

# Ottawa Macdonald-Cartier International Airport Intermodal Transportation Concept Plan

Final Report  
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If steps are taken quickly, there is an exciting opportunity to structure much more efficient communities and to harmonize air and other modes into a great intermodal transport system for the future.” - Conway (1977,p.2)

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# Executive Summary

## Introduction

In September of 2013, the Ottawa Macdonald-Cartier International Airport Authority (OMCIAA) retained a team of Master's students from Queen's University, School of Urban and Regional Planning (SURP) to provide advice on an optimal site for the development of an intermodal transportation centre and complimentary land uses. Through this project, the OMCIAA wishes to enhance the ground transportation system, improve the passenger experience, and optimize non-aeronautical revenues.

The major objectives throughout the course of the project were to:

- 1) Analyze the policy and regulatory framework associated with planning around airports.
- 2) Conduct an analysis of the study area.
- 3) Consider major airport planning theories and conduct case studies of other airports.
- 4) Consult with the project's stakeholders.
- 5) Identify two development sites and prepare a design concept for each.

## Study Area

The study area provided by the OMCIAA consists of lands between the airport passenger terminal area to the west and an existing railway line to the east. Figure 1 shows the study area divided into parcels for referencing purposes. Development sites were identified within these areas based on a range of considerations including the current use of the land, Provincially Significant Wetlands and buffers, future airport expansion plans, and the planned realignment of the Airport Parkway.



Figure 1: Study Area Parcels

## Background Research and Analysis

A range of policies, regulations, and studies were analyzed in order to understand what kinds of development are appropriate and permitted in an airport context. The analysis included various documents internal to the OMCIAA like the Airport Master Plan and the Airport Urban Design Plan, as well as a range of policies, regulations, and studies by external organizations like the City of Ottawa, National Capital Commission, and the provincial and federal governments. Fifteen airports were examined as part of the case study analysis which informed the planning of the design concepts. A set of criteria were used to analyze the subject airports which resulted in some key observations and recommendations that were used to guide the project.

## Design Concepts

Two development sites for an intermodal transit centre were chosen based on the two different public transit infrastructure scenarios identified in the City of Ottawa's Transportation Master Plan [Draft] 2013. In the first scenario, a spur line for the O-Train will come from the main line and connect directly with the passenger terminal. In the second scenario, the O-Train will have a stop located along the existing rail corridor. These scenarios are shown in Figure 2. Both concepts provide for a range of different modes of transportation like city and regional bus, O-Train, regional and high speed rail, automobiles, and active transportation connections for cycling and walking. A range of passenger amenities and services have also been considered for the intermodal transportation centres like remote check-in and baggage handling, car rentals, and restaurants.



Figure 2: Spur line scenario (left) and non-spur line scenario (right)

## Concept A



Figure 3: Overview of Concept A

Design Concept A is developed around the spur line scenario in which the intermodal transportation centre and some complimentary development are located next to the passenger terminal in parcel 1. An overview of Concept A is shown in Figure 3.

Concept A includes a stop in parcel 2 which would provide access to the Ernst & Young Centre as well as the nearby proposed development. The complimentary development on both sites consists of office and research & development space. Also proposed in this concept are the development of a hotel, gas station, restaurants, and some retail. Concept B is based on the non-spur line scenario. The intermodal transportation centre and complimentary development is located primarily adjacent to the existing railway line in parcel 3. An overview of Concept B is shown in figure 4.

## Concept B



Figure 4: Overview of Concept B

A unique feature of Concept B is the use of an innovative new technology called Personal Rapid Transit (PRT). The infrastructure for a PRT system is made up of a guideway, stations and pod cars which provide a quick and convenient journey between different facilities. In Concept B, the PRT system connects the intermodal transportation centre with the airport passenger terminal. There is one stop in-between to access parcel 2 in which the development of large sports complex with community amenities, as well as a grocery store is proposed.

