, and local movements at the airport are estimated to show modest growth with some flight training demand shifting from Buttonville Airport.

s.24(1)

[redacted]

6.4 High Speed Rail

Japan, China, Western Europe and other areas offer high speed rail competition between volume high city-pairs. Although Canada and the United States have significantly upgraded several intercity corridors, neither has developed infrastructure capable of sustaining truly high speed rail services. The dynamics of air and high speed rail competition in Canada are therefore largely a matter of speculation.

Several studies have identified a significant impact of high speed rail on air travel. An analysis of 35 airports and 90 airport pairs found that "the improvement in rail times was found to be a significant factor in reducing short haul air traffic in Europe"[9]. However, two studies have concluded that the airlines reduced the size of aircraft and total seat capacity, while maintaining frequencies on these routes[10]. A study of the Madrid-Barcelona route stated air service share of total traffic was 62.5 percent in 2007. It fell to 52.7 percent after the introduction of high speed rail services[11]. Table 6.4 shows market shares of selected high speed rail services.

[9] R.R. Clemow, J.M Sussnan and H. Balakrishnan, "The impact of high speed rail and low-cost carriers on European air passenger traffic," Engineering Systems, Massachusetts Institute of Technology, Cambridge MA, USA
[10] D. Albalate, G. Bel and X. Fageda, "Competition and cooperation between high speed rail and air transportation services in Europe," 2014, Journal of Transport Geography
[11] F. Pagliara, J.M. Vassallo, c. Roman, "High Speed Rail Versus Air Transportation: Case Study of Madrid-Barcelona"

Table 6.4 - Market Shares of High Speed Rail

City Pair	Rail Market Share	Source
London-Paris	68%	C. Behrens, E. Pels, Intermodal Competition in the London-Paris passenger market: high speed rail and air transport, (2009) Tinbergen Institute Discussion Paper
Madrid-Seville	83%	M. Finger, N. Bert, D. Kupfer "High Speed Rail versus Low Cost Air: competing or complementary modes?" (2014), European Transport Regulation, European University Institute
Paris-Brussels	95%	
Rome-Milan	63%	I. Barron, J. Campos, P. Gagnepain, C. Nash, A. Ulied, R. Vickerman "Economic Analysis of high speed rail in Europe, Informes 2012 Economia y Sociedad
Tokyo-Osaka	81%	
Tokyo-Hiroshima	47%	
Brussels-London	60%	

Statistics Canada discontinued its domestic origin-destination report after 1999. The information, despite being dated, can support useful conclusions. Table 6.5 shows the city-pairs that could be affected by a Quebec City-Montreal-Toronto-Windsor high speed rail service.

Table 6.5 - Domestic Origin-Destination Traffic Flows Potentially Affected by High Speed Rail

Origin & Destination	1998	1999
Domestic Origin-Destination		
Toronto-Kingston	9,540	11,700
Toronto-London	46,820	42,390
Toronto-Montreal	1,290,990	1,261,350
Toronto-Ottawa	731,750	725,890
Toronto-Quebec City	107,110	115,200
Toronto-Windsor	109,840	113,510
Sub-Total	2,296,050	2,270,040
Toronto-All Canada	6,209,880	6,145,040
Ottawa-London	40,530	38,870
Ottawa-Windsor	17,420	17,480
Montreal-London	32,010	35,340
Montreal-Windsor	21,050	21,420
Quebec City-London	2,660	3,130
Quebec City-Windsor	1,940	2,090
Sub-total	115,610	118,330
X 2	231,220	236,660
Total High Risk	**2,527,270**	**2,506,700**
Domestic Portions of U.S./ International Journeys		
Toronto-Kingston	9,050	17,140
Toronto-London	55,480	55,960
Toronto-Montreal	456,480	472,920
Toronto-Ottawa	295,610	301,710
Toronto-Quebec City	71,410	71,090
Toronto-Windsor	12,980	12,740
Sub-total	901,010	931,560
Toronto-All Canada	2,225,480	2,347,590
Total Domestic O-D	11,939,000	12,376,000

Source: Statistics Canada 51-204 "Air Passenger Origin and Destination Domestic Report"

Table 6.5 assists in identifying the air passengers at risk to change from air travel to a high speed rail service. The "high risk" category includes all air passengers traveling entirely within, the Quebec City-Windsor corridor. The table includes passengers connecting between domestic flights, but only for those city-pairs considered as candidates for a high speed rail service. Not all of these passengers connect at Toronto Pearson Airport. The Ottawa-London route already receives nonstop services. The table excludes passengers traveling via Toronto to a city that is not a candidate for the new rail service. An example would be a Quebec City-Vancouver passenger.

The table shows 2,506,700 passengers at high risk in 1999. According to the GTAA, Toronto Pearson Airport had 15,859,289 domestic enplaned-deplaned passengers in 2015, compared to 12,376,000 in 1999. If the high risk traffic grew at the same rate as Toronto Pearson Airport's domestic traffic, it would be equal to 3,212,224 passengers in 2015. If the high speed rail service captured 70% of the eligible traffic, **it would reduce air traffic by 2,248,557 passengers per annum.**

However, the short haul services are integral parts of the networks of Air Canada and WestJet. They carry large numbers of passengers connecting to transborder and international services, plus an unknown number of domestic connections. The loss of some point-to-point traffic might prompt the airlines to use smaller aircraft. However, these markets, particularly Montreal and Ottawa, are very important to both airlines. A large scale discontinuation of flights is unlikely. The high speed rail services would therefore not relieve the major constraint of runway availability. The introduction of high speed rail services within the "Windsor-Quebec City" corridor and its potential impact on passenger demands within the southern Ontario airport system is examined within Scenario 4 in Chapter 8.

A high speed rail service might operate along the entire Quebec City-Windsor corridor. However, separate initiatives are considering services east of and west of Toronto.

6.4.1 High Speed Rail Initiatives

VIA Rail has questioned the viability of a high speed rail system similar to those of Japan, China or the TGV of France[12]. High capital and operating costs have been quoted as prohibitive to such a development. Also, the city pairs of the Montreal-Ottawa-Toronto corridor lack in population as compared to other systems in Europe and Asia. However, VIA Rail has proposed developing a dedicated, electrified track between Toronto, Ottawa and Montreal. The estimated $4 billion project would reduce trip times by 33% but most importantly, operate on its own track, eliminating all conflicts with freight trains. It would also allow higher speeds and better on-time performance. Unlike air travel, it would offer true downtown-to-downtown service.

VIA Rail's proposal would likely attract those who particularly value direct access to the downtown. The trains could be especially detrimental to air traffic at Billy Bishop Airport. Passengers who have chosen to fly to Toronto Pearson Airport rather than Billy Bishop Airport have already shown a preference for an airport outside of Toronto's downtown core. They may be less susceptible to capture by high speed rail than those using the downtown airport.

[12] Kristine Owram, "High Speed Rail not the right solution for Canada," (Toronto Globe and Mail, November 3, 2015)

The high speed rail service, combined with the UP Express rail service, might increase Toronto Pearson Airport's traffic. Passengers from Ottawa, Montreal and intervening points might prefer this combination to catch flights at Toronto Pearson Airport.

The Ontario Government is reviewing a Toronto-Windsor high speed rail system. VIA Rail already owns much of the trackage. The route to Kitchener-Waterloo, London and Windsor passes close to Toronto Pearson Airport.

The short Toronto-London/Windsor distances and strong competition from surface modes such as cars and busses already discourage air travel for local passengers. The time savings from the aircraft's enroute speed advantage are not present due to increased time spent in security and boarding. However, Southwestern Ontario provides important traffic feed. In March 2016, WestJet Encore began twice daily flights from London to Toronto Pearson Airport, presumably to feed its other flights.

Traffic volumes between Toronto Pearson Airport and Southwestern Ontario are relatively modest. The train, and the convenience of a station near Toronto Pearson Airport, might counteract any growing tendency to use the London or Waterloo airports. Eventually, as traffic and congestion at Toronto Pearson Airport grows, high speed rail might accelerate the development of these secondary airports.

6.5 Air Cargo

Transport Canada did not provide forecasts of air cargo at the southern Ontario airports to support this study. Except in extreme cases, such as Federal Express (Fedex) in Memphis or UPS and Louisville, air cargo is relatively unimportant in the demand-capacity relationship at an airport.

The integrated air freight operators tend to schedule departures late in the evening, with early morning arrivals. The total number of runway operations is usually small. As demand builds, the carrier uses larger aircraft rather than higher frequencies. The carriers develop their own facilities on airport land, and often make extensive use of off-airport depots and sorting facilities.

Traditional passenger airlines also carry air freight. They rely primarily on otherwise-empty belly capacity of passenger flights. While air cargo needs may influence the timing of flights or the choice of aircraft, it is primarily a by-product. Air cargo volumes will therefore depend on passenger activity, particularly for wide-body flights. However, many such flights operate on routes generating minimal air cargo. For example, there is a consistently strong demand for Asia-North America capacity, but North America-Asia air cargo is chronically weak and generates low unit revenues.

Air freight forwarders largely control the air freight that travels on conventional airlines. Most forwarders have off-airport properties. They provide many logistics functions, such as shipment acceptance and documentation. They frequently tender containerized shipments to the airlines. This effectively minimizes air cargo's demand for on-airport functions.

The airlines and forwarders make extensive use of intercity trucks. Many "air cargo" shipments travel entirely by trucks. The road feeder services feed Toronto Pearson Airport from cities as distant as San Francisco. These trucks support each forwarder's proprietary hub-and-spoke network. At the hub, or "gateway," the forwarder has volume-based contracts with the airlines. This arrangement can cause extensive "leakage" of Ontario's air freight to airports in the United States. A forwarder may have incentive contacts out of New York Kennedy that help it serve the entire United States. It may be less expensive to route a Toronto-London shipment through New York even if direct flights are available from Toronto. With North America being viewed a single air cargo market, the future level of air freight at Toronto Pearson Airport is largely indeterminate.

Toronto Pearson Airport has relatively few all-cargo flights operated for general forwarder/airline cargo. These flights use wide-body all-cargo aircraft, usually ex-passenger B747-400s or new B777s. They provide large capacities, but usually do not operate on a daily basis. They serve shippers who do not have a steady history of using air cargo, carry outsized items or hazardous materials, and supplement passenger flights during heavy traffic periods. Since they depend solely on air cargo revenues to cover costs and generate profits, they are very vulnerable to yield dilution. The very large wide-body belly capacity of passenger flights on the North Atlantic has depressed cargo yields sufficiently to eliminate almost all freighter flights for airline-forwarder cargo. The Asia-North America corridor is one of the few trade lanes able to generate the volumes and unit revenues to support wide-body freighters for general cargo. Every week, Toronto Pearson Airport has only a handful of such flights.

These considerations make air cargo almost irrelevant to any demand-capacity analysis of Toronto Pearson Airport. This study therefore does not consider air cargo capacity at the southern Ontario airports as a major factor driving the need of an airport at Pickering.

6.6 Summary

The Transport Canada forecasts call for relatively little change in the roles of the airports within the southern Ontario airports system. As per the forecasts, in 2036, Toronto Pearson Airport will continue to serve as the region's leading gateway for commercial airlines. Although the airport exercised overwhelming leadership in 2016, it will capture an even larger share of total traffic by 2036. Figure 6.18 compares the forecast enplaned-deplaned passenger traffic levels for the 2036 Medium case, at each of the passenger airports within the system.

Billy Bishop Airport will continue to serve intercity passengers. Slot controls, a short runway and environmental concerns will constrain growth. It has already captured some traffic that would otherwise have used Toronto Pearson Airport, but there is little potential for a greater secondary airport role.

The forecasts suggest that neither the Waterloo Airport nor the Hamilton Airport will, in 2036, play a significant role in relieving Toronto Pearson Airport. Each will retain a modest selection of scheduled flights serving a small portion of the local market. Their respective communities will continue to rely on Toronto Pearson Airport for most of their air transportation needs.

s.24(1)

[redacted]

Furthermore, system demand within the Southern Ontario is shown in Figure 6.19. Passenger travel demand within southern Ontario is expected to grow significantly within the 20 year study horizon, with the majority of passengers utilizing Toronto Pearson Airport.

Figure 6.19 – Southern Ontario Passenger Demand

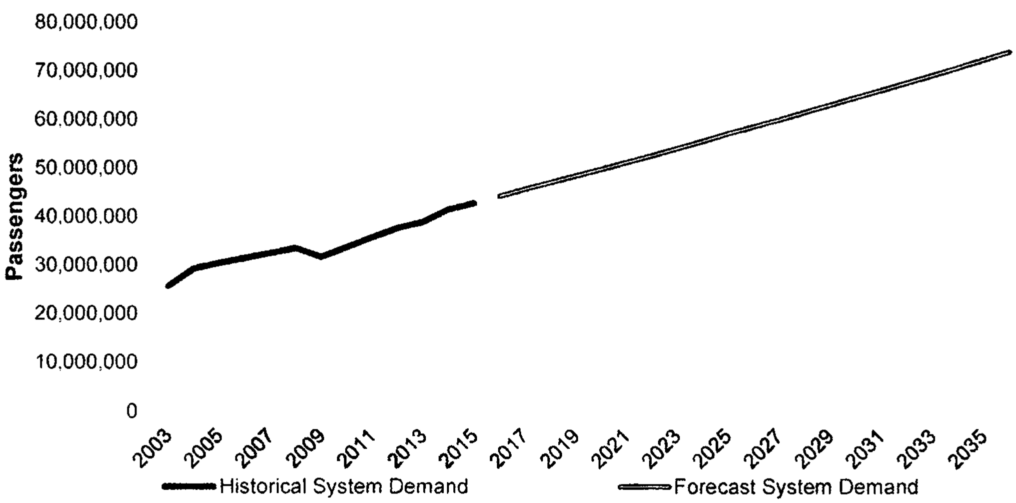


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Table 6.6 – Southern Ontario Passenger Demand Forecast (2036)

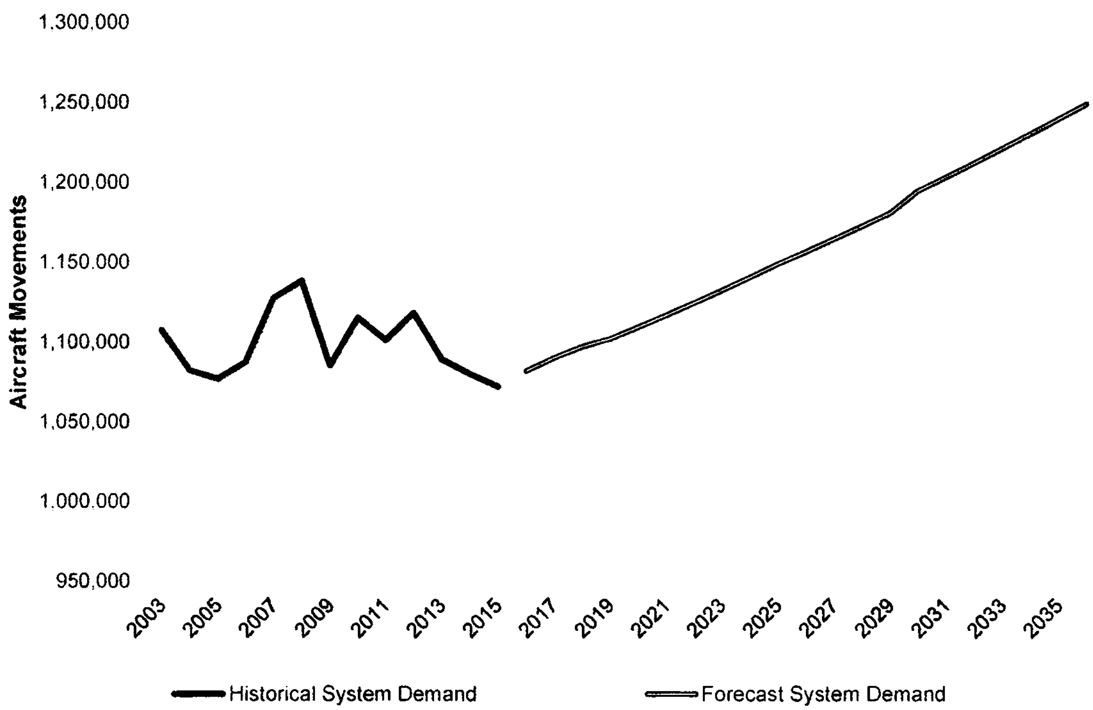
Summary of Passenger Demand (2036)				
Airport	Domestic	Transborder	International	Total
Toronto Pearson Airport	23,443,000	17,945,000	28,862,000	70,250,000
Billy Bishop Airport	[redacted]			
Hamilton Airport				
Waterloo Airport				

Larger traffic volumes at the Hamilton and Waterloo airports might postpone the need to develop an airport on the Pickering Lands. However, the advantages of Toronto Pearson Airport; Air Canada and WestJet hubs, high frequencies, a wide source of airlines and destinations, and numerous surface transport options, may offset the disadvantages of an increasingly crowded and delay-prone airport. Hamilton and Waterloo airports might then provide role models for the proposed Pickering airport. It might provide small scale, specialized commercial services of immediate relevance to the eastern extremities of the GTA. However, total volumes would not be sufficient to create a meaningful secondary role. Toronto Pearson Airport's "capacity" depends on its terminals, security services, government inspections services, gates, surface transportation links and airspace. However, its runways are arguably the most important determinant of its passenger throughput. Since it would be prohibitively expensive to purchase sufficient land for new runways, the airport's basic configuration is largely fixed. The number of runway operations is therefore an important determinant of passenger capacity. Figure 6.20 shows Transport Canada 2036 Medium aircraft movements forecasts for the southern Ontario airports. Figure 6.21 shows the total system demand for aircraft movements within southern Ontario.

[redacted]

s.24(1)

Figure 6.21 – Southern Ontario Aircraft Movement Demand Forecast



[redacted]

Figure 6.20 illustrates the strong dominance of Toronto Pearson Airport. These forecasts are most useful when compared to the capacities of each airport. The next section of this report will examine capacity issues in detail.

7.0 AIRPORT CAPACITIES

The requirement to develop a new Pickering Airport has, through previous studies, been identified based on a projected capacity shortfall or gap in Toronto Pearson Airport's ability to service the expected air passenger demand within southern Ontario. Previous studies also suggest that the capacity shortfall extends to include the airports within the southern Ontario airports system. This study considers current technologies, operational practices and infrastructure in order to determine the current capacity of the airports within the system, and identifies airport infrastructure, ATC improvements, and future aircraft fleets to determine the capacity of the system in 2036.

This chapter examines the infrastructure and operational capacities of the airports within the southern Ontario airports system based on several parameters described herein, and the assumptions shown in Appendix B. Chapter 7 also includes an explanation of the approach and methodology for calculating airport capacity, followed by a review of the key capacity terms, and provision of various capacities for airports within the southern Ontario airports system.

7.1 Approach and Methodology

The capacity of the airports within the southern Ontario airports system has been determined using a consistent set of definitions and assumptions. The capacities of each of the 10 individual airports have been estimated based on the key infrastructure elements and operational practices, including:

- Airfield infrastructure - Including runways and taxiways (passenger and general aviation airports);
- The terminal apron area - The number of aircraft stands available to support regular passenger aircraft operations (passenger airports only);
- Air terminal areas - The available passenger processing space within air terminal facilities (passenger airports only); and
- Groundside parking facilities – The number of vehicle parking stalls available for public use (passenger airports only).

In addition to these capacities, an estimate of cargo capacity has also been determined based on available uplift and processing capacity of current and future air cargo operations at Toronto Pearson and Hamilton Airport.

This study not only considers current infrastructure and operational practices at the airports within the southern Ontario airports system, but also considers future capacity in 2036 based on planned developments identified within current airport Master Plans and Development Plans commissioned by the study airports themselves. In addition, future changes in aircraft mix and Air Traffic Control (ATC) practices and procedures are considered when determining airport capacities at the end of the 20 year planning horizon (2036).

This study differentiates between two distinct groups of airports within the southern Ontario airports system as described below, and as identified in Table 1.1:

1. Passenger Airports - Airports that provide frequent passenger air services to the travelling public.
2. General Aviation Airports – Airports supporting flight training, recreational, corporate, and aviation related industrial roles.

Although most airports within the southern Ontario airports system fall within either one of the categories listed above, some airports serve both passengers and general aviation activities, as identified within this section.

7.2 Definitions

7.2.1 Airfield Capacity

The following definitions have been employed within this study to evaluate airfield capacity:

- Maximum Runway Throughput Capacity: The expected number of movements that can be performed on the runway(s) in an hour without violating ATC rules, assuming continuous aircraft demand.
- Hourly Practical Runway Movement Capacity: The expected average number of movements that can be performed in an hour with an average delay per movement of 4 minutes. Practical runway capacity = 85% of the Maximum Throughput Capacity (FAA definition). This is further expanded to determine annual capacity by categorizing hours of operation, aircraft mix, VFR and IFR throughput and applying an annual capacity factor to these values.
- Annual Practical Runway Movement Capacity: The annual practical runway capacity is determined by taking the practical runway capacity, and incorporating hours of operation, and other historical restrictions that will limit the airport's annual capacity (e.g. winter operations can result in a reduction in airfield capacity).
- Annual Runway Passenger Capacity: Annual runway passenger capacity is determined by taking the calculated practical annual capacity, and applying an average number of aircraft seats to each movement. An 80% load factor is assumed for each aircraft.
- Annual Terminal Apron Passenger Capacity: The expected number of passengers capable of being processed per annum determined by an average passenger gate throughput of 300,000 passengers per annum (PPA) at Toronto Pearson Airport and 250,000 PPA at the other passenger secondary airports. This per gate throughput is then multiplied by the number of passenger gates and remote stands to obtain the total terminal apron capacity. This definition and method was determined through research of current passenger volumes and number of gates at Toronto Pearson and Billy Bishop Toronto City Airport. Remote stands used to support passenger aircraft that are not permanently fixed to air terminal facilities are included within the capacity calculations.

7.2.2 Air Terminal & Groundside Capacity

The following definitions have been employed within this study to evaluate air terminal and groundside capacity at the airports within the southern Ontario airports system:

- Annual Terminal Building Passenger Capacity: The expected number of passengers capable of being processed within the facility and determined by estimating the relationship of 10,000 m^2 of terminal area per million PPA.
- Annual Groundside Parking Passenger Capacity: The number of parking stalls provided was determined by estimating the relationship of 850 parking stalls per 1 million PPA. This value was determined by the mathematical average from the Airport Systems | Planning, Design and Management's general guideline,[13] supported by a comparable rule-of-thumb used in the 2010 Needs Assessment Study. It is important to note Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities, vehicle drop offs and pickups and capacity provided by public transportation.

7.2.3 Cargo Capacity

The cargo capacity analysis focuses on the aggregate cargo uplift capacity of an airport's flights. It is this method that measures an airport's overall attractiveness to the air cargo industry. This was an important consideration when determining a definition for cargo capacity. The following definition has been employed within this study to evaluate airport cargo capacity:

- Cargo Capacity: The expected processing maximum in terms of tonnes of air cargo per annum that can be handled at on and off-airport facilities. These values were determined by identifying cargo uplift capacity at the southern Ontario airports and correlating typical daily cargo operations to historical air freight quantities available per flight. The United States Department of Transportation provides aircraft loads by aircraft type and flight segment and these numbers are then related to operations at identified cargo airports within the southern Ontario airports system. Both dedicated cargo aircraft and belly cargo space on passenger aircraft are considered in this definition. It is important to note that based on stakeholder consultations, only Toronto Pearson and Hamilton Airports have dedicated air cargo services and facilities. These are the only airports where air cargo capacity has been examined within this study.

7.3 Calculation of Airfield Capacity

In determining the ultimate capacity for each airport, multiple factors have been considered which have an impact on airfield capacity. These factors include:

- Number and geometric layout of the runways;

[13] De Neufville & Odoni, 'Airport Systems | Planning, Design, and Management', 2003

- ATC practices and procedures, including management of aircraft separation requirements on arrival or departure from an airport, sequencing of aircraft movements throughout the day, and year, and operational runway configurations;
- Weather conditions (visibility, precipitation, wind speed and direction);
- Mix of aircraft types based on aircraft weights; and
- Other restrictions such as noise abatement, hours of operation, etc.

Accordingly, runway capacity can vary, taking on different values at different times, depending on the specific set of parameters in effect at any given time.

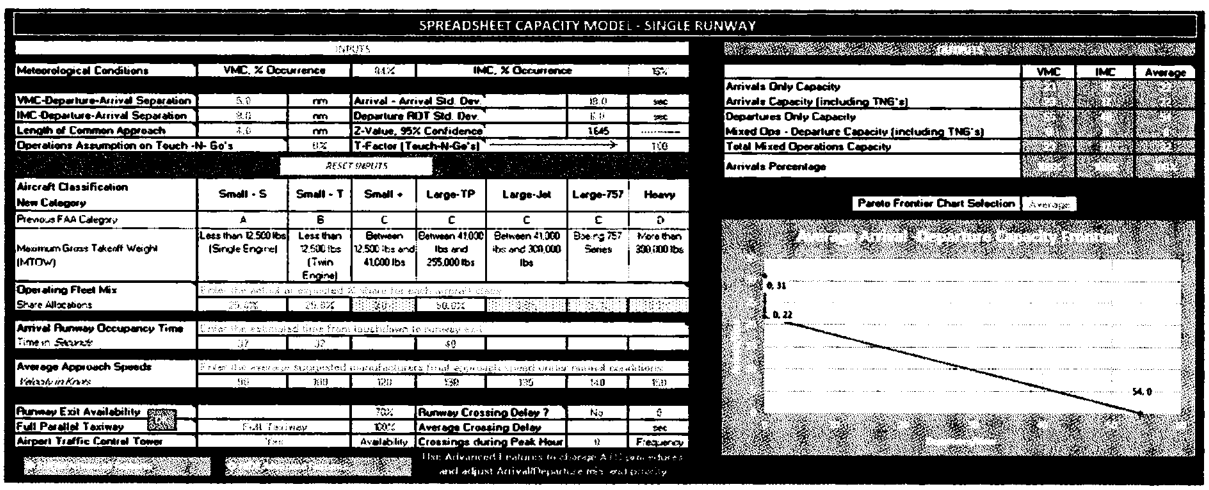
7.3.1 Selected Airfield Capacity Model

The Prototype Airfield Capacity Model (PACM) was utilized in the determination of airfield capacity at each airport within the southern Ontario airports system (except Toronto Pearson where capacity values were provided by the GTAA and validated by the project team). The model was developed by industry through sponsorship by the Airport Cooperative Research Program (ACRP), a division of the Transportation Research Board based in the United States.

The model is a simplified excel-based tool used to determine hourly maximum throughput capacity for a single runway, dual parallel runways, and dual intersecting runways.

Figure 7.1 shows a screen shot of the spreadsheet capacity model for a single runway airfield capacity calculation.

Figure 7.1 – Screenshot of PACM

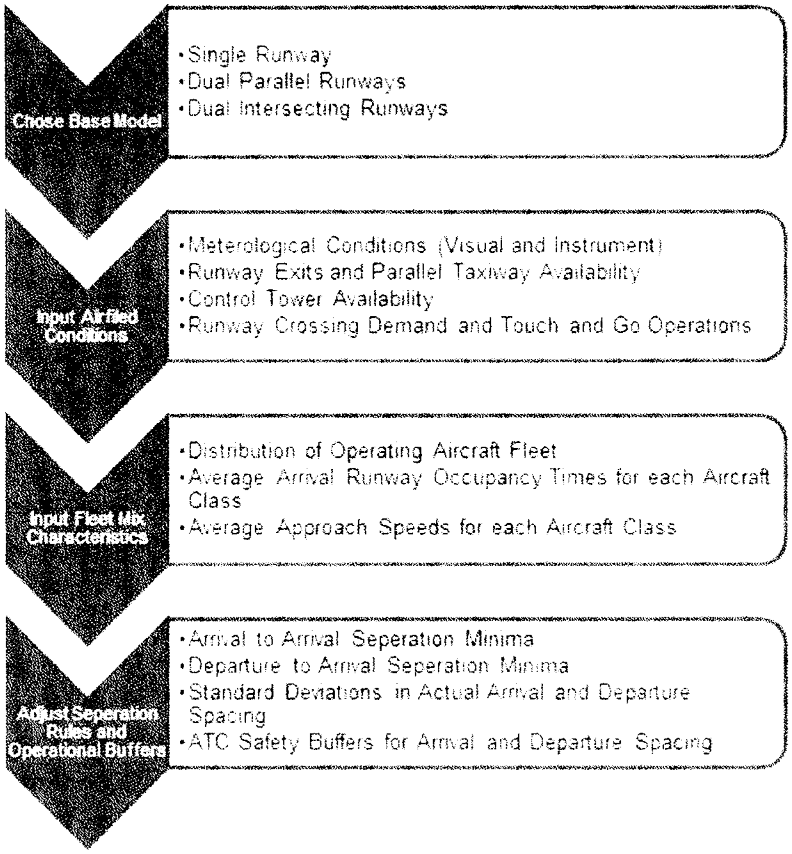


Note: Sample data shown for illustration purposes only.

The model is not meant to replace detailed capacity analysis which often utilizes programs such as the FAA Airport and Airspace Simulation Model (SIMMOD) or the FAA Airfield Delay Simulation Model (ADSIM). The PACM was selected because of its ability to consider all relevant capacity factors, and its strong positive correlation to historically accurate measurements of capacity.

Figure 7.2 – PACM Utilization Process provides an overview of the steps involved in using the capacity model including the necessary inputs required to estimate airfield capacity.

Figure 7.2 – PACM Utilization Process



Source: Landrum & Brown

The determination of airfield capacity is based on the average separation time between the arriving and departing aircraft, which produces a number of arrivals/departures that occur in a 1 hour period. PACM models the interactions of different aircraft classes in a given fleet mix following minimum spacing and air traffic rules. When there is sufficient spacing between successive arrival or departure movements, additional departures or arrivals can be inserted between the two, allowing for mixed operations. The optimal capacity is typically a balanced mix of arrivals and departures. As such, capacities have been estimated at a 1:1 mix of arrivals and departures.

7.3.1.1 Model Inputs and General Assumptions

Inputs to the PACM were used to determine airport capacities at the airports within the southern Ontario airports system are described below:

Runway Usage Statistics

Runway usage is an important consideration in establishing airfield capacity as the capacity of each runway may differ. The reasons for their differences in capacity from one runway to the next are a result of availability of runway exits, navigational aids and overall runway length. When wind speed and direction requires the airport operate a particular runway with an overall lower capacity, the maximum throughput of the system is reduced. Consequently, runway usage statistics were consulted and an average runway utilization was assigned to each airport in determining airfield capacity.

Prevailing Meteorological Conditions

A key adjustment within the capacity model is the percentage of time the airfield operates under Visual Meteorological Conditions (VMC, % Occurrence) and Instrument Meteorological Conditions (IMC, % Occurrence). Generally speaking, airfield capacity is highest during VMC as aircraft separation on approach and departure are based on visual identification of other aircraft. The greater the percent time of VMC an airport encounters, the higher the average airfield capacity compared to an airport operating under a high percentage of IMC, with greater aircraft separation on arrival and departure.

For the purpose of this study IMC is considered to be ceilings less than 1,000 feet Above Ground Level (AGL) and/or visibility less than 3 Statute Miles (SM). VMC is considered to be ceilings of 1,000 feet AGL and greater and visibilities of 3 SM and greater.

For the purpose of this study VMC includes both Marginal VFR (MVFR) and Visual Flight Rule (VFR) conditions.

In determination of IMC occurrence, NAV CANADA's Local Area Weather Manual was consulted. The climatic summary published for Buttonville Airport was selected as best representative of the region and the group of ten airports selected for capacity analysis, based on its central location within the system. To determine historical IMC occurrence for each airport independently would require the purchase of Environment Canada historical weather data for processing and analysis. This level of effort was considered to be beyond the scope of this study.

Figure 7.3 – Frequency of Ceilings below 1,000' AGL, and/or Visibility below 3 Miles during Summer – Buttonville Airport

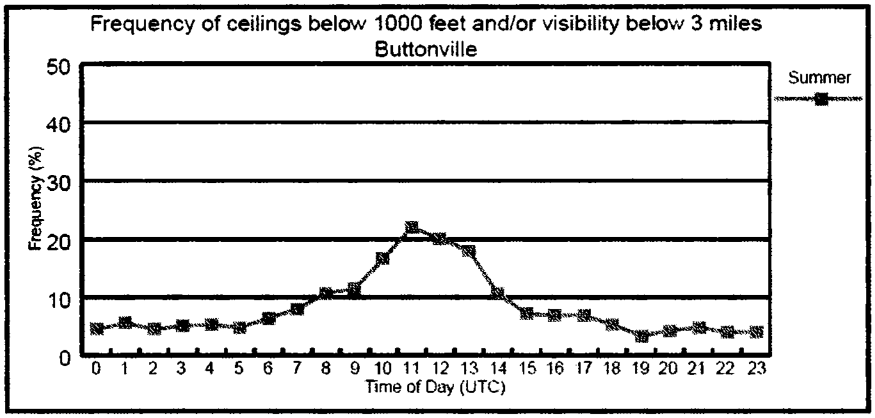
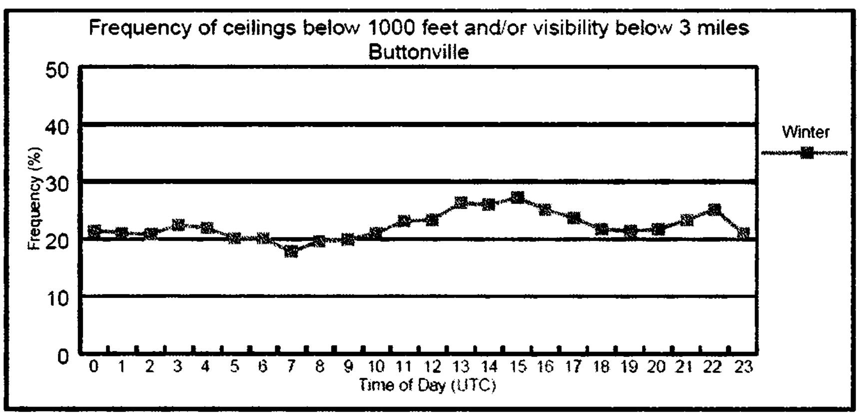


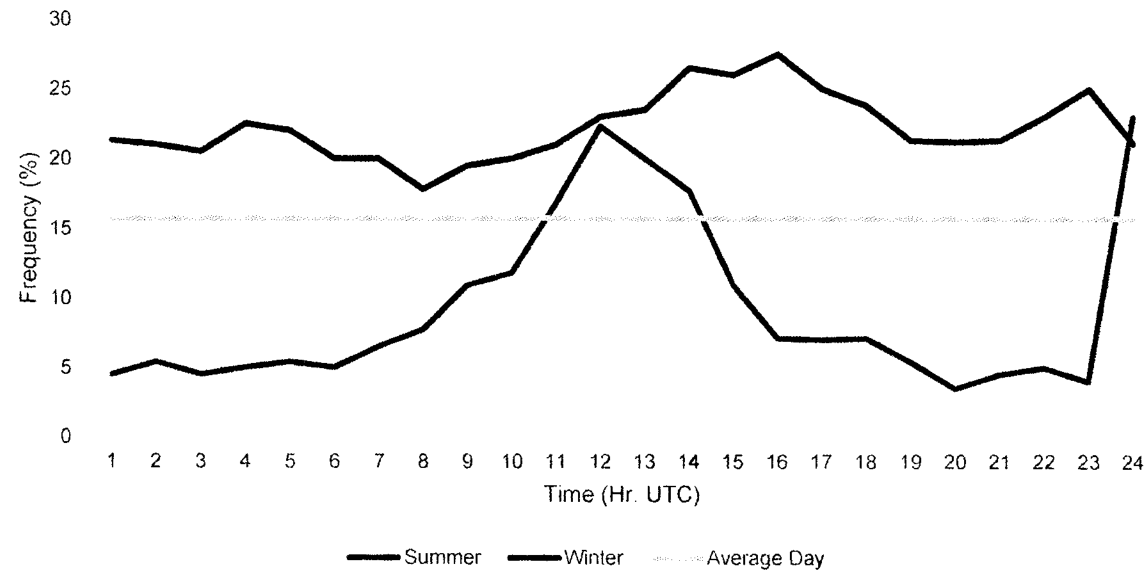
Figure 7.4 – Frequency of Ceilings below 1,000' AGL, and/or Visibility below 3 Miles during Winter – Buttonville Airport



Data from the Figures 7.3 and 7.4 was used to determine a meteorological average day for the purpose of determining percent IMC and percent VMC for the airports within the southern Ontario airports system. First, the frequency of an average summer day was calculated, followed by an average winter day. The median was then assumed to be the meteorological average day. This assumes an equal number of days and hours for both summer and winter in a two season year.

Figure 7.5 illustrates that the average meteorological day is 15.7% IMC. For the purposes of the capacity calculations presented within this study, this value has been rounded to 16% IMC.

Figure 7.5 – Composite Frequency of Ceilings below 1,000 Feet and/or Visibility below 3 Miles at Buttonville Airport



Touch and Go Factor

Possibly the number one influence on airfield capacity for the general aviation airports within the southern Ontario airports system is the percentage of traffic assumed to be conducting touch and go operations. In general, it has been assumed that the higher the percentage of traffic associated with flight training activities, the higher the touch and go factor. High percentages of touch and go aircraft movements will yield higher maximum runway throughput capacities, especially at the general aviation airports.

Aircraft Separation

For each airport, average aircraft separation (distance between aircraft on arrival and departure) was determined through consultation with NAV CANADA. PACM uses the average aircraft separation as a factor in calculating maximum throughput capacity of a runway.

The following average separations were determined through consultation with NAV CANADA:

- VMC-Departure-Arrival Separation in Nautical Miles (NM)

  This is the average separation between aircraft under VMC as defined by NAV CANADA's Manual of Operations (MANOPS).

- IMC-Departure-Arrival Separation (NM)

  This is the average separation between aircraft under IMC as defined by NAV CANADA's MANOPS. Spacing for Departure-Arrival separation takes into account the time required for an aircraft to climb into radar coverage and be identified by the controller. Spacing does not take into account winter operations or special situations that may necessitate increased spacing.

- Length of Common Approach

  The length from the average point at which ATC gives an aircraft clearance to land.

- Operations Assumptions on Touch and Go Movements

  Not applicable for most airports. More significant for general aviation airports that support flight raining activities.

- Arrival-Arrival Standard Deviation

  Expresses real variability in arrival to arrival separation. PACM assumes 18 seconds between aircraft.

- Departure ROT Standard Deviation

  Expresses real variability in departure runway occupancy time standards. PACM assumes 6 seconds standard deviation.

Operating Fleet Mix

Operating fleet mix, or the typical air traffic mix using operating at the airport has been determined through consultation with each airport. Operating fleet mix influences the number of movements achievable within a given hour as different aircraft sizes (weight classes) require varying separation standards and operate different approach and departure speeds.

Arrival Runway Occupancy Time

Arrival runway occupancy times were calculated for each airport, supported by consultations with NAV CANADA.

Average Approach Speed

In absence of average approach speeds for the operating fleet mix, standard or typical approach speeds have been used for each aircraft weight class.

Runway Exit Availability

The number of available runway exits influences capacity by decreasing the time it takes for an aircraft to exit the runway following a landing. Similarly the availability of a full or partial parallel taxiway can further decrease typical runway occupancy times.

Air Traffic Control (ATC) Services

The availability of an air traffic control tower also influences capacity. An airport supported by ATC benefits from positive control of aircraft and management of traffic to optimize capacity of the active runway.

Instrument Flight Rules (IFR) vs. Visual Flight Rules (VFR)

For the purpose of capacity calculations, all movements for Toronto Pearson Airport and Hamilton Airport are assumed to be completed under Instrument Flight Rule (IFR) operations with IFR clearance retained until landing. Waterloo Airport, Billy Bishop Airport and the general aviation airports are assumed to operate under both IFR and VFR conditions based on current and future airport roles.

Arrival Departure Sequencing

A 1:1 mix for arrivals and departures has been used as the target mix for planning purposes. This mix requires that a departure be sequenced between every arrival. Consequently, the runway capacity declared may be lower than would otherwise be observed if preference were given to a higher mix of departures or arrivals.

Conflicting Airspace

All airports were treated independently and do not reflect the impact on surrounding airports. For example: Approaches at Toronto Pearson Airport, Billy Bishop Airport, Brampton Airport and Burlington Airpark may not be able to operate simultaneously without impacting the separation/spacing at the other airport. Consultations with NAV CANADA suggest that this will not be a limiting factor in terms of the overall capacity of the southern Ontario airports, as future airspace and procedure modifications could be undertaken to mitigate this potential issue.

Daily Hours of Operation

Hours of operation have been identified based on consultation with stakeholders and a review of normal practices. In general, it has been assumed for passenger airports a normal day consists of 18 hours of operation and for general aviation airports 17 hours per day unless otherwise noted. This is reflected in the airport's declared practical annual capacity.

Annual Days of Operation

Since the demand for air travel is typically lower on weekends than on weekdays and lower in the fall, winter and spring seasons than in the summer, the multiplication of the planning day capacity by 365 days per year would yield an unrealistically high annual airfield capacity. Instead, analysis of weekday versus weekend and seasonal traffic data at Toronto Pearson Airport suggests that a planning day to annual capacity factor of 320 is more appropriate. For the purpose of this study, 320 days has been applied to the determination of annual capacity at all passenger and general aviation airports in the southern Ontario airports system.

Average Aircraft Size

In determining a corresponding annual runway passenger capacity, an expected average aircraft size was identified and utilized. For Toronto Pearson Airport, an average seating capacity per aircraft movement of 128 for 2016, and 148 for 2036 has been assumed. For Hamilton Airport and Waterloo Airport, the expected average size is 160 seats for both 2016 and 2036 conditions, representative of the B737-800W. For Billy Bishop Toronto City Airport, the average aircraft size 70 of seats applies to both 2016 and 2036, representative of the Bombardier DHC-8-400 operated by Porter Airlines and Air Canada. A load factor of 80% is applied to calculate the number of passengers per aircraft movement.

7.3.1.2 Conditions for Assessment

In evaluation of capacity of the airports within the southern Ontario airports system, three conditions were assessed. These conditions include:

- Base Condition: 2016 airport infrastructure, 2016 aircraft mix, 2016 ATC practices and procedures;
- Condition A : 2016 airport infrastructure, 2036 aircraft mix, 2016 ATC practices and procedures; and,
- Condition B: 2036 airport infrastructure, 2036 aircraft mix, and 2036 ATC practices and procedures.

7.4 Passenger Airports

7.4.1 Toronto Pearson International Airport

7.4.1.1 Background

In 2015, according to the GTAA, Toronto Pearson Airport accommodated ~41 million passengers, ~444 thousand aircraft movements and ~435 thousand tonnes of cargo[14].

In determination of Toronto Pearson Airport's ultimate capacity, direct consultations and reference to several existing studies were made. The first such study entitled "Toronto Pearson: Growth, Connectivity, Capacity – The Future of a Key Regional Asset" highlights Toronto Pearson Airport as a key global connection and economic asset, and outlines anticipated air travel demand in the region. The report states that by 2043 regional air travel volumes in southern Ontario are expected to reach 90 million passengers annually.

The second study, entitled "Pearson Connects: A Multi-Modal Platform for Prosperity", dated February 2016, prepared by Urban Strategies Inc., provides information related to the multi-modal transit hub at Toronto Pearson Airport referred to as 'Union Station West'.

Southern Ontario regional air traffic demand was estimated at approximately 44 million passengers annually in 2015 and is expected to at least double by the early 2040s. According to the GTAA, more than 90 per cent of the demand is anticipated to be accommodated at Toronto Pearson Airport[15].

The GTAA's current aviation growth projections for Toronto Pearson Airport estimate 51 million annual passengers and 501 thousand aircraft movements in 2020 and 69 million annual passengers and 599 thousand aircraft movements by 2034.[16] This forecast is subject to change as they periodically update their aviation growth forecasts to account for the changes in factors that affect the future aviation activity outlook.

[14] GTAA, Annual Report, 2015
[15] GTAA, Annual Report, 2015
[16] GTAA, Annual Report, 2015. GTAA projection, not forecast by Transport Canada

7.4.1.2 Airfield

Currently at Toronto Pearson, the GTAA applies an hourly cap of 90 movements in planning its operations. Accordingly, under Base Condition and Condition A, the cap of 90 movements has been used as the hourly practical runway movement capacity for Toronto Pearson as this reflects current practices. Further, it is assumed that the planning day is consisted of 18 standard operating hours. Based on these parameters, daily practical runway movement capacity of Pearson is estimated at 1,620 movements.

To test the validity of the above estimate, the project team has reviewed information provided by the GTAA, and historical runway usage patterns obtained from NAV CANADA. According to the GTAA and NAV CANADA, existing hourly maximum runway throughput capacity based on an east-west runway configuration was identified at 120 movements. Operating in north-south runway configuration, hourly maximum runway throughput capacity is reduced to 86 movements per hour. Historical runway usage patterns for east-west and north-south runway operations were utilized to determine an hourly maximum runway throughput value for the facility as a whole. Based on historical utilization of east-west runways (90%) and north-south runways (10%) at Toronto Pearson, these percentages were applied to the 120 and 86 movements per hour and an hourly maximum throughput value of 117 was determined. Multiplying the 117 movements by 18 hours, a factor of 0.90 to account for lower demand in some hours of the day, and a 0.85 factor to account for a practical service level, total daily practical throughput capacity would be 1,611. This figure reconciles well with the 1,620 daily practical throughout capacity calculated above, with a 90 movement per hour operational cap.

Under Condition B, improved ATC practices procedures and technologies are assumed to be employed within the 20 year study period. As a result, capacity may grow by a factor of 20% to best support continued aviation growth. Hence the hourly practical runway movement capacity in 2036 is estimated as the 90 movement per hour cap subject to a 20% improvement, resulting in a practical runway movement capacity of 108 movements per hour.

This 20% improvement in movements if applied to the 117 hourly maximum runway throughput capacity would provide 140 movements per hour in 2036. If the operational cap of 90 movements per hour was eliminated, the 20% capacity improvement resulting from new ATC practices and procedures applied to the unrestricted base case (117 movements per hour) would provide a maximum hourly throughput capacity of 140 movements per hour in 2036.

In order to annualize the daily practical runway movement capacity values, an annualization factor of 320 days was applied. The 320 value was selected as it was the basis for the 2010 Pickering Lands Needs Assessment study completed by the GTAA. We understand that this value was determined by the GTAA by analyzing the weekday, weekend and seasonal traffic demand at Toronto Pearson and determining a ratio of planning day movements to annual total movements.

After runway passenger factors and aircraft load factors were applied, an annual runway passenger capacity was determined as identified in Table 7.1. The estimated annual runway passenger capacity assumes that all aircraft movements consist of passenger-carrying aircraft.

Future airfield capacity is constrained by the current runway system. There are no firm plans for adding an additional east-west parallel runway. The most significant improvement to airfield capacity is expected to come as a result of ATC technology advancements as well as practices and procedural improvements. These improvements are expected to be operational within the 20 year planning horizon (and as early as 2026) and would include a combination of the three practices and procedures listed below. These technology enhancements are reflected in the Condition B capacity calculations for passenger airports.

- Visual Separation on Departure

  Allowing visual separation on departure procedures to be used will increase runway throughput by permitting a reduced distance to occur between aircraft. This would allow for departures to occur:

  - When the landing aircraft has cleared the runway; and
  - When a departure has turned clear of the departure path, or
  - When a departure has reached a point on the departure path where it will not conflict with the succeeding aircraft.

- Precision Runway Monitoring (PRM)

  Precision Runway Monitoring (PRM), once fully implemented, will permit close-parallel approaches to occur to 06L-24R and 06R-24L increasing capacity for those runways. The system is used by ATC to monitor simultaneous close parallel instrument approaches. The system utilizes a high speed, high precision radar system to monitor aircraft spacing.

- Time-Based Arrival Separation

  The current system in place relies heavily on distance-based separation standards for management of traffic flow. Replacing this system with time-based arrival separation will allow separation of traffic of similar weight category by time rather than distance. This will allow for increased airspace capacity and runway throughput by eliminating unnecessary buffers in distance to account for variability in aircraft approach speeds.

Combined, it is expected that these improvements will yield a 20% increase to maximum runway throughput. Other improvements, if implemented, which may contribute to achieve higher throughputs beyond the 20% increase, include the following:

- Performance Based Navigation (PBN)

  A lower reliance on traditional navigation using ground-based sensors, and a greater reliance on performance-based navigation, will continue to improve operational efficiency and capacity through tailored airspace architecture.

- Multilateration (MLAT)

  Eventual roll out of multilateration or MLAT within southern Ontario will lead to a "radar-like" condition that would extend beyond current radar coverage and provide more detailed and accurate flight information. This technology will help to enhance situational awareness of surface movements.

MLAT offers most advantages in situations where other surveillance systems (e.g. radar) are not available or severely limited. It can also be combined with other surveillance systems, such as radar and ADS-B, to improve the total surveillance picture.

- Aircraft Vortex Spacing System (AVOSS)

  Still in its infancy, the Aircraft Vortex Spacing System (AVOSS) developed by NASA allows for reduce wake-turbulence separation through active monitoring and prediction of wake vortex strength and location to produce dynamic wake vortex spacing criteria for arriving aircraft.

Based on these considerations, Toronto Pearson Airport's airfield capacity is presented in Table 7.1.

Table 7.1 – Toronto Pearson Airport Estimated Airfield Capacity

	Base Case	Condition A	Condition B
Flight Rules	IFR	IFR	IFR
Maximum Throughput (Hourly)	117	117	139.9
Practical Factor:	CAP	CAP	CAP
Practical Throughput (Hourly)	90	90	108
Daily Operation Factor (Hours):	x 18	x 18	x 18
Practical Throughput (Daily)	1620	1620	1944
Annualization Factor (Days/Annum):	x 320	x 320	x 320
Practical Throughput (Annual)	518,400	518,400	622,080
	518,000	**518,000**	**622,000**
Runway passenger factor:	128	148	148
Aircraft load factor:	0.8	0.8	0.8
Runway Passenger Capacity (Annual)	53,084,160	61,378,560	73,654,272
	53,100,000	**61,400,000**	**73,700,000**

Aircraft Capacity Factors

Larger aircraft might postpone Toronto Pearson Airport's eventual saturation. Table 7.2 shows average seat capacities by route for August 9, 2016, including every scheduled arrival and departure. Each record includes the airline, the type of aircraft and the seat capacity. Two fields consider the "successor aircraft" for each flight. For example, Air Canada may replace the 146 seat A320 with the B737 MAX of 170 seats. The database includes the most likely successor aircraft for each current type. For some instances, such as the B777, no successor is immediately evident. The database then assumes that the current type of aircraft will continue to serve in the future.

Table 7.2 - Aircraft Capacities by Route, Summer 2016

Route	Departures	Seats/Flight 2016	Seats/Flight Future	Seats/Flight Change
Ontario and Quebec	123	86	99	14.7%
Other Domestic	173	137	159	16.0%
Transborder Hub	59	79	98	22.9%
Transborder Leisure	20	164	187	14.2%
Transborder Intercity	170	82	101	24.0%
Caribbean and Latin America	39	162	183	12.9%
Europe	55	281	311	10.5%
Asia	16	318	333	4.9%
Total	**654**	**128**	**148**	**15.4%**

Source: Greater Toronto Airports Authority website and airline schedules – Summer, 2016

Between 2015 and 2035, Transport Canada forecasts Toronto Pearson Airport's enplaned-deplaned passenger traffic to grow by a compounded annual rate of 2.6 percent. The 15.4 percent increase in average seat capacity implies a 2.6 percent annual growth over 5.5 years. Larger aircraft could thus significantly increase the capacity of Toronto Pearson Airport and postpone large investments in new airports.

Table 7.2 understates the potential for larger aircraft on European and Asian services. New stretched versions of the B777 will increase capacity over and above the amounts appearing in the table.

"Transborder Leisure" markets include Florida, Las Vegas and Phoenix. "Intercity" routes of U.S. and Canadian carriers operate to non-hub points in the United States. The "Transborder Hub" row summarizes U.S. carrier services to their respective hubs. The average flight capacity of 79.35 seats is surprisingly small. It is substantially less than similar measures for Canadian domestic and U.S. domestic hub-oriented routes. Many of these routes, such as American Airlines' Toronto-Chicago flights, were once flown by narrow body aircraft and even 220 plus seat DC10s. There is considerable scope for using larger aircraft on transborder hub routes. However, the lower direct operating costs and greater capacities would likely lead to lower fares. Traffic on the relatively sluggish transborder routes would then increase. The capacity implications of the larger aircraft at Toronto Pearson Airport would depend on their traffic stimulation effects and their capacities.

Flight Timing Capacity Factors

The "true" capacity of Toronto Pearson Airport depends partly on the time-of-day preferences of its passengers and airlines. Lengthy periods can exist when there is no demand for runway slots and departure times are often dictated by downline arrival times and aircraft utilization concerns. For example, an evening transatlantic departure arrives in Europe in the morning, and affords good connections to a wide range of onward flights. The aircraft then departs for Toronto in the late morning, landing in the popular afternoon period. It can then be turned to repeat the process. No other timings provide such a combination of connecting opportunities, popular arrival and departure times and excellent aircraft utilization. Similar principles govern most international routes.

The rapid growth of international services to "non-traditional" destinations creates new opportunities to enhance Toronto Pearson Airport's utilization. For example, Air Canada's recently inaugurated flights to Dubai and New Delhi both depart Toronto at 22:55 and arrive back at 05:00 local time. These timings are significantly different from the traditional peaks in transatlantic services.

Services to the Far East have two operating "windows." Many inbound flights arrive in the morning and depart in the mid to late afternoon. They exacerbate the peaks of the transatlantic flights; however, a flight that leaves North America in the early morning arrives in the Far East at dawn, just as airport inspections services are opening. The return flights leave the Far East in the evening, and arrive in North America late at night.

New York Kennedy has a more developed trans Pacific schedule than Toronto Pearson Airport. It has seven daily departures during the traditional afternoon window and six in the early morning. Four airlines use both windows to offer double-daily services.

As Toronto Pearson Airport's Asian traffic grows, many airlines operating only during the afternoon window may consider adding a second departure in the early morning. Such twinning of flights, with no new carriers or destinations, could add up to 1.5 million passengers annually to the airport's traffic.

A similar process is affecting transatlantic flights. Several carriers with a daily core schedule have been adding seasonal or less than daily second flights. While most flights to Europe depart in the late afternoon and early evening, the second flights usually operate in the mid to late evening. They provide an arrival time in Europe close to noon. The westbound departures provide many connections that are not available to the earlier flights. As airlines expand their transatlantic frequencies, they will offer flights outside of Toronto Pearson Airport's customary traffic peak. Five such flights could accommodate 1.1 million additional passengers per annum.

In summary, Toronto Pearson Airport has many international growth opportunities. New flights to the Far East, Middle East and South America will follow scheduling patterns that are very different from the "traditional" markets of Canada, Europe and the United States. Some of the new flights could exacerbate Toronto Pearson Airport's operating peaks. However, many of the new flights will arrive and depart at off-peak times. They will allow Toronto Pearson Airport to increase its passenger throughput with no new investments in facilities.

7.4.1.3 Terminal Apron

At the end of 2015, Toronto Pearson Airport operated 85 Passenger Boarding Bridge (PBB) equipped aircraft stands, 35 walk-out commuter aircraft stands and 17 remote aircraft stands[17]. In the next 20 years the GTAA plans to increase the number of aircraft stands as aviation growth warrants and depending on the changes in aircraft fleet mix of the airlines serving Toronto Pearson Airport[18]. The current projections estimate an increase in the number of aircraft stands of 25 to 35% over the next 20 years. These projections are subject to change based on changes in aforementioned factors affecting the aircraft stand requirements.

[17] GTAA, 'Annual Information Form for the Year Ended December 31, 2015', 2015
[18] GTAA, 'Annual Information Form for the Year Ended December 31, 2015', 2015

Each contact aircraft stand (equipped with the passenger boarding bridge or walk-out) has an associated air terminal gate with passenger boarding gate equipment and holdroom space. Remote aircraft stands are served by bus from the bussing bays and are included in the aircraft stand values stated herein.

Based on the anticipated increase in gates it is expected that Toronto Pearson Airport's terminal apron capacity will grow from 41.1 million PPA in 2015, to 56.7 million PPA with 182 to 196 gates in the next 20 years. Included in this value is the capacity provided by the currently unused Infield Terminal.

7.4.1.4 Terminal Building

The total floor area of Terminal 1 is approximately 339,000 m^2, while the total floor area of Terminal 3 is approximately 178,000 m^2 [19]. The currently unused Infield Terminal (IFT) has an approximate floor area of 126,000 m^2. As part of the 20 year strategic framework approved by the Board in 2015, the GTAA is expected to continue to meet the growing demand for air travel through making optimum use of existing facilities prior to investing in new capital infrastructure. In the near term, the GTAA is expected continue to focus on capital programs that optimize the capacity and use of its existing infrastructure assets to improve passenger, baggage, and aircraft processing and flow, comply with regulatory requirements, and enhance customer experience.[20] The GTAA's current development plans contemplate expansion of Terminal 1 to the east. Phasing and timing of future air terminal expansion projects will depend on the forecast aviation growth. The expansion plans are currently in the conceptual stage and are subject to change. The current projections estimate an increase of 15 to 25% in the total terminal floor area in the next 20 years.

Based on the increase in floor area it is expected that Toronto Pearson Airport's terminal building capacity will grow from 51.7 million PPA to 71.1 million PPA with approximately 67,800 m^2 of terminal building expansion. Included in this figure is the capacity afforded by preservation of the Infield Terminal.

7.4.1.5 Groundside Parking

In 2015 the GTAA provided approximately 22,000 parking spaces at Toronto Pearson Airport in its four parking facilities.[21] This does not include the thousands of parking stalls provided by independents such as hotels and remote park and transfer companies. The four airport parking facilities provided by the GTAA are:

1. The 8-level Terminal 1 parking garage;
2. The 5-level Terminal 3 parking garage;
3. The 6-level Value Park parking garage at Viscount Road; and
4. A surface-level Value Park Lot.

The GTAA airport parking facilities provide parking for the public, tenants, employees and car rental companies. Express (short-stay) car parking is available only in the Terminal 1 parking garage representing less than 4% of the total number of GTAA airport car parking spaces.

[19] GTAA, 'Annual Information Form for the Year Ended December 31, 2015', 2015
[20] GTAA, 'Annual Report', 2015
[21] GTAA, 'Annual Information Form for the Year Ended December 31, 2015', 2015

According to the GTAA, the parking capacity requirements are currently under development. Future parking requirements depend on the allocation and utilization of Toronto Pearson Airport's parking facilities, car parking demand management measures, projected increase in transit mode share and emerging transportation technologies. The GTAA's current projections estimate an increase in the number of parking spaces in the range of 15 to 25% over the next 20 years. These projections are subject to change based on changes in aforementioned factors affecting the car parking requirements.

Based on the projected increase in the number of parking stalls, it is expected that Toronto Pearson Airport's groundside parking capacity will grow from supporting 25.9 million PPA to 31.1 million PPA with approximately 26,400 parking stalls. Although these capacities could be much lower than the projected annual passenger demand at Toronto Pearson Airport, many passengers arrive via private and commercial drop-offs and pickups, and via the UP express and other modes of public transportation.

7.4.1.6 Cargo

Cargo Capacity and Airline Operations

The importance of air cargo to an airline on any route depends on the volumes, unit revenues, the consistency of traffic over the week and year, the availability of backhaul traffic and the commercial conditions of carriage (e.g. does the airline control the traffic?). Different airlines have different policies about the importance of cargo. On some routes and for some companies, economic conditions justify all-cargo aircraft. For example, integrators offer a premium product, and can command sufficiently high unit revenues to justify fully dedicated cargo aircraft on many routes. Nonetheless, air cargo may range from a vital source of revenue in the bellies of passenger aircraft to being almost irrelevant on some flights. Cargo capacity cannot be described solely in terms of aircraft capabilities, but must consider market issues too.

Many passenger and all-cargo flights carry strong cargo traffic in one direction, but suffer from weak backhaul traffic. Most flights, whether with passenger or all-cargo aircraft, usually exhaust the cargo space long before they reach weight limits and a flight may operate well below its weight capacity, yet be physically full. Many forms of traffic, particularly perishables and items for Christmas, are highly seasonal and are a good example of how an aircraft can be at its maximum cargo volume, without reaching its maximum weight capacity. In addition, passenger loads may affect a flight's ability to board air cargo as loads on any flight may vary widely because of random shipping patterns or the airline's desire to clear out the backlog from a station. Some passenger flights have short station stops or make very fast turnarounds, and airlines may simply ignore their cargo capabilities. These factors help define an airport's effective cargo capacity; a measure substantially less than a purely mechanical measure of hold volumes and weight limits.

Cargo Capacity at Toronto Pearson Airport

Much of Toronto Pearson Airport's "air cargo" traffic travels by truck, also known as road feeder services. Trucks carry standard air cargo containers to cities served by narrow body aircraft and regional jets since they are not capable of accommodating such loads. Air freight forwarders routinely truck Toronto's air cargo traffic to and from airports in the United States.

Similarly, much of air cargo boarded at Toronto Pearson Airport arrives by truck from other communities.

These conditions rule out any capacity measure based purely on aircraft physical characteristics, such as passenger seats, hold volumes or operating weight limits. Rather, the measure must reflect operating realities, including directional imbalances, volume/weight/density concerns, scheduling constraints and other elements. A measure of cargo capacity should be based on real-world performance over a lengthy period of time.

The United States Department of Transportation publishes monthly databases showing domestic and international loads by airline, aircraft type and flight segment. The capacity estimates considered the flights with above-average loads, while minimizing the problems of outliers. The estimated capacities for each aircraft were the product of real world capacity/payload issues and marketing concerns.

The international estimates considered transatlantic, Asia, Latin American and Canadian routes. The domestic analysis focused on the length of the flight. Air cargo is most competitive over long distances.

Separate calculations were performed for Toronto Pearson Airport's transborder, transatlantic, South American, Caribbean/Central American, Middle East and Far East routes and the calculations considered both outbound and inbound traffic for international routes. The domestic calculations considered short haul (less than 500 miles), intermediate (500-1,500 miles) and long haul routes (greater than 1,500 miles) but did not incorporate direction. The estimated capacities were then applied to the flight operations of Tuesday, August 9 2016, and were then multiplied by 365 days[22] to obtain annual estimates. Table 7.3 summarizes the results.

Table 7.3 - Air Cargo Capacity of Toronto Pearson Airport, Base on Summer 2016 Data

Aircraft	Tonnes/Year Inbound & Outbound
Freighter	228,418
Passenger	797,748
Total	**1,026,166**

Statistics Canada periodically publishes air cargo statistics for the major Canadian airports; however, their report does not capture traffic on road feeder services or on small operations by small aircraft. Table 7.4 shows the historical statistics for air cargo at Toronto Pearson Airport and includes Hamilton Airport and Vancouver Airport for comparison purposes. Vancouver Airport has Canada's second largest air cargo volume, according to the Statistics Canada report.

[22] Cargo is very seasonal. Many routes experience traffic peaks during the pre-Christmas buildup of inventories. Certain perishables travel only when in season. Summer-only transatlantic and domestic flights accounted for a portion of Pearson's capacity.

Table 7.4 - Air Cargo at Canadian Airports (Tonnes)

	2013			2014		
	Loaded	Unloaded	Total	Loaded	Unloaded	Total
Hamilton	45,158	41,384	86,542	46,491	42,493	88,984
Toronto Pearson	151,974	193,559	346,352	162,607	193,841	356,448
Vancouver	100,290	94,027	194,958	112,976	104,225	217,201

Source: Statistics Canada Report 51-203, Air Carrier Traffic at Canadian Airports

According to Tables 7.3 and 7.4, the airlines used only 34.7 percent of Toronto Pearson Airport's effective capacity (2014 traffic versus 2016 capacity). This disparity could have many causes. For instance, many high capacity wide-body international flights were added to Toronto Pearson Airport's schedule between 2014 and 2016, including nonstop services to Dubai, New Delhi, Prague, Warsaw, Budapest, Tokyo Haneda and other points. Canadian routes tend to have strong outbound loads from Ontario, and weak inbound return loads; directional imbalances in Canada are likely different from those of the United States.

There are no publicly available sources of information on Canadian directional cargo flows. Some of the 2015 flights operated only during the summer, and had high density seating. Some all-cargo flights serve Toronto Pearson Airport primarily as an inbound or an outbound market. For example, Korean Air serves Toronto with a 747-400 freighter inbound from Asia, ferrying the returning aircraft to Halifax to board outbound seafood for the Canada-Korea sector. Transborder flights, including those of the integrators, usually have high inbound and weak outbound loads and short haul flights often have little value for air cargo. Toronto Pearson Airport's traffic statistics do not include road feeder services, which operate to cities as distant as San Francisco.

The complexities of air cargo mean that the capacity estimates are consistent with the reported traffic. The seemingly low cargo utilization does not necessarily reflect an opportunity for developing air cargo at Toronto Pearson Airport.

7.4.1.7 Summary

Toronto Pearson Airport's existing (2016) capacity is most limited by terminal apron capacity. The Airport's ultimate 2036 capacity has also been identified as being constrained by terminal apron capacity with a maximum of 56.7 million PPA. Table 7.5 presents a summary Toronto Pearson Airport's existing and future capacity. Groundside parking capacity is not considered to be a capacity constraint as public transit, the UP Express, private drop-offs and pickups, and private parking facilities provide the required additional capacity.

Table 7.5 – Summary, Toronto Pearson Airport Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Movement Capacity	Annual Practical Movement Capacity	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
2016	117	90	518,000	53,100,000	41,100,000	51,700,000	25,900,000
2036	140	108	622,000	73,700,000	56,700,000	71,100,000	31,100,000

Analysis suggests that Toronto Pearson Airport has adequate land within their current property boundary to provide additional annual terminal apron passenger capacity beyond the additional 25 to 35% increase that is currently planned within the next 20 years. The GTAA has recently stated that they have the capacity to accommodate projected growth of 80 million PPA by 2035[23]. Although details of how this growth can be accommodated have yet to be explicitly stated, the GTAA is currently considering updating their Airport Master Plan to identify future development strategies, and it is expected that terminal apron passenger capacity expansion will be a key part of the study.

In absence of a current Master Plan, reviewing the current layout of the core area at Toronto Pearson Airport and applying long term highest and best use airport use planning practices suggests that additional annual terminal apron capacity could be provided at Toronto Pearson to the east of the current Terminal 1 'Pier F' (in the location of the former Terminal 2), and to the north of Terminal 3. These capacity improvements would likely be undertaken in conjunction with air terminal capacity expansions, such as the development of a new concourse at Terminal 1. In the case of expansion to the north of Terminal 3, the processor could be expanded to the north with the development of additional air terminal piers or satellite terminals (or a combination of processor, pier and satellite terminal developments) to provide additional terminal apron and terminal building passenger capacity. However, in order for Terminal 3 to expand to the north aircraft maintenance hangars and facilities occupied by Air Canada and Air Canada Express would require relocation to other areas of the airfield. Considering that the GTAA has stated that they have the capacity to support 80 million PPA, it is expected that the next Airport Master Plan for Toronto Pearson will identify specific areas for expansion of aircraft aprons and air terminal buildings that will provide additional annual terminal apron passenger capacity, and annual terminal building passenger capacity beyond the values identified within this study.

7.4.2 Billy Bishop Toronto City Airport

7.4.2.1 Background

Billy Bishop Airport is served by two intersecting runways. The primary runway (08-26) is supported by a full length parallel taxiway whereas the secondary runway (06-24) has no supporting parallel taxiway. Air traffic control services are also provided at the airport.

[23] GTAA, 'Growing Canada with a Mega Hub Airport' December, 2016

As a result of the conditions of a tripartite agreement between The Corporation of the City of Toronto, Ports Toronto and Transport Canada, only propeller-driven aircraft are permitted to operate at Billy Bishop Airport.

7.4.2.2 Airfield

Airfield capacity at Billy Bishop Airport has been determined under Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) to better understand the impact IFR operations may have on capacity. Estimates of capacity take into account local conditions and where applicable anticipated improvements to infrastructure and ATC. In determining runway passenger equivalent volumes an average aircraft seat number of 70 with an 80% load factor has been used representative of the typical scheduled air carrier aircraft serving the market.

Base Condition

The Base Condition capacity for Billy Bishop Airport assumes the existing aircraft mix is maintained with up to a 25% touch and go applied. The resulting maximum throughput under IFR is estimated at 28 movements per hour, and VFR at 34 movements per hour. Typical airport operational hours are 16 per day. This results in a practical annual capacity of 122,880 movements for IFR and 148,480 movements for VFR, equivalent to 6.9 million PPA and 8.3 million PPA respectively.

However, due to noise concerns and associated restrictions in place by tripartite agreement, the number of movements is restricted to approximately 140,700 with 242 daily commercial slots. Consequently, the number of passenger carrying flights would be reduced to 88,330 and runway passengers would be reduced to approximately 4.3 million PPA.

Condition A

Capacity Condition A modifies the aircraft mix based on 2036 estimates which show commercial scheduled traffic may grow to approximately 75% of all movements. Consequently, Condition A also removes the touch and go factor from the calculation of capacity. The combination of the change to aircraft mix and removal of touch and go operations reduces the airfield capacity. The maximum throughput under this condition would decrease to 26 movements under IFR and 30 movements under VFR, resulting in 6.3 million PPA and 7.5 million PPA for IFR and VFR respectively. However, due to the noise restriction that would remain in effect, the number of runway passengers would also remain capped at approximately 4.3 million PPA.

Condition B

Capacity Condition B considers the infrastructure and ATC improvements identified for Billy Bishop Airport that could be implemented before 2036 if required to support increases in demand. The airport Master Plan focuses on improvements to the air terminal, apron area and the taxiway system. Overall the improvements identified for Billy Bishop Airport would not result in a significant increase to airfield capacity. The primary capacity influencer would be improvements to ATC. Based on research completed in support of this study, ATC improvements could yield a 7.5% improvement to hourly maximum runway throughput capacity at Billy Bishop Airport during IFR operations.

This has been reflected in the calculation of IFR capacity. The hourly maximum runway throughput under this condition would increase to 28 movements per hour under IFR resulting in a practical annual runway movement capacity of 121,856 movements equivalent to a runway passenger capacity of 6.8 million PPA. VFR capacity would remain unchanged compared to Condition A. However, as stated previously, the capacity of the airfield is limited to 242 commercial scheduled flights equivalent to approximately 4.3 million PPA.

7.4.2.3 Terminal Apron

Billy Bishop Airport's existing terminal has one common use lounge for transborder passengers and one for domestic passengers. Each lounge has 4 dedicated gates. In addition there are 2 swing gates to service domestic or transborder flights for a total of 10 gates. 10 passenger boarding bridges are arranged in linear configuration with shared corridors. For the purpose of this study, each gate is expected to process up to 250,000 PPA. Using this ratio, the terminal apron passenger capacity is estimated to be 2.5 million PPA.

Future plans for the passenger terminal building calls for up to 2 additional gates, which would increase capacity by approximately 500,000 PPA resulting in a total terminal apron passenger capacity of 3.0 million PPA.

Table 7.6 – Billy Bishop Toronto City Airport Estimated Airfield Capacity

	Base Condition		Condition A		Condition B	
Flight Rules	VFR	IFR	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	34	28	30	26	30	28
Practical Factor:	0.85		0.85		0.85	
Hourly Practical Runway Movement Capacity	29	24	26	22	26	24
Daily Operation Factor (Hours):	x 16		x 16		x 16	
Daily Practical Runway Movement Capacity	464	384	416	352	416	381
Annualization Factor (Days/Annum):	x 320		x 320		x 320	
Annual Practical Runway Movement Capacity	148,480	122,880	133,120	112,640	133,120	121,856
	144,000		**130,000**		**131,000**	
Runway Passenger Factor:	70		70		70	
Aircraft Load Factor:	0.8		0.8		0.8	
Annual Runway Passenger Capacity	8,300,000	6,900,000	7,500,000	6,300,000	7,500,000	6,800,000
	7,700,000		7,300,000		7,400,000	
Due to NEF restrictions in the Tripartite Agreement	**4,300,000**		**4,300,000**		**4,300,000**	

7.4.2.4 Terminal Building

The existing passenger terminal building has approximately 14,000 m^2 of combined passenger holding and processing space. Using a ratio of 1.0 million PPA to 10,000 m^2 of terminal area, would result in Billy Bishop Airport's existing terminal building capacity being identified as 1.4 million PPA. However, in actual practice and as other studies suggest, the existing terminal may have a capacity between 3.5 million and 3.8 million PPA. This higher capacity is attributed to a higher than normal utilization rates. Higher utilization rates are due to a high frequency of flights that are generally evenly distributed throughout the day. The fact that all flights are also Dash-8-400s also helps with maximizing utilization of facilities with a more even distribution of demand and reduction of needed capacity of certain functions such as baggage claim.

Plans to expand the terminal building by up to 2,000 m^2 would suggest that capacity could also increase by 200,000 PPA but in actual practice the capacity may remain at 3.8 million PPA as current planned expansions are only targeting improvements to level of service in lounge and holdroom areas. No improvements are planned to other processing elements such as baggage claim or security screening.

7.4.2.5 Groundside Parking

Designated vehicle parking space for the airport is limited, however groundside access at Billy Bishop Airport is not considered a constraint to capacity due to the recent addition of a fixed link tunnel and continued operation of a ferry service. Consequently, no estimate of ground capacity has been completed.

7.4.2.6 Summary

Billy Bishop Airport's existing capacity is currently most limited by terminal apron capacity. In addition, the Airport's future capacity has been identified as being constrained by the number of slots permitted under current noise restrictions, thus runway passenger values are limited to 4.3 million PPA. Table 7.7 presents a summary of BBTCA's existing and future capacity.

Table 7.7 – Summary, Billy Bishop Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Movement Capacity	Annual Practical Movement Capacity	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
2016	33	28	144,000	4,300,000	2,500,000	3,500,000	*N/A*
2036	30	26	131,000	4,300,000	3,000,000	3,800,000	*N/A*

7.4.3 Region of Waterloo International Airport

7.4.3.1 Background

Waterloo Airport is served by two intersecting runways which are both supported by a full length parallel taxiway. Air traffic control services are also provided at the airport. The airport supports regional scheduled passenger air service, chartered air services, general aviation flight training and corporate aviation activities.

7.4.3.2 Airfield

Airfield capacity at Waterloo Airport has been determined under IFR and VFR operations to better understand the impact IFR operations may have on capacity. Estimates of capacity take into account local conditions and where applicable, anticipated improvements to infrastructure and ATC. When determining annual runway passenger capacity, an average aircraft seat number of 160 with an 80% load factor has been used representative of the typical scheduled air carrier aircraft serving the market in 2016.

Base Condition

The Base Condition capacity for Waterloo Airport assumes the existing aircraft mix is maintained with up to a 25% touch and go factor applied. The resulting maximum throughput under IFR is estimated at 28 movements per hour, and VFR at 32 movements per hour. Typical airport operational hours are assumed to be 18 per day. An annual practical movement capacity of 138,240 movements for IFR and 155,520 movements for VFR, equivalent to 17.7 million runway PPA, and 19.9 million runway PPA for IFR and VFR conditions, respectively has been determined for Waterloo Airport.

Condition A

Capacity Condition A modifies the aircraft mix based on 2036 estimates which supports the selection of the Boeing 737-800 as representative of the future aircraft mix. Consequently, Condition A also removes the touch and go factor from the calculation of capacity for IFR operations.

The combination of the change to aircraft mix and removal of touch and go operations decreases the overall airfield capacity. The hourly maximum runway throughput capacity under this condition would lower to 30 movements under IFR and decrease to 30 movements under VFR, resulting in a runway passenger capacity of 19.2 million PPA for both IFR and VFR operations.

Condition B

Capacity Condition B considers the infrastructure and ATC improvements identified for Waterloo International Airport that could be implemented before 2036 if required to support increases in demand. Waterloo International Airport's Master Plan focuses on improvements to air terminal and possible runway extensions. Overall, the improvements identified for Waterloo Airport would not provide a significant increase to airfield capacity. The primary capacity influencer would be improvements to ATC. Based on research completed in support of this study, ATC improvements could yield a 7.5% improvement to hourly maximum runway throughput capacity.

This has been reflected in the calculation of IFR capacity as it does not apply to VFR operations. The maximum runway throughput capacity under this condition would increase to 32 movements per hour under IFR resulting in a practical annual capacity of 158,400 movements equivalent to a runway passenger capacity of 20.3 million PPA. VFR capacity would remain unchanged.

Table 7.8 – Waterloo Airport Estimated Airfield Capacity

	Base Condition		**Condition A**		**Condition B**	
Flight Rules	VFR	IFR	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	32	28	30	30	30	32
Practical Factor:	0.85		0.85		0.85	
Hourly Practical Runway Movement Capacity	27	24	26	26	26	28
Daily Operation Factor (Hours):	x 18		x 18		x 18	
Daily Practical Runway Movement Capacity	486	432	468	468	468	495
Annualization Factor (Days/Annum):	x 320		x 320		x 320	
Annual Practical Runway Movement Capacity	155,520	138,240	149,760	149,760	149,760	158,400
	153,000		**150,000**		**151,000**	
Runway Passenger Factor:	160		160		160	
Aircraft Load Factor:	0.8		0.8		0.8	
Annual Runway Passenger Capacity	19,900,000	17,700,000	19,200,000	19,200,000	19,200,000	20,300,000
	19,600,000		**19,200,000**		**19,300,000**	

7.4.3.3 Terminal Apron

Waterloo Airport's existing terminal has one common use holdroom. There are two gates arranged in linear configuration serving four walk-out commuter aircraft stands and three remote aircraft stands. For the purpose of this study, each gate is expected to be able to process up to 250,000 PPA. Using this ratio, the existing terminal apron capacity is estimated to be 1,750,000 PPA.

Future plans for the passenger terminal building are aggressive and call for up to 15 gates in total, which would increase capacity to approximately 3.8 million PPA.

7.4.3.4 Terminal Building

The existing air terminal building has approximately 2,500 m^2 of combined passenger holding and processing space. Using a ratio of 1.0 million PPA to 10,000 m^2 of terminal area, would result in Waterloo Airport's existing terminal building capacity being identified as 250,000 PPA.

Plans to expand the terminal building incrementally to provide up to a 22,680 m^2 of combined passenger holding and processing space would suggest that capacity could increase to 2.3 million PPA by 2036.

7.4.3.5 Groundside Parking

Surface parking is provided adjacent to the existing air terminal. A total of approximately 467 stalls are available for air terminal use. Based on ratio of 850 parking stalls to 1.0 million PPA, existing parking capacity is equivalent to approximately 550,000 PPA.

No plans are currently available to identify future parking capacity. However, based on the availability of developable lands, groundside parking expansion is not considered to be a significant constraint to airport expansion.

7.4.3.6 Summary

Waterloo International Airport's existing capacity is currently most limited by the air terminal with an ability to support only 250,000 PPA. The Airport's future capacity is expected to remain constrained by the terminal building. Based on the studies supplied by the Region of Waterloo, the availability of land does not present a significant constraint to the continued expansion of the terminal facility and therefore would not limit the ability for the airport to continue to meet demand. However, noise concerns surrounding the airport may be of greater issue and could stifle or inhibit the growth potential of the airport. Table 7.9 presents a summary of Waterloo Airport's existing and future capacity.

Table 7.9 – Summary, Waterloo Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Movement Capacity	Annual Practical Movement Capacity	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
2016	31	27	153,000	19,600,000	1,750,000	250,000	550,000
2036	30	26	151,000	19,300,000	3,800,000	2,300,000	*N/A*

7.4.4 John C. Munro Hamilton International Airport

7.4.4.1 Background

Hamilton Airport is served by a primary runway (12-30) which is supported by partial length parallel taxiway. The secondary runway (06-24) does not have a supporting parallel taxiway. Hamilton airport offers passenger and charter aircraft services as well as seasonal charter services to southern destinations.

7.4.4.2 Airfield

Airfield capacity at Hamilton Airport has been determined under Instrument Flight Rules (IFR) only. Estimates of capacity take into account local conditions and where applicable anticipated improvements to infrastructure and ATC. In determination of runway passenger capacity, an average aircraft seat number of 160 with an 80% load factor was selected as it is representative of the typical scheduled air carrier aircraft serving the airport.

Base Condition

The Base Condition capacity for Hamilton Airport assumes the existing aircraft mix is maintained with no touch and go factor applied. The resulting maximum throughput under IFR is estimated at 28 movements per hour. Due to the limited number of VFR movements, no calculation of VFR capacity has been made. Typical airport operational hours are 18 per day. This results in a practical annual capacity of 138,240 movements for IFR, equivalent to 17.7 million PPA.

Condition A

Capacity Condition A modifies the aircraft mix based on 2036 estimates including a decline in local movements supporting flight training. The change to aircraft mix increases the airfield capacity to provide a maximum throughput of 30 movements per hour resulting in a practical annual capacity of 149,760 movements equivalent to 19.2 million PPA.

Condition B

Capacity Condition B considers the infrastructure and ATC improvements identified for Hamilton International Airport that could be implemented before 2036 if required to support increases in demand. Hamilton Airport's Master Plan identifies expansions to the air terminal, improvements to taxiways and possible runway extensions. The most significant improvement to airfield capacity would come as a result of providing full length parallel taxiways on both runways. Overall, the infrastructure improvements identified for Hamilton Airport would increase airfield capacity by up to 3 movements per hour. Additional increases to throughput would come as a result of improvements to ATC practices and procedures. Based on research completed in support of this study, ATC improvements could yield a 7.5% improvement to maximum runway throughput. This has been reflected in the calculation of maximum throughput identified in Table 7.10. The maximum hourly throughput capacity under this condition would increase to 30 movements per hour under IFR operations, resulting in a practical annual capacity of 173,952 movements equivalent to a Runway passenger capacity of 22.3 million PPA.

7.4.4.3 Terminal Apron

Hamilton International Airport's existing terminal has one common use holdroom and domestic and international arrivals halls. There are seven gates arranged in linear configuration serving seven walk-out aircraft stands. For the purpose of this study, each gate is expected to be able to process up to 250,000 PPA. Using this ratio, the existing terminal apron capacity is estimated to be approximately 1.8 million PPA.

Future plans for the passenger terminal building call for up to 12 gates in total, which would increase capacity to approximately 3.0 million PPA.

Table 7.10 – Hamilton Airport, Estimated Airport Airfield Capacity

	Base Condition	Condition A	Condition B
Flight Rules	IFR	IFR	IFR
Hourly Maximum Runway Throughput Capacity	28	30	36
Practical Factor:	0.85	0.85	0.85
Hourly Practical Runway Movement Capacity	24	26	30
Daily Operation Factor (Hours):	x 18	x 18	x 18
Daily Practical Runway Movement Capacity	432	468	544
Annualization Factor (Days/Annum):	x 320	x 320	x 320
Annual Practical Runway Movement Capacity	138,240	149,760	173,952
	138,000	**150,000**	**174,000**
Runway Passenger Factor:	160	160	160
Aircraft Load Factor:	0.8	0.8	0.8
Annual Runway Passenger Capacity	17,694,720	19,169,280	22,265,856
	17,700,000	**19,200,000**	**22,300,000**

7.4.4.4 Terminal Building

The existing air terminal building has approximately 8,500 m^2 of combined passenger holding and processing space. Using a ratio of 1.0 million PPA to 10,000 m^2 of terminal area, the capacity of Hamilton International Airport's existing terminal building has been identified as 850,000 PPA.

Plans to expand the terminal building over two phases to provide up to 30,775 m^2 of combined passenger holding and processing space would suggest that capacity could increase to 3.1 million PPA by 2036.

7.4.4.5 Groundside Parking

Surface parking is provided adjacent to the existing air terminal building. A total of approximately 1,704 parking stalls are available. Based on ratio of 850 parking stalls to 1.0 million PPA, existing parking capacity is equivalent to approximately 2.0 million PPA. No plans are currently available to identify future parking capacity. However, based on the availability of developable lands, groundside access and parking would not appear to be a significant constraint to continued airport expansion.

7.4.4.6 Cargo

Estimating the cargo capacity at Hamilton Airport involves many of the same difficulties as at Toronto Pearson Airport. The all-cargo flights of CargoJet, DHL and United Parcel Service serve different and unique markets. The average aircraft loads used to estimate Toronto Pearson Airport's capacity applied to many types of aircraft, airlines and routes; however, Hamilton Airport has a much lower diversity of operations and fewer air carriers with the ability to carry cargo.

CargoJet, by far the largest operator, serves its own general cargo market, but also holds contracts with Purolator and Canada Post to ship air mail. Canadian and transborder routes often show strong directional imbalances, making a portion of the total calculated capacity of little practical value.

The relatively small number of all-cargo operators at Hamilton Airport creates volatility. In March 2015, Kelowna Flightcraft lost a key contract to CargoJet, and shifted its flights from Hamilton Airport to Toronto Pearson Airport. CargoJet has increased its capacity at Hamilton to accommodate the added traffic. In the spring of 2016, Air Canada announced that it would offer twice-weekly B767 flights to Mexico City and a weekly flight to Bogota and Lima. CargoJet will operate the flights on Air Canada's behalf, using an ACMI-type (Aircraft, Crew, Maintenance and Insurance) contract. While the flights ostensibly serve Toronto, they will actually operate to Hamilton. Hamilton Airport (and Toronto Pearson Airport) occasionally accommodates non-scheduled all-cargo flights, by aircraft as large as the B747. These flights are excluded from both the Hamilton Airport and the Toronto Pearson Airport air cargo capacity. These flights operate under very specific circumstances, and provide no indication of either's airports' strategic strengths or long term direction.

In the fall of 2016, the Hamilton Airport had a yearly cargo capacity of 127,572 enplaned-deplaned metric tonnes (excluding air mail). These calculations used the method outlined previously. The new Air Canada-CargoJet flights accounted for all of the international capacity. Air Canada will process much of their traffic at its Toronto terminal, and truck the cargo to and from the aircraft at Hamilton Airport. It is debatable whether this capacity "belongs" to Hamilton Airport or Toronto Pearson Airport. Table 7.11 shows totals by route.

Table 7.11 - Scheduled Cargo Capacity at Hamilton Airport (Tonnes)

Aircraft	Tonnes/Year
Canada	104,751
Transborder	7,941
International	14,879
Total	127,572

According to Statistics Canada, Hamilton Airport handled 88,984 tonnes of air cargo in 2014, excluding air mail. This volume, applied to the 2016 Canadian and Transborder capacities, represents a utilization of 79.0 percent. This is considerably higher than the 34.7 percent utilization at Toronto Pearson Airport. The all-cargo aircraft serving Hamilton are scheduled around the needs of shippers. High cargo space utilization is more critical to all-cargo flights than to passenger belly space. The operations of the U.S. domestic integrators provided estimates of the capacities of Cargojet's B757 and B767 freighters.

The integrators tend to have high cargo yields, and may be relatively tolerant of low weight/flight utilization. Cargojet's unit revenues are likely different, particularly if it serves many general cargo shippers. The estimation process may therefore understate Hamilton Airport's cargo capacity and overstate its utilization.

WestJet's passenger service operations made a modest contribution to cargo capacity at Hamilton Airport and Air Canada's regional jets have a limited cargo capability. Seasonal charter flights will offer a small cargo capability. Their low frequencies, seasonal schedules and high density seating will limit their contribution to Hamilton Airport's air cargo capacity.

Although the current cargo capacity is estimated at 79% usage for transborder and domestic shipments, additional capacity can be added at Hamilton Airport. The key to increasing cargo capacity at the facility is to provide additional cargo uplift and additional cargo processing space, which would be the responsibility of the air carriers and the forwarders. Hamilton Airport could readily handle 2-3 times the existing volume of cargo with only modest increases in infrastructure, a lot of it off-airport.

7.4.4.7 Summary

The airport's future capacity will likely remain constrained by the air terminal until the facility is further expanded. Table 7.12 presents a summary of Hamilton International Airport's existing and future capacity.

Table 7.12 – Summary, Hamilton Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Movement Capacity	Annual Practical Movement Capacity	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
2016	28	24	138,000	17,700,000	1,750,000	850,000	2,000,000
2036	36	30	174,000	22,300,000	3,000,000	3,100,000	2,000,000

7.5 General Aviation Airports

The capacity of general aviation airports in the southern Ontario airports system are defined by annual aircraft movements. The practical capacities of these airports assume a reasonable level of service being maintained during operation. These airports can operate beyond their practical capacity, but significant delays and degradation of level of service will ensue. At maximum throughput capacity, substantial delays for either departing or arriving aircraft may occur. Delays for departing aircraft include postponed taxi clearances, queues for takeoff, and ramp congestion. Delays for arriving aircraft include circling holds, extended or enlarged circuit flight patterns and runway overshoots. It is important to note that practical throughput capacity ensures a reasonable level of service with delays less than 4 minutes during typical operations.

7.5.1 Toronto Buttonville Airport

Buttonville Airport is served by two intersecting runways. The primary runway (15-33), and secondary runway (03-21), are both supported by full length parallel taxiways. ATC services are also provided at the Airport. This study assumes that Buttonville Airport will be closed by 2019.

7.5.1.1 Airfield

Buttonville Airport has maximized the use of available lands. In the current orientation, the runways are the maximum length feasible and are supported by full-length parallel taxiways. Because of the impending closure of the airport, improvements to increase airfield capacity are not anticipated.

Base Condition

The Base Condition capacity for Buttonville Airport assumes the existing aircraft mix is maintained, with a 40% touch and go ratio applied. The resulting maximum throughput capacity under IFR conditions is estimated at 32 movements per hour, and 36 movements per hour under VFR conditions. Typical airport operational hours are 18 per day, resulting in a practical annual capacity of 172,000 for IFR and VFR weighted movements.

Conditions A and B

Due to the pending closure of Buttonville Airport, anticipated in 2019, Conditions A and B do not apply to this facility.

Table 7.13 shows the capacities for Buttonville Airport.

Table 7.13 – Buttonville Airport Estimated Airfield Capacity

	Base Condition (2016)		Future (2036)
Flight Rules	VFR	IFR	Airport to be closed by 2019
Proportion of operations (%)	84%	16%	
Hourly Maximum Runway Throughput Capacity	36	32	
Practical Factor:	x 0.85		
Hourly Practical Runway Movement Capacity	31	27	
Daily Operation Factor (Hours):	x 18		
Daily Practical Runway Movement Capacity	551	486	
Annualization Factor (Days/Annum):	x 320		
Annual Practical Runway Movement Capacity	176,256	155,520	
	172,000		

7.5.1.2 Summary

Buttonville Airport currently has a practical annual movement capacity of approximately 172,000 aircraft movements per annum. The closure of the Airport will see the system-wide capacity drop by this value, expected in 2019. Table 7.14 summarizes the airfield capacities for Buttonville Airport illustrating the composite IFR/VFR condition values.

Table 7.14 – Summary, Buttonville Airport Estimated Airfield Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	35	30	172,000
2036	0	0	0

7.5.2 Peterborough Airport

Peterborough Airport is currently served by a two runway system. Runway 09-27 has a partial length parallel taxiway, and the secondary runway (13-31) has a full length parallel taxiway. Airside expansion, specifically the construction of additional runways, is limited by watercourses and the local road network. The construction of a full-length parallel taxiway supporting operations on Runway 09-27 was recommended in the 2009 Master Plan to increase capacity and to access additional airside commercial lots. Land is available for commercial development at Peterborough Airport. Industrial lots are currently being prepared north of the threshold of Runway 27. Additional land has been reserved for future development to the north of Runway 09-27 and to the east of Runway 13-31.

7.5.2.1 Airfield

Base Condition

The Base Condition capacity for Peterborough Airport reflects the current aircraft mix, with up to a 40% touch and go factor. The resulting maximum throughput under VFR operations has been estimated at 31 movements per hour, and 27 movements per hour under IFR operations. Typical operational hours for Peterborough Airport were assumed at 17 per day. This results in a practical annual capacity of 143,613 aircraft movements under VFR operations, and 125,120 movements under IFR operations. When considering the proportion of VFR and IFR operations, a weighted annual practical throughput value of 140,000 movements is determined.

Condition A

Since there is no expected change in aircraft mix, the values for Condition A (2016 infrastructure, 2036 aircraft mix, 2016 ATC practices and procedures) remain the same as the Base Condition.

Condition B

The addition of air traffic control services and the construction of a full parallel taxiway serving Runway 09-27 are expected to increase airfield capacity by 2036 at Peterborough Airport. While both local movements and general aviation movements are anticipated to grow, it is anticipated that local movements will continue to be dominant due to Seneca College's flight school operations. The forecasts suggest that the future 2036 aircraft mix and tough and go factor at the Airport will remain similar to that observed in 2015. The maximum throughput capacity under this condition would increase to 34 movements per hour under VFR conditions, and 30 movements per hour under IFR conditions, resulting in an annual practical throughput of approximately 155,000 movements. Table 7.15 illustrates the current and future capacities at Peterborough Airport.

Table 7.15 – Peterborough Airport Estimated Airfield Capacity

	Base Condition (2016)		Condition B (2036)	
Flight Rules	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	31	27	34	30
Practical Factor:	x 0.85		x 0.85	
Hourly Practical Runway Movement Capacity	26	23	29	26
Daily Operation Factor (Hours):	x 17		x 17	
Daily Practical Runway Movement Capacity	449	391	491	442
Annualization Factor (Days/Annum):	x 320		x 320	
Annual Practical Runway Movement Capacity	143,616	125,120	157,216	141,440
	140,000		**155,000**	

7.5.2.2 Summary

Peterborough Airport currently has an annual practical runway movement capacity of approximately 140,000 aircraft movements per annum, and this is expected to increase to 155,000 by 2036. Table 7.16 summarizes the airfield capacities for Peterborough Airport, illustrating the composite IFR/VFR condition values.

Table 7.16 – Summary, Peterborough Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	30	26	140,000
2036	33	28	155,000

7.5.3 Lake Simcoe Regional Airport

The airfield system at Lake Simcoe Airport is comprised of one runway (10-28) and a half-length parallel taxiway. Airside expansion, specifically the extension of the parallel taxiway to full-length, is not limited by physical constraints, though land acquisition would likely be necessary. The extension of the taxiway and the preparation of airside commercial lots have been planned.

7.5.3.1 Airfield

Base Condition

The Base Condition capacity for Lake Simcoe Airport reflects the current aircraft mix, with up to a 25% touch and go factor. The resulting maximum throughput under VFR operations has been estimated at 29 movements per hour, and 23 movements per hour under IFR operations. Typical operational hours for Lake Simcoe Airport were assumed at 17 hours per day. This results in a practical annual capacity of 134,368 aircraft movements under VFR operations, and 106,624 movements under IFR operations. When considering the proportion of VFR and IFR operations, a weighted annual practical runway movement capacity of 129,000 movements is determined.

Condition A

Since there is no expected change in aircraft mix, the values for Condition A (2016 infrastructure, 2036 aircraft mix, 2016 ATC practices and procedures) remain the same as the Base Condition.

Condition B

The extension of the parallel taxiway supporting Runway 10-28 at Lake Simcoe Airport is expected to increase airfield capacity. In recent years, general aviation traffic has been increasing at the Airport while local traffic has been decreasing. It is anticipated that this trend will continue. The forecasts suggest that the 2036 aircraft mix will have an increased proportion of jet traffic associated with corporate aviation and the touch and go factor will remain at 25%. The hourly maximum throughput capacity under this condition would increase to 32 movements per hour for VFR operations, and 26 for IFR, resulting in an annual practical runway movement capacity of 143,000 movements. Table 7.17 shows the calculated airfield capacities at Lake Simcoe Airport for the Base Condition and Condition B.

Table 7.17 – Lake Simcoe Airport Estimated Airfield Capacity

	Base Condition (2016)		Condition B (2036)	
Flight Rules	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	29	23	32	26
Practical Factor:	x 0.85		x 0.85	
Hourly Practical Runway Movement Capacity	25	20	27	22
Daily Operation Factor (Hours):	x 17		x 17	
Daily Practical Runway Movement Capacity	420	333	459	374
Annualization Factor (Days/Annum):	x 320		x 320	
Annual Practical Runway Movement Capacity	134,368	106,624	146,880	119,680
	129,000		**143,000**	

7.5.3.2 Summary

Lake Simcoe Airport currently has an annual practical movement capacity of approximately 129,000 aircraft movements per annum, and this is expected to increase to 143,000 by 2036. Table 7.18 summarizes the airfield capacities for Lake Simcoe Airport, illustrating the composite IFR/VFR condition values. Table 7.18 summarizes Lake Simcoe Airport's Capacities.

Table 7.18 – Summary, Lake Simcoe Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	28	24	129,000
2036	31	26	143,000

7.5.4 Oshawa Executive Airport

Oshawa Airport currently operates a two intersecting runway system. The primary runway (12-30) has a full length parallel taxiway, and the secondary runway (05-23) has taxiway access to both runway thresholds. The Airport is highly constrained in terms of airside expansion. Oshawa Airport has air traffic control services present and parallel taxiway infrastructure making the Airport's airfield capacity essentially maximized on its current site. The airport operator indicated that the airport's primary focus will be on accommodating flight training and corporate general aviation activities, with a restriction on flight training movements not to exceed 60,000 movements per annum.

7.5.4.1 Airfield

Base Condition

The Base Condition capacity for Oshawa Airport reflects the current aircraft mix, with up to a 25% touch and go factor. The resulting maximum throughput under VFR operations has been estimated at 34 movements per hour, and 30 movements per hour under IFR operations. Typical operational hours for Oshawa Airport were assumed at 17 hours per day. This results in an annual practical movement capacity of 157,216 aircraft movements under VFR operations, and 141,440 movements under IFR operations. When considering the proportion of VFR and IFR operations, a weighted annual practical runway movement capacity value of 154,000 movements is determined.

Condition A

Since there is no significant change in aircraft mix expected at Oshawa Airport, the values for Condition A (2016 infrastructure, 2036 aircraft mix, 2016 ATC practices and procedures) remain the same as the Base Condition.

Condition B

Both local movements and general aviation movements are expected to grow at Oshawa Airport. The forecasts suggest that the future 2036 aircraft mix and touch and go factor at the Airport will remain relatively similar to that observed in 2015. The only major airfield improvement planned by the operator is converting an existing 250 feet paved stopway at the end of Runway 30 to lengthen the runway to 4,250 feet. This extended runway length would allow for longer take off distances, particularly for small and medium corporate jet aircraft operating at the Airport. The hourly maximum throughput capacity under this condition would remain the same as the Base Condition for VFR movements (34), with improvements in ATC practices and procedures yielding an increase in IFR operational capacity to a value of 33 movements per hour. This results in an annual practical runway movement capacity of 157,216 under VFR operations, and 149,600 under IFR operations. Table 7.19 shows the calculated airfield capacities at Oshawa Airport for the Base Condition and Condition B.

Table 7.19 – Oshawa Airport Estimated Airfield Capacity

	Base Condition (2016)		Condition B (2036)	
Flight Rules	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	34	30	34	33
Practical Factor:	x 0.85		x 0.85	
Hourly Practical Runway Movement Capacity	29	26	29	28
Daily Operation Factor (Hours):	x 17		x 17	
Daily Practical Runway Movement Capacity	491	442	491	468
Annualization Factor (Days/Annum):	x 320		x 320	
Annual Practical Runway Movement Capacity	157,216	141,440	157,216	149,600
	154,000		**156,000**	

7.5.4.2 Summary

Oshawa Airport currently has an annual practical runway movement capacity of approximately 154,000, and this is expected to increase to 156,000 by 2036. Table 7.20 summarizes the airfield capacities for Oshawa Airport, illustrating the composite IFR/VFR condition values.

Table 7.20 – Summary, Oshawa Airport Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	33	28	154,000
2036	34	29	156,000

7.5.5 Burlington Executive Airpark

Burlington Airpark operates two intersecting runways. Both the principal and secondary crosswind runways have full length parallel taxiways. Expansion of the Aerodrome is constrained by its property boundary, roadways to the east & west and a water course to the South. Land is available within current boundaries for airside commercial and hangar lots.

7.5.5.1 Airfield

Base Condition

The Base Condition capacity for Burlington Airpark reflects the current aircraft mix, with up to a 20% touch and go factor. The resulting hourly maximum runway capacity under VFR operations has been estimated at 32 movements per hour, and 28 movements per hour under IFR operations. Typical operational hours for Burlington Airpark were assumed at 17 hours per day. This results in an annual practical runway movement capacity of 147,968 under VFR operations, and 130,560 movements under IFR operations. When considering the proportion of VFR and IFR operations, a weighted annual practical throughput value of 145,000 movements is determined.

As stated previously, the airfield component of the Aerodrome is largely constrained by the current property boundary and the Aerodrome's runways and taxiway facilities are maximized for the current site. Capacity at the Aerodrome is also maximized with the current facilities. Should air traffic demand warrant, air traffic control service could increase the ultimate capacity of the Aerodrome although there are no plans within the study horizon to implement such a service. Historical data for the Aerodrome is not available, however, the operator stated that operations at the airport will remain focused on flight training, recreational and small corporate aviation. It is therefore assumed that the aircraft mix in 2036 will remain similar to that of 2016. For this reason, Conditions A and B were not examined, as airport infrastructure, aircraft mix, touch and go factor, and ATC practices and procedures are not expected to change within the 20 year planning horizon of this study.

Table 7.21 outlines the capacities at Burlington Airpark.

Table 7.21 – Burlington Airpark Estimated Airfield Capacity

	Base Condition (2016)		Future (2036)	
Flight Rules	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	32	28	32	28
Practical Factor:	x 0.85		x 0.85	
Hourly Practical Runway Movement Capacity	27	24	27	24
Daily Operation Factor (Hours):	x 17		x 17	
Daily Practical Runway Movement Capacity	462	408	462	408
Annualization Factor (Days/Annum):	x 320		x 320	
Annual Practical Runway Movement Capacity	147,968	130,560	147,968	130,560
	145,000		**145,000**	

7.5.5.2 Summary

Burlington Airpark currently has an annual practical runway movement capacity of approximately 145,000, and this is expected to remain the same up until 2036. Table 7.22 summarizes the airfield capacities for Burlington Airpark, illustrating the composite IFR/VFR condition values.

Table 7.22 – Summary, Burlington Airpark Estimated Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	31	27	145,000
2036	31	27	145,000

7.5.6 Brampton Airport

Brampton Airport operates a 2 runway system. The runways are intersecting with a primary runway and a crosswind runway. Both runways have full length parallel taxiways with multiple entrances/exits. Expansion of the Airport is constrained by the property boundary. The Airport is owned and operated by a not-for-profit organization (the Brampton Flying Club) and as a result, funding for expansion projects is limited. The runway and taxiway system at Brampton Airport is constrained by the site boundaries and runway and taxiway extensions are not possible within the current site footprint. The airfield infrastructure is also limited to aircraft with a maximum taxi weight 12,500 lbs. As a result, the traffic mix at the airport is restricted to small single and twin propeller driven aircraft.

7.5.6.1 Airfield

Base Condition

The Base Condition capacity for Brampton Airport reflects the current aircraft mix, with up to a 40% touch and go factor. The resulting hourly maximum runway movement capacity under VFR operations has been estimated at 366, and 30 movements per hour under IFR operations. Typical operational hours for Brampton Airport were assumed at 17 hours per day. This results in a practical annual capacity of 166,464 aircraft movements under VFR operations, and 141,440 movements under IFR operations. When considering the proportion of VFR and IFR operations, a weighted annual practical throughput value of 162,000 movements is determined.

Since there no significant changes in aircraft mix, airport infrastructure and ATC practices and procedures anticipated until 2036, Conditions A and B were not examined.

Table 7.23 shows the airfield capacity at Brampton Airport.

Table 7.23 - Brampton Airport Estimated Airfield Capacity

	Base Condition (2016)		Future (2036)	
Flight Rules	VFR	IFR	VFR	IFR
Proportion of operations (%)	84%	16%	84%	16%
Hourly Maximum Runway Throughput Capacity	36	30	36	30
Practical Factor:	x 0.85		x 0.85	
Hourly Practical Runway Movement Capacity	31	26	31	26
Daily Operation Factor (Hours):	x 17		x 17	
Daily Practical Runway Movement Capacity	520	442	520	442
Annualization Factor (Days/Annum):	x 320		x 320	
Annual Practical Runway Movement Capacity	166,464	141,440	166,464	141,440
	162,000		**162,000**	

7.5.6.2 Summary

Brampton Airport currently has a practical annual throughput capacity of approximately 162,000 aircraft movements per annum, and this is expected to remain the same up until 2036. Table 7.24 summarizes the airfield capacities for Brampton Airport, illustrating the composite IFR/VFR condition values.

Table 7.24 – Summary, Brampton Airport Airfield Capacities

	Hourly Maximum Runway Throughput Capacity	Hourly Practical Runway Movement Capacity	Annual Practical Runway Movement Capacity
2016	35	30	162,000
2036	35	30	162,000

7.6 Southern Ontario Airports System Capacity Summary

Tables 7.25 and 7.26 illustrate the calculated capacities of the passenger airports, general aviation airports, and the southern Ontario airports system as a whole, both for 2016 and 2036.

7.6.1 2016 System Capacity

As illustrated Table 7.25, the passenger airports have an estimated annual runway passenger capacity of 94.7 million PPA, suggesting that this many passengers can be accommodated on the existing runways within the southern Ontario airports system. A value of 47.1 million PPA has been identified for the terminal apron capacity within the system, and current air terminal infrastructure has a capacity to support 56.3 million PPA. Groundside parking capacity for the southern Ontario airports is estimated at approximately 28.5 million PPA; however, this value excludes third party parking facilities, and does not take into consideration passengers arriving and departing from airports using public transportation. Cargo uplift capacity for Toronto Pearson Airport and Hamilton Airport is estimated at 1.2 million tonnes per annum (excluding belly cargo and air mail capacity).

In terms of the general aviation airports, Table 7.25 indicates an estimated practical annual capacity of 903,000 annual aircraft movements, based on weighted IFR and VFR operations.

Table 7.25 also indicates that terminal apron capacity is the limiting constraint to future capacity expansion at Toronto Pearson and Billy Bishop airports, and air terminal building capacity is the limiting constraint at Waterloo Airport and Hamilton Airport.

7.6.2 2036 System Capacity

When planned infrastructure changes, improvements in ATC practices and procedures, and future aircraft mixes are considered at the airports within the southern Ontario airports system, runway passenger capacity at the system's passenger airports is estimated at approximately 119.6 million PPA in 2036. Additionally, an annual capacity of 66.5 million PPA has been identified for the airport system's terminal apron capacity. Terminal building capacity is estimated at 80.3 million PPA. Future groundside parking capacity of the system has been estimated at 33.7 million PPA, not considering third party private parking facilities and public transit.

Table 7.25 – 2016 System Capacity Summary

<table>
<tr><th colspan="9">Airport Capacity Summary (2016)</th></tr>
<tr><th colspan="2">Airport</th><th>Hourly Maximum Runway Throughput Capacity</th><th>Annual Practical Movement Capacity</th><th>Annual Runway Passenger Capacity</th><th>Annual Terminal Apron Passenger Capacity</th><th>Annual Terminal Building Passenger Capacity</th><th>Annual Groundside Parking Passenger Capacity</th><th>Annual Cargo Capacity (Tonnes)</th></tr>
<tr><td>1</td><td>Toronto Pearson Airport</td><td>117</td><td>518,000</td><td>53,100,000</td><td>41,100,000</td><td>51,700,000</td><td>25,900,000</td><td>1,026,000</td></tr>
<tr><td>2</td><td>Billy Bishop Airport</td><td>33</td><td>144,000</td><td>4,300,000</td><td>2,500,000</td><td>3,500,000</td><td></td><td rowspan="2">N/A</td></tr>
<tr><td>3</td><td>Waterloo Airport</td><td>31</td><td>153,000</td><td>19,600,000</td><td>1,750,000</td><td>250,000</td><td>550,000</td></tr>
<tr><td>4</td><td>Hamilton Airport</td><td>28</td><td>138,000</td><td>17,700,000</td><td>1,750,000</td><td>850,000</td><td>2,000,000</td><td>128,000</td></tr>
<tr><td colspan="2">Subtotals</td><td>209</td><td>953,000</td><td>94,700,000</td><td>47,100,000</td><td>56,300,000</td><td>28,450,000</td><td>1,154,000</td></tr>
<tr><td>5</td><td>Buttonville Airport</td><td>35</td><td>172,000</td><td rowspan="7" colspan="5">N/A</td></tr>
<tr><td>6</td><td>Peterborough Airport</td><td>30</td><td>140,000</td></tr>
<tr><td>7</td><td>Lake Simcoe Airport</td><td>28</td><td>130,000</td></tr>
<tr><td>8</td><td>Oshawa Airport</td><td>33</td><td>154,000</td></tr>
<tr><td>9</td><td>Burlington Air Park</td><td>31</td><td>145,000</td></tr>
<tr><td>10</td><td>Brampton Airport</td><td>35</td><td>162,000</td></tr>
<tr><td colspan="2">Subtotals</td><td>193</td><td>903,000</td></tr>
<tr><td colspan="2">Grand Total</td><td>403</td><td>1,856,000</td><td>94,700,000</td><td>47,100,000</td><td>56,300,000</td><td>28,450,000</td><td>1,154,000</td></tr>
</table>

Table 7.26 – 2036 System Capacity Summary

<table>
<tr><th colspan="9">Airport Capacity Summary (2036)</th></tr>
<tr><th colspan="2">Airport</th><th>Hourly Maximum Runway Throughput Capacity</th><th>Annual Practical Movement Capacity</th><th>Annual Runway Passenger Capacity</th><th>Annual Terminal Apron Passenger Capacity</th><th>Annual Terminal Building Passenger Capacity</th><th>Annual Groundside Parking Passenger Capacity</th><th>Annual Cargo Capacity (Tonnes)</th></tr>
<tr><td>1</td><td>Toronto Pearson Airport</td><td>119</td><td>622,000</td><td>73,700,000</td><td>56,700,000</td><td>71,100,000</td><td>31,100,000</td><td>1,026,000</td></tr>
<tr><td>2</td><td>Billy Bishop Airport</td><td>30</td><td>131,000</td><td>4,300,000</td><td>3,000,000</td><td>3,800,000</td><td colspan="2" rowspan="2">N/A</td></tr>
<tr><td>3</td><td>Waterloo Airport</td><td>30</td><td>151,000</td><td>19,300,000</td><td>3,800,000</td><td>2,300,000</td></tr>
<tr><td>4</td><td>Hamilton Airport</td><td>36</td><td>174,000</td><td>22,300,000</td><td>3,000,000</td><td>3,100,000</td><td>2,000,000</td><td>128,000</td></tr>
<tr><td colspan="2">Subtotals</td><td>215</td><td>1,078,000</td><td>119,600,000</td><td>66,500,000</td><td>80,300,000</td><td>33,650,000</td><td>1,154,000</td></tr>
<tr><td>5</td><td>Buttonville Airport</td><td>0</td><td>0</td><td colspan="5" rowspan="7">N/A</td></tr>
<tr><td>6</td><td>Peterborough Airport</td><td>33</td><td>155,000</td></tr>
<tr><td>7</td><td>Lake Simcoe Airport</td><td>31</td><td>143,000</td></tr>
<tr><td>8</td><td>Oshawa Airport</td><td>34</td><td>156,000</td></tr>
<tr><td>9</td><td>Burlington Air Park</td><td>31</td><td>145,000</td></tr>
<tr><td>10</td><td>Brampton Airport</td><td>35</td><td>162,000</td></tr>
<tr><td colspan="2">Subtotals</td><td>165</td><td>761,000</td></tr>
<tr><td colspan="2">Grand Total</td><td>379</td><td>1,839,000</td><td>119,600,000</td><td>66,500,000</td><td>80,300,000</td><td>33,650,000</td><td>1,154,000</td></tr>
</table>

Cargo uplift capacity remains the same at 1.2 million tonnes per annum, as any major cargo facility expansions were not identified during consultations with the airports.

Table 7.26 illustrates that the general aviation airports are expected to have an annual practical capacity of 761,000 aircraft movements in 2036. This value is lower than the estimated capacity identified for 2016 due to the assumed closure of Buttonville Airport in 2019.

Terminal apron capacity is expected to be the limiting factor for accommodating additional demand at Toronto Pearson Airport, Billy Bishop Airport, and Hamilton Airport, while air terminal capacity is expected to be the limiting capacity factor at Waterloo Airport in 2036.

It is important to note that terminal apron and air terminal capacities can be further increased beyond the values stated herein for 2036 within the existing airport boundaries, with minimal constraints.

This suggests that capacity expansions in air terminal, terminal apron, and groundside parking facilities can be undertaken to increase overall system capacity, long before until additional runway passenger capacity will be required.

8.0 SCENARIO DEVELOPMENT

In order to compare the capacity of the southern Ontario airports system against the forecast demand, scenarios have been developed examining various factors that have an influence on both the capacity of airport facilities, and the passenger and aircraft movement demands. Four (4) scenarios have been developed as part of this study in order to determine if there will be an overall capacity shortage or surplus within the southern Ontario airports system within the 20 year planning horizon:

- Scenario 1 – 2016 Airport Conditions, 2036 Demand
- Scenario 2 – 2016 Airport Conditions, 2019 Demand (Buttonville Airport Closure)
- Scenario 3 – 2036 Airport Conditions, 2036 Demand
- Scenario 4 – 2036 Airport Conditions, 2036 Demand (With High-Speed Rail)

Individual airport capacities were determined in Chapter 7, whereas this chapter compares the various capacities and demands within the southern Ontario airport system as a whole, both for passenger service airport facilities, and for general aviation airports.

It is important to note that the supply and demand analysis and conclusions drawn herein do not take into account levels of service for both passengers and general aviation users (i.e. driving times and proximity to scheduled air services were not considered).

8.1 Scenario 1 – 2016 Airport Conditions, 2036 Demand

8.1.1 Scenario Parameters

Under this scenario, it is assumed that airport infrastructure in place in 2016 and the representative current capacities at each of the study airports will remain throughout the 20 year planning horizon (until 2036). Other assumptions impacting the supply and demand comparisons within this scenario include:

- Average number of seats per aircraft movement as per 2016 conditions (varies per passenger airport and identified in Chapter 7);
- 2016 ATC practices and procedures remain unchanged throughout the 20 year planning horizon;
- 2016 aircraft mix remains constant throughout the 20 year planning horizon; and
- 2036 demand based on the medium forecast to compare supply and demand throughout the entire southern Ontario airports system.

In effect Scenario 1 represents a "status quo" scenario to highlight whether there will be capacity shortfall in 2036 if there are no changes to the current airport system.

8.1.2 Supply and Demand

Airport capacities and demands are compared for passenger service and general aviation airports in the following subsections.

8.1.2.1 Passenger Service Airports

Supply and demand at the southern Ontario airports that have been categorized as passenger service facilities are compared in Table 8.1. The passenger service airport capacities are inclusive of the following airport facilities (as is the same with all scenarios identified herein):

- Toronto Pearson Airport;
- Billy Bishop Airport;
- Waterloo Airport; and
- Hamilton Airport.

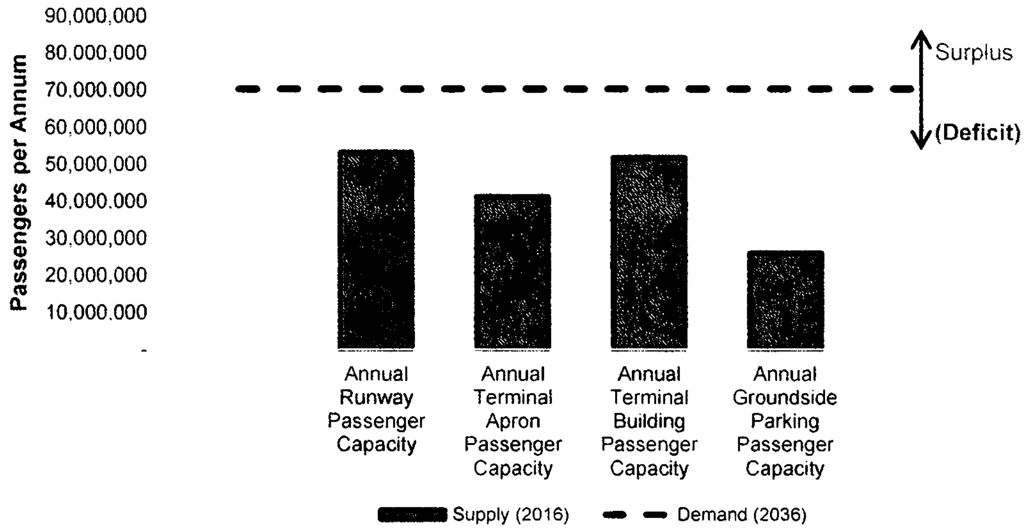
Table 8.1 – Passenger Airport Capacity vs. Demand – Scenario 1

	Scenario 1		
	Supply	**Demand**	**Delta**
	Annual Runway Passenger Capacity		
Toronto Pearson Airport	53,100,000	70,250,000	**(17,150,000)**
Billy Bishop Airport	[redacted]		
Waterloo Airport			
Hamilton Airport			
	Annual Terminal Apron Passenger Capacity		
Toronto Pearson Airport	41,100,000	70,250,000	**(29,150,000)**
Billy Bishop Airport	[redacted]		
Waterloo Airport			
Hamilton Airport			
	Annual Terminal Building Passenger Capacity		
Toronto Pearson Airport	51,700,000	70,250,000	**(18,550,000)**
Billy Bishop Airport	[redacted]		
Waterloo Airport			
Hamilton Airport			
	Annual Groundside Parking Passenger Capacity		
Toronto Pearson Airport	25,900,000*	70,250,000	**(44,350,000)**
Billy Bishop Airport	N/A		
Waterloo Airport	[redacted]		
Hamilton Airport			

* Estimated: Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities. vehicle drop offs and pickups and capacity provided by public transportation.

s.24(1)

Figure 8.1 – Toronto Pearson Airport Capacity vs. Demand Balance Scenario 1



[redacted]

[redacted]

Table 8.1 and Figure 8.1 demonstrate that if 2016 airport infrastructure remains as currently developed and ATC practices and procedures remain, demand in 2036 will surpass the annual runway passenger, terminal apron passenger, terminal building passenger, and groundside parking passenger capacities at Toronto Pearson Airport. The excess demand for runway passenger capacity (17.15 million PPA) would have to be accommodated by secondary airports. Terminal apron, terminal building and groundside parking passenger capacities at Toronto Pearson Airport are not considered to be a significant capacity concern, as these facilities can be expanded within the current airport land boundaries or through modest land acquisitions.

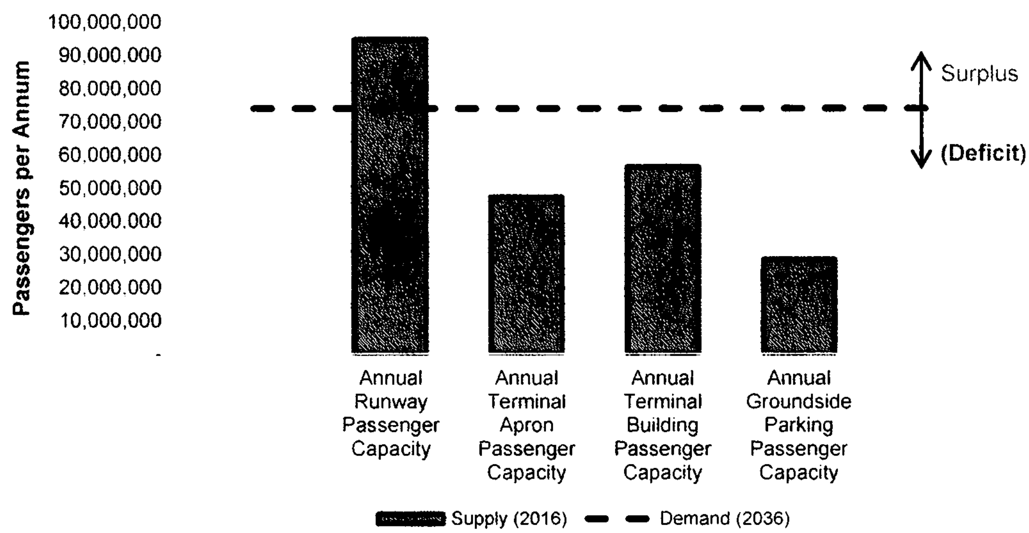
In addition, based on the parameters of this scenario, annual terminal apron passenger capacity at Billy Bishop Airport is expected to be lower than 2036 forecast demand, indicating a potential capacity deficit of approximately 528,000 PPA as shown in Figure 8.2. This modest annual terminal apron passenger capacity deficit could be accommodated by providing additional aircraft stands. It is important to note that as stated in Chapter 7, Billy Bishop Airport has higher gate utilization than other airports.

Table 8.2 illustrates the capacity of the passenger airports within the southern Ontario airport system as a whole for Scenario 1.

Table 8.2 – Passenger Airport System Capacity vs. Demand – Scenario 1

	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
Supply (2016)	94,700,000	47,100,000	56,300,000	28,450,000
Demand (2036)	73,900,000	73,900,000	73,900,000	73,900,000
Delta	**20,800,000**	**(26,800,000)**	**(17,600,000)**	**(45,450,000)**

Figure 8.5 – Passenger Airport System Capacity vs. Demand Balance Scenario 1



The results of Table 8.2 suggest that if airport infrastructure and ATC operational practices and procedures remain in place as they are in 2016, there will be a surplus of capacity of 20.8 million PPA runway passengers within the southern Ontario airport system, indicating that new runway infrastructure would not be required to support the forecast demand. Table 8.2 also illustrate that annual terminal apron, terminal building and groundside parking passenger capacities are constrained under this scenario for the southern Ontario airport system as a whole. This means if no further investment is made into the passenger processing ability of the airports, widespread delays, overcrowding and decreased level of service could result. Additional system capacity would have to be created within the passenger airports, by providing additional aircraft stands and terminal building capacity to support passenger demand.

When considering the parameters of this scenario, the surplus of annual runway passenger capacity within the system suggests that additional runway infrastructure would not be required to support the 2036 forecasted activity levels, as long as the secondary airports develop sufficiently to support additional travel demand.

Part of the analysis described above examines capacity at the southern Ontario airports as a whole, whereby capacities for each facility are summed. This implies that if one or more airports in the system has a capacity constraint within the 20 year planning horizon, capacity deficits can be accommodated at other airports within the system via transferring of traffic. Although this could be the theoretical case, in reality it may be difficult for air carriers to shift traffic to other airports within the system to address a capacity shortfall at their current operating base. For example, increased driving distances for passengers could be a deterrent to splitting passenger operations between airports (e.g. passengers departing from Toronto Pearson and driving from Kingston, Ontario may not want to travel the extra distance to airports further away such as Hamilton and Waterloo to board a flight to the same destination). In addition, air carriers with established operations at one airport would likely prefer not to split their traffic between several facilities as additional operational costs would be incurred for staffing, ground handling, etc.

Nonetheless, comparing total system supply and demand should be considered as a simplification that provides a general sense of whether there is capacity elsewhere in the system that can relieve any identified airport capacity constraints within the 20 year study horizon. In general, although capacity constraints can be alleviated at one airport by providing additional capacity at another facility within the southern Ontario airports system, passenger and air carrier behaviours will ultimately dictate the frequency and types of air services provided by the air carriers, and at which airport they are offered. Even though capacity surpluses at airports within the southern Ontario airports system can theoretically be utilized by transferring air traffic to airports with capacity deficits, an airport system can still experience operational challenges if one airport is severely congested.

8.1.2.2 General Aviation Airports

Supply and demand for the general aviation airports identified within this study based on 2016 conditions and 2036 demand is compared in Table 8.3. The general aviation airport capacities are inclusive of the following airport facilities (as is the same with all scenarios identified herein):

- Buttonville Airport;
- Peterborough Airport;
- Lake Simcoe Airport;
- Oshawa Airport;
- Burlington Airpark; and
- Brampton Airport.

Table 8.3 – General Aviation Airport System Capacity vs. Demand – Scenario 1

	Annual Practical Runway Movement Capacity
Supply (2016)	903,000
Demand (2036)	499,000
Delta	**404,000**

Table 8.3 suggests that based on 2016 airport infrastructure and 2036 aircraft movement demand, there will be a surplus of capacity of 404,000 annual practical runway movements within the southern Ontario airport system to support general aviation activities.

8.1.2.3 Summary

When comparing 2016 infrastructure to 2036 forecast demand, the calculations suggest that there is a surplus of runway capacity for both passenger service airports, and for general aviation airports within the southern Ontario airports system. Capacity shortfalls exist for terminal apron, terminal building and groundside parking capacity; however, these can be overcome with infrastructure expansion within existing airport boundaries. Additionally, off site lands could be acquired to provide additional annual groundside parking passenger capacity.

Scenario 1 is considered to be the most conservative scenario developed as part of this study, as it assumes that ATC practices and procedures, aircraft traffic mixes, and the average number of seats per aircraft movement (passenger service airports only) remain as they are in 2016.

8.2 Scenario 2 – 2016 Airport Conditions, 2019 Demand, Buttonville Airport Closure

8.2.1 Scenario Parameters

Similar to Scenario 1, this scenario assumes that airport infrastructure in place in 2016 will remain; with the exception that Buttonville Airport will close sometime between late 2017, and 2020, depending on future decisions made by the Ontario Municipal Board regarding future development approvals for the site. For the purposes of this study, it is assumed that Buttonville Airport will close by 2019.

It is also assumed that all of the remaining study airports will maintain their current capacities throughout the 20 year planning horizon of this study (until 2036). Other assumptions impacting the supply and demand comparisons within this scenario are shown below:

- Average number of seats per aircraft movement as per 2016 conditions (varies per airport and identified in Chapter 7);
- 2016 ATC practices and procedures remain unchanged throughout the 20-year planning horizon;
- 2016 aircraft mix remains constant throughout the 20-year planning horizon; and

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- 2019 demand based on the medium Transport Canada forecast to compare supply and demand throughout the entire southern Ontario airports system.

8.2.2 Supply and Demand

Airport capacities and demands are compared for both passenger service airports and general aviation airports in the following subsections.

8.2.2.1 Passenger Service Airports

Supply and demand at the southern Ontario airports that have been categorized as passenger service facilities are compared in Table 8.4.

Table 8.4 – Passenger Airport Capacity vs. Demand – Scenario 2

	Scenario 2		
	Supply	**Demand**	**Delta**
	Annual Runway Passenger Capacity		
Toronto Pearson Airport	53,100,000	45,320,000	7,780,000
Billy Bishop Airport	4,300,000		
Waterloo Airport	19,600,000		
Hamilton Airport	17,700,000		
	Annual Terminal Apron Passenger Capacity		
Toronto Pearson Airport	41,100,000	45,320,000	**(4,220,000)**
Billy Bishop Airport	2,500,000		
Waterloo Airport	1,750,000		
Hamilton Airport	1,750,000		
	Annual Terminal Building Passenger Capacity		
Toronto Pearson Airport	51,700,000	45,320,000	6,380,000
Billy Bishop Airport	3,500,000		
Waterloo Airport	250,000		
Hamilton Airport	850,000		
	Annual Groundside Parking Passenger Capacity		
Toronto Pearson Airport	25,900,000*	45,320,000	**(19,420,000)**
Billy Bishop Airport	N/A		
Waterloo Airport	550,000*		
Hamilton Airport	2,000,000*		

* Estimated: Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities, vehicle drop offs and pickups and capacity provided by public transportation.

Table 8.4 illustrates that if 2016 airport infrastructure remains as currently developed and ATC practices and procedures remain, forecast passenger demand in 2019 will not exceed the estimated capacities of the majority of the passenger airports, with the exception of Toronto Pearson Airport, where forecast demand is expected to surpass annual terminal apron passenger capacity and annual groundside parking passenger capacity, identifying a capacity shortfall. This is not considered to be a significant capacity

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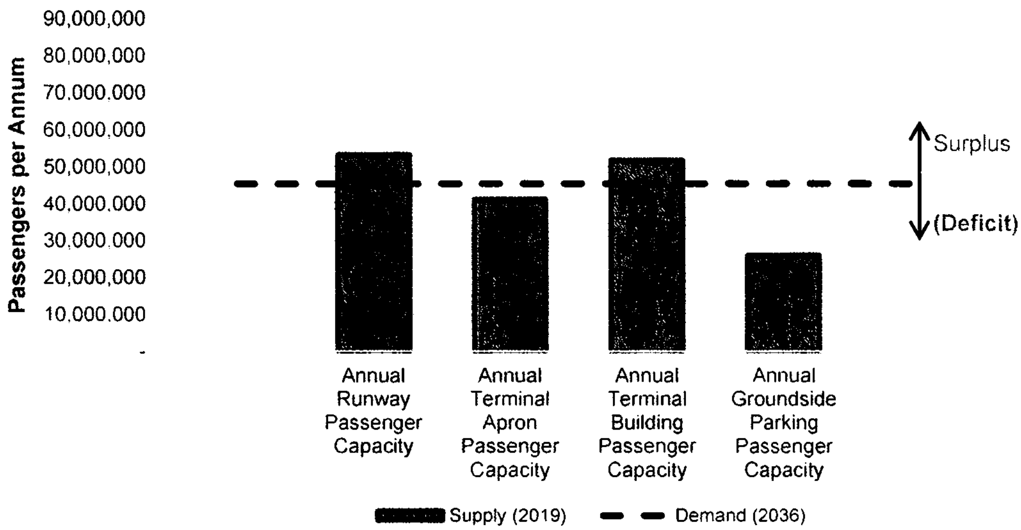
shortfall, as these capacities can be increased within Toronto Pearson Airport's property boundary, and through securing off airport lands for future development of additional parking facilities and promoting multi modal transit to and from the Airport.

Figure 8.6 – Toronto Pearson Airport Capacity vs. Demand Balance Scenario 2



Figures 8.7, 8.8 and 8.9 illustrate the relationship of calculated capacities and demand at Billy Bishop Airport, Waterloo Airport, and Hamilton Airport based on the parameters of Scenario 2. Annual terminal apron passenger capacity for Billy Bishop Airport is less than demand by approximately 150,000 PPA. This is also not considered to be significant as this capacity can be increased by developing one additional aircraft stand prior to 2019.

[redacted]

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[redacted]

Table 8.5 illustrates the capacity of the passenger airports within the southern Ontario airport system as a whole for Scenario 2.

Table 8.5 – Passenger Airport System Capacity vs. Demand – Scenario 2

	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
Supply (2016)	94,700,000	47,100,000	56,300,000	28,450,000
Demand (2019)	48,400,000	48,400,000	48,400,000	48,400,000
Delta	**46,300,000**	**(1,300,000)**	**7,900,000**	**(19,950,000)**

Figure 8.10 – Passenger Airport System Capacity vs. Demand Balance Scenario 2

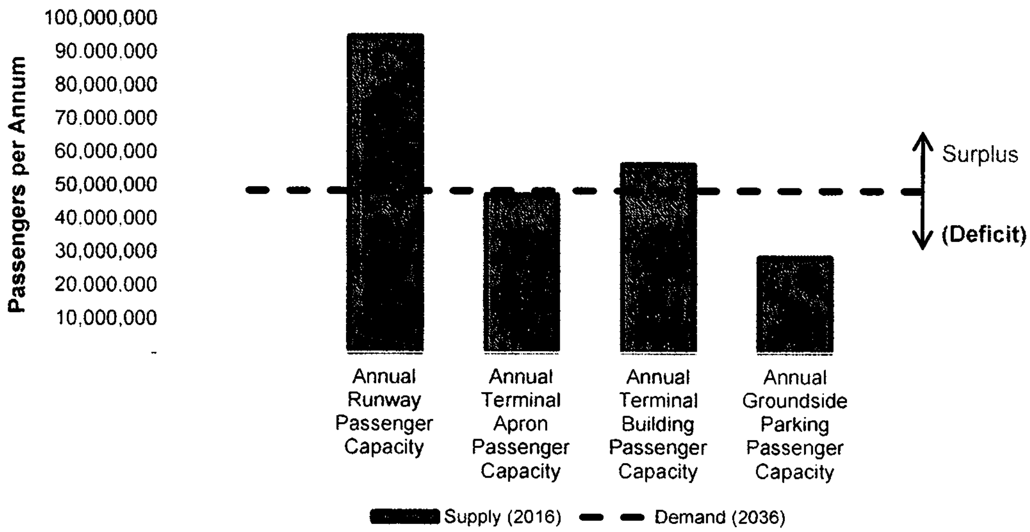

Table 8.5 and Figure 8.10 demonstrate that if airport infrastructure and ATC operational practices and procedures remain in place as they are in 2016, there will be a surplus capacity of 46.3 million PPA runway passengers within the southern Ontario airport system, indicating that new runway and taxiway infrastructure would not be required to support the forecast demand. Table 8.5 and Figure 8.10 demonstrate that terminal apron capacity is also the limiting capacity factor for the southern Ontario airport system in terms of balancing supply and demand. When considering the parameters of scenario 2, Table 8.5 indicates that an annual runway passenger capacity shortfall is not expected to exist in 2019 in the southern Ontario airport system and additional runway infrastructure will not be required to support forecast demand under this scenario.

8.2.2.2 General Aviation Airports

Supply and demand for the general aviation airports identified within this study is based on 2016 conditions and assumes the closure of Buttonville Airport in 2019. The resulting airport capacity (supply) is compared with and 2019 demand for the southern Ontario airport system's general aviation airports in Table 8.6.

Table 8.6 – General Aviation Airport System Capacity vs. Demand – Scenario 2

	Annual Practical Runway Movement Capacity
Supply (2016)	731,000
Demand (2019)	520,000
Delta	**211,000**

Table 8.6 indicates that based on 2016 airport infrastructure, the closure of Buttonville Airport (loss of capacity of approximately 172,000 runway movements), and 2019 aircraft movement demand, there will be a surplus of capacity of approximately 211,000 annual runway movements within the southern Ontario airport system to support general aviation activities.

8.2.2.3 Summary

When comparing 2016 infrastructure to 2019 forecast demand, and assuming that Buttonville Airport will close in 2019, the calculations suggest that there is a surplus of annual runway passenger capacity and annual practical movement capacity for both passenger service airports, and for general aviation airports within the southern Ontario airports system. Minor capacity deficits in annual terminal apron passenger capacity and annual groundside parking passenger capacity are expected but are not considered to be significant capacity constraints as they can be overcome (i.e. deficits can be managed within the existing airport footprints).

8.3 Scenario 3 - 2036 Airport Conditions, 2036 Demand

8.3.1 Scenario Parameters

Unlike the previous scenarios presented herein, Scenario 3 assumes that the airport infrastructure within the southern Ontario airports system will be expanded to full build-outs as identified by most recent airport Master Plans and Development Plans that were provided by the airport operators during the consultation process. The resulting capacities related to the full airport build-outs are then compared with 2036 passenger and aircraft movement demands to determine capacity shortfalls or surpluses within the system.

Other assumptions impacting the supply and demand comparisons within this scenario include the following:

- Average number of seats per aircraft movement as per 2036 conditions (varies per airport and identified in Chapter 7);
- 2036 ATC practices and procedures will be further advanced from 2016 and assumes that NAV CANADA will employ the use of visual separation on departure, Precision Runway Monitoring (PRM), timed arrival separation (Toronto Pearson Airport only), and other procedural improvements;
- 2036 aircraft mix based on the demand forecast and known industry trends; and
- 2036 demand based on the medium and high Transport Canada forecasts to compare supply and demand throughout the passenger serving airports within the southern Ontario airports system.
- 2036 demand based on the medium Transport Canada demand forecast to compare supply and demand throughout the general aviation airports within the southern Ontario airports system.

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8.3.2 Supply and Demand

Airport capacities and demands are compared for both passenger service airports, and general aviation airports based on the parameters of Scenario 3.

8.3.3 Passenger Service Airports (Medium Demand Forecast)

Supply and demand at the southern Ontario airports that have been categorized as passenger service facilities are compared in Table 8.7 based on the parameters of Scenario 3.

Table 8.7 – Passenger Airport Capacity vs. Medium Demand – Scenario 3

	Scenario 3 - 2036 Airport Conditions, 2036 Medium Demand		
	Supply	Demand	Delta
	Annual Runway Passenger Capacity		
Toronto Pearson Airport	73,700,000	70,250,000	3,450,000
Billy Bishop Airport	4,300,000	[redacted]	
Waterloo Airport	19,300,000		
Hamilton Airport	22,300,000		
	Annual Terminal Apron Passenger Capacity		
Toronto Pearson Airport	56,700,000	70,250,000	**(13,550,000)**
Billy Bishop Airport	3,000,000	[redacted]	
Waterloo Airport	3,800,000		
Hamilton Airport	3,000,000		
	Annual Terminal Building Passenger Capacity		
Toronto Pearson Airport	71,100,000	70,250,000	850,000
Billy Bishop Airport	3,800,000	[redacted]	
Waterloo Airport	2,300,000		
Hamilton Airport	3,100,000		
	Annual Groundside Parking Passenger Capacity		
Toronto Pearson Airport	31,100,000*	70,250,000	**(39,150,000)**
Billy Bishop Airport	N/A		
Waterloo Airport	550,000*	[redacted]	
Hamilton Airport	2,000,000*		

* Estimated: Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities, vehicle drop offs and pickups and capacity provided by public transportation.

Table 8.7 and Figure 8.11 demonstrate that based on airports providing additional capacity as stated within their current growth plans and comparing against passenger demand for 2036, Toronto Pearson Airport is expected to experience a capacity deficit in terms of annual terminal apron passenger capacity and annual groundside parking passenger capacity. These potential capacity deficits at Toronto Pearson Airport are more manageable compared against runway passenger capacity as terminal apron passenger and groundside parking passenger capacities can be more easily expanded.Table 8.7 and Figure 8.12 also indicate that Billy Bishop Airport will experience a deficit in terms of annual terminal apron capacity; however, this is not considered to be a major constraint. All other passenger airport facilities within the southern Ontario airport system are expected to have excess capacity in all areas examined and can be seen in Figures 8.12 , 8.13 and Figure 8.14.

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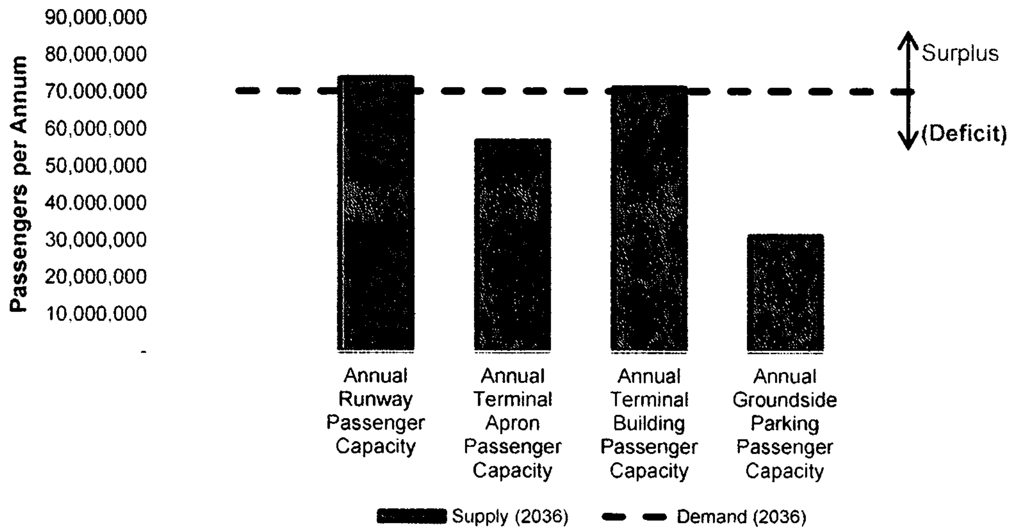
Figure 8.11 – Toronto Pearson Airport Capacity vs. Demand Scenario 3



[redacted]

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[redacted]

Table 8.8 illustrates the capacity of the passenger airports within the southern Ontario airport system as a whole for Scenario 3, based on the medium Transport Canada passenger demand forecast.

Table 8.8 – Passenger Airport System Capacity vs. Medium Demand – Scenario 3

	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
Supply (2036)	119,600,000	66,500,000	80,300,000	33,650,000
Demand (2036)	73,900,000	73,900,000	73,900,000	73,900,000
Delta	**45,700,000**	**(7,400,000)**	**6,400,000**	**(40,250,000)**

Figure 8.15 – Passenger Airport System Capacity vs. Demand Scenario 3

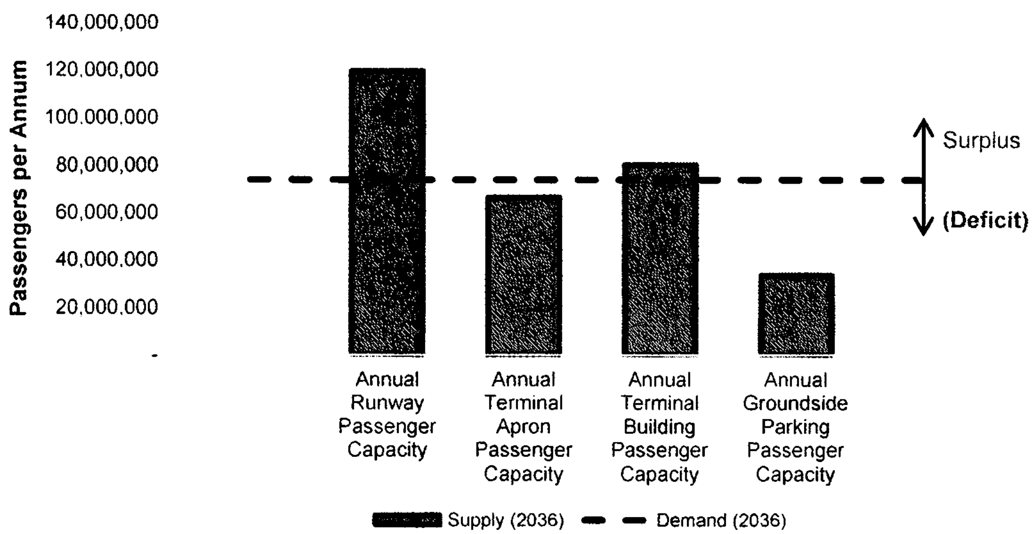

Table 8.8 and Figure 8.15 indicate that if airport infrastructure is expanded to its full potential as indicated in the study airports' Master Plans and Development Plans, and new ATC operational practices are put in place at Toronto Pearson Airport, there will be a surplus capacity of 45.7 million annual runway passengers within the southern Ontario airports system. This suggests that runway and taxiway infrastructure would not require expansion beyond what is currently published in Master Plans and Development Plans to support the forecast demand. Table 8.8 also illustrates that terminal apron passenger capacity is the limiting capacity factor for the southern Ontario airport system, suggesting that when additional capacity is required, additional aircraft stands or methods of increasing gate throughput must be provided to allow for increased capacity. Although not a significant constraint, groundside parking passenger capacity can impact passenger level of service but there are multiple ways to address the issue. The passenger airports in the southern Ontario airport's system will have to increase the capacity of groundside transportation systems moving into the future to ensure a reasonable level of service is maintained.

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8.3.4 Passenger Service Airports (High Demand Forecast)

In order to analyze the impact of a high traffic case on potential capacity deficit, Transport Canada's High Demand Traffic Forecast for 2036 is compared with the capacities of passenger airports. Table 8.9 illustrates the capacity of the passenger airports within the southern Ontario airport system for Scenario 3, based on the high Transport Canada passenger demand forecast.

Table 8.9 – Passenger Airport Capacity vs. High Demand – Scenario 3

	Scenario 3 - 2036 Airport Conditions, 2036 High Demand		
	Supply	**Demand**	**Delta**
	Runway Passenger Capacity		
Toronto Pearson Airport	73,700,000	83,400,000	**(9,700,000)**
Billy Bishop Airport	4,300,000	[redacted]	
Waterloo Airport	19,300,000		
Hamilton Airport	22,300,000		
	Terminal Apron Passenger Capacity		
Toronto Pearson Airport	56,700,000	83,400,000	**(26,700,000)**
Billy Bishop Airport	3,000,000	[redacted]	
Waterloo Airport	3,800,000		
Hamilton Airport	3,000,000		
	Terminal Building Passenger Capacity		
Toronto Pearson Airport	71,100,000	83,400,000	**(12,300,000)**
Billy Bishop Airport	3,800,000	[redacted]	
Waterloo Airport	2,300,000		
Hamilton Airport	3,100,000		
	Groundside Parking Passenger Capacity		
Toronto Pearson Airport	31,100,000*	83,400,000	**(52,300,000)**
Billy Bishop Airport	N/A		
Waterloo Airport	550,000*	[redacted]	
Hamilton Airport	2,000,000*		

* Estimated: Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities, vehicle drop offs and pickups and capacity provided by public transportation.

Table 8.9 indicates that based on 2036 airport conditions and the high Transport Canada forecast demand for 2036, Toronto Pearson Airport is expected to reach capacity and have a capacity deficit in terms of annual runway passenger capacity, terminal apron passenger capacity, terminal building passenger capacity, and groundside parking passenger capacity. This is the only instance within this study where runway passenger demand could exceed the estimated capacity for annual runway passengers at Toronto Pearson Airport. This suggests that additional runway passenger capacity would have to be provided at additional airports within the system, or an additional runway would be required at Toronto Pearson Airport to accommodate demand. In previous years the GTAA was examining the need for a 6th runway at Toronto Pearson Airport; however, consultations with the GTAA indicate that the 6th runway is not currently being considered for long term development. If no additional runway infrastructure is added and no further enhancements are available to increase system capacities, then traffic growth and level of service will be affected.

Table 8.10 illustrates the capacity of the passenger airports within the southern Ontario airport system as a whole for Scenario 3, based on the high Transport Canada passenger demand forecast.

Table 8.10 – Passenger Airport System Capacity vs. High Demand – Scenario 3

	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
Supply (2036)	119,600,000	66,500,000	80,300,000	33,650,000
Demand (2036)	87,700,000	87,700,000	87,700,000	87,700,000
Delta	**31,900,000**	**(21,200,000)**	**(7,400,000)**	**(54,050,000)**

As can be seen in Table 8.10 when estimated capacities for the passenger airports within the southern Ontario airports system are compared with the High Transport Canada forecasts for 2036, capacity deficits related to terminal apron, and groundside parking are still identified as a limiting factor to support demand, similar to the medium forecasts. However, when the high Transport Canada forecasts are compared against the estimated 2036, capacities, air terminal facilities also become a potential capacity constraint.

Nonetheless, even when the Transport Canada high demand forecasts are applied in Scenario 3, a surplus of 31.9 million PPA is identified for annual runway passenger capacity within the system. This suggests that new runways would not be required to support the high passenger demand forecast, and improvements in terminal apron, air terminal and groundside parking capacities would adequately support the 2036 high forecast passenger demand for the southern Ontario airports system.

8.3.5 General Aviation Airports

Supply and demand analysis for the general aviation airports identified within this study is based on 2036 conditions (full airport build-out as per Master Plans and Development Plans), compared with 2036 medium demand for the southern Ontario airport system's general aviation airports. The capacities and forecast demand of the general aviation airports are presented in Table 8.11.

Table 8.11 – General Aviation Airport System Capacity vs. Medium Demand – Scenario 3

	Annual Practical Runway Movement Capacity
Supply (2036)	761,000
Demand (2036)	499,000
Delta	**262,000**

Table 8.11 indicates that based on full build-out 2036 airport infrastructure and 2036 aircraft movement demand (medium forecast), there will be a surplus of capacity of 262,000 annual aircraft movements within the southern Ontario airport system to support general aviation activities.

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8.4 Scenario 4 – 2036 Airport Conditions, 2036 Demand, High Speed Rail

8.4.1 Scenario Parameters

Scenario 4 is similar to Scenario 3 whereby airport infrastructure is assumed to be expanded to full build-out potential as listed in master plans and development plans, and capacity (supply) is compared with adjusted 2036 demand in order to reflect the potential introduction of high speed rail services in the Windsor-Quebec City rail corridor. Scenario 4 includes the same parameters and assumptions as listed in Scenario 3 in terms of available airport capacity. It is important to note that the introduction of high speed rail in the Windsor-Quebec City rail corridor is not expected to influence demand on the general aviation airports within the southern Ontario airports system. The only difference between Scenario 3 and Scenario 4 are the reductions in the demand forecasts.

8.4.2 Supply and Demand

8.4.2.1 Passenger Service Airports

Supply and demand at the southern Ontario airports that have been categorized as passenger service facilities are compared in Table 8.12, based on the parameters of Scenario 3, with demand adjusted to reflect high speed rail services in the Windsor-Quebec City rail corridor.

Table 8.12 – Passenger Airport Capacity vs. Demand – Scenario 4

	Scenario 4 - 2036 Airport Conditions, 2036 Demand, High Speed Rail		
	Supply	**Demand**	**Delta**
	Annual Runway Passenger Capacity		
Toronto Pearson Airport	73,700,000	68,112,000	5,588,000
Billy Bishop Airport	4,300,000	[redacted]	
Waterloo Airport	19,300,000		
Hamilton Airport	22,300,000		
	Annual Terminal Apron Passenger Capacity		
Toronto Pearson Airport	56,700,000	68,112,000	**(11,412,000)**
Billy Bishop Airport	3,000,000	[redacted]	
Waterloo Airport	3,800,000		
Hamilton Airport	3,000,000		
	Annual Terminal Building Passenger Capacity		
Toronto Pearson Airport	71,100,000	68,112,000	2,988,000
Billy Bishop Airport	3,800,000	[redacted]	
Waterloo Airport	2,300,000		
Hamilton Airport	3,100,000		
	Annual Groundside Parking Passenger Capacity		
Toronto Pearson Airport	31,100,000*	68,112,000	**(37,012,000)**
Billy Bishop Airport	N/A		
Waterloo Airport	550,000*	[redacted]	
Hamilton Airport	2,000,000*		

* Estimated: Annual Groundside Parking Passenger Capacity does not include privately operated parking facilities, vehicle drop offs and pickups and capacity provided by public transportation.

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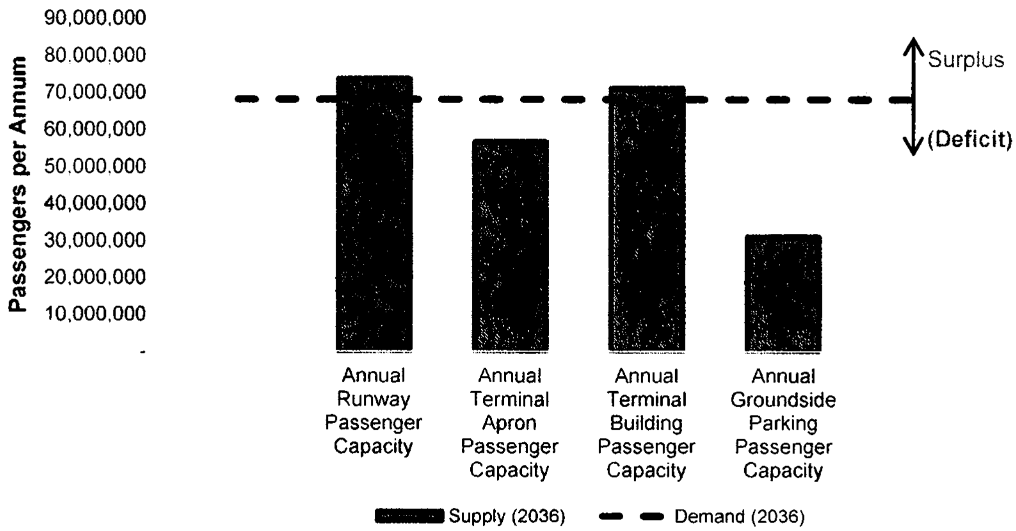
Table 8.12 and Figure 8.16 indicate that based on airport providing additional capacity as stated within their current Master Plans and Development Plans and comparing against passenger demand for 2036 (accounting for a reduction in demand for high speed rail), annual terminal apron passenger capacity and annual groundside parking capacity are identified as capacity constraints for Toronto Pearson Airport. These are not considered to be significant capacity constraints.

Figure 8.16 – Toronto Pearson Airport Capacity vs. Demand Scenario 4



All other passenger airports within the southern Ontario airports system are expected to be able to accommodate 2036 passenger demand in this scenario, based on their anticipated expansions and other scenario parameters.

[redacted]

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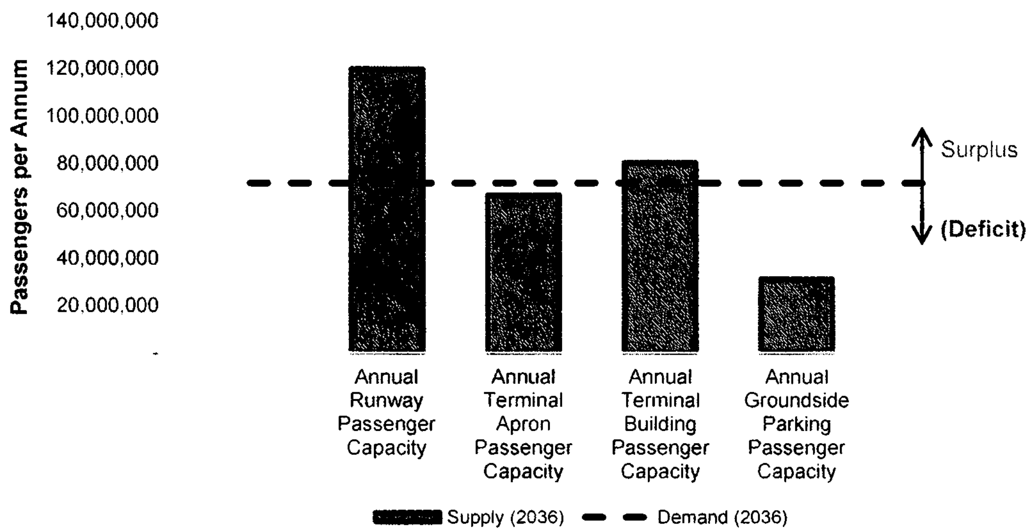
[redacted]

Table 8.13 illustrates the capacity of the passenger airports within the southern Ontario airport system as a whole for Scenario 4, based on the medium Transport Canada passenger demand forecast accounting for decreased passenger demand as a result of the introduction of high speed rail services in the Windsor-Quebec City corridor.

Table 8.13 – Passenger Airport System Capacity vs. Demand – Scenario 4

	Annual Runway Passenger Capacity	Annual Terminal Apron Passenger Capacity	Annual Terminal Building Passenger Capacity	Annual Groundside Parking Passenger Capacity
Supply (2036)	119,600,000	66,500,000	80,300,000	31,100,000
Demand (2036)	71,650,000	71,650,000	71,650,000	71,650,000
Delta	**47,950,000**	**(5,150,000)**	**8,650,000**	**(40,550,000)**

Figure 8.20 – Passenger Airport System Capacity vs. Demand Scenario 4



Through analysis discussed in Section 6.4, total passenger demand is reduced by approximately 2.3 million PPA within Scenario 4 as a result of the potential introduction of high speed rail services in the Windsor-Quebec City corridor. As with Scenario 3, under Scenario 4 runway facilities are sufficiently capable of handling the runway passenger demand in 2036.

Annual terminal building passenger capacity is also expected to be higher than forecast demand, owing to the GTAA's major expansion plans for Toronto Pearson Airport's Terminal 1, and further expansion at Billy Bishop Airport, Waterloo Airport and Hamilton Airport. Annual terminal apron passenger capacity is a constraint on the system and further expansions to aircraft aprons will likely alleviate this capacity shortfall. Groundside parking remains a minor capacity constraint. As discussed in Chapter 4, Toronto Pearson Airport has is planning to increase its mode share of trips to and from the Airport to alleviate some of the need for private vehicle parking.

8.5 Conclusion

Based on the results of the capacity analysis presented in Chapter 7 and the various demand and capacity scenarios considered in Chapter 8, included herein is a summary of the conclusions of the supply and demand analysis for the southern Ontario airports system to the year 2036.

8.5.1 Scenario 1 - 2016 Airport Conditions, 2036 Demand

In terms of passenger airports within the southern Ontario airports system, the results of Scenario 1 indicate that based on 2016 infrastructure and ATC practices and procedures and 2036 aircraft movement demand, a projected surplus runway passenger capacity of 20.80 million PPA is identified. Capacity shortfalls in terms of annual terminal apron passenger capacity, terminal building passenger capacity, and groundside parking passenger capacities of 26.80 million PPA, 17.60 million PPA, and 45.45 PPA were identified for the system airports respectively under the parameters of Scenario 1.

The following infrastructure and operational improvements could aid in alleviating the capacity deficits identified in Scenario 1:

- Provision of additional annual runway passenger capacity at Toronto Pearson Airport by implementing new ATC practices and procedures, or by increasing the average number of passenger per aircraft movement;
- Provision of additional terminal apron and terminal building passenger capacity by developing additional aircraft stands and air terminal gates at Toronto Pearson Airport, likely by extending Terminal 1 to the east, and Terminal 3 to the north. Specific areas of expansion are expected to be identified in the next Toronto Pearson Airport Master Plan; and
- Expansion of existing apron facilities at Billy Bishop Airport to provide additional terminal apron passenger capacity, likely to the east of the current air terminal facility (pending successful negotiations with the adjacent leaseholder).

Alternatively, overall levels of service could be reduced at Toronto Pearson Airport and Billy Bishop Airport by increasing utilization rates of existing facilities; however, this is likely not a preferred method of capacity enhancement by the airport operators.

Annual practical runway movement capacity of the general aviation airports within the southern Ontario airports system was determined to be well above forecast 2036 demand by approximately 404,000 annual movements, suggesting a substantial surplus of practical runway movement capacity at the general aviation airports within the system.

In summary, capacity constraints at Toronto Pearson Airport and Billy Bishop Airport can be overcome to support 2036 demand, indicating that there are no major capacity constraints based on the parameters of Scenario 1. The results of Scenario 1 indicate that capacity improvements can be undertaken at existing airports to support demand, and a new airport in southern Ontario would not be required from a capacity standpoint.

8.5.2 Scenario 2 - 2016 Airport Conditions, 2019 Demand (Buttonville Airport Closure)

When examining the passenger airports within the southern Ontario airport system and considering 2016 airport conditions and 2019 demand, it was found that there was adequate annual runway passenger capacity (surplus of 46.3 million PPA), and annual air terminal building passenger capacity (surplus of 7.9 million PPA) at the existing facilities to support 2019 demand. However, annual terminal apron and groundside parking passenger capacities were found to be in deficit by 1.3 million PPA, and 19.95 million PPA, respectively.

The following infrastructure improvements could aid in alleviating the capacity deficits identified in Scenario 2:

- Expansion of terminal apron passenger capacity by developing additional aircraft stands at Toronto Pearson Airport, likely in conjunction with air terminal capacity improvements to Terminal 1 and Terminal 3; and
- Provision of additional aircraft stands at Billy Bishop Airport prior to 2019 by expanding terminal apron facilities to the east (pending successful negotiations with the leaseholder).

As an alternative to increase capacity, levels of service could be reduced at Toronto Pearson Airport and Billy Bishop Airport by increasing utilization rates of existing facilities; however, this is likely not a preferred method of capacity enhancement by the airport operators.

When considering the capacity of the general aviation airports within the southern Ontario airports system based on 2016 infrastructure and ATC practices and procedures and applying 2019 forecast demand, a surplus capacity of 211,000 annual practical runway movements has been identified, even with the closure of Buttonville Airport in the same year.

In summary, provided the modest capacity expansions identified above can be undertaken at Toronto Pearson Airport and Billy Bishop Airport there will be sufficient capacity in the southern Ontario airports system in 2019 to support forecast demand, without the requirement to build a new airport.

8.5.3 Scenario 3 - 2036 Airport Conditions, 2036 Demand

Based on the medium passenger demand forecast presented in Chapter 6, this scenario revealed that, as a system as a whole, the southern Ontario passenger airports will have anticipated surplus capacities of 45.70 million PPA and 6.40 million PPA in terms of runway passenger capacity and air terminal building passenger capacity, respectively. Terminal apron passenger capacity and groundside parking passenger capacities were identified to be in deficit in 2036 by 7.40 million PPA and 40.25 million PPA respectively.

The following infrastructure improvements could aid in alleviating the capacity deficits identified in Scenario 3 (medium demand):

- Expansion of terminal apron passenger capacity by developing additional aircraft stands at Toronto Pearson Airport, likely in conjunction with air terminal capacity improvements to Terminal 1 and Terminal 3; and
- Provision of additional aircraft stands at Billy Bishop Airport by expanding terminal apron facilities to the east (pending successful negotiations with the leaseholder).

Alternatively, overall levels of service could be reduced at Toronto Pearson Airport and Billy Bishop Airport by increasing utilization rates of existing facilities; however, this is likely not a preferred method of capacity enhancement by the airport operators.

In relation to the general aviation facilities within the southern Ontario airports system, it was found that a capacity surplus of 262,000 annual practical runway movements will exist in 2036 based on the medium demand scenario. This indicates that adequate capacity is available to support general aviation operations at the facilities identified as part of the southern Ontario airports system.

When considering the high demand forecast presented in Chapter 6, Scenario 3 reveals projected capacity deficits for terminal apron passenger capacity (21.20 million PPA), terminal building passenger capacity (7.40 million PPA), and groundside parking passenger capacity (54.05 million PPA) throughout the system as a whole.

The following infrastructure and operational improvements could aid in alleviating the capacity deficits identified in Scenario 3 (high demand):

- Provision of additional runway passenger capacity at Toronto Pearson through the implementation of additional ATC practices and procedures (beyond those already anticipated to be implemented prior to 2036), or via increasing the average number of passengers per aircraft movement. Alternatively, the additional runway passenger capacity required at Toronto Pearson could be shifted to other facilities within the southern Ontario airports system.
- Provision of additional terminal apron and terminal building passenger capacity by developing additional aircraft stands and air terminal gates at Toronto Pearson Airport, likely by extending Terminal 1 to the east, and Terminal 3 to the north. Specific areas of expansion are expected to be identified in the next Toronto Pearson Airport Master Plan; and
- Provision of additional aircraft stands at Billy Bishop Airport by expanding terminal apron facilities to the east (pending successful negotiations with the leaseholder).

As an alternative to increase capacity, levels of service could be reduced at Toronto Pearson Airport and Billy Bishop Airport by increasing utilization rates of existing air terminal and terminal apron facilities; however, this is likely not a preferred method of capacity enhancement by the airport operators.

Capacity constraints at Toronto Pearson Airport and Billy Bishop Airport can be overcome to support 2036 demand, indicating that there are no major capacity constraints, and a new airport to provide additional capacity is not required in southern Ontario as per the parameters of Scenario 3 and as compared against the medium and high demand forecasts..

8.5.4 Scenario 4 - 2036 Airport Conditions, 2036 Demand (High Speed Rail)

Considering the passenger airports within the southern Ontario airports system, their estimated capacities in 2036, and applying 2036 demand as per the forecasts, it was found that adequate annual runway passenger capacity (47.95 million PPA) and annual air terminal building passenger capacity (8.65 million PPA) exists within the system as a whole with the introduction of high speed rail services in the region. However, identified annual terminal apron passenger and annual groundside parking passenger capacities were found to be in deficit within the system by approximately 5.15 million PPA and 40.55 million PPA respectively.

To aid in alleviating the capacity deficits identified in Scenario 4, expansion of terminal apron passenger capacity would be required by developing additional aircraft stands at Toronto Pearson Airport, likely in conjunction with air terminal capacity improvements to Terminal 1 and Terminal 3. Alternatively, overall levels of service could be reduced at Toronto Pearson Airport by increasing utilization rates of existing terminal apron facilities.

The capacities of the general aviation system airports was not analyzed in Scenario 4, as reductions in passenger demand as a result of high speed rail implementation only impacts passenger airports.

The results of Scenario 4 indicate that 2036 demand can be accommodated at the southern Ontario airports, provided modest expansions in terminal apron passenger capacity are undertaken at Toronto Pearson Airport. This suggests that adequate capacity exists within the southern Ontario airports system and an additional airport in southern Ontario would not be required to meet 2036 demand under the parameters of Scenario 4.

While the anticipated increases in the capacity of the southern Ontario airport system are expected to be sufficient to handle projected traffic demand within the 20 year planning horizon of this study, circumstances and industry trends can change. Also, the findings of this study do not preclude the need for a new airport in southern Ontario beyond the 20 year planning horizon.

APPENDIX A – Glossary of Terms

Glossary of Terms

Term	Definition
Aerodrome:	Any area of land, water (including frozen surfaces) or other supporting surface used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival and departure, movement or servicing or aircraft and include any building, installations and equipment in connection therewith.
Air Express:	Cargo shipments by dedicated air cargo couriers, such as FedEx, UPS, DHL, etc.
Air Freight:	The shipment of diversified products including machinery, pharmaceuticals, perishable foodstuffs, live animals, etc. with shipments varying in size. Air freight operators obtain shipments directly from shippers, or using freight forwarders and/or integrators.
Air Mail:	The delivery of letters, packages and other goods shipped by traditional mail delivery. Air mail is typically shipped within the cargo holds of scheduled passenger service aircraft, and through contracted agreements with air freight operators.
Air Traffic Rights:	A market access right which is expressed as an agreed physical or geographic specification, or combination of specifications, of who or what may be transported over an authorized route or parts thereof in the aircraft authorized. The term *air traffic rights* can have the same meaning as market access rights.
Aircraft Movement:	A take-off, a landing, or a simulated approach by an aircraft.
Airport Classification:	Under Transport Canada's National Airports Policy categories include: • National, Regional/Local, Small, Remote, Arctic.
Airport Governance:	The legal arrangements under which an airport is owned and operated.
Airport Ownership:	Airport lands are either publically or privately owned.
Airport Role:	The role an airport plays in a system of airports such as: • Primary Hub, Secondary, Feeder, GA Corporate, GA Industrial, GA Training.
Airport Service Type:	The dominant services an airport offers within passenger, cargo and general aviation categories, such as: • Passenger, Air Cargo, General Aviation
Airport System:	A grouping of airports structured as: • A set of airports within a geographic area, each functioning independent of each other; • An informal system featuring alliances among individual airports who agree to cooperate or compete with others; or • A formal system with cooperative agreements to behave for the common good, and potentially compete against another airport system.

Term	Definition
Air Carrier Movement	Aircraft movements conducted by air operators licensed by the Canadian Transportation Agency to transport persons, mail, and goods by air. In the context of this study an air carrier movement consists of major scheduled or charter passenger and cargo services.
Automatic dependent surveillance - broadcast (ADS-B):	A surveillance technology that gives controllers the opportunity to provide radar-like services. It uses aircraft avionics, satellites and/or ground infrastructure to relay a range of aircraft parameters to air traffic control (ATC). The system is automatic since no external stimulus is required for operation and dependent because it relies on aircraft avionics to provide surveillance services through broadcast messages. (Source: TC AIM)
Bilateral Agreements:	The basic document most often used by countries to jointly regulate their international air services relationships.
Business Strategy:	The operating philosophy pursued by an airport including: • Competitive or cooperative position with respect to other airports, potential alliances, and other operating and development strategies.
Cabotage:	The transportation of passengers or cargo between two points in the same state, by a transport operator registered in another country.
Certified Airport:	An aerodrome for which an airport certificate has been issued that confirms all facilities meet prescribed airport design standards and all operations are in accordance with the Canadian Aviation Regulations (CARs).
Domestic:	Domestic flights are those that occur within Canada
Instrument Flight Rules (IFR):	Rules that govern the procedures for conducting flight under instrument conditions without visual reference to the ground, with flight instruments being the primary source of information to the pilot.
Instrument Meteorological Conditions (IMC):	Weather conditions specified by the Canadian Aviation Regulations were primary reference to flight instruments is required to conduct a flight.
International:	International flights are those occurring between Canada and other countries not including the United States
General Aviation Movement:	At airports with control towers and/or flight service stations: General Aviation movements are considered as movements in which aircraft proceed to or arrive from another location; or where aircraft leave the circuit but return without landing at another airport. At airports without control towers/flight service stations: General Aviation movements are defined as when the aircraft arrives or departs to a point other than the reporting airport, or a movement by an aircraft that leaves the close proximity of an airport and returns without landing at another airport.

Term	Definition
Leakage:	The loss of passenger traffic from one airport to neighbouring airports through ground transportation
Local Aircraft Movement:	At airports with control towers and/or flight service stations: Local movements are considered as movements in which the aircraft remains in the airport circuit pattern. At airports without control towers and/or flight service stations: Local movements are recorded when the aircraft remains in the close proximity of the airport. Local movements are often carried out during training flights, equipment tests, etc.
Multilateration (MLAT):	MLAT increases air traffic service (ATS) situational awareness of aircraft and vehicles on the ground allowing them to safely manage ground movements, including in low visibility operations, by providing full surveillance coverage of runways, taxiways and terminal apron areas. MLAT uses a system of strategically placed ground stations to send interrogations and receive replies from Mode A, C or S transponders. (Source: TC AIM)
Precision Runway Monitor (PRM):	A high speed and high precision radar system that allows simultaneous approaches on closely spaced parallel runways.
Touch and Go:	A procedure in which an aircraft lands and then takes off without stopping. (Source: TC AIM)
Transborder:	Transborder flights are those occurring between Canada and the United States.
Visual Flight Rules (VFR):	Rules that govern the procedures for conducting flight under visual conditions.
Visual Meteorological Conditions (VMC):	Weather conditions specified by the Canadian Aviation Regulations in which flights can occur with visual reference to the ground. Weather minimums that constitute VMC differ with aircraft type and airspace.

APPENDIX B – Study Assumptions

Study Assumptions

Category	Issue	Assumptions
Policy and Regulatory Changes	International Liberalization	1. There will be no significant changes in the Freedoms of the Air. 2. There will be no Right of Establishment for foreign air carriers in Canada. 3. Cabotage will not be permitted in Canada. 4. Canada will continue with incremental liberalization of bilateral agreements, with no measures either constraining or favouring Toronto airports.
	Traffic Leakage to U.S.	5. There will be no significant changes in the 'user pay' approach to air transport in Canada. 6. The current leakage pattern to border U.S. airports will continue "as is" and will be subject to exchange rates and other factors.
	Airline Foreign Ownership	7. Foreign ownership rules may be relaxed up to a maximum of 49%, although control in fact provisions would remain.
	Billy Bishop Airport Status	8. The ban on jets will continue throughout the 20-year planning horizon. 9. Slot constraints and other limits to remain throughout 20-year planning horizon.
	Buttonville Airport Status	10. The airport will close in 2019 before a new Pickering Airport becomes operational with resident aircraft already relocated to other 9 southern Ontario airports.
	New Pickering Airport	11. Apart from government investment for servicing the site, and environmental assessment work, investment in the development of a new Pickering Airport will be non-government financed and operated. 12. The capacity of each southern Ontario airport will be developed subject to traffic levels and environmental concerns (noise, land use, etc.) 13. Future investors will seek sustainable financial returns. 14. While unlikely, competition cannot be precluded between a new Pickering Airport and Toronto Pearson Airport.
Airline Markets	Industry Consolidation	15. Canadian airline consolidations may occur. 16. Airline consolidation with a one carrier outcome will not occur. 17. Foreign airline consolidation may involve a Canadian airline and would follow the 49% ownership rule, assuming control in fact of carrier remains in Canada.
	Airline Alliances	18. Evolving alliance strategies will not directly impact development of the new Pickering Airport.
	Low Cost Carriers (LCC)	19. U.S. - LCCs may extend services into Canada (Southwest, Allegiant, Jet Blue, Spirit, other) and may serve a new Pickering Airport. 20. Trans-Atlantic LCCs may serve a new Pickering Airport (Icelandair, Norwegian, other).

	Ultra-Low Cost Carriers (ULCC)	21. One or more Canadian ULCC carriers will begin operations within 5 yrs. 22. ULCCs will stimulate new passenger traffic in Canada and southern Ontario. 23. ULCCs will not serve Toronto Pearson Airport.
	Load Factors	24. Passenger growth at Toronto Pearson Airport will require more frequencies and larger gauge aircraft and cannot be accommodated by higher load factors using existing aircraft types.
Aircraft Trends	Route Fragmentation	25. Fragmentation of markets will continue, facilitated by new "right-sized" long range aircraft (e.g.: B787) operating longer flight segments and able to support increased point-to-point services.
	Route Economics	26. The trend towards larger regional turboprop and larger medium range jet aircraft will continue. 27. Smaller regional jets and turboprops <50 seats will become rare in air service operations. These aircraft types will be deployed very selectively by air carriers.
	Environmental Impacts	28. New generation aircraft with lower noise signatures and lower emissions will increasingly enter airline fleets potentially serving a new Pickering Airport.
	Fuel Price	29. Fuel price fluctuations will not be considered due to unpredictability.
Airline Services	Air Canada	30. Air Canada will continue to focus on operating a Hub-and-Spoke model to maintain and strengthen their dominant position at Toronto Pearson Airport, with limited interest in other southern Ontario airports. 31. Air Canada will continue to emulate low cost carriers, with a separate division (Rouge).
	WestJet	32. WestJet will continue to serve multiple southern Ontario airports with expanded domestic, transborder and international services. 33. WestJet will continue to focus on Toronto Pearson Airport.
	Charter Air Services	34. Charter carriers will continue to seek lower cost alternatives to Toronto Pearson Airport, and will continue expansion into other southern Ontario Airports.
	Route Economics	35. Trend towards use of larger narrow body aircraft will continue in North and Central American domestic and transborder markets. 36. New wide-body aircraft (B787, A350) will cause fragmentation of international routes, both competing with and favouring Toronto Pearson Airport. 37. Very limited use of ultra-large wide-body aircraft (A380) with use primarily on frequency-constrained routes.

Air Cargo Services	Route Economics	38. The trend towards use of twin-engine wide-body aircraft will continue for intercontinental air cargo routes. 39. Industry will continue demands for increased flight frequency.
	Operational Models	40. Leading air express operations will remain based at Toronto Pearson Airport. 41. Air Freight operators will seek economic points of consolidation and flexible operational hours at other southern Ontario Airports. 42. Intermodal cargo operations (truck-air, air-truck) will occur at all airports.
General Aviation / Business Aviation	Types of Activities	43. Commercial, Corporate and Industrial activity may occur at a new Pickering Airport. 44. Stakeholders may identify a need for a General Aviation airport service type airport on Pickering Lands; however, this will not be the sole driver for a new airport.
Ground Transportation	Rail Services	45. The possibility of higher speed rail service (200 kph) between Toronto and Montreal within the next 20 years will be assessed, including impacts on passenger demand. 46. The possibility of regional/commuter rail services to Pickering Airport within the next 20 years will be assessed.
	Road Services	47. The new Highway #407 toll road will serve a new Pickering Airport beginning during the short term. 48. Congestion on Highway #401 and arteries in the GTA will make east-west travel increasingly difficult.