## Conclusion and Recommendations

The purpose of the project was to provide an evaluation of options based on two different infrastructure scenarios. Therefore, the strengths and weaknesses of both concept options were identified. The most important aspects of Concept A are the increased passenger convenience of the passenger to terminal connection as well as not having to transfer to a different mode of transportation after reaching airport lands. The main weaknesses are the high cost of servicing the airport with a dedicated spur line and the lack of opportunity for phasing.

The major strengths of Concept B are that it is not dependent on construction of additional rail infrastructure, lower costs of PRT versus a rail spur connecting the main rail line to the passenger terminal, and the possibility of phasing (providing shuttle bus service from the intermodal transportation centre to the passenger terminal before a PRT is constructed).

However, based on the research conducted throughout the course of the project, it was found that most airports locate their intermodal transportation centres as close as possible to the passenger terminal. The main reason for this is passenger convenience. Locating the intermodal transportation centre in proximity to the passenger terminal maximizes the seamlessness of the passenger's journey to and from the airport and increases the likelihood of influencing the passenger's travel decisions due to increased convenience. Therefore, it is the recommendation of this report to pursue Concept A.

Airports provide a unique service which connect urban regions to the rest of the world in an age where international cooperation, collaboration, and connectivity are increasingly becoming ever more important aspects of economic development. Development of the airport not only benefits the OMCIAA but the rest of the region as well. Finally, Ottawa is the Nation's capital and therefore the airport gateway is of national significance. This point cannot be over looked as the airport is the point of entry for most foreign dignitaries as well as ordinary Canadians travelling to Ottawa to explore their nation's capital.

This report is the product of the Land Use Planning Project Course (SURP 824) completed by Master's students at the Queen's University School of Urban and Regional Planning. The project was completed over the course of the fall semester of 2013-2014 school year. The course is intended to give students experience in preparing a plan under conditions simulating professional practice.



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# 1.0 Introduction

## 1.1 Study Terms of Reference

The Ottawa Macdonald-Cartier International Airport Authority (OMCIAA), under a long-term lease agreement with the federal government, is responsible for overseeing the management of the Ottawa Macdonald-Cartier International Airport's services and its aviation activity. The OMCIAA, in an effort to provide quality, secure and sustainable transportation facilities and services to its customers, is seeking to enhance the airport's ground transportation system, improve the passenger experience, and optimize non-aeronautical revenues. To achieve this goal, the OMCIAA sponsored a team of graduate students from the School of Urban and Regional Planning (SURP) at Queen's University to provide guidance and formulate concepts for the future development of an intermodal centre and complimentary land uses on airport property. Intermodal means involving several modes of transportation to complete a journey. Although the term intermodal has been used for cargo in the past, it has recently been applied to passengers as well. It is not always possible to complete a journey using one mode of transportation. It is therefore imperative that transferring between modes is made as seamless as possible to ensure a convenient and enjoyable journey. Studies have shown that domestic passengers are more likely to take public transit than other airport passenger.<sup>1</sup> Since most of Ottawa's airport passenger traffic is domestic, there is an opportunity to influence transportation choices by developing an intermodal centre at the OMCIA. The study area consists of lands to the north and east of the airport passenger terminal and is discussed in more detail in Section 3: Study Area Analysis.

## 1.2 Goals

There are two primary goals of this study. The first is to provide advice on an optimal site for a multi-modal transportation centre at the Ottawa Macdonald-Cartier International Airport, as well as a range of complementary land uses to be incorporated into the development. The second is to suggest land uses for property adjacent to the intermodal terminal that would be best served by the transit service and provide additional non-aeronautical revenue for the airport.

## 1.3 Objectives

The following key objectives were identified for achieving the project's goal:

- 1) Conduct a thorough analysis of the study area's existing conditions and the policy and regulatory contexts that guide development on the site;
- 2) Identify major development constraints and opportunities to address the major planning issues identified;
- 3) Consult with key stakeholders such as the City of Ottawa, OCTranspo, the Airport Authority, and the National Capital Commission to develop a comprehensive plan that takes into account the interests of all key stakeholders;
- 4) Conduct a comparative analysis, considering precedents set at other international airports to identify existing best practices and approaches;
- 5) Identify two possible sites for the development of an intermodal transportation centre and conduct a detailed analysis of the strengths, weakness, opportunities and constraints of each location;
- 6) Prepare design concepts and renderings for the development of an intermodal transportation centre and land use plans to guide development at the selected locations;
- 7) Prepare a final report and present final recommendations to the OM-CIAA and other stakeholders

## 1.4 Limitations

Several limitations must be recognized for this study and its recommendations.