APPENDIX C – Stakeholder Consultation List

Stakeholder Consultation Listing

Organization	Names	Title
Air Carriers		
Air Canada	Fitti Lourenco	Director, Government Affairs
WestJet	Chris Hedlin	Manager, Network Planning
Porter	Michael Diamond	Stakeholder and Community Engagement
Sunwing	Paul Desrochers	Vice President, Planning and Scheduling
Air Transat	George Petsikas	Senior Director, Government and Industry Affairs
Study Airports		
Toronto Pearson Airport	Paul Ritchi	Senior Manager, Strategy Development
	Eileen Waechter	Director, Airport Planning
	Lorrie McKee	Director, Public relations
Billy Bishop Airport	Gene Cabral	Executive Vice-President
	Mike Karsseboom	General Manager, Airport Operations
Buttonville Airport	Derek Sifton	President, Toronto Airways Ltd.
Waterloo Airport	Chris Wood	General Manager
	Michele Baumgarten	Marketing and Communications
Peterborough Airport	Trent Gervais	Airport Manager
	Lisa Davidson	Assistant Airport Manager
Lake Simcoe Airport	Michael Drumm	Airport Manager
	Christopher Drumm	Operations Manager
Oshawa Airport	Stephen Wilcox	Airport Manager
Burlington Airpark	Tim Crawford	Airport Manager
Hamilton Airport	Cathie Puckering	Vice President, Finance
	Warren Askew	Director, Operations
	Lauren Yaksich	Director, Marketing & Communications
Brampton Airport	Julie Pomeroy	General Manager
	Chris Pulley	President

Organization	Names	Title
Municipalities		
City of Markham	Elisabeth Silva-Stewart	Senior Policy Planner
	Marg Wouters	Senior Manager of Policy & Research
	Stephen Chait	Director, Economic Development
City of Pickering	David Ryan	Mayor
	Tony Prevedel	Chief Administrative Officer
	Fiaz Jadoon	Economic Development Coordinator
Region of York	Val Shuttleworth	Chief Planner
Region of Durham	Roger Anderson	Chair, CEO
	Christine Drimmie	Policy and Research advisor
	Sandra Austin	Policy and Research advisor
Town of Ajax	Steven Parish	Mayor
	Rachael Matheson	Sr. Government Communications and Public Relations
Industry Associations and Interest Groups		
Canadian Business Aviation Association (CBAA)	Rudy Toering	President and CEO
Airline Pilots Association (ALPA)	Kevin Psutka	Safety and Security Representative
Canadian Owners and Pilots Association (COPA)	Bernard Gervais	President and CEO
	Cheryl Marek	Southern Ontario Director
Ministry of Transportation Ontario (MTO)	Paul Steckham	Senior Policy Advisor
	Louis Bitomti	Senior Planner
NAV CANADA	Neil Bennett	National Manager, Level of Service
	Jeff Cochrane	Manager of Communication, Navigation and Surveillance Service Design
	John Urban	General Manager, Toronto Flight Information Region
Air Transport Association of Canada (ATAC)	Mike Skrobica	Senior Vice President and CFO Vice President, Ontario
Pickering Airpark	Mark Brooks	President
	David Steeves	Vice President
	Phil Lightstone	Treasurer
	Peter Ott	Financial & Business Development Advisor
Durham Gateway Partners	Ted Nickerson	President
	L. Lee Parsons	Chief Executive Officer
Canadian Airports Council	Daniel-Robert Gooch	President
National Airlines Council Canada	Marc-Andre O'Rourke	Executive Director

APPENDIX D – Forecasting Assumptions and Data

TC 2015 Enplaned/Deplaned Revenue Passenger Forecast Assumptions - Toronto Pearson Airport

[redacted]	[redacted]	2015	[redacted]	2030	[redacted]	AAGR 2014-2030	[redacted]	AAGR 2030-2035	[redacted]
Air Passenger Traffic (thousands)									
Toronto Pearson Airport- Domestic	15,197	15,871	17,792	21,366	23,083	2.2%	**2.3%**	1.6%	2.0%
Toronto Pearson Airport - Transborder	10,050	10,672	12,259	15,718	17,542	2.8%	**2.8%**	2.2%	2.7%
Toronto Pearson Airport - Other Int'l	12,277	13,360	16,669	23,962	27,981	4.3%	**4.5%**	3.1%	4.0%
Toronto Pearson Airport - Total	37,523	39,903	46,720	61,046	68,606	3.1%	**3.2%**	2.4%	2.9%
All 4 Pickering Airports - Total**	40,414	42,725	49,859	64,560	72,268	3.0%	**3.1%**	2.3%	2.8%
Canada GDP (Millions)									
Canada	1,570,343	1,595,040	1,762,372	2,124,527	2,313,215	1.9%	2.0%	1.7%	1.9%
Ontario	578,739	593,796	658,897	803,953	881,901	2.1%	2.1%	1.9%	2.0%
PDOM Zone (Toronto)	419,593	432,282	484,874	604,036	669,293	2.3%	2.3%	2.1%	2.2%
Population (thousands)									
Canada	35,540	35,863	37,735	41,671	43,579	1.0%	1.0%	0.9%	1.0%
Ontario	14,525	14,640	15,416	17,298	18,170	1.1%	1.0%	1.0%	1.1%
PDOM Zone (Toronto)	10,301	10,374	10,973	12,425	13,097	1.2%	1.1%	1.1%	1.2%
Disposable Income ($ Millions)									
Canada	25,817	26,026	26,964	28,265	28,995	0.6%	0.7%	0.5%	0.6%
Ontario	25,162	25,361	26,252	27,592	28,317	0.6%	0.7%	0.5%	0.6%
PDOM Zone (Toronto)	27,543	27,816	28,830	30,461	31,336	0.6%	0.7%	0.6%	0.6%
Immigration (Thousands)									
Canada	7,555	7,761	8,787	10,819	11,970	2.3%	2.5%	2.0%	2.2%
Ontario	3,928	4,041	4,602	5,714	6,350	2.4%	2.6%	2.1%	2.3%
PDOM Zone (Toronto)	3,389	3,486	3,970	4,930	5,479	2.4%	2.6%	2.1%	2.3%
Total Air Carriers Unit Cost Index, constant dollar (2014=100)									
Canada	100	94	94	94	94	-0.4%	0.0%	0.0%	-0.3%
U.S.GDP (Millions)	15,133,449	15,509,241	17,750,621	22,261,723	24,817,535	2.4%	2.7%	2.2%	2.4%

* Includes Pearson Toronto, Billy Bishop Toronto City, Hamilton and Waterloo

Analysis of Project Team Variance 2030				
Route	Origin	Variable	Project Team Variance to TC Medium	
			Low Case	High Case
Domestic	All	GDP	-4.4%	2.8%
		PDI	-1.5%	5.3%
		Adult Population	-2.6%	4.5%
		Fares	2.8%	-1.3%
		Linguistic Similarity	0.0%	0.0%
		Direct Flight	0.0%	0.0%
		Time by Car	0.0%	0.0%
Transborder	Canada Origin	U.S. GDP Millions	-4.8%	1.5%
		PDI Canada.	-1.5%	5.3%
		Adult Population	-2.6%	4.5%
		Fares	0.0%	0.0%
		Sunspot	0.0%	0.0%
		Direct Flight	0.0%	0.0%
	U.S. Origin	Canada GDP	-4.4%	2.8%
		PDI US	-4.0%	2.4%
		Adult Population	-0.9%	1.9%
		Fares	0.0%	0.0%
		Sunspot	0.0%	0.0%
		Direct Flight	0.0%	0.0%
Other International	Canada Origin	GDP Other	-2.8%	3.1%
		GDP per Capita Canada	-1.9%	5.2%
		Pop Adult Canada	-2.6%	4.5%
		Fares	2.8%	-1.3%
		Immigration	-7.2%	5.5%
		Direct Flight	0.0%	0.0%
	Foreign Origin	GDP Canada	-4.4%	2.8%
		GDP per Capita Other	-0.9%	1.9%
		Pop Adult Other	-1.9%	1.2%
		Fares	0.0%	0.0%
		Immigration	0.0%	0.0%
		Direct Flight	0.0%	0.0%

Figure D.1 – Toronto Pearson Airport Domestic Aircraft Movement Forecast

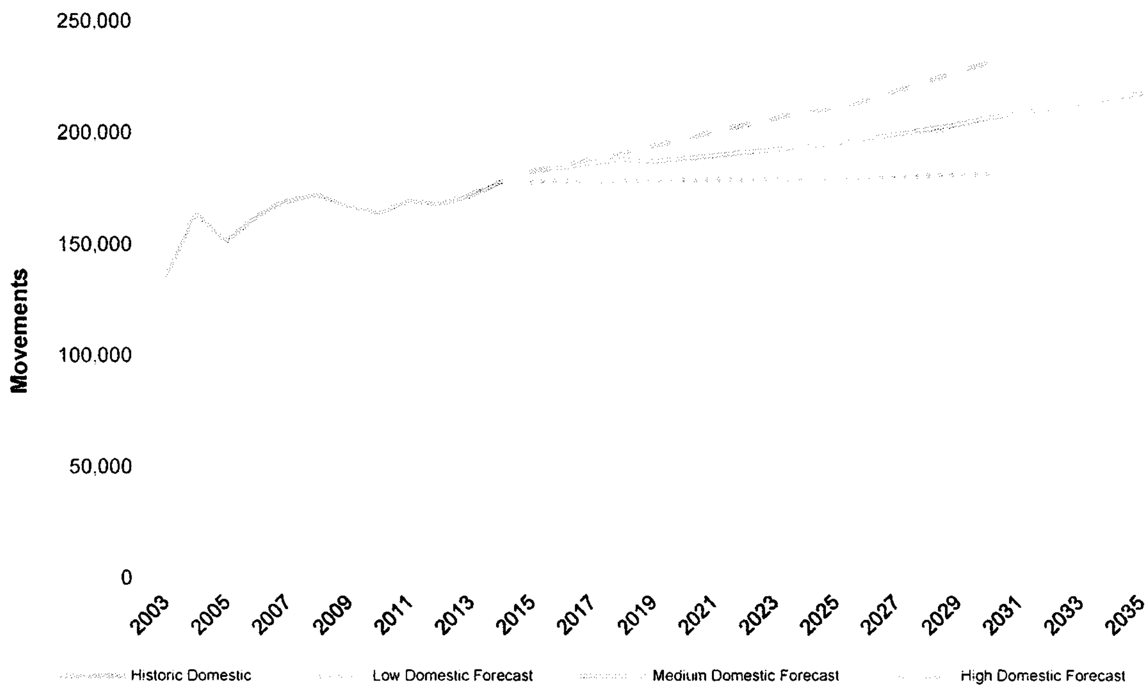


Figure D.2 - Toronto Pearson Airport Transborder Aircraft Movement Forecast

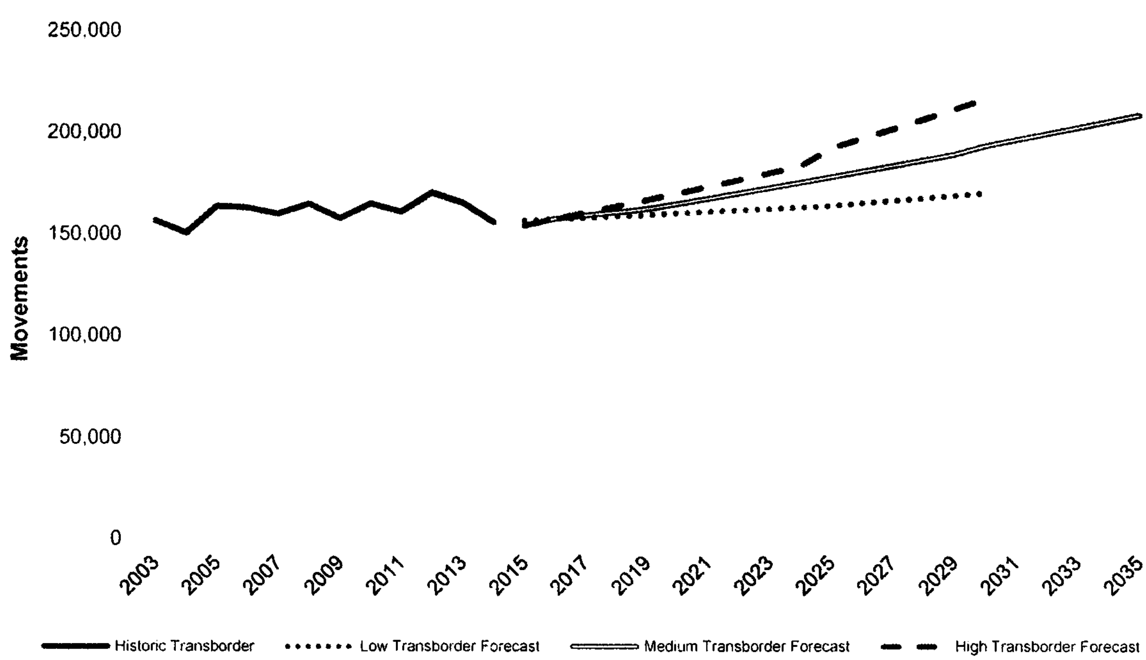


Figure D.3 - Toronto Pearson Airport International Aircraft Movement Forecast

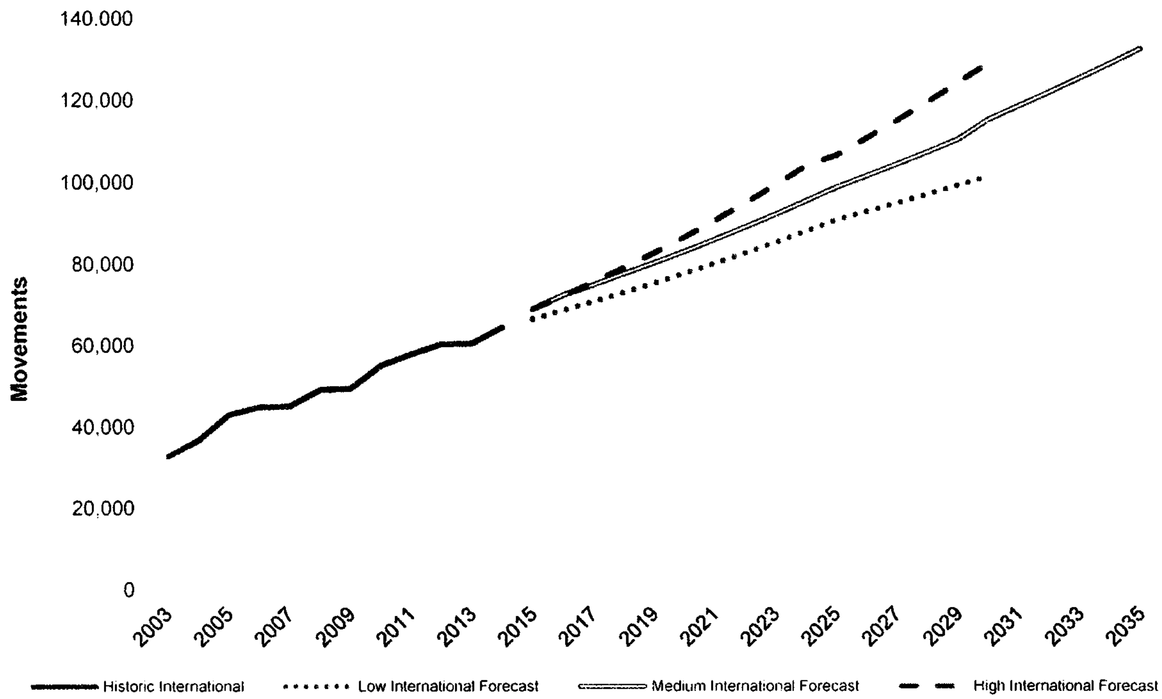


Figure D.4 - Toronto Pearson Airport Non-Reported Aircraft Movement Forecast

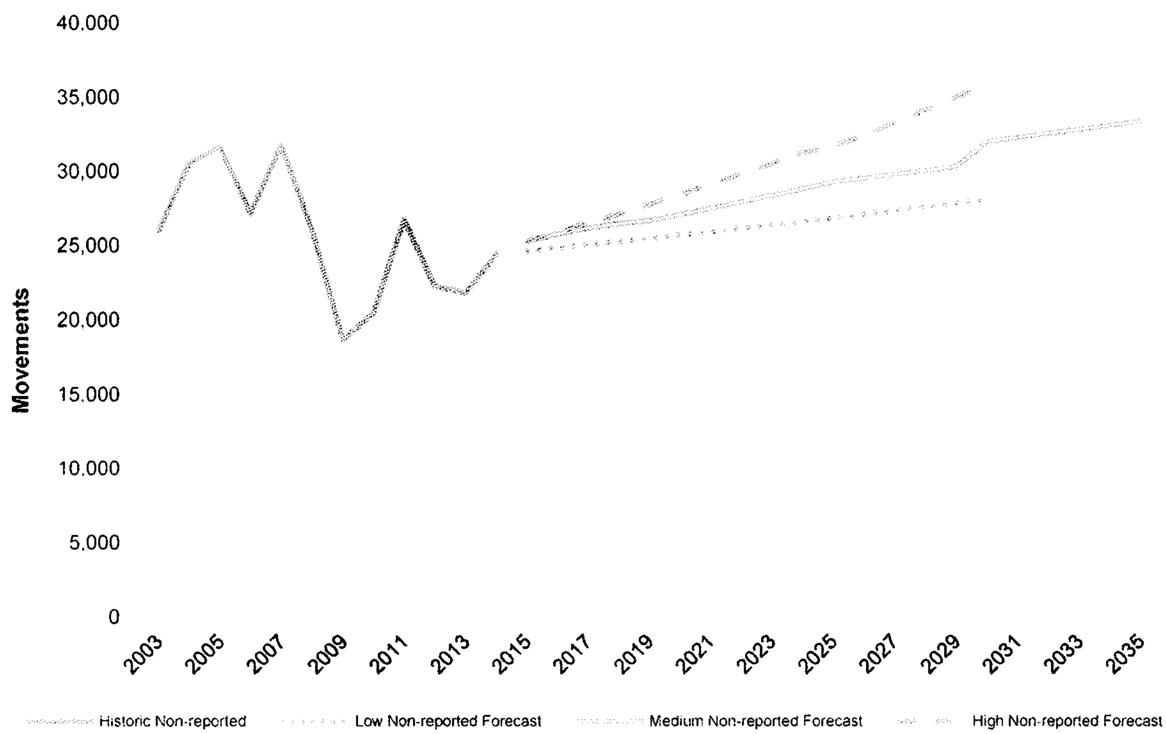
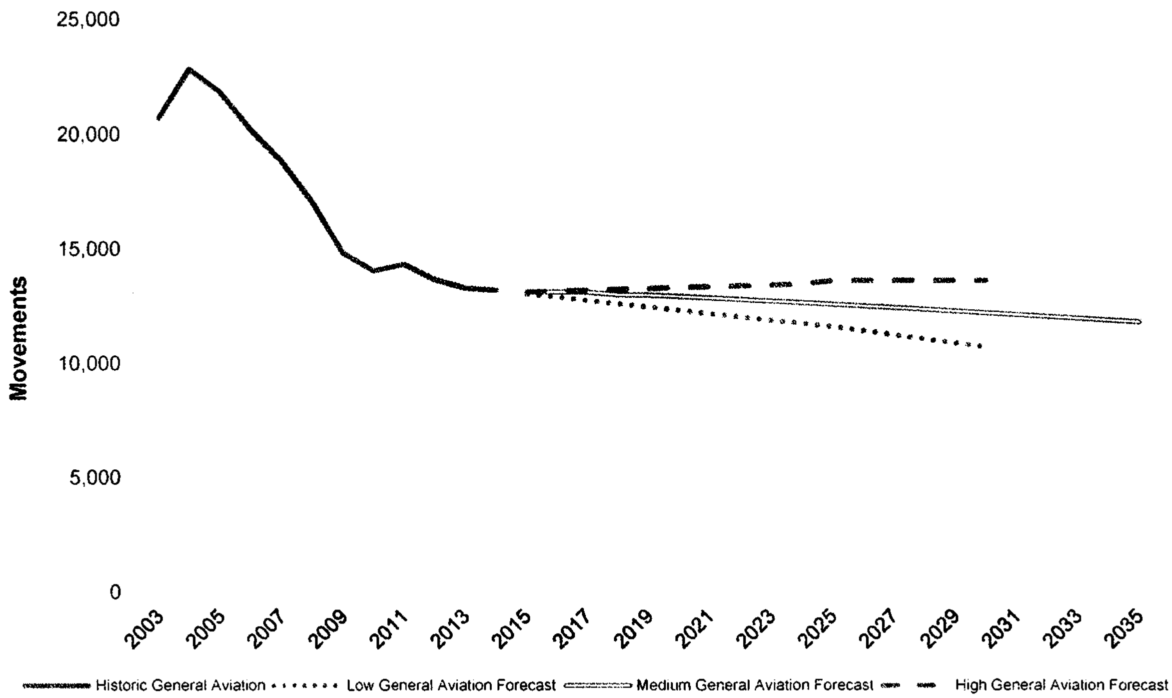


Figure D.5 - Toronto Pearson Airport General Aviation Aircraft Movement Forecast



MMM Group Limited

TRANSPORT CANADA

CONTEXTUAL BRIDGE REPORT

PICKERING LANDS AVIATION SECTOR ANALYSIS

NOVEMBER 7, 2017 CONFIDENTIAL

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1 BACKGROUND

In 1972, the Government of Canada acquired approximately 7,530 ha of land within the municipalities of Pickering, Uxbridge and Markham known as the Pickering Lands. Since acquiring the lands, several studies have been commissioned by Transport Canada to determine the need for an airport to support growing aviation demand in the Greater Toronto Area (GTA). The first of these studies concluded that an airport in Pickering would be required in the future and the lands should continue to be held by Transport Canada. The most recent study (Pickering Lands Needs Assessment Study) completed in 2010, identified a requirement for a new Pickering Airport as early as 2027 or as late as 2037.

In 2016, Transport Canada commissioned a new initiative to update the forecasts and revisit the available system capacity of the airports in and surrounding the GTA. The initiative, known as the Pickering Lands Aviation Sector Analysis, will contain 3 major components: The Supply and Demand Report, the Airport Type and Role Report, and the Economic Impact and Revenue Generation Report.

The Supply and Demand report of the Pickering Lands Aviation Sector Analysis contains a detailed capacity and demand forecasting analysis for the airports in southern Ontario, focused primarily on the GTA and its surrounding area. The Supply and Demand report concluded that within the study horizon (2036), the forecasted demand for air travel in the GTA would only modestly exceed terminal apron passenger capacity at Toronto Pearson Airport and Billy Bishop Airport. The passenger service airports within the region (Toronto Pearson Airport, Billy Bishop Airport, Waterloo Airport and Hamilton Airport) would be capable of satisfying this forecasted demand through terminal and apron expansions without the need for additional runways or airports. It was concluded that within the 20 year horizon, a new airport on the Pickering Lands would not be required to satisfy passenger demand, provided that the Greater Toronto Airports Authority makes necessary capital investments in Toronto Pearson Airport (e.g. capacity improvements to Terminal 1 and 3), new air traffic control practices are adopted (e.g. Visual Separation on Departure and Time Based Arrivals Separation), and investments are made in new technology (e.g. Precision Runway Monitoring).[1] Abbreviated information on these anticipated improvements is presented on p. 7 of this document.

This supplementary document has been developed in response to Transport Canada's request for a 'bridge' between the Supply and Demand Report and the Airport Type and Role Report. It enhances the findings of the Supply and Demand Report by illustrating how the passenger airports studied could expand within their current boundaries to meet projected demand within the study horizon. This report also outlines how these airports could, theoretically, be expanded to their full capacity. At the same time, it highlights some policy factors that should be considered, in addition to the airports' ability to meet projected demand, when deciding whether or not to proceed with plans for developing a Pickering Airport. These policy factors provide a basis for proceeding with the Type and Role Report and the Revenue Generating Potential and Economic Impact Report.

[1] Pickering Lands Aviation Sector Analysis: Supply and Demand Report, 2016, p.113-115.

2 INTRODUCTION TO AIRPORT CAPACITY

The annual total passenger capacity that an airport can achieve is dependent upon three components: Runway capacity, terminal apron capacity, and terminal building capacity. Definitions for capacity measurement were provided in the Supply and Demand Report, and are re-stated herein for convenience.

2.1 ANNUAL RUNWAY PASSENGER CAPACITY

Annual Runway Passenger Capacity is determined by the number of passengers that can be served by a runway, or a runway system. Calculating the Annual Passenger Runway Capacity is a multi-step process, described below.

First, the expected number of movements that can be performed on the runway(s) in an hour without violating Air Traffic Control (ATC) rules, assuming continuous aircraft demand is determined. This is the Maximum Runway Throughput Capacity.

Second, the Hourly Practical Runway Movement Capacity is calculated. This represents the expected average number of movements that can be performed in an hour with an average delay per movement of 4 minutes. Hourly Practical Runway Capacity is equal to 85% of the Maximum Throughput Capacity (Federal Aviation Administration definition). This is further expanded to determine annual capacity by categorizing hours of operation, aircraft mix, and Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) throughput.

Third, the Annual Practical Runway Movement Capacity is determined by taking the Hourly Practical Runway Capacity, and incorporating hours of operation, and other historical restrictions that will limit the airport's annual capacity (e.g. noise abatement restrictions and winter operations can result in a reduction in runway capacity).

Finally, Annual Runway Passenger Capacity is determined by taking the calculated practical annual movement capacity, and applying an average number of aircraft seats to each movement. To determine annual runway passenger capacity in 2036, an expected average aircraft size and seating capacity was identified for each of the airports. For Toronto Pearson Airport, an average seating capacity of 148 passengers per aircraft movement is assumed based on the forecast aircraft mix (widebody, narrowbody, and regional jet traffic). For Hamilton Airport and Waterloo Airport, expected average seating capacity of 160 seats is assumed based on the forecast aircraft mix of primarily narrowbody aircraft, such as the Boeing B737. For Billy Bishop Toronto City Airport, the expected average seating capacity of 70 of seats is assumed, representative of the Bombardier DHC-8-400 operated by Porter Airlines and Air Canada. A load factor of 80% is applied to calculate the number of passengers per aircraft movement at each airport. An 80% load factor is a recognized industry rule of thumb when estimating passenger loads.

2.2 ANNUAL TERMINAL APRON CAPACITY

Annual Terminal Apron Passenger Capacity is the expected number of passengers capable of being processed per annum, determined by an average passenger gate throughput of 300,000 Passengers Per Annum (PPA) at Toronto Pearson Airport and Billy Bishop Toronto City and 250,000 PPA at the key passenger airports.[2]

Section 7.4.2.4 of the Supply and Demand Report stated that, in actual practice, Billy Bishop Toronto City's existing passenger terminal building may have a capacity between 3.5 million and 3.8 million PPA. Utilizing 300,000 PPA per passenger gate for both Toronto Pearson and Billy Bishop Toronto City is appropriate. This per gate throughput is then multiplied by the number of passenger gates and remote stands to obtain the total Annual Terminal Apron Capacity.

2.3 ANNUAL TERMINAL BUILDING PASSENGER CAPACITY

Annual Terminal Building Passenger Capacity is the expected number of passengers capable of being processed within the facility and determined by estimating that 10,000 m^2 of terminal area is required per million PPA for Toronto Pearson, Waterloo and Hamilton airports, and 4,000m^2 is required per million PPA for Billy Bishop Toronto City Airport.[3]

As stated in Section 7.4.2.4 of the Supply and Demand Report, Billy Bishop Toronto City's existing passenger terminal building has approximately 14,000 m^2 of combined passenger holding and processing space[4]. Using a ratio of 1.0 Million PPA to 10,000m^2 of terminal area should result in Billy Bishop Airport's existing terminal building capacity being identified as 1.4 million PPA. However, previous studies have stated that the capacity of the current passenger terminal is 3.5 million PPA indicating a higher throughput of approximately 1 million PPA per 4,000 m^2.[5] According to Ports Toronto the terminal processed 2.7 million PPA in 2016, further demonstrating this enhanced throughput.

There is a gap at Toronto Pearson Airport between the amount of new terminal area required and the number of new gates required. This is not uncommon at large airports that devote significant terminal area to non-passenger processing activities, including concessions. In theory, Toronto Pearson Airport's terminal building could meet 2036 passenger demand with modest expansion. However, actual expansion will depend upon the GTAA's desire to maintain or increase current passenger concessions.

2.4 RELATIONSHIP OF CAPACITIES

Each capacity component – runways, aprons and terminal buildings – must be viewed as part of a complete airport system. The total capacity of an airport is therefore limited by the component of the system with the lowest capacity. For example, an airport with an Annual Runway Passenger Capacity of 10 million, an Annual Terminal Apron Passenger Capacity of 6 million, and an Annual Terminal Building Passenger Capacity of 8 million would have a total Annual Passenger Capacity of 6 million passengers. Airports can operate above these annual capacities; however, this can result in frequent flight delays, significant terminal building congestion, and a reduced passenger Level of Service (LOS), potentially to the point of system failure.

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[2] Pickering Lands Aviation Sector Analysis: Supply and Demand Report, 2016, p.103.
[3] Pickering Lands Aviation Sector Analysis: Supply and Demand Report, 2016, p.104.
[4] Pickering Lands Aviation Sector Analysis: Supply and Demand Report, 2016, p.125.
[5] Needs Assessment Study: Pickering Lands Final Report, 2010, Ch. 5.

3 ASSESSMENT OF REQUIRED INVESTMENTS

This section identifies the footprint of infrastructure investments that could be developed to meet or exceed the forecast passenger demand in 2036 at the four key passenger airports within the southern Ontario airport system based on recognized airport planning principles. Table 3.1 identifies the minimum Terminal Apron Capacity (gates) and Terminal Building Passenger Capacity (m2) developments required to meet runway capacity at the four key passenger airports. The following general assumptions were made in the preparation of the concepts:

- Where land was available, existing terminal buildings were expanded before considering new terminal building sites;
- Once land adjacent to the existing passenger terminal buildings was exhausted, sites within existing airport property boundaries were utilized;
- If annual runway passenger capacity could not be accommodated within existing airport property boundaries, areas of appropriate land assembly were identified (Hamilton only);
- Each gate can serve Code C aircraft, however Code E aircraft can be accommodated with some limitations on adjacent gates. For example, one Code E aircraft could occupy two Code C positions. This practice is common at many Canadian airports including Toronto Pearson, Vancouver, and Calgary.

Table 3.1 Hypothetical Required Infrastructure Investments

	Toronto Pearson	Billy Bishop Toronto City	Hamilton	Waterloo
2036 Annual Runway Passenger Capacity	73,700,000	4,300,000	22,300,000	19,300,000
Terminal Apron				
Current Terminal Apron (Gates/Stands)	137	10	7	7
Total Required Terminal Apron (Gates/Stands)	246	14	89	77
Additional Terminal Apron Required (Gates/Stands)	109	4	82	70
Terminal Building				
Current Terminal Building Area (m^2)	643,000	14,000	8,500	25,000
Required Terminal Building Area (m^2)	737,000	17,200	223,000	193,000
Additional Terminal Building Area Required (m^2)	94,000	3,200	214,500	168,000

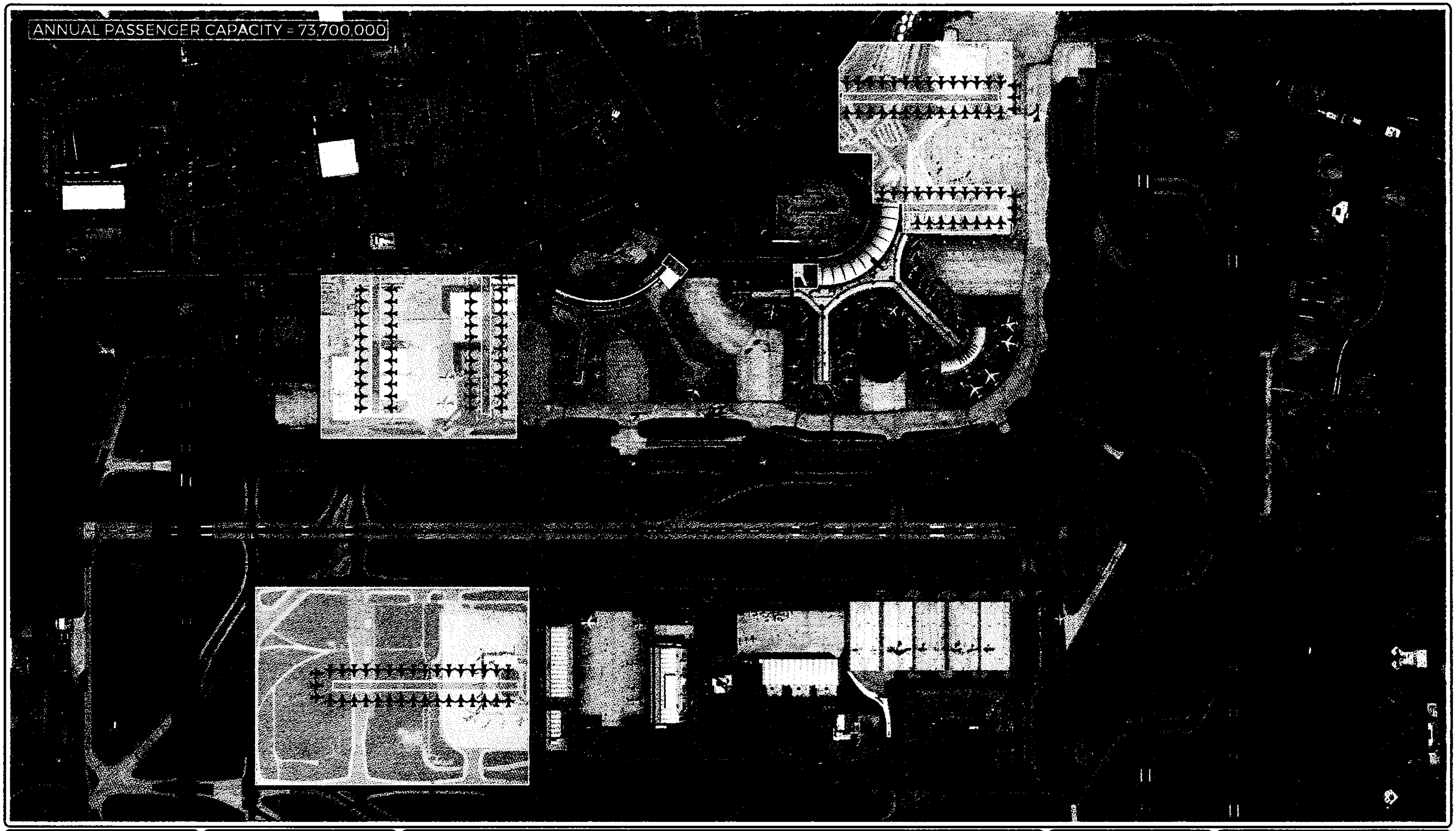
The footprints of the infrastructure required to achieve identified Annual Runway Passenger Capacity, as well as the requirement for land assembly (where necessary), are illustrated at a proof-of-concept level in Figures 3.1, 3.4, 3.7 and 3.10. These concepts illustrate how capacity "could" be increased, but do not reflect the only options for infrastructure expansion or the expansion plans being contemplated by the airports themselves. The purpose of these illustrations is not to predict how future expansion will occur, but rather show that it could be possible. These renderings show only concourses and gates. The Waterloo Airport concept suggests that the two terminals may not be linked, however, they could be. There are a variety of methods that could be used to link satellite or secondary terminals with a primary terminal. These methods include passenger tunnels or bridges equipped with moving sidewalks, Automated People Movers (APMs) similar to the Terminal Link train in use at Toronto Pearson. Figures 3.2, 3.3, 3.5, 3.6, 3.8, 3.9, 3.11, and 3.12 illustrate the difference in capacity between the current expected build-out and the potential maximum build-out illustrated.

Additional detailed studies would need to be undertaken to validate assumptions and identify whether any constraints would limit the extent of possible airport expansion and validate the feasibility of expansion.

The high-level capacity analysis found that future Annual Terminal Apron Capacity (increase of 256 gates) and Annual Terminal Building Passenger Capacity (increase of 479,700 m2) could meet Annual Runway Passenger Capacity at the 4 key passenger airports given the land currently available; with modest land assembly required at Hamilton Airport. The assumptions used were those outlined in Scenario 3 of the Phase 1: Supply and Demand Report (2036 airport conditions, 2036 demand).

Parameters used in the 2036 assessment include:

- Changes to ATC technology: 20% increase of hourly movement capacity through the use of Visual Separation on Departure, Precision Runway Monitoring, and Time-Base Arrival Separation.
- Upgauging of aircraft at Toronto Pearson from 128 seats per movement (2016) to 148 seats per movement (2036). This was derived by assigning successor aircraft to the current schedule. For example:
  - Air Canada's Airbus A320 (146 seats) will be replaced in 2018 by the Boeing 737 Max 8 at 170 seats. This aircraft order was finalized on April 1st 2014, with thirty-three 737 Max 8 and twenty-eight 737 Max 9 orders. Deliveries are set to begin in early 2018.
  - Air Canada will replace its Airbus A319 and Embraer E190 aircraft with the new Bombardier C-series CS-300 aircraft. Air Canada has 45 firm orders. The CS-300 will seat between 130 to 160 passengers.



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HYPOTHETICAL CONCEPT OF REQUIRED CAPACITY INVESTMENTS (2036)

FIGURE 3.1: TORONTO PEARSON INTERNATIONAL AIRPORT (CYYZ)

Legend

- EXISTING AIRPORT PROPERTY BOUNDARY
- TERMINAL REQUIREMENT
- NEW PAVEMENT REQUIRED
- POTENTIAL GATE LOCATION

Figure 3.2 - Toronto Pearson Airport Expected Buildout (2008 Master Plan)

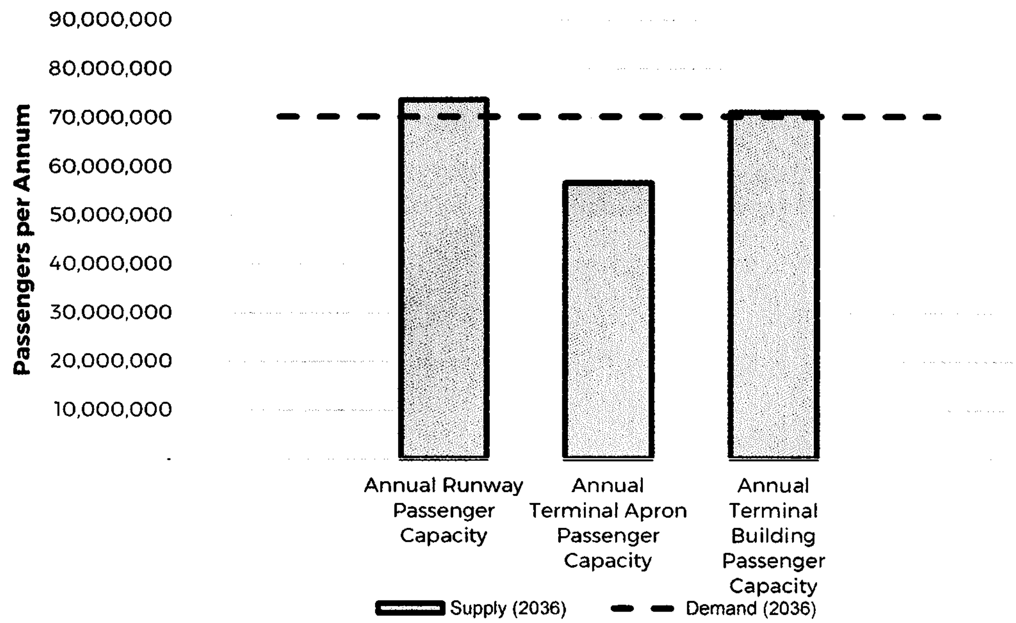
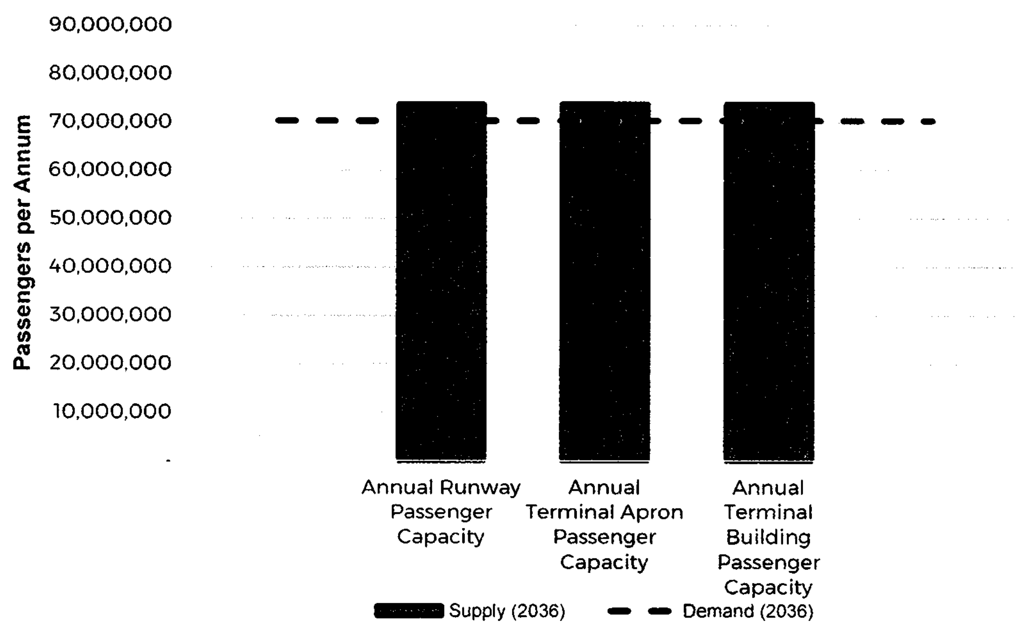
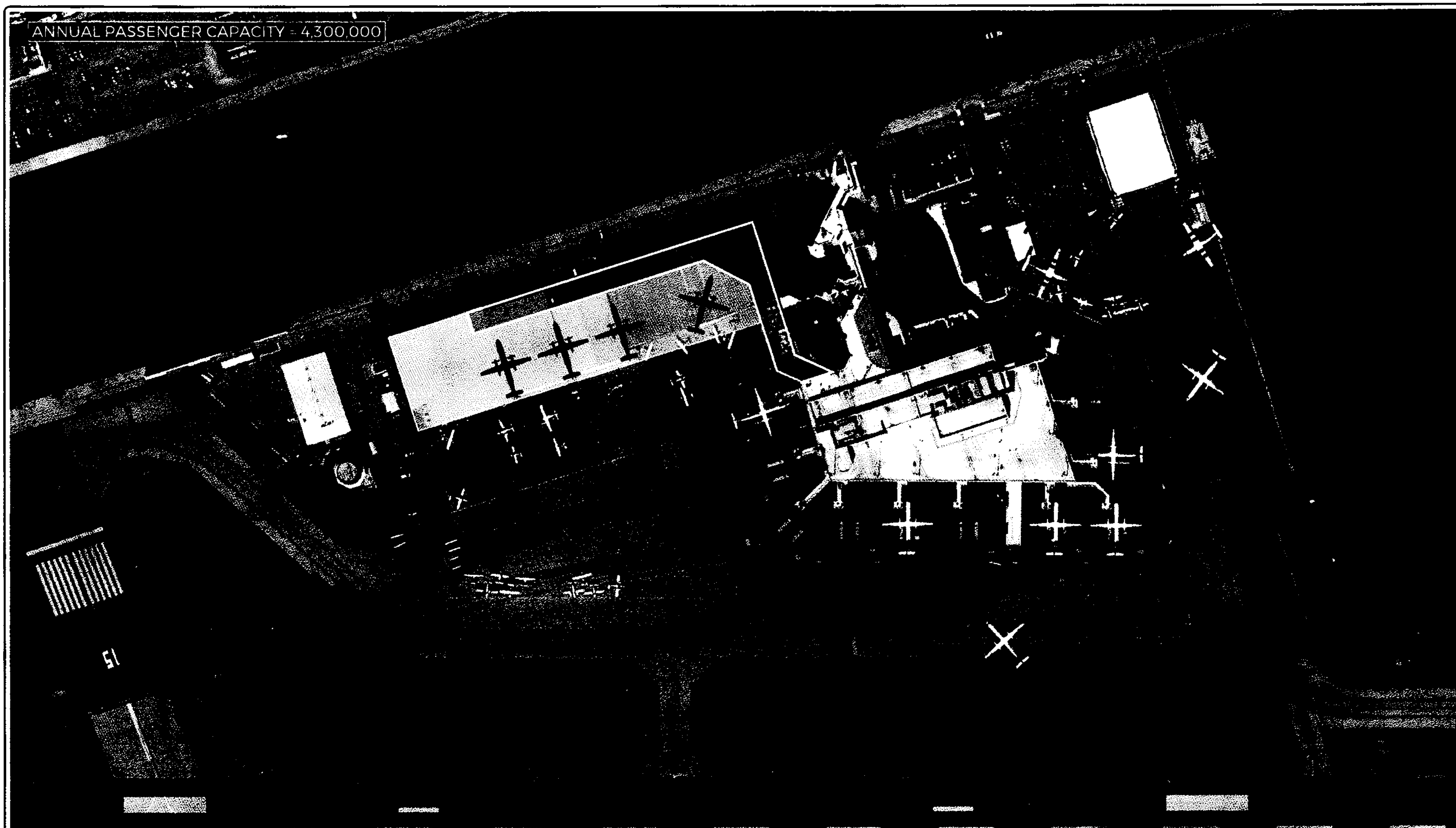


Figure 3.3 - Toronto Pearson Airport Buildout to Achieve Full Utilization of Annual Runway Passenger Capacity





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HYPOTHETICAL CONCEPT OF REQUIRED CAPACITY INVESTMENTS (2036)

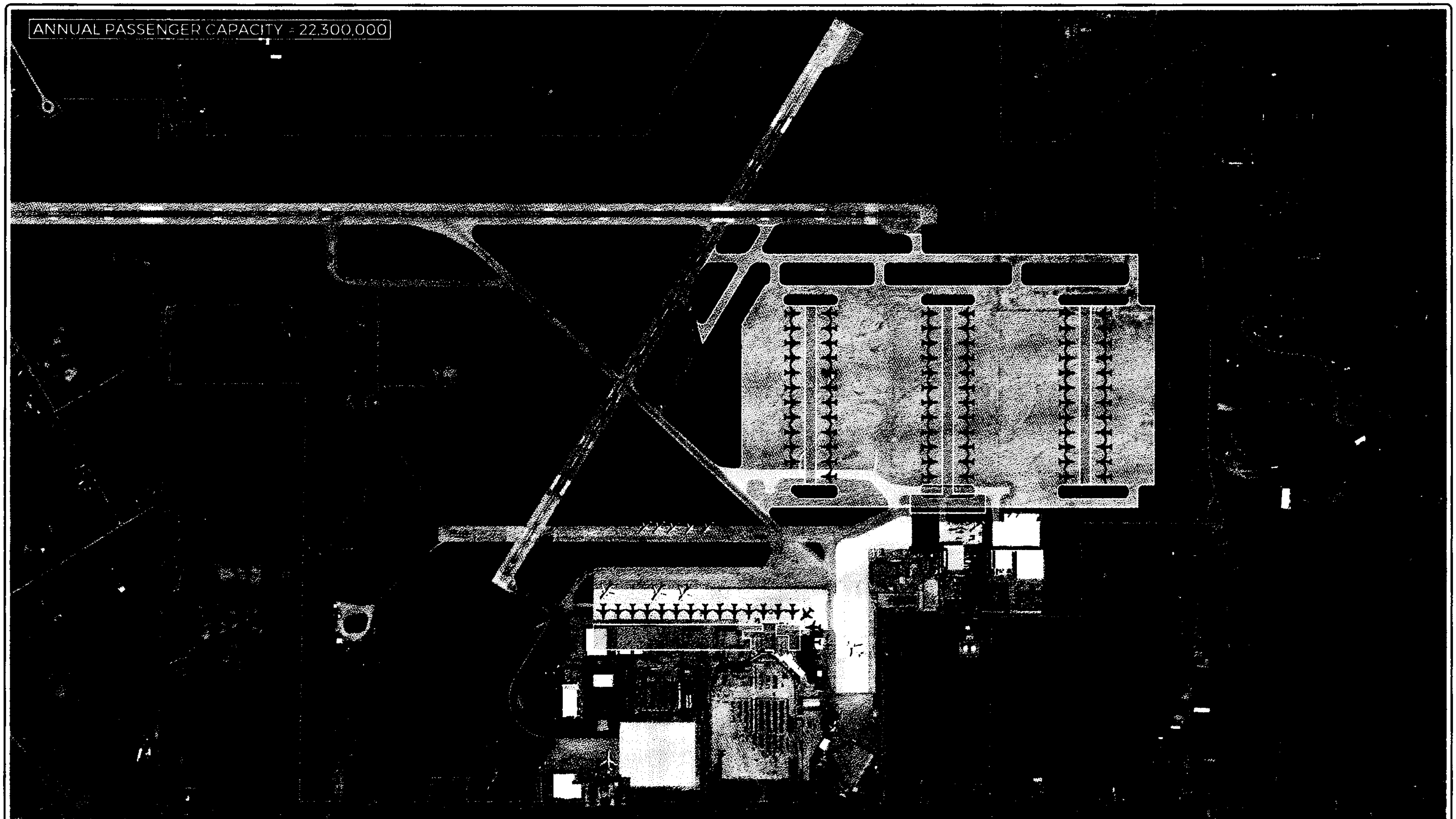
FIGURE 3.4: BILLY BISHOP TORONTO CITY AIRPORT (CYTZ)

Legend

- EXISTING AIRPORT PROPERTY BOUNDARY
- TERMINAL REQUIREMENT
- NEW PAVEMENT REQUIRED
- NEW GATE REQUIRED

s.24(1)

[redacted]



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HYPOTHETICAL CONCEPT OF REQUIRED
CAPACITY INVESTMENTS (2036)

FIGURE 3.7: JOHN C. MUNRO HAMILTON INTERNATIONAL AIRPORT (CYHM)

0 100 200 Meters

Legend

- EXISTING AIRPORT PROPERTY BOUNDARY
- LAND ASSEMBLY REQUIRED
- TERMINAL REQUIREMENT
- NEW PAVEMENT REQUIRED
- POTENTIAL LOCATION OF GATE

s.24(1)

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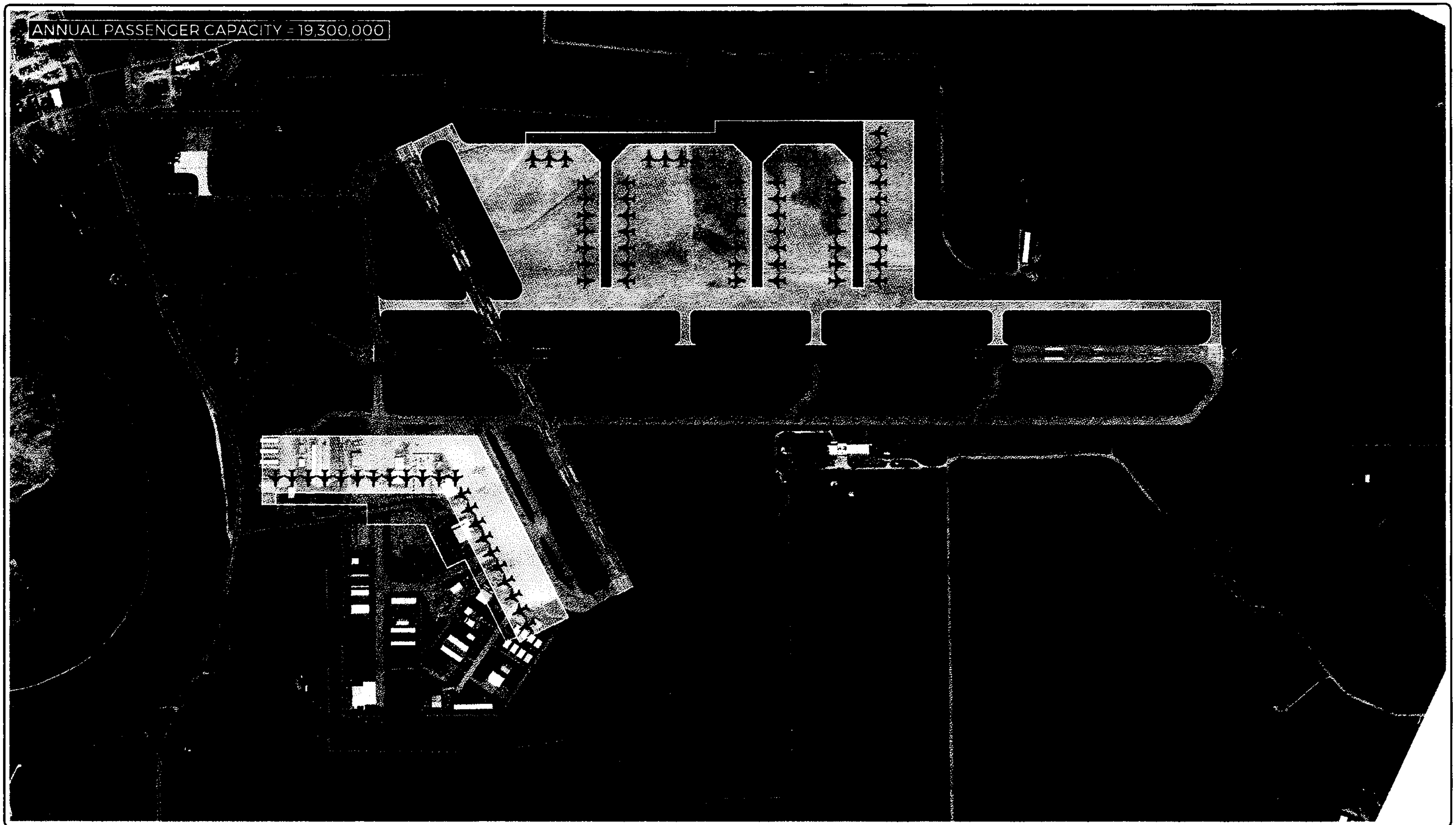

Consultants: KPMG, WSP

Client: Transports Canada / Transport Canada

HYPOTHETICAL CONCEPT OF REQUIRED CAPACITY INVESTMENTS (2036)

FIGURE 3.10: REGION OF WATERLOO INTERNATIONAL AIRPORT (CYKF)

0 150 300 Meters

Legend

- EXISTING AIRPORT PROPERTY BOUNDARY
- TERMINAL REQUIREMENT
- NEW PAVEMENT REQUIRED
- NEW GATE REQUIRED

[redacted]

4 FACTORS INFLUENCING THE DECISION TO DEVELOP A PICKERING AIRPORT

Development of a new airport on the Pickering Lands may not be required to provide additional capacity in the southern Ontario airport system, however other factors may influence the decision to build a new airport facility on the Pickering Lands. The policy factors that could justify the development of a Pickering Airport include, but are not limited to those listed below. Detailed analysis of the impact of factors will be deferred to the Type and Role Report. Transport Canada is encouraged to monitor aviation industry and economic conditions related to these factors as they could trigger a requirement to develop a new airport on the Pickering Lands.

4.1 POLICY FACTORS INFLUENCING THE DECISION TO DEVELOP A PICKERING AIRPORT

A lack of capacity within the southern Ontario airport system is just one reason for developing an airport on the Picking Lands. Other benefits could be derived from developing an airport on the Pickering Lands, such as the ability to stimulate economic growth. The following provides a brief overview of some policy factors that could form the basis for justifying development of an airport on the Pickering Lands, beyond developing and airport purely for providing additional system capacity.

1. **Stimulating Economic Growth** – Airports can be a significant economic generator for a region and can stimulate nearby commercial and industrial development. The announcement of a new airport on the Pickering Lands could stimulate job creation through spin-off commercial and industrial development in Durham Region, and support the vision for new development in the designated Greenfield area (per Places to Grow, 2017). Further, consultations undertaken during development of the Supply and Demand Report indicate that some companies are interested in developing commercial and industrial facilities on, or in close proximity to the Pickering Lands, if a new airport were to be developed on the site.

2. **Changes in Airport Roles and Airport Closures** – Toronto Pearson International Airport is pursuing a 'Mega Hub' concept that will focus on increasing the number of passengers per movement, which may force regional passenger (50 seats or less) and General Aviation (GA) traffic to other airports. Additionally, Buttonville Airport is expected to close in late 2018 (tentative) which will require their GA activity to relocate elsewhere in southern Ontario. Consultations with the GA community undertaken during the development of the Supply and Demand Report indicate a strong desire to develop a new airport on the Pickering Lands. This may increase the feasibility of developing the airport.

3. **Improving Passenger Access to Air Services** – The eastern GTA has been identified as an area of significant population growth within the province of Ontario. Currently, passengers residing in the eastern GTA (and points beyond such as Peterborough, Belleville, and Kingston) experience lengthy travel times (especially during peak periods) between their point of origin and the passenger airports within the southern Ontario airport system. If an airport were to be developed at Pickering, it is expected that the facility would be used by many passengers in the eastern GTA (i.e. within the future Pickering Airport catchment area) as driving times would be significantly shorter compared to other passenger airports within the southern Ontario airport system). This assumes that suitable and in-demand scheduled and / or charter air services would be provided at a new airport on the Pickering Lands.

4.2 INDUSTRY AND ECONOMIC FACTORS TO MONITOR

Transport Canada should consider monitoring changes to the following factors, which could affect the decision and the timing for developing an airport on the Pickering Lands. These factors should be monitored on a quarterly basis to maintain awareness of market conditions.

1. **Changes in Air Traffic Patterns** – Since the National Airports Policy was introduced in 1994, Transport Canada's role in operating and funding airports has been significantly reduced. Aside from operating small remote airports deemed as essential and those that could not be divested for other reasons (such as indigenous land claims), Transport Canada's role is now limited to being a regulator, a policy maker, and a landlord for designated airports identified in the National Airport System (NAS). A change in this government role and/or policy could affect the capacity and air traffic patterns of the southern Ontario airport system. For example, if Transport Canada were to privatize the top 8 NAS airports (media has recently reported that Government is assessing airport ownership options, including private for-profit models), there would be an incentive for airport operators to up-gauge aircraft sizes in order to process the maximum number of passengers per annum, maximizing revenues for investors. This could result in an increase in the number of passengers per aircraft movement at Toronto Pearson, and a more significant shift of regional, domestic and GA traffic from this airport to other airports in the southern Ontario airport system. Capacity would need to be provided for these services, either at a new airport on the Pickering Lands, or at other existing airports such as Waterloo, or Hamilton.

   Changes to bilateral agreements and policies for international air carriers could also impact demand at the key airports within the southern Ontario airport system. If Transport Canada were to expand the opportunities for international air carriers to access Toronto Pearson, international traffic would likely increase at the airport, requiring additional regional, domestic and GA traffic to be displaced to other key airports in southern Ontario.

   Recent policy changes by the Government of Canada have allowed for an increased ability of international passengers to transfer through select Canadian airports with streamlined customs and immigration screening requirements. This could make Canada a more attractive connection point between foreign markets (such as the Far East and the United States). Passenger volumes at Toronto Pearson could be significantly impacted and more capacity may be required to support the increased demand from international travelers, reducing the capacity available for other types of air traffic. In order to accommodate shifted air traffic, domestic, regional and GA traffic may require relocation to other airports within the southern Ontario airport system.

2. **Establishment of a High-Speed Rail System Serving Southern Ontario** – The introduction of high-speed rail service in southern Ontario could have a significant impact on both surface and air passenger traffic in the province. This service could delay the need for a new airport on the Pickering Lands by reducing overall demand for air travel between Toronto, Ottawa, and Montreal. Alternatively, it is possible that a high-speed rail service properly networked with airports (including the new Pickering Airport) could accelerate the need for a new airport on the Pickering Lands by stimulating passenger air traffic demand.

3. **Economic Conditions –** If economic conditions in southern Ontario were to improve to a level greater than anticipated, there could be a resulting increase in the public's propensity to travel. This increased demand for air services could exceed system capacity and trigger the requirement for a new airport prior to 2036. Propensity to travel may increase with an increase in the price of oil and/or a fall in the value of the Canadian dollar.

4. **Air Traffic Control Technologies and Procedures** – Improvements in Air Traffic Control beyond those identified in the Supply and Demand report (Precision Runway Monitoring and Visual Separation) could increase the capacity of Toronto Pearson. However, if technology improvements and procedural changes are not undertaken as anticipated, Toronto Pearson will have less capacity and a new airport on Pickering Lands may be required prior to 2036.

5. **Terminal Efficiencies** – Emerging and evolving technologies such as self check-in kiosks, CATSA Plus screening, self-boarding, automated border clearance kiosks, and mobile applications continue to deliver significant efficiencies to terminal design and overall space requirements. As these technologies mature, there is an increasing ability to process more passengers within the same terminal footprint, increasing overall capacity while minimizing the need for new infrastructure. Transport Canada is encouraged to monitor major advancements in technology that will significantly improve passenger processing times and space requirements. Any major change to the air terminal area requirement per 1 million PPA could delay the need for significant terminal expansions at the key airports in the southern Ontario airports system.

6. **Available Federal Infrastructure Funding** - Changes to Federal policy for funding (airport) infrastructure may also impact which airports expand/develop and the timing of these projects. This could delay or accelerate the requirement to provide additional passenger capacity in the southern Ontario airport system, and the need for a new airport on the Pickering Lands.

7. **Private Sector Interest in Developing a Pickering Airport** - If private sector indicates interest in participating in developing a Pickering Airport, there may be a business case for developing the project. If this is the case, Transport Canada could entertain a Public-Private Partnership (P3) arrangement with an investment group. New airlines have recently entered the Canadian market. Ultra-Low Cost Carriers (ULCCs) such as Flair Air (formerly NewLeaf) have established scheduled passenger services after the slow-down in Alberta's oil patch, resulting in aircraft underutilization. These carriers typically avoid high-cost airports such as Toronto Pearson and Vancouver in favor of low fee airports including Hamilton and Abbotsford. Depending on the success of this airline segment and future population growth in the eastern GTA, a ULCC may wish to establish operation at a new airport on the Pickering Lands. If the ULCC market in Canada matures, carriers will likely view a new airport on the Pickering Lands as an attractive location to provide air services, especially given the extensive potential catchment area for the Pickering airport.

8. **Invalid Assumptions** – As further studies progress examining the feasibility and business case for developing a Pickering Airport, some assumptions may turn out not to be valid. For example, the assumption that no constraints exist that would limit the expansion of the four existing key passenger airports may be identified as inappropriate as further studies and work progresses (e.g., geotechnical studies, public perception and community support/opposition surveys, etc.). As assumptions are validated or proven to be invalid, Transport Canada may wish to re-evaluate the decision to develop a new airport on the Pickering Lands.

5 CONCLUSIONS

As demonstrated through the hypothetical concepts of required investments, passenger serving airports within southern Ontario airport system will be capable of meeting the forecast demand within the 20 year study horizon if necessary capital investments are made and air traffic control best practices are adopted. This validates the results of the Supply and Demand report. Therefore, on the basis of capacity versus demand alone, a new airport on the Pickering Lands is not foreseen to be required before 2036. Recent publications and initiatives, such as the southern Ontario Airport Network[6] and the GTAA Mega hub strategy[7] support this conclusion.

However, this does not necessarily mean that the airports will develop as shown in the concepts nor are the concepts demonstrative of the only way for the system to grow. It is clear that the investments required to fully utilize runway passenger capacity at Hamilton and Waterloo Airports would be expensive and are not currently met by sufficient forecast demand to justify such expansion. Coincidentally, Hamilton, Waterloo and Toronto Pearson Airports are situated to the west of the central core of Toronto. Available capacity at the Hamilton and Waterloo Airports exceeds the forecast demand, indicating their ability to grow and serve as reliever airports to Toronto Pearson Airport. The travelling public in the east GTA do not have the same options. As growth increases in the east GTA, the only viable option is travel via Toronto Pearson Airport. This, along with the potential positive economic development benefits of a new airport are compelling reasons to continue with the identification of a Type and Role for the new Pickering Airport.

Although the Supply and Demand Report concluded that a new Pickering Airport would not be required based on the forecast demand within the study horizon, at current growth rates, Toronto Pearson Airport is expected to reach and exceed its runway passenger capacity sometime after 2036. Therefore, it is recommended that Transport Canada monitor policy and industry factors and events that could change projections and / or the timing for a decision to develop a new airport on the Pickering Lands. For example, accelerated growth in the GTA could advance the need for an airport forward. In this context, the Type and Role Report should explore options for airport development within the southern Ontario airport system, to prepare Transport Canada to make timely decisions when forecast demand exceeds supply.

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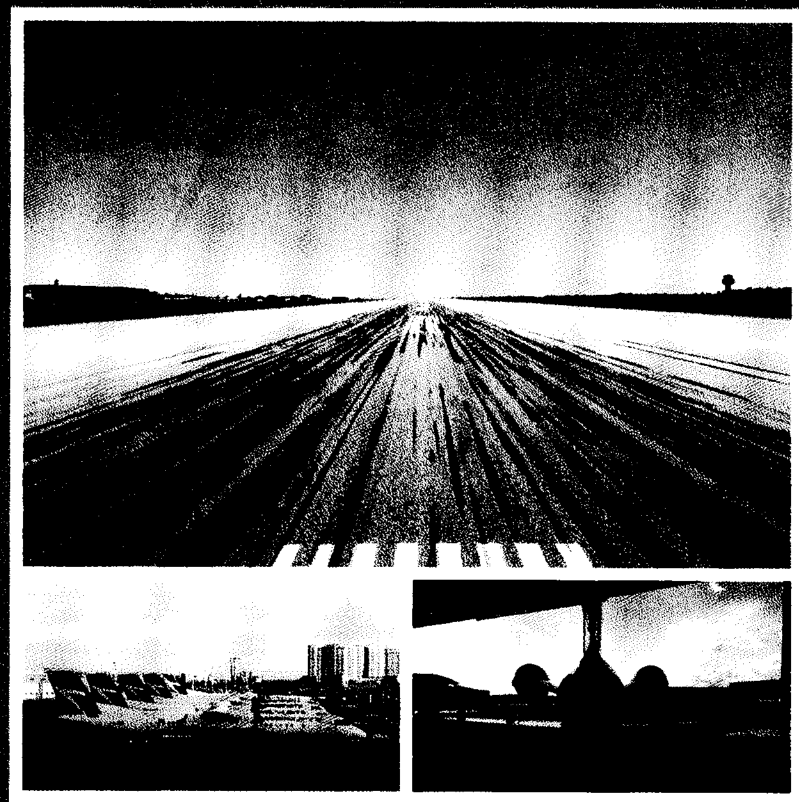
[6] Flying Together: The Southern Ontario Airport Network, May 2017.

[7] Growing Canada with a Mega Hub Airport, Toronto Pearson International Airport, December 2016.



Pickering Lands Aviation Sector Analysis

Type and Role Report

1216053-000
September 2018

EXECUTIVE SUMMARY

KPMG LLP (KPMG) in partnership with WSP (formerly MMM Group Limited) has been retained by Transport Canada to carry out an Aviation Sector Analysis of the Pickering Lands. The Analysis comprises three primary reports and one additional contextual piece (an annex to the first report) to bridge the findings between the first and second reports:

1) The Supply and Demand Report

1.5) The Contextual Bridge Report;

2) The Type and Role Report; and,

3) The Revenue Generation and Economic Impact Report.

This Type and Role Report is the second report completed of three primary reports comprising the Aviation Sector Analysis.

The first report (Supply and Demand) projected that passenger demand within southern Ontario will grow to approximately 73.9 Million Passengers Per Annum (MPPA) by 2036. The Supply and Demand Report further concluded that the southern Ontario airports system has sufficient capacity to meet the forecast passenger demand and that a new airport on the Pickering Lands would not be needed before 2036 from a capacity standpoint. Collectively, southern Ontario airports have capacity to support 94.7 MPPA with existing infrastructure. Capacity improvements within the southern Ontario airports system, including the addition of runways and taxiways, could augment the overall capacity within southern Ontario to approximately 119.6 MPPA by 2036.

Following the completion of the Supply and Demand Report, Transport Canada commissioned an additional Contextual Bridge Report to demonstrate how the individual airports within the southern Ontario airports system could be expanded to meet forecasted passenger demand. The Contextual Bridge Report concluded that existing and future passenger demand could see secondary airports (such as Hamilton, Waterloo, and Billy Bishop) continue to grow and provide additional capacity within their existing boundaries (or with modest land assembly).

The overall purpose of this Type and Role Report was to develop and assess options for the service type(s) and role of a new airport on the Pickering Lands, based primarily on market factors, the past experience of similar airports, and how a new airport would fit into the existing southern Ontario airports system. Five options were developed and assessed based on their ability to minimize airport competition within the existing network, and on their potential for sustainable financial success. As a result, two airport types were identified as the most viable for the Pickering Lands: an industrial airport and a specialty passenger airport. Governance options to support the success of these two airport types in the context of the southern Ontario airports systems were also examined and assessed.

The third report (Revenue Generation and Economic Impact) will examine the revenue-generating potential of an airport that incorporates elements of both an industrial airport and a specialty passenger airport, as well as its potential economic impacts of such an airport on the region.

The following provides additional detail regarding the research and analysis contained within this Type and Role Report.

Market Factors that could Influence Development of a New Airport

The Type and Role Report identified and analyzed how factors other than a passenger capacity shortfall could trigger and influence the development of a new airport. Key factors were identified based on perceived gaps in, or challenges with, the southern Ontario airports system. The factors included: general aviation trends in eastern GTA, accommodating Low-Cost Carriers (LCC), providing domestic point-to-point service, reducing surface travel times to airports, accommodating the growth of e-commerce, and key regional developments.

General aviation trends in eastern GTA: There is currently relatively low industrial service within the southern Ontario airport network, with Peterborough Airport being the only airport to offer industrial general aviation as a primary service type. Toronto Pearson, Billy Bishop, Oshawa and Hamilton Airports offer industrial general aviation as a secondary service type. This factor influenced the consideration of an industrial airport option.

Accommodating low-cost carriers: Aviation industry trends are expected to influence the need and timing for a new airport on the Pickering Lands. LCC and Ultra Low-Cost Carriers (ULCC) have been gaining popularity in Canada. These carriers provide basic airfares at a low price and offer additional services such as checked baggage, seat selection, and priority boarding at an added cost. LCCs and ULCCs are common internationally, such as EasyJet and Ryanair in Europe, and Southwest and Allegiant in the United States. These airlines typically operate from secondary airports, offering a no-frills experience. While Hamilton Airport currently accommodates LCC and ULCC operations by Swoop, a new airport on the Pickering Lands could provide an alternative base of operations for LCC or ULCC operations in the eastern GTA, and has the potential to offer a cost-structure conducive to accommodating this type of air traffic.

Providing domestic point-to-point service: Air carriers, such as WestJet and Air Canada, could use a new airport on the Pickering Lands to provide domestic point-to-point air service. Point-to-point is a service offering where secondary markets are provided with low frequency, non-stop service, typically to long-range destinations, contrary to the traditional hub-and-spoke model. The Toronto Pearson Airport mega-hub strategy may see smaller point-to-point domestic services displaced to increase runway capacity. A new airport on the Pickering Lands could draw upon the population of the eastern GTA in addition to Toronto Pearson Airport's catchment area.

Reducing surface travel times: Congestion on the GTA's road network is increasing as the region grows. The Ontario Government projects that the GTA's population will increase from 6.7 million in 2016 to 9.6 million in 2041. A new airport on the Pickering Lands could significantly improve access to air service for travellers in the eastern GTA, Durham Region, Peterborough County, Northumberland County, and points further east, by significantly reducing travel times.

Accommodating growth of e-commerce: E-commerce has experienced significant growth in recent years, facilitated in part by access to affordable and high frequency air transportation. For example, Amazon, a global leader in e-commerce, uses a network of fulfillment centres to ensure that sufficient inventory of popular consumer items is located strategically. The just-in-time business model makes access to an airport and a major road network essential. An airport capable of supporting air cargo services in the east GTA would be highly desirable for e-commerce firms considering expanding operations in this area of the GTA.

Further, to better understand these and other factors that contribute to successful airport systems, three case studies were examined: (1) Phoenix Sky Harbour Airport and Phoenix Mesa Gateway Airport in the United States; (2) Vancouver International Airport and Abbotsford International Airport in Canada, and (3) Pierre Elliot Trudeau International Airport and Montreal Mirabel International Airport in Canada. These were selected for analysis based on their similarities with Toronto Pearson Airport and a potential new airport on the Pickering Lands. They were also selected to understand both the factors that led to successful airport pairs (as in the first two cases), and the factors that are widely considered by industry experts to have led to failure (the third case). Based on this analysis, factors that appear to contribute to the success of secondary airports include:

1. geographic proximity to urban centres and suburban areas (a factor that is now fixed for the Pickering airport, given that the location of the Pickering Lands is known),
2. an appropriate governance model (which is discussed in this report),
3. the orderly and planned development of airport infrastructure and development areas (which is addressed in this report through a proposed conceptual land use plan), and
4. competitive aeronautical fees and land lease rates (which will be explored in more detail in the Revenue Generation and Economic Impact Report).

Airport Options and Assessment

In summary, the five options assessed for primary airport roles and service types were:

Option A: Industrial Airport – assumes a new airport on the Pickering Lands would be developed primarily for aviation-related industrial purposes. This could include provisions for the development of large scale aviation industrial businesses, including but not limited to: aircraft/component manufacturing, maintenance, repair, and overhaul firms, avionics installation/repair, or aircraft parts supply and distribution.

Option B: Specialty Passenger Airport – explores developing a new airport on the Pickering Lands for the accommodation of specialized passenger air services, such as ULCCs, point-to-point domestic air service, and charter air services catered to leisure travel.

Option C: Primary Hub International Airport – considers an airport with a primary focus on international passenger service. This option, beyond typical airport infrastructure, would require the inclusion of large scale terminal facilities to accommodate significant traffic on trans-Atlantic and/or trans-Pacific routes.

Option D: Passenger Feeder Airport – investigates a passenger feeder airport on the Pickering Lands that would direct passengers to hub airports with the intent of connecting them to their final destinations.

Option E: Major Air Cargo Airport – assesses the viability of developing a new airport primarily for air cargo operations. Air cargo operations include dedicated cargo aircraft, warehouse space, freight forwarding, and distribution.

These options were assessed based on two criteria: 1) minimizing service overlap with existing airports in the system and 2) the potential for financial and operational success.

The assessment of the five options resulted in the identification of Option A (Industrial Airport) and Option B (Specialty Passenger Airport) to be studied further and designed conceptually. These options were identified to have minimal service overlap with other airports within the southern Ontario airports system and appear to have the most potential for financial and operational success. The remaining options were discounted primarily due to their direct conflicts with the existing or planned roles of other airports.

Potential Implementation of Options A and B

To explore the potential implementation of an industrial airport and a specialty passenger airport, development concepts were prepared for a new airport on the Pickering Lands that would be capable of fulfilling the requirements of both Option A and Option B. To allow for the growth of Options A and B to accommodate market demand over time while also maintaining flexibility, three development concepts were identified for both options:

1. Small Development Concept: Representing the anticipated minimal infrastructure requirements and development areas of a new airport on the Pickering Lands.
2. Medium Development Concept: Demonstrating the first stage of potential growth as activity at the airport increases. The expansions might include new airfield infrastructure, improved groundside access, terminal buildings, and additional land parcels.
3. Significant Development Concept: Assuming substantial growth in aviation activity at a new airport on the Pickering Lands.

The Medium and Significant Development Concepts build upon the infrastructure requirements identified and described in the Small Development Concept. However, it is not necessary for the airport to evolve through each of the phases of development sequentially, as the concepts provide flexibility to respond to local economic demands and aviation industry trends.

The primary infrastructure elements that define an industrial airport (Option A) are the prepared development lots that could support aviation industrial and commercial uses. The elements that will support a specialty passenger airport (Option B) are an air terminal building and related groundside development. Development plans were prepared to demonstrate how a new airport on the Pickering Lands could develop both as an industrial airport and as a specialty passenger airport, concurrently and without major infrastructure reconfigurations.

The parallel runways, crosswind runway, and taxiway infrastructure, as well as their protective operational areas, demonstrate the ultimate development of the Airport in accordance with the Pickering Lands Airport Zoning Regulations, which accords full coverage for a seven-runway airport on all the lands. Given the large assembly of land available, the conceptual land allocations outlined in the above development concepts do not preclude a new airport on the Pickering Lands from developing further to also accommodate Options C, D, or E.

From the conceptual designs for the Industrial and Specialty Passenger Airport options, a conceptual land use plan was developed to help ensure adequate land is protected for future development according to the requirements of each use. Land uses identified for the proposed conceptual land use plan include: airfield, air terminal area, aviation commercial, non-aviation commercial, airport operations, and airport reserve. Again, this conceptual land use plan does not preclude a new airport on the Pickering Lands from developing to accommodate Options C, D, or E.

How a New Airport would fit into the Southern Ontario Airports System - Governance Considerations

The success of a new airport on the Pickering Lands may be impacted by the governance option selected. There are a range of governance options that are used by airports across Canada. Governance options explored for a new airport on the Pickering Lands include:

- Privately Owned and Operated,
- Municipally Owned and Operated or Contractor Operated,
- Municipally Owned and Airport Commission Operated,
- Municipally Owned and Airport Authority Operated,
- Transport Canada Owned and Airport Authority Operated, and
- Transport Canada Owned and Operated.

In examining the governance option or options that may be appropriate when developing and operating an airport on the Pickering Lands, many factors were considered, including: land control, initial capital investment, initial operating investment, stakeholder representation, rate of economic development, and system competition. Each of the governance options were evaluated against the governance considerations to determine the option(s) most applicable. It was found that the Municipally owned and Airport Commission Operated option and the Transport Canada Owned and Airport Authority Operated option feature desirable governance characteristics including independent, knowledgeable, experienced and autonomous groups responsible for all aspects of airport planning, development, marketing, operations, business management with ultimate control of land use remaining with Transport Canada.

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1.0 INTRODUCTION

1.1 Study Background

KPMG[LLP] (KPMG), in partnership with WSP (formerly MMM Group Limited), has been retained by Transport Canada to carry out an Aviation Sector Analysis for the Pickering Lands (as described in Section 1.0 of the Supply and Demand Report). This report summarizes an analysis of the southern Ontario airports system to determine the appropriate timing and role for a new airport on the Pickering Lands. The Pickering Lands Aviation Sector Analysis consists of the following studies undertaken by KPMG/WSP:

- Supply and Demand Report (completed in 2017)
- Contextual Bridge Report (completed in 2017)
- **Type and Role Report** (completed in 2018)
- Economic Impact and Revenue Generation Report (to be completed in 2019).

The Aviation Sector Analysis considers the following airports within southern Ontario, which were included for consistency with previous studies related to a Pickering Airport (as described in Section 1.1 of the Supply and Demand Report):

- Toronto Pearson International Airport (Toronto Pearson Airport)
- Billy Bishop Toronto City Airport (Billy Bishop Airport)
- John C. Munro Hamilton International Airport (Hamilton Airport)
- Region of Waterloo International Airport (Waterloo Airport)
- Toronto Buttonville Municipal Airport (Buttonville Airport)
- Peterborough Municipal Airport (Peterborough Airport
- Lake Simcoe Regional Airport (Lake Simcoe Airport)
- Oshawa Executive Airport (Oshawa Airport)
- Burlington Executive Airpark (Burlington Airport)
- Brampton Airport.

The current and future capacity of the southern Ontario airports system is measured by determining annual runway passenger capacity. Annual runway passenger capacity is determined by the number of passengers that can be served by a runway or a runway system. The Supply and Demand Report projected that passenger demand within southern Ontario will grow from approximately 41.5 Million in 2014 to approximately 73.9 Million Passengers Per Annum (MPPA) by 2036. Airports within the southern Ontario airports system that would be expected to contribute to meeting this demand are: Toronto Pearson Airport, Hamilton Airport, Waterloo Airport, and Billy Bishop Airport.

Collectively, these airports have an existing capacity (as of 2016) to support 94.7 MPPA (as identified in the Supply and Demand Report) with existing infrastructure. However, capacity improvements within the southern Ontario airports system, including the addition of runways and supporting taxiways, could augment the overall capacity within southern Ontario to approximately 119.6 MPPA by 2036. As a result, the Supply and Demand Report concluded that the southern Ontario airports system has sufficient capacity to meet forecast passenger demand and that a new passenger airport on the Pickering Lands would not be needed before 2036 from a capacity standpoint.

While not included in the original scope of the Aviation Sector Analysis, Transport Canada commissioned a Contextual Bridge Report to illustrate how individual airports within the southern Ontario airports system could be expanded to meet forecasted passenger demand in southern Ontario. The Conceptual Bridge Report concluded that existing and future demand could see secondary airports (such as Hamilton, Waterloo, and Billy Bishop) continue to grow within their existing boundaries (or with modest land assembly) to provide additional capacity to support anticipated passenger demand within southern Ontario.

The results of the Supply and Demand Report and the Contextual Bridge Report resulted in a desire to examine potential roles and service types for a new airport on Pickering Lands that could support economic growth as opposed to responding to a need for additional passenger capacity within southern Ontario.[1]

1.2 Study Objectives

While the Supply and Demand showed that there is sufficient capacity to accommodate passenger demand to 2036 at the existing southern Ontario airports, anecdotal evidence suggests that there is market interest in developing a passenger airport on the Pickering Lands and that, if a passenger airport were developed, there could possibly be sufficient traffic to make the new airport financially feasible. This conclusion is based on the potential for discount airlines to be served at low marginal cost and on the improved service provided by an airport more proximate to passenger originating from east GTA. Further, there is likely a point in the future, beyond the 2036 horizon of the Supply and Demand Report, at which passenger demand will exceed the existing capacity in the southern Ontario airports system. This conundrum prompted Transport Canada to proceed with future phases of the study, to identify what type and role a new airport on the Pickering Lands could play.

Within this context, the objectives of the Type and Role Report are to:

- identify service types and potential airport roles for a new airport on the Pickering Lands, considering there is no current or foreseen passenger capacity constraint in the southern Ontario airports system before 2036;
- study comparable airport pairs in the United States and Canada to identify factors that could impact the future success of Toronto Pearson Airport if a new airport was developed on the Pickering Lands;

[1] Jets and Jobs – Summary of Findings from the Targeted Stakeholder Consultation by the Independent Advisor on the Economic Development of the Pickering Lands". Dr. Gary Polonsky, June 2016.

- identify how a new airport on the Pickering Lands would integrate into the existing southern Ontario airports system;
- identify and describe infrastructure requirements for the phased development of a new airport on the Pickering Lands;
- develop a conceptual land use plan to guide and protect land for the ultimate development of a new airport on the Pickering Lands; and
- identify and discuss options for the governance of a new Pickering Airport including appropriate governance models that meet Transport Canada objectives, while supporting economic growth in the eastern GTA.

1.3 Study Assumptions, Limitations and Use of this Report

To maintain consistency throughout the study, assumptions regarding the regulatory environment, airline markets and trends, passenger services, air cargo services, general aviation, and ground transportation have been made. These assumptions are applicable throughout the 20-year study period and are listed in Appendix B.

The Type and Role Report covers a 20-year planning period. The analysis presented in this report is preliminary, is subject to significant uncertainties, and is derived using assumptions on economic and market conditions, which may change based on several factors, including for example:

- investments and changes in the southern Ontario airports system;
- evolving industry trends and requirements;
- shifts in air passenger travel patterns;
- economic conditions (the value of the Canadian Dollar relative to the U.S. Dollar, energy prices, stock market volatility, etc.);
- changes in government airport policy;
- differences between forecast and actual demand over the 20-year planning period; and
- discrepancies between anticipated and actual infrastructure development.

The analysis presented in this report incorporates information available as of the report date and the appropriateness of many of the assumptions that were used in preparing the analysis may change. Accordingly, underlying ground rules, assumptions, and the resulting estimates and conclusions should be reviewed and potentially adjusted as conditions evolve.

KPMG and WSP's procedures consisted solely of inquiry, comparison and analysis of identified and provided information and relevant information from third party sources. The team relied on information provided by project participants without verification or audit. The information contained in this document does not constitute an audit. Accordingly, KPMG and WSP do not express an opinion on such matters.

This document should be considered in its entirety. Selection of, or reliance on, specific portions of this document could result in the misinterpretation of comments and analysis provided. KPMG and WSP will not assume any liability in connection with the reliance by any third party on this document.

KPMG and WSP reserve the right, but will be under no obligation, to review all findings, conclusions and calculations included or referred to herein and, if KPMG and WSP consider it necessary, to revise the findings, conclusions and calculations in light of any information that becomes known to KPMG and WSP after the date of this document.

2.0 AVIATION FUTURE OF PICKERING LANDS

2.1 Need and Timing for a New Pickering Airport

The Supply and Demand Report concluded that adequate capacity exists within the southern Ontario airports system (with modest airport expansions) and an additional airport in southern Ontario will not be required to meet 2036 demand. However, an additional airport may still be needed at some point beyond 2036. Further, there are other market-based factors that may influence the timing of the decision to develop a new airport on the Pickering Lands beyond providing additional passenger capacity within the airport system. These factors are presented in Sections 2.1.1 through 2.1.7.

2.1.1 Additional Factors

2.1.1.1 Toronto Pearson International Airport – Mega Hub

In May 2018, the Greater Toronto Airports Authority (GTAA) published the Toronto Pearson Airport's 2017-2037 Master Plan[2]. The Master Plan indicates that Toronto Pearson Airport is capable of accommodating future growth through 2037, which corresponds to a capacity of 85 million passengers and 632,000 aircraft movements per annum. This growth in passengers and aircraft movements can be accommodated by implementing the capacity enhancement measures discussed in the Toronto Pearson Master Plan (and summarized in the Supply and Demand Report). These measures include:

- improvements in runway passenger capacity by increasing seats per aircraft movement (up from 106 average passengers per aircraft movement in 2016 to 140 average passengers per aircraft movement in 2037) and increasing load factors per flight; and
- maximizing utilization of the existing runway system at Toronto Pearson Airport, for example through improvements in air navigation technology and by diverting short-haul demand to ground-based transportation modes.

Table 2.1 summarizes the aircraft movement forecasts and passenger capacities identified in the 2017-2037 Master Plan.

Table 2.1 – GTAA Aircraft Movement and Passenger Capacity, Master Plan 2017-2037

	2017 Actual	2037 Forecast	2037 Capacity
Aircraft Movements	465,536	632,000	615,000 – 650,000
Enplaned/Deplaned Passengers	47,130,358	85,000,000	85,000,000*

*Passenger capacity is not directly addressed, however GTAA indicates they expect to be capable of meeting this demand through medium and long-term terminal developments.

[2] "Toronto Pearson Airport Master Plan", Greater Toronto Airports Authority, December 2017.

While protected in the Toronto/Lester B. Pearson International Airport Zoning Regulations, it is not anticipated that a new 4th east-west runway will be required within Toronto Pearson Airport's Master Plan time horizon. Terminal development concepts to accommodate short and medium-term passenger demand are shown to expand existing Terminals 1 and 3 within the current airport boundary. The GTAA has stated that expanded terminal planning efforts are in progress, although they are not described in the Master Plan.

Relevance to a New Airport on the Pickering Lands

The evolving role of Toronto Pearson Airport, with its envisioned role as a mega-hub, will likely require the displacement of small passenger and GA aircraft from Toronto Pearson Airport to other airports within the southern Ontario airports system to provide capacity for additional wide-body aircraft movements with more seats per aircraft. The Master Plan states, "*We also anticipate that many short-haul flights currently serving Toronto Pearson will cease. Some may be replaced by ground transportation; especially as inter-city rail improves in [southern] Ontario. Other regional flights that currently connect through Pearson will likely be able to by-pass Toronto as growth in regional markets makes more non-stop routes between smaller centres viable.*"[3]

Given Toronto Pearson Airport's current Master Plan, any plans for a new airport on the Pickering Lands should consider the following:

- that a new airport providing international passenger air service on a large scale on the Pickering Lands would likely be in direct competition with Toronto Pearson Airport's mega-hub strategy;
- that there may be an opportunity for a new airport on the Pickering Lands to accommodate smaller, specialized regional and charter passenger traffic, which may be displaced from Toronto Pearson Airport to make room for larger aircraft (to increase Pearson's runway capacity); and
- that there may be sufficient demand to trigger a new or increased development of an airport on the Pickering Lands sometime after 2036, when Toronto Pearson Airport is expected to reach 85 million passengers per annum (GTAA's stated capacity).

2.1.2 Aviation Industry Trends

2.1.2.1 Low-Cost Carriers

The travelling public's interest in Low-Cost Carrier (LCC) and Ultra-Low-Cost Carrier (ULCC) air travel has been growing in Canada. The ULCC business model sells basic airfares at a low price and then offers additional services such as checked baggage, seat selection and priority boarding for an additional price. ULCCs and LCCs often operate from low-cost secondary airports that serve densely populated catchment areas. Examples of this business model include Southwest and Allegiant Air in the United States, and Ryanair and EasyJet in Europe.

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[3] "Toronto Pearson Airport Master Plan", Greater Toronto Airports Authority, Page 26, December 2017.

LCC and ULCC operators in Canada have had a volatile past, with many new entrants beginning operations, experiencing rapid growth, and ultimately failing shortly thereafter. For example, former ULCC airline, JetsGO operated domestic and transborder services, commencing operations in 2001. JetsGo ultimately faced bankruptcy and ceased operations abruptly in 2005. Conversely, WestJet began operation as a low-cost airline in 1996 and is now one of Canada's largest air carriers.

Several LCC/ULCCs are currently offering domestic ULCC services or exploring the potential for serving Canadian cities. Flair Airlines is an example of a ULCC operating in Canada. Flair Airlines began scheduled passenger operations under the travel reseller NewLeaf in July 2016 from Hamilton Airport utilizing Boeing 737-400 aircraft; it has since announced its plan to move to Toronto Pearson Airport in late October 2018. Other examples of new entrants in the market include Canada Jetlines and Swoop (a WestJet subsidiary).

An integral component to a successful ULCC operation is the use of a suitable low-cost airport environment as an alternative to larger, more expensive airports. At larger airports various fees (e.g., Airport Improvement Fees, Canadian Air Transport Security Authority (CATSA) service charges, and Canada Border Services Agency service charges) are charged to passengers, via the ticket price, for use of the airport facility. Airports also charge the airlines directly for each aircraft departure and for using airport facilities, such as passenger boarding bridges, check-in desks, and baggage handling systems. A low-cost airport may be able to offer lower fees for these various services. It can thus help ULCC's cater to a cost-conscious market segment, where passengers are not particular with respect to the services being provided at the airport or during their flight.

Within southern Ontario, Hamilton Airport has aligned itself to fill the role of a low-cost airport, providing a no-frills experience for passengers. Hamilton Airport has long been the starting point for LCCs in Canada. WestJet established its eastern Canadian operations in 2000 at Hamilton Airport before moving to Toronto Pearson Airport. NewLeaf (now Flair Airlines) established its eastern base at Hamilton Airport in 2016, however, like WestJet's beginnings, the air carrier recently announced that they will be moving their southern Ontario base of operations to Toronto Pearson Airport effective late October 2018.

Relevance to a New Airport on the Pickering Lands

There may be an opportunity for a new airport on the Pickering Lands to increase the momentum of ULCC operations in Canada. Pickering's proximity to downtown Toronto, the possibility that it could be a low-cost airport, and the high-density population in the east GTA could potentially allow for considerable growth of this market segment over time. If the airport is operated to promote a low-cost environment for passengers and airlines while continuing to be financially sustainable, a new airport on the Pickering Lands could potentially generate new air passenger demand in the ULCC market sector.

Past experience with ULCC and LCC airlines in Canada should be considered when assessing the financial viability of a new airport on the Pickering Lands supporting these types of operations. The abrupt suspension of ULCC or LCC operations due to financial shocks (e.g. rapid oil price increase, weak demand due to economic recession, or significant geopolitical events) could result in reduced revenue generation for the airport due to a decrease in passengers utilizing the airport's facilities and a reduction in landing fees as a result of decreased aircraft movements.

2.1.2.2 Domestic Point-to-Point Service

Major airlines in Canada are already providing point-to-point domestic air services. Point-to-point is a service offering where secondary markets are provided low frequency, non-stop service to typically long-range destinations, contrary to the traditional hub-and-spoke model. For example, air carriers WestJet and Air Canada serve Hamilton Airport, and provide service to various non-stop destinations in Canada and the U.S. These point-to-point services do not typically feed the airlines' major hubs. This type of service is provided primarily to serve customers looking for a more convenient travel option. For example, while Hamilton and Toronto Pearson Airports serve many of the same destinations, the public travelling from within Hamilton Airport's catchment area may view travel to Toronto Pearson Airport as inconvenient because it is further away. Porter Airlines has been successful in developing a point-to-point network of domestic and transborder destinations, pulling from Toronto Pearson Airport's catchment area. This highlights the willingness of travellers to choose departure and arrival airports based on convenience. Table 2.2 provides examples of point-to-point domestic air service currently offered in the southern Ontario airports system. The below services currently operate Boeing 737, Bombardier Q400, and Bombardier CRJ type aircraft.

New aircraft have been developed recently to better support higher frequency point-to-point air services. Bombardier's C-Series aircraft have entered service to support regional and trans-continental air service in the 100 to 150 seat range, while providing improved fuel efficiency. The lower seat capacity, which improves efficiencies serving long-range routes (such as Toronto-Vancouver) as compared to similar Airbus or Boeing aircraft, make the C-Series a likely candidate aircraft for providing point-to-point services to secondary, non-hub airports. There are few aircraft in the 100 to 150 seat range and the entrance of the C-Series could stimulate the regional and trans-continental service market. Bombardier has stated, with respect to the C-Series, that *"airlines can connect distant points on continents or sectors that were previously not profitable or possible."*[4]

Air Canada currently has 45 orders for the 130 to 160-seat Bombardier CS300 aircraft that are intended to replace the airline's fleet of 65 to 100-seat Embraer 170/175/190 aircraft. Air Canada has compared the CS300 aircraft to the Boeing 787, noting its ability to allow for major shifts in its route planning while remaining profitable[5]. The Boeing 787, with its relatively low capacity compared to other widebody aircraft and its greatly improved route economics (lower fuel burn and reduced cost per passenger), has allowed Air Canada to offer non-stop service to international destinations which were previously not financially viable. These routes had insufficient demand to justify larger aircraft such as the Boeing 777 or Airbus A330. It is expected that these newer, more efficient aircraft (e.g. the CS100 and CS300) could have a moderate impact on the air sector's evolution towards providing higher frequency point-to-point service to secondary airports in Canada.

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[4] "Bombardier C-Series Brochure", Bombardier Commercial Aircraft, Page 6, 2017.

[5] "Air Canada's CS300s could enable broad network changes", Jon Hemmerdinger – FlightGlobal, February 2017.

Table 2.2 – Summer 2018 Point-to-Point Air Service at Secondary Airports in southern Ontario

Origin	Destination	Air Carrier	Frequency
Hamilton Airport	Vancouver	WestJet	4 x weekly
	Calgary	WestJet	Daily
	Montreal	Air Canada	Daily
	Abbotsford	Swoop	6 x weekly
	Edmonton	Swoop/Flair*	6 x weekly/daily*
	Winnipeg	Swoop/Flair*	6 x weekly/daily*
	Halifax	Swoop/Flair*	6 x weekly/daily*
Waterloo Airport	Calgary	WestJet	Daily
Billy Bishop Airport	Montreal	Porter, Air Canada Express	Daily
	Ottawa	Porter	Daily
	Fredericton	Porter	Daily
	Quebec City	Porter	Daily
	Sault Ste. Marie	Porter	Daily
	Sudbury	Porter	Daily
	Thunder Bay	Porter	Daily
	Timmins	Porter	Daily
	Windsor	Porter	Daily
	St. John	Porter	Daily

Source: Various Summer 2018 schedules

*Flair Airlines is operating at Hamilton Airport until October 2018, after which it will relocate its operations to Toronto Pearson Airport.

Relevance to a New Airport on the Pickering Lands

Even though Toronto Pearson Airport is not anticipated to reach its maximum passenger capacity before 2036, congestion in the terminal and on surface access routes to the Airport could increase the demand for point-to-point services at secondary airports in southern Ontario. There may be an opportunity for a new airport on the Pickering Lands to support the displaced air services. Furthermore, the GTAA's plans to become a mega-hub airport could see further displacement of smaller domestic point-to-point operations to secondary airports. In addition, advancements in airplane design have improved the economics of providing point-to-point services to and from secondary airports.

Demonstrated growth of domestic point-to-point air service at secondary airports in southern Ontario demonstrates how point-to-point air services can operate successfully in Canada and are likely to be sustainable at a new airport on the Pickering Lands. Therefore, a new airport on the Pickering Lands could supplement and support low-frequency domestic point-to-point service for travelers inside Toronto Pearson Airport's catchment area, east of the GTA, and beyond.

2.1.3 Reduced Surface Travel Times to Airports

The Ontario Government projects the GTA's population to increase from 6.7 million in 2016 to 9.6 million in 2041[6]. This increased population could result in increased congestion on major road networks in the region and, as a result, drivers may experience longer travel times. In 2016, it is estimated that Toronto commuters experience on average an additional 34 minutes per day in traffic over the off peak free flow time, and Toronto is regarded as among the worst cities in North America for traffic congestion[7]. Due to its location near the intersection of the highly congested Highways 401, 427 and 409, accessing Toronto Pearson Airport could become more challenging in the future as congestion increases. Figure 2.1 identifies several examples of the difference between off peak and peak travel times from various points within the GTA to Toronto Pearson Airport and to a potential new Pickering airport.

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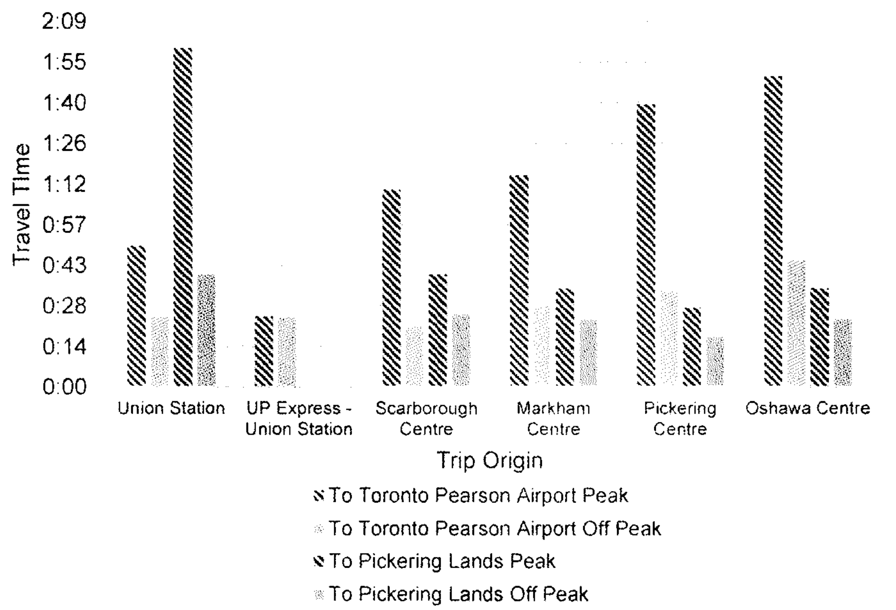
6 "Ontario Population Projections Update 2016-2041", Ministry of Finance (Ontario), Spring 2017.

7 "Tomtom North American Traffic Index", Tomtom International, 2016.

Figure 2.1 – Peak and Off-Peak travel times to Toronto Pearson Airport and Pickering Lands



Source: Google Maps Travel Time predictions, worst case time used. Excludes use of Highways 407 and 412.

To demonstrate the significant travel times faced by residents in the east GTA, Table 2.3 compares surface travel times from locations within and surrounding the GTA to the four passenger serving airports in the southern Ontario system as well as to the Pickering Lands. The west and south GTA do not experience ground travel times to Hamilton, Waterloo or Toronto Pearson Airports in excess of 120 minutes in peak travel hours. In off-peak hours, travellers in the west and south GTA can typically access these airport in less than 90 minutes. Conversely, communities in the east and north GTA can access Hamilton or Waterloo Airports in 120 to 175 minutes during peak times and between 65 to 140 minutes off peak. Access to Toronto Pearson Airport for travellers in the east GTA, is marginally better, typically between 41 minutes to 120 minutes in peak conditions and between 20 minutes and 90 minutes in off-peak conditions. There is a significant variance between the off peak and peak travel times, demonstrating the traffic congestion associated with travelling through Toronto.

Table 2.3 – Southern Ontario Airports System Surface Travel Times

	Municipality (Origin)	Airport (Destination)									
		Hamilton Airport		Waterloo Airport		Toronto Pearson Airport		Billy Bishop Airport		Pickering Lands	
		Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak	Peak	Off-Peak
East	Pickering	[illegible]	75	135	80	70	[illegible]	88	[illegible]	[illegible]	[illegible]
East	Ajax	[illegible]	80	140	90	78	38	80	40	[illegible]	[illegible]
East	Oshawa	[illegible]	90	[illegible]	93	135	45	98	45	[illegible]	[illegible]
East	Clarington	[illegible]	100	[illegible]	100	90	55	103	55	35	35
East	Cobourg	[illegible]	120	[illegible]	130	110	80	125	80	70	60
East	Peterborough	[illegible]	[illegible]	[illegible]	140	120	90	130	90	73	70
North	Vaughan	[illegible]	65	120	70	41	[illegible]	85	32	63	40
North	Markham	[illegible]	75	140	80	68	[illegible]	78	[illegible]	36	[illegible]
North	Richmond Hill	140	75	130	80	55	35	80	35	43	35
North	Whitchurch-Stouffville	[illegible]	90	150	93	78	45	90	45	[illegible]	[illegible]
North	Newmarket	[illegible]	85	120	90	65	40	95	40	45	40
North	Uxbridge	[illegible]	100	[illegible]	110	88	60	110	60	[illegible]	[illegible]
North	Barrie	150	100	[illegible]	105	73	55	115	70	93	80
South	Hamilton	[illegible]	[illegible]	70	50	85	45	105	48	[illegible]	78
South	Grimsby	45	35	90	65	85	50	110	55	[illegible]	85
South	St. Catharines	70	50	103	83	100	68	130	70	[illegible]	100
South	Niagara Falls	75	60	110	90	108	75	130	78	[illegible]	110
West	Mississauga	103	48	95	55	[illegible]	[illegible]	60	[illegible]	[illegible]	50
West	Brampton	120	55	100	55	31	[illegible]	70	31	[illegible]	55
West	Oakville	90	35	80	55	48	[illegible]	70	[illegible]	115	60
West	Milton	70	45	53	40	43	[illegible]	85	35	135	60
West	Burlington	50	[illegible]	80	50	65	33	90	35	150	70
West	Guelph	70	55	35	[illegible]	78	50	118	65	150	90
West	Kitchener	83	60	[illegible]	[illegible]	83	60	130	70	[illegible]	93
West	Cambridge	53	40	[illegible]	[illegible]	80	53	120	65	[illegible]	90
West	Brantford	37	[illegible]	63	45	105	65	125	68	[illegible]	100
West	Woodstock	55	50	50	40	100	78	135	90	[illegible]	110

Legend
[illegible]
31-60 min.
61-90 min.
91-120 min.
121-150 min.
[illegible]

Table 2.3 excludes travel on Highway 407ETR and Highway 412. These toll highways create a consistent travel experience across the GTA, although at an additional cost to the user. It is assumed that typical ULCC and LCC passengers are cost conscious and would not use toll roads to access low-cost air services.

Assumptions:

1. All driving times are sourced from Google Maps
2. Where a time range is given, the average is used.
3. "Peak time" is the slower driving time estimate of 7:30 AM or 4:30 PM.
4. "Off-peak time" is 2:00 AM.

The colour scale in Table 2.3 demonstrates that surface travel times to the four passenger serving airports in both peak and off-peak conditions are typically lower for residents in the west GTA and longer for residents in the east GTA. An airport servicing ULCC and LCC airlines on the Pickering Lands would greatly reduce travel times for residents in the east and north GTA. Travel times in peak hours do not exceed 73 minutes in peak hours (excluding Barrie due to distance) and 70 minutes in off-peak hours for residents in the east and north GTA. There is no noticeable variance between times in peak and off-peak hours, indicating insignificant delays during peak hours and therefore consistency in travel times for travellers in the east and north GTA wishing to reach the Pickering Lands.

As discussed in Section 2.1.2.2, travellers often consider convenience when making air travel plans and selecting departure airports. Travellers residing in north and east Toronto, Durham Region, York Region, Peterborough County, Northumberland County, and points further east along the Highway 401 corridor to Kingston may see significant increases in travel times to Toronto Pearson Airport during peak hours or incur tolls on Highway 407 to reach the Airport with shorter travel times.

Relevance to a New Airport on the Pickering Lands

A new airport on the Pickering Lands could significantly improve access to air service for travellers in the GTA, particularly in the east, in addition to potential passengers in Durham Region, Peterborough County, Northumberland County, and points further east, because it would significantly reduce travel times.

Providing specialized passenger services at an airport on the Pickering Lands, such as sun-destination charters and domestic point-to-point passenger service, could provide residents in Toronto and east GTA with alternatives to such services at an increasingly congested Toronto Pearson Airport.

2.1.4 Facilitation of E-Commerce

E-Commerce has experienced significant growth in recent years, facilitated in part by access to affordable and high frequency air transportation. For example, Amazon, a global leader in e-commerce, uses a network of fulfillment centres (regional warehouses and distribution centres) to ensure that sufficient inventories of popular consumer items are located strategically to facilitate above industry-average delivery times. There are currently six fulfillment centres located in Canada, with three located in the western GTA.

The Just-In-Time (JIT) business model for Amazon shipping, makes access to an airport and a major road network essential to support its fulfilment centres. Should Amazon, or another similar e-commerce firm wish to have improved access to east GTA, the development of a fulfillment centre east of Toronto may be a realistic prospect.

This potential is illustrated by the fact that in January 2018, Amazon announced that it had narrowed a list of 238 candidate cities for its new headquarters to 20. The only Canadian city to be given further consideration was Toronto. The regional Toronto bid offered several sites downtown and nine in suburban areas. One proposal offers Amazon a 100-acre "east harbour" region just east of downtown Toronto and near the new Google Sidewalk Lab. Given the desirability of this site, whether or not Amazon establishes a fulfillment centre at this location, it is likely that other e-commerce businesses will identify the site for its good access to major transportation hubs, including airports.

The City of Pickering has designated a Pickering Innovation Corridor bordered by Highway 7 to the north, Brock Road to the east, Highway 407 to the south and the City of Markham border to the west. The City estimates the Innovation Corridor will accommodate approximately 24,000 office and industrial jobs. The role of a future airport on the Pickering Lands with respect to the facilitation of e-commerce could depend upon the business types of future occupants. According to City of Pickering representatives, the zoning in place allows for very limited warehousing in the Innovation Corridor, suggesting that the establishment of a fulfillment centre-type facility is unlikely.

Relevance to a New Airport on the Pickering Lands

While it is unclear whether or not Amazon, or other e-commerce businesses, will establish fulfillment centres in the east GTA, it is clear that an airport capable of supporting air cargo services in the east GTA would be highly desirable for e-commerce businesses expanding operations in that area of the GTA. It is also likely that the presence or plans for construction of a capable airport could have a significant influence on the decision of such a company to establish operations in the area. It would not be necessary for an airport to have air cargo as its primary role to support such air cargo operations. Industrial, passenger, or general aviation airports may be capable of supporting air cargo operations in a secondary role and do not necessarily require large dedicated cargo facilities to do so.

Further, should Amazon select Toronto for its new headquarters and then select a site east of downtown for development, an airport on the Pickering Lands could be far more strategically important to the GTA's economy. A new airport on the Pickering Lands may be easier to access by surface transportation than Toronto Pearson Airport. The demand for access to air services for business travel, potentially paired with a new fulfillment centre east of the GTA, could further support the feasibility of a new airport on the Pickering Lands.

The proximity of the Pickering Innovation Corridor to the Pickering Lands and the understanding that those lands may one day be the site of a capable airport could attract businesses to the Innovation Corridor which would either utilize or support an airport.

2.1.5 Bombardier Sale of Downsview Airport

In May 2018, Bombardier announced its intention to sell the Downsview Airport, where it performs final assembly and interior completion of Q400 aircraft and final assembly of the Global family of business jets. In June 2018, Bombardier confirmed that it had sold the airport. It has been reported that Bombardier will be relocating its Global assembly line to Toronto Pearson Airport, but the future location for Q400 final assembly has not yet been announced.

Relevance to a New Airport on the Pickering Lands

Q400 final assembly and interior completion functions might not move to Toronto Pearson Airport due to several factors. One of those factors could be the limited availability of land at Toronto Pearson Airport to accommodate both the Global and Q400 manufacturing operations. Because of the length of time proposed before Bombardier considers the relocation of the Q400 final assembly, a new airport on the Pickering Lands could be a viable site.

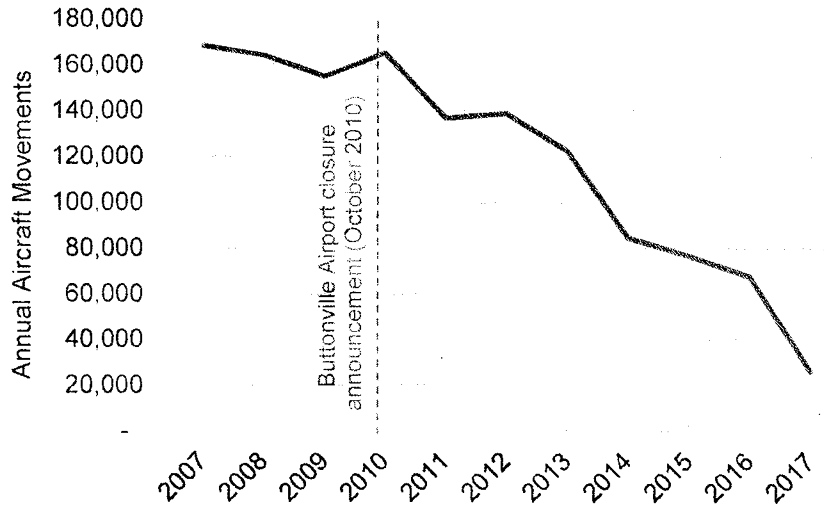
The departure of an anchor tenant from an industrial airport is uncommon and the factors involved in Bombardier's sale of Downsview Airport are unique. The capital costs associated with establishing operations at an airport and challenges involved with developing a reliable supply chain and skilled work force discourage large industrial businesses from relocating unless required by external forces. Bombardier is relocating its operations from an airport that it owns so that the land can be sold. This reflects the high market value of the land rather than any inherent advantage that might be achieved by relocating manufacturing operations. Because of the significant capital investment involved, it is uncommon for a large manufacturing or overhaul organization to relocate its facilities.

2.1.6 General Aviation in Eastern GTA

2.1.6.1 Buttonville Airport Closure

Buttonville Airport is privately owned and operated by Toronto Airways Limited and has been in operation under the current ownership since 1963. The Airport was initially located in rural surroundings; however, growth in the York Region has resulted in the Airport being constrained by surrounding urban developments. The Airport received a $1.5 million annual subsidy from the GTAA to assist Toronto Pearson Airport by accepting smaller, lower passenger-capacity aircraft during its large-scale redevelopment project in the mid-2000s. This operating subsidy ended in 2009 and, in October 2010, Toronto Airways announced that an agreement had been reached with Cadillac Fairview and Armadale Properties to redevelop the airport site into a new mixed-use commercial and residential community. Since the first announcement of the Airport's closure, aviation activity levels have dropped significantly, as operators using the airport began relocating to other airports in southern Ontario. The decline in aviation activity (aircraft movements) at Buttonville Airport is illustrated in Figure 2.2.

Figure 2.2 – Buttonville Airport Aircraft Movements (2007-2017)



Source: CANSIM Table 401-023 (2007-2016), CANSIM Table 401-008 (Monthly Jan 2017-Dec 2017).

While the Buttonville Airport closing date has changed a number of times, according to the most recent announcement made in the spring of 2018, the operations will continue until at least spring 2023.

Relevance to a New Airport on the Pickering Lands

The sale of Buttonville Airport could indicate a trend with other airports within the suburban GTA, such as Brampton, Burlington, and Oshawa, all of which are experiencing encroachment by rapid growth. It is possible that in the long term, these airports could be closed and redeveloped for higher-value uses. The closure of any of these airports would decrease the options for operational bases to support general aviation in southern Ontario, and could create demand for an airport that can support general aviation aircraft, especially if the airport were within proximity to Toronto's downtown core.

At this point in time, the closure of additional airports for non-aviation development is highly speculative, however, the recent re-allocation of traffic from Buttonville Airport to other airports in southern Ontario demonstrated that the airports currently within southern Ontario can accommodate changes in the system, and that market forces will drive business decisions regarding the relocation of various tenants and air operators. If a new airport was to be developed on the Pickering Lands that could support general aviation operations, it is possible that those users who are displaced from Buttonville Airport would relocate to a new Pickering Airport.

2.1.6.2 Oshawa Airport Closure

Oshawa Airport was formerly owned and operated by Transport Canada - until the Airport was divested to the City of Oshawa as part of the National Airports Policy of 1994. There was concern at the time that the airport would be closed and redeveloped for non-aviation use shortly after divestiture. To prevent the City of Oshawa from prematurely closing the airport, a special 50-year Continuing Service Agreement between the City and Transport Canada sets out financial penalties to the City for the early closure of the facility.

These require that a proportion of the proceeds of the sale of the Airport go to Transport Canada, with payment amounts decreasing with time. For example, if the Airport closes in 2033, the City will receive 18% of the land value; and if the Airport closes at the end of the 50-year agreement (2047) the City will receive 100%. There is a clause in the agreement that allows for the expedited closure of the Airport should it become "redundant" – possibly triggered by a new airport on the Pickering Lands. Under the terms of the Continuing Service Agreement, if a new airport on the Pickering Lands were to become operational before 2030, the City of Oshawa could receive 100% of the proceeds of the Airport sale - if they decide to close and redevelop the lands for non-aviation use.

Relevance to a New Airport on the Pickering Lands

Given the nature of the service agreement between Transport Canada and the City of Oshawa, it is likely that Oshawa Airport would close if a new airport on the Pickering Lands were to open.

The construction of a new airport on the Pickering Lands would likely result in an almost immediate demand for the relocation of most of Oshawa Airport's general aviation tenants and users.

A new airport on the Pickering Lands has the potential to enhance the operation of, and provide more growth opportunities for general aviation users currently at Oshawa Airport, as a new Pickering Airport could provide higher levels of service than currently provided at Oshawa Airport, such as a longer runway, closer proximity to downtown Toronto, and fewer operational restrictions, such as reduced operational hours due to noise abatement.

2.1.6.3 Global Pilot Shortage

The aviation industry is currently experiencing a global pilot shortage. In Canada, the shortage is being attributed to several causes including: pilots reaching retirement age, expanding airline flight schedules, and new pilot fatigue regulations[8]. With the growing worldwide demand for air travel, the need for experienced pilots is expected to continue to grow; driving the requirement to train more pilots, and increasing the importance of reasonably-accessible airports (in terms of driving time) that support flight training operators. Buttonville Airport is in a convenient location, is within a reasonable driving distance of much of the GTA, and has historically proven itself to be popular for flight training operators.

Relevance to a New Airport on the Pickering Lands

There are currently several flight training programs operating in southern Ontario, however, the ability of these operations to expand to meet forecast demand is unknown. A flight training centre established at a new airport on the Pickering Lands could provide additional and convenient flight training options for residents in the eastern and northeastern GTA, especially after the Buttonville Airport closes. Because the Pickering Lands are surrounded by rural areas, the required pilot training flight time and overall cost would be significantly less for a student training at the new Pickering Airport compared to a student training at Billy Bishop Airport; this reflects the fact that distances to non-populated areas where air training exercises are conducted would be shorter.

[8] "Pilots Wanted", James Careless – Skies Magazine, November 7, 2017.

This reduction in training cost does not necessarily imply that a flight school at a new airport on the Pickering Lands would be commercially viable, given the existence of flight training institutions at many neighboring airports. For example, Oshawa and Peterborough Airports offer flight training opportunities within the eastern GTA. The announcement of Buttonville Airport's closure in 2010 has seen nearly all flight training capability relocated to other airports, including Toronto Airways to Oshawa Airport and Seneca College to Peterborough Airport.

A new airport on the Pickering Lands could be an attractive location for a new university or college flight program sponsored by a post-secondary institution. Existing vocational programs formerly located at Buttonville Airport, however, have already relocated to other system airports and have invested significantly in hangars and training facilities. This makes a move by these programs to another airport in the near future unlikely. While flight training could be an appropriate use of a new airport on the Pickering Lands, it is unlikely that such training could justify the development of a new airport alone. Flight training units do not typically have the capability to construct and maintain an airport the size and scope foreseen for a new airport on the Pickering Lands.

2.1.7 Key Regional Developments

2.1.7.1 Durham Transportation Master Plan

In 2017, the Regional Municipality of Durham released an update to their Transportation Master Plan. The objective was to update policies, programs, and to identify infrastructure modifications and expansions required to accommodate anticipated regional growth to 2031[9]. The Master Plan update covers seven areas:

1. Land use and transportation
2. Public transit
3. Walking and cycling
4. Roads
5. Travel choices
6. Goods movement
7. Implementation

The planned road infrastructure identified within the Master Plan can have the most influence on a potential new airport on the Pickering Lands, given that the road network providing access to airports is critical. Located north of Highway 7, the Pickering Lands can be accessed from the west by York Durham Line and from the east by Brock Road. Both roads have an interchange with Highway 407. The Master Plan indicates that Brock Road will be widened to 6 or 7 lanes from Finch Avenue north to Highway 7, with a new interchange constructed at Highway 407.

[9] "Durham Transportation Master Plan" – Durham Region, December 2017

Whites Road will be widened to 6 or 7 lanes from Highway 401 to Concession 3 Road and realigned to the east end extended north to Highway 7, with a new interchange constructed at Highway 407 - with additional modifications to the interchange with Highway 401. Finally, Rossland Road will be widened to 4 or 5 lanes from Brock Road west to the Canadian Pacific Railway - Belleville rail corridor and extended to Highway 7 to the north with 5 lanes – in addition to a new interchange constructed at Highway 407. By 2031, the Region of Durham anticipates that there will be 4 interchanges with Highway 407 on the southern boundary of the Pickering Lands.

Relevance to a New Airport on the Pickering Lands

The Durham Transportation Master Plan shows significant road infrastructure improvements to serve both the Seaton Lands (development lands identified by the Region of Durham for commercial and residential uses) and potentially a new airport on the Pickering Lands. The resulting road network would provide effective and convenient access to a new airport on the Pickering Lands. At present, Highway 407 is a toll road. With significant improvements, other routes accessing a new airport on the Pickering Lands could provide cost-conscious travelers a cost-free option to Highway 407. For example, Brock Road could become the major access to the Pickering Lands due to its extensive frontage on the eastern boundary of the property, its planned widening and projected high traffic volumes, and the potential for significant non-aviation commercial development. Similar to many other airports, this non-aviation commercial development has the potential to provide additional revenue to the new airport's owner and/or operator, depending on the terms of the airport operating agreement (as further discussed in Section 7).

The planned road improvements identified in the Durham Transportation Master Plan are unlikely to impact the decision to build, or the recommended timing of the development of a new Pickering Airport. However, experience at other airports suggests that the timing of these road improvements could be advanced to meet access demands of a new airport and support further regional economic growth.

2.1.8 Public Support

When the Pickering Lands were first purchased by the Federal Government in 1972, there was public opposition to the use of the land for the development of an airport, which is ongoing. However, over time, support for the airport has also grown: there is now private interest in the development of a new airport on the Pickering Lands for general aviation use. There is also strong local political support. In October 2017, the City of Pickering endorsed a motion to support the development of an airport in Pickering (subject to study results) citing the anticipated economic benefit and job creation potential[10].

Significant stakeholder consultations were undertaken in support of the development of Section 3.0 of the Supply and Demand Report. As part of the consultation process, representatives from the primary stakeholders were contacted to provide input on their opinions as to how a new airport on the Pickering Lands would integrate into the southern Ontario airports system. These stakeholders included air carriers, airports in the southern Ontario airports system, surrounding municipalities, industry associations and special interest groups.

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[10] "City of Pickering Supports Development of an Airport", City of Pickering News Release – October 11, 2017.

Apart from the existing air carriers, who were concerned about the potential splitting of operations between Toronto Pearson Airport and a new airport on the Pickering Lands, the other stakeholders generally expressed widespread support for a new airport on the Pickering Lands. Furthermore, some of the strongest proponents for a new airport on the Pickering Lands were the municipal and regional governments surrounding the Pickering Lands, who see the potential benefits that an airport could provide to their respective local economies. The general trends and opinions collected as part of the Supply and Demands Report were largely similar to those outlined in Dr. Polanski's report on the potential future use of the Pickering Lands.

Relevance to a New Airport on the Pickering Lands

Support from all levels of government and from the public will influence the decision to build a new airport on the Pickering Lands. The MPs, MPPs, and City Councillors representing the region will provide support for, or opposition to, development of an airport on the Pickering Lands based on the input of their constituents. The decision to construct a new airport on the Pickering Lands will be influenced by the political environment and public opinion at that time. Some elected municipal representatives were elected on a pro airport platform, potentially indicating support by local constituents for a new airport on the Pickering Lands.

3.0 AIRPORT SYSTEMS

It is not uncommon to see airports in proximity to each other work as systems, fulfilling different or complementary roles. To gain a better understanding of how airport systems have successfully and unsuccessfully worked in the past, this section provides an overview of a number of airport systems.

3.1 Formal System

Canada's major airports are part of a formal guiding framework called the National Airports System. This framework defines the federal government's involvement with airports that have scheduled passenger service and is organized by different tiers of airports: nationally-significant airports and regional/local airports. There are currently 26 airports that form the National Airports System. These airports are deemed to be nationally significant, essential to Canada's air transportation system and to the promotion of prosperity and international competitiveness. The National Airports System also defines the operating structure for most of Canada's largest airports, which may or may not include a new passenger airport on the Pickering Lands.

A potential benefit of pursuing a formal agreement between members of the southern Ontario airports system would be the assignment of formal roles to each (which would likely be differentiated). This would enable airports to focus their efforts within their pre-determined roles. Commitments regarding funding coordination could also be achieved. The viability of a formalized airport system within Southern Ontario is unknown; formal commitments from the member airports would be required in terms of the role they will play within the system, which could be undermined by their desire to retain autonomy in decision making and to protect their respective market interests. Further, fundamental questions such as what recourse would exist if the agreement were violated could be difficult to resolve.

3.2 Informal System

3.2.1 Southern Ontario Airport Network

In May 2017, the GTAA entered into informal agreements with a group of airports in southern Ontario, referred to as the Southern Ontario Airport Network (SOAN). The SOAN is comprised of 11 commercial airports with Windsor Airport at the western extent and Kingston at the eastern extent (see Figure 3.1). Not all airports within the SOAN are included within the southern Ontario airports system analyzed in this report, and in other Pickering Lands Aviation Sector Analysis studies. Airports included within the SOAN are identified herein, and those airports that are included within the southern Ontario airports system (within the context of the Pickering Lands Aviation Sector Analysis) are specifically highlighted in bold text:

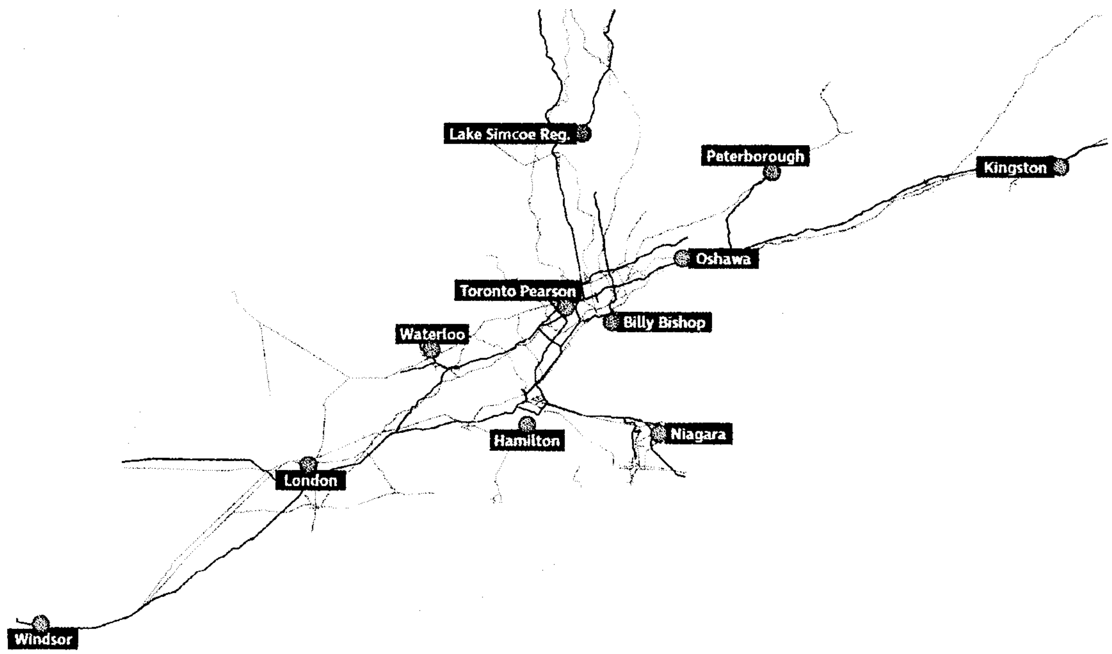
- **Toronto Pearson Airport**
- **Billy Bishop Airport**
- **Hamilton Airport**
- **Waterloo Airport**
- **Oshawa Airport**
- Kingston Airport
- **Lake Simcoe Airport**
- London Airport
- Niagara District Airport
- **Peterborough Airport**
- Windsor Airport

As demonstrated, the SOAN's airport membership differs slightly from the airports studied in the Supply and Demand Report. The SOAN focuses on passenger serving and larger scale general aviation airports, with Kingston, London, Niagara District, and Windsor Airport included in the network to gain broader coverage of southern Ontario and with less emphasis on the GTA. Smaller general aviation airports included in the Supply and Demand Report (Burlington, Buttonville, and Brampton) were not included in the SOAN membership.

According to the SOAN's mandate, its members work together to collectively meet future capacity deficiencies resulting from population and air travel growth in the region. The GTAA promotes the informal nature of airport membership, indicating that each airport will continue to operate as an independent entity, with the freedom to continue making autonomous decisions that best serve their respective communities[11]. The network does, however, provide airport operators with an open forum to discuss capacity issues and opportunities for business development.

[11] "Flying Together: The Southern Ontario Airport Network", Southern Ontario Airport Network, Pg. 5, May 2017.

Figure 3.1 – Southern Ontario Airport Network, Member Airports



Source: Southern Ontario Airport Network, May 2017.

3.2.2 Identified Airport Roles

Current SOAN documentation references airport roles, as self-identified by the participating airports. Given the informal nature of the agreement, airports are free to make independent decisions as to which airport service types they wish to offer, and the resulting role the airport will serve within the SOAN. The SOAN refers to various airport service type offerings at each of the network airports. The roles and service types identified by the SOAN for the airports common to the SOAN and the southern Ontario airports system are consistent with the roles and service types identified for those airports in the Supply and Demand Report. The service types and roles for the additional four airports are identified as follows:

1. Kingston Airport: This is a small passenger airport, and has the ability to substantially expand current operations as it has available capacity.
2. London Airport: This is a passenger and industrial airport, and has the ability to substantially expand current operations as it has available capacity.
3. Niagara District Airport: This is a passenger and general aviation airport, and has the capacity to start charter or scheduled service and expand current general aviation operations.
4. Windsor Airport: This is a passenger, cargo and general aviation airport and has the ability to substantially expand current operations as it has available capacity.

The airport roles above are primarily focused on market segments currently served at Toronto Pearson Airport. As passenger traffic activity increases at Toronto Pearson Airport, the relocation of general aviation activity (primarily corporate aviation) to another southern Ontario airport, will be required at some point in the future to provide additional runway passenger capacity. This is typical of mega-hub airports which are approaching their current annual runway passenger capacities[12].

3.2.3 Potential Changes in Airport Roles

The SOAN report acknowledges that member airports are business-driven and will make decisions based on evolving industry demands, opportunities, and market factors. The identified roles for airports in the network are generalized, providing flexibility to the airports to evolve as they see fit. The informal nature of the SOAN does not require any of the member airports to sustain a single or fixed airport role or service type. For the purpose of the Pickering Lands Aviation Sector Analysis, it is assumed that the airports within the SOAN will maintain their current roles and service types throughout the planning horizon of the reports.

3.3 Case Studies – Airport Profiles

Multiple-airport systems that exist in North America and in Europe have arisen as a result of two primary phenomena:

1. Urban growth: As cities expanded outwards, they often surrounded existing airports, limiting their expansion potential, either physically (due to limited space) or as a result of noise complaints from the (newly) surrounding community. This led to aviation authorities acquiring land at considerable distances from the urban areas to develop new airports to support growing demand. These airports were built to provide air passenger services to cater to different market segments.
2. Legacy military airports: Many airports developed to support military flight training and manufacturing efforts during the Second World War were no longer needed to support military operations after the war. In many cases, these airports were built in cities where commercial and other airports already existed, and so they were converted to secondary airports, to relieve congestion and provide additional capacity for the primary airports.

To better understand the factors that contribute to successful airport systems, several airport pairs were selected for study based on their comparability with a Toronto Pearson – new Pickering airport pairing. The airport pairs were selected based on:

- the evolution of their development,
- their socio-economic profiles, roles, and service types, and
- their ability to represent current examples of a dominant primary airport being supplemented by a secondary airport as a result of market forces.

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[12] John F. Kennedy, LaGuardia, Newark Liberty, Chicago O'Hare and Atlanta airports approach or reach their practical runway capacities and therefore accommodate minimal GA traffic. GA traffic in these localities usually operate at secondary airports for operational flexibility, reduced cost and availability of suitable facilities.

The two airport pairs chosen were:

1. Phoenix Sky Harbour Airport and Phoenix Mesa Gateway in the United States; and
2. Vancouver International Airport and Abbotsford International Airport in Canada.

In addition, the experience of the Trudeau Airport and Mirabel Airport pair was reviewed to understand the factors that led to the failure of Mirabel to fulfill its planned role as a passenger airport.

Neither of the airport pairs were developed or grew because of a passenger capacity shortfall at their respective primary airports. The secondary airports serving the cities of Phoenix and Vancouver grew through response to passenger and private sector market demand for low cost passenger service. Conversely, Mirabel Airport's type and role were defined by Government policy in the 1970s that may not have adequately considered the importance of market conditions, and as a result it was unable to attract passenger air services as originally anticipated.

Neither of the secondary airports studied herein was developed as a true "reliever" airport because their respective primary airports had not reached or exceeded their aircraft movement and/or runway passenger capacities. The secondary airports studied could represent the potential types and roles that a new airport on the Pickering Lands would serve. To provide additional context, Table 3.1 presents relevant characteristics of the selected case study airport pairs.

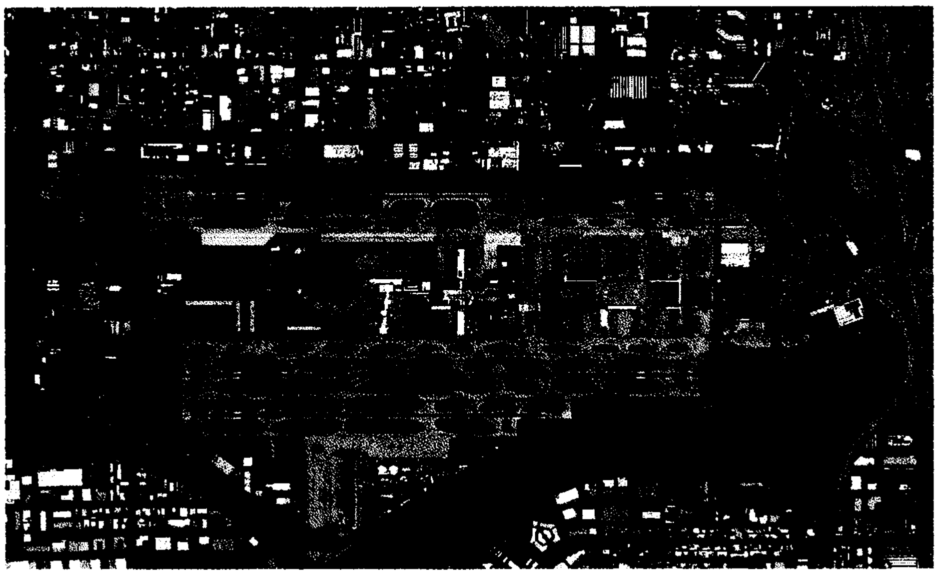
Table 3.1 – Comparative Airport Parameters

	Toronto, Ontario		Phoenix, Arizona		Vancouver, British Columbia		Montreal, Quebec	
	Toronto Pearson Airport	Pickering Lands	Phoenix Sky Harbor Airport	Mesa Gateway Airport	Vancouver Airport	Abbotsford Airport	Pierre Elliott Trudeau Airport	Mirabel Airport
Population (2016)	6.4 million		4.6 million		2.5 million		4.1 million	
Distance of Airport to City Centre (Air Distance)	19 km	36 km	7 km	41 km	11 km	61 km	15 km	42 km
Distance Between Airport Pair (Air Distance)	50 km		35 km		61 km		32 km	
Direction of Airport from City Centre	NW	NE	ESE	SE	SSW	SE	W	NW
Enplaned/Deplaned Passengers (2017)	44,335,198	N/A	43,896,894	1,360,713	24,166,122	677,653	18,165,029	0
Aircraft Movements	456,536	N/A	440,643	253,006	330,839	127,134	234,254	20,101
Non-Stop Destinations	180 +	N/A	119	50	125+	8	110+	0

3.3.1.1 Phoenix Sky Harbor – Phoenix Mesa Gateway Airports

In addition to being the most populous region in Arizona, the Phoenix Metropolitan Area (Metro Phoenix) is the administrative centre and state capital. In 2016, Metro Phoenix had a population of 4.57 million people. Phoenix's air travel demand is served by Phoenix Sky Harbor Airport and Phoenix Mesa Gateway Airport. An aerial photo of Phoenix Sky Harbor Airport is presented in Figure 3.2.

Figure 3.2 – Phoenix Sky Harbour Airport



Source: Google Earth 2018

Phoenix Sky Harbor Airport (Sky Harbor Airport) is the primary hub airport for Metro Phoenix, serving 43.9 million passengers in 2017 and facilitating 444,643 aircraft operations using three-runways. The Airport is owned by the City of Phoenix and operated by the Phoenix Airport System. The facility is located approximately 7 km east of Phoenix's central urban core and is surrounded by industrial and commercial land developments. The Airport supports air services to over 90 US domestic destinations and over 20 international destinations.

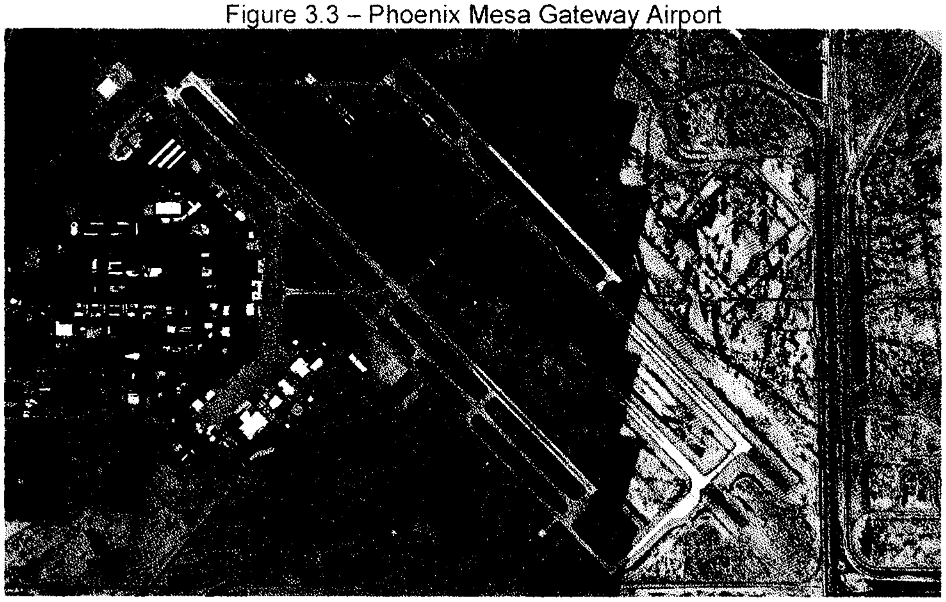
As shown in Figure 3.2, the runway configuration of Sky Harbour Airport is similar to Toronto Pearson Airport's, with three principal east-west runways. The Airport features a pair of closely spaced parallel runways (Runway 07L-25R and 07R-25L) and Runway 08-26, located further north, which can operate independently of the two parallel runways. The runways are supported by a system of full length parallel taxiways. In total, the Airport occupies a footprint of 1,375 hectares[13]; approximately 500 hectares less than Toronto Pearson Airport. Sky Harbour Airport serves primarily scheduled and charter passenger services; however, it has sizable secondary service offerings including air cargo, general aviation Corporate, and Air National-Guard military operations.

[13] Phoenix Sky Harbor Intl Airport Master Record, Federal Aviation Administration, January 2018

Phoenix Mesa Gateway Airport (Mesa Gateway Airport) shown in Figure 3.3, is classified by the Federal Aviation Administration (FAA) as a general aviation reliever airport[14] and is located approximately 41 km southeast of downtown Phoenix. Mesa Gateway Airport (formerly known as Williams Air Force Base), was operated exclusively for military purposes until 1991 when its divestiture was announced as part of the reorganization of military facilities in the United States. The Mesa Gateway Airport opened to civilian operations in 1994, operated by the Williams Gateway Airport Authority (WGAA).

Mesa Gateway Airport has since established itself as a prominent alternative to Sky Harbour Airport, accommodating 1.4 million passengers and 253,006 aircraft movements per annum in 2017. Passenger service to over 40 destinations within the US and Canada are facilitated primarily by Allegiant Air's Ultra-Low-Cost Carrier operations to US domestic destinations and by WestJet, which provides scheduled passenger air services to Calgary and Edmonton.

Figure 3.3 – Phoenix Mesa Gateway Airport



Source: Google Earth 2018

Given Mesa Gateway Airport's military heritage, the WGAA inherited substantial airside infrastructure for an airport of its anticipated type and role, including three parallel runways, supporting taxiways, and extensive apron areas. This greatly assisted with the initial development of the Airport, where efforts were focused on stimulating business and air service interest utilizing the available infrastructure.

Mesa Gateway Airport also accommodates significant business activity including: aircraft Maintenance Repair and Overhaul (MRO) operations, flight training organizations, fixed base operators, manufacturing, government agencies, and numerous non-aviation related companies. The 2009 Mesa Gateway Airport Master Plan indicates that the Airport is a significant economic generator for the community, directly creating over 1,250 jobs and generating over $200 million in revenue each year.

[14] Phoenix-Mesa Gateway Airport Master Plan, Coffman Associates Inc, February 2009.

3.3.1.2 Vancouver International – Abbotsford Airports

Metro Vancouver (Vancouver) has a population of approximately 2.5 million and is the largest metropolitan area in the province of British Columbia. Vancouver is similar in its demographic composition to the Greater Toronto Area, with 40.8% of its population being foreign-born. As a result, significant demand for international air travel exists within Vancouver. Passenger air service to and from Vancouver is facilitated by two airports: Vancouver International Airport and Abbotsford International Airport.

Vancouver International Airport (Vancouver Airport) is the primary hub for Vancouver and the Province of British Columbia, serving 24 million air passengers in 2017 and facilitating 330,839 aircraft movements. Its three-runway system is comprised of a pair of parallel runways and a crosswind runway (see Figure 3.4). The Airport is part of Transport Canada's National Airports System, owned by the Federal Government and operated by the Vancouver Airport Authority. It is located on Sea Island approximately 11 km south southwest of downtown Vancouver, and is surrounded entirely by the Strait of Georgia to the west and the Fraser River to the north, east and south. Vancouver Airport occupies a land assembly of approximately 1,700 hectares, comparable to that of Toronto Pearson Airport.

Figure 3.4 – Vancouver International Airport

Source: Google Earth, 2018

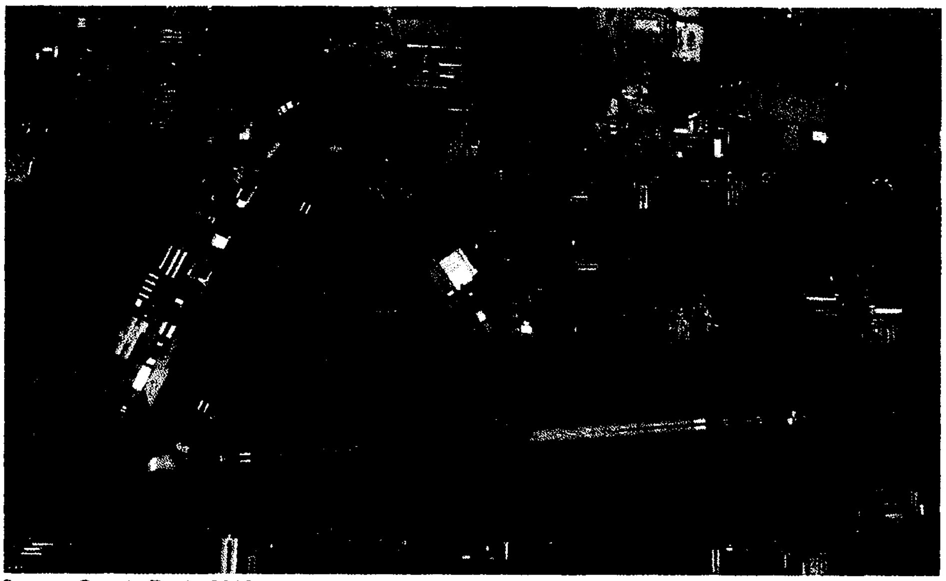
Vancouver Airport is Air Canada's primary hub for serving the Asia-Pacific market[15], and a service destination for many domestic, transborder and international air carriers. In total, Vancouver Airport serves 125 domestic, transborder, and international destinations. The Airport also has sizable service offerings in small scale passenger charter and general aviation, with a secondary, south field terminal exclusively used by low capacity passenger aircraft, seaplanes, helicopter operations, and corporate charters.

[15] "Corporate Profile: Global Network and Convenient Gateways", Air Canada, February 2018.

Abbotsford International Airport (Abbotsford Airport) is located approximately 61 km southeast of downtown Vancouver. Similar to Toronto's eastern suburbs in the Durham Region, Abbotsford Airport is near the growing communities of Abbotsford, Langley, Mission, and White Rock. Abbotsford Airport was initially constructed during the Second World War for military purposes. It was owned and operated by Transport Canada as a civilian airport starting in 1958. As part of the National Airports Policy of 1994, ownership of the airport was transferred to the City of Abbotsford and has since been operated by the Abbotsford Airport Authority. Its growth has been market driven, facilitating 126,568 aircraft movements in 2016 and 677,653 passengers in 2017, making it Canada's 11th busiest airport.

The Airport operates two runways; a primary 9,600 ft. length east-west runway and a secondary 5,300 ft. length crosswind runway (see Figure 3.5). Both runways are supported by an extensive system of taxiways and apron infrastructure. Overall, the airport occupies a land area of approximately 520 hectares.

Figure 3.5 – Abbotsford International Airport



Source: Google Earth, 2018

Abbotsford Airport has developed into a prominent alternative to Vancouver Airport with primary service offerings in general aviation commercial and industrial, in addition to providing specialty passenger service. The Abbotsford Airport has supported the operation of Canadian Low-Cost Carriers and charter airlines, providing scheduled point-to-point domestic air service, seasonal sun destination charters, and service to major hubs to connect to points abroad. Even though Vancouver Airport has yet to reach its capacity, Abbotsford Airport continues to grow as a prominent low-cost airport, as it provides an alternative for travelers in east Vancouver and the Fraser Valley.

The Abbotsford Airport has maintained several long-term general aviation tenants. Conair Aerial Firefighting began operations at Abbotsford Airport in 1969 and provides aerial fire suppression services with a fleet of over 65 aircraft and 300 employees. Cascade Aerospace operates a 235,000-square foot facility and specializes in aerospace engineering and modifications, and MRO services for civil, commercial and military aircraft. Other general aviation businesses at the Airport facilitate flight training, fixed base operations, and recreational flying.

3.3.1.3 Pierre Elliot Trudeau International Airport – Mirabel Airport[16]

The Pierre Elliot Trudeau International Airport (Trudeau Airport) – Mirabel Airport pair is widely viewed as an example of an unsuccessful formal airport pair.

Trudeau and Mirabel Airports are both owned by Transport Canada and operated by Aéroports de Montréal. These airports are one of the few examples of an airport pair in Canada where more than one airport is operated under a single airport authority (others include the Calgary Airport Authority and the Edmonton Regional Airports Authority).

At the time Mirabel was planned, bi-lateral agreements required that all international traffic originating from Europe enter Canada through Montreal. Montreal was the only approved point-of-entry in Canada for trans-Atlantic flights. The demand forecasts for air travel in the Montreal area assumed that these agreements would continue, and based on this, it was predicted that Trudeau Airport (then called Dorval) would reach its maximum runway passenger capacity in 1985. The urban location of Trudeau Airport also resulted in frequent noise complaints, which also influenced Transport Canada's decision to develop Mirabel as a large-scale airport providing primarily domestic, transborder and international air services. To meet the perceived aviation runway passenger capacity deficit in the Montreal area, Mirabel Airport was planned to have a six runway – six passenger terminal configuration with the capability to accommodate 60 MPPA by 2025.

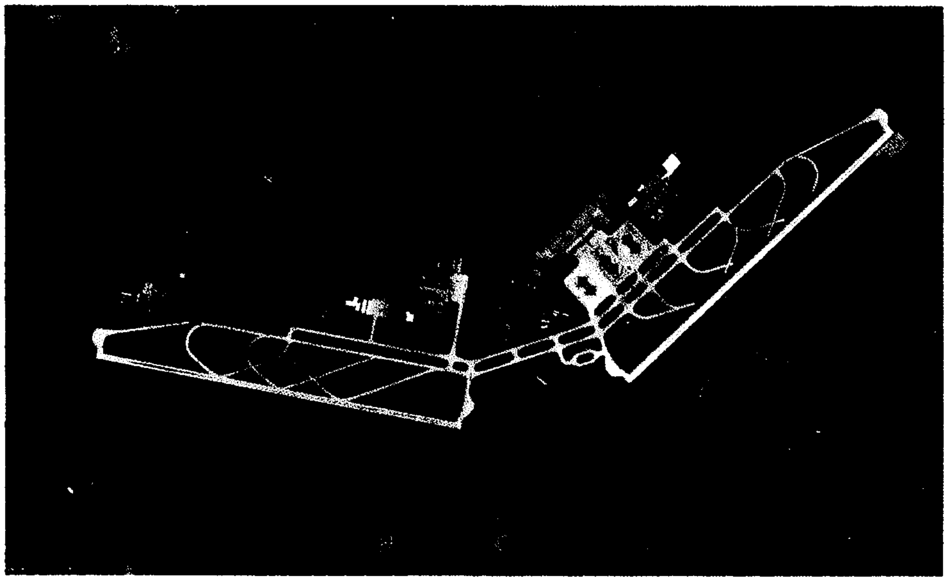
Originally, it was anticipated that some airlines would relocate from Trudeau Airport to Mirabel Airport. Mirabel Airport was planned to be connected to Trudeau Airport and downtown Montreal by a high-speed rail system, which would support the connecting passengers between the airports.

Construction of the Mirabel Airport began in 1970 on a 36,000-hectare property located 42 kilometers northwest of downtown Montreal. The completed Mirabel airport is presented in Figure 3.6. The initial implementation had a two-runway configuration, a single terminal building, a hotel, a parking garage, and a control tower. Mirabel Airport officially opened in 1975 and all transoceanic scheduled and charter traffic was transferred to Mirabel from Trudeau Airport.

However, the predicted traffic through Mirabel Airport did not materialize; and in 1979, Mirabel processed only 2.75 million passengers compared to 6.25 million at Trudeau in the same year. The Airport continued to have lower-than-expected activity thereafter. To consolidate passenger traffic at Trudeau Airport, the last international flight departed from Mirabel in 2004.

[16] "TP 5239E - History of Canadian Airports", Transport Canada, pg. 441 to 443, 1984.

Figure 3.6 – Mirabel Airport



Source: Google Earth, 2018

A number of factors contributed to Mirabel's failure to fulfill its planned passenger airport role. First, Mirabel Airport was planned and initiated during unprecedented economic and social growth in the province of Quebec. However, subsequent slowdowns of the global economy in the 1970s and 1980s and political instability in the province resulted in lower than forecast growth in air travel in the region. In addition, changes to bi-lateral agreements between Canada and European countries in the early 1970s allowed for direct international flights to other Canadian airports, most importantly Toronto Pearson Airport. The introduction of new turbofan engine aircraft also resulted in sufficient range improvements, which enabled direct service to other major Canadian cities, thus eliminating the need for aircraft to make fueling or technical stops in Montreal before crossing the Atlantic or vice versa.

Further, the infrastructure planned to support Mirabel was never fully built. Neither the rail system nor the additional planned highways (providing access between Trudeau and Mirabel Airports) were constructed. As a result, the intended relocation of all airline operations to Mirabel Airport did not occur, resulting in fragmented operations with international passenger air services at Mirabel Airport and domestic and transborder air services at Trudeau Airport. Passengers were often required to take lengthy bus trips to transfer between the airports. This led to frustration of the airlines and prompted passengers to bypass Montreal altogether, opting for more convenient connections in Toronto.

Mirabel Airport was unsuccessful in fulfilling its planned role. However, Mirabel Airport remains in operation to this day as an industrial and cargo airport. It is currently fulfilling a significant aviation role as the facility accommodates extensive cargo and aviation manufacturing operations, and is the home to Bombardier's manufacturing facility supporting the development of the C-Series aircraft program. These operations continue to grow.

A 2014 economic impact study of Mirabel Airport[17] showed direct employment of 4,501 people on the airport site, generating nearly $700 million in GDP contributions per annum. The indirect and induced economic effects result in nearly 10,000 employed Canadians and $1 billion in annual contributions to GDP. While the anticipated air passenger aviation activity did not come to fruition, businesses have embraced the services and facilities that Mirabel Airport offers and the facility has grown to have significant influence on the economic environment of the Montreal Area.

3.4 Findings

Based on the case studies highlighted above, the success of secondary airports is typically driven/influenced by four key factors:

1. Airport governance;
2. Geographic location and ground transportation access;
3. Competitive aeronautical airport fees and land lease rates; and
4. Orderly and planned airport development.

Observations with respect to the influence these factors had on the success of the airports highlighted in the case studies are detailed below.

3.4.1.1 Governance

Both Mesa Gateway Airport and Abbotsford Airport operate and make decisions (regarding business direction, service types, and their airport roles) independently from their respective primary airport (e.g., Phoenix Sky Harbour and Vancouver International Airports). By having the ability to make operating decisions in their best interest and independent from primary airport influence, the secondary airports can modify their service types to respond to changing market conditions.

Potential success factor for a new airport on the Pickering Lands

Establish an independent governance model that has the flexibility to attract and adapt service types, and the resulting airport role, to respond to, and accommodate changes in market demand.

3.4.1.2 Geographic Location and Ground Transport Access

Another important factor influencing the success of the secondary airports is the geographic location (i.e., proximity to urban centres). The secondary airports studied are in relatively close proximity to their respective urban centres and suburbs within their catchment areas. In addition, they are surrounded by rural and/or commercial lands, allowing for greater operational freedom with respect to noise and airspace restrictions.

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[17] "The Economic and Tax Impacts of the Activities at Montreal-Mirabel Airport", E&B Data/Aéroports de Montreal, September 2014.

Adequate ground access is imperative for success, and Mesa Gateway Airport and Abbotsford Airport are both in proximity to controlled access highways allowing for reasonable driving times to/from urban centres. The importance of ground access is further demonstrated when examining Mirabel Airport, where several critical ground transportation projects to facilitate ground access between Mirabel and Trudeau Airports failed to materialize. This impeded access to Mirabel Airport, and led to under-use and inconvenience for both air carriers and the traveling public.

Potential success factor for a new airport on the Pickering Lands

The Pickering Lands are well positioned near current and future high growth areas in the eastern GTA and are positioned close to existing densely populated areas. Existing and planned enhancements to ground transportation access to controlled access, divided highways, regional roads, and rail service connections could contribute to the success of a new airport on the Pickering Lands. The Pickering Lands are near to communities (such as Oshawa, Pickering and Markham) that see significant increases in driving times to Toronto Pearson Airport during peak periods as shown in Section 2.1.3. A new airport on the Pickering Lands would result in a significant reduction in driving times to an Airport for the travelling public in the east GTA.

3.4.1.3 Competitive Aeronautical Fees and Land Lease Rates

Aeronautical, land lease and passenger fees contribute to the success of the secondary airports. Both Mesa-Gateway and Abbotsford Airports provide a low-cost environment compared to their primary airports. While the primary airports feature large air terminal buildings with significant passenger amenities, the secondary airports offer more basic terminal buildings and services, at a lower cost. By providing basic passenger amenities, these secondary airports assist emerging low-cost carriers in offering competitive fares within close proximity to urban centres, with large air passenger catchment areas.

Potential success factor for a new airport on the Pickering Lands

Offer competitive land lease rates and aeronautical fees to stimulate growth of aviation-related commercial activity.

3.4.1.4 Orderly and Planned Airport Development

Assuming that existing airports within a given airport system have developed long term development plans using best practice airport planning principles, these facilities should be prepared for future infrastructure expansion. This planning allows for the orderly development of the airport as demand warrants, without initially overbuilding infrastructure or hindering future development. Developing a long expansion plan provides airports with the ability to incrementally phase developments and respond to market demands, as they develop.

Potential success factor for a new airport on the Pickering Lands

Ensure a new airport on the Pickering Lands is well planned, allowing for flexible phased development to satisfy evolving aviation market demand.

4.0 OPTIONS IDENTIFICATION AND EVALUATION

In previous reports and studies evaluating the need for and timing of a new airport on the Pickering Lands, emphasis was placed on the development of an airport to relieve Toronto Pearson Airport when it reaches its ultimate capacity. The results of the Supply and Demand Report determined that there is sufficient passenger capacity within the southern Ontario airports until at least 2036, prompting the Type and Role Report to study alternative service types and roles for a new airport on the Pickering Lands.

To effectively plan and protect land uses for the long-term development of a new airport on the Pickering Lands, five options for primary roles and service types were assessed, looking beyond the previously assumed primary role as a reliever for Toronto Pearson Airport. A cursory review of the following five options was completed to determine their plausibility as the primary roles and service types of a new airport on the Pickering Lands:

1. **Option A: Industrial Airport** – Option A assumes a new airport on the Pickering Lands would be developed primarily for aviation-related industrial purposes. This could include provision for the development of large scale aviation industrial businesses, including but not limited to: aircraft/component manufacturing, MRO, avionics installation/repair, or aircraft parts supply and distribution.
2. **Option B: Specialty Passenger Airport** – Option B explores developing a new airport on the Pickering Lands primarily for the accommodation of specialized passenger air service, such as ULCCs, Point-to-Point Domestic Air Service, and Charter Services catered towards leisure travel.
3. **Option C: Primary Hub International Airport** – Option C considers an airport with a primary focus on international passenger service. This option, beyond typical airport infrastructure, would require the inclusion of large scale terminal facilities to accommodate significant traffic on trans-Atlantic and/or trans-Pacific routes.
4. **Option D: Passenger Feeder Airport** – Option D investigates a passenger feeder airport on the Pickering Lands that would direct passengers to hub airports with the primary intent of connecting to points beyond.
5. **Option E: Major Air Cargo Airport** – Option E assesses the viability of developing a new airport primarily for Air Cargo operations. Air Cargo operations include all-cargo dedicated aircraft, warehouse space, freight forwarding, distribution, and warehousing.

4.1 Options Definition and Analysis

4.1.1 Defining Service Types

Airport service types ("types") are the different business offerings provided at each airport in the southern Ontario airports system. Potential service types were identified for options in a manner consistent with the Supply and Demand Report. Examples of primary service types are presented in Table 4.1 (originally presented in Table 2.1 of the Supply and Demand Report). This allows for the identification of overlapping service types with other airports in the study area. The potential services include primary and secondary service types; with the primary service type being the airport's core service. These services are further categorized into three distinct market segments: domestic, transborder, and international. In Table 4.1 the darkest shading represents the service types offered most within the southern Ontario airports system based on the number of airports providing the service. The dotted line circles indicate service types that are not very prominent within the southern Ontario airports system.

Table 4.1 – Primary Service Type Saturation

	Passenger		**Cargo**		**General Aviation**		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic							
Transborder							
International							

Low **High**

Data source: Supply and Demand Report

4.1.2 Defining Airport Roles

Airport roles are defined based on the mix of service types supported at a particular facility, and their relative scale. The potential airport roles associated with the options presented herein are similar to those presented in the Supply and Demand Report.

Airport roles have been applied to each of the options presented herein to provide clarity regarding the potential future role that a new airport on the Pickering Lands could play in the southern Ontario airports system, while considering existing service type combinations and roles currently supported by existing airports in the system.

Potential airport roles that could be appropriate for a new airport on the Pickering Lands are listed below and are further defined in Appendix A:

- Primary Hub
- Secondary
- Potential Reliever
- Feeder
- GA Corporate
- GA Recreational
- GA Industrial
- GA Training
- GA Other

4.1.3 Option A: Industrial Airport

The airport service types associated with Option A are primarily focused on General Aviation Industrial activities. Secondary service types in General Aviation Commercial and General Aviation Other are also included in Option A and presented in Table 4.2.

Table 4.2 – Option A – New Pickering Industrial Airport - Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic				○	○	●	○
Transborder				○	○	●	
International				○	○	●	

● Primary Service Type

○ Secondary Service Type

In Option A, the role of a new airport on the Pickering Lands (within the context of the southern Ontario airports system) would be a **General Aviation Industrial and Corporate Airport.**

Option A could provide large scale industrial aviation capacity within the study area. Hamilton, Waterloo, Peterborough, and Lake Simcoe airports have sufficient runway length to accommodate the operational requirements of most industrial users. However, not all the airports have the required land assembly for a large-scale aviation-industrial operation, such as a large-scale aircraft manufacturer, or an MRO operator.

A high-level review of industrial airports was unable to identify a purpose-built greenfield industrial airport in North America. Typically, industrial airports are established on former military air bases in the United States and former BCATP airports in Canada. For example, the Mobile Downtown Airport in Mobile, Alabama (formerly Brookley Airforce Base) supports the Mobile Aeroplex at Brookley and is home to Airbus's U.S. A320 final assembly operations. Slemon Park in Summerside, PEI (formerly CFB Summerside) has aeronautical tenants including Honeywell and StandardAero. Conversely, in southern Ontario, Peterborough Airport began as a small GA airport and through strategic investment has grown to become a significant industrial airport.

4.1.4 Option B: Specialty Passenger Airport

The airport service types associated with Option B are primarily focused on domestic scheduled and domestic transborder and international charter passenger air services. Secondary service types in General Aviation Commercial, and General Aviation Other are included in Option B to account for corporate activities and the anticipated closure of Buttonville Airport. Additional secondary service types include Charter Air Cargo which could support the transportation of goods via courier, air mail and belly cargo carried on charter flights. The identified airport service types applicable to Option B are presented in Table 4.3.

Table 4.3 – Option B – Specialty Passenger Airport - Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	●	●		○	○		○
Transborder		●		○	○		
International		●		○	○		

● Primary Service Type

○ Secondary Service Type

A new airport on the Pickering Lands supporting the service types identified above would be categorized as a **Potential Reliever and General Aviation Corporate Airport,** within the southern Ontario airports system.

The Supply and Demand Report concluded that passenger demand and future airport capacity constraints within southern Ontario would not trigger the need for a new airport on the Pickering Lands before 2036. However, developing an airport that supports service types applicable to Option B could stimulate demand for air travel and result in significant economic growth in the eastern GTA, and specifically Durham Region. This could be a consideration when making a decision to develop a new airport on the Pickering Lands prior to 2036.

Furthermore, travelers residing in the eastern GTA currently lack convenient airport options that support a variety of cost effective scheduled and charter passenger air service offerings, when compared to travelers in the west GTA who reside in closer proximity to several airports (Waterloo, Hamilton, Toronto Pearson, and Billy Bishop airports). Reducing driving times to/from airports that provide desirable passenger air services for residents within regions of the eastern GTA and in neighbouring counties further east along the Highway 401 corridor (and beyond) is likely to increase the number of air trips of existing travelers and/or induce travel demand in non-travelers living in the eastern GTA (especially if a ULCC were to operate from a new airport on the Pickering Lands). Additional information on surface travel times in the GTA is presented in Section 2.1.3.

Development of a new airport on the Pickering Lands could also stimulate significant regional economic growth as proximity to an airport that supports passenger and/or cargo air services is an important factor when large scale companies make decisions regarding the location of their headquarters and other facilities to support their business. These companies sometimes employ several hundred local workers who add to the overall economic activity within the region.

Although the Supply and Demand Report indicates that additional passenger capacity is not required within the southern Ontario airports system prior to 2036, the long-term (beyond 2036) requirement to provide additional passenger capacity within the southern Ontario airports system should not be discounted.

4.1.5 Option C: Primary Hub International Airport

As presented in Table 4.4, Option C considers development of a new airport on the Pickering Lands supporting primary service types including scheduled and charter passenger air services to/from domestic, transborder and international destinations.

To support this mix of service types, significant infrastructure investments beyond the basic elements would be required to appropriately support domestic and transborder passenger air services and/or general aviation operations. For example, an airport supporting widebody aircraft operating trans-Atlantic or trans-Pacific routes (such as the Boeing B777 or the Airbus A350 series of aircraft that are capable carrying more than 400 passengers) would require significant enhancements to the air terminal relative to that required for a specialty passenger airport, access road, parking and airfield infrastructure.

With a significant proportion of the GTA's population being foreign-born (46% of Toronto's population in 2016[18]), the continued trend of increasing international air passenger trips within the GTA is likely through to 2036, and beyond. The identified airport service types applicable to Option C are presented in Table 4.4.

Table 4.4 – Option C – Primary Hub International Airport - Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	•	•	○	○			○
Transborder	•	•	○	○			
International	•	•	○	○			

• Primary Service Type

○ Secondary Service Type

A new airport on the Pickering Lands supporting the service types identified for Option C would have a defined role as a **Primary International Hub (Passenger) Airport.**

[18] "The Daily, Wednesday October 25, 2017", Statistics Canada, October 2017.

As described in Section 2.1.1.1, Toronto Pearson Airport is currently implementing a "mega-hub" strategy whereby they are promoting international air service growth and the use of Toronto Pearson Airport as an international gateway and transit hub, providing multiple carriers with the capability of offering connections to Asia, South America, North America, and Europe. In many cases travelers prefer not to transit through a U.S. airport due to travel visa requirements and other political factors.

The current and planned infrastructure at Toronto Pearson Airport is designed to support large, wide-body aircraft and is capable of supporting Toronto Pearson Airport's goal of being an international gateway and transit hub. As a result, large-scale international operations at a new airport on the Pickering Lands are not considered to be a viable primary service offering that solely justifies development of a new airport. This option was discounted due to conflicting current and future roles with Toronto Pearson Airport.

4.1.6 Option D: Passenger Feeder Airport

Option D examines the potential for a passenger feeder airport on the Pickering Lands that would support primary service types including scheduled and charter domestic and transborder passenger air services, and international charter air services to/from hub airport destinations such as Calgary, Vancouver, Newark, Detroit, Reykjavik, London Gatwick, etc. Hub airports support the consolidation of passengers arriving and departing from feeder airports and allow air carriers to provide higher capacity services to multiple destinations. Although a passenger feeder role could be appropriate for a new airport on the Pickering Lands, the high initial development costs and the relatively low anticipated passenger activity is not considered to be sufficient, on its own, to justify developing a new airport. The identified airport service types applicable to Option D are presented in Table 4.5.

Table 4.5 – Option D – Passenger Feeder Airport - Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	•	•		○			○
Transborder	•	•		○			
International		•		○			

• Primary Service Type

○ Secondary Service Type

A new airport on the Pickering Lands supporting the service types identified for Option D would have a defined role as a **Feeder Airport.**

With Toronto Pearson Airport offering a wide variety of international and transborder air service destination options, air travelers may seek the convenience of departing from the hub on direct, nonstop flights versus connecting via a short haul flight (e.g., connecting to an international flight by flying from Pickering to Newark, then to Sao Paulo, Brazil versus flying direct from Toronto Pearson Airport to Sao Paulo).

Furthermore, compatibility with airlines currently established at Toronto Pearson Airport may be an issue. In consultations with air carriers, some expressed resistance to splitting their core hub operations between Toronto Pearson Airport and a new airport on the Pickering Lands. For this reason, and due to the close proximity of the Pickering Lands to Toronto Pearson Airport, it is considered unlikely that a new airport on the Pickering Lands would be developed solely to feed a major hub airport. This option was therefore discounted.

4.1.7 Option E: Major Air Cargo Airport

An airport supporting scheduled and charter air cargo services to domestic, transborder, and international destinations was also considered, and has been identified as Option E. As discussed in Section 2.1.4, the increased prevalence of e-commerce has increased the need for domestic, transborder, and international shipping of goods by air, indicating that, under the right circumstances, air cargo activities could play a role in the future of a new airport on the Pickering Lands. The identified airport service types applicable to Option E are presented in Table 4.6.

Table 4.6 – Option E – Major Air Cargo Airport - Service Types

	Passenger		Cargo		General Aviation		
	Scheduled	Charter	Scheduled	Charter	Commercial	Industrial	Other
Domestic	○	○	●	●			○
Transborder		○	●	●			
International		○	●	●			

● Primary Service Type

○ Secondary Service Type

A new airport on the Pickering Lands supporting the service types identified for Option E would have a defined role as a **Primary Hub (Cargo) Airport.**

Hamilton Airport has developed its role and service type to cater to dedicated scheduled and charter air service operators. Hamilton Airport's location, facilities, and lack of operational restrictions make it an appropriate location to continue serving domestic, transborder and international air cargo carriers. Developing a new airport on the Pickering Lands with the primary goal of serving the air cargo market in southern Ontario would compete directly with Hamilton Airport's established service types and role and would not satisfy the 'minimize negative impacts' evaluation criteria. For this reason, it was discounted.

4.2 Option Evaluation

The type and role options for a new airport on the Pickering Lands were primarily assessed and evaluated based on the following criteria:

1. **Minimal service overlap with existing airports in the system** - This approach seeks to minimize competition between the existing airports and a new airport by minimizing service type and role replication. Although the identification of the service type of a new airport on the Pickering Lands will be market-driven, it is assumed that the primary service types of a new airport will be those currently underserved by the system, so as to avoid the intentional replication of airport service types already provided within the system.

2. **Potential for financial and operational success** – This approach seeks to identify the potential for financial and operational success of each option. This assumes that should the entity responsible for establishing a new airport would be invested in increasing its chances for long-term financial and operational success. This criterion is further broken down into three sub-criteria that would contribute to an airport's potential for financial and operational success:

    a. anticipated business interest in the option,

    b. availability of talent with relevant skills, and

    c. availability of existing infrastructure / ability to build new infrastructure to support the airport.

In addition, the information collected through stakeholder consultations as part of the Supply and Demand Report and consultations completed by Dr. Polanski to assess stakeholder visions for a new airport were used to inform the assessment.

4.3 Summary of Evaluation

To summarize the analysis provided above, Table 4.7 provides a direct comparison of the options considered against the evaluation criteria.

Table 4.7 – Evaluation Summary

	Option A – Industrial Airport	Option B – Specialty Passenger Airport	Option C – Primary Hub International Airport	Option D – Passenger Feeder Airport	Option E – Major Cargo Airport
	Does the Option meet the Criterion?				
Criterion 1: Minimal service overlap with existing airports in the system (defined primarily as reducing competition between the airports by minimizing service type and role replication)	**Yes** – General Aviation Industrial as a primary service type in the southern Ontario airports system is not common as per Table 2.1.	**Yes** – The Passenger Charter primary service type is not common among airports in the southern Ontario airport network as per Table 2.1.	No – Creating a Primary Hub International Airport would compete directly with Toronto Pearson Airport replicate its primary service types.	**Yes** – A new Passenger Feeder Airport on the Pickering Lands would fulfill a unique role and service type in the southern Ontario airports system and would not negatively impact other system airports.	No – Creating a Major Cargo Airport would compete directly with Hamilton and Toronto Pearson Airports by replicating service types and roles.
Criterion 2a: Potential for financial and operational success, based on the anticipated business/market interest in the option	**Yes** – It is anticipated that there would be both developer and industrial tenant interest in an industrial airport. The industrial tenant would likely be involved in manufacturing, aircraft completions, or MRO activities.	**Yes** – It is anticipated that there would be passenger interest in a specialty passenger airport for two main reasons: 1) The location of a new Pickering Airport could better serve eastern communities of the GTA, which are relatively distant from the existing passenger serving airports. 2) ULCCs are currently not prevalent in the region, and a new airport may be able to draw from a large catchment area.	No – A new Primary Hub International airport on the Pickering Lands would be challenged by the fact that air carriers have expressed resistance to splitting their core hub operation between two airports, and so it would be difficult to attract major air carriers to the Pickering airport.	No – Learning from the Trudeau – Mirabel experience, it is anticipated that passengers would be unwilling to travel between Toronto Pearson Airport and a new Pickering Airport. Further, any airport developer would consider the passenger's preference for convenience (e.g., to take direct flights), and would be unlikely to invest in such an airport.	No – There would be significant competition with the major cargo hubs at Toronto Pearson and Hamilton Airport. Further, the infrastructure to support cargo operations is present at Hamilton Airport, and dedicated air cargo aircraft have established a base and distribution network there.
Criterion 2b: Potential for financial and operational success, based on the availability of talent with relevant skills	**Yes** – Industrial airports require specialized skill sets. The GTA's existing pool of skilled workers and local training programs specializing in aviation related fields would increase the likelihood of success for this airport type and role.	**Yes** – Specialty Passenger Airports typically do not require specialized skill sets, and so this is not a concern for this type of airport.	**Yes** – Primary Hub International Airports typically do not require specialized skill sets, and so this is not a concern for this type of airport.	**Yes** – Passenger Feeder Airports typically do not require specialized skill sets, and so this is not a concern for this type of airport.	**Yes** – Major Cargo Airports typically do not require specialized skill sets, and so this is not a concern for this type of airport.

	Option A – Industrial Airport	Option B – Specialty Passenger Airport	Option C – Primary Hub International Airport	Option D – Passenger Feeder Airport	Option E – Major Cargo Airport
	Does the Option meet the Criterion?				
Criterion 2c: Potential for financial and operational success, based on the initial capital investment needed to develop infrastructure required to support the airport type and role	**Yes** – Industrial airports typically require the least infrastructure investment, which is generally limited to providing utilities, road access, airfield infrastructure and prepared development lots (tenants are expected to be responsible for developing their respective facilities).	**Yes** – Passenger airports typically require more infrastructure to support their development (including increased transportation access to the airport, more airfield infrastructure, terminal space, parking space, etc.), however, this can be scaled to anticipated demand.	No – The initial capital costs required to develop a primary hub international airport are significant based primarily on the scale of the airport. These costs are typically only justified if it can be demonstrated that there is sufficient demand to recuperate the costs within a reasonable timeframe.	**Yes** – Passenger airports typically require more infrastructure to support their development (including increased transportation access to the airport, more airfield infrastructure, terminal space, parking space, etc.), however, this can be scaled to anticipated demand.	**Yes** – Cargo airports typically require the least infrastructure investment, which is generally limited to providing utilities, road access, airfield infrastructure and prepared development lots (tenants are expected to be responsible for developing their respective facilities).
Overall Assessment	**Meets all criteria**	**Meets all criteria**	Meets some criteria	Meets some criteria	Meets some criteria

The assessment of the five options for a new airport on the Pickering Lands identified two options as candidates for further analysis in Sections 5 and 6. Options A and B were deemed to have the appropriate combination of airport service types to facilitate economic growth within Durham Region and beyond. Options A and B were also identified to have minimal overlap in services with other airports within the southern Ontario airports system. Conversely, the Primary International Hub Airport, Passenger Feeder Airport, and a Major Air Cargo Hub Airport options were discounted, mainly due to their direct conflicts with the existing or planned roles of other airports. Table 4.8 summarizes the results of the options evaluation.

Table 4.8 – Results of Options Analysis and Evaluation

Option	Result
Option A: Industrial Airport	Selected for further study in Sections 5 and 6
Option B: Specialty Passenger Airport	Selected for further study in Sections 5 and 6
Option C: Primary Hub International Airport	Discounted due to conflict with Toronto Pearson Airport type and role
Option D: Passenger Feeder Airport	Discounted due to equivalent air service options at Toronto Pearson Airport.
Option E: Major Air Cargo Airport	Discounted due conflict with Hamilton and Toronto Pearson Airport types and roles.

5.0 AIRPORT DEVELOPMENT REQUIREMENTS

Of the five potential roles for a new airport on the Pickering Lands discussed in Section 4, Option A – Industrial Airport and Option B – Specialty Passenger Airport were selected for further analysis. In this section, development concepts are presented for a new airport on the Pickering Lands that are capable of fulfilling the requirements of both Option A and Option B are presented for a new airport on the Pickering Lands. This section contains commentary of a technical nature. Section 6 presents a conceptual land use plan that can accommodate the conceptual development plans presented here.

The actual development of a future airport on the Pickering Lands may differ from the concepts presented herein, due to changing market conditions and the evolving needs of prospective airport tenants. Conditions that could impact the development of a new airport on the Pickering Lands are identified and discussed in Section 2.1. Estimates of future airport demand and activity are based on the realization of a number of conditions and assumptions (for example, that the airport secures an anchor tenant for the industrial airport option). Therefore, the illustrations contained in this section should be interpreted as concept development plans only. Detailed airport master planning would be required if the development of the Pickering Airport goes forward.

Furthermore, the exact timing for developing the airport and the anticipated rate of growth of traffic at a new airport on the Pickering Lands are unknown. The size of an airport on the Pickering Lands may never reach the full development illustrated in the concept plans. As such, the phased concepts presented herein are intended to demonstrate how a new airport on the Pickering Lands could grow to accommodate both airport roles (Industrial Airport and Specialty Passenger Airport) without significant limitations. An analysis of airport constraints, presented in Appendix C, did not reveal any substantive limitations to the development of either Option. Each of the development concepts is self-contained, meaning that it could be fully operational without the presence of the other Option.

There is significant uncertainty related to the conceptual design of a new Airport on the Pickering Lands. Two of the greatest sources of uncertainty are related to the airport role and to the timing of airport development:

1. Airport Role – Because the airport options are based on a perceived market opportunity, rather than based on excess demand relative to existing capacity, the realization of the airport role(s) depends on business interest in pursuing the opportunities. Further, as the market evolves over time, the type and role of an airport may need to change to optimize its competitive advantage. For example, an industrial airport may shift roles to better serve flight training businesses if there is an identified opportunity and a business case for providing flight training. If an airport land use plan does not sufficiently consider potential market shifts, it may not be able to sufficiently accommodate new uses or new roles.

2. Timing of Development – Forecasting aviation demand for the purpose of airport development planning is challenging and depends on many underlying assumptions. Further, as the development concepts contemplated in this report are based on market opportunity, rather than excess demand, it is even more difficult to accurately predict the 'right' timing for development of a new airport. For example, while industry trends can be monitored, one cannot accurately predict when an aircraft manufacturer may elect to relocate operations or when and where a new passenger air carrier may enter the market.

While these uncertainties exist, their impacts can be mitigated through effective land use planning, and by developing a phased approach to airport development to allow the airport the opportunity to change service types and roles over time. These approaches can help improve the chances for airport success.

The development concepts for each of the Options demonstrate how organized growth can occur without restricting the airport type and role from evolving over time.

To demonstrate how Options A and B could grow to meet market demand over time while maintaining flexibility with respect to the exact timing of development and ability to support evolving roles and service types), three development concepts have been identified, as follows:

1. Small Development Concept: Representing the anticipated minimal infrastructure requirements and development areas of a new airport on the Pickering Lands.
2. Medium Development Concept: Demonstrating the first stage of potential growth as activity at the Airport increases. The expansions may include new airfield infrastructure, improved groundside access, terminal buildings, and additional land parcels.
3. Significant Development Concept: Assuming substantial growth in aviation activity at a new airport on the Pickering Lands. The Significant Development Concept does not depict the full build-out potential of the Airport. Instead, it demonstrates activities which could occur based on the factors discussed in Section 2.

The Medium and Significant Development Concepts build upon the infrastructure requirements identified and described in the Small Development Concept. However, it is not necessary for the airport to go through each of the phases of development sequentially – if a business case can be made for the Significant Development Concept, it could be developed all at once. Furthermore, although there is potential to provide non-aviation related commercial development lands, these lands have not been specifically depicted within the development concepts, as the purpose of this study is to consider development of the Pickering Lands for aviation purposes.

5.1 Key Development Assumptions and Considerations

To prepare the three development concepts for each of the two options considered, a number of common assumptions were made. These assumptions are identified and explained in detail:

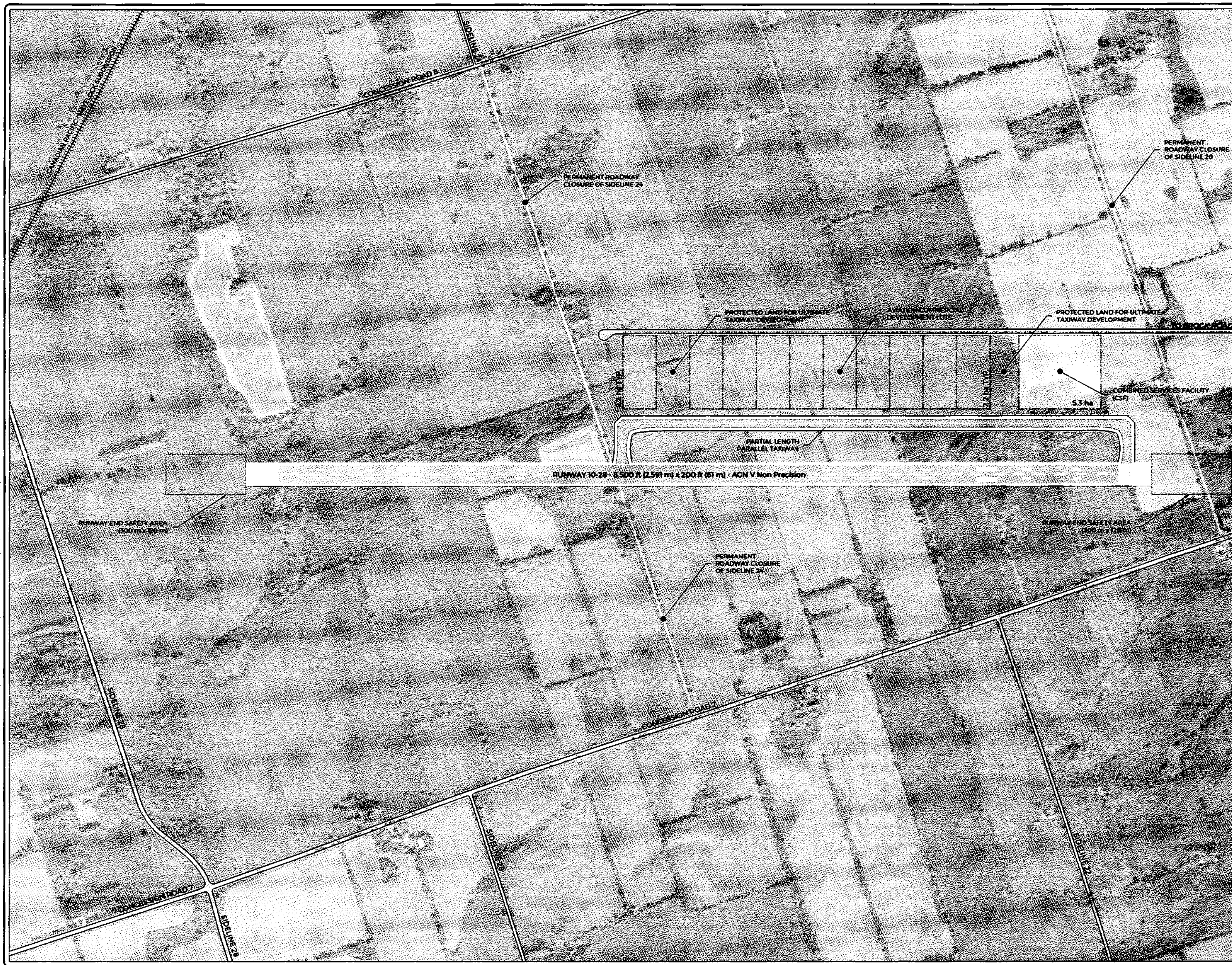
- Development concepts presented herein have been developed with a consideration of industry-recognized airport planning principles and regulatory requirements as specified by Transport Canada's – TP312 – Aerodrome Standards and Recommended Practices, 5th Edition.
- The runway configurations presented in the Development Concepts are aligned with the Pickering Airport Lands updated Zoning Regulations (see Appendix C).
- The long-range Boeing 787-9, which has an Aircraft Group Number (AGN) V, was selected as the design aircraft for both options. AGN is a categorization of an aircraft based on its wing span, outer main gear span, tail height, and approach speed. The AGN of the design aircraft normally defines the airfield design criteria including but not limited to runway and taxiway width and Obstacle Limitation Surfaces (OLS). The Boeing 787-9 was selected because it would be the largest anticipated aircraft for both Industrial and Specialty Passenger operations. The design aircraft is the aircraft identified as having the most demanding operational requirements with respect to the determination of movement area dimensions, and other aerodrome physical characteristics at an airport. The Boeing 787-9 is a new aircraft and is expected to be in operation up to and beyond 2036. The unique capacity of the aircraft (225 to 275 seats) and its excellent efficiency allow for it to serve point-to-point service to secondary airports, and is compatible with the type and role identified for a Specialty Passenger Airport. Although it is anticipated that the airport will be used more frequently by smaller aircraft, identifying a more demanding design aircraft allows for greater flexibility of aircraft operations.

5.2 Option A – Industrial Airport

The phased development of Option A (Industrial Airport) allows for the construction and further expansion of general aviation industrial and commercial facilities. The core element of Option A consists of prepared development lots with the capability to support industrial and general aviation activities but without detailing the exact size and type of development in the concepts.

5.2.1 Small Development Concept

The characteristics of the Small Development Concept for an Industrial Airport are illustrated in Figure 5.1, with the general characteristics identified herein.



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PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

INDUSTRIAL AIRPORT - SMALL DEVELOPMENT CONCEPT

Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.1	SHEET No.	01 of 09

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5.2.1.1 Airside Development

The Small Development Concept presented herein could be the initial configuration for a new airport on the Pickering Lands. The Small Development Concept includes a single 8,500 ft. (2,591 m) by 200 ft. (61 m) runway with shoulders (Runway 10-28) sufficiently sized to allow for nearly unrestricted operations of the aircraft mix typically associated with industrial and MRO operations (narrow-body aircraft such as the B737 series). The proposed runway length and width has the ability to accommodate Aircraft Group Number (AGN) V, which can be as large as modern airliners such as the long-range Boeing 787-9.

In addition, Runway End Safety Areas (RESAs) have been identified at both ends of the runway, designed to the International Civil Aviation Organization (ICAO) recommended length of 300 m. RESAs are provided to reduce the risk posed to aircraft that overrun or undershoot the runway. In this early stage of development, it is expected that Runway 10-28 will provide a Level of Service (referring to the accuracy of Instrument Flight Procedures that can be accepted on a runway) per Non-Precision (NP) standards. Nevertheless, the airfield configuration was configured to protect for a Precision (P) Level of Service when required by tenants and airport users. It is estimated that the Airside configuration presented in the Small Development Concept would be capable of accommodating approximately 75,000 annual aircraft movements.

A single AGN V partial parallel taxiway (75 ft. (23m) wide) was depicted to provide primary access to the Aviation Commercial Development Lots located north of Runway 10-28. The Aviation Commercial Development Lots identified within the development concept are sufficiently large (2.2 hectares) to accommodate the land requirements of large-scale tenants (such as aircraft manufacturers and Maintenance Repair and Overhaul facilities) but could be further subdivided to accommodate smaller tenants. It is assumed that future tenants will develop their own private taxiways and aprons to connect to the primary taxiway.

In the Small Development Concept, it is expected that minimal ground-based navigational aids will be required to support aircraft operating under Instrument Flight Rules (IFR). It is assumed that Runway 10-28 will be supported with Instrument Flight Procedures (IFPs) based on Global Positioning System (GPS) technology, such as Localizer Performance with Vertical Guidance (LPV) procedures. These procedures do not generally require ground-based infrastructure at the Airport and can be used by suitably equipped aircraft. Current trends indicate that the widespread growth and popularity of GPS-based IFPs will continue, supported by the fact that NAV CANADA (Canada's air navigations service provider) has commenced the decommissioning of many ground-based navigational aids nationwide (such as VHF Omni-Directional Ranges (VORs) and Non-Directional Beacons (NDBs)). The airfield characteristics of the Small Development Concept are presented in Table 5.1.

Table 5.1 – Airfield Characteristics, Small Development Concept

Runway Designation	Length	Width	AGN	Level of Service	Visual Aids[1]	Navigational Aids[2]	Aircraft Movement Capacity (Annual)	Capacity Constraint
Runway 10	8,500 ft. (2,591 m)	200 ft. (61 m)	AGN V	Non-Precision	High Intensity Runway Edge Lights	GPS (LPV or similar)	~75,000	Airfield
Runway 28								
Taxiways		75 ft. (23 m)	AGN V	-	Taxiway Edge Lights	-		

[1]Visual Aids include approach lighting systems, aerodrome flight maneuvering area hazard beacons, and visual aids provided on the movement area of an airport.

[2] Navigational Aids include ground-based, space-based, or on-aircraft systems that support or provide positioning capabilities.

5.2.1.2 Groundside Development and Airport Access

The Small Development Concept was created to minimize interruptions to the existing municipal road network. Sideline 20 and 24 roadways are identified for permanent closure because of conflicts with the proposed runway and supporting RESAs. A new two-lane access road connecting to Brock Road is depicted to provide access to the Aviation Commercial Developments Lots. Public transit service could be extended to the Airport by regional transit agencies (e.g., Metrolinx), should demand warrant – although public transit requirements are likely to be minimal in the Small Development Concept, and it is expected that the majority of trips to and from the Airport will be by private automobile. The Small Development Concept assumes that tenants will be responsible for providing adequate parking facilities within their development areas to support their operational requirements.

5.2.1.3 Airport Operations

Airport operations, administration, maintenance, and emergency response services are illustrated at the Combined Services Facility (CSF), with a suitable location proposed to the east of the Aviation Commercial Development Lots. A land assembly of 5.3 ha is protected for initial development and the ultimate expansion of the facility. Air Traffic Control services and dedicated de-icing facilities are not anticipated to be required in the Small Development Concept, as activity levels are expected to be well below the industry thresholds required to provide such services.

Based on the anticipated airport activity levels associated with the Small Development Concept, an on-site Air Traffic Services (ATS) facility is not likely to be required. Nonetheless, under the current operating rules of the Canadian Aviation Regulations (CARs), the Airport would be classified as uncontrolled (operated as an Aerodrome Traffic Frequency), meaning). This means that aircraft operating at, and in vicinity of the Airport would be responsible for broadcasting their intentions and ensuring self-separation between other aircraft through communications and visual contact. De-icing operations are anticipated to occur on the private aprons of the aviation commercial tenants on an ad hoc basis.

5.2.2 Medium Development Concept

The Medium Development Concept builds upon the Small Development concept and illustrates how additional lands can be developed to support additional airport tenants and accommodate growth in overall airport activity levels. The Medium Development Concept is illustrated in Figure 5.2, with the general characteristics identified in the following sections.

5.2.2.1 Airside Development

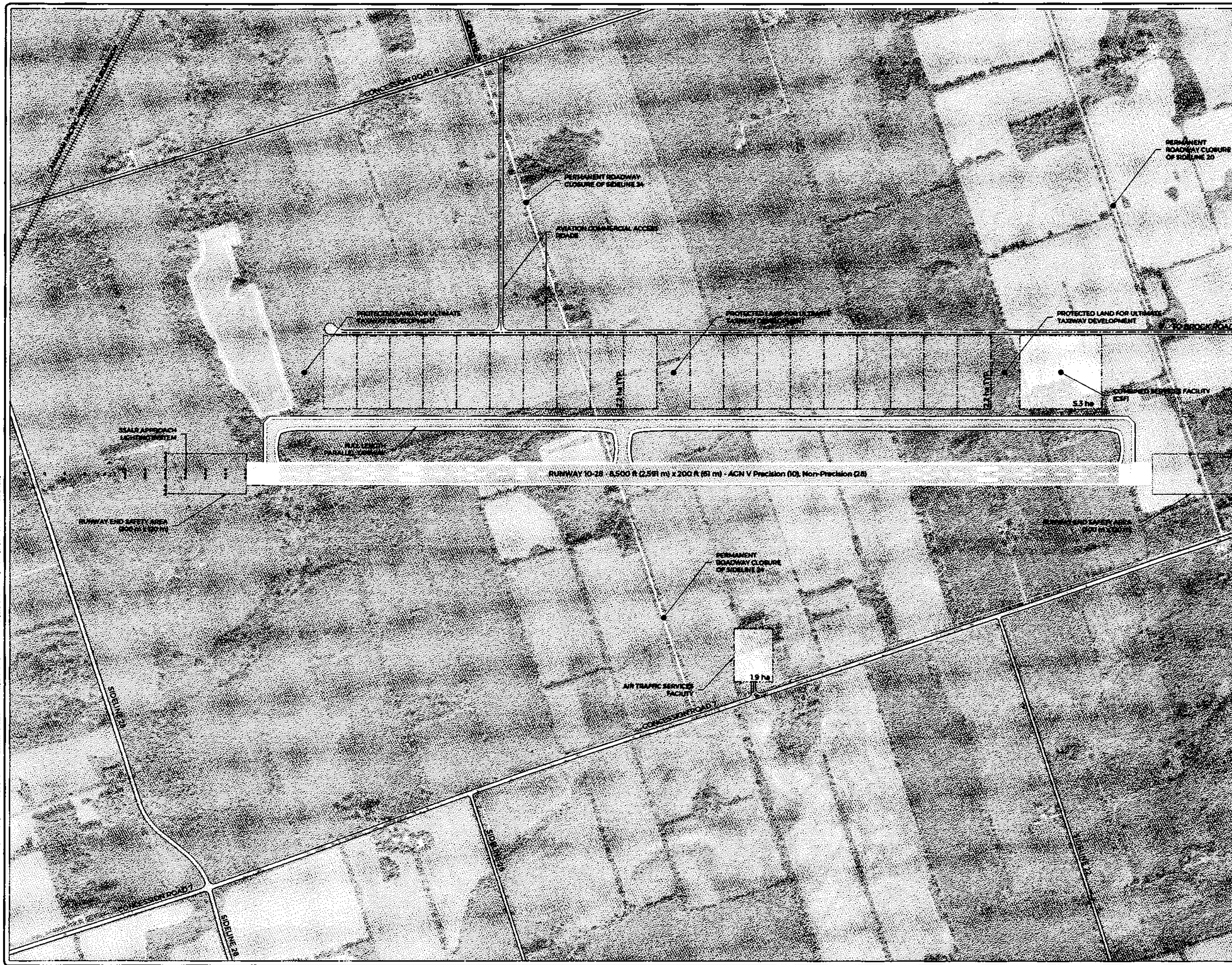
The Medium Development Concept involves a modest expansion of airside facilities identified in the Small Development Concept so as to accommodate increasing volumes of aircraft movements, and to improve the operational efficiency of the airfield. Runway 10-28 has not been identified for extension within this phase and it retains all of the specifications detailed in Section 5.1.1.1, with the exception of an improved approach lighting system (i.e., Short Simplified Approach Lighting System with Runway Alignment Strobes (SSALR)) supporting Runway 10). Expansions to Runway 10-28 are not required in the Medium Development Concept, as the runway length and width is adequate to continue supporting aircraft operations similar to the Small Development Concept.