There are features of consulting reports that are outside the scope of this project as an academic exercise. The first is a full economic analysis of the region. While this would be ideal for the commercial development planning aspect of the project, it is unfeasible under the timescale given. A full financial analysis of the proposal is also outside of the scope of this project. Though a relative cost evaluation will be provided comparing the proposal options, a more detailed investigation would be difficult given the team involved at this preliminary stage.

Another key limitation of this project relates to the nature of the transit development, as this proposal is heavily dependent on the development of key transit infrastructure by the City of Ottawa. There is a substantial degree of uncertainty as to the type of transit that will serve the airport and the timeline of such

development in current planning documents. This brings significant uncertainty to the proposal itself. The multiple options presented in this project will attempt to cover a variety of potential transit options, removing some of this uncertainty from the project.



## 2.0 Background

### 2.1 Regional Context- Greater Ottawa-Gatineau Area

The City of Ottawa, located in the Province of Ontario, is the National Capital of Canada. The Ottawa region, which includes neighbouring Gatineau, is the fourth largest metropolitan area in Canada after Toronto, Montreal and Vancouver. Urban development covers 10% of Ottawa's 2760 square kilometre area. The balance is rural land.<sup>2</sup> Separated by the Ottawa River, Ottawa and Gatineau share a growing association with each other. Projections for the Greater Ottawa-Gatineau Area are increasingly important for coordinating future business and infrastructure. The airport is located 13 km from Ottawa's central business district (see Appendix A)

#### 2.1.1 Population trends

The population of Ottawa is projected to grow to 1,192,000 by 2021. Much of this growth is due to the fact that the city is one of Canada's largest points of entry for international immigration. The city's total fertility rate is 1.43, which is lower than the Ontario average. The aging baby boom will mean a steady rise in deaths during the 2006-2031 projection period. Moving forward, migration will be Ottawa's key source of new residents. International immigration will be especially important, as it has accounted for almost three quarters of the city's net migration in recent decades.<sup>2</sup>

#### 2.1.2 Unemployment Rates

Ottawa-Gatineau has traditionally held one of the lowest unemployment rates in Canada, which helps flatten the swings attributable to economic cycles.<sup>2</sup> This makes Ottawa an attractive destination for immigrants and businesses looking to invest and live in the city.

#### 2.1.3 Net Commuting

In the 2001 census there were approximately 85,000 residents living in the surrounding municipalities working in Ottawa, and approximately 20,000 Ottawa residents working in surrounding municipalities. Commuting patterns show that many downtown commuting residents live in surrounding municipalities.<sup>2</sup> Further development of the transit network will ensure that a higher proportion of commuters use public transportation as their means of transportation in the coming decades.

#### 2.1.4 Housing

Ottawa has experienced an ongoing decline in average household size in recent years. Studies provided by the City of Ottawa also note a changing trend in

housing type, specifically a decline in apartments and single detached houses and an increase in townhouses.<sup>2</sup> This compares well with other large urban centres across the country, reflecting prevailing baby boomer demographic changes. Any decisions made on new land use planning and transportation infrastructure planning in the city will have to take into account these housing changes.