The Medium Development Concept illustrates expansion of the partial parallel taxiway to the north of Runway 10-28 to a full-length parallel taxiway, allowing. This allows for the development of an additional nine (9) Aviation Commercial Development Lots when compared to the Small Development Concept. In addition, extension of the taxiway improves overall aircraft circulation and taxi times by eliminating the need for aircraft to backtrack (taxi and turn on the runway). Lands are also identified for future reserve within the Medium Development Concept to protect for the ultimate development of a north-south taxiway connecting to the northern airside complex identified in the Combined Significant Development (Option A + Option B) identified in subsequent sections of this report. The Airside configuration presented in the Medium Development Concept would be capable of accommodating approximately 100,000 annual aircraft movements.

Similar to the Small Development Concept for an Industrial Airport, it is assumed that airport tenants will develop their own private aprons connecting to the parallel taxiway to support aircraft parking and servicing activities. The airfield characteristics of the Medium Development Concept are presented in Table 5.2.

Table 5.2 – Airfield Characteristics, Medium Development Concept

Runway Designation	Length	Width	AGN	Level of Service	Visual Aids	Navigational Aids	Aircraft Movement Capacity (Annual)
Runway 10	8,500 ft. (2,591 m)	200 ft. (61 m)	AGN V	Precision	High Intensity Edge Lights, SSALR	GPS (LPV)	~100,000
Runway 28				Non-Precision	High Intensity Edge Lights		
Taxiways		75 ft. (23 m)	AGN V	-	Taxiway Edge Lights	-	



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PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

INDUSTRIAL AIRPORT- MEDIUM DEVELOPMENT CONCEPT

Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.2	SHEET No.	02 of 09

5.2.2.2 Groundside Development and Airport Access

The Medium Development Concept illustrates the extension of the two-lane access road connecting to Brock Road to provide access to all identified development lots. In addition, the Concept depicts a new two-lane north-south access road connecting to Concession Road 8. This will provide additional access capacity and an alternate access/egress from the Airport property in the event of an emergency.

Similar to the Small Development Concept, it is assumed that provision of parking areas will continue to be the responsibility of the airport tenants. Depending on demand, public transit services may be provided, but they are not expected to be required based on the anticipated role, service types and levels offered at the Airport in this Concept.

5.2.2.3 Airport Operations

Although actual Airport activity levels will dictate the requirement for Air Traffic Services (ATS) (such as an Air Traffic Control Tower or Flight Service Station), the Medium Development Concept illustrates a development parcel suitable for an Air Traffic Services Facility of approximately 1.9 ha in size. The location of the ATS facility has been selected based on highest and best use planning principles, and NAV CANADA's ATS facility guidelines.

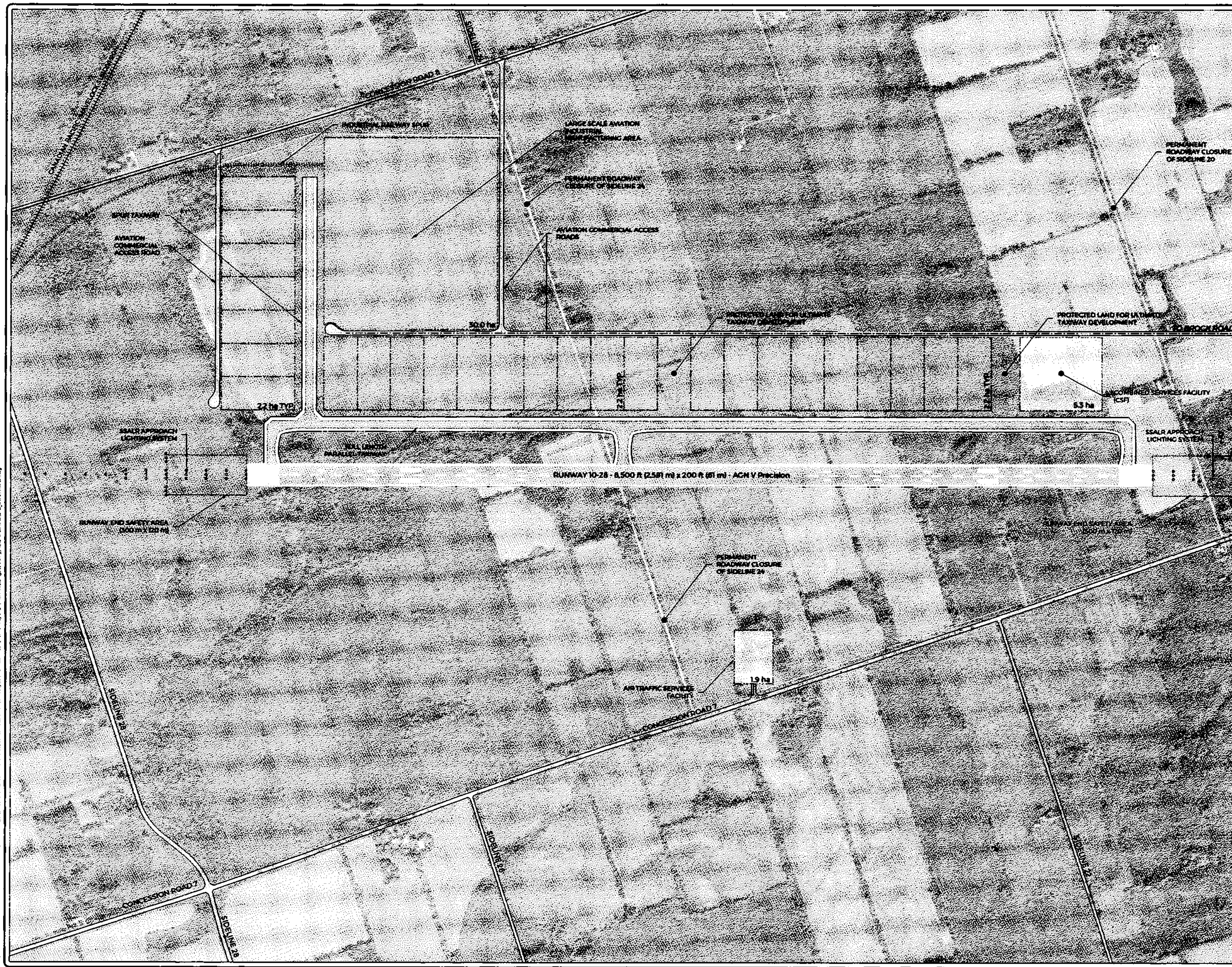
Modest expansions may be required to the CSF developed within the Small Development Concept to support the increased airport maintenance and administration requirements.

5.2.3 Significant Development Concept

The Significant Development Concept builds upon the Small and Medium Development Concepts and illustrates how expansion capacity can be provided to support additional airport tenants and accommodate growth in overall Airport activity levels. The Significant Development Concept is illustrated in Figure 5.3, with the general characteristics identified in the following sections.

5.2.3.1 Airside Development

The Significant Development Concept presented for a new Industrial Airport on the Pickering Lands is similar to the Medium Development Concept; the characteristics of the runway and taxiway system remain the same, with the exception of a new north-south spur taxiway and a SSALR approach lighting system for Runway 28 which would improve the Level of Service under instrument flight conditions. The AGN V (75 ft. (23 m) wide) spur taxiway is illustrated to provide access to seven (7) new Aviation Commercial Development Lots and a 30 ha Large Scale Aviation Industrial Manufacturing Area. As aircraft manufacturing activities are not typically associated with significant aircraft movement activity, a single runway is anticipated to be sufficient for the Significant Development Concept. It is estimated that the Airside configuration presented in the Significant Development Concept would be capable of accommodating approximately 125,000 annual aircraft movements. The airfield characteristics of the Significant Development Concept are presented in Table 5.3.



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Project No.	18M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.3	SHEET No.	03 of 09

Table 5.3 – Airfield Characteristics, Significant Development Concept

Runway Designation	Length	Width	Shoulders	AGN	Level of Service	Visual Aids	Navigational Aids	Aircraft Movement Capacity (Annual)
Runway 10	8,500 ft. (2,591 m)	200 ft. (61 m)	Yes	AGN V	Precision	High Intensity Edge Lights, SSALR	GPS (LPV)	~125,000
Runway 28					Precision	High Intensity Edge Lights, SSALR		
Taxiways		75 ft. (23 m)	Yes	AGN V		Taxiway Edge Lights		

5.2.3.2 Groundside Development and Airport Access

Building further upon the developments identified in the Small and Medium Development Concepts, a new additional north-south collector road connecting to Concession Road 8 is illustrated. This road would service the new Aviation Commercial Development Lots along the spur taxiway.

An industrial railway spur is also identified connecting Canadian Pacific's Havelock Subdivision to an Aviation Industrial development area. If required, this rail spur could be used for the transportation of aircraft components that are too heavy or large to be transported by other modes. The railway spur could also be used for the delivery of aviation fuel products, depending on airport activity levels and the volume of fuel dispensing capacity required. If required, the industrial railway spur is compatible with and could be constructed in the Small and/or Medium Development Concepts.

5.2.3.3 Airport Operations

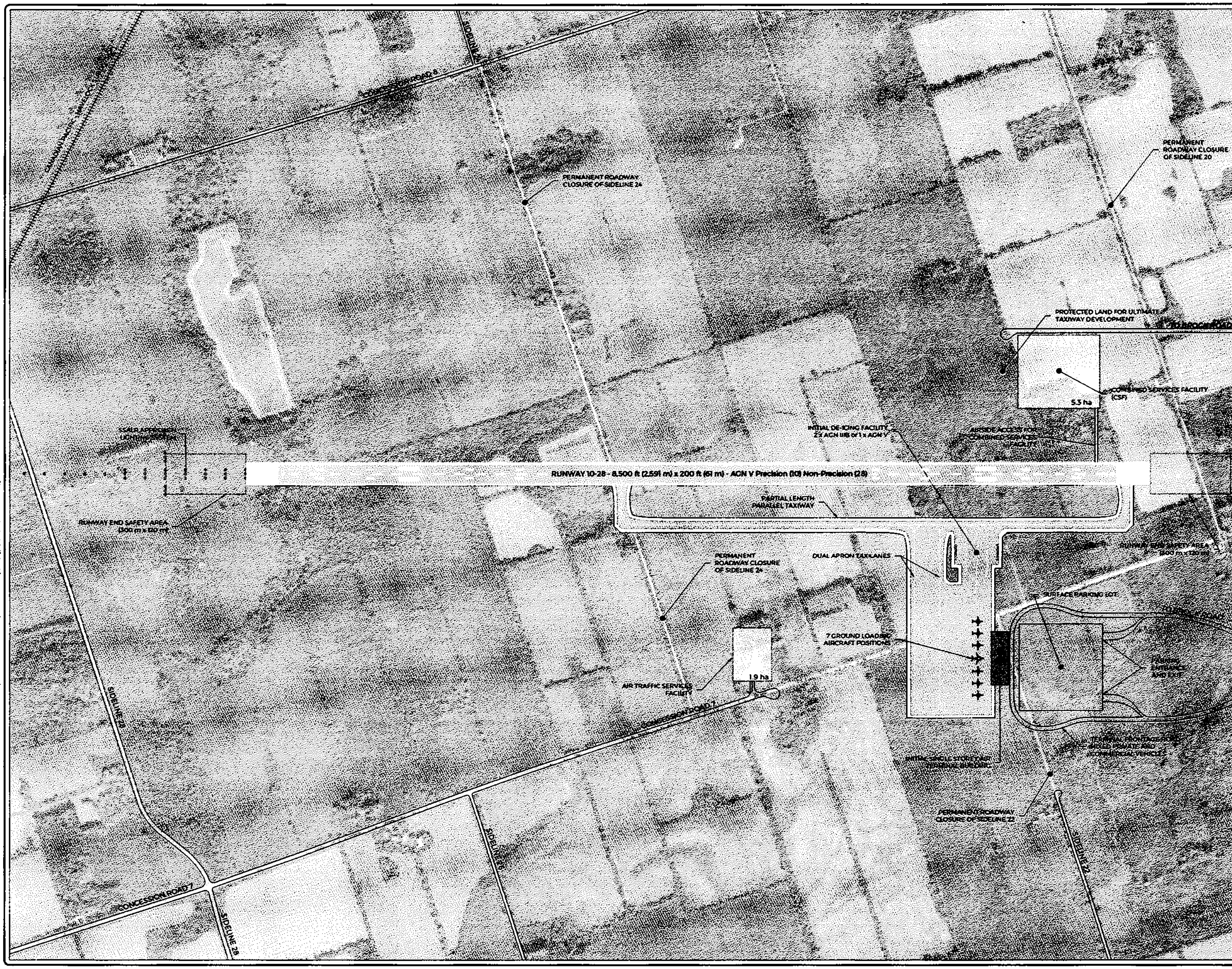
To adequately maintain and operate the expanded airport infrastructure illustrated within the Significant Development Concept, expansion of the Combined Services Facility within the existing land allocation may be required. Dependent on aircraft movements and airport congestion, the expansion of the Air Traffic Services Facility within its existing footprint may also be required.

5.3 Option B – Specialty Passenger Airport

Option B is a three-phased concept for the initial development and subsequent expansion of passenger facilities at a new airport on the Pickering Lands. The core components of Option B are passenger service focused, with general infrastructure elements including a terminal building, access roads, parking, and airport operational support facilities. The conceptual layout of these elements allows for expansion within and beyond the study development horizon (to 2036) to accommodate a large-scale passenger facility, if and when required.

5.3.1 Small Development Concept

The characteristics of the Small Development Concept for a Specialty Passenger Airport are illustrated in Figure 5.4, with the primary characteristics identified below.



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0 25 50 100 150 250 400 METRES

0 250 500 1000 FEET

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Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.4	SHEET No.	04 of 09

5.3.1.1 Airside Development

The Small Development Concept for a Specialty Passenger Airport includes a single 8,500 ft. (2,591 m) by 200 ft. (61 m) AGN V runway (Runway 10-28). The dimensions of Runway 10-28 allow for the nearly unrestricted operation of short and medium-range narrow-body passenger aircraft currently being operated in Canada (see Sections 5.2.3 and 5.2.4 in the Supply and Demand Report). Additionally, the runway dimensions can accommodate some smaller wide-body AGN V aircraft, such as the Boeing 787 (design aircraft). Runway 10-28 includes 300 m RESAs beyond both thresholds, illustrated to meet current ICAO best practices. Reliable commercial passenger air services require high levels of airport availability, therefore a SSALR approach lighting system is proposed for Runway 10 to allow a Precision Level of Service on Runway 10, with Runway 28 providing a Non-Precision Level of Service.

A single parallel AGN V taxiway (75 ft. (23 m) wide) is located to the south of the runway, spanning approximately half of the runway length. This taxiway is proposed to provide access to the Airport Terminal Building (ATB) development area to the southwest of the threshold of Runway 28. Aircraft loading would be conducted on an apron capable of providing approximately 7 ground loading positions, adjacent to the ATB. The apron is connected to the taxiway and features two taxi lanes to improve aircraft circulation. The Airside configuration presented in the Small Development Concept would be capable of accommodating approximately 75,000 annual aircraft movements.

Aircraft operating under Instrument Flight Rules (IFR) are expected to utilize GPS-based IFPs, such as an LPV procedure. As discussed in previous sections, the current trend of decommissioning ground-based navigation aids provides little justification for the installation of such facilities at a new airport on the Pickering Lands. However, the provision of a Category I Instrument Landing System (ILS) is likely to be required at a new Pickering Airport to provide the highest levels of airport availability in inclement weather.

The general airfield characteristics associated with the Small Development Concept for a Specialty Passenger Airport are summarized in Table 5.4.

Table 5.4 – Airfield Characteristics, Small Development Concept

<table>
<tr><th>Runway Designation</th><th>Length</th><th>Width</th><th>AGN</th><th>Level of Service</th><th>Visual Aids</th><th>Navigational Aids</th><th>Aircraft Movement Capacity (Annual)</th></tr>
<tr><td>Runway 10</td><td rowspan="2">8,500 ft. (2,591 m)</td><td rowspan="2">200 ft. (61 m)</td><td rowspan="2">AGN V</td><td>Precision</td><td>High Intensity Edge Lights, SSALR</td><td>GPS (LPV) CAT I ILS</td><td rowspan="3">~75,000</td></tr>
<tr><td>Runway 28</td><td>Non-Precision</td><td>High Intensity Edge Lights</td><td>GPS (LPV)</td></tr>
<tr><td>Taxiways</td><td></td><td>75 ft. (23 m)</td><td>AGN V</td><td>-</td><td>Taxiway Edge Lights</td><td>-</td></tr>
</table>

5.3.1.2 Air Terminal Building Development

The initial ATB supporting the Small Development Concept is envisioned to be a simple, single-story, modular facility that can be expanded in the future without disrupting passenger operations during construction. The terminal would include the typical amenities discussed in Section 6.1.2, including check-in areas, baggage drops, passenger screening facilities, secure hold rooms and concessions. The ATB is conceptually illustrated to support approximately 250,000 to 750,000 Passengers Per Annum (PPA), and has a similar configuration to Hamilton Airport. Given the passenger capacity of the ATB, approximately 4,000 to 12,000 passenger aircraft operations per annum could occur under the Small Development Concept, well within the 75,000-annual aircraft movement capacity. This suggests that the capacity constraint for the Small Development Concept is the ATB. Table 5.5 summarizes the airfield capacities as part of the Small Development Concept.

Table 5.5 – Airport Capacity – Small Development Concept

Terminal Capacity Low (PPA)	Terminal Capacity High (PPA)	Airfield Capacity (Annual Movements)	Aircraft Movements (Low Terminal Capacity)	Aircraft Movements (High Terminal Capacity)	Capacity Constraint
250,000	750,000	75,000	4,000	12,000	ATB

If a new airport on the Pickering Lands were to fulfill the role of a Specialty Passenger Airport within southern Ontario, it is anticipated that the ATB would primarily support the following service types through all three Development Concepts, with varying degrees of activity (as previously identified in Table 3.3):

- domestic scheduled and charter passenger air services;
- transborder charter passenger air services; and,
- international charter passenger air services.

The single-story configuration of the ATB in the Small Development Concept does not warrant passenger boarding bridges; therefore, passenger enplaning and deplaning would be conducted via air stairs on the apron (i.e., ground-based). Ground-based passenger enplaning/deplaning methods are a cost-effective option for both air carriers and the airport operator. The size of the ATB and its features would vary based on the desired Level of Service. However, this concept is assumed to cater to domestic scheduled Low-Cost or Ultra Low-Cost Carriers; therefore, a simple ATB facility with limited concessions and that minimizes unnecessary features is considered to be most likely for the Small Development Concept.

5.3.1.3 Groundside Development and Airside Access

When compared to the groundside infrastructure required to support an Industrial Airport, a Specialty Passenger Airport would require increased initial investment to provide appropriate access road and parking facilities.

The target market for passenger services is assumed to be cost-conscious passengers; such travelers desire connections to public, toll-free road infrastructure. For this reason, Brock Road has been identified as the primary means of airport access/egress for the travelling public and employees. Brock Road features a recently expanded interchange with Highway 407, and is planned to be expanded to seven (7) lanes to Highway 401 in the future.

Significant modifications and closures to the surrounding road network are required to accommodate the Small Development Concept for a Specialty Passenger Airport. The permanent closure of Sideline 20 and 24 roadways are illustrated to accommodate the development of Runway 10-28 and their associated RESAs. In addition, a partial closure of Concession Road 7 and Sideline 22 roadway is shown to accommodate the ATB and supporting groundside infrastructure.

A new two-lane terminal frontage road is illustrated connecting to Brock Road and aligned in an east-west orientation. The access and terminal frontage road system has been conceptually planned to allow vehicular traffic to diverge and travel in a one-way counter-clockwise direction around the surface parking lot. The road is aligned to allow for the expansion of the ATB, parking lots, and terminal curbside in subsequent development concepts. Initially, commercial and private vehicles would be mixed on the terminal curbside, further separated in subsequent growth concepts.

A surface-level vehicle parking facility is illustrated to the east of the ATB to accommodate short term, long term, and employee parking, with controlled entrance and exit points to the Terminal Frontage Road. A cell phone waiting area, where private vehicles wait to pick up arriving passengers on the terminal curbside, could be developed further to the east along the Terminal Frontage Road near its intersection with Brock Road.

Public transit access would primarily be by bus and likely operated by regional transit providers. Routes to major transit hubs, such as the Metrolinx Pickering GO Station and the York Region Transit Markham Stouffville Hospital terminal, are likely to serve as critical connections to downtown Toronto and other destinations. Transit buses would share the Terminal Frontage Road with commercial and private vehicles, but a dedicated layby zone on the terminal curbside would be provided to enable consistent service.

5.3.1.4 Airport Operations

Airport operations, administration, maintenance, and emergency response services would be housed at a Combined Services Facility (CSF) to the north of the threshold of Runway 28 (or administrative functions could be located within the ATB facility). A land assembly of 5.3 ha is assembled by the airport operator and protected for the ultimate expansion of the CSF; however, the initial facility would likely occupy less space. The land assembly retained for the CSF in the Specialty Passenger Airport Development Concepts is similar in its size and configuration to the Development Concepts for an Industrial Airport.

An access road connecting the CSF to the airside area is illustrated to allow maintenance and emergency response vehicles to enter and exit the airfield system. The anticipated size and frequency of aircraft operations warrants the provision of Aircraft Rescue and Fire Fighting (ARFF) services, in turn requiring an emergency response facility in close proximity to the runway thresholds.

A dedicated de-icing facility is provided on the apron to the north of the ATB to provide a common area for de-icing operations. The facility has been conceptually illustrated to accommodate two AGN IIIB aircraft (e.g., Boeing 737) simultaneously or one AGN V aircraft (e.g., the Boeing 787).

Air Traffic Services (ATS) facilities are illustrated on a 1.9 ha land reserve, with the same location and dimensions as those proposed in the Industrial Airport Development Concepts. The area reserves sufficient land for the initial development and expansion of Air Traffic Services, up to the ultimate build-out of the airport. Full Air Traffic Control Services are ultimately anticipated to be required, although the exact timing (and therefore phase) of when they may be required is difficult to determine in the absence of aircraft movement activity forecasts.

5.3.2 Medium Development Concept

The Medium Development Concept for a Specialty Passenger Airport builds upon the Small Development Concept and illustrates how the Airport can further expand to accommodate growing passenger and aircraft movement demand. The Medium Development Concept is illustrated in Figure 5.5, with the general characteristics identified in the following sections.

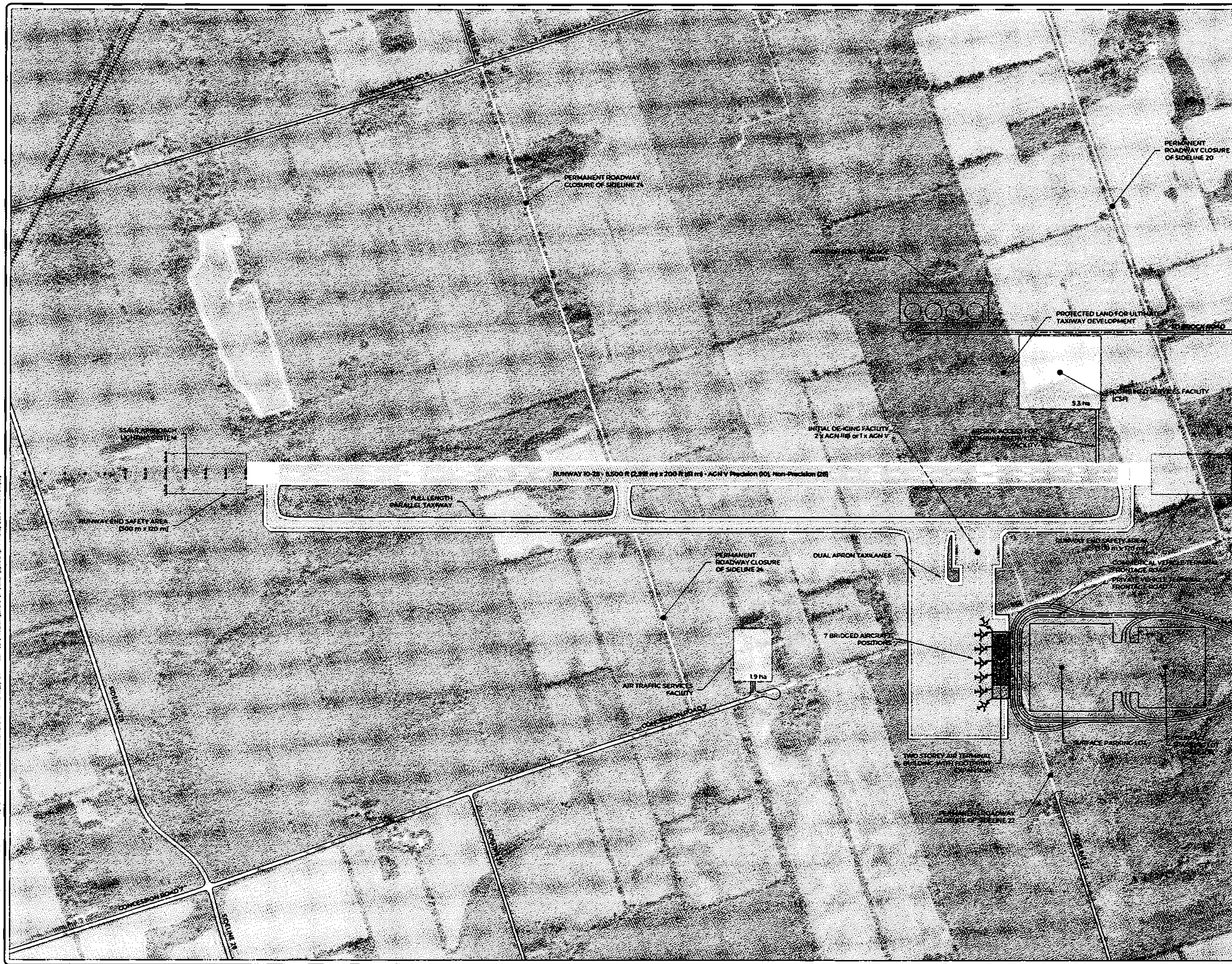
5.3.2.1 Airside Development

The Medium Development Concept expands upon the airside infrastructure developed in the Small Development Concept (Section 5.2.1.1). The anticipated length and width of Runway 10-28 remains unchanged; however, the concept illustrates an extension of the AGN V (75ft. (23 m) wide) parallel taxiway in a westerly direction to the threshold of Runway 10. As discussed in the Industrial Airport Option, the extension of the taxiway to a full-length parallel facility allows for greater operational efficiency and eliminates the requirement for aircraft to backtrack when operating on Runway 10. The apron facility supporting the ATB has also been expanded to the south to support anticipated traffic levels accommodated by an expanded ATB facility. It is estimated that the Airside configuration presented in the Medium Development Concept would be capable of accommodating approximately 100,000 annual aircraft movements.

Table 5.6 outlines the airfield characteristics in Medium Development Concept.

Table 5.6 – Airfield Characteristics, Medium Development Concept

Runway Designation	Length	Width	AGN	Level-of-Service	Visual Aids	Navigational Aids	Aircraft Movement Capacity (Annual)
Runway 10	8,500 ft. (2,591 m)	200 ft. (61 m)	AGN V	Precision	High Intensity Edge Lights, SSALR	GPS (LPV) CAT I ILS	~100,000
Runway 28				Non-Precision	High Intensity Edge Lights	GPS (LPV)	
Taxiways		75 ft. (23 m)	AGN V		Taxiway Edge Lights		



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Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AM
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DRAWING No.	FIGURE 5.5	SHEET No.	05 of 09

5.3.2.2 Air Terminal Building Development

Within the Medium Development Concept, the ATB is significantly expanded from the Small Development Concept, leading to a doubling of its passenger processing capacity. This is achieved through the modest building footprint expansion to the south and the addition of a second storey. The ATB for the Medium Development Concept is conceptually illustrated to support approximately 750,000 to 1,500,000 Passengers Per Annum (PPA), and has a similar configuration to the Regina Airport. Given the passenger capacity of the ATB, it is estimated that approximately 11,000 to 22,000 passenger aircraft operations per annum could occur under the Medium Development Concept, well within the 100,000 Annual Aircraft Movement Capacity. This suggests that the capacity constraint for the Medium Development Concept is the ATB. Table 5.7 summarizes the airfield capacities as part of the Medium Development Concept.

Table 5.7 – Airport Capacity – Medium Development Concept

Terminal Capacity Low (PPA)	Terminal Capacity High (PPA)	Airfield Capacity (Annual Movements)	Aircraft Movements (Low Terminal Capacity)	Aircraft Movements (High Terminal Capacity)	Capacity Constraint
750,000	1,500,000	100,000	11,000	22,000	ATB

The two-storey configuration allows for the construction of seven Passenger Boarding Bridges (PBBs). PBBs improve the passenger enplaning and deplaning experience, especially in the winter and in poor weather conditions, and enhance operational efficiency and security. The expanded ATB could increase the floor space available for concessions and act as an additional source of revenue for the airport operator.

5.3.2.3 Groundside Development and Airport Access

The ability of the groundside system to accommodate passenger growth is significantly improved under the Medium Development Concept compared to the Small Development Concept for a Specialty Passenger Airport. Most importantly, the Terminal Frontage Road is illustrated to diverge near the ATB curbside to segregate commercial and private vehicle traffic. This is a common practice at many passenger airports in Canada, as it allows for efficient passenger pick-up and drop-off operations, minimizes congestion, and accommodates the requirements of commercial and private vehicles. Commercial vehicles, such as taxis, limousines, hotel shuttles and buses often have significant dwell times (time spent waiting), which can result in long vehicle queues. Conversely, private vehicles dropping off and picking up passengers typically have shorter dwell times, requiring less extensive roadway infrastructure.

When compared to the Small Development Concept, the surface parking lot has been illustrated to expand to the east, with minor modifications to the entrance and exit ramps to accommodate increased traffic and the geometric expansion itself. The addition of a cell phone parking lot would further reduce vehicle dwell times, providing meeters and greeters with the opportunity to wait within their vehicle for an arriving passenger without congesting the terminal access and curbside road network.

To provide access to an aviation fuel storage facility (fuel farm), the Medium Development Concept illustrates expansion of the CSF collector road to the west.

5.3.2.4 Airport Operations

In the Medium Development Concept, an aviation fuel storage facility is anticipated to be required and has been illustrated in a location to the north of Runway 10-28, and to the west of the CSF. The fuel facility has been conceptually sized to accommodate the fuel demands of the ultimate development of the Airport. It is anticipated that passenger aircraft fueling will be conducted via in-ground hydrant fueling, with fuel transported via underground pipelines from the fuel storage facility to the apron, and/or by fuel tanker trucks. A modest expansion of the Combined Services Facility may be required to accommodate additional maintenance equipment and administrative spaces to support the operation of the expanded airport, when compared to the Small Development Concept.

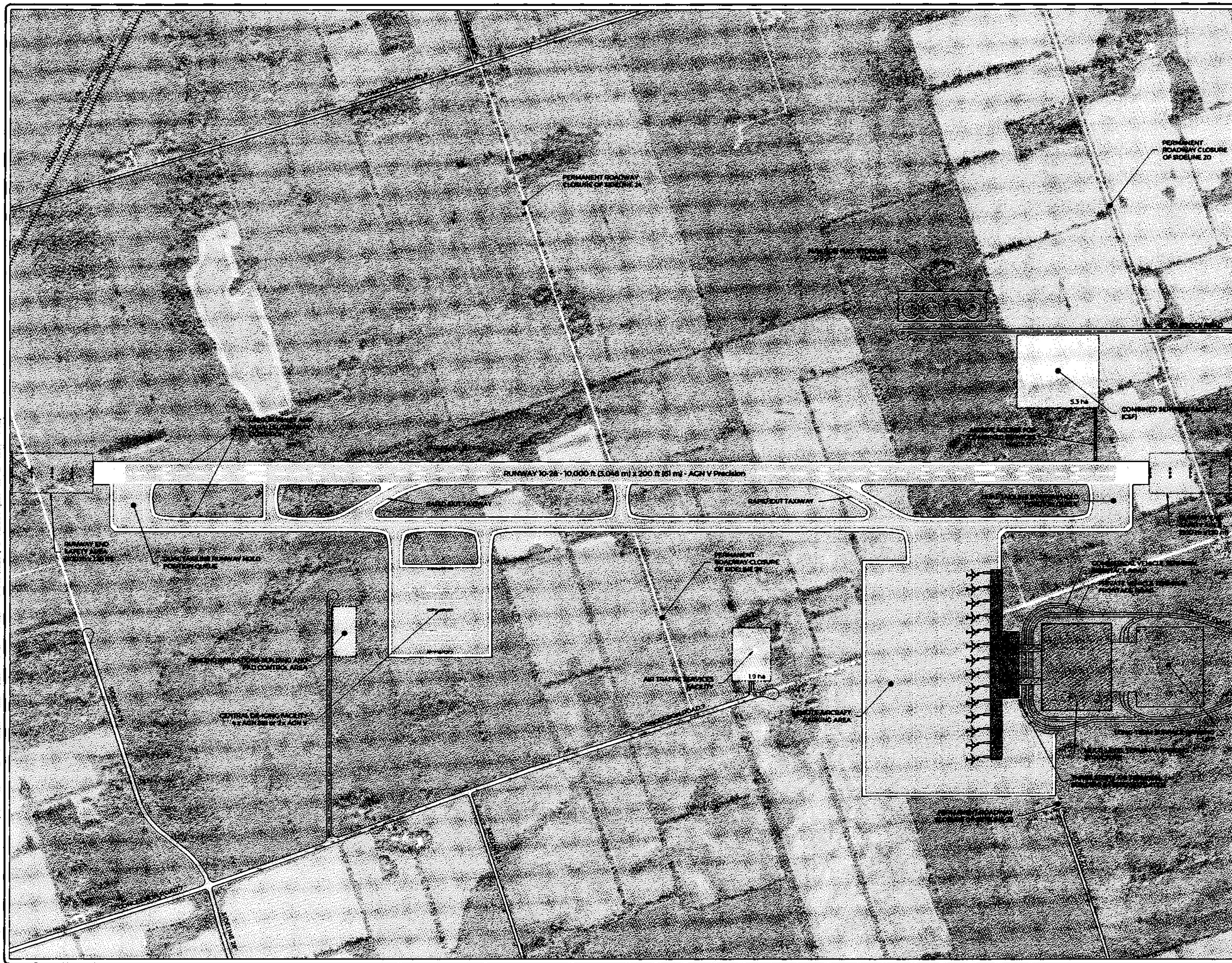
5.3.3 Significant Development Concept

The Significant Development Concept for a Specialty Passenger Airport builds upon the Small and Medium Development Concepts and illustrates how additional lands can be developed to accommodate growth in overall airport activity levels, which in these concepts, is mainly through increased passenger volumes. The Significant Development Concept is illustrated in Figure 5.6, with the general characteristics identified in the following sections.

5.3.3.1 Airside Development

The Significant Development Concept illustrates expansion of the airside facilities in Section 5.3.2.1 to increase the operational capabilities of the Airport and to improve the efficiency of aircraft movements. Runway 10-28 is extended by 1,500 ft. (457 m) to a total length of 10,000 ft. (3,048 m), to provide the capability of less restrictive operations of heavier, longer range aircraft. While Runway 10-28 maintains its designation as an AGN V facility, it could accommodate larger and heavier wide-body aircraft (up to the Boeing 777) based on an ultimate runway length of 10,000 ft. The runway extension includes the relocation of the Runway 10 RESA and approach lighting system. Improved approach lighting and a provision for an Instrument Landing System are provided on Runway 28 to increase its capability in poor weather conditions. Both Runway 10 and 28 provide Precision Levels of Service within the Significant Development Concept.

The taxiway system is also illustrated to support the extended runway and to optimize airfield efficiency. At both runway thresholds, the taxiways have been widened to accommodate dual taxi lanes, which allows two aircraft to hold short of the runway simultaneously prior to takeoff. This provides additional queuing space and reduces aircraft runway occupancy times. The introduction of two rapid exit taxiways would allow arriving aircraft to exit the runway at higher speed, reducing the amount of time spent on the runway. Reducing runway occupancy times allows for a higher number of aircraft movements to be processed on a runway in a given time period, therefore increasing capacity and reducing congestion. It is estimated that the Airside configuration presented in the Significant Development Concept would be capable of accommodating approximately 150,000 annual aircraft movements.



N W E S

General Notes

1. DRAWING TO BE USED FOR PLANNING PURPOSES ONLY

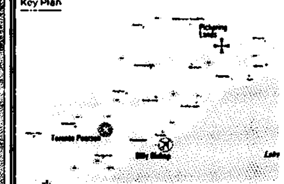
Legend

ULTIMATE DEVELOPMENT CONFIGURATION
- DEVELOPMENT LOT OR RESERVE
- AIRFIELD PAVEMENT
- PAVED SHOULDERS
- PROPERTY BOUNDARY
- RAIL CORRIDOR

Scale 1:5000

0 25 50 100 150 250 400 METRES
0 250 500 1000 FEET

Key Plan



No.	DATE	DESCRIPTION	BY	APPV
B	Sept 2018	FINAL	NI	AIM
A	July 2018	DRAFT	NI	AIM

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Transports Canada / Transport Canada

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PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

SPECIALTY PASSENGER AIRPORT - SIGNIFICANT DEVELOPMENT CONCEPT

Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.6	SHEET No.	06 of 09

The apron is illustrated to expand to the west to support remote aircraft parking and servicing at a distance from the ATB, typically utilized during peak or overnight periods. Additional apron extension has been depicted to the south and southeast of the expanded ATB to allow for ground boarding operations supporting small regional or commuter aircraft on the eastern side of the facility. A relocated aircraft de-icing facility is shown to the west on the south side of Runway 10-28 to allow for the expansion of the ATB.

The general airfield characteristics in the Significant Development Concept are presented in Table 5.8.

Table 5.8 – Airfield Characteristics, Significant Development Concept

Runway Designation	Length	Width	AGN	Level-of-Service	Visual Aids	Navigational Aids	Aircraft Movement Capacity (Annual)
Runway 10	10,000 ft. (3,048 m)	200 ft. (61 m)	AGN V	Precision	High Intensity Edge Lights, SSALR	GPS (LPV) CAT I ILS	~150,000
Runway 28						GPS (LPV) CAT I ILS	
Taxiways		75 ft. (23 m)	AGN V		Taxiway Edge Lights		

5.3.3.2 Air Terminal Building Development

To support higher volumes of passengers on an annual and peak period basis, the ATB requires substantial expansion beyond the concept illustrated for the Medium Development Concept. For the Significant Development Concept, the ATB is illustrated to support approximately 1,500,000 to 5,000,000 Passengers Per Annum (PPA), and has a similar configuration to the Ottawa International Airport. Given the passenger capacity of the ATB, it is estimated that approximately 20,000 to 65,000 passenger aircraft operations per annum could occur under the Significant Development Concept, well within the 150,000-annual aircraft movement capacity. This suggests that the capacity constraint for the Significant Development Concept is the ATB. Table 5.9 summarizes the airfield capacities as part of the Significant Development Concept.

Table 5.9 – Airport Capacity – Significant Development Concept

Terminal Capacity Low (PPA)	Terminal Capacity High (PPA)	Airfield Capacity (Annual Movements)	Aircraft Movements (Low Terminal Capacity)	Aircraft Movements (High Terminal Capacity)	Capacity Constraint
1,500,000	5,000,000	150,000	20,000	65,000	ATB

The ATB facility associated with the Significant Development Concept consists of a three-storey central passenger processing area, and connecting two-storey linear concourse extending to the north and south. The ATB is conceptually illustrated to provide fourteen fixed passenger boarding bridges along the western façade, with an additional four ground loading gates on the eastern side of the linear concourse. During periods of significant demand (peak hours), passenger enplanements and deplanements could be supported by ground loading operations within the remote aircraft parking area identified on the western side of the apron with the support of transfer buses and mobile aircraft stairs. In general, the ATB facility conceptually illustrated for the Significant Development Concept provides more than two and a half times the capacity when compared to the facility conceptually presented for the Medium Development Concept.

5.3.3.3 Groundside Development and Airport Access

Minor changes to the Terminal Frontage Road have been conceptually illustrated within the Significant Development Concept, when compared to the Medium Development Concept. Primary enhancements to the airport access infrastructure include an overpass ramp from Brock Road (northbound) to the Terminal Frontage Road (westbound), supporting efficient flows for vehicles accessing the Airport from the south by eliminating the need for a left-hand turn while traveling northbound.

The Terminal Frontage Road is largely unchanged as it abuts the ATB facility, when compared to the Medium Development Concept - only minor realignments and widening to accommodate increased traffic volumes are illustrated. The surface parking lot adjacent to the ATB is replaced by a multi-level parking structure to substantially increase capacity. The parking structure, constructed in a modular fashion, is anticipated to be easily expandable by adding additional levels. The development of a small two-lane road is conceptually illustrated to provide access to the relocated de-icing facility.

5.3.3.4 Airport Operations

The primary differences to Airport Operations between the Medium and Significant Development Concepts for a Specialty Passenger Airport are the relocation of the de-icing facility, and the potential expansion of the CSF.

The new Central De-icing Facility (CDF) is conceptually illustrated to the west of the ATB and apron complex, near the threshold of Runway 10. The facility's location decreases the aircraft taxi time to Runway 10, which is anticipated to be the dominant runway in operation during severe winter weather events with easterly prevailing winds, based on knowledge of local climactic conditions. An additional flex de-icing bay is provided within this concept to improve the throughput capacity of the CDF. The facility can accommodate four AGN III aircraft (e.g., Boeing 737) or two AGN V aircraft (e.g., Boeing 787) simultaneously, doubling the capacity of the de-icing facility shown in the Small and Medium Development Concepts. A land reserve for a de-icing operations building and pad control tower is provided west of the de-icing bays, allowing for future de-icing pads to be installed to the south with minimal conflict to other airfield infrastructure.

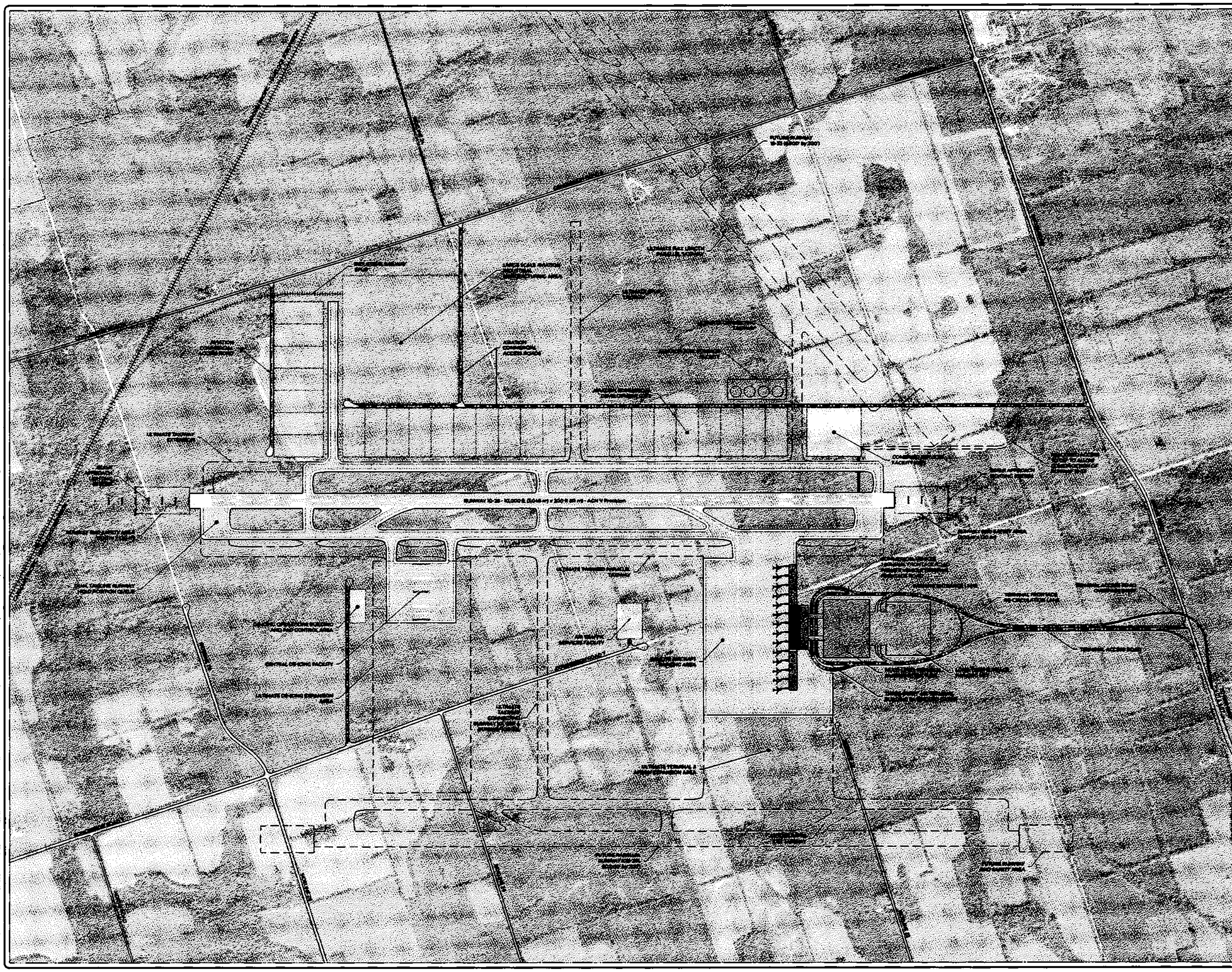
The CSF is likely to require incremental expansions beyond the size required for the Small and Medium Development Concepts to support increased airport maintenance and operational activities. Adequate space has been illustrated within the concept to allow for this expansion.

5.4 Options A and B – Concurrent Development, Multiple Service Types and Roles

A conceptual plan was developed to demonstrate how a new airport on the Pickering Lands could develop as both an Industrial Airport (Option A) and as a Specialty Passenger Airport (Option B), without major infrastructure reconfigurations. Figure 5.7 shows how the Significant Development Concepts for both Options have been developed whereby they can be integrated on the site. The parallel runways, crosswind runway, and taxiway infrastructure, as well as their protective operational areas, are illustrated to demonstrate the ultimate development of the Airport in accordance with the Pickering Lands Airport Zoning Regulations (AZRs). Given the large assembly of land available, the conceptual land allocations illustrated herein do not preclude a new airport on the Pickering Lands from becoming a major large-scale domestic or international airport facility, although this is not described in Option A or B. The concept also provides an overall sense of scale, demonstrating the true size of the Pickering Lands and how the growth of an airport of any size is not overly constrained by land availability.

5.5 Options A and B – Summary

To easily compare and contrast the two airport types, as well as their constituent development concepts, Tables 5.10 and 5.11 present a high-level overview of the general elements of each of the development concepts presented for a new Industrial and/or Specialty Passenger Airport on the Pickering Lands.



General Notes

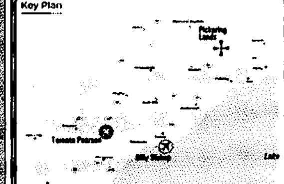
1. DRAWING TO BE USED FOR PLANNING PURPOSES ONLY

Legend

- ULTIMATE DEVELOPMENT CONFIGURATION
- DEVELOPMENT LOT OR RESERVE
- AIRFIELD PAVEMENT
- PAVED SHOULDERS
- AVIATION COMMERCIAL LOTS
- PROPERTY BOUNDARY
- RAIL CORRIDOR

Scale 1:7500

Key Plan



No.	DATE	DESCRIPTION	BY	APPD
B	Sept 2018	FINAL	NI	AIM
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Client

Transports Canada — Transport Canada

Project

PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

COMBINED INDUSTRIAL AND SPECIALTY PASSENGER AIRPORT SIGNIFICANT DEVELOPMENT CONCEPTS

Project No.	18M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE 5.7	SHEET No.	07 of 09

[redacted]

Table 5.10 – Summary, Option A – Industrial Airport

Development Concept	Runways	Taxiways	Aviation Commercial Development Lots	Groundside Network	Parking	Transit	Airport Operations
Small	Runway 10-28 8,500 ft. x 200 ft. (2,591 m x 61 m) Shoulders 300 m RESA AGN V Non-Precision[1] High intensity edge lights LPV instrument flight procedures	Partial length parallel taxiway 75 ft. (23 m) width AGN V Taxiway edge lights	10 lots (2.2 ha) Total: 22 ha of developable land	Permanent closure of Sidelines 20 and 24. New collector road connected to Brock Road.	Parking provided by tenants, additional public parking provided on the collector roads.	Transit service dependent on demand. No dedicated transit infrastructure.	Airport administration and maintenance at a 5.3 ha Combined Services Facility (CSF). No ground based navigational aids. No dedicated de-icing facility. Uncontrolled airport.
Medium	Runway 10-28 8,500 ft. x 200 ft. (2,591 m x 61 m) Shoulders 300 m RESA AGN V Precision[1] High intensity edge lights SSLAR approach lighting system, Runway 10	Full length parallel taxiway 75 ft. (23 m) width AGN V Taxiway edge lights	19 lots (2.2 ha) Total: 42 ha of developable land	Permanent closure of Sidelines 20 and 24. New collector road connected to Brock Road. Construct new collector road to Concession Road 8.	Parking provided by tenants, additional public parking provided on the collector roads.	Transit service dependent on demand. No dedicated transit infrastructure.	Airport administration and maintenance at a 5.3 ha Combined Services Facility (CSF). No ground based navigational aids. No dedicated de-icing facility. Air Traffic Services (ATS) on 1.9 ha reserve.

[redacted]

Development Concept	Runways	Taxiways	Aviation Commercial Development Lots	Groundside Network	Parking	Transit	Airport Operations
Significant	Runway 10-28 8,500 ft. x 200 ft. (2,591 m x 61 m) Shoulders 300 m RESA AGN V Precision[1] High intensity edge lights SSLAR approach lighting system, Runway 10 and 28	Full length parallel taxiway and spur taxiway 75 ft. (23 m) width AGN V Taxiway edge lights	26 lots (2.2 ha) 1 large-scale aviation industrial manufacturing area lot (30 ha) Total: 87 ha of developable land	Permanent closure of Sidelines 20 and 24. New collector road connected to Brock Road. Two new collector roads to Concession Road 8. New freight railway spur between Canadian Pacific – Havelock Subdivision and Large-Scale Aviation Industrial Manufacturing Area.	Parking provided by tenants, additional public parking provided on the collector roads.	Transit service dependent on demand. No dedicated transit infrastructure.	Airport administration and maintenance at a 5.3 ha Combined Services Facility (CSF). No ground based navigational aids. No dedicated de-icing facility. Full Air Traffic Services (ATS) facility and services on 1.9 ha reserve.

[1] Denotes highest level-of-service available.

Table 5.11 – Summary, Option B – Specialty Passenger Airport

Development Concept	Runways	Taxiways & Aprons	Air Terminal Building (ATB)	Groundside Network	Parking	Transit	Airport Operations
Small	Runway 10-28 8,500 ft. x 200 ft. (2,591 m x 61 m) Shoulders 300 m RESA AGN V Precision[1] High intensity edge lights ILS Runway 10 SSLAR approach lightning system, Runway 10	Partial length parallel taxiway. 75 ft. (23 m) width AGN V Taxiway edge lights Dual taxi-lane terminal apron.	Single-storey ATB with 7 ground loading gates. Annual capacity (PPA): 250,000-750,000	Permanent closure of Sidelines 20 and 24. Partial termination of Concession Road 7 and Sideline 22. Collector road to Brock Road to serve the CSF. Terminal access loop road to Brock Road.	Surface parking accommodating short and long-term vehicles and employees. Cell phone waiting area located to the east.	Regional transit connections anticipated. Dedicated bus layby area provided on Terminal Frontage Road.	Combined Services Facility (CSF), 5.3 ha reserve. Airport fire hall on CSF lands. Air Traffic Control. 2 bay dedicated de-icing facility.
Medium	Runway 10-28 8,500 ft. x 200 ft. (2,591 m x 61 m) Shoulders 300 m RESA AGN V Precision[1] High intensity edge lights ILS Runway 10 SSLAR approach lightning system, Runway 10	Full length parallel taxiway. 75 ft. (23 m) width AGN V Taxiway edge lights Dual taxi-lane terminal apron.	Two-storey ATB with 7 bridged aircraft gates. Annual capacity (PPA): 750,000-1,500,000	Permanent closure of Sidelines 20 and 24. Partial termination of Concession Road 7 and Sideline 22. Collector road to Brock Road to serve the CSF and fuel storage facility. Terminal access loop road to Brock Road, with separate commercial and private vehicle terminal frontage roads provided.	Surface parking accommodating short and long-term vehicles and employees. Cell phone waiting area located to the east.	Regional transit connections anticipated. Dedicated bus layby area provided on Terminal Frontage Road.	Combined Services Facility (CSF), 5.3 ha reserve. Airport fire hall on CSF lands. Air Traffic Control. 2 bay dedicated de-icing facility. Fuel storage facility.

Development Concept	Runways	Taxiways & Aprons	Air Terminal Building (ATB)	Groundside Network	Parking	Transit	Airport Operations
Significant	Runway 10-28 10.000 ft. x 200 ft. (3.048 m x 61 m) Shoulders 300 m RESA AGN V Precision[1] High intensity edge lights ILS Runway 10 and 28 SSLAR approach lightning system, Runway 10 and 28	Full length parallel taxiway. Rapid exit taxiways. Dual taxi-line runway hold positions. 75 ft. (23 m) width AGN V Taxiway edge lights Dual taxi-line runway hold positions. Dual taxi-lane terminal apron, area for remote aircraft parking.	Three-storey ATB with 14 bridged aircraft gates, 4 ground loading gates. Annual capacity (PPA): 1,500,000 – 5,000,000	Permanent closure of Sidelines 20 and 24. Partial termination of Concession Road 7 and Sideline 22. Collector road to Brock Road to serve the CSF and fuel storage facility. Terminal access loop road to Brock Road, with separate commercial and private vehicle terminal frontage roads provided. Sideline 28 partially terminated. Access road from Concession Road 8 to de-icing operations building.	Multi-level terminal parking structure. Long-term surface parking lot. Cell phone waiting area located to the east.	Regional transit connections anticipated. Dedicated bus layby area provided on Terminal Frontage Road.	Combined Services Facility (CSF). 5.3 ha reserve. Airport fire hall on CSF lands. Air Traffic Control. 4 bay dedicated de-icing facility. Fuel storage facility.

[1] Denotes highest level-of-service available.

6.0 LAND USE

Land use planning is critical to ensuring that the development and growth of an airport is both efficient and orderly. A land use plan designates different land areas according to their intended uses. It is also used to protect adequate land for future development according to the unique requirements of each use. The land requirements of the Air Terminal Area, for example, are different from those of Aviation Commercial areas. By separating incompatible uses and grouping codependent uses, the airport can function, develop, and grow in an efficient and orderly manner. Land use plans also guide prospective tenants as to where they may locate on the airport and inform decisions by the airport operator. Lastly, a well-developed land use plan will ensure that future uses do not compromise the growth potential and the flexibility for a range of airport roles and service types.

6.1 Land Use Designations

The land uses designated at a new airport on the Pickering Lands should be based on a systematic land assignment for airport facilities, as well as a definition for each use, as described below.

6.1.1 Airfield

The Airfield designation is used for the airfield system, which facilitates the arrival and departure of aircraft in addition to supporting the circulation of aircraft, support vehicles and other equipment on the ground. The airfield system includes the runways, taxiways, and aprons.

6.1.1.1 Runways

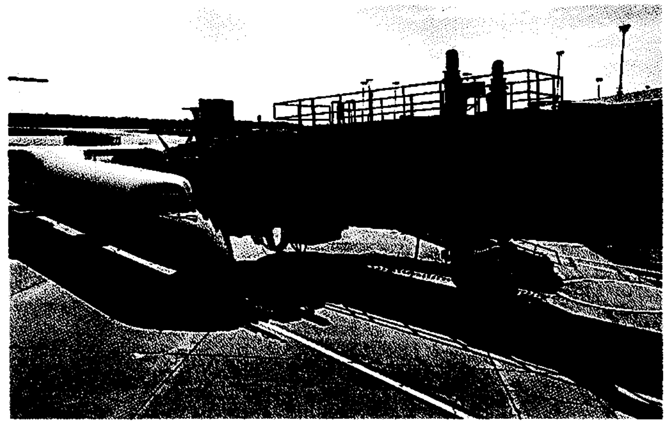
Runways facilitate the takeoff and landing of aircraft and are the primary components forming the Airfield land use. In addition to the runway itself, the runway strip, Runway End Safety Areas (RESA), and operational surfaces (approach and takeoff surfaces) are sized appropriately for the most demanding aircraft and for future advances in technology. Provision for future extension of the runways beyond their proposed 8,500 ft. and 10,000 ft. lengths is provided within the Airfield land use area, should demand warrant such improvements. Navigational and visual aids supporting runway operations are also included in this land use designation.

6.1.1.2 Taxiways

Taxiways facilitate the movement of aircraft on the ground and allow aircraft access to development areas and services at the airport. Since aircraft operating on taxiways are travelling at lower speeds than aircraft movements associated with runway operations, their protective areas are less restrictive. Nonetheless, sufficient land to protect the taxiway environment is provided under the Airfield land use designation to allow for the expansion of the taxiway system and to allow for taxiway extensions supporting full-build airport growth scenarios.

6.1.1.3 Aprons

Aprons are large paved surfaces where aircraft are parked while not operating. Aprons typically serve as an interface between airfield and groundside land uses and are collocated with air terminal facilities, air cargo facilities, and commercial and private hangars. Critical functions undertaken on aprons typically include: fueling, enplaning and deplaning passengers, loading and unloading air cargo, aircraft maintenance, and overnight aircraft parking.



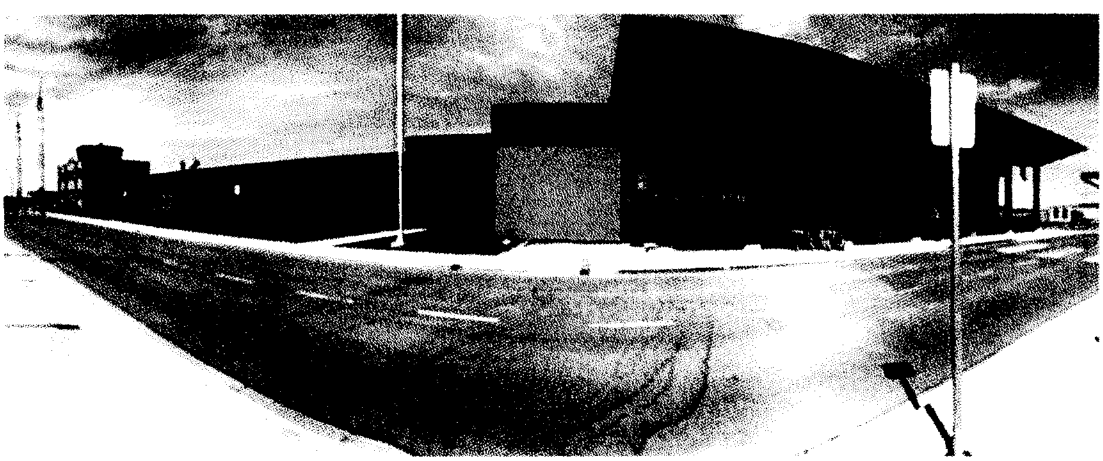
Terminal apron at Halifax Stanfield International Airport.

6.1.2 Air Terminal Area

The conceptual land use plan includes an Air Terminal Area designation for an air terminal building (ATB). The primary function of the ATB is to facilitate the movement of passengers from the groundside to airside. Modern ATBs are comprised of numerous elements as described below, each having a unique function. The following subsystems would be accommodated within the facility (and within the Air Terminal Area designation).

6.1.2.1 Terminal Frontage

The terminal frontage is the first area that passengers experience upon arriving at the Airport, through which the public enters the terminal. The frontage includes associated curbside areas for the drop-off and pick-up of passengers through one or more access roadways (also called terminal frontage roads). The terminal frontage may include dedicated facilities for taxis and ride share services, coach buses, and hotel shuttles.



Terminal frontage road at Brandon Municipal Airport.

6.1.2.2 Vehicle Parking

Parking can be provided through surface lots, multi-level garages, or a combination of both. To facilitate safe pedestrian movement, parking facilities are sometimes connected to the ATB through dedicated walkways or bridges. Parking can be designated for different uses, including: employee, short-term duration, long-term duration, and cell-phone waiting.

6.1.2.3 Public Transit

Public transit services can decrease the private vehicular modal share of airport traffic and connect the airport to key destinations and transportation hubs. Common forms of public transit include bus, light rail transit (LRT), and regional rail. How public transit is accommodated can vary depending on the mode. Buses can be accommodated curbside on the terminal frontage, whereas an LRT would require land for rights-of-way, stations and supporting infrastructure.

6.1.2.4 Ticketing / Check-In

The ticketing / check-in area is a dedicated space within the ATB for passengers to purchase tickets, deposit their checked baggage, and be processed prior to their flight. This area typically includes both staffed counters and self-serve kiosks, as well as infrastructure for the processing of checked baggage.

6.1.2.5 General Waiting

The general waiting area applies to the unsecured portion of the ATB intended for use by individuals who have not yet been screened at security, or are awaiting arriving air passengers. This function of the ATB typically includes seating areas and concessions to serve arriving and departing passengers, airport staff and associated meeters and greeters.

6.1.2.6 Baggage Claim

The baggage claim is the area of the ATB where bags offloaded from an arriving flight are made available for passengers to reclaim. After being sorted and conveyed via the terminal baggage system, bags are reclaimed by passengers at dedicated conveyor belts, carousels or other means. Facilities for oversized bags and special cargo, such as pets, are also commonly provided in the ATB.

Baggage claim carousel at Brandon Municipal Airport.

6.1.2.7 Secure Hold Rooms

Secure hold rooms (sometimes referred to as departure lounges) are used to contain passengers who have undergone screening, prior to boarding a departing flight. These areas of the ATB are typically furnished with seating and passenger amenities, such as washrooms, restaurants, and televisions.

6.1.2.8 Gates

The gate is the part of the ATB through which a passenger enplanes or deplanes a departing or arriving flight. A gate is staffed by airline employees who ensure that all passengers are boarding the correct flight and resolve any issues with passengers. Passengers then board their aircraft, either through an accompanying passenger boarding bridge connected to a secure holdroom, by walking across the apron, or by bus to a remote aircraft stand (aircraft parking position).

6.1.2.9 Customs and Immigration

An airport that accepts international and transborder traffic must have Customs and Immigration facilities and inspection services. Immigration screening is done to ensure that the passenger is eligible to enter Canada, whereas Customs controls the flow of goods into the country. Arriving international passengers and their luggage must be segregated from domestic travelers, until they have cleared both Customs and Immigration.

6.1.2.10 Passenger Screening

Passengers and carry-on baggage are screened for dangerous and illicit materials to minimize threats to the safety of air travel. Passenger screening areas include queuing lanes, metal detectors, x-ray machines, secondary search areas, and other supporting elements. More advanced screening facilities are being developed to minimize the intrusiveness of the process while improving the overall capacity, effectiveness and quality of screening.

6.1.2.11 Concessions

Located within both secure and unsecure areas of the ATB, concession facilities provide services and amenities to passengers, visitors, and airport employees. Such facilities range from vending machines, small cafes, and shops to full-service restaurants, duty-free zones, and large-format retail stores.

6.1.2.12 Car Rental

Car rental companies often operate out of dedicated offices and counter areas, either within or near the ATB, to serve arriving and departing passengers.

6.1.2.13 Airline Operations and Administration

Office space is typically required for airlines, airport staff, and terminal tenants. These offices can be used for flight planning and briefing, as space for the airline base manager, and for storage. The airport operator may also require space for its employees, such as the airport manager, operations staff, and administrative support employees.

6.1.3 Aviation Commercial

The Aviation Commercial land use designation encompasses six typical primary uses as described herein. The common characteristic for each use is the need for airfield access, typically through a taxiway or apron connection. The uses are not mutually exclusive, with several businesses often sharing space (e.g., a fixed-based operator may collocate with a flight training unit).

6.1.3.1 Fixed Based Operations

A fixed-base operator (FBO) is a business dedicated to servicing and supporting local and transient (visiting) aircraft. FBOs typically cater to corporate and general aviation customers, such as charter flights, business jets, and recreational pilots. Beyond these customers, FBOs can accommodate a wide range of traffic such as military and air ambulance movements. Among the services offered by fixed-base operators are: fueling, aircraft parking and storage, ground support, the sale of pilot supplies, and aircraft de-icing. The main components of FBO facilities include hangar(s) and associated apron space, lounges, offices, and pilot briefing rooms. The services and facilities offered by fixed-base operators can change according to the level of traffic served and the target clientele. In the Canadian context, fixed-base operators commonly partner with their principal fuel suppliers (e.g., World Fuels, Shell) and are branded in association with these firms.

6.1.3.2 Manufacturing, Maintenance, Repair, and Overhaul

A unique Aviation Commercial use is business dedicated to the manufacturing of aircraft or aircraft components. Such companies operate facilities for the completion of aircraft (final assembly lines) or for the manufacturing of the constituent parts. The form that the facility takes is dependent on the type and number of aircraft being produced; a company completing general aviation aircraft could be housed in a smaller hangar with minimal additional facilities, whereas major commercial aircraft manufacturers require multi-acre campuses with numerous assembly lines, ramp space, and supporting infrastructure. Airside access is required to support the flight testing and delivery of the product aircraft, with landside access also necessary to support the delivery of materials. The manufacturers of aircraft components, such as avionics and engines, may also choose to locate themselves on airport lands. However, the need for airside access is less critical as the components produced may be shipped for use elsewhere.

MRO facility in Tampa, Florida.

MROs are businesses that cater to the servicing, repair and refurbishment of aircraft through their staff of qualified engineers and technicians. Aircraft of all types and sizes require routine maintenance, inspections, and ad-hoc repairs, with MROs catering to one or more of these areas. MROs typically require one or more hangars to shelter the aircraft being serviced, with associated ramp space, offices, component warehouses, and workshops. A smaller MRO may be capable of completing routine inspections and maintenance on general aviation aircraft, whereas large facilities can handle the comprehensive maintenance and overhaul of airliners and complex aircraft. Specialized facilities focus on niche work, such as painting, interior finishing, and aircraft role conversion (e.g., passenger to cargo conversions).

6.1.3.3 Airline Support

Airline Support encompasses businesses that provide specialized service airlines. Airline support firms are sometimes contracted by airlines to supplement or entirely fulfill the role of in-house airline employees. Ground support services include loading cargo and baggage, providing fueling, marshalling and pushing-back the aircraft, and aircraft grooming. These companies can also check-in passengers, facilitate boarding at the gate, and provide other passenger services. Airline support functions also include specialized tasks, such as providing catering and handling routine maintenance.

The demand for land with airside access is dependent on the type of work done by the business. If ground support services are provided, storage areas for equipment, vehicles, and maintenance facilities may be required. Catering companies require sophisticated flight kitchens, and part storehouses and workshops are necessary if line maintenance is to be performed. Organizations providing passenger check-in and other passenger services require office space in the ATB.

6.1.3.4 Corporate and Private Hangars

Hangars are enclosed or semi-enclosed structures used for the storage and protection of aircraft. Hangars can be accessed directly from a taxiway, although larger facilities may have an associated ramp area to facilitate aircraft movements. The size of the hangar is dictated by the type and number of aircraft it is designed to accommodate; while a small hangar for a general aviation airplane can be as small as 1,000 square feet (93 square metres), large hangars housing multiple aircraft can be more than 15,000 square feet (1,400 square metres).

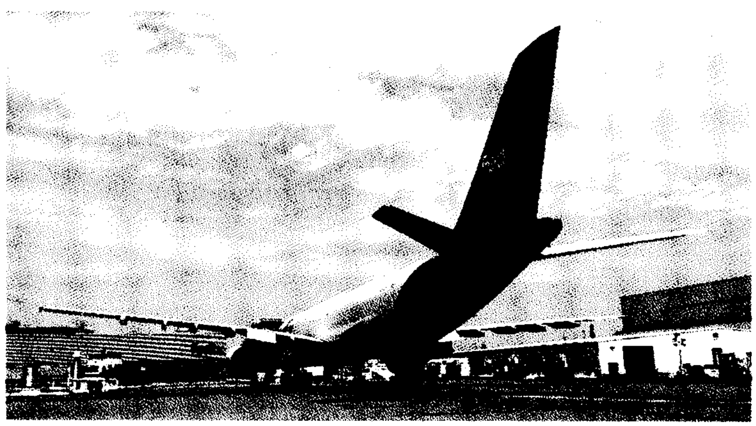
An example of a corporate hangar.

A high-density building configuration for private small aircraft storage is known as a "T-Hangar". T-Hangars are attached facilities that are arranged in rows to maximize available space while providing each individual aircraft owner with direct access to the airside. Detached hangars are standalone structures that typically house individual aircraft or multiple aircraft with a single access to the airside. Hangars may be owned outright, leased or rented, or available on a user fee basis from the operator. Corporate hangars catering to expensive, luxury general aviation traffic may also support private charter and aircraft management services.

6.1.3.5 Air Cargo Facilities

An air cargo facility (ACF) acts as an interface between ground-based and airborne cargo transportation. Cargo is received at the terminal, sorted and possibly stored, then loaded onto a truck or aircraft for distribution to further destinations. Due to the need to transfer cargo between ground and airborne transportation modes, the ACF must have adequate roadway access as well as airside access. Typically, an ACF will have a vehicle loading area/loading bays, one or more transfer terminals, and an apron to accommodate aircraft parking and the loading and unloading of cargo aircraft. The apron space may be omitted if the cargo is to be carried in commercial airliners, with the goods instead transported from the ACF to the Air Terminal Area. Facilities can also be developed to accept specialized cargo, such as refrigerated warehouses, dangerous good handling, and animal handling areas.

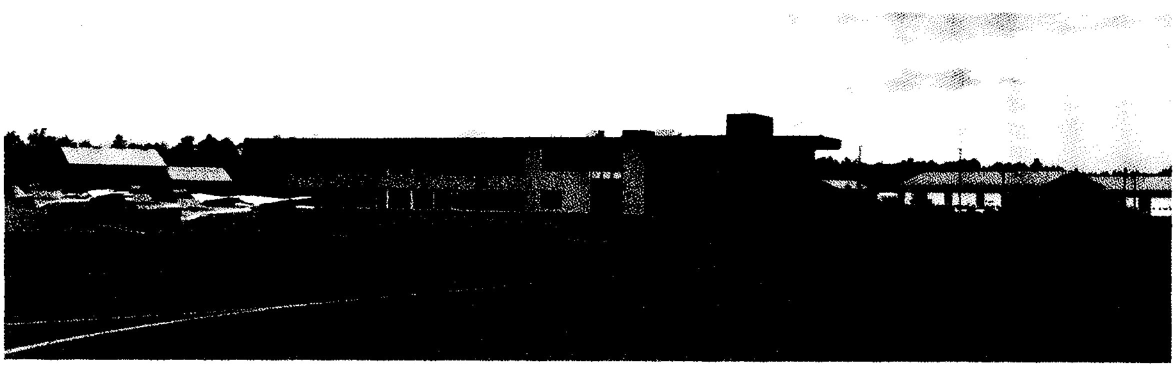
ACFs range in size and complexity from basic transfer points for occasional freight movements to multi-warehouse shipment centres for global cargo integrators with the capacity for loading several aircraft simultaneously. Further information on air cargo trends and requirements can be found in Section 5.4 of the Supply and Demand Report.



FedEx air cargo operations at Ottawa Macdonald-Cartier International Airport.

6.1.3.6 Flight Training

Flight training units (FTUs) are educational institutions accredited by Transport Canada to provide pilot training services through ground-based courses and practical instruction. FTUs typically have multiple training aircraft and are based out of a hangar with accompanying offices, classrooms, and simulators. FTUs vary in their size; small schools may operate with few aircraft out of basic facilities, whereas a large training institution could have a variety of aircraft types. Certain FTUs partner with post-secondary institutions to offer specialized aviation programs, which integrate professional pilot training with a degree or diploma. Beyond the training of students, FTUs often rent out their fleet for recreational usage, sight-seeing flights, and for small passenger charter services. Certain specialized FTUs and other training institutions are dedicated to providing initial and recurrent training on complex aircraft types, such as airliners and business jets, typically through simulator and classroom sessions.



Seneca College flight training operations at Peterborough Airport.

6.1.4 Non-Aviation Commercial

The Non-Aviation Commercial designation is used to describe commercial developments that do not require airside access. While these businesses may support airport users, they are not directly needed for the operation of aircraft. The benefits of locating near an airport include access to air services, supply chain opportunities through air cargo services, and the ability to accommodate uses that may not be compatible with more noise sensitive areas (e.g., heavy manufacturing). The extent and form of these lands depends on the type of development to be accommodated, with flexibility needed in lot sizes, access, and servicing.

The Non-Aviation Commercial designation encompasses a wide range of uses. The transportation and logistics sector can be served through warehouses, freight distribution centres, and truck terminals, which benefit from the intermodal opportunities of the air cargo industry. Hotels and motels are also commonly located near airports, to serve visiting professionals, tourists, and flight crews. Rental car facilities serve arriving passengers, and may be adjacent to the ATB or connected via shuttles. Additional uses include:

- office buildings and conference centres;
- retail stores, shopping centres, and restaurants; and
- manufacturers.

These uses should only be permitted if they are compatible with the operational airport. By ensuring compatibility, commercial lands can develop without compromising the safety and operational viability of a new Pickering Airport. Transport Canada has published TP1247 – Land Use in the Vicinity of Aerodromes, which is a comprehensive guide regarding compatible development types within proximity to aerodromes. Certain uses may be discouraged because of their propensity to:

- attract birds and wildlife, which may strike or be ingested by aircraft;
- be noise-sensitive, meaning that the user may experience annoyance from aircraft operations; and
- generate exhaust plumes that reduce visibility or cause other hazards to aircraft.

For each of the considerations above, additional analysis techniques exist to help determine whether specific uses may be acceptable at and within the vicinity of a new airport on the Pickering Lands.

6.1.5 Airport Operations

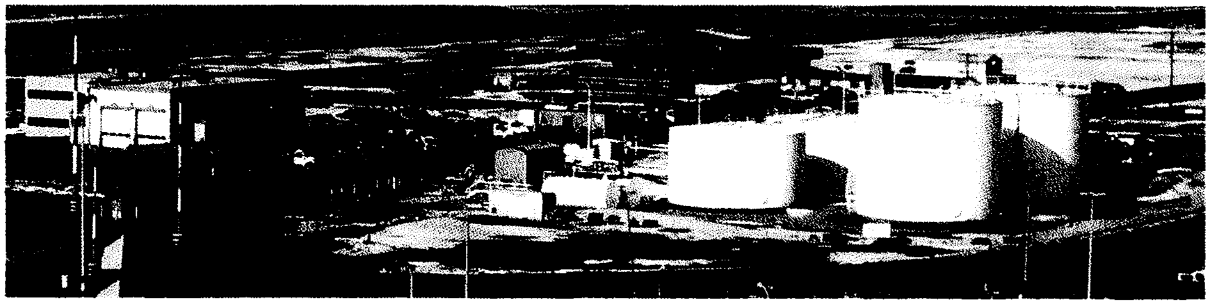
The Airport Operations land use designation encompasses all functions concerned with the maintenance and safe operation of an airport. Relevant uses to the Airport Operations land use designation, are described herein.

6.1.5.1 Airport Maintenance Facilities

Airport maintenance facilities support the ongoing preventative maintenance of airport infrastructure. Maintenance activities typically include grass cutting, snow removal, pavement crack repair, wildlife control & management and painting of markings. These facilities can be located either airside or groundside, depending on ease of access and land availability. Maintenance facilities typically include vehicle bays, mechanic shops, and parts storage. Airport maintenance facilities are often collocated with ERS in a combined services facility (CSF) to gain improved operational efficiencies and the possibility of cross-trained staff.

6.1.5.2 Aviation Fuel

Aviation fuel facilities at airports supporting scheduled passenger services typically include a fuel depot for the bulk storage of aviation fuels and sometimes also include a pressurized pipe network to fill tanker trucks (bowsers) or to transport fuel directly to hydrants located on aircraft aprons. The fuel depot can be located either on or off airport property, depending on the availability of land and the ease of access to fuel supplies (e.g., pipelines, rail, etc.), although safety and security are important considerations when selecting a site. At many passenger airports, these facilities have the capacity to store approximately 8-10 days of fuel at typical demand.



Aviation fuel facility at Edmonton International Airport.

6.1.5.3 Emergency Response Services

Emergency response services (ERS) are provided at airports to respond to various incidents including aircraft accidents, building fires, and passenger medical emergencies. Facilities supporting ERS on airports, including fire halls, are strategically located to facilitate access to any area of the airfield within a prescribed time limit. These facilities typically incorporate vehicle bays, control centres, crew rest areas, and equipment storage rooms, in addition to live exercise training areas located elsewhere on the airfield.

6.1.5.4 Aircraft De-icing

Aircraft de-icing can either be performed on the aircraft stand or at a dedicated de-icing facility. Central de-icing facilities (CDF) are increasing in popularity because of their associated environmental benefits. CDFs include effluent collection systems to ensure de-icing fluids are collected and recycled, and not released into the surrounding watershed. A CDF is typically supported by a building housing a control tower and fluid storage and pre-heating. De-icing facilities are ideally located to allow for access to all runways within a prescribed holdover time.

De-icing operations at Ottawa Macdonald-Cartier International Airport.

6.1.5.5 Air Traffic Services

Air traffic service facilities generally include an air traffic control tower (ATCT), supporting offices, and a meteorological observation site that may or may not be collocated with the ATCT. The ATCT is typically centrally located and allows an unobstructed view of aircraft on the ground and in the surrounding airspace.

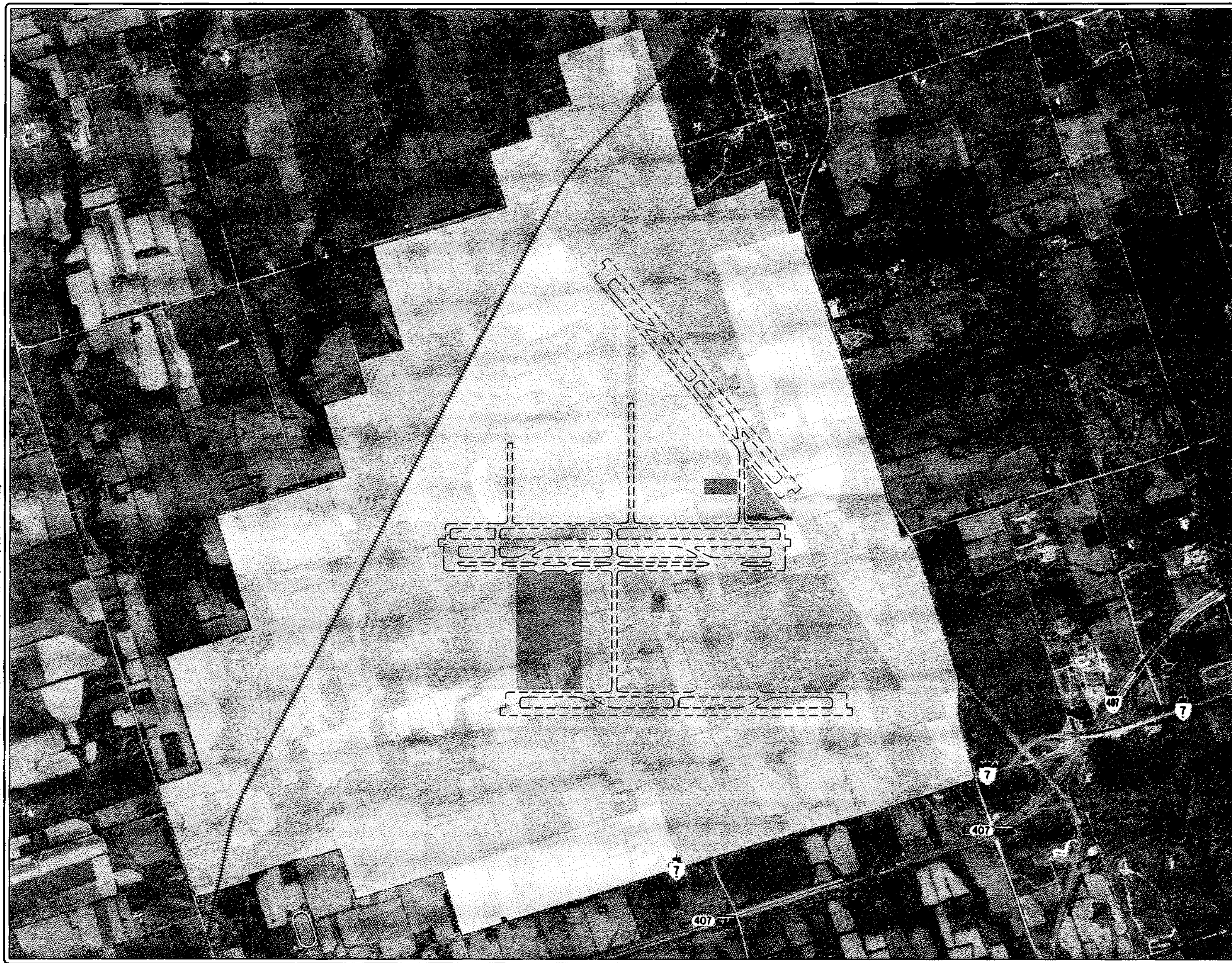
6.1.6 Airport Reserve

The Airport Reserve contains lands for which it is not currently practical to designate for specific uses. The lands are held in reserve to meet unforeseen demands or possible contingency requirements within and beyond the planning horizon. This land use designation allows flexibility in its future development, in addition to allowing for the continued use of the land by existing tenants which are deemed to be compatible with the airport's development without compromising the land use plan.

In the interim, the Airport Reserve designation limits development and protects the existing creek systems on the western portion of the Pickering Lands.

6.2 Proposed Conceptual Land Use Plan

The proposed conceptual land use plan for a new airport on the Pickering Lands is presented as Figure 6.1, and was developed to accommodate the airport roles and service types as per the Significant Development Concepts of both an Industrial Airport and Specialty Passenger Airport and the runway configurations identified in the Pickering Lands AZRs.



General Notes

1. DRAWING TO BE USED FOR PLANNING PURPOSES ONLY

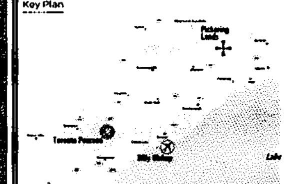
Legend

- AIRFIELD
- AIR TERMINAL AREA
- AIRPORT OPERATIONS
- AVIATION COMMERCIAL
- NON AVIATION COMMERCIAL
- AIRPORT RESERVE
- PROPERTY BOUNDARY
- RAIL CORRIDOR

Scale - AS NOTED

1:15,000

Key Plan



No.	DATE	DESCRIPTION	BY	APPD
B	Sept 2018	FINAL	NI	AIM
A	July 2018	DRAFT	NI	AIM

REVISION / ISSUE

Consultants

KPMG

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Client

Transports Canada / Transport Canada

Project

PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

PROPOSED CONCEPTUAL LAND USE PLAN

Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE G1	SHEET No.	08 of 09

7.0 NEW PICKERING AIRPORT GOVERNANCE OPTIONS

Selecting an appropriate governance option will help ensure that a new airport on the Pickering Lands is positioned for success. Specifically, an appropriate governance structure would help ensure an airport is positioned to operate efficiently, is subject to appropriate oversight, and has the necessary authority to make major decisions. This section provides a preliminary analysis of potential governance options, ranging from a privately owned and operated airport to a Transport Canada owned and operated airport on the Pickering Lands.

7.1 Background

Governance is defined as the exercise of authority, direction, and control of an organization to ensure the purpose of the organization is achieved. The key principles of effective governance include:

- clearly defining objectives and responsibilities in the organization's mandate;
- ensuring the appropriate treatment of stakeholders and respecting any legal requirements;
- appointing a qualified, professional supervisory board to provide overall direction to the management team;
- maintaining good relationships with all stakeholders;
- empowering the management team to make timely decisions in line with corporate objectives, responsibilities and board direction, and to be accountable to the board of directors;
- ensuring shareholders have timely access to reliable information;
- enhancing predictability in the conduct and actions of board members and appointed staff by adhering with applicable laws, regulations, and the organization's mandate; and,
- collecting appropriate input from stakeholders in planning, evaluation, and decision making.

These principles are important considerations in defining airport governance options.

7.2 International Airport Governance

To put the governance of Canadian airports in context, there are a variety of governance options employed by airports globally, which can generally be classified into one of the six categories below:

1. A government agency or department that is responsible for the airport(s) and reports to a larger government organization, such as a department of airports within the transportation department of a large municipality. Examples include Hartsfield-Jackson Atlanta International Airport, Chicago O'Hare International Airport, and Singapore Changi Airport.
2. A corporation in which the private sector is the majority shareholder. Examples include Leonardo da Vinci International Airport in Rome and Melbourne Airport.

3. A corporation in which the public sector is the majority shareholder. Examples include Brussels Airport and Hamburg Airport.
4. A local private authority operating under a long-term lease. Examples include Boston Logan International (and the National Airports System airports in Canada).
5. A local authority responsible to different levels of government. Examples include Amsterdam Airport Schiphol and Milan Malpensa Airport.
6. A corporation that is 100% federally/nationally owned. Examples include Oslo Airport, Barcelona-El Prat Airport, and Seoul Incheon International Airport.

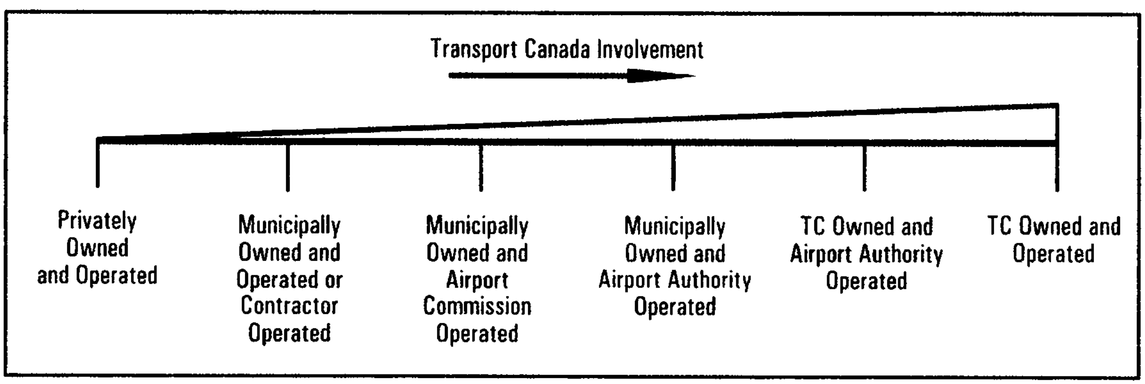
These options highlight sample experience involving both the private sector and the public sector in airport governance. The next section identifies airport governance options which are common in Canada.

7.3 Canadian Airport Governance

There are a range of governance options that are in place in airports across Canada. The governance options observed in Canada range from privately owned and operated airports, typically used at small general aviation airports, to airport authorities for facilities with substantial commercial passenger traffic. The relevance of these governance options to an airport on the Pickering Lands varies, in part, based on the ownership, size, type, role, and strategic importance of the airport.

It is important to note that an airport governance structure is not defined by who operates the airport but by how decisions affecting development and operations of the airport are made. The spectrum of governance approaches is illustrated in Figure 7.1, with those typically used in Canada identified. The significant features of the governance options identified in Figure 7.1 are summarized in Table 7.1 (presented at the end of Section 7.3).

Figure 7.1 – Airport Governance Options Spectrum



For each governance option, there are different potential operating arrangements. In an example where a government owns an airport, the government might decide to operate the airport with its own employees, contract operations to a private party under its direct supervision and guiding control, or contract operations to a private party that reports to an airport commission or authority.

(An airport commission is a semi-autonomous group of individuals appointed by the municipality that focus on the planning, management, development, and promotion of the airport on behalf of the municipal council. An airport authority is created by a statute which gives it significant powers to charge fees and incur debt. An authority has the ability to plan, develop, and operate the airport with independence from municipal decision-making processes.)

7.3.1 Option 1 – Privately Owned and Operated

This option would require transfer of the Pickering Lands to a private entity. The private entity would be obligated to use the Pickering Lands for an airport through an agreement with the Government of Canada (federal government), and would be responsible for developing, operating, and maintaining an airport on the Pickering Lands. In this option, a private entity would be the airport owner and operator with full decision-making authority, subject to the terms of its agreement with the federal government. The private entity may elect to operate the airport itself or contract operations to another party. Responsibility for capital and operating costs would be held by the private entity, and airport management would be held accountable by the board of directors to achieve financial objectives.

An example of this governance option is Buttonville Airport, which serves general aviation, corporate aviation, and flight training. Buttonville Airport is privately owned and is operated under contract to Toronto Airways. It is currently funded by airport operating revenues. In the past (i.e., until April 2009), a subsidy from the GTAA was paid to ensure that the airport was available to serve as a reliever for corporate jet traffic from Toronto Pearson Airport.

7.3.2 Option 2 - Municipally Owned and Operated

In this option, the federal government would transfer the Pickering Lands to the municipality (e.g., a region, city, township, or a combination thereof). The municipality retains legal and regulatory obligations related to airport ownership and operations, and the day-to-day operations of the airport would typically be conducted by a municipal department, with the municipal council responsible for significant decision-making and general oversight of the airport operations and staff. The municipality, as owner and operator, is responsible for funding both capital and operating costs of the airport. Operational budgets and capital projects would therefore be funded through airport operating revenues, funding from upper levels of government, and from the municipal tax base.

This form of governance often includes an airport committee comprised of elected officials from the municipality (or multiple municipalities if jointly governed) to advise the municipal council on airport matters. The membership of the airport committee may experience turnover frequently due to municipal elections, and committee members do not necessarily have knowledge and experience necessary to guide planning, development, and operations of an airport. The nature of the municipal decision-making process is such that airport matters compete with other municipal priorities for scarce resources. In addition, airport committee members have many responsibilities as members of a municipal council, which can make it difficult to commit time to focus on airport development.

Municipally Owned and Operated

If the municipality elects to operate the airport directly, the municipality is responsible for hiring and managing airport staff. This adds to the administrative burden of the municipality. The municipality has direct control over airport planning and operations and fulfilling legal and regulatory obligations.

An example of this governance option is Waterloo Airport, which is owned and operated by the Regional Municipality of Waterloo. The decision-making authority for matters related to the airport lies with Waterloo Regional Council. Airport operating fees and the regional tax base are the primary sources of revenue. For example, in 2017 43% of the revenue came from fees and charges collected by the Airport and 57% came from tax levies, excluding debt servicing. The governing body is the Region of Waterloo Planning and Works Committee comprised exclusively of Regional Council members.

Municipally Owned and Contractor Operated

A variation of this option would be to have a private entity operate the airport under a contractual arrangement with the municipality. This eliminates the municipality's day-to-day operational obligation, but there may be additional cost associated with this option, in part due to the need to generate profit for the company that is operating the airport. On the other hand, a private sector operator may bring additional efficiencies through items such as risk acceptance, faster decision making, access to expertise, and access to broader economies of scale. When this governance is employed, the municipality retains legal and regulatory obligations related to airport ownership and operations.

The operating contract typically involves a company operating the airport for a fee. The contractor may not be focused on cost efficiency or additional revenue generation unless they share in the financial gains. The private operator may also assist in the administration of the airport.

An example of this form of arrangement is Peterborough Airport, which is owned by the City of Peterborough and operated under contract by the Loomex Group. Decision-making authority rests with the City of Peterborough Council, and funding comes from airport revenues, municipal subsidies, and various federal and provincial programs that assist with airport development.

7.3.3 Option 3 – Municipally Owned and Airport Commission Operated

In this governance option, the Pickering Lands would be transferred to the municipality (e.g., a region, city, township, or a combination thereof) which would establish an airport commission. An airport commission is a semi-autonomous group of individuals appointed by the municipality that focus on the planning, management, development, and promotion of the airport on behalf of the municipal council. The commission reports to the municipal council(s) on a periodic basis and seeks approval for significant financial or operating decisions. A commission brings a business focus to the airport whereby commission members are responsible for oversight of airport operations, relieving any airport committee or council of this task. Generally, an airport commission has less membership turnover as its appointments could be for a longer term than the municipal council tenure.

Commission members are typically selected based on their skills that are important to develop and operate an airport, including for example knowledge and experience

with the aviation industry, airport operations, accounting, law, and marketing. Commission members often use their local contacts to promote the airport and secure funding (e.g., including private investments, additional airport revenues, grants or loans). Furthermore, the existence of a qualified commission assists in creating credibility when approaching governments and industry to encourage participation in the development of the airport. The municipality, as the airport owner, continues to carry the legal and regulatory obligations.

An example of this governance option is Lake Simcoe Airport which is jointly owned by the City of Barrie, the County of Simcoe, and Oro-Medonte Township. The airport serves general aviation, corporate aviation, and flight training traffic. Airport operations, expansion, and improvements are funded from airport revenues and a subsidy from the City, County, and Township (which is based on a pre-established cost sharing arrangement). The independent members of the commission are appointed from the three municipalities and are tasked with overseeing the corporation that operates the airport. The commission has nine members, five appointed by the City of Barrie, two by the County of Simcoe and two by the Township of Oro-Medonte. The representation of this commission mirrors the ownership interests of the municipalities in the Airport.

7.3.4 Option 4 - Municipally Owned and Airport Authority Operated

In this governance option, the Pickering Lands would be transferred to the municipality (e.g., a region, city, township, or a combination thereof) and an airport authority would make all decisions concerning airport planning, funding, construction, customer relations, and would be responsible for complying with all applicable laws and regulations. In this option, the airport authority becomes the operator of the airport and the municipality becomes the landlord. Depending on the arrangements, the municipality can be relieved of its operational responsibilities and liabilities.

This option is often used when a large airport authority sees a need to have a smaller airport in its portfolio to enhance its network of services or to create a competitive advantage or if a municipality wishes to divest its direct operational and financial obligations. This is an infrequently used governance structure in Canada, although some smaller airports in Canada are governed by airport authorities. Most satellite airports for larger airport authorities were part of the original transfer from the federal government.

An example of this governance option is Iqaluit Airport. The airport is owned by the Government of Nunavut, reporting through the Department of Economic Development and Transportation, and operates under a 30-year contract with Nunavut Airport Services, which is a subsidiary of the Winnipeg Airport Authority. Though owned by a territory rather than a municipality, Iqaluit Airport is a rare example of this governance option in Canada.

7.3.5 Option 5 - Transport Canada Owned and Airport Authority Operated

In this option, the federal government (e.g., through Transport Canada) retains ownership of the Pickering Lands, and the operations are governed by an airport authority. The airport authority has full authority to plan, develop, and operate the airport. Above a certain threshold of activity at the airport, an annual lease payment would be made to the federal government.

The airport authority board of directors would be comprised of individuals nominated by stakeholders and interest groups, such as trade boards, professional institutions, and various levels of government. The board would be accountable to the public through annual public meetings, reports, audit requirements, and public consultations. Generally, an airport authority is a not-for-profit corporation, is self-funding and obtains revenue through user fees and charges. It also has considerable authority to raise debt; it can borrow to finance capital projects and day-to-day operations.

This form of airport governance is well known in the Canadian aviation community and potential investors typically understand the risks, decision making processes, and potential benefits of this option. Section 7.4.10 outlines the significant features of the authority structure.

An example of this governance option is Toronto Pearson Airport. The facilities are owned by Transport Canada and operated by the Greater Toronto Airports Authority. The airport lands are owned by the federal government (e.g., through Transport Canada) and leased to the local airport authority under a 60-year ground lease with a 20-year renewal clause. The Greater Toronto Airports Authority was created by federal legislation and has full decision-making power over all aspects of the airport. It is self-funding with the ability to incur debt by borrowing.

7.3.6 Option 6 - Transport Canada Owned and Operated

In this governance option Transport Canada is the owner, funding source, developer, and operator of an airport. The federal government would be responsible for the capital and operational funding, as well as staffing, management, and administration of the airport. Transport Canada would assume all liability for operations at the airport. As the regulator of aviation safety, Transport Canada would be regulating its own airport, which could potentially be perceived as a conflict.

This option is best represented by the management of Canadian airports prior to the introduction of the National Airports Policy. Today this governance option is rarely implemented. Current examples of this option include, but are not limited to, Sandspit Airport and Penticton Airport in British Columbia and Sept-Îles Airport in Quebec. Transport Canada has retained ownership and operations of these airports because of challenges associated with their transfer including, for example, land claims, remoteness, and complex multi-party agreements.

7.3.7 Options Summary

Table 7.1 summarizes the key features of the governance options described in section 7.3.6.

Table 7.1 – Governance Options Comparison

	Land Ownership/Control of Land	Governing Body	Primary Responsibility for Capital Investment (a)	Primary Responsibility for Operating Profit or Loss (a)	Operation of the Airport
Option 1: Privately Owned and Operated	Private	Private entity	Private	Private	Private entity to determine in-house staff or contracts
Option 2: Municipally* Owned and Operated or Contractor Operated	Municipality	Department within the municipality	Municipality	Municipality	Municipal staff or contracted third party
Option 3: Municipally Owned and Airport Commission Operated	Municipality	Airport commission with semi-autonomous board	Municipality	Municipality	Municipal staff or contracted third party
Option 4: Municipally Owned and Airport Authority Operated	Municipality	Municipality as landlord, with operating rights granted to an airport authority	Municipality (through contracted airport authority (b))	Municipality (through contracted airport authority)	Airport authority staff or contracted third party (as determined by the authority)
Option 5: Transport Canada Owned; and Airport Authority Operated	Federal government	Independent not-for-profit entity with lease from federal government	Airport authority	Airport authority	Airport authority staff or contracted third party (as determined by the authority)
Option 6: Transport Canada Owned and Operated	Federal government	Transport Canada	Federal government	Federal government	Transport Canada staff or contracted third party.

(a) Regardless of the entity with primary responsibility, federal or provincial infrastructure funding programs may apply.

(b) Contracted airport authority refers to the entity that entered into a lease with the municipality. The contracted airport authority can be formed by a new party or by a pre-existing airport authority.

*Municipal can mean a single municipality, a group of municipalities, a region or county.

7.4 Governance Considerations

In examining governance options that may be relevant to the development of an airport on the Pickering Lands, several considerations will assist in determining which option could best help position a new airport for ongoing success.

7.4.1 Land Control

The entity that controls the Pickering Lands is an integral part of the governance structure in each option. The entity could control the lands through ownership, or by transfer of rights through a long-term lease. The current owner of the Pickering Lands is the federal government.

Ongoing ownership of the Pickering Lands by the federal government would help ensure that the federal government is a stakeholder of any future airport.

7.4.2 Initial Capital Investment

Currently, there is no airport infrastructure on the Pickering Lands (i.e., it is a greenfield site). The initial construction of an airport on the Pickering Lands could potentially be cost prohibitive to a municipality considering using its own resources. Under the National Airports Policy, however, the federal government cannot make financial contributions to airport authorities that operate on federal lands. Accordingly, under the current policy framework, the federal government could not be a source of capital financing for the airport development.

With municipal and federal financing unlikely, this leaves external sources to fund such an undertaking. Private sector funding may be available under an arrangement such as a public-private partnership (P3). It should be emphasized that a P3 is not an airport governance structure. A P3 is a mechanism which allows governments to have high-cost infrastructure built in conjunction with the financing and expertise of the private sector.

The private sector assumes the major share of the risks, and expects a return on investment commensurate with the risks it is assuming and. It will also require an influential voice and participation in an independent, and effective governance structure.

7.4.3 Initial Operating Investment

In the initial phases of airport operations, the revenue generated may not cover the operating costs of a new airport on the Pickering Lands, depending on factors such as the level of traffic at Pickering. There may need to be some form of loan or ongoing subsidy provided to the airport operator until the revenues from operations can meet operating costs. The sources of this financing could potentially include subsidies or a repayable loan from local municipalities or the Province.

The option exists for an airport operator to fund the initial operating losses as part of a long-term contract to operate the airport. The operator would expect to recover the initial losses as the airport revenues grow to the point of an operating surplus.

Any entity prepared to support operating costs would likely want to be a significant partner in any governance structure established for a new airport on the Pickering Lands.

7.4.4 Stakeholder Representation

The governance options presented provide varying approaches for incorporating stakeholder interests into the activities that contribute to the governance of an airport. For example, in Options 1 (Privately Owned and Operated), 2 (Municipally Owned and Operated), and 6 (Transport Canada Owned and Operated), the responsibility of the individuals contributing to the governance of the airport is to represent the interests of the airport owner. This can lead to efficient decision-making (providing the interests of the owner are agreed upon),) but can also minimize opportunity for input from stakeholders. Under Option 3 (Municipally Owned and Airport Commission Operated), individuals responsible for the governance of the airport are appointed by the municipality. They are responsible for representing the municipality's interests, but are "at arm's length", which helps to reduce the potential for (actual or perceived) political interference. (whether actual or perceived). Under Options 4 (Municipally Owned and Airport Authority Operated) and 5 (Transport Canada Owned and Airport Authority Operated), individuals responsible for the governance of the airport are appointed by a pre-determined group of stakeholders, and in this capacity, are responsible for representing the stakeholder's interests. These options help to ensure that stakeholder interests are considered, but may be less efficient when these interests diverge.

This report presents two potential options for the type and role of a new airport on the Pickering Lands, both of which have unique stakeholders that would potentially benefit from stakeholder representation in the governance of the airport.

The first option considered is an industrial airport. An industrial airport is one which has industrial aviation activities (e.g. aircraft maintenance, overhaul, and manufacturing) as its core user base. Industry investing in facilities at the airport would likely want to participate in any governance structure. Industry may be hesitant to invest in the airport and participate in a governance structure if they are not provided significant representation in the decision-making process. A notable feature of an industrial airport is the significant commercial development that takes place around the facility to support aviation activities. This is a valuable form of economic development for a municipality. The business community that may develop around a future industrial airport could also have an interest in the governance of the airport and may desire to participate in the decision-making process.

The second option considered is a specialized passenger airport with a focus on domestic scheduled passenger air services, passenger charters, and LCC operations. In this option, all levels of government may desire a larger role in the governance structure than in the industrial airport case because of the impact a passenger airport could have on the region (e.g. economic development, job creation, access to air services, and aircraft noise). They would likely request a greater representation on any decision-making body than in the industrial airport option. Similar to the industrial airport, there will be non-aviation related economic development around the airport. This business community will likely want to participate in the governance of a new airport on the Pickering Lands.

Over time, the airport activity levels could grow based on increasing demand. Therefore, the proportional representation on any governing body may change over time. The governance structure and body will therefore need to have a degree of flexibility built into its composition to allow for changes to reflect evolving conditions. For example, if a new airport on the Pickering Lands were initially constructed to accommodate Specialty Passenger operations, and later attracted a major industrial tenant (e.g. aircraft manufacturer) the governance model should be sufficiently flexible to facilitate changes in the representation to allow for participation of the manufacturing tenant in the decision-making process. This could be facilitated by periodic review of airport roles and service types to ensure appropriate Board representation.

7.4.5 Rate of Economic Development

When any airport is constructed, economic development occurs on the airport lands and in the immediate vicinity of the airport. The rate at which the development may occur could be affected by the governance option selected. Private-sector confidence in making long-term commitments at the airport may be positively influenced by a governance option that allows for private involvement in the decision-making processes.

7.4.6 System Competition

Any airport developed on the Pickering Lands will provide some level of competition to other airports in the southern Ontario airports system. It is in the best interest of the southern Ontario airports system that a governance option is selected that does not provide a new airport on the Pickering Lands with a competitive advantage at the expense of the existing airports.

7.4.7 Comparison of the Governance Options

Table 7.2 sets out a comparison of the governance options identified herein from the perspective of Transport Canada. The comparison is based on the key governance considerations presented in Section 7.4.

In considering the overall merits of each option, the comparison provides initial ratings against the evaluation of individual considerations. Because no attempt has been made to determine if some considerations are more (or less) important than others, the considerations should not be compared against each other (in other words, a positive rating for one consideration could bear more weight than a positive rating for another consideration). Further, the ratings do not indicate how "close" options are for a given consideration (for example, the difference between positive and neutral may not be the same as the difference between neutral and negative) – only that there are differences between them. As this is an initial assessment of the governance options and is intended to explore potential benefits and challenges, no attempt has been made to quantify differences between the ratings or considerations or to establish a numeric score for the options against each consideration.

Ratings have been assigned to each consideration using the following categories:

Blue – positive impact on the consideration;

White – no impact on the consideration; and

Yellow – negative impact on the consideration.

Note that the assignment of a "yellow" does not imply that an option could not work, only that there may be substantive risk that would need to be addressed to successfully address a certain consideration.

Table 7.2 – Preliminary Comparison of Governance Considerations

	Land Control	Initial Capital Investment	Initial Operating Investment	Stakeholder Representation	Rate of Economic Development	System Competition
Option 1: Private Owned and Operated	-	+	+		+	+
Option 2: Municipally* Owned and Operated or Contractor Operated	-	+	+	-	-	
Option 3: Municipally Owned and Airport Commission Operated	-	+	+		-	
Option 4: Municipally Owned; Operated by Airport Authority	-	+	+			-
Option 5: Transport Canada Owned; Operated by Airport Authority	+	+	+	+	+	+
Option 6: Transport Canada Owned and Operated	+	-	-	+	+	-

Positive	+	Neutral		Negative	-

7.5 Governance Options Evaluation

The six governance options have been evaluated against the considerations presented in Section 7.4. An evaluation of the governance options as they apply to a new airport on the Pickering Lands is presented below.

7.5.1 Option 1 - Privately Owned and Operated

This option involves Transport Canada selling or transferring under a long term lease the ownership of the Pickering Lands to a private entity for it to develop and operate the new airport. The Pickering Lands have been held for over 40 years with the intention of constructing an airport, therefore it would be difficult for Transport Canada to sell or transfer the Lands if the final use was not aviation related.

The Pickering Lands could be sold or transferred to a private entity with conditions. [redacted]. If the federal government were to sell the property outright, all outstanding obligations must be satisfied prior to the transaction. [redacted]

[redacted]

Each party involved in the sale or transfer of lands may have varying and even conflicting objectives (e.g., the ongoing return on investment for the airport's investors versus service quality requirements to the travelling public) that would need to be addressed.

[redacted]

It would be unusual in the Canadian airport governance context to sell outright lands reserved by the federal government for airport use. In this case, the federal government would need to ensure the ongoing use of the lands is tied to an airport.

7.5.2 Option 2 - Municipally Owned and Operated or Contractor Operated

Option 2 assumes that the Pickering Lands would be transferred, sold or leased to a municipality, with specific conditions and controls to ensure that the property is used for aviation purposes. If the property were to be sold to the municipality at fair market value, the cost may be prohibitively expensive, which would be compounded by the cost to develop the required supporting infrastructure. The municipality would need to generate this revenue from its tax base. In addition, the municipality would need to provide operating subsidies in the initial years of operation.

Under this option, there is the potential for operations to be conducted by the owner municipality or under contract with a suitable operator. [redacted]

Using a contractor would relieve the owner municipality of the day-to-day operating responsibilities, but there would be additional costs to compensate the contractor, including the contractor's profit margin.

Ultimately, the municipality would still be responsible for the oversight of the contractor and ensuring the performance of operations meet the ongoing requirements as stipulated in the contract. In addition, the contractor may need to be prepared to subsidize the operations in the initial years. Assuming the contractor does subsidize operations in the initial years, this cost-plus interest would need to be repaid over the period of the contract. The potential investor issues of oversight and decision-making process would remain if a contractor were to operate the Airport.

7.5.3 Option 3 – Municipally Owned and Airport Commission Operated

This option has numerous similarities with Option 2 - the ownership of the property would be assumed by a municipality and the significant capital outlay and potential operating subsidies would be borne by the municipality itself, or through arrangements with the private sector.

The significant difference between Options 2 and 3 is the independence that an airport commission has from municipal government's decision-making processes. The development and operation of the airport would be the primary focus of the commission, versus the various and potentially conflicting responsibilities of municipal officials. Members of the commission, appointed by stakeholders, would bring expertise and credibility to the management of the airport, providing confidence to potential investors.

The airport commission structure provides flexibility to accommodate all significant stakeholders (e.g., different levels of government, private sector investors, local businesses, etc.) through the appointment of appropriate representatives. This form of oversight has the flexibility to modify stakeholder representation as a new airport develops. In the case of a new airport on the Pickering Lands, the type of airport (industrial or specialty passenger airport) and the potential rate of growth are currently unknown. There will be a need for flexibility in the governance structure and confidence in airport management to attract potential investors. The same condition could help attract large-scale tenants, as they have the potential to generate significant revenue in the early years of operations.

This form of governance has a high potential to stimulate development of the airport based on market demand and would allow for fair competition with the other airports in the southern Ontario airports system. There would be a need to resolve the land ownership issue and funding challenges; however, this option has significant benefits regarding stakeholder involvement, decision-making expertise, and flexibility.

7.5.4 Option 4 - Municipally Owned and Airport Authority Operated

Option 4 is similar to Options 2 and 3 with respect to the land being transferred to a municipality. The airport would be operated, under a contractual arrangement, by a new or existing airport authority. The benefit of contracting operations to an established airport authority is that it would bring its proven knowledge and expertise to the airport operation, with this option also relieving the municipality of the operating and management burden of the airport. Initial capital and operating costs would likely be borne by the owner municipality; however, an airport authority may be able to bring capital investment.

In the case of the Pickering Lands, the municipality would have responsibility for developing the airport. This would require significant management efforts and unique expertise that is different from operating an existing and established airport.

If an existing airport authority were to operate a new airport on the Pickering Lands it would have obligation to the operation of their "home" airport and a new Pickering Airport. The diversion of significant management efforts to focus on a new airport could cause concern with the "home" airport stakeholders. The airport authority could be placed in a difficult or conflicting situation for decisions that affect both airports, particularly if they operate another airport in the southern Ontario airports system.

The primary disadvantages related to this option involve the role of the municipality, as it would be responsible for funding the significant capital outlay and operating subsidies in the initial years. Management energy and focus from the municipal council would also be required. Additional potential obstacles exist in terms of operating focus, competitive fairness and objectivity in decision-making.

7.5.5 Option 5 - Transport Canada Owned and Airport Authority Operated

This option does not require a change in land ownership as an airport authority, either existing or newly created, would plan, develop, and operate the airport.

The authority would need to develop and operate the airport on a demand-driven basis using common business principles. Because this option is demand-driven, it would not be seen to have a competitive advantage over the other airports in the southern Ontario airports system because it is not receiving any direct subsidy for construction and operating costs from the federal government or the municipality. For example, Transport Canada, under the National Airports Policy, is unable to provide such funding. It is expected that the airport authority would be wholly funded by private sector investments and ultimately operationally self-sustaining through the collection of operating revenues.

To maximize the likelihood of success, individual representation within the authority's decision-making structure would need to be flexible enough to accommodate potential future changes in the airport's role and appropriate stakeholder participation.

This option exhibits many of the important considerations for good governance identified in Section 7.1, as well as increased investor confidence, stakeholder involvement, and flexibility to change as the airport grows.

7.5.6 Option 6 - Transport Canada Owned and Operated

Contrary to Option 5, Option 6 assumes that Transport Canada would own the Pickering Lands and be responsible for the initial capital expenses and ongoing funding of a new airport. In addition to its ownership role, Transport Canada would need to operate and maintain the airport on an ongoing basis. This would involve further developing in-house expertise to carry out planning, marketing, real estate management, financial management and a variety of other administrative and support functions. While Transport Canada does own and operate some small airports today, the airport expertise the department once had in the 1980's was significantly reduced with the establishment of local airport authorities.

The Minister and Transport Canada would be responsible for answering questions from the public on airport plans, operational activities (e.g. noise and environmental concerns), financing, and future development. Notwithstanding the above, there is inherent conflict in acting as airport owner, operator, and regulator.

7.6 Governance Findings

The following findings can be drawn from the airport governance analysis presented and evaluated herein:

1. There are many different airport governance options, each with unique characteristics.
2. The funding of capital and ongoing operations is an important issue because it can affect the decision to develop the airport. The cost of initial development and ongoing operations could be cost prohibitive to a municipality.
3. A new airport on the Pickering Lands would operate within an existing aviation system and has the potential to impact other airports. It is important that the decision to develop a new airport is based on a sound business case.
4. The operations of an airport can be carried out in a variety of ways (e.g., owner operated, privately contracted operations, another airport operator, etc.).
5. Developing an airport on the Pickering Lands would be a complex and challenging process. The governance approach chosen will need to be sufficiently robust and flexible to meet the challenges and changes that arise (e.g., access to capital and operational funding, expertise, and capacity).
6. There are many stakeholders that may desire to be part of, or provide input to the airport governance. They include the federal government, the provincial government, the municipalities, private sector, local businesses and the travelling public.
7. The collective skillset of individuals on the decision-making body is critical to achieve success. These individuals should have appropriate skills, be independent, have credibility with the local and aviation community, and act with the best interest of the airport.

The following can be drawn from the governance analysis described herein:

1. Option 3 (Municipally Owned and Airport Commission Operated) and Option 5 (Transport Canada Owned and Airport Authority Operated) have independent, knowledgeable, experienced and autonomous groups responsible for all aspects of airport planning, development, marketing, operations and business management. Furthermore, these options are potentially more attractive to large private sector investors. Based on the findings above, an airport authority or commission is well suited to govern a new airport on the Pickering Lands.
2. The number of representatives on an authority board or commission from each stakeholder sector should reflect the contribution and relative importance of that sector to the airport's development and ongoing operations.
3. An authority or commission governance option should include a significant number of representative nominations available to the authority board/commission, so that changes in sector representation can be accommodated, particularly as the airport evolves.

8.0 CONCLUSIONS

The Pickering Lands Aviation Sector Analysis – Part 2 Type and Role Report analyzed market factors that could influence the characteristics and timing of the development of a new airport on the Pickering Lands. This analysis included the relationship between airports in airport systems, to better understand how individual (and specifically secondary) airports can be successful within larger airport systems. This informed the airport development concepts presented herein. Using conclusions drawn from analysis contained within the Supply and Demand report and this Type and Role report, a conceptual land use plan is proposed to protect the ability to develop an airport on the Pickering Lands. Furthermore, this report identified appropriate governance models to oversee the development and operation of new industrial and/or specialty passenger airport on the Pickering Lands.

The following conclusions summarize the findings from the Supply and Demand Report, the Contextual Bridge Report, and this Type and Role Report:

1. A new airport on the Pickering Lands is not anticipated to be required to accommodate a shortfall in air passenger capacity within the southern Ontario airports system before the 2036 horizon of the Supply and Demand Report. Forecast air passenger demand up to 2036 can be accommodated by the existing facilities of the southern Ontario airports system with modest improvements to airfield, air terminal, and groundside infrastructure, in addition to technological advancements in air traffic control. However, it may be desirable to develop an airport on the Pickering Lands before it is required to accommodate a projected passenger capacity shortfall in the southern Ontario airports system. Development of the airport could instead support industrial developments in southern Ontario and provide improved access to air services to travelers in East GTA.
2. The location of a new airport on the Pickering Lands is likely to be compatible with reliable access to existing surface transportation modes to facilitate growth of business and/or passenger service.
3. The most appropriate options, based on the evaluation criteria, for a new airport on the Pickering Lands are an Industrial Airport (providing Aviation Commercial Development Lots) and a Specialty Passenger Airport (facilitating point-to-point scheduled and charter passenger air services, including those by ULCCs).
4. The proposed conceptual land use plan for a future airport on the Pickering Lands would have the ability to accommodate most potential airport uses, and would allow the airport type and role to evolve over time, if and as market demand evolves.
5. A new airport on the Pickering Lands could expand progressively in phases based on market demand. The Development Concepts illustrated do not preclude the development of non-identified uses.
6. An independent Airport Commission or Airport Authority with appropriate representation from stakeholders is likely to be the most effective governance model for the development, management, and operation of a new airport on the Pickering Lands - assuming Transport Canada retains ownership of the facility.

APPENDIX A – Glossary of Terms and List of Acronyms

Glossary of Terms

Term	Definition
Aerodrome:	Any area of land, water (including frozen surfaces) or other supporting surface used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival and departure, movement or servicing or aircraft and include any building, installations and equipment in connection therewith.
Air Express:	Cargo shipments by dedicated air cargo couriers, such as FedEx, UPS, DHL, etc.
Air Freight:	The shipment of diversified products including machinery, pharmaceuticals, perishable foodstuffs, live animals, etc. with shipments varying in size. Air freight operators obtain shipments directly from shippers, or using freight forwarders and/or integrators.
Air Mail:	The delivery of letters, packages and other goods shipped by traditional mail delivery. Air mail is typically shipped within the cargo holds of scheduled passenger service aircraft, and through contracted agreements with air freight operators.
Air Terminal Building (ATB):	A building that is used to facilitate the movement of passengers to and from their flights.
Air Traffic Control (ATC):	A service that instructs and directs aircraft flying in designated airspace to improve the safety and efficiency of operations. Aircraft must comply with ATC instructions.
Air Traffic Rights:	A market access right which is expressed as an agreed physical or geographic specification, or combination of specifications, of who or what may be transported over an authorized route or parts thereof in the aircraft authorized. The term *air traffic rights* can have the same meaning as market access rights.
Aircraft Group Number (AGN):	A categorization of an aircraft based on its wing span, outer main gear span, tail height, and approach speed. The AGN of aircraft typically served by an airport defines airfield characteristics including runway and taxiway width and Obstacle Limitation Surfaces (OLS).
Aircraft Movement:	A take-off, a landing, or a simulated approach by an aircraft.
Airport Authority	Created by a statute which gives it significant powers to charge fees and incur debt. An authority has the ability to plan, develop, and operate the airport with independence from municipal decision-making processes
Airport Classification:	Under Transport Canada's National Airports Policy categories include: National, Regional/Local, Small, Remote, and Arctic.
Airport Commission	A semi-autonomous group of individuals appointed by the municipality that focus on the planning, management, development, and promotion of the airport on behalf of the municipal council
Airport Governance:	The legal arrangements under which an airport is owned and operated.
Airport Ownership:	Airport lands are either publicly or privately owned.

Term	Definition
Airport Rescue and Fire Fighting (ARFF):	On-site emergency response services that are specialized for airport-specific accidents and hazards.
Airport Role:	The role an airport plays in a system of airports such as: • Primary Hub, Secondary, Feeder, GA Corporate, GA Industrial, GA Training.
Airport Service Type:	The dominant services an airport offers within passenger, cargo and general aviation categories, such as: • Passenger, Air Cargo, General Aviation
Airport System:	A grouping of airports structured as: • A set of airports within a geographic area, each functioning independent of each other; • An informal system featuring alliances among individual airports who agree to cooperate or compete with others; or • A formal system with cooperative agreements to behave for the common good, and potentially compete against another airport system.
Airport Zoning Regulations (AZRs)	Federally enacted regulations that are designated for the protection of airport operations through height restrictions.
Airside	The part of the airport that is secured and not open to the general public.
Bilateral Agreements:	The basic document most often used by countries to jointly regulate their international air services relationships.
Cabotage:	The transportation of passengers or cargo between two points in the same state, by a transport operator registered in another country.
Canadian Aviation Regulations (CARs):	Federally-designated regulations that govern matters including, but not limited to: airports, air navigation, and flight operations.
Central De-icing Facility (CDF):	A dedicated facility for the de-icing of aircraft during winter conditions. A CDF typically includes an apron for one or more aircraft, de-icing trucks and equipment, and a control centre.
Certified Airport:	An aerodrome for which an airport certificate has been issued that confirms all facilities meet prescribed airport design standards and all operations are in accordance with the Canadian Aviation Regulations (CARs).
Combined Services Facility (CSF):	A building or complex that typically houses airport maintenance staff, administration, and Emergency Response Services.
Deplane:	To exit an aircraft.
Domestic:	Domestic flights are those that occur within Canada
Enplane:	To board an aircraft.
GA Corporate:	An airport which handles corporate general aviation aircraft and operations. Typical GA corporate activities include private jet charter, luxury FBO services and smaller propeller aircraft charter.

Term	Definition
GA Industrial	An airport which accommodates industrial aviation activities, such as aircraft maintenance repair and overhaul (MRO), manufacturing, engineering and modifications.
GA Other	An airport which accommodates general aviation activity not conforming to the other categories.
GA Recreational:	An airport which accommodates privately owned, or rented aircraft whose primary use is for pleasure.
GA Training:	An airport which accommodates flight training activities, ranging from recreational pilot training to comprehensive professional pilot programs.
General Aviation (GA):	A broad range of aviation activities that generally excludes scheduled air services and includes training, recreational, and corporate flights.
Global Positioning System (GPS):	A satellite-based navigation system. The aircraft GPS receiver measures the distance to at least four satellites and uses geometry to determine its location.
Groundside	The portion of the airport that is unsecured and open to the public. Also known as "landside."
Feeder Airport:	An airport that is used primarily to feed a primary hub airport, allowing passenger to transfer to points further within the airline's network. An example of a feeder airport is Kingston. Kingston Airport's only scheduled passenger service offering is daily service to Toronto Pearson Airport.
Flight Service Station (FSS):	NAV Canada facilities that provide advisory services and weather information to pilots.
Fuel Farm:	A facility for the storage of aviation fuels.
Hub Airport:	An airport that serves a concentrated level of traffic for a given airline. Hub airports are used as transfer points for passengers travelling from one city to another, with a connection through the hub.
Level of Service (LoS):	The accuracy of flight procedures that can be conducted on a runway categorized as Non-Instrument, Non-Precision, or Precision.
Instrument Flight Procedure (IFP):	A standardized navigation procedure for aircraft operating under Instrument Flight Rules. Such procedures may include landing approaches, holding patterns, and departure routes.
Instrument Flight Rules (IFR):	Rules that govern the procedures for conducting flight under instrument conditions without visual reference to the ground, with flight instruments being the primary source of information to the pilot.
Instrument Landing System (ILS):	A ground-based navigation system that provides vertical and lateral direction to an aircraft inbound for landing. An ILS is categorized by how poor the weather can be for a landing to be permitted, ranging from Category I (least poor visibility) to Category III (worst visibility).

Term	Definition
International:	International flights are those occurring between Canada and other countries not including the United States.
International Civil Aviation Organization (ICAO):	An agency of the United Nations that addresses air transport and navigation at the global level.
Leakage:	The loss of passenger traffic from one airport to neighbouring airports through ground transportation.
Localizer Performance with Vertical Guidance (LPV):	A GPS-based approach that provides a level of precision similar to that of an ILS approach. LPV approach minimum altitudes are typically the lowest available for a GPS approach.
Low-Cost Carrier (LCC)	An airline that offers lower passenger ticket prices compared to a traditional airline, typically with a fewer complimentary services.
Maintenance, Repair & Overhaul	Facilities for the servicing, repair and refurbishment of aircraft. Additional specialized functions include painting, interior finishing, and aircraft role conversion.
Navigation Aid:	Ground-based, space-based, or on-aircraft systems that support or provide positioning capabilities.
NAV Canada	The not-for-profit corporation that owns and operates Canada's air navigation system.
Non-Directional Beacon (NDB):	A ground-based radio transmitter used for aircraft navigation. Pilots are able to determine their direction and distance to the beacon.
Obstacle Limitation Surfaces (OLS)	Three-dimensional surfaces designated for the protection of aircraft operations. Ground-based obstacles may not penetrate these surfaces.
Passenger Boarding Bridge (PBB):	A movable elevated bridge that is extended from the Air Terminal Building to the aircraft, to facilitate the boarding and disembarking of passengers. Commonly referred to as "jetways" or "air bridges."
Passengers Per Annum (PPA):	The total number of arriving and departing passengers handled by an airport in a given year.
Potential Reliever:	A potential reliever is an airport which may relieve congestion from a primary hub airport before the primary hub exceeds its capacity. The split of traffic typically occurs because the travelling public could deem, the primary hub too inconvenient, thus moving demand to the potential reliever.
Primary Hub:	An airport that operates as a hub for one or more airlines and aims to concentrate passenger and flight operations to one airport. They are often a point of transfer for passengers travelling within an airline's network. An example of a Primary Hub is Toronto Pearson Airport, which is a hub for both Air Canada and WestJet.
Rail Spur:	A small railway line that branches off from the main line to accommodate the loading and unloading of railcars.
Runway End Safety Area (RESA):	A cleared area past the end of the runway that reduces the risk posed to aircraft that undershoot, overshoot, or otherwise exit the runway.

Term	Definition
Secure / Unsecure	Secure areas are the controlled parts of the airport that are only accessible to individuals who have passed through security screening. Unsecured areas are open to the general public and are not subject to security screening.
Secondary Airport:	A secondary airport is one that provides passenger air services but is not a primary hub. These airports typically provide point to point services by existing airlines. The secondary airport will typically have fewer destination choices and lower frequency than a primary hub airport. An example of a secondary airport is Hamilton Airport. It provides non-stop passenger service to numerous Domestic, Transborder and International destinations, albeit with lesser frequency and destination selection as compared to Toronto Pearson Airport.
Southern Ontario Airport Network (SOAN):	An informal forum of 11 airports in southern Ontario with the mandate to collectively meet future airport capacity deficiencies.
Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR):	A ground-based lighting system that provides guidance to pilots as they approach a runway for landing.
Transborder:	A sub-category of International flights, for flights between Canada and the United States.
Ultra Low-Cost Carrier (ULCC)	A Low-Cost Carrier that further extends the concept of low fares by removing almost all complimentary services and by charging extra fees for add-ons.
Very High Frequency Omni-Directional Range (VOR)	A navigation system where pilots determine their position by receiving radio signals from one or more ground-based radio beacons.
Visual Aid:	Approach lighting systems, aerodrome flight maneuvering area hazard beacons, and visual aids provided on the movement area of an airport.

List of Acronyms

Acronym	Term
ACF	Air Cargo Facility
AGN	Aircraft Group Number
ARFF	Aircraft Rescue and Fire Fighting
ATB	Air Terminal Building
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
ATS	Air Traffic Services
AZRs	Airport Zoning Regulations
CARs	Canadian Aviation Regulations
CATSA	Canadian Air Transport Security Authority
CDF	Central De-icing Facility
CSF	Combined Services Facility
EA	Environmental Assessment
ERS	Emergency Response Services
FAA	Federal Aviation Administration
FBO	Fixed-Base Operator
FSS	Flight Service Station
FTU	Flight Training Units
GA	General Aviation
GPS	Global Positioning System
GTA	Greater Toronto Area
GTAA	Greater Toronto Airports Authority
ICAO	International Civil Aviation Organization
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules

Acronym	Term
ILS	Instrument Landing System
LCC	Low-Cost Carrier
LoS	Level of Service
LPV	Localizer Performance with Vertical Guidance
LRT	Light Rail Transit
MPPA	Million Passengers Per Annum
MRO	Maintenance Repair and Overhaul
MZO	Minister's Zoning Orders
NDB	Non-Directional Beacon
NEF	Noise Exposure System
NEP	Noise Exposure Projection
NP	Non-Precision
OLS	Obstacle Limitation Surfaces
P	Precision
P3	Public-Private Partnership
PBB	Passenger Boarding Bridge
PPA	Passenger Per Annum
RESA	Runway End Safety Area
SOAN	Southern Ontario Airport Network
SSALR	Short Simplified Approach Lighting System with Runway Alignment Strobes
ULCC	Ultra Low-Cost Carrier
VOR	Very High Frequency Omni-Directional Ranges
WGAA	Williams Gateway Airport Authority

APPENDIX B – Study Assumptions

Study Assumptions

Category	Issue	Assumptions
Policy and Regulatory Changes	International Liberalization	1. There will be no significant changes in the freedoms of the air. 2. There will be no right of establishment for foreign air carriers in Canada. 3. Cabotage will not be permitted in Canada. 4. Canada will continue with incremental liberalization of bilateral agreements, with no measures either constraining or favouring Toronto airports.
	Traffic Leakage to U.S.	5. There will be no significant changes in the 'user pay' approach to air transport in Canada. 6. The current leakage pattern to border U.S. airports will continue "as is" and will be subject to exchange rates and other factors.
	Airline Foreign Ownership	7. Foreign ownership rules may be relaxed up to a maximum of 49%, although control in fact provisions would remain.
	Billy Bishop Airport Status	8. The ban on jets will continue throughout the 20-year planning horizon. 9. Slot constraints and other limits to remain throughout 20-year planning horizon.
	Buttonville Airport Status	10. The airport will close in 2023, before a new Pickering Airport becomes operational, with resident aircraft already relocated to other 9 southern Ontario airports.
	New Pickering Airport	11. Apart from government investment for servicing the site, and environmental assessment work, investment in the development of a new Pickering Airport will be non-government financed and operated. 12. The capacity of each southern Ontario airport will be developed subject to traffic levels and environmental concerns (noise, land use, etc.) 13. Future investors will seek sustainable financial returns. 14. While unlikely, competition cannot be precluded between a new Pickering Airport and Toronto Pearson Airport.
	System Competition	15. A governance option will be selected which does not provide a new airport on the Pickering Lands a competitive advantage at the expense of the existing airports.

Category	Issue	Assumptions
Airline Markets	Industry Consolidation	16. Canadian airline consolidations may occur. 17. Airline consolidation with a one carrier outcome will not occur. 18. Foreign airline consolidation may involve a Canadian airline and would follow the 49% ownership rule, assuming control in fact of carrier remains in Canada.
	Airline Alliances	19. Evolving alliance strategies will not directly impact development of the new Pickering Airport.
	Low Cost Carriers (LCC)	20. U.S. - LCCs may extend services into Canada (Southwest, Allegiant, Jet Blue, Spirit, other) and may serve a new Pickering Airport. 21. Trans-Atlantic LCCs may serve a new Pickering Airport (Icelandair, Norwegian, other).
	Ultra-Low Cost Carriers (ULCC)	22. One or more Canadian ULCC carriers will begin operations within 5 yrs. 23. ULCCs will stimulate new passenger traffic in Canada and southern Ontario. 24. ULCCs will not serve Toronto Pearson Airport.
	Load Factors	25. Passenger growth at Toronto Pearson Airport will require more frequencies and larger gauge aircraft and cannot be accommodated by higher load factors using existing aircraft types.
Aircraft Trends	Route Fragmentation	26. Fragmentation of markets will continue, facilitated by new "right-sized" long range aircraft (e.g.: B787) operating longer flight segments and able to support increased point-to-point services.
	Route Economics	27. The trend towards larger regional turboprop and larger medium range jet aircraft will continue. 28. Smaller regional jets and turboprops <50 seats will become rare in air service operations. These aircraft types will be deployed very selectively by air carriers.
	Environmental Impacts	29. New generation aircraft with lower noise signatures and lower emissions will increasingly enter airline fleets potentially serving a new Pickering Airport.
	Fuel Price	30. Fuel price fluctuations will not be considered due to unpredictability.

Category	Issue	Assumptions
Airline Services	Air Canada	31. Air Canada will continue to focus on operating a Hub-and-Spoke model to maintain and strengthen their dominant position at Toronto Pearson Airport, with limited interest in other southern Ontario airports. 32. Air Canada will continue to emulate low cost carriers, with a separate division (Rouge).
	WestJet	33. WestJet will continue to serve multiple southern Ontario airports with expanded domestic, transborder and international services. 34. WestJet will continue to focus on Toronto Pearson Airport. 35. WestJet's wholly owned subsidiary Swoop is an ultra-low-cost carrier, which began flight operations in June 2018. Swoop will continue to grow and challenge new ULCC entrants to the Canadian market.
	Charter Air Services	36. Charter carriers will continue to seek lower cost alternatives to Toronto Pearson Airport, and will continue expansion into other southern Ontario Airports.
	Route Economics	37. Trend towards use of larger narrow body aircraft will continue in North and Central American domestic and transborder markets. 38. New wide-body aircraft (B787, A350) will cause fragmentation of international routes, both competing with and favouring Toronto Pearson Airport. 39. Very limited use of ultra-large wide-body aircraft (A380) with use primarily on frequency-constrained routes.
Air Cargo Services	Route Economics	40. The trend towards use of twin-engine wide-body aircraft will continue for intercontinental air cargo routes. 41. Industry will continue demands for increased flight frequency.
	Operational Models	42. Leading air express operations will remain based at Toronto Pearson Airport. 43. Air Freight operators will seek economic points of consolidation and flexible operational hours at other southern Ontario Airports. 44. Intermodal cargo operations (truck-air, air-truck) will occur at all airports.

Category	Issue	Assumptions
General Aviation / Business Aviation	Types of Activities	45. Commercial, Corporate and Industrial activity may occur at a new Pickering Airport. 46. Stakeholders may identify a need for a General Aviation airport service type airport on Pickering Lands; however, this will not be the sole driver for a new airport.
Ground Transportation	Rail Services	47. The possibility of higher speed rail service (200 kph) between Toronto and Montreal within the next 20 years will be assessed, including impacts on passenger demand. 48. The possibility of regional/commuter rail services to Pickering Airport within the next 20 years will be assessed.
	Road Services	49. The new Highway #407 toll road will serve a new Pickering Airport beginning during the short term. 50. Congestion on Highway #401 and arteries in the GTA will make east-west travel increasingly difficult.

APPENDIX C – Airport Development Constraints

AIRPORT DEVELOPMENT CONSTRAINTS

The extent to which a greenfield airport can be developed may be constrained by several physical factors. These factors include, but are not limited to:

- aircraft noise;
- aircraft flight procedures;
- airport zoning;
- environmental considerations;
- urban development; and
- the existing and proposed surface transportation network.

The above factors were reviewed and analysis was completed to determine if these constraints would prevent, or limit a new airport on the Pickering Lands from providing the service types and roles identified in Section 4.1.

Aviation

Noise Exposure

An assessment of the annoyance resulting from anticipated aircraft noise levels is important. An individual's perception of noise generated by aviation is dependent on the type of noise, frequency of occurrence, type of aircraft, and the time of day it occurs. The Noise Exposure Forecast (NEF) system, endorsed by Transport Canada, takes these factors into consideration to produce a noise footprint that assists in determining appropriate land uses near an airport.

NEF land use guidelines are intended to encourage compatible land uses near airports. Transport Canada states that it advocates compatible land use in areas affected by aircraft noise. These are defined as areas where aircraft noise reaches NEF 25. At NEF 30, speech interference and annoyance caused by aircraft noise are present and potentially increasing. At NEF 35, these effects are significant. New residential development is therefore not compatible within areas where aircraft noise reaches NEF 30 and above. To provide guidance in long range land use planning, the Noise Exposure Projection (NEP) was introduced by Transport Canada. The NEP is based on a projection of aircraft movements for 10 years or more into the future, and includes aircraft types and runway configurations that may be planned.

For new aerodromes, Transport Canada recommends that no new noise sensitive land uses be permitted above 25 NEF/NEP. Noise sensitive land uses are listed in Transport Canada's document – TP1247 – Land Use in the Vicinity of Airports and include, but are not limited to houses, schools, day care centres, nursing homes, and hospitals.

The Province of Ontario's Policy Statement under the Planning Act states that airports should be protected from incompatible land uses by:

- prohibiting new residential development and other sensitive land uses in areas above 30 NEF/NEP;
- considering redevelopment of existing residential or other sensitive land uses in areas above 30 NEF/NEP if it has been demonstrated that there will be no negative impacts on the long-term function of the airport; and
- discouraging land uses which may cause a potential aviation safety hazard.

The land use guidelines are enforced by Minister's Zoning Orders (MZO)s. Because of the previously established MZOs and Airport Zoning Regulations (AZRs) by Transport Canada, the current and future proposed land uses surrounding the Pickering Lands are compatible with future airport operations.

The NEF contours for a new airport on the Pickering Lands, as defined by Transport Canada (February 2016), are shown in Figure C.1.

Instrument Flight Procedures

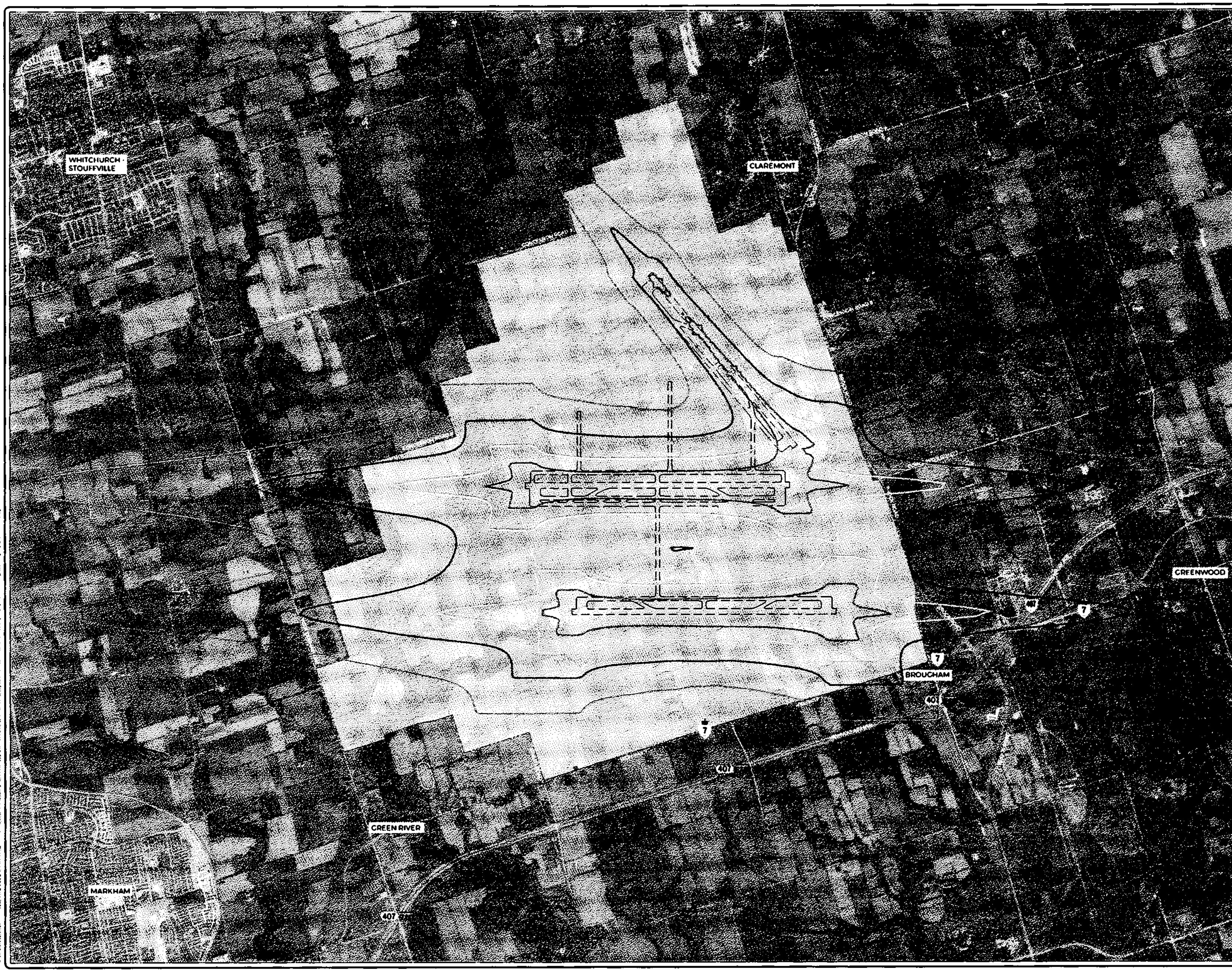
Instrument Flight Procedures (IFPs) can be categorized as one of the following: departure, enroute, holding, or arrival procedures. These procedures allow aircraft operating under Instrument Flight Rules (IFR) to safely transition through the stages of flight, between takeoff and landing. Airports with published IFPs closest to the Pickering Lands may have the potential to impact future operations at Oshawa Airport, Buttonville Airport, and Toronto Pearson Airport.

An initial review of currently published IFPs near the Pickering Lands and the proposed runway configuration for a new Pickering Airport suggests that there would be no notable conflicts between flight operations in the surrounding airspace and those using a new airport on the Pickering Lands. Developing a new airport on the Pickering Lands may require modest airspace reconfigurations, which would be the responsibility of Canada's air traffic service provider - NAV CANADA.

Airport Zoning Regulations

Airport Zoning Regulations (AZRs) are legal regulations enacted under Section 5.4 (2) of the Aeronautics Act and apply to lands within and outside of airport property. These federally authorized AZRs protect operational surfaces for both existing and future facilities by imposing limitations to the development of any object that would be deemed an obstruction. The intention of the AZRs is to ensure future development surrounding the airport will allow safe aviation operations at the facility.

The current AZRs in force for the Pickering Lands were published in 2004, and feature a five-runway configuration for a new Pickering Airport. Since the introduction of the AZRs, significant portions of the Pickering Lands were transferred to Parks Canada to create the Rouge National Urban Park. Therefore, the current AZRs may overprotect for a new airport on the Pickering Lands. Figure C.2 shows the current AZR configuration.



General Notes

1. DRAWING TO BE USED FOR PLANNING PURPOSES ONLY
2. NEF CONTOURS BY TRANSPORT CANADA 2014

Legend

- NEF 40 NOISE CONTOUR
- NEF 35 NOISE CONTOUR
- NEF 30 NOISE CONTOUR
- NEF 25 NOISE CONTOUR
- PROPERTY BOUNDARY
- FUTURE AIRSIDE INFRASTRUCTURE

Scale - AS NOTED

1:20,000

Key Plan

No	DATE	DESCRIPTION	BY	APPD
B	Sept 2018	FINAL	NI	AIM
A	July 2018	DRAFT	NI	AIM

REVISION / ISSUE

Consultants

KPMG

WSP

Client

Transports Canada / Transport Canada

Project

PICKERING LANDS AVIATION SECTOR ANALYSIS - TYPE AND ROLE REPORT

Title

NOISE EXPOSURE FORECAST (2014)

Project No.	16M-00201-01	Contract No.	AV2
Design	NI	Checked	AIM
Drawn	NI	Date	SEPT 2018
DRAWING No.	FIGURE C.1	SHEET No.	09 of 09

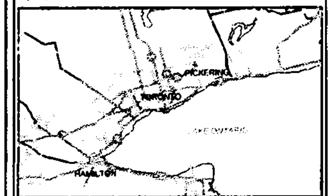
Transport Canada | Transports Canada

SKETCH ILLUSTRATING PROPOSED PICKERING AIRPORT SITE BOUNDARIES WITH PROPOSED SURFACES

DESSIN ILLUSTRANT LES LIMITES PROPOSÉES DE LA ZONE AÉROPORTUAIRE DE PICKERING ET LES SURFACES PROPOSÉES

ONTARIO

Key Map



Plan showing lands affected by zoning regulations for the PICKERING AIRPORT SITE, being part of the City of Markham and Town of Whitchurch-Stouffville in the Regional Municipality of York, and the City of Pickering, Towns of Ajax and Whitby, and the Townships of Scugog and Uxbridge in the Regional Municipality of Durham

Plan montrant les terrains touchés par les règlements de zonage du ZONE AÉROPORTUAIRE DE PICKERING, qui font partie des villes de Markham et Whitchurch-Stouffville dans la municipalité régionale de York, ainsi que les villes de Pickering, Ajax, et Whitby, et le canton de Scugog et Uxbridge dans la municipalité régionale de Durham

Legend	Légende
Proposed Airport Site Boundary Limites proposées de la zone aéroportuaire	
Proposed Approach Surface Surface d'approche proposée	
Proposed Transitional Surface Surface de transition proposée	
Proposed Strip Surface (300m wide) Surface de bande proposée (largeur de 300 m)	
Proposed Outer Surface Surface extérieure proposée	
Wildlife Hazard Zone Zone de péril faunique	
Airport Reference Point Point de référence de l'aéroport	△

Scale | Échelle

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Canada

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In 2004, the GTAA completed the Pickering Airport Draft Plan Report[19] and presented a functional plan for a new airport on the Pickering Lands. The plan outlined a new three-runway configuration (two parallel runways and one crosswind runway), which optimized the use of available space in the land assembly to the south-east of the CPR Havelock Subdivision rail corridor. This plan is compatible with the new property boundary resulting from land transferred to the Rouge National Urban Park. In 2013, Transport Canada announced a "responsible and balanced approach for developing the federally-owned Pickering Lands"[20]. This included the reduction of Pickering Lands designated as an airport site and the creation of new AZRs to reflect the three-runway configuration outlined in the 2004 Pickering Airport Draft Plan. The new AZRs were submitted to the Canada Gazette in 2015, and are still in the final stages of approval and enactment. For the purpose of this report, the planning of airside infrastructure for a new airport on the Pickering Lands will consider implementation of the new AZRs utilizing the three-runway configuration. Figure A.2 illustrates the proposed/revised AZRs which are currently in the process of being enacted.

Environmental

Rouge National Urban Park

In April 2015, the Government of Canada announced the transfer of 1,910 hectares of Transport Canada lands to Parks Canada, and in July 2015 it was further announced that the Government of Canada would contribute an additional 2,100 ha of lands previously reserved for airport development and reserve purposes to the Rouge National Urban Park. According to Parks Canada, the Rouge National Urban Park will be one of the largest urban parks in the world, encompassing 7,910 hectares and overlapping the cities of Pickering, Markham, and Toronto.

The Rouge National Urban Park is comprised of natural, cultural, and agricultural elements including:

- Working farms;
- Forests;
- Campgrounds;
- Marshes;
- Beaches;
- Hiking trails; and
- Indigenous sites and villages.

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[19] "Pickering Airport Draft Plan Report", Greater Toronto Airports Authority, November 2004.

[20] "Public Notice – Proposed Regulations for The Federally-Owned Pickering Lands", Transport Canada, March 2017.

Rouge National Urban Park extends from the shore of Lake Ontario, west of the Seaton Lands and Pickering Lands, and terminates approximately 3 km north of the site of the future Pickering Airport. The Rouge National Urban Park limits airport development on the Pickering Lands to the north and west. It is anticipated that the greatest potential issue associated with this constraint is the environmental impact of a new airport on the Pickering Lands. The noise generated by aircraft, aircraft and vehicle emissions, and glycol runoff resulting from aircraft de-icing operations could have an adverse effect on both flora and fauna in the Park. In addition, the Park could attract large bird populations, creating a potential bird strike hazard for aircraft. These issues, along with other environmental impacts would be studied through an Environmental Assessment (EA). The EA would identify both potential environmental issues, and appropriate mitigations to minimize overall environmental impacts.

Urban Development

Seaton Lands

The Seaton Lands is a proposed 3,100 acre residential and commercial development located in the City of Pickering, adjacent to the Pickering Lands and south of Highway 407. According to Infrastructure Ontario, "The Seaton Lands will be a mixed use, sustainable community which will be a workplace for 30,500 and home to 61,000 people by 2031".[21]

It is anticipated that many employers will be located around the Highway 407 corridor. Planning and design work for development of the Seaton Lands is underway with several studies being completed or pending. The results and recommendations of these studies will impact the start date for further preparation of the Seaton Lands for commercial development.

One of the most common concerns when planning residential developments near an airport is aircraft noise. A review of the Pickering Lands and Existing Provincial Ministers Zoning Orders (February 2016) revealed that the planned approach and departure flight paths to the three planned runways will not extend over planned residential areas of the Seaton Lands. As a result, aircraft noise is expected to have a minimal impact on Seaton developments. The areas of the Seaton Lands identified for development near the approach and departure flight paths associated with a new airport on the Pickering Lands are intended for commercial and industrial uses, which are less sensitive to aircraft noise.

[21] Infrastructure Ontario – Seaton Lands. http://www.infrastructureontario.ca/Seaton-Lands/, May 22, 2018.

Green River and Claremont

The Villages of Green River of Claremont are small, rural residential communities located southwest and northeast of the Pickering Lands boundary, respectively. While immediately adjacent to the Pickering Lands, both communities lie outside of the 25 NEF contour (2014) shown in Figure C.1. Therefore, development of an airport on the Pickering Lands as per the MZOs is expected to minimize levels of aircraft noise exposure to the Villages of Green River and Claremont.

Transportation

Havelock Rail Corridor

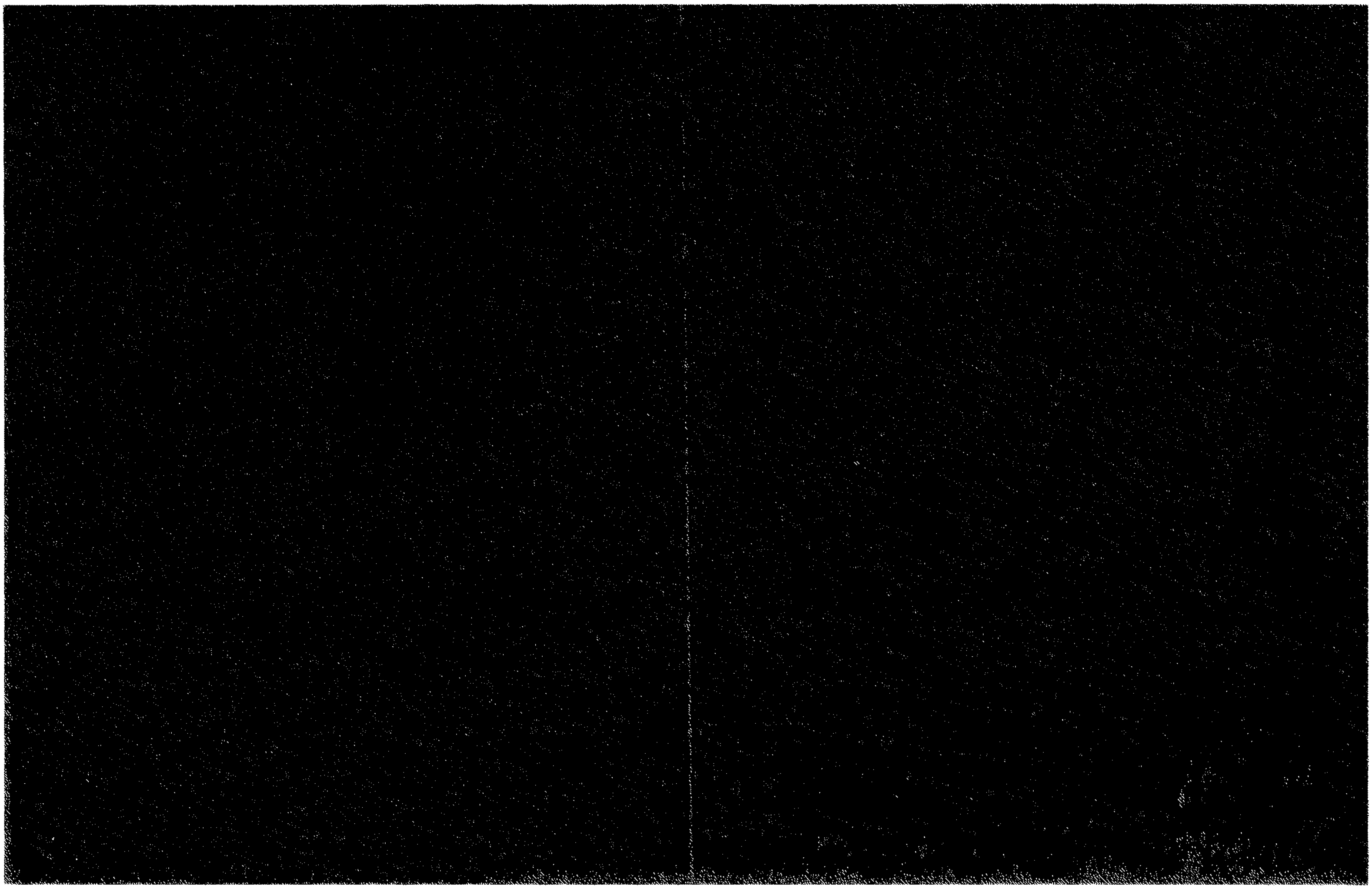
The Canadian Pacific Railway Havelock Corridor enters the Pickering Lands from the southwest corner and continues in a northeasterly direction. The length of the rail line within the Pickering Lands boundary extends 8.5 km and constrains airfield development in the northwest portion of the Pickering Lands. Transport Canada regulations requires that, when assessing rail as a potential obstacle, a minimum 7 metres of clearance be provided above the rail infrastructure to allow for obstacle protection. The lands west of the Rail Corridor are unsuitable for airside use, but are appropriate for commercial uses that do not require direct access to airfield infrastructure. The rail corridor is used by CP freight trains multiple times per week. Passenger service was discontinued in the corridor in 1990. Recently, there have been discussions about the possibility of utilizing the corridor for both GO Train and VIA Rail service; however, a timeline for the introduction of either service has yet to be announced.

Road Network

The Pickering Lands are bordered by Highway 7 and Highway 407 to the south, Brock Road to the east, York Durham Line to the west, and Concession Road 9 to the north. For the purpose of evaluating obstacles, Transport Canada regulations require that 4.7 m of clearance be provided above the crown of the road. This indicates that an appropriate buffer is required between a runway end and roads bordering the airport. The Durham Transportation Master Plan proposes both new and enhanced roads that will improve access to the Pickering Lands by 2031; however, these planned road developments are not expected to impede the development of a new Pickering Airport, as described within this study.

Findings

Analysis of the above constraints determined that the Pickering Lands could be developed as an industrial or specialty passenger airport with no limitations or restrictions. Additionally, the Lands could be developed for any airport service type or role, including those discounted in Section 4.2. Further studies related to geotechnical conditions, environmental assessment, and existing infrastructure condition (e.g., buried services and roads) may identify additional constraints.



KPMG

Pickering Lands Aviation Sector Analysis
Revenue Generation and Economic Impact Report

Transport Canada

KPMG Canada Advisory Services Inc.

March 31, 2019

KPMG

Executive Summary

Transport Canada retained KPMG LLP (KPMG), in partnership with WSP (formerly MMM Group Limited), to carry out an Aviation Sector Analysis of the Pickering Lands. The Analysis comprises three primary reports and one additional contextual piece (an annex to the first report) to bridge the findings between the first and second reports:

1) The Supply and Demand Report,

1.5) The Contextual Bridge Report,

2) The Type and Role Report, and,

3) The Revenue Generation and Economic Impact Report.

This Revenue Generation and Economic Impact Report is the third and final report comprising the Aviation Sector Analysis.

The Supply and Demand Report projected that passenger demand within southern Ontario will grow to approximately 73.9 Million Passengers Per Annum (MPPA) by 2036. It further concluded that the southern Ontario airports system has sufficient capacity to meet the forecast passenger demand and that a new airport on the Pickering Lands would not be needed before 2036 from a capacity standpoint. Collectively, southern Ontario airports have capacity to support 94.7 MPPA using existing runway infrastructure. Capacity improvements within the southern Ontario airports system, including the addition of runways and taxiways, could augment the overall capacity within southern Ontario to approximately 119.6 MPPA by 2036.

Following the completion of the Supply and Demand Report, Transport Canada commissioned an additional Contextual Bridge Report to demonstrate how the individual airports within the southern Ontario airports system could be expanded to meet forecasted passenger demand. The Contextual Bridge Report concluded that existing and future passenger demand could see secondary airports (such as Hamilton, Waterloo, and Billy Bishop) continue to grow and provide additional capacity within their existing boundaries (or with modest land assembly).

The results of the Supply and Demand Report and the Contextual Bridge Report led to a desire to examine potential roles and service types for a new airport on the Pickering Lands that could support economic growth as opposed to responding only to a need for additional passenger capacity within southern Ontario. The Type and Role Report developed and assessed options for the service type(s) and role of a potential new airport on the Pickering Lands, based primarily on market factors, the past experience of similar airports, and how a new airport would fit into the existing southern Ontario airports system. Five options were developed and assessed based on minimizing competition with airports within the existing network, and on their potential for sustainable financial success. The Type and Role Report concluded that three options would be most ideally suited for development on the Pickering Lands in order to minimize potential impact on other airports within the southern Ontario airport system. These type and role options were:

- an Industrial Airport,
- a Specialty Passenger Airport, or
- a combined Industrial and Specialty Passenger Airport.

Small, Medium and Significant development concepts were developed for each of the airport types. To enable the implementation of all of these airport scenarios (including scenarios beyond those considered), a proposed conceptual land use plan was also developed. Finally, the report examined various governance options, and analyzed them for their ability to support the success of a potential new airport. The report identified that the Municipally Owned and Airport Commission Operated governance option and the Transport Canada Owned and Airport Authority Operated governance option both feature desirable governance characteristics, including independent, knowledgeable, experienced and autonomous groups responsible for all aspects of airport planning, development, marketing, operations, and business management, with ultimate control of land use remaining with Transport Canada.

The overall purpose of this Revenue Generation and Economic Impact Report is to examine the potential financial outcomes associated with each of the airport types identified in the Type and Role Report (e.g., industrial, specialty passenger, and combined industrial and specialty passenger), and to assess the potential economic benefits that would be derived from each. The purpose of undertaking this analysis is to better understand whether there could be a business case that would support the development of a new (industrial, specialty passenger, or combined) airport on the Pickering Lands, including whether an investor could be interested in developing the airport.

The following paragraphs highlight the findings from the research and analysis contained within this Revenue Generation and Economic Impact Report.

Six Airport Scenarios Developed and Analyzed

To test the potential financial outcomes of a potential new airport on the Pickering Lands, six airport scenarios were developed. These scenarios were developed to reflect a small and a large version (referred to as Small and Significant, respectively) of each of the three airport types (industrial, specialty passenger, and combined industrial and specialty passenger). The infrastructure and facilities required for each of the six scenarios corresponds with the infrastructure and facilities put forward in the Type and Role Report for the following conceptual designs:

1. Small Industrial Airport
2. Small Specialty Passenger Airport
3. Small Combined Industrial and Specialty Passenger Airport
4. Significant Industrial Airport
5. Significant Specialty Passenger Airport, and
6. Significant Combined Industrial and Specialty Passenger Airport.

The facility scenarios served as the foundation for developing capital and operating cost estimates for each. Each of the six facility scenarios was complemented with the development of a corresponding air traffic scenario and tenant scenario, which served as the foundation for calculating the potential magnitude of the revenue streams associated with each. Additional financing assumptions were developed. These assumptions and estimates were then used to develop a financial model for each scenario, covering the construction period plus 30 years of operations.

Results of the Revenue Generation Analysis

While conclusions regarding actual financial outcomes of a potential new airport on the Pickering Lands, including the potential private sector interest, remain speculative at this time, the results of the financial analysis help to shed light on what might be expected for each of the scenarios presented. To assess the financial outcomes of each scenario, the minimum values for three key financial metrics that would likely be required for a private sector investor to *consider* investing in the development of a new airport were identified. These were:

- Project IRR (Internal Rate of Return) to be at least 8.0%
- EBITDA/Interest (Interest Coverage Ratio) should not fall below 1.2
- Annual cash flows are positive within five (5) years of beginning opening.

[redacted]

Results of the Economic Impact Analysis

The Economic Impact Analysis was conducted for the three Significant airport scenarios (#4, #5 and # 6), to explore the potential upper range of the economic benefits that could be achieved, based on the six airport scenarios developed. [redacted]

[redacted] In this context (e.g., analyzing construction impacts), a job corresponds to one full-time position held for one year.

Concluding Remarks

The study conducted and documented within this report was exploratory in nature, and is based on a number of assumptions reflective of the early nature of the analysis conducted. From this perspective, the results should not be interpreted as providing conclusive evidence regarding the potential success (or lack of success) of a new airport on the Pickering Lands. However, they can be interpreted as indicative of what could be expected if the assumptions underpinning a given scenario materialize.

Table of Contents

KPMG

Transport Canada
Pickering Lands Aviation Sector Analysis
March 31, 2019

1 Introduction

1.1 Study Background

Transport Canada retained KPMG LLP (KPMG), in partnership with WSP (formerly MMM Group Limited), to carry out an Aviation Sector Analysis for the Pickering Lands (as described in Section 1.0 of the Supply and Demand Report). This broad scope of work is referred to as the "Pickering Lands Aviation Sector Analysis", or simply as the "Aviation Sector Analysis".

This report, referred to as the "Revenue Generation and Economic Impact Report", summarizes the financial analysis undertaken for three airport type and role options; these options were identified in the Type and Role Report. This report also summarizes the economic impact analysis of each of the airport types. This analysis was undertaken to better understand the potential attractiveness, from a business case perspective, of developing a new airport on the Pickering Lands, operating within the southern Ontario airports system.

The broader Pickering Lands Aviation Sector Analysis consists of the following studies undertaken by KPMG/WSP:

- Supply and Demand Report (completed in 2017)
- Contextual Bridge Report (completed in 2017)
- Type and Role Report (completed in 2018)
- Revenue Generation and Economic Impact Report (i.e., the current report).

The Aviation Sector Analysis considers the following airports within southern Ontario, which were chosen for consistency with previous studies related to a Pickering Airport (as described in section 1.1 of the Supply and Demand Report):

- Toronto Pearson International Airport (Toronto Pearson Airport, Pearson Airport, or Pearson)
- Billy Bishop Toronto City Airport (Billy Bishop Airport or Billy Bishop)
- John C. Munro Hamilton International Airport (Hamilton Airport)
- Region of Waterloo International Airport (Waterloo Airport)
- Toronto Buttonville Municipal Airport (Buttonville Airport)
- Peterborough Municipal Airport (Peterborough Airport)
- Lake Simcoe Regional Airport (Lake Simcoe Airport)
- Oshawa Executive Airport (Oshawa Airport)
- Burlington Executive Airpark (Burlington Airport)
- Brampton Airport.

The current and future capacity of the southern Ontario airports system is measured by determining annual runway passenger capacity. Annual runway passenger capacity is determined by the number of passengers that can be served by a runway or a runway system. The Supply and Demand Report projected that passenger demand within southern Ontario will grow from approximately 41.5 Million in 2014 to approximately 73.9 Million Passengers Per Annum (MPPA) by 2036. Airports within the southern Ontario airport system that would be expected to contribute to meeting this demand are Toronto Pearson Airport, Hamilton Airport, Waterloo Airport, and Billy Bishop Airport.

Cumulatively, these airports have an existing capacity (as of 2016) to support 94.7 MPPA (as identified in the Supply and Demand Report) with existing runway infrastructure. However, capacity improvements within the southern Ontario airports system, including the addition of runways and supporting taxiways, could augment the overall capacity within southern Ontario to approximately 119.6 MPPA by 2036. As a result, the Supply and Demand Report concluded that the southern Ontario airports system has, or will have, sufficient capacity to meet forecast passenger demand and that a new passenger airport on the Pickering Lands would not be needed before 2036 from a capacity standpoint.

While not included in the original scope of the Aviation Sector Analysis, Transport Canada commissioned a Contextual Bridge Report to illustrate how individual airports within the southern Ontario airports system could be expanded to meet forecasted passenger demand in southern Ontario. The Contextual Bridge Report concluded that existing and future demand could see secondary airports (such as Hamilton, Waterloo, and Billy Bishop) continue to grow within their existing boundaries (or with modest land assembly) to provide additional capacity to support anticipated passenger demand within southern Ontario.

The results of the Supply and Demand Report and the Contextual Bridge Report led to a desire to examine potential roles and service types for a new airport on Pickering Lands that could support economic growth as opposed to responding only to a need for additional passenger capacity within southern Ontario. The potential roles and service types for a new airport on the Pickering Lands were examined in the Type and Role Report, which concluded that three options would be most ideally suited for development on the Pickering Lands in order to minimize potential impact on other airports within the southern Ontario airport system. These type and role options were:

- an industrial airport
- a specialty passenger airport, or
- a combined industrial and specialty passenger airport.

The Type and Role Report included Small, Medium, and Significant development concepts that were developed for each of the three airport type and role options. These options are designed so that they do not preclude the potential evolution of the airport into a regular passenger airport at some point in order to address capacity constraints that may arise after 2036 within the southern Ontario airports system. Based on these development concepts, the Type and Role Report also presented one proposed conceptual land use plan, illustrating how land could be designated in such a way to permit the three type and role options, at all three of the scales of development contemplated in the report (Small, Medium, and Significant), without precluding the potential eventual evolution to a regular passenger airport.

This report builds on the findings of the first two reports, by illustrating and analyzing what the potential financial results could look like for each of the three airport type and role options, as well as the potential economic impact of each.

KPMG led the preparation of this report with inputs on capital costs from WSP.

1.2 Study Objectives

Recognizing that the passenger airports in the southern Ontario airports system can accommodate projected passenger growth through to the end of the projection horizon (2036) and that there may be other reasons for pursuing the development of an airport on the Pickering Lands (as described in the Contextual Bridge Report), this study examines the potential financial attractiveness of various airport development scenarios, as well as the potential economic impact of a new airport.

The study is intended to contribute to a decision by Transport Canada to decide whether or not to continue to study the potential for a new airport on the Pickering Lands.

Recognizing that it is impractical to study all potential airport development scenarios, the objective of this study is to develop a better understanding of:

- what a new airport on the Pickering Lands could look like, based on the roles identified in the Type and Role Report,
- what the costs, revenues and cash flows could look like under each of the scenarios developed,
- the potential funding requirements for a new airport on the Pickering Lands, and
- the potential economic impact of the development and operation of a new airport on the Pickering Lands.

1.3 Study Assumptions, Limitations and Use of this Report

To maintain consistency throughout the Pickering Lands Aviation Sector Analysis study, assumptions regarding the regulatory environment, airline markets and trends, passenger services, air cargo services, general aviation, and ground transportation have been made. These assumptions are applicable throughout the 20-year study period and are listed in Appendix B. A change in any of the assumptions could have a material impact on the financial and economic analysis contained in this report.

This Revenue Generation and Economic Impact Report covers an approximately 30-year planning period, extending beyond the horizon of both the Supply and Demand Report and the Type and Role Report. The analysis presented in this report is preliminary, is subject to significant uncertainties, and is derived using assumptions, which may change based on several factors, including, for example:

- investments and changes in the southern Ontario airport system,
- evolving industry trends and requirements,
- shifts in air passenger travel patterns,
- economic conditions (the value of the Canadian Dollar relative to the U.S. Dollar, energy prices, stock market volatility, etc.),
- changes in government airport policy,
- differences between forecast and actual demand over the 20-year planning period, and
- discrepancies between anticipated and actual infrastructure development.

The analysis presented in this report incorporates information available as of the report date, and many of the assumptions used in preparing the analysis may change. Accordingly, the development framework, assumptions, and the resulting estimates and conclusions should be reviewed and potentially adjusted as major assumptions evolve.

This study identifies a number of potential scenarios, not necessarily representative of the entire spectrum of possibilities, to better understand what might be possible, but does not suggest that the scenarios presented herein are more or less likely to occur than others not presented in this report. As a result, there may be viable potential scenarios that were outside the scope of the analysis contained in this report. To emphasize the point: the scenarios contained within this report should not be interpreted as projections of the future; rather, they are intended only to provide a sub-set of potential scenarios. The future may differ substantially from the assumptions used in the analysis, and the impact of these differences on the analysis might well be material.

Further, assumptions contained in this report were based on information and analysis available from other existing airports. In many cases, information required to develop assumptions was only available from a limited set of sources, creating a high degree of dependence on relatively few data points, broad assumptions, and professional judgment.

KPMG and WSP's procedures consisted solely of inquiry, comparison and analysis of identified and provided information and relevant information from third-party sources. The team relied on information provided by project participants without verification or audit. The information contained in this document does not constitute an audit. Accordingly, KPMG and WSP do not express an opinion on such matters.

This document should be considered in its entirety, and in conjunction with the other three reports that comprise the Pickering Lands Aviation Sector Analysis. These reports provided many of the assumptions upon which the analysis contained in this report is based. Selection of, or reliance on, specific portions of this document could result in the misinterpretation of comments and analysis provided. KPMG and WSP will not assume any liability in connection with the reliance by any third party on this document.

KPMG and WSP reserve the right, but will be under no obligation, to review all findings, conclusions and calculations included or referred to herein and, if KPMG and WSP consider it necessary, to revise the findings, conclusions and calculations in light of any information that becomes known to KPMG and WSP after the date of this document.

2 Approach, Method, and Key Assumptions

This section provides a description of the approach, method and key assumptions used to develop the analysis and findings contained in this report.

2.1 Case Study Airports

To analyze the revenue generation potential and economic impact of a new airport on the Pickering Lands, assumptions on airport users, traffic volume, airport revenue and pricing, airport operating costs, and various other assumptions needed to be developed. Development of these assumptions for a greenfield airport is subject to a high degree of uncertainty as there is no prior operating history. KPMG's approach was to identify existing airports that have similarities with the airport scenarios to be analyzed and to use information from those airports as reference points for development the required assumptions.

A number of airport case studies were developed to inform the assumptions for the scenarios analyzed in this report. Case study airports were selected in consultation with Transport Canada based on their degree of similarity with a potential new airport on the Pickering Lands, as identified by the three options in the Type and Role Report. Similarity was measured according to the following criteria:

- the airport is able to represent one or both of the two airport types identified as preferable in the Type and Role Report (e.g., it is an industrial or passenger airport),
- the airport is part of the same, or similar, market(s) as a potential new airport on the Pickering Lands (e.g., part of the southern Ontario airport system, or at least part of a North American market),
- the airport is part of a system (e.g., at least two airports exist in the system that serve the same geographic area), and
- the airport publishes publicly available information regarding the history of the airport, its operations, and its financial statements.

Since it was rare to find airports that could meet all of the above criteria, information on comparator airports was used in a composite manner. For example, one airport may have informed air traffic assumptions, while another may have been used to inform potential fee structure and revenues. It should be noted that the selected comparator airports were not based on an exhaustive review of all similar airports; it is possible that other airports would make better comparators. However, within the scope of the assignment, those selected were viewed as providing sufficient breadth for the purpose of this study.

Appendix C contains a summary of the research conducted for each of the initial comparator airports.

2.1.1 General Aviation and Industrial Airports

To identify comparators for general aviation and industrial airports in Canada, KPMG looked for airports that are located within the southern Ontario airport system, and classified as having general aviation (GA) and/or industrial aviation activity.

To identify comparators located in the United States, KPMG looked for airports that included large aircraft assembly or manufacturing plants, either adjacent to them or onsite. To identify these airports, we examined corporate information from Boeing and EADS North America on their employment locations (EASDS is the manufacturer of Airbus aircraft).

The following airports were identified for further review as comparators:

Airports located in Canada and selected as GA / Industrial comparators:

- Slemon Park (located in Prince Edward Island)
- Peterborough Airport (located in Peterborough, Ontario)
- Downsview Airport (while not publicly owned, Downsview was identified as being of interest given the recent 2018 sale of the airport by Bombardier).

Airports located in the U.S. and selected as GA / Industrial comparators:

- King County International Airport / Boeing Field (located in Seattle, Washington)
- Mobile Aeroplex at Brookley (located in Mobile, Alabama).

2.1.2 Speciality Passenger Airports

For comparator specialty passenger airports, existing secondary passenger airports (airports primarily focused on scheduled and charter passenger services) both in the United States (U.S.) and Canada that complement major passenger airports were examined. Through the research, the following airports and locations were identified for further review:

Airports located in Canada selected as specialty passenger comparators:

- John C. Munro Hamilton International Airport (Hamilton Airport)
- Region of Waterloo International Airport (Waterloo Airport)
- Abbotsford International Airport

Airports located in the United States selected as specialty passenger comparators:

- Phoenix-Mesa Gateway Airport.

2.1.3 Case Study Findings

The following provides a high-level overview of the case study findings. Detailed findings are provided in Appendix C.

2.1.3.1 Industrial Airports

Overall findings regarding the industrial airports researched include:

- Most industrial airports are located either on former military bases or on former municipal airports that had become surplus or were decommissioned[1]. Since these airports had existing runways in place, often with very long lengths and a high load carrying capacity, they could

[1] It should be noted that, at some industrial airports, military activity continues in parallel. Thus the industrial airport may use just that portion of the site that became surplus.

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be repurposed at low incremental cost. This provided a very cost-effective basis for new operations.

- In addition to runway facilities, former military bases often have significant building infrastructure, including hangars with large footprints. While facilities may have needed (and may still need) upgrading and rehabilitation, the presence of these facilities offers the potential to offer building space to aerospace tenants at low cost.
- Industrial airports are often operated by municipal and state (or provincial) agencies that see significant value in supporting aeronautical clusters, seeing them as tools for local economic development. The aerospace industry has a reputation for supporting high-paying, knowledge-intensive employment, both directly and in its supply chain.
- Because of the perceived value of industry clusters in the aerospace sector, governments are often very willing to provide financial support to industrial airports. A number of airports where revenues do not cover operating expenses were identified. For example, relevant airports include the Mobile Regional Airport, Mobile Downtown Airport and Mobile Aeroplex at Brookley, and the Peterborough Airport.

2.1.3.2 Passenger Airports

Overall findings regarding the passenger airports researched include:

- [redacted]
- Some U.S. secondary or reliever passenger airports were able to capture more significant market share, for example with William P. Hobby Airport serving Houston, Texas capturing 24.3% of the passenger market. However, upon closer examination, it was revealed that those secondary or reliever airports able to capture more than 10% of market share had historically been primary passenger airports and were typically closer to the city centre than their more recently established counterparts. Of the secondary or reliever airports that were originally established for that purpose and that were located further from the city centre than their counterparts, St. Pete – Clearwater International Airport was able to capture the largest market share at 9.5%. This suggests that this percentage may be an upper bound on the market share that can be captured by airports established as secondary or reliever airports and that are more distant from the city centre than their counterparts.

2.2 Other Reference Airports

As the study progressed, additional research requirements were identified for various assumptions that were not fully addressed by the airport case studies. To address these needs, additional airports were identified for review and research on these airports was used to further inform the analysis. These airports were identified based on their similarity in type, role, and/or scale, and on the availability of information. The information available from these airports was used in a variety of ways; in some cases to inform assumptions used in the financial modelling, and in other cases, to validate that the assumptions used were reasonable given observed values in the comparators.

Additional reference airports include:

- Brantford Airport, Ontario
- Cecil Airport, Jacksonville, Florida
- Charleston Air Force Base and International Airport, South Carolina
- Downsview Airport, Ontario
- Golden Triangle Regional Airport, Columbus, Mississippi
- London Airport, Ontario
- Ottawa International Airport, Ontario
- Pensacola International Airport, Florida
- Savanah and Hilton Head, Georgia
- Snohomish County Airport, Everett Washington
- Thunder Bay Airport, Ontario
- Winnipeg Airport, Manitoba.

2.3 Financial Analysis

Financial analysis was developed for a set of six potential development scenarios. Descriptions of the scenarios are provided in the next section.

Each development scenario represents a specific physical airport configuration, including assumptions on runway, apron and terminal sizes and assumptions on supporting infrastructure (e.g., access roads and parking). The purpose of developing the scenarios was to show potential development outcomes, while at the same time basing the assumptions and analysis on what has been observed elsewhere, in relatively similar conditions.

To develop assumptions for the scenarios, information from existing airports was used as reference. However, in many cases relevant information is available only from a limited number of existing airports. As a result, in many cases, the assumptions developed were based on a limited data set and broad assumptions.

2.3.1 Scenarios Developed

Six scenarios were developed for a potential new Pickering Airport in consultation with Transport Canada, and based on the findings from the Type and Role Report. The Type and Role Report identified that industrial, specialty passenger, and combined industrial and specialty passenger roles would have minimal overlap with the existing airports in the southern Ontario airport system. It is possible that the Pickering Airport could serve other potential roles but those were not selected for analysis. For each of the three selected roles, a small and a large scenario were developed for a total of six scenarios:

1. Industrial - Small Development Concept ("Small Industrial Airport")
2. Specialty Passenger - Small Development Concept ("Small Specialty Passenger Airport")

3. Combined Industrial and Specialty Passenger - Small Development Concept ("Small Combined Industrial and Specialty Passenger Airport")
4. Industrial - Significant Development Concept ("Significant Industrial Airport")
5. Specialty Passenger - Significant Development Concept ("Significant Specialty Passenger Airport")
6. Combined Industrial and Specialty Passenger - Significant Development Concept ("Significant Combined Industrial and Specialty Passenger Airport").

Each of the six scenarios was developed independently, and represents a potential scenario within a wide range of possibilities for the Pickering Airport. The selection of these scenarios does not imply that they are more or less likely to occur than a scenario that has not been explored; it only implies that the team believes that the scenario could occur. Further, the small scenario should not be interpreted to represent the smallest size the airport could be, just as the significant scenarios do not represent the largest size the airports could be. What will unfold over the next 10-20 years will likely be different from the scenarios contained in this report. The intent is that the scenarios explored in this report will provide the reader with some insight into the potential attractiveness of each of the analyzed scenarios.

All six scenarios share the following common assumption set:

- Development of an airport on the Pickering Lands would be subject to market forces.
- A private partner would develop the airport, and would be responsible for obtaining the required financing for the development.
- Transport Canada would provide the land required for development of the airport.
- Key legislation and policy currently governing airport operations would remain unchanged.
- No other new airports would enter the southern Ontario airports system.
- Infrastructure investments at other airports in the southern Ontario airports system would unfold as currently identified in existing Master Planning documents.

For each of the six scenarios, physical facilities to be developed, likely characteristics of key tenants, and potential air carriers were identified. These were then used to drive the development of associated traffic and revenue estimates. Information on physical facilities for each scenario was used to determine capital costs.

Further detail on the development of these sub-components is provided in the following sections.

2.3.1.1 *Small Industrial Airport Description*

The Small Industrial Airport scenario represents a scenario in which an Original Equipment Manufacturer (OEM) in the aerospace sector moves to the Pickering Airport, catalyzing the establishment of aviation businesses similar in size and type to those currently located at the Oshawa Airport. Some additional tenants would also establish a presence, and would lease land at the Pickering Airport. The construction timeframe for such a facility would be in the order of 3 years from 2026 to the end of 2028, and would open for operations in 2029.

2.3.1.2 *Small Specialty Passenger Airport*

The Small Specialty Passenger Airport represents a scenario in which one Low-Cost Carrier (LCC), or Ultra Low-Cost Carrier (ULCC) similar to Flair or Enerjet, decides to use the Pickering Airport as its base. Traffic at the airport would consist only of passenger aircraft movements, with the airport focussing exclusively on passenger service. The construction timeframe for such a facility would be in the order of 4 years, from 2026 to the end of 2029, and the facility would open for operations in 2030.

2.3.1.3 *Small Combined Industrial and Specialty Passenger Airport*

The Small Combined Industrial and Specialty Passenger Airport represents a combination of the Small Industrial Airport and the Small Specialty Passenger Airport scenarios described above. In this scenario, one LCC decides to use the Pickering Airport as its base (similar to Flair or Enerjet), an OEM moves to the Pickering Airport, and tenants similar in size and operations to those currently located at the Oshawa Airport, would move to the Pickering Airport. Some additional tenants would also lease land at the Pickering Airport. The construction timeframe for the industrial component of such a facility would be in the order of 3 years to build, from 2026 to the end of 2028, and would open for operations in 2029. It is anticipated that construction for the passenger component of the airport would not begin until after the industrial component of the airport is operational, and so would last from 2030 until 2033, and the passenger component would be open for operations in 2034.

2.3.1.4 *Significant Industrial Airport*

The Significant Industrial Airport represents a scenario in which:

- an OEM moves to the Pickering Airport, and is the anchor tenant, catalyzing interest of other tenants, specifically:
- tenants similar in size and operations to the Oshawa and Buttonville Airports combined move to the Pickering Airport,
- a minor cargo operation approximately ¼ the size of the cargo operation at Hamilton Airport is established at the Pickering Airport to serve the east of the Greater Toronto Area (GTA), and
- an air taxi service is also established at the airport.

In addition, other aviation-related businesses would lease land at the Pickering Airport.

The construction timeframe for such a facility would be in the order of 4 years, from 2026 to 2029, and would open for operations in 2030.

2.3.1.5 *Significant Specialty Passenger Airport*

The Significant Specialty Passenger Airport represents a scenario in which the Pickering Airport would attract approximately 5 million passengers annually, which is equivalent to about 7% of total projected traffic within the southern Ontario airports system, and similar in scale to the Ottawa Airport. This would be equivalent to having two LCCs provide passenger service from the Pickering Airport. The construction timeframe for such a facility would be in the order of 5 years, from 2027 to 2031, and would open for operations in 2032.

2.3.1.6 *Significant Combined Industrial and Specialty Passenger Airport*

The Significant Industrial and Specialty Passenger Airport represents a combination of both the Significant Industrial Airport scenario and the Significant Specialty Passenger Airport scenario represented above. In this scenario, Pickering Airport would attract passenger traffic equivalent to about 7% of total projected traffic within the southern Ontario airports system. This would be equivalent to having two LCCs or ULCCs provide passenger service from the Pickering Airport. In addition, the developments outlined under the scenario for a Significant Industrial Airport would also occur.

The construction timeframe for the industrial component of such a facility would be in the order of 4 years, from 2026 to 2029, and would open for operations in 2030. It is anticipated that the design of the passenger component of the airport would not begin until construction of the industrial component had begun, and so would start in 2030, lasting 5 years until 2034. The passenger component would become operational in 2035.

2.3.2 Facilities for each Scenario

This section describes the physical facilities assumed to be developed under each of the six airport scenarios being analyzed.