#### 2.1.5 Economy

Ottawa's economy centers on two major sectors, high technology and the federal government. Both offer secure and high wage jobs for workers in a relatively stable environment. The technology and federal government sectors of Ottawa's economy account for 37% of the total GDP in Ottawa. This means Ottawa relies heavily on these two sectors as the main drivers of its economy. Ottawa does not experience economic fluctuations seen in other municipalities because the federal government sector has been stable over the years and government employment does not tend to vary with economic cycles.<sup>2</sup> Although the government is currently experiencing a period of downsizing, there are a large number of infrastructure projects in the city that may buffer the economy in the meantime. Service sector growth in the last decade should also buffer the region from losses in government employment. In Ottawa, the rural economy contributes over \$1 billion to the GDP. Agriculture alone accounts for \$136.7 million of the rural economic activity which includes agriculture, retail sales, construction, forestry and mining, tourism, manufacturing, personal and business services, and transportation. Responsible, sustainable farming practices contribute to maintaining the value of Ottawa's countryside. Agriculture not only complements and affects the prosperity of the city but it also helps preserve the quality of rural Ottawa as a place to live and work.<sup>2</sup>

#### 2.1.6 Employment

Employment rates in both the City of Ottawa and Ottawa-Gatineau are above the national average. Employment growth, however, is increasingly constrained by an aging workforce, as younger generations are experiencing difficulties entering the workforce. Ottawa-Gatineau has the third highest participation rate among Canadian cities, which is consistent with the fact that Ottawa's economy is strong and relatively secure.<sup>2</sup>

#### 2.1.7 Transportation

Ottawa's vision is of a sustainable, resilient and livable city that incorporates economic prosperity, environmental and social well-being, vibrant culture and identity. Transportation is essential to meeting these goals because it is a primary factor in shaping future growth. Key aspects of the current plan include complete streets, active transportation, transit oriented development as well as transit mode share increases. The current draft Transportation Master Plan (TMP) places a strong emphasis on the concept of affordability, including prioritizing projects based on financial criteria and fiscal constraints.<sup>3</sup>

Ottawa's 2008 TMP included a transportation vision that expressed how a future transportation system would benefit residents. That vision has been maintained in 2013s TMP with modifications. By 2031, Ottawa's transportation system will enhance the city's quality of life by supporting social, environmental and economic sustainability in an accountable and responsive manner. It will reduce automobile dependence, meet mobility needs, integrate transportation and land use, protect public health and safety as well as protect the environment. This vision will enhance the economy, deliver cost-effective services, measure performance, protect the public interest, provide adequate and equitable funding and encourage cooperation with other levels of government.<sup>3</sup>

## 2.2 History of Airport Development

The Ottawa Macdonald-Cartier International Airport (OMCIA) was inaugurated in 1928 as the Uplands Flying Grounds for the Ottawa Flying Club. The field was a joint military-civilian facility and it served as a training school for pilots during the Second World War. During the 1950s, Uplands was the busiest airport in Canada in terms of total aircraft movements. As a result of this the federal government built a new terminal and two new runways large enough to handle up to 900,000 passengers a year. After the construction of the first passenger terminal in 1960 the airport was publicly labelled as the Ottawa International Airport in 1964. Airport authorities were established across the country during the 1990s as a result of the new National Airport Policy. The Minister of Transport transferred management and operation of the airport to the Ottawa Macdonald-Cartier International Airport Authority (OMCIAA) on February 1, 1997.<sup>4</sup>

The OMCIAA is a not-for-profit private sector corporation comprised of a fourteen member Board of Directors representing Federal, Provincial, Municipal, and industry delegates, and is responsible for the operation, regulation and governance of the airport and its aviation activity.<sup>4</sup> The passenger terminal building, airfield system and surrounding lands within the total 1800 hectare airport premises are operated and managed by the Authority under a long-term lease with Transport Canada. This contract lasts until 2077, with a 20 year extension option granted by the Minister of Transport in 2012. The Airport Authority collects revenue from airport operations and surrounding ground leases, which is put towards airport-lands infrastructure, both aeronautical and non-aeronautical.<sup>5</sup> The airport's land use plan is subject to consultation with the public and the city.