Requirements for a small and a significant facility were developed for each of the three airport roles: industrial, specialty passenger and combined industrial and specialty passenger. These facility requirements were based on development concepts presented in the Type and Role Report, specifically those identified in section 2.3.1.

As noted in the Type and Role Report, each of these facility concepts was developed:

- with consideration of industry-recognized airport planning principles and regulatory requirements as specified by Transport Canada's TP312 Aerodrome Standards and Recommended Practices, 5th Edition
- in alignment with the Pickering Airport Lands updated Zoning Regulations
- to be able to accommodate a long-range Boeing 787-9 AGN V.

Additional assumptions used to guide the development of each of the concepts can be consulted in the Type and Role Report. It should be noted however, that the exact size of the facilities developed is somewhat arbitrary, and that the facilities could be designed to be bigger or smaller to accommodate various other traffic scenarios. Exhibit 2-1 identifies the key infrastructure components included for each of the six airport scenarios. Some of the design features of these components are further detailed in Exhibit 2-2.

Exhibit 2-1: Key infrastructure components included in the development concepts.

		Small			Significant		
		Industrial	Specialty Passenger	Industrial & Specialty Passenger	Industrial	Specialty Passenger	Industrial & Specialty Passenger
Airside	Runway	X	X	X	X	X	X
	Taxiways	X	X	X	X	X	X
	Visual Aids	X	X	X	X	X	X
	Apron		X	X		X	X
	Central De-icing Facility		X	X		X	X
Groundside	Access Roads	X	X	X	X	X	X
	Terminal Frontage		X	X		X	X
	Parking		X	X		X	X
	Development Lots	X		X	X		X
Buildings & Misc.	Air Terminal Building		X	X		X	X
	Combined Service Building	X	X	X	X	X	X
	Air Traffic Control Tower		X	X	X	X	X
	FEC	X	X	X	X	X	X

Exhibit 2-2: Summary of key design features of each facility scenario

	Small Industrial	Small Specialty Passenger	Small Industrial & Specialty Passenger	Significant Industrial	Significant Specialty Passenger	Significant Industrial & Specialty Passenger
Airside	• 8,500 ft. x 200 ft. non-precision runway • Runway end safety areas (RESA) • Partial length single parallel AGN V taxiway • Combined Services facility • 22 ha of aviation commercial development lots	• 8,500 ft. x 200 ft. precision runway • Partial length single parallel AGN V taxiway • Ground loading positions • Dedicated de-icing facility • Air Traffic Services facilities • Combined Service facility	• 8,500 ft. x 200 ft. precision runway • Two partial length single parallel AGN V taxiways • Ground loading positions • Dedicated de-icing facility • Air Traffic Services facilities • Combined Service facility • 22 ha of aviation commercial development lots	• 8,500 ft. x 200 ft. precision runway • Runway end safety areas (RESA) • Full length single parallel AGN V taxiway • Combined Service facility • Air Traffic Services facilities • 87.2 ha of aviation commercial development lots	• 10,000 ft. x 200 ft. precision runway • Full-length single parallel AGN V taxiway, and two rapid exit taxiways • 14 bridged gates and 4 ground loading positions • Aviation fuel storage facility • Central De-icing facility • Air Traffic Services facilities • Combined Service facility	• 10,000 ft. x 200 ft. precision runway • Full-length single parallel AGN V taxiway, and two rapid exit taxiways • 14 bridged gates and 4 ground loading positions • Aviation fuel storage facility • Central De-icing facility • Air Traffic Services facilities • Combined Service facility • 87.2 ha of aviation commercial development lots
Terminal	• n/a	• Single-storey ATB to accommodate up to 750,000 passengers	• Single-storey ATB to accommodate up to 750,000 passengers	• n/a	• A Three-storey ATB to accommodate up to 5,000,000 passengers	• A Three-storey ATB to accommodate up to 5,000,000 passengers
Groundside	• A new two lane access road • 312.9 ha of leasable commercial land*	• New two lane terminal frontage road • Surface-level vehicle parking facility • 312.9 ha of leasable commercial land*	• New two lane terminal frontage road • Surface-level vehicle parking facility • 312.9 ha of leasable commercial land*	• New two lane access road • Surface-level vehicle parking facility • 312.9 ha of leasable commercial land*	• New two lane terminal frontage road • Overpass ramp from Brock Road • Multiple-level vehicle parking structure • 312.9 ha of leasable commercial land*	• New two lane terminal frontage road • Overpass ramp from Brock Road • Multiple-level vehicle parking facility • 312.9 ha of leasable commercial land*

*The groundside leasable commercial land does not have airfield access

Some of the infrastructure components were excluded from individual facilities for the following reasons:

- Apron – to be constructed by tenants when developing their respective facilities at an industrial airport.
- Central De-icing Facility – not anticipated to be required for an industrial airport as tenants would conduct de-icing at their respective facilities.
- Parking – to be constructed by individual tenants on their lease area depending on their requirements.
- Terminal Frontage – not necessary for an airport used for industrial purposes.
- Air Traffic Control Tower – not likely to be needed for a small industrial airport.
- Air Terminal Building – not necessary for an airport that is not used for passenger service.
- Airside Development lots – not assumed to be necessary for a passenger airport.
- Fuel Storage and Distribution – assumed to be provided and paid for by an independent fuel supplier (most likely an airline-sponsored consortium).
- De-icing Operations Building - assumed to be provided by a de-icing service provider.

2.3.2.1 Capital Cost Scenarios

Capital cost estimates for each of the six facility scenarios were developed to a rough order of magnitude, which is considered a very preliminary estimate. The estimates were developed using the following overarching assumptions:

1. Construction techniques and materials that are currently used in the industry would be used.
2. Airport designs would adhere to Transport Canada TP312 Aerodromes Standards and Recommended Practices, 5th Edition.
3. Airports would be designed to satisfy the Proposed Airport Zoning Regulations (2015) for the Pickering Airport Lands.
4. There would be no significant topographical features that would cause the need for significant grading, beyond topsoil stripping and an average excavation of 1 metre per unit area of pavement for the runway, taxiways, and apron areas.
5. There would be no substantive interventions required to address potential findings from an Environmental and Archeological Assessment (e.g., such as the presence of protected flora or fauna, archeological heritage, or contaminated soils).
6. Geotechnical conditions would be typical of those found elsewhere in the region. No significant geotechnical interventions were assumed to be required.

More detailed capital cost assumptions are available in Appendix D.

2.3.2.2 *Operating Cost Scenarios*

Operating cost scenarios were developed for each of the six facility scenarios, based on three primary cost types:

- Airfield operating costs,
- Airport terminal costs, and
- Other general costs.

Typically, the operating costs incurred by an industrial airport are largely those related to the operation of the airfield, as an air terminal building is not required for an industrial airport. In addition, some general administrative costs will be incurred.

Typically, passenger airports will incur airfield and general administrative costs (similar to an industrial airport) and will also incur costs associated with operating a passenger terminal.

Industrial Airport

The operating costs incurred by an industrial airport are largely those related to the operation of the airfield.

Airfield operating costs include costs for operating and maintaining the runway and associated taxiways. Associated costs will include salaries and benefits, a share of municipal taxes or payment in lieu, utilities, contracted maintenance, purchased repairs, materials and supplies, contracted services, insurance and vehicle maintenance. Operations and maintenance activities such as snow-clearing, debris and vegetation removal, maintenance of airfield markings and on-going repair of runway lighting systems are anticipated to be covered in the above list.

Airfield operating costs will be largely fixed based on the size of the airport, but may depend on the number of hours for which the runways are kept open. For example, some operating costs may be avoided by shutting down airfield operations in overnight hours and therefore eliminating the need to keep lighting on and provide full emergency capability during the night.

Higher traffic volumes may result in increased maintenance costs for runways and taxiways in the longer term. For simplicity, KPMG assumed maintenance costs would remain unchanged in real terms throughout the operating period.

Operating costs for an air traffic control centre were not included in the estimates as the costs of control facilities are paid by NAV CANADA and are not part of the airport's operating cost structure.

In addition to the airfield costs, some costs, on the order of approximately 16% - 20%, would be associated with general administrative expenses, for example related to telephone, office and administrative, repairs maintenance and equipment rentals, advertising and business development, directors fees, training & meetings, travel, and professional fees.

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Specialty Passenger Airport

In addition to airfield and general administrative costs, a specialty passenger airport will incur costs associated with the operation of a passenger terminal. Conceptually, the costs of operating the terminal could be divided into the following categories:

- Fixed costs. For a given terminal configuration, most costs are likely to be fixed and will not vary significantly with the usage of the facility (e.g., passenger throughput). Thus, costs for heating and lighting the terminal will be largely a function of facility size and design.
- Costs that vary with passenger volumes. Some terminal costs may vary with passenger throughput. For example, some component of cleaning costs could vary with throughput and associated activity levels.
- Costs that vary with other volume or usage metrics. Some terminal costs may depend on usage or tenancy parameters other than passenger volumes. For example, the number of flights and the length of operations during the day may influence on-site staffing requirements and utility usage, independently of the impacts from passenger throughput.

Many costs may not fall perfectly into just one of the above categories. For example, costs for fire-fighting services may be largely fixed, and dependent only on the number of hours of airport operation. However, with significant growth in traffic volumes, some increases in firefighting staff and equipment on hand may be required, leading to step increases in these costs once certain traffic thresholds are reached.

Notwithstanding the hypothetical cost relationships noted above, for modeling purposes air terminal operating costs will be assumed to be largely fixed for a given terminal configuration. This reflects some cross-sectional and time-series analysis of operating costs at a number of existing airports in Canada that serve from 400 to 900 thousand passengers annually. Operating costs at any given airport tend not to vary significantly from year to year even with changes in passenger volumes. Other factors, such as weather (which impacts snow-clearing and utilities costs), appear to play a larger role. Looking across airports, airports that handle a smaller number of passengers may have higher costs than airports that handle a larger number of passengers, even with similar terminal configurations.

Combined Industrial and Specialty Passenger Airport

As the combined industrial and specialty passenger airport share some of the infrastructure (e.g., airfield assets), the operating costs for the combined airport are lower than the sum of the operating costs of the two individual airports (industrial, specialty passenger), built separately.

Developing Operating Cost Estimates

Operating cost estimates were developed by finding reasonable comparators, and applying a series of assumptions to build out operating costs for each scenario.

[redacted] This covers general and administration, airside, and terminal costs for a Combined Industrial and Specialty Passenger Airport. This is also aligned with other airports of approximately the same size.

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[redacted] This was based on scaling the total operating costs to account for the increased level of passenger service.

The operating cost estimates for the individual industrial airport and specialty passenger airport scenarios were then constructed by developing assumptions regarding the costs that are attributable to the airfield, air terminal, and to general administrative activities (as previously discussed). The assumptions used were developed based on two factors:

- Observed cost distribution at similar airports
- Scalability of the costs.

2.3.3 Tenants and Air Carriers

This section describes the airport tenants and air carriers assumed under each of the six airport scenarios being analyzed.

In evaluating potential usage scenarios, it is important to recognize that there is significant uncertainty regarding the level of traffic that might be attracted to the Pickering Airport in the period under review (through 2036). Because existing airports can accommodate projected passenger traffic in the Greater Toronto Hamilton Area (GTHA) through to 2036, the traffic at the Pickering Airport will be based on the transfer of demand for reasons other than capacity constraints or additional induced demand. These reasons may include:

- Decisions by a particular airline to use the Pickering Airport as a hub (potentially based either on savings in costs or on Pickering's role as a marketplace differentiator).
- Decisions by an aviation-related OEM to establish operations at the Pickering Airport.
- Better proximity of the Pickering Airport to a portion of the market catchment area (e.g., regions east of the City of Toronto).
- Changes in existing airport roles and/or the potential closure of other airports in the southern Ontario airport system.

These driving factors are inherently less predictable than a calculation of excess demand relative to existing capacity, which could be the basis of a forecast in the presence of airport capacity constraints.

Air traffic scenarios (and therefore revenue scenarios) were therefore developed based on assumptions about the tenant and air carrier mix that might be established at a new Pickering Airport, while at the same time recognizing the physical constraints presented by the facility concepts. The following sections provide additional detail on the tenant and air carrier assumptions for each of the facility scenarios.

2.3.3.1 Industrial Airport Tenants

As defined in the Type and Role Report, an industrial airport would be developed primarily to serve aviation-related industrial purposes. This could include provisions for the development of large scale aviation industrial businesses, including but not limited to: aircraft/component manufacturing, maintenance, repair and overhaul firms, avionics installation/repair, or aircraft parts supply and distribution.

Under the identified development scenario for an industrial airport, as outlined in further detail in the Type and Role Report, the airport would include development of a runway and taxiways and some roads to provide site access. Developable land would be made available to potential industrial tenants, who would be responsible for developing their own facilities and buildings as required. The key advantage of this land from a marketing perspective would be that it will have access to airside infrastructure, giving tenants ready access to the runways and taxiways. Thus, these tenants will be able to have goods delivered and/or shipped by air, and can also use the facilities for test flights.

In addition, tenants may be attracted by the potential development of an aeronautical industry "cluster" at Pickering. The presence of multiple tenants from the aeronautical sector on one site can provide operational and marketing synergies for participating companies. Individual tenants would see benefits from the location of other industry players nearby who can, variously, act as partners, suppliers and/or direct customers, depending on the circumstances. Ready access to other industry participants can provide significant benefits in terms of developing cost-effective supply chains and promoting inter-firm collaboration.

For a Small Industrial Airport, it is anticipated that an anchor tenant would be an aviation-related OEM, similar to Boeing or Bombardier, which would be the catalyst for other aviation-related businesses to establish operations at Pickering. These other aviation-related businesses would likely be similar to the tenants currently found at the Oshawa Executive Airport. For example, they may include a mix of:

- Aircraft charters
- Aircraft maintainers
- Aircraft suppliers, including aviation parts suppliers
- Airport management (including safety, administration, operations, finance, and facilities management – such as hangar rentals)
- Airport services (e.g., CBSA, NAV CANADA, others)
- Fixed base operator(s) (FBO)
- Flight training providers
- Fuel providers and service
- Local attractions, such as small museums
- Other aviation-related businesses (e.g., aviation associations, tele-communications industry, etc.).

As under the Small Industrial Airport scenario, the Significant Industrial Airport scenario would have an aviation-related OEM, similar to Boeing or Bombardier, as an anchor tenant. This would then be the catalyst for other aviation-related businesses to establish operations at the Pickering Airport. Under the Significant Industrial Airport scenario, however, more aviation-related businesses would establish operations at the Airport than under the Small Industrial scenario. They would likely be similar to the types of tenants listed above, and which are currently found at the Oshawa Executive Airport and the Buttonville Airport. The businesses located at the Airport would also be augmented by additional businesses establishing operations, including:

- Additional air taxi service providers
- Dedicated cargo service providers serving the eastern GTA

- Other commercial tenants on available groundside lots (that don't require runway access).

While not a primary role of the airport, the cargo operation was assumed to be relatively substantial, generating approximately ¼ of the traffic for Hamilton. This was done to explore the upper end of the fee potential for an industrial airport that has cargo as a secondary use (for further detail see section 2.3.5.1). In summary, the types of air traffic that could be expected under each industrial airport tenant scenario include those identified in Exhibit 2-3.

Exhibit 2-3: Types of air traffic expected under each tenant scenario

Small Industrial Airport:	Significant Industrial Airport:
• Industrial • Cargo • Corporate • Flight school • Other	• Industrial • Cargo • Corporate • Flight school • Air Taxi • Other

There will be greater amounts of each type of air traffic under the Significant Industrial Airport scenario.

2.3.3.2 *Bombardier Operations*

For the purpose of this study, a new OEM, which hasn't already established operations within the southern Ontario airport system, is assumed to establish operations at the Pickering Airport. While there is a possibility that Bombardier would relocate to the Pickering Airport following the expiration of its lease with PSP Investments, it is unclear how likely this is.

2.3.3.3 *Specialty Passenger Airport Tenants*

Typically, passenger airports rely on one or more air carriers with a significant number of flights, or perhaps even a hub, to anchor the operations of the airport. From this perspective, one would expect the commitment of an air carrier to headquarter its operations in southern Ontario at a new Pickering Airport to be a condition required for a private-sector investor to be willing to invest in developing the airport.

Under a Small Specialty Passenger Airport scenario, one ULCC or LCC, such as Flair or Enerjet, would establish service from a new Pickering Airport. The service frequency assumed to be offered by the anchor air carrier is indicative of the airport's scale: it would likely initially offer a frequency of service similar to Flair's service out of Edmonton, and would grow over time to approximately double that level, as the new airline builds up its customer base and adds to the full projected complement of destinations.

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Under a Significant Specialty Passenger Airport scenario, two ULCCs or LCCs would establish service from a new Pickering Airport. In this case, the frequency of service of both of the carriers together would grow to approximately 80 landings per day.

In addition to the air carriers, a number of commercial/retail businesses would operate concessions in the terminal building. Similar to the industrial airport scenarios, other commercial tenants, not requiring runway access, would also lease land on available groundside lots.

In summary, passenger traffic is the only type of air traffic that would be generated from the tenant mix assumed for both the Small and Significant Specialty Passenger Airport scenarios.

2.3.4 Potential Traffic Scenarios

2.3.4.1 Small Industrial Airport

The potential traffic scenario for the Small Industrial Airport is based on the assumption that an OEM would establish operations at Pickering. The announcement by an OEM that it will establish operations there would act as a catalyst, and likely help to attract other aviation and aviation-related tenants. Given this, assumed initial air traffic levels would reflect the operations of all expected aviation tenants immediately upon the airport's opening in 2029. (This assumption also helps to improve the projected financial returns from investment in the airport, since it enhances facility utilization.) Subsequent growth in traffic would then be in line with aviation industry growth, at about 1% annually.

Exhibit 2-4 illustrates the assumed air traffic at a Small Industrial Airport scenario on the Pickering Lands.

Exhibit 2-4: Air traffic for the Small Industrial Airport scenario

[redacted]

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2.3.4.2 *Significant Industrial Airport*

The potential traffic scenario for the Significant Industrial Airport is also based on the establishment of an OEM at Pickering Airport. Similar to the Small Industrial Airport scenario, the announcement that the OEM is establishing operations would catalyze other aviation and aviation-related tenants to establish operations at the Airport. These are assumed to be on a similar scale as the aviation businesses and traffic currently observed at the Oshawa Airport and Buttonville Airport combined. In addition, an air taxi service and two air cargo service providers would establish operations at the Airport. Similar to the Small Industrial Airport scenario, all new service providers would move to the Airport at its opening in 2030, with the exception of the second air cargo service provider, which would move two years later. After all tenants move to Pickering, subsequent growth is expected to be in line with aviation industry growth, at about 1% annually.

Exhibit 2-5: illustrates the air traffic at a significant industrial airport on the Pickering Lands under a scenario built on these assumptions.

Exhibit 2-5: Air traffic for the Significant Industrial Airport scenario

2.3.4.3 *Small Specialty Passenger Airport*

Under the Small Specialty Passenger Airport scenario, one LCC or ULCC is anticipated to establish operations at Pickering, similar to Flair or Enerjet. Initial flight frequency would be approximately 6 aircraft movements per day, representing approximately 375,000 passengers per year. The initial 5-year growth period is assumed to be high, as the new airline builds up its customer base and adds to the full projected complement of destinations. At the end of the 5-year growth period, subsequent growth would be in line with growth projected for Pearson Airport, until the facility reached its annual capacity of 750,000 passengers in 2039, approximately equal to providing 12 aircraft movements per day. Projected volumes under this scenario would represent approximately 0.6% of the southern Ontario passenger traffic in 2030, and approximately 1.0% of the traffic in 2036.

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Exhibit 2-6: Passenger traffic for the Small Specialty Passenger Airport scenario

[redacted]

Exhibit 2-7: Air traffic for the Small Specialty Passenger Airport scenario

[redacted]

Precedents elsewhere actually suggest that there is a potential for much higher traffic volumes if the airport succeeds in attracting significant market share. For example:

- The Phoenix Mesa Airport attracts 3.0% of traffic in the Phoenix area. The primary domestic service provider is Allegiant, with California Pacific Airlines, Flair Airlines, Swoop and WestJet also providing limited additional service.

- The St. Pete-Clearwater International Airport attracts 9.5% of air passenger traffic in the Tampa area. Similar to Phoenix Mesa, Allegiant is the one primary domestic airline that serves this airport. Three additional airlines also provide limited international service: Beau Rivage Charter service, Sunwing international service, and Flair Airlines. Of the airports that were analyzed, and that are located further away from downtown than the associated primary passenger airport, this represented the most successful secondary airport at capturing market share.
- The Orlando Sandford International Airport attracts 6.2% of traffic in the Orlando area. Similar to the two airports identified above, the primary air carrier is Allegiant, with Beau Rivage, Surinam Airways, Tui and ViaAir providing limited additional passenger service.

In the southern Ontario airport system itself, market share captured by secondary airports has fluctuated over time. At its peak, in 2003, Hamilton attracted passenger volumes that exceeded 1.0 million. At that time, Hamilton was the eastern hub of WestJet, and its passenger volumes were equivalent to 4.4% of passenger volumes at Pearson.[2] WestJet later moved its primary hub to Pearson when terminal capacity was freed up following the merger of Air Canada and Canadian Airlines in 2003.[3]

For comparison, a complete list of primary and secondary airport pairs, along with their market share and relevant commentary, is provided in Appendix C.

2.3.4.4 *Significant Specialty Passenger Airport*

Under a Significant Specialty Passenger Airport scenario, it is assumed that two ULCCs or LCCs will establish service from a new Pickering Airport, with an initial total frequency of approximately 40 aircraft movements per day. High growth rates in the first five years would result in the facility reaching 90% capacity, while the new airlines build up their customer base and add the full projected complement of destinations. Subsequent growth would be aligned with the average growth rate projected for Pearson, at 2.3% annually, until the airport reaches its capacity of 5,000,000 passengers in 2041 (equal to approximately 7% of total traffic in the southern Ontario airports system). This would be approximately equivalent to 80 aircraft movements per day. This would represent approximately 5.3% of all passenger traffic in the southern Ontario airport system in 2036. This proportion of market share is more aligned with what has been observed in comparable airport pairs in the United States (as described above). Most likely, the passenger traffic at Pickering Airport will represent a mix of new passenger traffic and passenger traffic that transfers from other airports.

Exhibit 2-8 illustrates the air traffic at a Significant Specialty Passenger Airport on the Pickering Lands under a scenario built on these assumptions.

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[2] Based on E/D passenger volumes at Pearson of 22.993 million in 2003.
[3] Genivar, John C. Munro Hamilton International Airport – Airport Master Plan, May 2011, p. 2.

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Exhibit 2-8: Passenger traffic for the Significant Specialty Passenger Airport scenario

[redacted]

Exhibit 2-9: Air traffic for the Significant Specialty Passenger Airport scenario

[redacted]

2.3.4.5 Small Combined Industrial and Specialty Passenger Airport

The potential traffic scenario for the Small Combined Industrial and Specialty Passenger Airport is based on the assumptions from both the Small Industrial Airport and the Small Specialty Passenger Airport. That is to say that an OEM would establish operations at Pickering, catalyzing other industrial

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and GA aviation businesses to establish operations at the Pickering Airport, and that one LCC or ULCC, such as Flair or Enerjet, would move to the Pickering Airport.

Exhibit 2-10 illustrates the air traffic at a Small Specialty Passenger Airport on the Pickering Lands under a scenario built on these assumptions. As can be seen, the movements observed are predominantly those generated by passenger aircraft.

Exhibit 2-10: Air traffic for the Small Combined Industrial and Specialty Passenger Airport scenario

2.3.4.6 Significant Combined Industrial and Specialty Passenger Airport

The potential traffic scenario for the Significant Combined Industrial and Specialty Passenger Airport is based on the assumption that traffic from both the Significant Industrial Airport and the Significant Specialty Passenger Airport would materialize. That is to say that an OEM would establish operations at Pickering, catalyzing additional aviation businesses to establish operations at the Pickering Airport. In addition, an air taxi service provider and two cargo service providers would establish operations at Pickering. Two LCCs or ULCCs, would also provide passenger service.

Exhibit 2-11 illustrates the air traffic at a Significant Combined Industrial and Specialty Passenger Airport on the Pickering Lands under a scenario built on these assumptions.

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Exhibit 2-11: Air traffic for the Significant Combined Industrial and Specialty Passenger Airport scenario

[redacted]

2.3.5 Potential Revenues

The following sections provide a discussion of the assumptions used to develop potential revenue estimates for each of the scenarios. The amount and type of revenue depends on airport type, and so, similar to previous sections, the discussion is organized by airport type. Note also that the estimated revenues cover the period for the financial model (e.g., from beginning of construction through to the end of the 30-year operating period), and do not include potential revenues generated pre-construction. A discussion regarding revenues generated pre-construction period is included in Appendix E.

2.3.5.1 Industrial Revenues

Revenues at industrial airports tend to come from two primary sources:

- Aeronautical fees from the use of airside infrastructure, and specifically landing fees.
- Long-term lease revenues from airport land.

For industrial and GA airports, local movements related to flight schools or primary industrial tenants of the airport are often exempt from landing fees. Landing fee revenues therefore primarily come from other GA movements, including cargo, air taxi, corporate and other movements. Landing fees are calculated based on the takeoff weight of aircraft. For the purpose of developing aircraft movement scenarios and associated landing fees, the following aircraft were used as representative of each type of movement:

- Cargo – B737-600
- Air Taxi – Beechcraft King Air

- Corporate – Cessna Citation
- Other – Cessna 172.

Landing fees for each type of aircraft movement were then developed in 2018 dollars, as indicated in Exhibit 2-12.

Exhibit 2-12: Landing fee assumptions

Type of traffic			Rationale
Cargo	($ per 1000 kg)	12.00	On par with Hamilton Airport fees of $12.80
Air Taxi	($ per 1000 kg)	6.00	On par with Oshawa Airport Fees of $5.96
Corporate	($ per 1000 kg)	6.00	On par with Oshawa Airport Fees of $5.96
Other	($ per 1000 kg)	6.00	On par with Oshawa Airport Fees of $5.96

At industrial airports, land leases are available for lots with basic services, and it is often the responsibility of the tenant to install the facilities required, including any hangar or warehousing structures. Where buildings are in place, information on individual building lease rates at industrial airports is rarely disclosed. Lease agreements are negotiated privately with individual tenants and thus are generally not public.

It should also be noted that the availability of information varies widely among airports. Some industrial airports publicly disclose a significant amount of financial information, including financial statements with detailed revenue and expense breakdowns (e.g., Peterborough). In other cases, even where owned by municipalities, airports provide little to no detail, even with respect to overall revenues (e.g., Golden Triangle Regional Airport). In still other cases, detailed financial statements may be available but only for a group of airports, rather than for individual industrial airports within the group. (For example, segmented financial results for Mirabel are not disclosed but rather reported on a consolidated basis with the Montreal Trudeau Airport.) As a consequence, the ability to identify the actual revenues of other industrial airports has been limited. Assumptions have been based on the publicly available information that was located (and which may not necessarily be representative of all industrial airports). Land lease rates selected for the industrial airport scenarios are as indicated in Exhibit 2-13.

Exhibit 2-13. Land lease rates

Description		Assumption	Rationale
Lease Rate (2018)	($ per sq. ft. per year)	0.30000	Aligned with Peterborough rates
Increase per year	($ per sq. ft. per year)	0.02500	Aligned with Peterborough rates

2.3.5.2 *Passenger Revenues*

To a large degree, estimated revenues for a passenger airport are directly proportional to passenger volumes. Even for landing fees which are based on aircraft movements, higher passenger volume will mean more aircraft movements.

The revenue that an airport can expect to earn from concession operators is also primarily a function of passenger volumes. The revenues earned by food service, retail outlets, and car rental companies at the airport will, in general, be proportional to passenger throughput. Certain types of passengers (e.g., international passenger or business passengers) may tend to spend more than other types of passengers, reflecting their longer average wait times at the terminal and/or differences in spending propensities. Also, average spending per passenger may be increased by the presence of "greeters", or individuals who meet incoming passengers in the airline terminal

For an airport serving discount or ULCC airlines, propensities to spend at concessions are expected to be lower. This reflects greater passenger price sensitivity, a lower tendency to use car rental services, and increased focus on outbound (or locally-based) travellers relative to inbound (out-of-country) travellers.

Rental payments that can be made by concession operators to the airport operator will be limited by the revenues available from passenger users. At low levels of terminal facility usage, the ability of concession operators to earn an appropriate return may be constrained by the variability in passenger volumes throughout the day and hence a low capacity factor. When a terminal facility is in start-up mode or otherwise underutilized, terminal operators may also accept lower concession rental payments than they would otherwise to encourage or support a broader variety of concession operators. Terminals that have few services available may become less attractive to potential travellers, exacerbating issues with market acceptance.

To estimate rents earned from concession operators, the following approach was used:

- Spending per passenger on services is based on information available from other airports.
- Revenues earned by the terminal operator are a fixed percentage of estimated passenger spending.

In general, potential revenues per passenger at Pickering were assumed to be lower than that at primary airports, reflecting its greater reliance on leisure and price-sensitive traffic.

In the sub-sections below, more specific information on the baseline assumptions for a new Specialty Passenger Airport at Pickering is provided.

Aeronautical Revenues

Aeronautical revenues at Pickering are assumed to be generated primarily through three tariff elements:

- A Landing Fee based an aircraft Maximum Take-Off Weight ("MTOW").
- An Airport Improvement Fee ("AIF") levied per enplaned passenger.
- Terminal Charges applied to departing aircraft seats.

Terminal charges are assumed to be higher for transborder and international flights, reflecting these flights' requirements for greater terminal space for Canadian customs and for U.S. pre-clearance facilities.

The tariff structure adopted is consistent with those used at other Canadian airports, including those in the GTHA. The mix of tariffs, and the different charge determinants used for each, ensures that a range of factors are taken into account in generating aeronautical charges.

The specific tariff assumptions are shown in Exhibit 2-14 below. Fee amounts are shown in 2018 dollars. These amounts are escalated with inflation for the purposes of the financial projections.

Exhibit 2-14: Aeronautical fees

Base Case Aeronautical Fees - Pickering (2018$s)		
Landing Fee	($ 1k kg MTOW)	15.00
AIF	($ per enplaned pax)	22.50
Terminal Charges - Domestic	($ per aircraft seat)	4.50
Terminal Charges - International	($ per aircraft seat)	6.50

The specific values have been selected to provide a discount relative to other major airports, including those in the GTHA. To benchmark fee levels with other airports, one turnaround of a Boeing 737-600 on a transborder route, with 113 seats and 75% load factor is assumed. The 737-600 is an aircraft commonly used by LCCs and charter operators, both for domestic flights and for transborder and Caribbean flights. For this benchmark movement, the tariff schedules above produce a cost for airlines at Pickering that would be roughly 82% of that of Pearson and 95% of Hamilton, based on current fee levels. Overall fees are higher than at Waterloo, which does not currently apply terminal charges.

Discounted aeronautical fees relative to at least Pearson would provide an incentive for LCCs to use Pickering Airport as an alternative terminal location in the GTA.

Non-Aeronautical Revenues

As noted earlier, airports also earn revenue from parking and from concessionaires. Concessionaires include food and beverage providers, duty-free, and car rental agencies.

Parking revenue for the terminal operator per enplaned/deplaned (E/D) passenger of $3.75 (in $2018) is assumed. This fee is net of any revenues that may be retained by a third-party parking operator.

Airport revenue from concession operators of $2.50 (in $2018) is assumed. This figure is intended to cover income from both car rental operators and on-premises food and retail providers, including duty-free. This assumption is consistent with observed revenues at other smaller to medium-sized Canadian airports.

For reference, Pearson earned roughly $2.75 per passenger from concessions in 2017 and $3.77 per passenger in 2017 from parking.

As can be seen, there are a number of factors to consider when comparing the numbers:

- Lower availability of public transit to the Pickering Lands than to Pearson, and hence greater reliance by users on travel by personal vehicle.
- An assumed lower proportion of connecting passengers, given that Pickering Airport would not play a "hub" role. This increases the share of passengers that need transportation to and from the airport.
- An assumed higher proportion of outbound passengers, rather than inbound passengers, given Pickering's role as an airport that focuses to a greater degree on serving local leisure travellers.
- Lower expected availability of off-site parking options, given low traffic volumes and the relative newness of Pickering.

These factors will offset the fact that Pickering may need to have relatively low-cost rates (e.g., per hour) for parking given its target passenger market. Assumed parking revenues per passenger at Pickering (of $3.75) lie between those recently observed at Abbotsford and at London International Airport (Ontario) (at $3.18 and $3.96 per passenger respectively.)

2.3.5.3 *Summary of Sources of Revenue*

Exhibit 2-15: summarizes the key sources of revenue for each airport type.

Exhibit 2-15: Summary of revenue sources for each airport scenario

		Small			Significant		
		Industrial	Specialty Passenger	Industrial & Specialty Passenger	Industrial	Specialty Passenger	Industrial & Specialty Passenger
Aeronautical Revenue	Landing Fees	X	X	X	X	X	X
	Airport Improvement Fee		X	X		X	X
	Terminal Charges		X	X		X	X
Non-Aeronautical Revenue	Concession Revenues		X	X		X	X
	Parking Fees		X	X		X	X
	Land Leases – Airside	X		X	X		X
	Land Leases - Groundside	X	X	X	X	X	X

2.3.6 Financial Model

The financial model for each scenario was built using the facility and tenant/air carrier scenarios described above, including their respective cost (capital and operating) estimates and revenue (traffic and fee) estimates. The model was developed to include the construction period and a 30-year operations period, starting from the time operations first begin at the airport. For the Combined Industrial and Specialty Passenger Scenarios, this means that the financial model was built to cover 30 years of industrial operations, and a shorter period (25 years) for the passenger component of the airport.

Key financial assumptions for each of the six scenarios included:

- The capital costs are funded 50% with debt and 50% equity injections.
- Debt carries an interest rate of 5% and is repaid over the 30-year operating term. Debt service payments during the first four years are interest only.
- A minimum cash balance equal to one month of operating expenses is maintained during the operating period, reflecting the need to invest in working capital for the airport.

- Depreciation is calculated using a declining balance method, with rates between 6% and 20%.
- The corporate tax rate is 26%. Depreciation for tax purposes is assumed to be equal to depreciation for book purposes.
- For calculations of investment return, the terminal value at the end of the projection period is assumed to be equal to the book value of assets, less any debt outstanding (debt is generally zero).
- Any excess cash, above the required minimum target balance, is dispersed as dividends.

Results generated using the assumptions outlined in this chapter are summarized in the next Chapter of this report.

3 Financial Analysis and Findings

This section summarizes the findings of the financial analysis of each of the six scenarios described in the previous section.

Each of the following subsections summarizes the nature of revenues and costs and the cash flow over the modelling period for the associated scenario. Commentary on the potential attractiveness of each scenario to a private sector investor is also provided.

3.1 Financial Metrics

As noted earlier in this report, scenarios are analyzed under an assumption that the airport will be developed by private-sector investors. The Federal government is assumed to make the Pickering lands available for development but, for this initial review, it is assumed that it will not provide additional capital funding support.

Given the assumption that private investors may play a role in airport development, it is important to look at the types of financial metrics that may be used by such investors (both debt and equity providers). The following metrics are included in the model and in the review of the financial results of different scenarios (see Appendix A for definitions):

- Internal Rate of Return (IRR) – Project
- Internal Rate of Return (IRR) – Equity
- EBITDA/Interest (Interest Coverage Ratio)
- The ratio of Debt to Total Assets (both the minimum during the operating period and on a year-by-year basis).
- Number of years to reach project break-even.
- Number of years to reach equity break-even (on a cash-flow basis).

IRRs are evaluated over a term that includes airport development and 30-years of operation. A terminal value is provided that is equal to the book value of outstanding assets at the end of the period.

Potential investors may use other metrics instead of, or in addition to, those outlined above. Further, the specific targets that would be sought by these investors will vary depending on their appetite for the proposed investment and their risk tolerance. As a broad guideline, however, the following metrics will likely be required, at a minimum, in order for any given scenario to be attractive to potential investors:

- Project IRR should be greater than 8%
- Interest coverage ratios do not fall below 1.2
- Annual cash flows to equity are positive within five years of opening.

When scenarios meet these criteria, this provides some indication that the business case for the airport merits further examination and market testing. Investors willing to accept project IRR less than 8%, interest coverage ratios that fall below 1.2, or annual cash flows that take longer than five years to become positive may be willing to entertain scenarios that do not meet these criteria.

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It should be noted that financial metrics are very dependent on the assumptions made with respect to traffic levels and associated fees and charges. Returns for the industrial airport scenarios are, in particular, very dependent on assumptions with respect to the pace, scale and pricing assumptions for airport land development. These parameters are very difficult to forecast in advance and will depend on market conditions and investments by potential airport tenants. Potential investors will make their own assumptions with respect to these factors and this will change their assessment of potential returns. In addition, and as with all projections, actual results may vary significantly from estimates.

3.2 Small Industrial Airport

Revenues for the Small Industrial Airport are primarily derived from land leases (with groundside leases representing the larger proportion of these revenues) and with aeronautical revenues representing a smaller component of the revenues. Exhibit 3-1 shows the calculated revenue for the Small Industrial Airport scenario, by source of revenue. [redacted]

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Exhibit 3-1: Source of revenues for the Small Industrial Airport

[redacted]

Exhibit 3-2: Cost breakdown for the Small Industrial Airport

[redacted]

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Exhibit 3.3: Free cash flow for the Small Industrial Airport

[redacted]

3.3 Small Specialty Passenger Airport

Revenues for the Small Specialty Passenger Airport are primarily derived from aeronautical fees from passenger traffic, with some also coming from other passenger-related airport fees (such as car parking, concessions and other rental fees) and from groundside land leases. Exhibit 3-4 shows the calculated revenue for the Small Specialty Passenger Airport scenario, by source of revenue. [redacted]

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[redacted]

[redacted]

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Exhibit 3-6: Free cash flow for the Small Specialty Passenger Airport

[redacted]

3.4 Small Combined Industrial and Specialty Passenger Airport

Revenues for the Small Combined Industrial and Specialty Passenger Airport are derived primarily from fees related to airline passenger traffic – including both aeronautical and other fees (such as car parking, concessions and other rental fees). Revenues related to industrial operations (including aeronautical revenues and revenues from airside and groundside land leases) are also present, but make up a small proportion of the total revenues. [redacted]

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[redacted]

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[redacted]

3.5 Significant Industrial Airport

Similar to the Small Industrial Airport, revenues for the Significant Industrial Airport are primarily derived from land leases (with groundside leases representing the larger proportion of these revenues) and with aeronautical revenues representing a smaller component of the revenues. [redacted]

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[redacted]

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[redacted]

3.6 Significant Specialty Passenger Airport

Revenues for the Significant Specialty Passenger Airport are primarily derived from aeronautical passenger fees, with some also coming from other passenger related fees (such as car parking, concessions and other rental fees). A very small proportion of the revenues comes from groundside land leases under this scenario. [redacted]

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[redacted]

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[redacted]

3.7 Significant Combined Industrial and Specialty Passenger Airport

Revenues for the Significant Combined Industrial and Specialty Passenger Airport are primarily derived from passenger related fees – both aeronautical and other fees (such as car parking, concessions and other rental fees). Aeronautical revenues related to the industrial operations and the Airport and from airside and groundside land leases are also present, but make up a small proportion of the total revenues. [redacted]

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[redacted]

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[redacted]

3.8 Summary of Financial Analysis Findings

This chapter presents a summary of the financial analysis of the six scenarios. As discussed earlier in the report, the scenarios are meant to be illustrative of what *could* happen if the specific airport types identified are developed. The scenarios do not represent the full spectrum of possible development scenarios.

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Pickering Lands Aviation Sector Analysis
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The assumptions used to develop the scenarios were developed based on what has been observed at other, similar airports. A new airport at Pickering could develop unique features that do not exactly match what has evolved elsewhere. Hence, caution should be used in interpreting these results. The future will undoubtedly look different than the scenarios presented herein, and the differences could be material.

For comparability, the results of the preliminary financial analysis have been summarized in Exhibit 3-19, below. Some overall observations with respect to these results are as follows:

- [redacted]
- [redacted]
- [redacted]

[redacted]

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Pickering Lands Aviation Sector Analysis
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Exhibit 3-19: Summary of financial performance of each of the scenarios

Measure	Units	Small – Industrial	Small – Specialty Passenger	Small – Combined Industrial and Specialty Passenger	Significant – Industrial	Significant – Specialty Passenger	Significant – Combined Industrial and Specialty Passenger
IRR Project	(%)	[redacted]					
IRR Equity	(%)						
Years to Project Breakeven	(Years)						
Years to Equity Breakeven	(Years)						
EBITDA / Interest - Median	(Ratio)						
EBITDA / Interest – 2035	(Ratio)						
EBITDA / Interest - Minimum	(Ratio)						
Max Debt/Total Assets	(%)						
Terminal Payment	($ M)						
Total Equity Contribution	($ M)						
Years to Max Capacity	Years						
Revenues – First year of Operations	($ M)						
Revenues - 2045	($ M)						
Cash flow to equity before tax – First year of operations	($ M)						
Cash flow to equity before tax - 2045	($ M)						

4 Sensitivity Analysis

To develop a better understanding of the key drivers impacting financial outcomes from the scenarios, a sensitivity analyses was conducted on a limited number of input assumptions. The purpose of the sensitivity testing is to better understand which variables, or group of variables, have the greatest potential to affect financial returns.

4.1 Approach

The sensitivity testing focussed on testing the sensitivity of project and equity IRRs for the various scenarios to changes in the value of specific input variables. Project IRR and equity IRR were selected as the key metrics for measuring financial outcomes, as these are the key indicators of investment profitability. While other indicators, such as maintaining reasonable interest and debt service coverage levels and reaching positive annual cash flows within a reasonable timeframe, are also useful, IRR provides a more comprehensive view of the potential success of a new airport. This is primarily because IRR assesses the overall profitability of an investment project over time. Cash flow positive within five years does not measure "how good" an investment is. Likewise, the interest coverage ratio assesses the ability to pay interest from debt, but does not measure the profitability of the project.

Project IRR and equity IRR, as described in Chapter 3, were tested for sensitivity to the following variables:

- Capital costs
- Operating costs
- Fees
  - Aeronautical
  - Other
  - Land leases
- Interest rates
- Occupancy
  - Airside ground leases
  - Groundside land leases
- Air traffic.

In general, sensitivities were developed by changing a given input variable by 20% from its Base Case value. (The Base Case values are those values used for the scenarios presented in Chapter 3.) For interest rate sensitivities, the sensitivities were based on an increase or decrease in interest rates by one percentage point. (Thus, the base interest rate assumption of 5% was adjusted to either 4% or 6%.)

In summarizing results, sensitivities were categorized as either "Pessimistic" or "Optimistic" depending on the expected or observed impact on financial return. Thus, the Optimistic column in the results tables is used to report the impact of increases in revenue and of decreases in input costs. Conversely, the Pessimistic column shows the impact, as applicable, of decreases in revenue or of increases in costs. Thus, the Optimistic column summarizes those sensitivity changes that should improve returns.

It should also be noted, that unless otherwise specified, sensitivity testing was conducted for only one variable at a time; all other variables were held at their "Base Case" values. The entry labelled "All" at the bottom of each table represents the extreme scenario in which either all pessimistic cases, or all optimistic cases, as indicated in the associated table are combined. Hence, this entry represents a relatively extreme scenario, and this is borne out by the observed variations in returns.

The intermediate row labelled "Fees – All" represents the case in which all revenue items were adjusted up or down, rather than just one revenue item. (Thus, this line represents the case in which aeronautical fees, concession and parking fees, and tenant lease payments were all adjusted in unison. The preceding lines in the table represent cases in which just one of these revenue items was adjusted.)

The majority of the variables tested apply to all six airport scenarios, however, a few apply only to the industrial or passenger component of the airport. Exhibit 4-1 identifies the applicability of each variable, below.

Exhibit 4-1: Applicability of variables tested for sensitivity

Type of Revenue	Applies to…					
	Small Industrial	Small Passenger	Small Combined	Significant Industrial	Significant Passenger	Significant Combined
Capital Costs	x	x	x	x	x	x
Operating Costs	x	x	x	x	x	x
Fees – Aeronautical	x	x	x	x	x	x
Fees - Other		x	x		x	x
Fees – Land Leases	x	x	x	x	x	x
Interest Rates	x	x	x	x	x	x
Occupancy – Airside Land Leases	x		x	x		x
Occupancy – Groundside Land Leases	x	x	x	x	x	x
Air Traffic	x	x	x	x	x	x

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The following sub-sections provide observations and analysis based on the results of the sensitivity testing.

4.2 Sensitivity Results

The results are presented by type of airport, as each type of airport has similar responses to the sensitivity testing.

4.2.1 Industrial Airports

Exhibits 4-2 and 4-3 document the results of the sensitivity testing on the project IRR and equity IRR, for the Small Industrial Airport and the Significant Industrial Airport, respectively.

Exhibit 4-2: Sensitivity testing results, Small Industrial Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs						
Operating Costs						
Fees - Aero.						
Fees – Other*						
Fees - Land Leases						
Fees - All						
Interest Rates						
Occ. - Airside						
Occ. - Groundside						
Traffic						
All						

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Exhibit 4-3: Sensitivity testing results, Significant Industrial Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs						
Operating Costs						
Fees - Aero.						
Fees – Other*						
Fees - Land Leases						
Fees - All						
Interest Rates						
Occ. - Airside						
Occ. - Groundside						
Traffic						
All						

**does not apply to the Industrial Airport scenarios*

4.2.2 Specialty Passenger Airports

Exhibits 4-4 and 4-5 document the results of the sensitivity testing on the project IRR and equity IRR, for the Small Specialty Passenger Airport and the Significant Specialty Passenger Airport, respectively.

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Exhibit 4-4: Sensitivity testing results, Small Specialty Passenger Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs						
Operating Costs						
Fees - Aero.						
Fees - Other						
Fees - Land Leases						
Fees - All						
Interest Rates						
Occ. – Airside*						
Occ. - Groundside						
Traffic						
All						

Exhibit 4-5: Sensitivity testing results, Significant Specialty Passenger Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs						
Operating Costs						
Fees - Aero.						
Fees - Other						
Fees - Land Leases						
Fees - All						
Interest Rates						
Occ. – Airside*						
Occ. - Groundside						
Traffic						
All						

*does not apply to the Specialty Passenger Airport scenarios

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[redacted]

4.2.3 Combined Industrial and Specialty Passenger Airports

Exhibits 4-6 and 4-7 document the results of the sensitivity testing on the project IRR and equity IRR, for the Small Combined Industrial and Specialty Passenger Airport and the Significant Combined Industrial and Specialty Passenger Airport, respectively.

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Exhibit 4-6: Sensitivity testing results, Small Combined Industrial and Specialty Passenger Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Operating Costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Aero.	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Land Leases	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - All	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Interest Rates	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Occ. - Airside	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Occ. - Groundside	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Traffic	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
All	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Exhibit 4-7: Sensitivity testing results, Significant Combined Industrial and Specialty Passenger Airport

Variable Tested	Project IRR			Equity IRR		
	Pessimistic	Base Case	Optimistic	Pessimistic	Base Case	Optimistic
Capital Costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Operating Costs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Aero.	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - Land Lease	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Fees - All	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Interest Rates	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Occ. - Airside	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Occ. - Groundside	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Traffic	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
All Variables	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

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[redacted]

4.2.4 Overall Observations

The analysis above shows that each of the airport types are sensitive to different changes in variables. This is not surprising, given that there are different cost and revenue drivers for each scenario. Exhibit 4-8 summarizes the variables that project IRR and equity IRR are most sensitive to.

Exhibit 4-8: Variables that project IRR and equity IRR are most sensitive to by airport type

Industrial Airports	Specialty Passenger Airport	Combined Industrial and Specialty Passenger Airport
• Fees - land leases	• Fees - aeronautical • Capital costs	• Capital costs • Fees - aeronautical • Air traffic

4.3 Discussion Regarding Assumptions, Results and Sensitivity Testing

It is worth reviewing and discussing some of the key assumptions in light of the results of the financial analysis and of the sensitivity testing, to specifically highlight key areas of uncertainty.

4.3.1 Capital Costs

Capital costs represent the initial capital investment required to construct each of the airport scenarios. At this very early stage, they represent order-of-magnitude estimates only, and a number of factors have the potential to significantly alter the estimated and actual costs.

Most importantly, the capital costs were derived from the conceptual airport scenarios presented in the Type and Role Report. While useful for examining the potential for a new airport on the Pickering Lands, they were developed as concepts only, and without the benefit of additional market studies (e.g., market soundings, customer surveys, etc.) that might help better identify the potential traffic demand in an airport system that is not currently capacity-constrained. Further study into potential market demand (in a non-capacity-constrained environment) would (and should) inform the size of airport facilities that may be built. This would help to ensure that the facilities are "right-sized" to anticipated demand, and therefore, that the capital investment is also optimized.

Secondly, because of the initial nature of the capital cost estimates, there is potential that there will be significant differences between these estimates and more detailed estimates. (Such estimates typically rely on engineering and planning studies that provide more detail on the nature of the site – including environmental, geotechnical, and regulatory environments.) If engineering and planning studies reveal that some assumptions used in developing the capital costs estimates do not hold, the actual costs could be significantly different. For example, the current rough order of magnitude (ROM) estimates assume that no significant geotechnical interventions would be required for the site. This assumption would need to be confirmed through a geotechnical engineering study, which would also be used to inform any updated cost estimates. Should a follow-up geotechnical study reveal that substantial geotechnical intervention is required, the estimated capital costs could vary substantially from those presented in this Report.

The uncertainty associated with these two factors could well be beyond the 20% scaling applied as part of the sensitivity testing.

4.3.2 Occupancy – Groundside

Groundside land leases will potentially compete with land leases available elsewhere in Pickering and the eastern GTA. As groundside leases do not have access to the airport runway, the key differentiating factor will be the land leases' proximity to the airport and to its tenants. This may (or may not) be sufficient to compete with other available land leases.

For the Base Case, a 42% occupancy rate for groundside land leases was assumed, which is equivalent to the current overall occupancy rate for designated Employment Areas (both serviced and un-serviced lands) observed in Pickering[4]. This high occupancy assumption is consistent with a case where there is high demand for airport land due to aviation or other business activities at the airport, and in the context of competition from other land available in adjacent areas, such as the Pickering Innovation Corridor. The Pickering Innovation Corridor consists of 324 ha of land, located adjacent to the Pickering Lands, which are primarily owned by the Province of Ontario. Servicing for the Innovation Corridor lands has already started, and these lands are being promoted by the City of Pickering for prestige industrial and office developments.

As identified through the sensitivity analysis, a deviation in the occupancy of groundside land leases from that assumed for the purpose of this study could significantly impact financial returns from the Industrial Airport scenarios.

[4] Durham Region. City of Pickering Development and Servicing Status Employment Areas. Accessed on March 1, 2019 at https://www.durham.ca/en/living-here/resources/Documents/EnvironmentalStability/EAServicing_Pickering.pdf

4.3.3 Occupancy – Airside

Competition for airside land leases will (for the most part) be limited to groundside land leases available at other airports in the southern Ontario airport system. However, it is difficult to assess the demand (and therefore occupancy) for airside land leases, given the fairly significant differences in experience at other airports. Through the analysis conducted on comparator airports, observed occupancy rates for airside land leases at other industrial airports varies significantly, however, one would expect airside occupancy to be higher than groundside, given that there are relatively few competing lands that can also provide runway access. This study has assumed that 60% of the airside lands would be occupied under the Small Industrial and Small Combined Airport scenarios, and that 70% of the airside lands would be occupied under the Significant Industrial and Significant Combined Airport Scenarios.

4.3.4 Air Traffic

As noted earlier, the air traffic scenarios used for this study do not have the benefit of being informed by additional market studies (for example, through market soundings or customer surveys). In the case of the Specialty Passenger Airport scenarios (or the passenger component of Combined scenarios), it was assumed that air traffic would be able to reach capacity of the facilities relatively quickly – which may represent an overly aggressive assumption. In the case of the industrial airport scenarios (or industrial component), traffic levels were assumed to mimic traffic levels observed at other similar airports within the southern Ontario airports systems. These assumptions should be tested through additional market studies – as they could well affect the potential financial outcomes.

4.3.5 Specialty Passenger Airport Fees

By definition, the Specialty Passenger Airports are identified as filling the role of providing an anchor airport for LCCs and ULCCs. These types of airlines offer no-frills service at lower costs than their other counterparts, and pass savings onto their customers. Given this market niche that LCCs and ULCCs are serving, there will be pressure for the carriers to keep costs low. This has direct implications for the sensitivity testing conducted on the aeronautical fees at Specialty Passenger Airports. As the Base Case aeronautical fee assumptions were developed to be on par with aeronautical fees charged at other airports in the southern Ontario airport system, raising fees by 20% (as tested under the "Optimistic Case") may not be a feasible option; in fact, there may be more pressure by LCCs and ULCCs to lower these fees.

4.3.6 Other Revenues

As part of the study, Transport Canada requested that, in addition to other sources of revenue, the annual revenues realized from current land leases be assumed to continue into the future. This was done to ensure that, at a minimum, the current potential for land leases is captured within the financial projections. However, this also represents some potential double-counting, as it is likely that the revenues from some of the airside and groundside lands are also contributing to the existing revenue streams. While this represents a relatively small proportion of revenues for the Specialty Passenger and Combined Industrial and Specialty Passenger Airport scenarios, it is not insignificant. Further, this source of revenues is substantial in the Industrial Airport scenarios, and has the potential to significantly impact their financial outcomes.

5 Economic Impact Analysis

This section summarizes the analysis of the potential economic impacts of a new airport on the Pickering Lands, including the methodology and approach used to estimate these impacts. In this section the following topics are discussed in turn:

- The different elements of economic impact,
- The general approach for this study,
- The scope of activities considered,
- Recent economic impact studies of other airports,
- Key assumptions for this study,
- Economic impacts from operations,
- Economic impacts from visitor spending,
- Economic impact of capital expenditures,
- Summary of economic impacts,
- Qualitative considerations.

5.1 The Different Elements of Economic Impact

Economic impact studies typically examine the employment, Gross Domestic Product (GDP), and labour income impacts associated with the construction of a particular project and/or with the ongoing operations of a facility or industry. Definitions of the metrics that are typically reported are provided below:

- **Employment impact** estimates the number of jobs created, including any self-employed jobs. Employment impacts are often reported in terms of Full-Time Equivalent (FTE) positions, which weights jobs according to whether they are part-time or full-time;
- **GDP impact** is a measure of economic output from the production of goods and services, measured in dollars. It measures the total amount of "value-add" that individual producers contribute to the purchased inputs to generate their output. GDP impacts can be broken down into segments corresponding to labour income, government revenues and income to businesses. Where available, this Study separately reports labour income, in addition to reporting overall GDP impact; and
- **Labour income impact** is defined as all compensation paid to employees (e.g., including wages, salaries, employer social contributions, bonuses, and performance pay, etc.). Labour income is measured in dollars and is a component of the GDP impact.

Economic impacts of each type can be further broken down into three categories: (i) direct; (ii) indirect; and (iii) induced impacts. A definition of each category of impact is provided below:

- **Direct impacts** are those economic impacts generated by the industry or entity in question and can be observed through an analysis of an industry's employee base, payroll, taxes paid and the difference between the value of sales (e.g., revenues) and purchased inputs. For the economic impact studies of airports, direct impacts typically include those generated by airlines, tenants and other agencies at an airport, in addition to those directly attributable to the airport operator. This is discussed in more detail later in this section.

- **Indirect impacts** are those economic impacts generated by suppliers who are further up the supply chain, and who provide goods and services to the entities whose direct economic impact is captured as noted above. For example, suppliers to an organization have their own employees and purchase commodities from other suppliers in turn. These expenditures ultimately result in income to labour, income to businesses or governments, or in the import of a good or service from another jurisdiction.
- **Induced Impacts** are the direct and indirect impacts that result from the subsequent spending by employees of their wages and salaries. This includes spending by employees both within the entity or entities studied (i.e., direct employees) and within their upstream supplier base (i.e., indirect employees). It is important to note that induced impacts should be interpreted with some caution as they are affected by households' propensities to save, amongst other variables. For example, when an economy experiences high unemployment, household saving rates tend to increase and induced economic impacts will decrease. Therefore, it is important to be mindful that induced economic impacts may not always materialize to the extent shown.

5.1.1 Economic Impact Estimation Model

Economic impacts are generally estimated with an Input / Output model ("I/O model") or by using multipliers derived from such models. An I/O model divides the economy into a matrix of industries and commodities. Relationships within the model map the production of commodities to industries and identify the primary or intermediate commodities that are used in the production of each final commodity. Final commodities are either used by consumers or sold as an export. The model then aggregates all the expenditures on goods and services and in the supply chain as commodities are produced. Based on the commodity structure of a specific industry, an I/O model can estimate the employment, gross output, and the labour, business and government income (collectively, the value-added) as a result of expenditures in that industry.

In Canada, the most authoritative and comprehensive I/O model is the Interprovincial Input-Output Model of Statistics Canada ("Statistics Canada I/O Model"). The Statistics Canada I/O Model can be used in two ways. If detailed expenditure data are available, a tailored production function can be developed for the target entity and the I/O model can then simulate economic impacts based on the associated commodity structure. If detailed expenditure data are limited or aggregated at a higher level, multiplier tables can be used instead. Multiplier tables are based on the aggregate production function of a given industry. For the purposes of this Study, Statistics Canada's I/O Multiplier Tables were used to estimate the economic impacts of the expected capital expenditures of a new airport on the Pickering Lands, as used in the financial projections.

The Statistics Canada I/O Multiplier Tables used in this analysis represent the most recent versions publicly available and are calibrated to Canada's economy in 2014. This means that economic impacts are based on the commodity structure of industries in 2014. Use of the 2014 table does not imply or require that impacts be presented in 2014 dollars. It only implies that the structure of the economy, in terms of the relationships among industries and their relative commodity usage, is as in 2014. Statistics Canada's I/O Model is managed and calibrated solely by Statistics Canada, including the assumptions that are built into the model.

5.2 General Approach for this Study

In discussions regarding this phase of work, Transport Canada requested an economic impact analysis similar to those done recently by other airport authorities, including by the Greater Toronto Airports Authority (GTAA). The intent is to develop a broad indication of potential overall economic impacts of a new airport at Pickering.

Because Pickering does not yet exist, and hence there are no existing airport users, the analysis has been very dependent on data collected by other airport operators for estimates of the levels of activity and user spending that will be associated with the airport's operations. Note that other airport economic impact studies have typically focussed just on impacts in their home province (in this case Ontario) and a similar approach is followed in this study.

5.3 The Scope of Activities Considered

In considering the economic impact of an airport, it is important to define the activities that will be included in the analysis. These can include activities related to both the ongoing operation of the airport as well as its initial construction, as more fully outlined below.

Ongoing Operating Impacts

For a new or existing airport, there are various layers of operating activity that can potentially be taken into account:

- Airport Operations. These are activities associated with those operations that are undertaken directly by the airport authority. These will generally include operation of the terminal, runways, and access roads. Operations may include some ongoing repair and rehabilitation expenditures to keep the airport in a state of good repair.
- Concession Operations. These are activities undertaken by concessionaires at the airport, which may include food and beverage providers, car rental companies, and parking operators. The specific list of concessionaires may depend on the approach that the airport takes to operating the airport and, in particular, on the specific functions that it transfers to outside operators versus those that it retains in-house. For example, any given airport may or may not outsource parking operations.
- Airline Operations. This may include functions performed by the airline at the airport itself (passenger check-in, baggage handling, aircraft maintenance and refueling). It may also include all or a portion of the activities associated with inbound and outbound flights (including on-board staffing and airplane operation).
- Activities by Tenants. These are activities undertaken by tenants at the airport and potentially also by businesses located nearby but not on the airport property. These tenants and businesses may include aircraft maintenance companies, aerospace parts manufacturers, and cargo companies and freight forwarders.
- Visitor Spending: This reflects spending by visitors to the province who travel through the airport.

Most of these elements of economic impact are beyond the direct oversight and control of the airport operator. This reflects the fact that they result from spending by parties other than the airport itself.

Because this spending is not included in airport financial statements, nor in airport financial projections, most studies of economic impact for existing airports rely on a survey approach to collect information on levels of activity in the broader airport community. (This broader community includes airlines, concession operators, airport tenants and visitors to the region.)

To assess the economic impact for a potential new airport such as Pickering, however, there is obviously no ability to survey existing airport participants. Accordingly, in order to estimate the potential economic impacts of a new airport on the Pickering Lands, this study has relied on a review of prior economic impact studies for existing airports in Canada. Results from these other studies were used to estimate the potential levels of activity that a new airport could generate, given assumptions on passenger traffic and aircraft movements. Traffic and occupancy levels at the new airport were estimated by relying on the market research and analysis undertaken as part of this project and presented in the previous Pickering Lands Aviation Sector Analysis reports (the Supply and Demand Report and the Type and Role Report).

An important consideration in the review of economic impact results is that they are calculated based on current period expenses or, in other words, on cash flows related to the purchase of goods and services in the year in question. They do not consider accrual, or non-cash, costs such as depreciation and amortization. Costs associated with the initial construction of the airport must be considered separately as noted below.

Further, economic impact analyses do not explicitly consider the opportunity cost of funds required to build a specific project. Thus, the operating impacts outlined herein assume that an airport has been put in place; reported results do not account for the diversion of investment or of resources from other potential projects, which might also have generated economic impacts. These impacts may have been greater or lesser. Thus, the economic impact analysis does not prove that a particular investment is optimum or that it provides for benefits that are greater than its costs.

Impacts from Initial Construction

For a new airport such as Pickering, there will also be economic impacts associated with the initial construction of the airport. These need to be reported separately from impacts associated with ongoing operations because they occur only during the construction phase and therefore are 'one-time' in nature.

The specific methodologies applied by other studies, and the approach to quantifying results for Pickering, are discussed in more detail in the sections below.

5.4 Recent Economic Impact Studies of Other Airports

In this section, a number of recent economic impact studies of other airports and the methodologies used therein are reviewed. This provides important context for this analysis, and serves as references for this study. KPMG relied extensively on data from these existing studies for our calculations to inform the analysis in this report.

5.4.1 Methodological Approach

As noted, other economic studies typically survey tenants and businesses that operate at the airport, or supply services to it or to airport users. Through these surveys, the studies identify the 'direct' jobs and employment income associated with survey participants' employee base. Participants in the survey typically include concessionaires, airlines, other airport tenants, direct suppliers (e.g., catering companies) and related government agencies (customs and security departments). In the case of a 2016 study of Pearson for the GTAA, survey data was supplemented with data from the National Household Survey (NHS) on the number of people working within the vicinity of Pearson.[5] Assumptions were made as to the relationship of this employment to the airport depending on industry codes of the employer under the North American Industry Classification System (NAICS). The study for Pearson also estimated employment associated with taxi and other ground transportation services by making some direct assumptions regarding travel patterns and trip times, rather than using survey data for the related sectors.

In many of the studies reviewed, there is limited disclosure of the make-up of these direct jobs, in terms of the allocation of jobs among airport participants. Disclosure of assumptions and input data also varies across the studies. Hence, it may be difficult to identify exactly what is included and what is not.

5.4.2 GTAA Study

The GTAA study of Pearson is a relatively recent study of airport economic impact. It is also a relevant comparator because it addresses the economic impacts of the major existing airport in the GTHA. Accordingly, this study was examined in detail in the review of potential data sources. Results of this study are summarized in more detail below.

The GTAA study distinguishes between jobs located at Pearson and those offsite. A summary table of reported employment is provided below. Exhibit 5-1 below summarizes employment impacts resulting from the ongoing operation of the airport. Impacts associated with visitor spending and "connectivity" benefits were reported separately.

Exhibit 5-1: Reported GTAA employment impacts

Direct Employment Generated By GTAA - 2015		
	(Jobs)	
Jobs At Pearson		
Within 0-2 miles	21,050	42.6%
Within 2-5 miles	17,850	36.1%
Subtotal	38,900	78.7%
Jobs Not Located At Pearson		
Airline Staff	6,700	13.6%
Ground Transport	2,600	5.3%
Hotel Employment	1,200	2.4%
Subtotal	10,500	21.3%
Total	**49,400**	**100.0%**

[5] MNP and Frontier Economics, "Toronto Pearson's Economic Impact – A Report for the Greater Toronto Airports Authority", 20 October 2016,

As shown in the exhibit above, the total direct employment linked to the operations of the GTAA is 49,400 jobs. This compares to the number of employees of the GTAA itself, which was reported as 1,600 in its 2017 annual report. It can thus be seen that reported direct employment (at 49,400 jobs) is over 30 times the number of jobs for just the GTAA itself. This illustrates that employment impacts are much broader than those generated by just the airport operator. This finding is common across the economic impact studies reviewed.

Within the 49,400 figure, most of the jobs (38,900 or 78%) are located at the airport. The GTAA study indicates that these jobs include:

- Employees of the GTAA.
- Employees of contractors, businesses and government agencies located at, or operating from, Pearson. This includes airline customer service and ground handling staff, as well as employees of retail stores and government agencies.
- Employment in the vicinity of Toronto Pearson that is related to the provision of cargo services, including by couriers, trucking companies, and cargo handlers. Some of this employment may presumably be at adjacent warehouses and distribution facilities.
- Employment of businesses engaged in aerospace manufacturing located in the vicinity of Toronto Pearson.

The jobs located 'offsite' include taxi and limousine drivers, Union Pearson Express attendants, airline inflight crew and hotel employees.

The GTAA study did not estimate GDP impacts (in dollar terms) from operations. Nor did it look at impacts beyond Ontario. Rather, it focused on employment impacts within the province. This analysis followed a similar approach.

5.4.2.1 Comparison with Other Studies

Comparing total direct employment with airport passenger traffic, the results for Pearson suggest that there are 1.195 direct jobs per 1,000 airport passengers.[6] This ratio is somewhat higher than ratios calculated from economic impact studies for Billy Bishop Airport and Moncton Airport (0.700 and 0.795 jobs per 1,000 passengers respectively).[7] [8] However, it is in line with results calculated from a study for the Edmonton Airport (1.141 direct jobs per 1,000 passengers). It would not be surprising that Pearson may generate greater employment than other airports based on the following considerations:

- Pearson processes a higher proportion of international, trans-border and business passengers, who likely have higher spending propensities than average based on greater times spent at the airport, higher income levels and, for business travelers, the ability to claim many costs as employment expenses.
- The size of Pearson, and its role as an airline hub, likely means that airlines concentrate relatively more activities at this location than they do at their feeder airports.

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[6] This is based on 2015 airport passenger volumes of 41.0 million at Pearson.
[7] InterVISTAS Consulting, Final Report: Billy Bishop Toronto City Airport (YTZ) Economic Impact Study, 25 October 2012.
[8] SNC-Lavalin, Greater Moncton Romeo LeBlanc International Airport – Master Plan 2038 – Final, Volume 1 : Report, August 2018. Economic impacts are reported in Chapter 4.

- Pearson's size and role as an industry cluster suggest that there may be more manufacturing and other support activities in the vicinity than would be typical.

5.4.3 Hamilton Airport Economic Impact Study

In the course of the work, an economic impact study of the Hamilton Airport was also reviewed.[9] It is more difficult to compare ratios of economic impact to passenger volumes for this study because the Hamilton Airport relies more extensively on cargo and courier flights and because the presentation of study results is different than in the GTAA study. The study presents employment estimates separately for each of:

- Capital expenditures,
- Cargo operational activity,
- Passenger operational activity,
- General operational activity,
- Visitor spending on concessions, and
- Visitor tourism spending.

The general operational activity covers positions at the airport that do not fall into either passenger or cargo related employment, but rather "fit into both categories".[10] If one-half of the impacts related to general operational activity is arbitrarily assigned to Hamilton's passenger operations (with the balance assumed to be related to cargo traffic), and add all impacts related to passenger operational activity and concessions, then the number of direct jobs related to passenger traffic works out to 0.958 jobs per 1,000 passengers. As it falls within the range observed, this number appears in line with those reported for the airports discussed earlier.

The Hamilton Airport study reports employment impacts in terms of "jobs", but does not specify if these are defined as Full Time Equivalent (FTE) jobs or whether a part-time job would qualify as one job.

5.4.3.1 Cargo Impacts at Hamilton

The segmentation of results in the Hamilton Airport economic impact study can provide a potential indication of impacts related just to cargo traffic. If one adds the balance of general operational impacts (i.e., those not allocated to passenger traffic) to those cited specifically for cargo operations, one can derive a ratio of direct employment impacts to cargo traffic of 2.79 direct jobs per 1000 tonnes MTOW for cargo flights.

5.5 Key Assumptions for this study

For this study, the focus is on estimating impacts for the Significant airport development scenarios, with separate estimates for the Significant Specialty Passenger scenario and for the Significant

[9] ICF, John C Munro Hamilton Airport Economic Impact Analysis, October 2018.
[10] p. 30.

Industrial scenario. These were chosen to explore the upper limit of the economic benefits that could be expected under the six scenarios developed. Impact from the ongoing operation of the Combined Significant Specialty Passenger and Industrial Airport can be roughly assumed to be the sum of impacts separately estimated for passenger and industrial airports on their own.[11]

KPMG's approach relies on the following data inputs:

- For estimates of direct employment as a function of passenger traffic, the ratios developed from studies at Billy Bishop Airport and Moncton Airport were relied upon.
- For estimates of indirect and induced employment, as a function of direct employment, relationships developed in the GTAA study were used.

The rationale for this approach is more fully outlined below.

5.5.1 Direct Impacts

For this study, a ratio of 0.750 direct jobs per 1,000 passengers is assumed, which is roughly the midpoint of values calculated from the Billy Bishop Airport and Moncton Airport studies. Reliance on these studies rather than the Pearson study for ratios of direct employment reflects the assumption that:

- Pickering would have a higher proportion of outbound leisure travellers than Pearson, many of whom will be traveling on lower cost airlines. These travellers will tend to generate lower concession spending. This is based on the following assumptions:
  - Most non-resident business travellers will go through Pearson or Billy Bishop airports, unless their final destination is in Pickering or the eastern GTA. Pearson and Billy Bishop will remain the favoured destinations for most business travellers because of better local transportation connections and flight choices (Pearson) and/or better proximity to the downtown core (Billy Bishop and, to a lesser degree, Pearson).
  - The out-bound business travellers who use a new Pickering Airport will tend to be those who live and work in the Pickering area or eastern GTA, reflecting the benefits of the airport's proximity. For travellers living elsewhere, the airport may not offer the most convenient access and the potential for cheaper fares from LCCs will likely not be a sufficient offsetting benefit.
  - A Specialty Passenger Airport serving LCCs and ULCCs would primarily cater to cost-conscious leisure travellers. Flights schedules may thus favour vacation destinations. A Specialty Passenger Airport serving LCCs and ULCCs would primarily be catering to cost-conscious leisure travellers. Flights schedules may favour vacation destinations.

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[11] Economic impacts will not be additive to the extent that some operating costs are shared between the Passenger and Industrial scenarios. (There are some general and administrative costs that are common to each.) However, such shared operating costs are a relatively small proportion of the activities associated with the airports and that are the basis of our economic impact estimates. Our methodology for estimating impacts, based on employment multipliers on passenger and cargo volumes, does not provide an easy method of identifying the economic impacts that are shared between the scenarios and which would therefore not be additive. KPMG believes that any overestimation of shared impacts as a result is small and within the error of our overall estimate.

- Pickering passengers would tend to rely more on personal vehicles to travel to/from the airport, yielding lower taxi and limousine employment.
- By virtue of being a smaller and newer airport, Pickering would have fewer businesses on-site and in the surrounding area, resulting in fewer opportunities to generate economic activity in the local area as a result of passenger and airport traffic.

Although the 0.750 value is a reasonable assumption given observed metrics from other studies, KPMG also acknowledges that is somewhat arbitrary and not rigorously tied to verifiable data. For this reason, estimates of impacts from operations are limited to potential employment impacts and do not, in addition, try to quantify GDP and employment earnings estimates.

5.5.2 Estimation of Indirect and Induced Impacts

The studies reviewed use standard economic impact multipliers to identify indirect and induced impacts. They typically apply multipliers to the direct impacts identified through the surveys undertaken. This study follows a similar approach in this study.

In the sub-sections below, the specific multipliers applied in other studies are reviewed, and then the multipliers selected for this project are identified.

5.5.2.1 GTAA Study

In the case of the GTAA study, multipliers from Statistics Canada were applied separately to employment in each of the various industry sectors identified through the study's survey and analysis work. Thus, the study made use of specific industry multipliers in its analytical approach.

Overall, on a composite basis, the GTAA study implies that the following multipliers can be applied to direct employment observed at the airport:

- A **Type I multiplier** of 1.67. This is the ratio of direct and indirect employment, to direct employment.
- A **Type II multiplier** of 2.06. This is the ratio of direct, indirect and induced employment, to direct employment.

The definitions of Type I and Type II multipliers follow those used by Statistics Canada. The specific numerical values observed result from the particular mix of industries assumed in the make-up of the 'direct' employee base at Pearson, based on the survey and NHS data. The multipliers used in the GTAA study are calculated from the Stat Can I/O model's projections of employment impacts within Ontario. They therefore do not measure total employment impacts within Canada, which would be slightly higher as a result of the effects of imports from other Provinces.

5.5.2.2 Study for Billy Bishop Airport

The study for Billy Bishop also reportedly used multipliers from Statistic Canada for Ontario. However, it shows much higher ratios, with an implied Type I multiplier of 2.27 for operations (and a Type II multiplier of 3.34). The rationale for the higher multipliers observed is unclear.

5.5.2.3 *Hamilton Airport*

The Hamilton Airport economic impact study based its analysis on the IMPLAN model, and is thus not directly comparable in modelling approach to the GTAA and Billy Bishop studies. IMPLAN is a U.S.-based private consulting firm that provides economic impact analysis tools for its clients in the public and private sectors. IMPLAN reportedly has an input/output model that has been tailored to the Ontario economy, and this model was used to derive the results for Hamilton.

As shown in Exhibit 5-2 below, which summarizes impacts shown in the studies discussed above, the Hamilton study also has higher implied multipliers than the GTAA study (at 2.46 and 3.46 for Type I and Type II respectively).

Exhibit 5-2: Multipliers from recent studies

Implied Employment Multipliers - Airport Operations			
	GTAA	Billy Bishop	Hamilton
Type I	1.67	2.57	2.46
Type II	2.06	3.34	3.46

5.5.2.4 *Assumptions for this study*

For the analysis for this study, the observed multipliers from the GTAA study are applied. These multipliers were then applied to estimates of direct employment at the Pickering Airport. (As noted earlier, estimates of direct employment were calculated based on employment to passenger ratios taken from studies for Billy Bishop and Moncton. Thus, ratios from different studies were used at different steps in the process.)

The rationale for using GTAA multipliers for indirect and inducted impacts is that Statistics Canada multipliers are more widely used than IMPLAN multipliers in the Canadian context. They have the advantage of clearly being more closely tied to Statistics Canada's economic accounts. As such, KPMG views the Statistics Canada ratios as more defensible.

Implied multipliers from the Moncton and Edmonton studies for indirect and induced employment were not examined. Multipliers from these studies would be affected by the different structures of the economies in their home provinces (New Brunswick and Alberta respectively) relative to that of Ontario. Accordingly, multipliers from these studies are less relevant comparators for a study of the Pickering Airport, which will be located in Ontario.

5.6 Economic Impacts from Operations

Based on the assumptions outlined above, the economic impacts associated with airport operations for both the Industrial Airport and the Specialty Passenger Airport are identified. (Impacts for the Combined Industrial and Specialty Passenger Airport can be roughly identified by simply adding the impacts of the Industrial Airport to the impacts of the Specialty Passenger Airport). Analysis focusses on the Significant airport scenarios in order to highlight the upper end of potential economic impacts of the scenarios analyzed.

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Impacts associated with off-airport visitor spending (i.e., tourism impacts) and from initial construction are summarized in separate sections later in this Chapter.

5.6.1 Significant Specialty Passenger Scenario

Estimated economic impacts from the operation of the Pickering Airport are based on projected passenger operations at full capacity under the Significant scenario. This scenario corresponds to annual traffic of 5 million passengers.

The following are the elements of the approach:

- Where impacts are measured in dollar terms, they are provided in 2018 dollars. The exact year at which full passenger capacity is reached can vary among scenarios and it was felt that presenting results in today's dollars can provide more meaningful comparison to other potential projects or activities.
- A ratio of direct jobs to passenger traffic of 0.750 jobs per 1,000 passengers was used, based, as discussed earlier, on ratios observed for studies at Billy Bishop and Moncton.
- Type I and Type II multipliers were applied for employment impacts of 1.67 and 2.06 respectively, based on ratios observed in the GTAA study.

Applying the factors noted above results in employment impacts as summarized in Exhibit 5-3 below.

Exhibit 5-3: Employment impacts from the Significant Specialty Passenger scenario

Employment Impacts - Significant Specialty Passenger		
Passenger Traffic	(000s)	[redacted]
Direct Employment Multipliers	(Jobs/1000 pax)	
Direct Employment	(Jobs)	
Indirect Employment	"	
Induced Employment	(Jobs)	
Total Employment	**(Jobs)**	

The direct employment impact of [redacted] summarized above conceptually includes the following elements:

- Employment directly by the airport operator and by on-site agencies and suppliers. It thus includes airport security and customs personnel employed by government agencies.
- Employment by airlines, including both ground personnel operating at the airport and flight crew operating from the airport.
- Employment by concession operators at the airport.

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In comparison, and as noted elsewhere, the figure for indirect employment captures employment at businesses in the supply chain to the companies and organizations responsible for the direct employment impacts noted. Further, the figure for induced employment captures the employment generated when direct employees and employees within the airport community's supplier base (i.e., indirect employees) spend their employment earnings on goods and services for their own personal consumption. Total employment impacts of [redacted] includes employment in Ontario from the three types of impacts noted above.

5.6.2 Significant Industrial Airport

Economic impacts associated with the Significant Industrial Airport may include impacts from each of the following potential streams of activity at the airport:

- Employment associated with cargo operations.
- Employment associated with other GA activity, which may include the operations of personal private aircraft, flight-school training, and business aircraft.
- Employment by aircraft manufacturers and aircraft parts suppliers that may be located at the airport.
- Employment by other specialized businesses operating at the airport, including providers of aircraft maintenance and repair services.

Economic impacts will depend on the actual mix of business operations that develop at the airport. More so than the operations of a passenger airport, the actual activities that will be observed at an industrial airport are highly uncertain.

For this study, the focus is on economic impacts associated with projected cargo volumes, for reasons more fully outlined below.

5.6.2.1 Impacts associated with aircraft manufacturers and related suppliers

[redacted]

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[redacted]

5.6.2.2 *Diversion of Activity from Other Airports*

Some activity attracted to an industrial airport at Pickering may be diverted from other airports in the region, including from those in Peterborough and Hamilton. These airports are also looking to increase their base of industrial tenants and to develop clusters of aerospace manufacturing activity. Any diversion of activity from other airports in the region could detract from the net economic impact of a new airport on the Pickering Lands. Estimates of impact included in this study do not explicitly take this potential for the diversion of economic activity. This applies also to estimates of impact from passenger operations.

5.6.2.3 *Approach to Impact Estimation*

As the basis of the estimate of economic impacts from operation of the Significant Industrial Airport on the Pickering Lands, economic impact multipliers related to direct employment as a function of cargo volumes observed at the Hamilton Airport were applied. As noted earlier, the analysis of the direct employment at the Hamilton airport that is attributable to cargo operations yielded a ratio of 2.79 jobs per 1000 tonnes (billable) of Maximum Take-Off Weight (MTOW) associated with airport cargo movements.

For the Base Case scenario of a Significant Industrial Airport slightly more than 3,500 cargo aircraft movements are projected by 2035. This translates to 1,750 landings, and a billable total weight of 114,625 Tonnes MTOW.

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Exhibit 5-4: Employment impacts from the Significant Industrial Airport scenario

Employment Impacts - Significant Industrial		
Cargo Flight Activity	(Tonnes MTOW - Billable)	[redacted]
Direct Employment Multiplier	(Jobs/000 Tonnes MTOW)	
Direct Employment	(Jobs)	
Indirect Employment	"	
Induced Employment	"	
Total Employment	**(Jobs)**	

As shown in Exhibit 5-4, [redacted]

For indirect and induced employment, the same relationships between direct jobs and indirect and induced jobs as were observed in the GTAA study were assumed. The Type I and Type II multipliers implied by the Hamilton airport study were not used, since these appear to be generated from the IMPLAN model and generate considerably more employment impacts than Statistics Canada multipliers. In summary, the estimation approach combines data from both the GTAA and Hamilton studies.

The estimate of economic impacts does not specifically address impacts from other non-cargo GA activity. However, it is reasonable to assume that direct impacts observed at Hamilton include some employment that is related to GA activity, and is thus embedded in the numbers summarized above. KPMG also notes that other non-cargo GA activity would primarily be dominated by flight training activity and by private aircraft movements. These activities typically do not contribute significantly to aeronautical revenues nor, given their relatively low employment numbers, to economic impacts.

5.7 Economic Impact from Visitor Spending

As noted earlier, an important component of the economic impact of an airport is the impact associated with visitor spending. Non-resident tourists and business travellers will spend money during their stay in Canada to cover lodging, food, local travel and ancillary expenses such as event admissions and sundry items. Most of the economic impact studies for airports quantify the amount of associated economic impacts and report these as a component of overall impact. These studies typically do not, however:

- Measure or report on the offsetting economic impacts from outbound tourism. (In other words, they do not consider leakages from the economy as a result of travel outside of Canada by domestic residents.)
- Try to quantify the proportion of inbound spending that can be attributable to the airport. (Some of the visitor spending may have occurred even without the availability of that specific airport as an entry point.)

The same approaches are adopted in this study. Economic impacts associated with visitor travel via the airport are estimated but not the proportion of such travel that would not occur if the airport were not in place. Nor does the study examine or deduct from the results the economic impacts associated with outbound travel by Canadian residents visiting out-of-country destinations. In other words, the focus is on gross visitor impacts.

Estimated impacts from visitor spending capture spending by visitors on businesses outside of the airport property. Impacts from spending at the airport are already captured in the analysis of operational impacts, which includes the employment associated with concessionaires and businesses that serve passengers on the airport property.

5.7.1 The Role of Pickering Airport

As outlined elsewhere, it is assumed that Pickering will initially be used predominantly by LCCs serving domestic and leisure markets and sun destinations. Business travel may, in addition, be generated from markets for which Pickering is a more convenient alternative than Pearson (e.g., for travellers in the Eastern GTA). Given the airport's expected role, international destinations will likely be focused more on Caribbean and vacation destinations than on Europe or Asia. Consistent with discussion elsewhere in this report, it is therefore expected that:

- The passenger profile at the airport, relative to other airports such as Pearson, may be skewed slightly more toward local domestic travellers than inbound travellers.
- The proportion of business travel may be lower than at other airports. For economic impacts associated with inbound travel, this means that local spending per visitor may be slightly lower than for airports that have a higher proportion of business travellers.

Where appropriate, assumptions are adjusted to match the above differences in market profile.

5.7.2 Detailed Assumptions for Visitor Spending

Exhibit 5-5 lays out the calculation of annual visitor spending, based on a number of assumptions as more fully outlined below.

Exhibit 5-5: Visitor spending

Calculation of Visitor Spending					
Flight Sector		**Domestic**	**Transborder**	**International**	**Total**
Sector Share	(%)	75%	20%	5%	100%
Inbound Pax	(000s)	1,875	500	125	2,500
Visitor Share	(%)	25%	45%	25%	
Visitors	(000s)	469	225	31	725
Spending Per Pax	($)	486	578	2,128	
Total Spending	**($Millions)**	**228**	**130**	**67**	**424**

Figures in the exhibit above are more fully explained below.

As noted elsewhere, the economic impact analysis is based on passenger volumes once the terminal capacity of the Significant development concept is reached (i.e., 5.0 million passengers annually). Based on the assumed airport role and on an analysis of flight patterns at other similar airports, the following mix of flights, and hence passengers, is assumed:

- Domestic: 75%
- Transborder: 20%
- International: 5%

Because Pickering is not assumed to serve as a major hub for connecting flights, the role of transiting passengers in the analysis has not been specifically considered. Airlines operating at the airport, even if it is their local market base, will tend to operate more on a point-to-point basis. The above market mix is thus assumed to match passengers' origins and destinations. Based on the above mix, inbound passengers by sector can be calculated (assuming inbound passengers are one-half of the total number of passengers).

The next step in the process is to consider the proportion of inbound visitors within each sector. Assumptions were developed based on an analysis of broader travel patterns using Ontario-level data. These assumptions are more fully articulated in the sub-sections below.

5.7.2.1 *Visitor Proportion for Domestic Flights*

Stat Can Table 23-10-0253 indicates that the total number of passengers processed at airports across Ontario on domestic flights was 26.1 million. Dividing the figure of 26.1 passengers by 2 results in an estimate of deplaned domestic passengers of 13.1 million in Ontario. In comparison, Stat Can Table 24-10-0029-01 reports that there were 3.421 million visits via commercial aircraft by Canadian residents to Ontario in 2017. Comparing this value to the figure for deplaned domestic passengers of 13.1 million noted earlier suggests that 26.2% of domestic traffic in Ontario is associated with visits to Ontario by Canadian residents. For the purpose of the analysis, this figure is rounded down to 25%.

The relatively low figure of 25% is consistent with an airport that is oriented to outbound traffic and with a general assumption that, in terms of total numbers, Ontario residents may travel more to other provinces than residents of other provinces travel to Ontario. Some of the domestic travel captured in Table 23-10-0253 (and included in the 26.1 million figure) will also be associated with travel entirely within Ontario. Such intra-provincial travel is not included in the analysis of visitor economic impacts. (As one factor in this decision to exclude this traffic from the analysis, KPMG assumed a significant proportion of this traffic may be associated with same-day business flights and will also tend not to use Pickering.)

5.7.2.2 *Visitor Proportion for Transborder Flights*

The proportion of inbound visitors on transborder flights was estimated through an analysis of data from Stat Can Table 24-10-0041-02. This table provides montbly data on international travel to Canada and each of the provinces, by travel mode and country of residence of the traveller. Analysis of data for entry into Ontario for two months in 2017 (July and December) suggests the following usage patterns for transborder flights:

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- 46% of traffic is accounted for by U.S. residents or by overseas residents entering Ontario via the U.S. (with shares of 38% and 7.9% respectively).
- 53.7% of traffic is accounted for by Canadian residents returning from the U.S. or from overseas destinations via the U.S. (48.4% and 5.3% respectively).

The overall 46% share noted above for non-resident passengers is directly relevant to our estimate of the proportion of non-resident visitors on inbound transborder flights to Pickering. This figure was rounded down to 45% for the calculations.

5.7.2.3 *Visitor Proportion for International Flights*

Similar to the analysis of visitors on transborder flights, data from Stat Can Table 24-10-0041-02 was also used to estimate the proportion of inbound visitors on international flights. For international flights into Ontario, data from this table suggests that about 36% of international passengers entering Canada are residents of other countries, whereas 64% are returning residents of Canada. For the analysis of this study, 25% of international traffic at Pickering is assumed to be by foreign visitors. The lower percentage relative to actual observed values for Ontario is consistent with the assumption that the airport will serve leisure and sun destinations and hence a higher proportion of its international traffic will be by Canadian residents.

5.7.2.4 *Spending Patterns*

Spending patterns assumed for inbound travellers are based on expenditure data published by the Ontario Ministry of Tourism, Culture and Sport (MTCS). Figures are for visitors to Ontario staying one or more nights in 2016. These data suggest spending of $486 per visit by Canadian visitors (i.e., out-of-province residents). Average spending figures for U.S. visitors and international visitors were $578 and $2,178 respectively. These spending figures are applied in this study without adjustment.[12]

The Ontario spending figures noted above are averages for all visitors, including those arriving by car. Figures for inbound airline travellers may differ slightly but are not readily available.

5.7.2.5 *Overall Estimate of Visitor Spending*

[redacted]

[12] Given uncertainties in the data inputs generally KPMG conservatively made no allowance for inflation to today
[13] MNP and Frontier Economics, Toronto Pearson's Economic Impact, p. 62.

5.7.3 Economic Impact of Visitor Spending

To estimate the economic impacts that result from the visitor spending estimates developed above, KPMG used multipliers implied by MTCS figures were used for the total economic impact of visitor spending in Ontario in 2016. Based on visitor spending in Ontario of 26.87 billion in 2016, MTCS estimates the following impacts:

- A total GDP impact (including direct, indirect and induced) of $25.2 billion.
- Total employment impacts of 309,884 (including direct, indirect and induced).

To obtain economic impact estimates for Pickering, the results were simply scaled down to align with the estimated spending profile of [redacted] This yields the results noted in below in Exhibit 5-6.

[redacted]

Impacts from Visitor Spending - Significant Passenger		
	GDP	Employment
	($ Millions)	(Jobs)
Assumed Spending	[redacted]	
Direct		
Indirect		
Induced		
Total		

[redacted]

The employment figures shown above imply a value of 1.25 for the Type I multiplier (the ratio of direct and indirect employment to direct employment) and a value of 1.50 for the Type II multiplier (the ratio of direct, indirect and induced employment to direct employment). These values reflect relationships observed in MTSC reported results. These multipliers are less than those associated with airport operations (which imply values of 1.67 and 2.06 for the Type I and Type II multipliers respectively). Lower multipliers for visitor spending are not unexpected given the nature of services associated with visitor travel. These services tend to be more labour intensive and also to have lower average direct wages than other sectors that require many purchased inputs.

Note that the GTAA study did not estimate GDP impacts from visitor spending and instead simply focused on employment impacts. Hence, there is not a figure from this study to compare to our estimate of a GDP impact from visitor spending through Pickering of $398 million.

The results calculated above entail more conservative assumptions than some other studies. For example, the Hamilton Airport study has employment multipliers of 1.38 and 1.79 respectively (Type I and Type II). These are slightly higher than those embodied in the MTCS estimates that are the basis of our analysis.

MTCS tourism impact reports do not show economic impacts for Canada. Hence KPMG was unable to generate Canadian-level impacts for visitor spending. As outlined later in this Chapter, Canadian impacts for construction spending are about 10% higher than the Ontario impacts. Because visitor spending tends to focus on local services such as accommodation and food outlets, interprovincial impact are likely to be lower than for construction spending.

5.8 Economic Impact of Capital Expenditures

In this section, the economic impact of the construction of a new airport at Pickering is examined. The economic impacts associated with the construction phase are one-time in nature: unlike the operating phase, the economic impacts will not continue annually into the future. As such, these impacts need to be reported separately from operating impacts.

There will be economic impacts associated with ongoing rehabilitation and refurbishment of the airport, but these will be much smaller and may vary significantly from year to year.

In the following sections, impacts are reported separately for:

- the Significant Industrial Airport,
- the Significant Specialty Passenger Airport, and
- the Significant Industrial and Specialty Passenger Airport (combined).

Consistent with presentation of economic impact results elsewhere in this report, impacts have been reported in current (2018) dollars. Depending on the particular scenario, actual construction will take place sometime in the future over a four- to eight-year timeframe. Impacts reported herein will accordingly be spread over the relevant multi-year period. Employment impacts are in terms of Full-Time Equivalent positions (FTE's, or more simply, jobs). An FTE or job is a full-time position occupied for one year. Accordingly, an employment impact from the construction project reported as 100 jobs may, in fact, be in the form of 25 positions that last for four years.

5.8.1 Methodology

To estimate the economic impacts from construction expenditures, capital costs are assumed to translate into an increase in industry output in Ontario from the following sectors:

- Non-residential building construction,
- Transportation engineering construction, and
- Other engineering constructions

Proportions varied by scenario, depending on the mix of assets built. (For the combined scenarios, for example, the allocation of expenditures across the three industries was 52%, 4%, and 44%.)

Employment and GDP impacts were estimated using Statistics Canada multipliers for these industries. This methodology allowed estimation of economic impacts across Canada as well as just in Ontario. This report focusses on reporting on employment and GDP impacts.

Impacts are based on the assumed capital costs as summarized in Exhibit 5-7 below.

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Exhibit 5-7: Assumed capital costs

Cost Items (2018$ 000s)	Industrial	Passenger	Combined
Runways and taxiways	[redacted]	[redacted]	[redacted]
Mobile Equipment	[redacted]	[redacted]	[redacted]
Other Equipment	[redacted]	[redacted]	[redacted]
Land Improvements	[redacted]	[redacted]	[redacted]
Car Parking	[redacted]	[redacted]	[redacted]
Building and Structures	[redacted]	[redacted]	[redacted]
Contingency	[redacted]	[redacted]	[redacted]
Engineering, Design and Contract Admin	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]

5.8.2 Calculated Impacts

Exhibit 5-8 summarizes impacts as calculated for Ontario. As shown in the exhibit, the construction of the Significant Industrial Airport will result in a GDP impact of [redacted] A total employment impact in Ontario of [redacted] is estimated. Impacts for the Specialty Passenger and Combined Airports [redacted]

Exhibit 5-8: Ontario Economic Impacts

Economic Impact of Capital Expenditures - Ontario			
	Industrial	**Passenger**	**Combined**
GDP ($ millions)	[redacted]	[redacted]	[redacted]
Direct	[redacted]	[redacted]	[redacted]
Indirect	[redacted]	[redacted]	[redacted]
Induced	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]
Labour Income ($ millions)	[redacted]	[redacted]	[redacted]
Direct	[redacted]	[redacted]	[redacted]
Indirect	[redacted]	[redacted]	[redacted]
Induced	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]
Employment (No. of Jobs)	[redacted]	[redacted]	[redacted]
Direct	[redacted]	[redacted]	[redacted]
Indirect	[redacted]	[redacted]	[redacted]
Induced	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]

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[redacted]

Exhibit 5-9: Canada Economic Impacts

Economic Impact of Capital Expenditures -Canada			
	Industrial	**Passenger**	**Combined**
GDP ($ millions)	[redacted]		
Direct			
Indirect			
Induced			
Total			
Labour Income ($ millions)			
Direct			
Indirect			
Induced			
Total			
Employment (No. of Jobs)			
Direct			
Indirect			
Induced			
Total			

5.9 Summary of Economic Impacts

Exhibit 5-10 summarizes employment impacts for the various sources of impact analyzed in this report. This exhibit focuses on employment impacts (in terms of number of jobs), since this is the metric that was calculated across each of the sources of economic impact. The distribution of GDP impacts would likely be similar, but not exactly the same, across the various sources of impact (e.g. operations, inbound visitor spending, and construction). Differences in the distribution of GDP will result from differences in average employment income and the role of imports for industries in the various supply chains associated with each spending type. Thus, employment impacts cannot be said to perfectly project GDP impacts.

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Transport Canada
Pickering Lands Aviation Sector Analysis
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Exhibit 5-10: Employment Impacts

Summary of Employment Impacts (Jobs) - Ontario			
	Industrial	**Passenger**	**Combined**
Operations			
Direct			
Indirect			
Induced			
Total			
Inbound Visitor Spendi			
Direct			
Indirect			
Induced			
Total			
Subtotal - Annual Impa			
Direct			
Indirect			
Induced			
Total			
Construction Impacts			
Direct			
Indirect			
Induced			
Total			

[redacted]

[redacted]

Exhibit 5-11 shows Ontario GDP impacts for those sources of impact for which these have been calculated (visitor spending and construction).

Exhibit 5-11: Ontario GDP Impacts

Summary of GDP Impacts - Ontario ($Millions)			
	Industrial	**Passenger**	**Combined**
Inbound Visitor Spending			
Direct	[redacted]		
Indirect			
Induced			
Total			
Construction Impacts			
Direct			
Indirect			
Induced			
Total			

5.10 Qualitative Considerations

In this section a number of qualitative considerations with respect to potential economic impacts from a new airport on the Pickering Lands are summarized. These include those associated with:

- Shifts in airport traffic,
- Development patterns,
- Transportation patterns,
- Connectivity benefits.

The focus of the discussion of qualitative impacts is on the impacts of a specialty passenger airport rather than on an industrial airport, since it is likely that shifts in passenger activity will have the greatest influence on development patterns and on other airports in the GTHA. In the analysis, projected movements for the Specialty Passenger scenarios are significantly more than those for the Industrial scenarios.

5.10.1 Shifts in Airport Traffic

Completion of a new airport on the Pickering Lands would result in both:

- A diversion of air traffic away from existing airports.
- Some net stimulation of new airport traffic.

The proportion of each is difficult to determine, although a greater share of traffic is estimated to be associated with diverted traffic than with new traffic. As noted in the Supply and Demand report, there are no major capacity constraints in the southern Ontario airport system that are currently inhibiting passenger activity to any significant degree. Thus, there is likely limited unmet demand in the market.

Some stimulation of new air traffic could result from the following:

- Better airport access provided by a new Pickering Airport for certain geographic areas (the Eastern GTA).
- Availability of a lower cost airport option, which may result in market entry by new LCCs and/or greater activity by existing carriers. Lower prices offered by LCCs, in particular, may induce greater passenger volumes.
- Some reduction in congestion and hence increased service levels at existing airports.

As a slight offsetting factor, the dispersal of some airline traffic away from Pearson may reduce this airport's effectiveness in positioning itself as a major airline hub. For hubs, there are benefits from the centralization of passenger and flight volumes, which can help to increase options for connecting flights. However, to the extent that Pickering focuses on serving local origin/destination passengers with point-to-point flights, impacts from the loss of concentration at the Pearson hub will be less. Further, Pearson can benefit from a reduction of congestion and hence greater available capacity.

Airlines may welcome the increase in competition, and hence downward fee pressure that might result from the introduction of an airport on the Pickering Lands that is operated by an entity separate from existing airport and terminal operators. As an offsetting factor, however, airlines may see a loss of some economies of scale to the extent that they need to split existing traffic among separate facilities (i.e., among existing airports and a new Pickering Airport).

It should be noted that even if new airlines enter the southern Ontario market in conjunction with a new airport on the Pickering Lands, this does not mean that most or all of their passenger traffic represents incremental passenger demand. Some of the passengers may be diverted from existing carriers at existing airports. Thus, the presence of airline tenants at a new Pickering Airport that are new to the Region is not in itself an indication that there is incremental passenger traffic.

5.10.2 Development Patterns

Availability of a new airport on the Pickering Lands may stimulate some shift in GTA development eastward, since it will improve transportation connectivity to the eastern GTA. Development of the Pickering Airport is also likely to spur additional business development in its vicinity, as manufacturing and business locations take advantage of the benefits from nearby passenger and/or cargo flight availability. Area business may also try to serve associated demand for goods and services (e.g., airline meal preparation, freight and customs forwarding, warehousing). Hotels, gas stations and restaurants and fast food chains may also develop nearby. Since some critical mass of passenger traffic will be required to induce these investments, they will likely be more than proportionately greater for a Significant Specialty Passenger Airport than for a Small Specialty Passenger Airport.

The economy in the eastern GTA has recently suffered from the closure of the General Motors (GM) assembly plant at Oshawa. This may have domino impacts on automobile parts suppliers and other local businesses. Closure of the GTA GM plant may also dampen some demand for air cargo services. Of note, is that the existing airport at Peterborough cited cargo services to/from the GM plant as one of its important markets.

5.10.3 Transportation Patterns

Shifts in air traffic to Pickering will increase usage of road networks in the eastern GTA. Initially, there are likely to be limited transit services to the Pickering Airport and those available will be via bus rather than fixed link or rail. Accordingly most passengers would access the facility by automobile. Over time, demand for transit services will increase but the Airport is unlikely to offer until well into the future the multiple of options and frequency that are now available at Pearson.

5.10.4 Connectivity Benefits

The GTAA study calculated impacts associated with the productivity and growth benefits resulting from the direct connections and high flight frequencies now available at Pearson. These impacts were referred to as "catalytic" impacts; a substantial number of jobs (179,000) were attributed to this category of impact. Factors contributing to these impacts were as follows:

- Direct connections will induce more travel, because travel times will be lower.
- Additional travel for business purposes will enhance trade, as a result of additional in-person meetings and subsequent business transactions.
- There are time value savings associated with direct connections, and the value of these savings can be monetized.

Overall, the GTAA study estimated that Ontario's GDP would be 4.4% lower in the event that "Pearson did not facilitate the direct connections it provides today".[14] This is a substantial impact and leads to the figure of 179,000 jobs resulting from catalytic impacts.

KPMG has not tried to estimate a similar value for Pickering. This reflects the following considerations:

- Given the projected role of Pickering as a Specialty Passenger Airport serving leisure and low-cost markets, it is not likely to will substantially increase the number of direct connections serving the GTHA relative to today. Further, its mix of flights would not be focused on business travellers.
- Shifts in traffic away from Pearson as a result of the opening of Pickering may actually have a slight dampening effect on the growth of direct connections and flight frequencies at Pearson. This may serve to moderate overall incremental benefits from Pickering associated with catalytic impacts.
- The exact calculations underlying the GTAA study are not fully disclosed and hence are difficult to replicate.

[14] GTAA Study, p. 80.

Nevertheless, the catalytic benefits from facilitating additional air traffic must be acknowledged, even if benefits are difficult to quantify.

5.11 Other Airport Scenarios

As noted earlier, this Chapter focusses on calculating economic impacts of the Significant Airport scenarios, both industrial and specialty passenger. Because economic impacts should be largely proportional to the volume of airport traffic (both passengers and cargo), the economic impacts of the Small scenarios can be roughly estimated by scaling the benefits estimated in this chapter by relative traffic volumes. Since the Small Specialty Passenger scenario involves a full capacity of 750,000 passengers, versus 5.0 million for the Significant Specialty Passenger scenario, then benefits of the Small Specialty Passenger scenario will be about 15 percent of those calculated herein.

6 Conclusion

This report, the Pickering Lands Aviation Sector Analysis – Revenue Generation and Economic Impact Assessment Report, analyzes the potential financial outcomes and economic impacts of different scenarios for a new airport on the Pickering Lands. While the analysis is not comprehensive, in that it does not test the full range of options available for a potential new airport on the Pickering Lands, it can serve as a useful tool for understanding the potential of various types of airports, given a set of assumptions. It can also help to understand potential private market interest in the development of a new airport. Finally, the analysis in this report provides a snapshot of the potential magnitude of economic benefits that could be realized with airport development.

Because this study is exploratory in nature, examining only a small sub-set of potential options for a new airport on the Pickering Lands, definite conclusions regarding the potential of each type of airport cannot be drawn; scenarios for each type of airport could exist that would likely attract investment for development of a new airport, just as scenarios could exist that are unlikely to attract investment. Six scenarios have been analyzed associated with industrial, specialty passenger, and combined industrial and specialty passenger airports. This analysis provides a snapshot of the potential impacts to help inform further consideration of a new airport on the Pickering Lands. Investors interested in the potential opportunity to participate in the development of a new airport on the Pickering Lands will need to conduct their own analysis and draw their own conclusions regarding the potential financial outcomes and economic impacts a new airport would have.

The six scenarios presented in this report were developed for the Pickering Airport in consultation with Transport Canada, and based on the findings from the Type and Role Report, which identified that industrial, specialty passenger, and combined industrial and specialty passenger roles would have minimal overlap with the existing airports in the southern Ontario airport system. For each of the three selected roles, a small ("Small") and a large ("Significant") scenario were developed, for a total of six scenarios. The development of the assumptions underlying each of the scenarios was informed by research and analysis of other airports, selected based on their comparability to a potential new airport on the Pickering Lands.

All six scenarios share the following common assumption set:

- Development of an airport on the Pickering Lands would be subject to market forces.
- A private partner would develop the airport, and would be responsible for obtaining the required financing for the development.
- Transport Canada would provide the land required for development of the airport.
- Key legislation and policy currently governing airport operations would remain unchanged.
- No other new airports would enter the southern Ontario airports system.
- Infrastructure investments at other airports in the southern Ontario airports system would unfold as currently identified in existing Master Planning documents.

These scenarios are driven by underlying assumptions regarding the magnitude of capital costs of development, ongoing operating costs, revenue collected through aeronautical and non-aeronautical fees, occupancy levels, and air traffic levels. There is a significant level of uncertainty associated with the assumptions used to generate the scenarios, and it is likely that the future will deviate from the assumptions presented in this report. Despite this uncertainty, KPMG offers the following observations:

s.24(1)

Regarding key scenario assumptions:

- Capital costs associated with the development of a passenger terminal building account for significant differences in the overall capital costs between the Industrial and Specialty Passenger scenarios.
- Under the assumptions used for the Industrial Airport scenarios, a significant proportion of the revenue is generated from the land leases, and relatively little revenue is generated from aeronautical fees.
- Under the assumptions used for the Specialty Passenger Airports, a significant proportion of revenue is generated from the aeronautical fees.

Regarding the financial analysis:

- The financial models analyzed the potential financial outcomes for a period covering construction and 30 years of operations. They considered capital costs, operating costs, revenues (aeronautical, non-aeronautical passenger-related, leases), and financing assumptions, to develop a picture of the potential cash flows and profitability of each scenario.

[redacted]

s.24(1)

Transport Canada
Pickering Lands Aviation Sector Analysis
March 31, 2019

[redacted]

Transport Canada
Pickering Lands Aviation Sector Analysis
March 31, 2019

Appendices

A Glossary of Terms and List of Acronyms

Exhibit A-1: Glossary of Terms

Term	Definition
Air Taxi Air Traffic:	Air traffic that is generated by the provision of air taxi service.
Air Traffic:	Traffic generated by in-flight aircraft.
Airport Role:	The role an airport plays in a system of airports such as: • Primary Hub, Secondary, Feeder, GA Corporate, GA, Industrial, GA Training.
Airport Service Type:	The dominant services an airport offers within passenger, cargo and general aviation categories, such as: • Passenger, Air Cargo, General Aviation
Airport System:	A grouping of airports structured as: • A set of airports within a geographic area, each functioning independent of each other; • An informal system featuring alliances among individual airports who agree to cooperate or compete with others; or • A formal system with cooperative agreements to behave for the common good, and potentially compete against another airport system.
Airside:	The part of the airport that is secured and not open to the general public.
Base Case:	The Base Case represents the set of assumptions used for each of the six airport scenarios in this study. It also represents the associated financial outcomes based on the set of assumptions.
Cargo Air Traffic:	Air traffic that is generated by the provision of cargo service.
Central De-icing Facility (CDF):	A dedicated facility for the de-icing of aircraft during winter conditions. A CDF typically includes an apron for one or more aircraft, de-icing trucks and equipment, and a control centre.
Combined Services Facility (CSF):	A building or complex that typically houses airport maintenance staff, administration, and Emergency Response Services.
Corporate Air Traffic:	Air traffic that is generated by the provision of corporate service.
EBITDA/Interest Ratio:	This represents the ratio of Earnings Before Interest, Taxes and Depreciation/Amortization (EBITDA) to Interest charges and fees. It is a measure of the cash flow available from operations to support interest charges.
Domestic:	Domestic flights are those that occur within Canada.

Term	Definition
Deplane:	To exit an aircraft.
Enplane:	To board an aircraft.
Equity Break Even:	The time it would take, in years, for the equity investor to reach breakeven (e.g., to recoup its initial investment).
Equity Internal Rate of Return (Equity IRR):	The Internal Rate of Return on the Equity portion of the investment.
Fees – Aeronautical:	For the Industrial Airport scenarios, aeronautical fees include landing fees. For the Specialty Passenger Airport scenarios, aeronautical fees include landing fees, Airport Improvement Fees and terminal charges levied on a per aircraft seat basis.
Fees – Land Leases:	Land lease fees are fees collected for land leases, airside or groundside.
Fees – Other:	Other fees are non-aeronautical fees collected that are associated with passenger airport operations. They include revenues and fees earned by the airport operator from car parking, concessions (including car rentals), and other rentals, including of terminal space.
General Aviation (GA):	A broad range of aviation activities that generally excludes scheduled air services and includes training, recreational, and corporate flights.
Groundside:	The portion of the airport that is unsecured and open to the public. Also known as "landside."
Internal Rate of Return (IRR):	A metric used in capital budgeting to estimate the profitability of potential investments. The internal rate of return is a discount rate that makes the net present value (NPV) of all cash flows from a particular project equal to zero.
International:	International flights are those occurring between Canada and other countries not including the United States.
Low Cost Carrier (LCC):	An airline that is operated with an especially high emphasis on minimizing operating costs and without some of the traditional services and amenities provided in the fare, resulting in lower fares and fewer comforts.
Maintenance, Repair & Overhaul:	Facilities for the servicing, repair and refurbishment of aircraft. Additional specialized functions include painting, interior finishing, and aircraft role conversion.
Maximum Take-off Weight (MTOW):	The maximum weight of the aircraft at which the pilot is allowed to attempt to take off, due to structural or other limits.
Occupancy – Airside:	The occupancy rate assumed for airside land leases.

Term	Definition
Occupancy – Groundside:	The occupancy rate assumed for groundside land leases.
Optimistic Case:	The Optimistic Case represents an adjustment to the set of assumptions used for the Base Case airport scenario for the purposes of conducting sensitivity testing. In the Optimistic Case, the assumptions are adjusted by 20% in the direction that would lead to an anticipated increase in Project and Equity IRR.
Original Equipment Manufacturer (OEM):	A company that produces parts and equipment that may be marketed by another manufacturer.
Passengers Per Annum (PPA):	The total number of arriving and departing passengers handled by an airport in a given year.
Pessimistic Case:	The Pessimistic Optimistic Case represents an adjustment to the set of assumptions used for the Base Case airport scenario for the purposes of conducting sensitivity testing. In the Pessimistic Case, the assumptions are adjusted by 20% in the direction that would lead to an anticipated decrease in Project and Equity IRR.
Pickering Lands:	The 7,350 ha of land in Pickering, Markham and Uxbridge, owned by the Government of Canada, and that have been reserved for a future airport.
Project Break Even:	The time it would take, in years, for the full project investment to reach breakeven (e.g., to recoup its initial investment).
Project Internal Rate of Return (Project IRR):	The Internal Rate of Return for the total investment on the project.
Secondary Airport:	A secondary airport is one that provides passenger air services but is not a primary hub. These airports typically provide point to point services by existing airlines. The secondary airport will typically have fewer destination choices and lower frequency than a primary hub airport. An example of a secondary airport is Hamilton Airport. It provides non-stop passenger service to numerous Domestic, Transborder and International destinations, albeit with lesser frequency and destination selection as compared to Toronto Pearson Airport.
Significant Industrial Airport:	The airport development scenario tested in this study that corresponds with the Industrial Airport – Significant Development Concept, presented in the Type and Role Report.
Significant Specialty Passenger Airport:	The airport development scenario tested in this study that corresponds with the Specialty Passenger Airport – Significant Development Concept, presented in the Type and Role Report.
Significant Combined Industrial Airport and	The airport development scenario tested in this study that corresponds with the combination of the Industrial Airport – Significant Development Concept and

Term	Definition
Specialty Passenger Airport:	the Specialty Passenger Airport – Significant Development Concept, presented in the Type and Role Report.
Small Industrial Airport:	The airport development scenario tested in this study that corresponds with the Industrial Airport – Small Development Concept, presented in the Type and Role Report.
Small Specialty Passenger Airport:	The airport development scenario tested in this study that corresponds with the Specialty Passenger Airport – Small Development Concept, presented in the Type and Role Report.
Small Combined Industrial Airport and Specialty Passenger Airport:	The airport development scenario tested in this study that corresponds with the combination of the Industrial Airport – Small Development Concept and the Specialty Passenger Airport – Small Development Concept, presented in the Type and Role Report.
Southern Ontario Airports System:	The ten airports contemplated in the Pickering Lands Aviation Sector Analysis studies.
Terminal Payment:	The book value of the airport asset at the end of the assumed 30-year loan period.
Ultra Low-Cost Carrier (ULCC):	A Low-Cost Carrier that further extends the concept of low fares by removing almost all complimentary services and by charging extra fees for add-ons.

Exhibit A-2: List of Acronyms

Acronym	Term
ACF	Air Cargo Facility
AIF	Airport Improvement Fee
ATB	Air Terminal Building
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
BFI	King County International Airport/Boeing Field
CFB	Canadian Forces Base
CBSA	Canada Border and Services Agency
CDF	Central De-icing Facility
CSF	Combined Services Facility
DSCR	Debt Service Coverage Ratio
E/D	Enplaned/Deplaned
FBO	Fixed Base Operator
GDP	Gross Domestic Product
GTA	Greater Toronto Area
GTAA	Greater Toronto Airports Authority
GTHA	Greater Toronto and Hamilton Area
LCC	Low-Cost Carrier
MAA	Mobile Airport Authority
MGLW	Maximum Gross Landing Weight
MRO	Maintenance Repair and Overhaul
MPPA	Million Passengers Per Annum
MTCS	Ontario Ministry of Tourism, Culture and Sport
MTOW	Maximum Take-off Weight
NHS	National Household Survey

Acronym	Term
OEM	Original Equipment Manufacturer
PPA	Passenger Per Annum
SEA	Seattle-Tacoma International Airport
ULCC	Ultra Low-Cost Carrier
WGAA	Williams Gateway Airport Authority

B Pickering Lands Aviation Sector Analysis Study Assumptions (for the next 20 years)

Exhibit B-1: Pickering Lands Aviation Sector Analysis Study Assumptions (for the next 20 years)

Category	Issue	Assumptions
Policy and Regulatory Changes	International Liberalization	1. There will be no significant changes in the freedoms of the air. 2. There will be no right of establishment for foreign air carriers in Canada. 3. Cabotage will not be allowed in Canada. 4. Canada will continue with incremental liberalization of bilateral agreements, with no measures either constraining or favouring Toronto airports.
	Traffic Leakage to U.S.	5. There will be no significant changes in the 'user pay' approach to air transport in Canada. 6. The current leakage pattern to border U.S. airports will continue "as is" and will be subject to exchange rates and other factors
	Airline Foreign Ownership	7. Foreign ownership rules may be relaxed up to a maximum of 49%, although control in fact provisions would remain.
	Billy Bishop Airport Status	8. The ban on jets will continue throughout the 20-year planning horizon. 9. Slot constraints and other limits are likely to remain throughout the 20-year planning horizon.
	Buttonville Airport Status	10. The airport will close in 2023, before a new Pickering Airport becomes operational, with resident aircraft already relocated to other 9 southern Ontario airports.

Category	Issue	Assumptions
	New Pickering Airport	11. Apart from government investment for servicing the site, and environmental assessment work, investment in the development of a new Pickering Airport will be non-government financed and operated. 12. The capacity of each southern Ontario airport will be developed subject to traffic levels and environmental concerns (noise, land use, etc.) 13. Future investors will seek sustainable financial returns. 14. While unlikely, competition cannot be precluded between a new Pickering Airport and Toronto Pearson Airport.
	System Competition	15. A governance option will be selected which does not provide a new airport on the Pickering Lands a competitive advantage at the expense of the existing airports.
Airline Markets	Industry Consolidation	16. Canadian airline consolidations may occur. 17. Airline consolidation with a one carrier outcome will not occur. 18. Foreign airline consolidation may involve a Canadian airline and would follow the 49% ownership rule, assuming control in fact of carrier remains in Canada.
	Airline Alliances	19. Evolving alliance strategies will not directly impact development of the new Pickering Airport.
	Low-Cost Carriers (LCC)	20. U.S. - LCCs may extend services into Canada (Southwest, Allegiant, Jet Blue, Spirit, other) and may serve a new Pickering Airport. 21. Trans-Atlantic LCCs may serve a new Pickering Airport (Icelandair, Norwegian, other).
	Ultra Low-Cost Carriers (ULCC)	22. One or more Canadian ULCC carriers will begin operations within 5 yrs. 23. ULCCs will stimulate new passenger traffic in Canada and southern Ontario.

Category	Issue	Assumptions
		24. ULCCs will not serve Toronto Pearson Airport[15].
	Load Factors	25. Passenger growth at Toronto Pearson Airport will require more frequencies and larger gauge aircraft and cannot be accommodated by higher load factors using existing aircraft types.
Aircraft Trends	Route Fragmentation	26. Fragmentation of markets will continue, facilitated by new "right-sized" long range aircraft (e.g.: B787) operating longer flight segments and able to support increased point-to-point services.
	Route Economics	27. The trend towards larger regional turboprop, and larger medium range jet aircraft will continue. 28. Smaller regional jets and turboprops <50 seats will become rare in air service operations. These aircraft types will be deployed very selectively by air carriers.
	Environmental Impacts	29. New generation aircraft with lower noise signatures and lower emissions will increasingly enter airline fleets potentially serving a new Pickering Airport.
	Fuel Price	30. Fuel price fluctuations will not be considered due to unpredictability.
Airline Services	Air Canada	31. Air Canada will continue to focus on operating a Hub-and-Spoke model to maintain and strengthen their dominant position at Pearson, with limited interest in other southern Ontario airports. 32. Air Canada will continue to emulate LCCs, with a separate division (Rouge).

[15] Note that these assumptions were originally developed in 2016. Flair Airlines now provides service to Toronto Pearson Airport, however, KPMG believes that this change will not have material impact on our analysis.

Category	Issue	Assumptions
	WestJet	33. WestJet will continue to serve multiple southern Ontario airports with expanded domestic, transborder and international services. 34. WestJet will continue to focus on Toronto Pearson Airport. 35. WestJet's wholly owned subsidiary Swoop is an ultra-low-cost carrier, which began flight operations in June 2018. Swoop will continue to grow and challenge new ULCC entrants to the Canadian market.
	Charter Air Services	36. Charter carriers will continue to seek lower cost alternatives to Toronto Pearson Airport, and will continue expansion into other southern Ontario Airports.
	Route Economics	37. Trend towards use of larger narrow body aircraft will continue in North and Central American domestic and trans-border markets. 38. New wide body aircraft (B787, A350) will cause fragmentation of international routes, both competing with and favouring Toronto Pearson Airport. 39. Very limited use of ultra-large wide body aircraft (A380) with use primarily on frequency-constrained routes.
Air Cargo Services	Route Economics	40. The trend towards use of twin-engine wide body aircraft will continue for intercontinental air cargo routes. 41. Industry will continue demands for increased flight frequency.
	Operational Models	42. Leading air express operations will remain based at Toronto Pearson Airport. 43. Air Freight operators will seek economic points of consolidation and flexible operational hours at other southern Ontario Airports. 44. Intermodal cargo operations (truck-air, air-truck) will occur at all airports.

Category	Issue	Assumptions
General Aviation	Types of Activities	45. Commercial, Corporate and Industrial activity may occur at a new Pickering Airport. 46. Stakeholders may identify a need for a General Aviation airport service type airport on Pickering Lands; however, this will not be the sole driver for a new airport.
Ground Transportation	Rail Services	47. The possibility of higher-speed rail service (200kph) between Toronto and Montreal within the next 20 years will be assessed, including impacts on passenger demand. 48. The possibility of regional/commuter rail services to Pickering Airport within the next 20 years will be assessed.
	Road Services	49. The new Highway #407 toll road will serve a new Pickering Airport beginning during the short term. 50. Congestion on Highway #401 and arteries in the GTA will make east-west travel increasingly difficult.

C Comparator Airports

This section documents findings with respect to the airports chosen as comparators to inform the development of scenarios in this report.

C.1 Method for Selection

Airports were selected, in consultation with Transport Canada, as comparator airports based on their degree of similarity with a potential new airport on the Pickering Lands, as identified by the three options in the Type and Role Report. This was measured according to the following criteria:

- The airport is able to represent one of the two airport types identified as preferable in the Type and Role Report, e.g., is an industrial or passenger airport;
- The airport is part of the same, or similar, market(s) as a potential new airport on the Pickering Lands (e.g., part of the southern Ontario airport system, or at least part of a North American market);
- The airport is publicly owned;
- Information regarding the history of the airport, operations and financial statements is publicly available.

It was rare to find airports that were able to meet all of the above criteria, and so those selected represent airports that were viewed as reasonable comparators given the information available. As a result, each of the selected comparator airports will be used to inform relevant assumptions for a new Pickering Airport. For example, one airport may have informed air traffic assumptions, while another may have been used to inform potential fee structure and revenues. Finally, it should be noted that the selected comparator airports do not provide an exhaustive review of all similar airports; it is possible that other airports would make better comparators. However, in the interest of time and efficiency, those selected were viewed as providing sufficient breadth for the purpose of this study.

C.2 Comparator Airports: General Aviation and Industrial Airports

C.2.1 King County International Airport / Boeing Field

King County International Airport/Boeing Field (BFI) is located in Seattle and was built as the Region's first municipal airport. It is one of five (5) general aviation reliever airports to Seattle-Tacoma International Airport (SEA), within the Puget Sound Airport System that includes twenty (20) public-use general aviation airports and two (2) military airfields[16]. It is one of the busiest primary non-hub airports in the U.S. and the primary general aviation reliever airport to Seattle-Tacoma International Airport (SEA). The airport's primary runway is 10,000 ft. long, and 200 ft. wide, and its secondary runway is 3,710 ft. long and 150 ft. wide[17]. King County was chosen as a comparator airport for analysis given its significant industrial operations and presence of a primary industrial tenant (Boeing).

[16] Mead & Hunt, King County International Airport/Boeing Field, Master Plan Update, Working Paper One, May 2016, p. A.5

[17] [17] Mead & Hunt, King County International Airport/Boeing Field, Master Plan Update, Working Paper One, May 2016, p. A.8 & A.10

King County / Boeing Field was approved for construction in 1928, and was originally named in honour of Boeing's Company Founder. Through the 1930s, it served as a regional centre for commercial and recreational aviation. The airport was briefly closed to the public for part of World War II to produce B-17 and B-29 bombers. King County / Boeing Field was the main passenger airport in Seattle from construction until the late 1940s, when Seattle-Tacoma International Airport began operations.

King County, in which the airport is located, is reportedly the largest centre for aerospace activity in the U.S. with over 45,000 industry employees and more than 400 aerospace companies.[18] The high level of activity in the Region reflects the fact that it is a major manufacturing centre for Boeing. Boeing has manufacturing facilities located along the west side of BFI, including Boeing Company's civilian and military aircraft Flight Test and Delivery Center Operations. On the east side of the airport, there are a number of other companies involved in the manufacturing of parts of components sold to the aerospace trade, including custom aircraft interiors.[19] In total, the airport has approximately 150 tenant businesses, directly supporting 5,209 jobs for the local economy[20].

BFI serves a wide variety of aviation users, including small commercial passenger airlines, large and small air cargo carriers, commercial general aviation Fixed Base Operators, corporate general aviation flight departments, private aircraft owners, helicopters, and military aircraft. In 2015, BFI recorded 20,214 enplanements, 165,571 aircraft takeoffs/landings, and 390 based aircraft. Also, in 2014 BFI ranked as the 27th busiest cargo airport in the country, recording a landed weight of 407,629 tons.

Boeing accounts for about 4,200 operations annually at BFI (with an operation referring to either a takeoff or a landing). Boeing thus accounts for about 2.5% of airport traffic, an important but not an overwhelming proportion. These operations are in support of Boeing's civilian and military aircraft manufacturing, testing and customer delivery operations, with nearly 90% of these attributable to the B-737 aircraft. (Other aircraft involved include the 787, 767, and 777 series.) BFI's Master Plan Update notes that each Boeing aircraft is involved with an average of 3 to 5 test/readiness flights at BFI prior to its final customer delivery. Production of the B-737 was at a rate of 504 aircraft per year in 2015, but was expected to ramp up to 624 aircraft per year by the end of 2018.

Airlines accounted for only 3,646 operations in 2015 and 20,214 passenger enplanements. BFI is served by regional airlines serving niche markets and that primarily use 9-seat turboprop commuter aircraft. Expansion of passenger traffic with larger mainline carriers is not expected as a result of constraints associated with noise and local transportation barriers.[21]

A summary of operations by major user group is provided below.

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[18] Mead & Hunt, King County International Airport/Boeing Field, Master Plan Update, Working Paper One, May 2016, p. A.1.
[19] William Beyers, "King County International Airport Economic Impact Study 2013, prepared for King County International Airport, February 2014, pp. 1-2.
[20] Mead & Hunt, King County International Airport/Boeing Field, Master Plan Update, Working Paper One, May 2016, p.A.1
[21] Mead & Hunt, p. B.4.

Exhibit C-1: BFI forecast operations

BFI Forecast Operations			
	2015	**2020**	**%**
		Forecast	
Airline	3,646	3,889	2.4%
Air Cargo	12,336	12,965	8.1%
Boeing	4,198	5,197	3.3%
GA - Air Taxi	20,503	21,979	13.8%
GA - Other	123,280	113,538	71.3%
Military	1,608	1,608	1.0%
Total	**165,571**	**159,176**	**100.0%**

As noted in the table above, General Aviation activity, other than for air taxi, is forecast to decline. The master plan attributes this to declines in piston aircraft utilization, pilot training and fleet production rates nationwide.

While the airport is explored for its industrial operations, it does also provide commercial passenger service, making up approximately 0.1% of passenger enplanements in Seattle.

Landing fees at BFI are quite competitive, at $1.50 per 1,000 lbs MGLW for non-based aircraft over 12,500 lbs. Fees schedules note that aircraft based at the airport are not charged a landing fee unless they are revenue generating.

If one assumes that Boeing operations are accounted for by 737-800 aircraft of 79,000 kg (or 174,165 lbs), then these operations would result in revenue of approximately $550,000 annually.[22] This assumes that landing fees are charged and Boeing is not subject to the exemption noted above for non-revenue generating operations. KPMG has not been able to confirm this assumption.

Like many municipally-owned airports, BFI does not publish stand-alone financial statements. Financial results are embedded in municipal financial statements (in this case for King County). The budget adopted for 2017-2018 provides for revenues of $42.1 million (US) and expenditures of $34.0 million. The budget provides for employment of 48.5 FTEs. Limited additional information is provided in terms of the breakdown of revenues and expenses.

BFI is owned by King County, but operated, managed, and administered as a division of the County's Department of Transportation. This management structure includes the King County Executive, King County Council, and the Director of the King County Department of Transportation. The Airport Division is also served by an airport advisory board (i.e., Airport Roundtable) that consists of community representatives, airport tenants, Pilot's association, off-site businesses, and labor representatives. The Roundtable makes recommendations on airport matters to airport administrators, the King County Executive, and King County Council.[23]

[22] Calculated as 4,198 x 50% x 174,165 x $1.50 / 1000.
[23] Mead & Hunt, King County International Airport/Boeing Field, Master Plan Update, Working Paper One, May 2016, p.A.5

C.2.2 Mobile Aeroplex at Brookley and the Mobile Downtown Airport

The Mobile Aeroplex at Brookley ("Mobile Aeroplex") is a 400-acre multi-model office and industrial complex situated on Mobile Bay in Alabama. Adjacent to the Aeroplex is the Mobile Downtown Airport, which is a general aviation facility. Notes to Mobile's financial statements note that Mobile Downtown operates primarily as an industrial airport. It is freight-only and does not provide passenger service. It is one of two airports serving Mobile, Alabama, the other being the Mobile Regional Airport, which is a small non-hub airport, serving domestic commercial, general aviation and military operations. It is located approximately 16 km northwest of the Brookley site. In 2016, 292,876 enplanements occurred at the Regional Mobile Airport. The Mobile Downtown Airport has a 9,600 ft. long and 150 ft. wide runway. It is contiguous to the Port of Mobile and its Intermodal facility. Further, it is connected to two interstate highways and CSX rail lines. It is located in Mobile's Foreign Trade Zone 82, which provides special customs procedures to U.S. plants engaged in international trade-related activities. This airport was chosen for analysis given the significant industrial operations taking place on adjacent lands in the complex.

Mobile Downtown was initially established in 1929 as a municipal airport. It was purchased by the U.S. Army in 1938 and then returned to control of the City after closure of the associated army base in1969. In 1982 the Alabama legislature created the Mobile Airport Authority to manage both the Mobile Downtown and the Mobile Regional Airports. A new terminal building was completed in 1986.

In 2015, Airbus Americas completed the construction of a $600 million Final Assembly line for the A320 series aircraft. The first A321 aircraft was completed and delivered in the second quarter of 2016. Through to the end of 2016, Airbus delivered a total of 17 A321 aircraft from the Mobile plant.[24] The Airbus facility is expected to employ up to 1,000 when at full capacity and to produce 40 to 50 aircraft per year.[25] More recently, Airbus announced the start of a production line for A220 series aircraft at Mobile, following its purchase of the C-series aircraft (rebranded as A220 series) from Bombardier. The initial planned capacity is 4 aircraft per month.

In addition to Airbus, Mobile Downtown is home to Mobile County's large private industry employer: VT MAE. VT MAE is a subsidiary of Singapore Aerospace International Inc. that provides maintenance services to mainline carriers. It is the airport's largest tenant and employs approximately 1,200 technical, engineering and administrative personnel. In total the Mobile Downtown Airport and Mobile Aeroplex at Brookley employed approximately 4,200 employees in over 80 business in 2016[26].

As previously mentioned, Mobile Downtown operates primarily as an industrial airport. Exhibit C-2 shows the breakdown of aircraft operations by type. Military operations still account for a large share (63.5%) of the total.

[24] Mobile Airport Authority, Financial Statements for the year ended September 30, 2016, p. iii.
[25] Press Register, "Airbus is coming: Agreement approved for $600 million, 1,000 worker plan in Mobile", June 30, 2012.
[26] Mobile Airport Authority, Financial Statements for the year ended September 30, 2016, p. 3.

Exhibit C-2: Mobile Downtown – Aircraft Operations [27]

Mobile Downtown - Aircraft Operations (No.) - 2016		
Air Carrier	2,109	3.6%
Air Taxi / Commuter	3,076	5.3%
General Aviation	11,614	19.9%
Location Operation - Civilian	4,572	7.8%
Military	37,135	63.5%
Total	**58,506**	**100.0%**

Revenues are generated from landing fees for the freight airlines, leases on various buildings and land located on the property[28]. The language included in the financial statements implies that landing fees are charged only to airline (cargo) users, which are a relatively small proportion of the total movements, as outlined in Exhibit C-2 above.

Summary financial data for the two entities profiled here (Mobile Downtown and Mobile Aeroplex) are summarized in Exhibit C-3 below.

[27] Mobile Airport Authority, Financial Statements and Supplementary Information for the Year Ended September 30, 2016, with Comparative Totals for the Year Ended September 30, 2015. P.7
[28] Mobile Airport Authority, Financial Statements and Supplementary Information for the Year Ended September 30, 2016, with Comparative Totals for the Year Ended September 30, 2015

Exhibit C-3: Summary Financial Information – FY 2016 ($000s) [29]

Summary Financial Information - FY 2016 ($000s)	Mobile Downtown	Mobile Aeroplex	Total
Operating Revenues			
Airfield	1,294.1	-	1,294.1
Land and Building rentals	1,324.2	2,732.3	4,056.5
Other	-	32.7	32.7
Total Operating Revenues	2,618.3	2,764.9	5,383.3
Operating Expenses			
Aviation	1,157.1		1,157.1
Non-aviation	0.4	2,125.8	2,126.2
General maintenance / security	19.9	110.5	130.4
Administration	178.3	478.7	656.9
Subtotal - Expenses	1,355.7	2,715.0	4,070.7
			-
Depreciation	2,106.5	740.8	2,847.3
			-
Net Operating Income	(843.9)	(690.8)	(1,534.7)
			-
Non-Operating Revenues (Expenses)			-
Net Interest Expense	(11.5)	(321.6)	(333.1)
Other	800.0	1,508.5	2,308.5
	788.5	1,186.9	1,975.4
			-
Net Income Loss Before Capital Contr'ns	**(55.4)**	**496.1**	**440.6**

Information on fee was not available for the Mobile Downtown Airport. However, as noted in the Exhibit, Airfield revenues were only $1.29 million in Fiscal 2016. This works out to only $22.12 per aircraft operation. On the other hand, airfield revenues were $613.16 per air carrier movement. This latter metric may be relevant if one assumes, as notes to the financial statements suggest, that landing fees are charged only to airline (i.e., cargo) operators.

The Mobile Aeroplex (including the Mobile Downtown Airport) and the Mobile Regional Airport are both operated by the Mobile Airport Authority ("MAA"). The Mobile Regional Airport is the largest of the three entities operated by MAA, accounting for about 60% of operating revenues. The Mobile Regional Airport handles 600,000 travelers annually, with 20 daily flights to major hubs. Revenues for the Mobile Airport Authority in 2016 were $2.6 million. The Mobile Regional Airport accounts for the majority of revenues for the Mobile Airport Authority.

[29] Mobile Airport Authority, Financial Statements and Supplementary Information for the Year Ended September 30, 2016, with Comparative Totals for the Year Ended September 30, 2015. P. 19

C.2.3 Slemon Park

Slemon Park is a general aviation airport located at the former Canadian Forces Base (CFB) Summerside, in Summerside P.E.I. It is located approximately 60 km from downtown Charlottetown, and is one of two airports serving the City, the other being the Charlottetown Airport (which is primarily a passenger airport). Slemon Park has one main runway of 8,000 feet. It is profiled here as an example of a smaller industrial airport that has developed in a Canadian context.

The CFB airfield was originally constructed by the Royal Canadian Air Force between 1940 and 1941 to serve military purposes. Assets at CFB Summerside were transferred to Slemon Park Corporation in 1992 after the closure of the base in 1989. Assets transferred in 1992 included residential housing as well as the airport assets. Finance P.E.I, an economic development arm of the provincial government, held a minority stake in the corporation. In 2016, Finance P.E.I. bought out the shares of the remaining equity owners for $2.39 million.[30] The purchase was touted as removing financial constraints on the corporation, presumably related to the need to fund additional investment in asset rehabilitation and upgrades (for example, the need to repave a runway that was last repaved in the 1970s). At the time of the sale, the provincial Economic Development Minister noted:

> "As sole owner, the province will explore ways to ensure the corporation realizes its full potential through improvements to the airport runway and other facilities. This acquisition will allow the province to make capital improvements to Slemon Park that will help us increase exports, expand our economy, and create jobs for Islanders in this fast-growing industry."

Currently, Slemon Park comprises 30 commercial buildings (including 6 aircraft hangers), 253 residential housing units, and 1,400 acres of land. There are 20 commercial organizations located at Slemon Park, occupying approximately 85% of all available space. It generates 30% of P.E.I's manufacturing wages, and employed approximately 1,100 people in 2017 (including aeronautical and non-aeronautical business)[31]. According to the Slemon Park website, current aerospace tenants include:

- FD Air Tours
- Global Flight Academy
- Honeywell
- StandardAero
- Tronosjet Maintenance Inc.

The website further notes that 830,000 square feet of space is available for commercial rent, of which 60% is "prime commercial" space.

Slemon Park Corporation does not publish details on its operations or financial statements on its website and financial reports for Finance P.E.I. do not segment results by business unit. Hence, revenues and expenses for the Slemon Park Corporation, and more specifically for the airport, are not available.

[30] Colin MacLean, "P.E.I. government buys out Slemon Park shareholders", Journal Pioneer, April 1, 2016.
[31] https://slemonpark.com/about/

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C.2.4 Peterborough Airport

The Peterborough Airport focuses on supporting general aviation and industrial operations. It is part of the southern Ontario airport system in which a new Pickering Airport would operate. The airport has one main 7,000 foot runway. Peterborough Airport was chosen for analysis because of its general aviation operations and location making part of the southern Ontario airport system.

In 1957, the City of Peterborough joined the Peterborough Airport Company to develop an airfield southwest of the City. Following the construction of two turf runways in the early 1960s, the first commercial service located at the airport in 1965. In the late 1960s a 5,000 ft. runway was built. The official opening of the Peterborough Municipal Airport was held in 1969. In 1995 the runway/taxiway rehabilitation was completed. Since 2010, over $35 million has been invested in the airport. An initial investment of $28.6 million with funding support from the Federal and Provincial governments, included:

- Lengthening the runway from 5,000 to 7,000 ft.
- Completion of a new central apron
- An air terminal building
- Maintenance facilities
- Fully serviced airside and groundside commercial/industrial development lots
- An expanded general aviation area
- Extended Bravo taxiway with holding bay

In 2013, a second phase of expansion, funded by a $6 million investment from the City of Peterborough, included a 2,000 ft. cross-wind runway and supporting taxiway, and Bravo taxiway extension of 1,000 ft. Upgrades were designed to support large narrow body aircraft such as the Boeing 737 and Airbus 320 series. As a result, employment at the airport has increased from 150 in 2002 to over 570 in 2017, through the business expansion and addition of Seneca College School of Aviation[32]. The City of Peterborough also recently approved (in 2018) a Strategic Development Plan that foresees an additional investment of approximately $48 million over the next 20 years[33]. This is being undertaken to achieve an economic return on the Airport expansion investment, as the airport is hoping to attract a major industrial tenant[34].

A profile of the airport on the City website notes that general aircraft movements play a very important role at the airport, with many recreational users. [redacted] Commercial usage includes corporate jets, medical flights, flight school activity and cargo shipments. General Motors is cited as a cargo customer, and takes advantage of the absence of noise By-Laws or operating hour curfews.

Given the recent growth and investment at the airport, financials are best reflected in the 2018 forecast budget (as opposed to the 2017 actuals), which were used as the basis for the following financial analysis. [redacted] A

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[32] City of Peterborough. 2018-2027 Capital Budget Details. January 2018
[33] https://www.thepeterboroughexaminer.com/news-story/8175273-peterborough-airport-has-a-20-year-48m-expansion-plan/
[34] City of Peterborough. 2018 Operating Budget Details, User Fees and Charges and Work Programs (Budget Book 2 of 3). January 2018, p. 250

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fee of $7 to $10 is charged per enplaned charter passenger. Given forecast revenues of $5,000 annually, this implies enplaned passenger volumes of from about 500 to 700 passengers annually.

Exhibit C-4: Peterborough – User Fees and Charges - 2018

Peterborough - User Fees and Charges - 2018	
	($000s)
Landing Fees	[redacted]
Tie Down Fees	
Daily Parking	
After Hours Call Out	
Meeting Room Rental	
Passenger Fee ($7 to $10 per passenger)	
Airprot Fuel Surcharge ($0.04 per litre)	
Development Review Fees	
Total Budgeted	

Landing fees are shown in Exhibit C-5. Small private aircraft (under 3,000 kg) and military aircraft are exempt from fees.

Exhibit C-5 – Peterborough – Landing Fees

Peterborough - Landing Fees		
Weight Category (kg)		
2,000 - 4,999	($)	20.00
5,000 - 9,999	($/Tonne)	6.00
10,000 - 19,999	"	6.50
20,000 - 44,999	"	7.00
Over 45,000	($/Tonne)	7.50
Military		Exempt
Private Aircraft under 3,000 kg		Exempt

Exhibit C-6 below summarize the airport's operating budget for 2018. [redacted]

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Exhibit C-6: Peterborough – Operating Budget 2018

Peterborough - Operating Budget 2018	
	($000s)
Expenditures	
Personnel	
Contracts	
Materials	
Repairs / Maintenace	
Fees	
Interdepartment Charge	
Travel	
Total Operating Expenditures	
Contributions to Reserves	
Total Expenditures	
Less: Revenues	
Net Funding Required	

C.2.5 Downsview Airport

Downsview Airport is a privately owned industrial airport located in the Downsview Neighbourhood of Toronto, and is north of Highway 401 and east of Highway 400. The Downsview Neighbourhood comprises both the Downsview Lands, the airport lands, and Downsview Park, a 291 ha parcel of open and recreational space. The Downsview Airport itself includes a 7003 ft. runway[36] and covers 152 ha. Although it is not one of the airports that was studied as part of the southern Ontario airport system, it does fall within the same study area. It was chosen for analysis because of its industrial function, key tenant (Bombardier) and location within the southern Ontario airports system.

Downsview Airfield was originally built as a private airport by de Havilland Canada for the purposes of testing aircraft. It was opened in 1929 as a general aviation airfield. In 1937 the Department of National Defence (DND) expropriated parts of the property, creating the Royal Canadian Air Force Station Downsview to provide an air base for Royal Canadian Air Force units. In 1952, DND acquired Downsview land and buildings owned by de Havilland. It was renamed Canadian Forces Base Toronto (Downsview) in 1968. The Government of Canada announced its closure in 1995, at which time the site was transitioned into two main parcels: the Downsview Lands and Downsview Park.

[35] This calculation is based on MTOWs of 28,000 kg and 65,600 kg respectively for the two aircraft.
[36] Arup. City of Toronto: Keele Finch Plus Downsview Airport Operational Needs Assessment. November 2, 2016

Since that time, the Downsview Airport has been owned by Bombardier, and has been used for airplane manufacturing, building and testing Q400 turboprops, and building the Global 5000, 6000, and 7000 business jets[37].

Most recently, in January 2018, Bombardier announced that it would sell the 152 ha site and move to another location, as part of its five-year financial turnaround plan. The divestiture was part of a move to sell non-core assets[38], and the company had publicly cited that they were only using one tenth of the land[39]. The 635 million USD sale closed on June 7, 2018, between Bombardier and PSP Investments. As part of the agreement, Bombardier agreed to continue operating at Downsview for 3 another years after close, with two one-year optional extension periods[40]. Bombardier currently employs 3500 workers[41].

In parallel, Bombardier entered into a letter for agreement with the GTAA for a long-term lease of approximately 38 acres of property at Toronto Pearson International Airport, where it is currently planning to open a new centre of excellence and final assembly plan for its Global business jets.

As the airport was privately owned by Bombardier until recently, details of its operations and financial status are not publicly available.

C.3 Passenger Airports

C.3.1 Canada

C.3.1.1 John C. Munro Hamilton International Airport (Hamilton International Airport)

John C. Munro Hamilton International Airport ("Hamilton International Airport") is situated in Mount Hope, Ontario, which is 11 kilometres Southwest of Downtown Hamilton and 65 kilometres from Downtown Toronto.[42] This makes it part of the southern Ontario airports system. The airport serves the population of Hamilton and the GTA as a reliever airport facility to Toronto Pearson International Airport.[43] As part of its strategic plans, the Airport's role is to serve as a secondary passenger gateway

[37] Tess Kalinowski. The Star. "Could Downsview – one of the city's last remaining blank canvases – be Toronto's next 'it' neighbourhood?". March 31, 2018. Retrieved from: https://www.thestar.com/business/2018/03/31/could-downsview-one-of-the-citys-last-remaining-blank-canvases-be-torontos-next-it-neighbourhood.html
[38] Bombardier. Press Release: Bombardier Reports Third Quarter 2018 Results, Announces Sale of Non-Core Assets and Strategic Actions to Streamlines the Company and Drive Productivity
[39] Tess Kalinowski. The Star. "Could Downsview – one of the city's last remaining blank canvases – be Toronto's next 'it' neighbourhood?". March 31, 2018. Retrieved from: https://www.thestar.com/business/2018/03/31/could-downsview-one-of-the-citys-last-remaining-blank-canvases-be-torontos-next-it-neighbourhood.html
[40] PSP Investments. News Release: PSP Investments acquires Downsview Airport property in Toronto. May 3, 2018
[41] Tess Kalinowski. The Star. "Could Downsview – one of the city's last remaining blank canvases – be Toronto's next 'it' neighbourhood?". March 31, 2018. Retrieved from: https://www.thestar.com/business/2018/03/31/could-downsview-one-of-the-citys-last-remaining-blank-canvases-be-torontos-next-it-neighbourhood.html
[42] John C. Munro Hamilton International Airport Economic Impact Study, February 26, 2014.
[43] John C. Munro Hamilton International Airport Master Plan, May 2011

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to the Southern Ontario region and a primary inter-modal air freighter gateway in Canada.[44] The Airport also provides the capability to accommodate corporate and general aviation users. It currently has two runways; the first being 6000 ft. long and 150 ft. wide, and the second being 10,297 ft. long and 200 ft. wide. The airport was selected for analysis as it is located within the southern Ontario airport system (and may be representative of the same market forces that Pickering would be subject to), and because it is the closest example of an airport serving LCCs in Canada.

The John C. Munro Hamilton International Airport was built in 1940 as a wartime air force training station. In the early 1980s, the federal government invested $55 million to expand and develop Hamilton International Airport's existing facilities. Construction for this expansion was completed in 1986.

Passenger Operations

A broad range of airline operators including WestJet, Air Canada, Swoop, Air Transat, and Sunwing Airlines, offer year-round and/or seasonal passenger service from Hamilton International Airport to domestic and international destinations.[45] In 2017, Hamilton International Airport recorded [redacted] in passenger numbers flying to and from the airport, representing an [redacted] percent growth in passenger volume from 2016 levels [redacted][46]

Exhibit C-7: Passenger Traffic in the GTHA Airports

Airports in Greater Toronto and Hamilton Area (GTHA)	2017 Passenger Traffic (000s)	% of Total Passenger Traffic
Toronto Pearson International Airport	47,130	93.0%
Billy Bishop Toronto Airport	[redacted]	
Hamilton International Airport		
Waterloo International Airport		
Total Passenger Traffic		

Exhibit C-7 above highlights Hamilton International Airport's 2017 passenger traffic in comparison to other airports in the GTHA.

Cargo Operations

Currently, Hamilton International Airport is Canada's largest overnight express cargo airport[47], and is one of Canada's largest domestic cargo freighter distribution networks.[48] It has achieved this by maintaining its position as a strategic gateway for facilitating goods movement from coast to coast and across the globe.[49] Hamilton International Airport boasts of major cargo airlines as partners

[44] Ibid.
[45] John C. Munro Hamilton International Airport 2017 Year in Review Report
[46] Ibid.
[47] Ibid.
[48] John C. Munro Hamilton International Airport Facts and Figures. Retrieved from http://flyhamilton.ca/passenger/news-media/facts-figures
[49] John C. Munro Hamilton International Airport 2017 Year in Review Report

including Cargojet, Purolator, Canada Post, DHL and UPS.[50] Together, these cargo airlines make up a comprehensive freight network that connects Hamilton to multiple destinations and markets in Canada, Europe and South America. In 2017, Hamilton International Airport handled 499,211 kilograms in Cargo Aircraft Billable Weight.[51]

The airport earns revenues through standard fees such as landing fees, terminal fees, security fees, aircraft parking fees, airport improvement fees, exclusive use rental rates, common use counter space, vehicle licensing, ground transportation, vehicle parking, land development and construction and other miscellaneous fees.

Financial Performance

In 2017, Hamilton International Airport recorded the following financial highlights[52]:

- A total of $24 million in revenues generated, most of which were derived from passenger operations, cargo operations and commercial property rents.
- A total of $15.6 million in operating expenses incurred
- A total of $8.4 million of revenues generated in excess of expenses
- The airport is owned by the City of Hamilton and operated by the Vantage Airport Group. Because the airport is privately operated, detailed financial statements are not available.

C.3.1.2 *Region of Waterloo International Airport (Waterloo Airport)*

The Region of Waterloo International Airport (Waterloo Airport) is centrally located in southwest Ontario in the Woolwich Township, and is bordered by the cities of Cambridge, Guelph, Kitchener, and Waterloo.[53] The airport is located 10 minutes North of Highway 401, 85 kilometres from the City of Toronto, and 60 kilometres from the City of Hamilton. It is part of the southern Ontario airport system. The Waterloo Airport currently operates as a full service international airport with commercial, corporate, and general aviation activities. Because of infrastructure improvements undertaken at the facility overtime, the Waterloo Airport offers local passengers in the southwest Ontario an alternative to Toronto Pearson International Airport.[54] With a primary catchment area of 35 kilometres driving distance surrounding the airport, the Waterloo Airport offers services to a population of over 720,000.[55]

The Waterloo Airport was originally built in 1929, through investment from local businessmen. In 1948 the Waterloo-Wellington Airport Commission was formally established to oversee a new site selection and construction of a new airport. An agreement regarding funding the airport was developed, with the Federal Government funding approximately 73% of the project, and the municipalities funding the

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[50] John C. Munro Hamilton International Airport Facts and Figures. Retrieved from http://flyhamilton.ca/passenger/news-media/facts-figures
[51] John C. Munro Hamilton International Airport 2017 Year in Review Report
[52] Ibid.
[53] Region of Waterloo International Airport (YKF) Business Plan 2017-2022, March 2017
[54] Ibid.
[55] Ibid.

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other 27%. The newly-constructed airport opened in 1950, and ownership was transferred in 1996, to the Regional Municipality of Waterloo.

With a land area of approximately 1000 acres, the Waterloo Airport currently serves over 250 private and charter aircrafts, 25 businesses, and over 300 employees.[56]

Passenger Operations

Waterloo Airport is currently home to daily non-stop passenger service to Calgary, Alberta offered by WestJet Airlines as well as seasonal service to Punta Cana, Dominican Republic offered by Sunwing Airlines.[57] In 2016, the Waterloo Airport handled approximately [redacted] passengers in total enplaning and deplaning the facility, marking a sharp drop from the annual passengers processed in 2015 [redacted] passengers as a result of the loss of American Airlines scheduled passenger service to Chicago, Illinois and private charter passenger aviation service from Nolinor Aviation.[58] In the fall of 2017, WestJet Airlines also discontinued its seasonal service to Orlando, Florida from the Waterloo Airport siting low passenger utilization.[59]

Exhibit C-8: Passenger Traffic in the GTHA Airports[60]

Airports in Greater Toronto and Hamilton Area (GTHA)	2017 Passenger Traffic (000s)	% of Total Passenger Traffic
Toronto Pearson International Airport	47,130	93.0%
Billy Bishop Toronto Airport	[redacted]	
Hamilton International Airport	599	1.2%
Waterloo International Airport	[redacted]	
Total Passenger Traffic	50,657	100%

Exhibit C-8 above highlights Waterloo Airport's 2017 passenger traffic in comparison to other airports in the GTHA.

Financial Performance

In 2016, Waterloo Airport reported [redacted] in revenues with the [redacted] A detailed breakdown of the revenues are presented below in Exhibit C-9 below. An assessment of the Airport's expenditures is excluded as part of this study as the Region of Waterloo financial statements omits information on operating expenses.

[56] Region of Waterloo International Airport Master Plan, March 2017
[57] Region of Waterloo International Airport (YKF) Business Plan 2017-2022, March 2017
[58] Ibid.
[59] Canadian Broadcasting Corporation (CBC). YKF down to 1 daily, 1 weekly flight after Westjet cancels Florida route. September 7, 2017. Retrieved from [illegible]
[60] Derived from multiple sources

Exhibit C-9: Revenue breakdown for Waterloo Airport[61]

Revenues	2016 Actual ($000s)	% of Total	$ Per Passenger (Enplaned/Deplaned)
Aeronautical Revenues:			
Passenger Facility Fees	958	31%	7.50
Aircraft Fees	685	22%	5.36
Airport Maintenance, Tug, and Handling Licensing Fees	23	1%	0.18
Non Aeronautical Revenues:			
Airport Vehicle Parking	55	1.8%	0.43
Car Rental Concession Fees	65	2.1%	0.51
Airport Revenue (includes Concession, Advertising, Service)	66	2.1%	0.51
Other Revenues:			
Rental Fees	487	15.6%	3.81
Property Tax Recoveries	493	15.8%	3.85
Hydro Recoveries	209	6.7%	1.63
Other Fees and Revenues	75	2.4%	0.59
Total Revenues	**3,116**	**100%**	**24.38**

C.3.1.3 Abbotsford International Airport

Abbotsford International Airport (Abbotsford Airport) is located approximately 61 km southeast of downtown Vancouver near the growing communities of Abbotsford, Langley, Mission, and White Rock. Abbotsford Airport was initially constructed during the Second World War for military purposes. It was owned and operated by Transport Canada as a civilian airport starting in 1958. However, ownership of the airport was transferred to the City of Abbotsford as part of the National Airports Policy of 1994 and has since been operated by the Abbotsford Airport Authority. The Airport operates utilizing two runways; a primary 9,600 ft. length east-west runway and a secondary 5,300 ft. length crosswind runway. Both runways are supported by an extensive system of taxiways and apron infrastructure. Overall, the airport occupies a land assembly of approximately 520 hectares.

Passenger Operations

Abbotsford Airport continues to grow as a low cost alternative to Vancouver International Airport for travelers located in east Vancouver and the Fraser Valley. Multiple airline companies, primarily Canadian LCCs and charter airlines, operate out of Abbotsford Airport offering direct and/or connecting, scheduled and/or seasonal, flights to multiple destinations (domestic and international). The airlines include Air Canada, WestJet Airlines, Flair Airlines, Swoop Airlines, and Island Express Air. Swoop Airlines, for example, offers scheduled direct and/or connecting flights from Abbotsford Airport to multiple destinations in Canada (including Edmonton, Winnipeg, Hamilton, and Halifax) as well as multiple sun destinations in the United States, Mexico, and Jamaica.[62]

[61] Region of Waterloo International Airport (YKF) Business Plan 2017-2022, March 2017
[62] Swoop Airlines – Where We Fly. 2018. Retrieved from https://www.flyswoop.com/where-we-fly/

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Abbotsford Airport has recorded strong growth in passenger volume since 1997.[63] Abbotsford International Airport processed 677,653 passengers in 2017, marking the highest passenger volume recorded to date.[64] It also recorded 135,000 aircraft movements in 2017.[65]

Exhibit C-10: Passenger Traffic in Lower Mainland Vancouver and Fraser Valley

Airports in Lower Mainland - Vancouver, BC and Fraser Valley	2017 Passenger Traffic (000s)	% of Total Passenger Traffic
Vancouver International Airport	16,347	96.0%
Abbotsford International Airport	**678**	**4.0%**
Total Passenger Traffic	17,025	100.0%

Exhibit C-10 above compares Abbotsford Airport's passenger traffic in relation to other airports located in the Lower Mainland-Fraser Valley area in British Columbia.

Abbotsford Airport accounts for only a small share (four percent) of the annual total air passenger volume in the Lower Mainland- Fraser Valley area in British Columbia.

Abbotsford Airport offers airlines considerable savings relative to Vancouver International Airport in terms of aeronautical fees. [redacted]

Financial Performance

[redacted] A detailed breakdown of the revenues and expenses is presented in Exhibit C-11 below.

[63] Abbotsford International Airport Master Plan. August 2006
[64] City of Abbotsford 2017 Annual Report
[65] Ibid.
[66] KPMG assumed the turnaround of an aircraft with 79,000 kg MTOW, 189 seats, and a load factor of 75% on a transborder flight. Aircraft details are equivalent to a 737-800 series aircraft.
[67] Ibid.

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Transport Canada
Pickering Lands Aviation Sector Analysis
March 31, 2019

Exhibit C-11: Revenues and Expenses for Abbotsford Airport

Revenues	2017 Actual ($000s)	% of Total	$ Per Passenger (Enplaned/Deplaned)
Fees and Charges:	[redacted]	[redacted]	[redacted]
Aeronautical Fees (including Landing Fees and General Terminal Fees)	[redacted]	[redacted]	[redacted]
Public Parking Fees	[redacted]	[redacted]	[redacted]
Concessions	[redacted]	[redacted]	[redacted]
Other Fees and Charges	[redacted]	[redacted]	[redacted]
Rent	[redacted]	[redacted]	[redacted]
Investment Income	[redacted]	[redacted]	[redacted]
Total Revenues	[redacted]	[redacted]	[redacted]
Expenses	**2017 Actual ($000s)**	**% of Total**	**Per Passenger (Enplaned/Deplaned)**
Administration	[redacted]	[redacted]	[redacted]
Marketing	[redacted]	[redacted]	[redacted]
Terminal Building	[redacted]	[redacted]	[redacted]
Airside	[redacted]	[redacted]	[redacted]
Mobile Equipment	[redacted]	[redacted]	[redacted]
Parking	[redacted]	[redacted]	[redacted]
Total Expenses	[redacted]	[redacted]	[redacted]
Annual Surplus (before Amortization)	[redacted]	[redacted]	[redacted]
Amortization	[redacted]	[redacted]	[redacted]
Loss/(gain) on disposal of tangible capital assets	[redacted]	[redacted]	[redacted]
Annual Surplus	[redacted]	[redacted]	[redacted]

C.3.2 United States

For this study, KPMG conducted a high-level review of a number of twin airport systems in the United States as part of our comparator research. The review was conducted to acquire some understanding of the relationships and interdependencies between airport pairs over time, and to glean potential useful data points (e.g., passenger traffic split, distance and geographic location, long term shifts in status and usage) and/or assumptions to support the financial analyses conducted as part of this study. The results of the high-level review are summarized in Exhibit C-12 below.

Exhibit C-12: Comparator Airports in the United States

Airports	2017 Passenger Traffic (000s)	% of Total	Observations
Dallas/Fort Worth, Texas			
Dallas Fort Worth International Airport Dallas Love Field Airport Total	67,092 15,724 82,816	81.0% 19.0% 100%	• Dallas Love Field is a former primary airport that is located closer to the Dallas downtown core than DFW (10 km versus 28 km). • Love Field is served by Alaska Air, Delta and Southwest.
Houston, Texas			
George Bush Intercontinental Airport William P. Hobby Airport Total	41,415 13,284 54,699	75.7% 24.3% 100%	• William P. Hobby Airport (HOU) is a former primary airport that is located closer to the downtown core than George Bush (IAH). • HOU serves four carriers: AA, Delta, JetBlue and Southwest, for domestic and near-by Caribbean destinations. • IAH and HOU are managed jointly.
Phoenix, Arizona			
Phoenix Sky Harbor Airport Phoenix Mesa Gateway Airport Total	43,922 1,347 45,268	97.0% 3.0% 100%	• Mesa Gateway is a reliever international airport to Sky Harbor serving the Phoenix Metropolitan area. • Mesa is located approximately 32 km southeast of Phoenix, and is thus more distant than Sky Harbor (which is 5 km from Downtown Phoenix). • Additional discussion is found in the profile of Mesa Gateway
Tampa, Florida			**Tampa International Airport (TPA)**[68]
Tampa International Airport St. Pete–Clearwater International Airport Total	19,624 2,055 21,680	90.5% 9.5% 100%	• TPA is the largest commercial airport facility serving the Tampa Bay Area, located 9 km west of Downtown Tampa. **St. Pete–Clearwater International Airport (PIE)**[69] • PIE is former military airport located in Clearwater that also serves the Tampa Bay area, primarily for one LCC (Allegiant). • PEI is also a major Coast Guard facility and has an industrial park. • PIE is more distant, located 17 km SW of Tampa, and 11 km SE of Clearwater.

Airports	2017 Passenger Traffic (000s)	% of Total	Observations
Orlando, Florida			**Orlando International Airport (MCO)**[70] • MCO is the business passenger airport in Florida.
Orlando International Airport	44,611	93.9%	**Orlando Sanford International Airport (SFB)**[71] • Operates as the secondary commercial airport for the Greater Orlando Metropolitan area. • SFB is more distant, located approx.29 km NE of Orlando (versus 10 km for MCO) • SFB serves a very limited number of LCCs: Allegiant, TUI, Via-Air.
Orlando Sanford International Airport	2,922	6.1%	
Total	47,534	100%	

Reliever airports profiled in Exhibit C-12 that are similar in capacity to the passenger airport option being considered for the Pickering Airport are further assessed in the subsection(s) below.

C.3.2.1 Phoenix-Mesa Gateway Airport

Phoenix-Mesa Gateway Airport is located 41 km from Phoenix city centre, in Arizona. It is a general aviation reliever airport, being the secondary airport for the City. It has secondary service offerings, including air cargo, general aviation, corporate and Air-National-Guard military operations. The primary airport in Phoenix is the Phoenix Sky Harbour Airport, which is the primary hub for the Phoenix Metropolitan area. Phoenix-Mesa has three runways: two which are 10,401 ft. in length and 150 ft. in width, and one that is 9,301 ft. long and 150 ft. wide[72]. This airport was chosen to illustrate a secondary passenger airport.

Phoenix-Mesa was operated exclusively for military purposes until 1991, when its divestiture was announced as part of the reorganization of military facilities in the US. It opened to civilian operations in 1994, and is operated by the Williams Gateway Airport Authority (WGAA). WGAA inherited substantial airside infrastructure for an airport of its anticipated type and role, which assisted with the

[68] Tampa International Airport (TIA) Online Newsroom. Retrieved from [illegible]airport.com/media
[69] About Pete-Clearwater International Airport (PIE) (2018). Retrieved from [illegible]fly2pie.com/about-pie-[illegible]
[70] Orlando International Airport Fact Sheet (2017). Retrieved from [illegible]andoairports.net/site[illegible]oads/factsheet.pdf
[71] Orlando Sanford International Airport – History and General Information (2016). Retrieved from [illegible]net/history.asp
[72] Coffman Associates Airport Consultants, Phoenix-Mesa Gateway Airport. Airport Master Plan Executive Summary

initial development of the Airport. It was initially operated as a reliever general aviation airport, but has been providing regularly scheduled commercial passenger airport service since October 2007[73].

The airport is viewed as a significant economic generator, having created over 1,250 jobs and generating over $200 million in revenue each year. Estimates indicate that it generates $ 1.3 billion in regional economic activity. Currently, it accommodates business activity including: aircraft Maintenance Repair and Overhaul (MRO) operations, flight training organizations, fixed base operators, manufacturing, government agencies, and numerous non-aviation related companies, and has plans to diversify aeronautical and non-aeronautical revenue streams.

The airport offers passenger service to over 40 destinations within the U.S. and Canada, facilitated primarily by Allegiant Air's Ultra Low Cost Carrier ("ULLC") services to domestic destinations and by WestJet (for Calgary and Edmonton), as well as marginal other activity from other airlines. In 2017, it accommodated approximately 1.3 million passengers and approximately 273,000 aircraft movements[74].

Phoenix Sky Harbour Airport, the primary airport serving Phoenix, is owned by the City of Phoenix and operated by Phoenix Airport System. With three runways, it served 43.9 million passengers in 2017, and facilitated 444,643 aircraft operations. It currently services 90 U.S. domestic destinations and over 20 international destinations.

Phoenix-Mesa airport earns revenues by charging fees for items in line with those charged at other airports, including: aircraft landing fees, terminal use feels, aircraft parking fees, car rental customer facility charge, aviation fuel flowage fees, fire suppression fees, parking fees, passenger facility charge, airport licenses & permits, and common use equipment. These fees vary according to whether or not the commercial carriers are signatories. In addition, the airport rents terminal office space and paved equipment staging and storage area space on a per square foot basis. Other rates are charged on a per flight basis to commercial carriers for items such as ticket counters, lobby area, secure hold room and boarding area podium, baggage claim area, and common use computer equipment. Finally, rates are charged for aircraft tie-down and ramp use.

In fiscal year 2015, Phoenix-Mesa Airport generated 18.6 million USD in revenues, and incurred 27.8 million USD in expenses, resulting in an operating loss (before other non-operating revenues) of approximately 9.2 million USD. A detailed breakdown is presented in Exhibit C-13, below.

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[73] Coffman Associates Airport Consultants, Phoenix-Mesa Gateway Airport. Airport Master Plan Executive Summary
[74] Phoenix-Mesa Gateway Airport. Fiscal Year 2017 Traffic Counts.

Exhibit C-13: Revenues and Expenses for Phoenix Mesa Airport

Revenues	2015 Actual ($000s)	% of Total	$ Per Passenger (Enplaned/Deplaned)
Fueling operations	7,585	41%	5.81
Lease income	4,454	24%	3.41
Maintenance services	420	2%	0.32
Airport usage fees	6,166	33%	4.72
Total Revenues	**18,625**	**100%**	14.26

Expenses	2017 Actual ($000s)	% of Total	Per Passenger (Enplaned/Deplaned)
Personnel costs	5,980	21%	4.58
Professional services	4,368	16%	3.34
Cost of goods sold - fueling operations	2,854	10%	2.19
Costs of maintenance services sold	33	0%	0.03
Repair and maintenance	767	3%	0.59
Utilities	788	3%	0.60
Insurance	295	1%	0.23
Other expense	1,099	4%	0.84
Depreciation	11,662	42%	8.93
Total Expenses	**27,846**	**100%**	**17.77**
Operating Loss	**-9,221**	**N/A**	**3.51**

Phoenix-Mesa Airport is now governed by the Phoenix-Mesa Gateway Airport Authority, which is a Joint Power Airport Authority, comprised of the Cities of Mesa and Phoenix, the Towns of Queen Creek and Gilbert, the Gila River Indian Community and the City of Apache Junction. It was formed to develop, reuse, operate and maintain the airport property and facilities at the former Williams Air Force Base, which closed in 1993.

D Potential Costs

This section will include the detailed development of the potential airport costs.

D.1 Capital Costs for Airport Development

D.1.1 Key Assumptions

In the preparation of the Rough Order of Magnitude cost estimates for a future airport on the Pickering Lands, the following assumptions were made:

1. Common Construction Techniques
   - It is assumed that the airport will be constructed with common construction techniques and materials. Techniques and materials currently under development have not been considered in the cost estimates.
2. Adherence to TP312 5th Edition standards
   - The cost estimates reflect designs that adhere to Transport Canada TP312 Aerodromes Standards and Recommended Practices, 5th Edition.
3. Designed to Current Airport Zoning Regulations
   - The designs satisfy the Proposed Airport Zoning Regulations (2015) for the Pickering Airport Site. Runway orientations, lengths, threshold coordinates, and threshold elevations were sourced from the Canada Gazette, Vol. 149, No.29 – July 18, 2015.
4. Detailed Grading
   - High level analysis of the proposed airfield site did not reveal any significant topographical features that would be expected to have major impacts on the cost of constructing the airport. The land is currently used for agricultural purposes and comprised of relatively minor changes to site elevation, and is mostly clear of trees. The estimates assume topsoil stripping and an average excavation of 1 metre per unit area of pavement for the runway, taxiways, and apron areas.
5. 2018 Dollars
   - All cost estimates are provided in 2018 Canadian Dollars, using actual construction costs from comparable airport projects completed between 2015 and 2018. Cost estimates for future concepts are all in constant 2018 dollars. Actual costs will be dependent on the timing of construction.
6. Environmental and Archeological Assessment
   - The identification of protected flora or fauna on the airport site may require specific mitigations, which may result in the addition or modification of the proposed airport infrastructure. Additionally, the presence of contaminated soils can result in significant impacts to cost and project timeline should they be encountered.
   - The presence of archeological heritage, such as human remains or First Nations settlements, could also result in additional costs above those allocated for construction, however these

may be uncovered during construction. Costs associated with the discovery of archeological heritage have not been considered in these estimates.

7. Geotechnical Investigation
   - Geotechnical conditions have not been assessed as part of this scope of work. Pavement design is dependent on the bearing strength of the soils upon which the surface is built. If the soil has a low bearing strength, the pavement structure design must take this into account. The pavement structure assumed that soils on the Pickering Lands are typical of those found elsewhere in the region.
   - Other technical assumptions that guided the development of the ROM capital cost estimates included the following:
     - The cost estimates do not include the costs of a grading plan (which would typically not be included in a ROM estimate), but does include the cost of topsoil stripping and 1 m of excavation for removals.
     - The design and materials of the runway would be equivalent to a pavement load rating of (PLR) 12
     - Where applicable, edge lighting fixtures would be included every 60 m on either side of the runway
     - Where applicable, 1 storm drain would be included at 50 m intervals, and would be sized at 250 mm PVC storm sewer.

D.1.2 References

The capital cost estimates were developed based on the airport concepts presented in the Type and Role Report. Costs are presented in 2018 dollars, and were based on unit cost estimates used for other recent airport planning exercises, including from:

- The Lethbridge County Airport (CYQL), Ontario - Master Plan Costing
- McDonald-Cartier Ottawa International Airport (CYOW), Ontario - Master Plan
- Fond-du-Lac Airport (CZFD), Saskatchewan - Runway Rehabilitation and Extension Project
- Brandon Municipal Airport (CYBR), Ontario - Electrical Rehab
- Yellowknife Airport (CYZF), Northwest Territories - De-icing Pad Design
- Kingston Airport (CYGK), Ontario - Runway Extension
- Arkansas Highways Cost per Mile
- Calgary International Airport (CYYC)
- Alberni Valley Regional Airport (2015)

Other sources of information regarding unit costs include:

- City of Ottawa Specification Code List
- Saskatoon Shuttle Parking Lot Development Project

s.24(1)

- Hanscomb Yardsticks for Costing – Cost Data for the Canadian Construction Industry.

D.1.3 Capital Cost Estimates

Exhibit E-1 details the rough order of magnitude capital cost estimates for each of the six facility scenarios.

Exhibit E-1: Capital Expenditure Estimates for each of the Six Scenarios

Capital Expenditures in CAD 2018	Small Development Concept			Significant Development Concept		
$'000	**Industrial**	**Specialty Passenger**	**Industrial + Specialty Passenger**	**Industrial**	**Specialty Passenger**	**Industrial + Specialty Passenger**
Airside	[redacted]					
Groundside						
Buildings & Miscellaneous						
Contingency						
Engineering Design and Contract Admin						
Total ROM						

[redacted]

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E Potential Revenues from Pre-construction Land Use Scenarios

As part of this study, Transport Canada requested that pre-construction land-use scenarios be explored for their potential to generate revenues *before* construction of a new airport begins, with an emphasis on the lands currently leased for agricultural uses. This appendix provides a discussion and high-level analysis on this potential.

It should be noted that the potential revenues from pre-construction land use were not included for consideration in the financial modelling or economic impact analysis.

E.1 Current State

The Pickering Lands include approximately 3520.8 ha of land, owned by Transport Canada and located within the Region of Durham. They are bordered by other undeveloped lands, including:

- The greenbelt and Rouge National Urban Park to the west and north.
- Brock Road Prime Agricultural area to the east.
- The Pickering Innovation Corridor, a 324 hectare corridor south of Highway 7 and of the Pickering Lands, and on either side Highway 407.

The Pickering Innovation Corridor lands are designated Employment Areas, zoned for prestige industrial and office, limited warehousing, and accessory uses. They are part of a larger development plan for the Seaton Lands, which is a proposed 3,100 acre residential and commercial development.

Currently, Transport Canada leases the Pickering Lands. Leases are for a range of uses, including for agricultural purposes, for a golf club and conference centre, and for single family residences. A total of approximately 2406 hectares of workable area are available for agricultural leases.

E.2 Approach and Assumptions

The analysis to determine the potential for fees generated from pre-construction land uses is focussed on identifying the upper bound of potential revenue generation. While commentary on the potential competitiveness of the lands is provided, and therefore implications for occupancy/vacancy, there has been no attempt to quantify actual uptake levels. Further, the analysis is based on the following assumptions:

- A new airport would be built on the Pickering Lands. Depending on the type of airport built, construction would commence sometime between 2026 and 2029 (consistent with the timeline assumptions regarding the airport development scenarios presented in this report).
- Provincial and municipal policy regarding land development would not be significantly changed from current policy (e.g., Growth Plan for the Greater Golden Horseshoe, Durham Regional Official Plan, etc.).
- Land uses or development on the Pickering Lands would need to be compatible with applicable provincial and municipal policy.
- Market dynamics would primarily remain the same as today.

- Revenue potential is limited to what might be achieved before construction of a new airport begins.

E.3 Limitations of the Analysis

This analysis is exploratory in nature and does not represent a prediction of what revenues may be obtained by Transport Canada. Its purpose is to inform future decisions regarding the interim uses for the Pickering Lands, should a plan to build a new airport be approved.

E.4 Current Guiding Policy

There are several key documents that guide current development policy for the Pickering Lands and surrounding areas. These include the Growth Plan for the Greater Golden Horseshoe, the Durham Regional Official Plan, and the Central Pickering Development Plan[75].

The Growth Plan for the Greater Golden Horseshoe (2017)[76] indicates that the Pickering Lands fall on lands designated as Greater Golden Horseshoe Growth Plan Area. The Pickering lands lie just south of lands designated as Greenbelt Area, and just north of Designated Greenfield Area – Conceptual (which lie just to the south of Highway 407 (e.g., the Seaton lands). The lands are not on or in close vicinity to a designated urban growth centre - and so pressure for growth, and therefore speed of development, may be slower than in areas that *are* designated urban growth centres.

The Growth Plan for the Greater Golden Horseshoe (2017) also projects that by 2036, the Region of Durham is expected to grow to a population of 1,080,000, with 390,000 jobs. This represents an increase from 682,000 people[77] (2017) and 196,713 jobs (2016)[78]. For clarity, the increase in population and jobs will be spread across all of Durham Region, including Pickering.

In the Durham Regional Official Plan, the Pickering Lands are located on Oak Ridges Moraine Areas, and are surrounded to the north and east by more Oak Ridges Moraine Areas, and to the south and west by Prime Agricultural Areas. The closest urban area identified in the Official Plan is located within Specific Policy Area A. Specific Policy Area A covers the future Central Pickering development. The Official Plan identifies the desire to develop these lands according to the Central Pickering Development Plan, and with the intent to 'develop a sustainable urban community in Seaton, together with a thriving agricultural community'. Further, the Region of Durham Official Plan[79] indicates a desire to expedite development on the Federal Airport Lands in order to increase employment opportunities.

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[75] Central Pickering Development Plan. May 2006. Accessed on March 1, 2019 from https://www.pickering.ca/en/city-hall/resources/PickeringPlan.pdf
[76] Government of Ontario. May 2017. Growth Plan for the Greater Golden Horseshoe. Retrieved on March 1, 2019 at http://placestogrow.ca/images/pdfs/ggh2017/en/growth%20plan%20%282017%29.pdf
[77] Durham Region Health Department. September 2018. Population at a Glance. Accessed on March 25, 2019 from https://www.durham.ca/en/health-and-wellness/resources/Documents/HealthInformationServices/HealthStatisticsReports/Population-at-a-Glance.pdf
[78] Region of Durham. 2017. 2017 Business Count Region of Durham Highlights. Accessed on March 25, 2019 from https://www.durham.ca/en/doing-business/resources/Documents/EconomicDevelopment/2017-Business-Count-Highlights.pdf
[79] Region of Durham. Consolidation May 11, 2017. Durham Regional Official Plan. Retrieved on March 1, 2019 at https://www.durham.ca/en/doing-business/resources/Documents/PlanningandDevelopment/Official-Plan/2017-Durham-Regional-Official-Plan-Consolidation.pdf

The Central Pickering Development Plan identifies lands located just to the south of the Pickering Lands to be designated as Industrial Areas. The concepts put forward in this Plan have begun to be implemented, with the announcement in January 2016 that the Province of Ontario plans to sell the employment and residential lands in the Seaton Area[80]. Further, the employment lands located on either side of Highway 407, which form the Pickering Innovation Corridor, are in the process of being serviced[81].

E.5 Potential Pre-construction Land Use Scenarios

E.5.1 Constraints - Timeframe

Given the assumed timelines for airport development, there is a window of between seven and ten years for establishing and operating new pre-construction land uses. Plans for pre-construction land use will therefore need to consider the magnitude of the potential benefits that could be obtained from establishing a new use, in relation to the investment required to realize the vision and the necessarily limited term nature of operations. For example, it is highly unlikely that a developer would be willing to invest in erecting a permanent structure to create or enhance revenue from the lands, given the short time frame during which revenues could be earned from its operation. This becomes evident when considering the activities that would need to occur before the airport construction begins, which, for a typical building, include (but are not limited to): market studies, conceptual design, municipal approvals, engineering design, construction, and commissioning. Even assuming a relatively simple design and construction method, it is unlikely that the upfront planning would take less than two years, let alone the time required for construction. Further, permanent structures would likely need to be decommissioned before development of the airport begins. Between the time required for development and the time required for decommissioning, the window for generating revenues is reduced from the original seven to ten years, to a maximum of a five to seven year window. And this assumes that required municipal infrastructure (roads, water, wastewater) to support the facilities could be built in the same timeframe, which is highly unlikely.

The primary exception to this case, where there might be appetite to develop a permanent structure, is if there is sufficient certainty that the structure could keep operating during airport development and operations. This could potentially be achieved under two key circumstances:

1) A land use plan for the Pickering Lands is approved, clearly identifying designated areas for commercial and industrial development. This will help to identify lands that can be developed for the longer term without interfering with future airport construction and operation
2) There is a clear commitment to develop the airport. This will provide certainty of a nearby customer base for those businesses likely to have an interest in developing the land.

These circumstances would likely be achieved once an RFP process leads to a signed agreement between the Government of Canada and an airport developer, and when it is clear that the airport developer has begun investing in development of the airport. Without these two conditions in place, a developer would be better served by locating their development in the Pickering Innovation Corridor

[80] City of Pickering. January 7, 2016. Pickering Ready to Welcome 35,000 New Jobs to Seaton. Accessed on March 25, 2019 from https://www.pickering.ca/Modules/News/index.aspx?feedId=5DC74CC8-C7B5-43F1-904C-AB24FC21AE17&newsId=67ca1ab1-f524-416f-a5eb-0ba992af3d0e
[81] City of Pickering. (no date). Pickering Innovation Corridor. Accessed on March 1, 2019 from https://www.pickering.ca/en/business/resources/pickering-innovation-corridor.pdf

(where construction to service the lands is already underway) than near a potential airport on the Pickering Lands.

In effect, this scenario simply attempts to bring forward approvals and development of the groundside land leases in designated development areas. However, the earliest that such development is likely to occur would be when construction starts (which ranges from 2026 to 2030, depending on the scenario). Under the stated assumptions, this rules out land uses that require development of permanent structure(s), as they are unlikely to generate revenues *before* construction of a new airport begins. Despite this, it may be worth further considering the benefits of and the ability to accelerate development on designated development areas, should a plan for the development of a new airport proceed.

Based on this analysis, revenues generated pre-construction would be generated through temporary uses. These temporary uses would need to end operations before development of a new airport begins. The following analysis explores revenue potential from temporary land uses.

E.5.2 Temporary Uses

Uses that could be temporary and potentially generate revenue on the Pickering Lands include those identified in the table below. These uses were identified by consulting other municipal plans and policies in Ontario regarding land uses. The examples of potential uses listed are not comprehensive, but are intended to be indicative of what could be achieved. The table below outlines the general use type along with some specific examples, and also identifies how fees might be charged, as well as whether there is likely to be sufficient demand for the type of land use.

Exhibit F-1: Potential Temporary Uses for Pre-Construction

General Use	Fee Potential	Demand Potential
Agricultural (e.g., large scale agricultural, community garden, etc.)	Agricultural leases are currently generating revenue on the Lands	Existing demand demonstrated through existing leases
Park / Parkland (e.g., natural areas, walking trails, etc.)	Fees could be charged on a per-use basis	Public unlikely to pay if free alternatives exist
Surface Parking (e.g., surface gravel parking)	Lease for lands to operator	Unlikely for high demand, given the lands and adjacent areas are not currently developed (e.g., why would people need to park there?)
Stormwater Management (e.g., stormwater management pond)	Lease to municipality	Unlikely for demand at this time, given little development in the vicinity. Even if the Innovation Corridor and Seaton Lands are developed, the area that could be used for stormwater management may no

General Use	Fee Potential	Demand Potential
		longer be available (due to impending airport development).
Temporary Light Industrial (e.g., construction staging area)	Lease to municipality/ developer	Unlikely for demand at this time. Even though development is planned in the vicinity (Seaton and Innovation Corridor), there are plenty of other undeveloped alternatives that may be better suited (e.g., closer) for required staging areas.
Special Events (e.g., Fair, amusement park, parades, outdoor sporting/activities, concert area, concerts, promotional activities, etc.)	Lease for lands to operator	Potential for demand, however the lands would have to compete with other available lands in the GTA. Further, the Pickering lands are relatively far from currently developed urban areas, which could act as a barrier to attracting customers of these businesses to the site. Lands may also require site preparation in order to serve this purpose. Additional study would be required to quantify potential demand.
Recreational Areas (e.g., skating rink, walking trails, etc.)	Fee for use	Public unlikely to pay if free alternatives exist.
Disaster Recovery Area	Low/no potential	Demand potential unclear.
Seasonal Commercial Uses (e.g., Christmas tree sales, garden centre sales, fall events, sale of motor vehicles, etc.)	Lease for lands to operator	Potential for demand exists, however, the lands would have to compete with other available lands in the GTA. Further, the Pickering lands are relatively far from currently developed urban areas, which could act as a barrier to attracting customers of these businesses to the site. Additional study would be required to quantify potential demand.

For the most part, the uses identified above require minimal facility and municipal infrastructure to support their use. Site preparation is limited (for the most part) to some grading and landscaping, and to the use of temporary infrastructure to support the use (e.g., tents, skating rinks, port-a-potty, etc.). As an offsetting factor, the revenue potential of many of these uses is also quite limited.

Based on the analysis above, only three temporary uses could generate potential revenue: agricultural uses, special events, and seasonal commercial areas. Of these two, the agricultural uses are proven, and barriers that are not insignificant exist for the other two potential uses.

The ability to implement any of the three potential uses identified above will also depend on actual morphological and natural features of the site (which are not contemplated in the context of this study). The morphological and natural features of the site may place additional constraints on site uses, or may require higher levels of investment to prepare the site for use. For example, the geology of the site may (or may not) be able to support the burden associated with heavy equipment, and therefore may not be appropriate for use as a construction staging area or a fairground.

E.6 Magnitude of Potential Pre-construction Revenues

Transport Canada is already leasing approximately 98% of the total workable area for agricultural uses. As a result, increasing occupancy will not substantially contribute to increasing potential pre-construction revenues of the Pickering Lands. This leaves lease rates as the primary option for increasing potential pre-construction revenues.

Agricultural lease rates can vary considerably within a region, depending on factors such as location, and quality of agricultural land, and these factors would apply equally to the Pickering Lands. As a result, the analysis below relies on averages, as a means to benchmark what might be achieved on the Pickering Lands, but will not be conclusive without additional information regarding the qualitative aspects of the land to inform potential changes to the land lease rates.

According to the 2017 Farmland Value and Rental Value Survey[82], the average cash rent per tillable acre for average quality cropland in the Region of Durham in 2017 was $100/acre. At $120/acre of workable area, Transport Canada is already charging a premium for the agricultural leases on the Pickering Lands based on the calculated lease rates. However, the Survey also noted that there is a significant difference between the average and the median price to purchase an average quality tillable acre of cropland, which suggests that there is substantial variance in the cost per acre of agricultural land, which may in turn affect agricultural lease rates. From this perspective, if the Pickering Lands represent some of the highest quality lands in the area, there may be an opportunity to increase the lease rates.

Based on the Farmland Value and Rental Value Survey, the highest observed cash rent per tillable acre for average quality cropland was in the County of Perth at $300/acre. Perth is located in eastern Ontario, and is not a good comparator for what might be earned. Municipalities surrounding Durham reported the following average cash rents:

Municipality	Average 2017 cash rent / tillable acre for average quality cropland
Census Division of Kawartha Lakes	$ 100
County of Northumberland	$ 50
County of Peterborough	$ 50
County of Simcoe	$ 100
Regional Municipality of York	$ 100
Regional Municipality of Peel	$ 50
Regional Municipality of Halton	$ 50

These values are all lower than the rates currently charged by Transport Canada, and so it is unlikely that much higher rates could be achieved.

[82] University of Guelph (Ontario Agricultural College, Department of Food, Agricultural and Resource Economics). March 2018. 2017 Farmland Value and Rental Value Survey: Summary of Findings. Accessed on March 26, 2018 from https://ofa.on.ca/wp-content/uploads/2018/03/2017_FarmlandValue_RentalValue_Report.pdf