Airports experience several challenges, which include, but are not limited to, meeting traveler demands, providing improved public service, increasing revenue, decreasing the cost of services, generating business incentives and providing real-time operational flexibility. Due to these challenges, airport executives aim to plan for smarter airports with access to multi-modal transportation networks and up to date infra-

structure. The growing stresses that have been placed on all modes of transportation are

enhanced by Ottawa's regional population growth, rapid urbanization and prompt implementation of advanced technologies. This expands the role of international airports past their connectivity goals and towards advancing regional economic affluence with global reach. Since the approval of the 1998 Airport Master Plan, the Ottawa Macdonald-Cartier International Airport (OMCIA) has experienced tremendous increases in both aviation services and passenger growth. The number of passengers has increased from 3.11 million in 1998 to 3.81 million in 2006 and it reached to 4.6 million in 2012 (see Figure 1).<sup>4</sup>

## 2.3 Passenger Forecasts

### 2.3.1

According to the Jacobs Consultancy, the current and forecasted Enplaned/Deplaned (E/D) passengers indicates an increasing rate between the years 1993 to 2030. A 2.9% growth in E/D passengers is forecasted between 2010 and 2020 and a 2.7% between 2020 through 2030 which makes passenger traffic to reach at 7.66 million by 2030 (see Figure 1).<sup>4</sup>

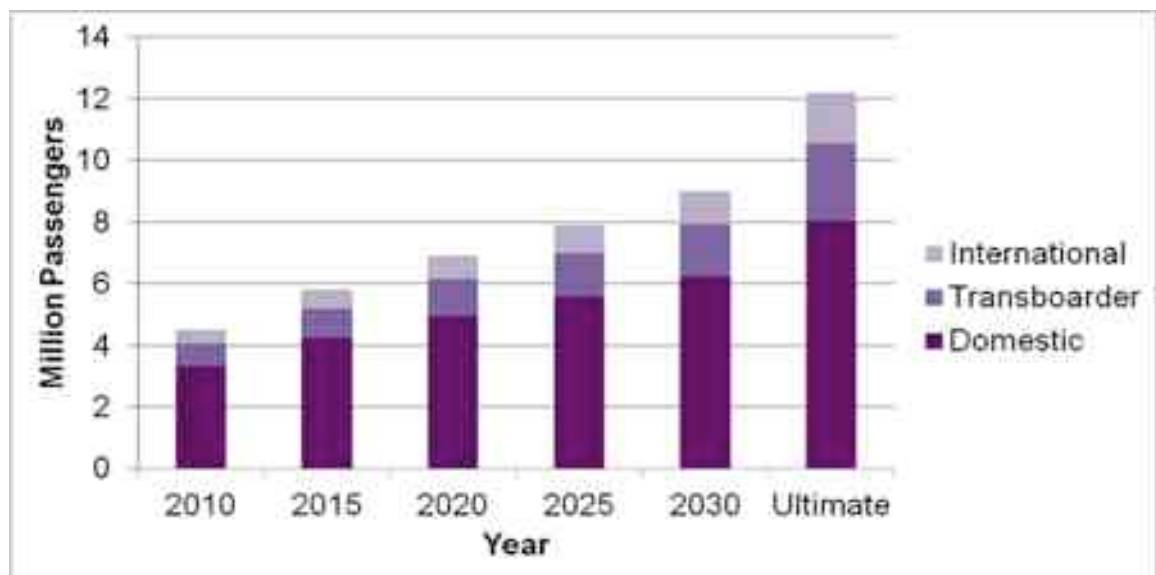


Figure 1: Passenger forecast of total annual enplaned/deplaned passengers until ultimate capacity (2044)<sup>6</sup>

The currently operating runways (07/25 and 14/32) can accommodate projected aircraft movements into the near and mid-term, but as the airport reaches its maximum capacity in 2044, a new runway may be required in order to reduce congestion during peak hours. These increases will require a series of terminal and apron expansions. By 2030, 10 additional gates will be required, so a full terminal expansion will likely be necessary.<sup>4</sup> Figure 2 shows the planned apron and terminal expansions until 2044.



Figure 2: Phase 5 Ultimate Terminal Build-out (2044)<sup>6</sup>

### 2.3.2 Capacity and Terminal Expansion Requirements

Curb frontage, security points, check-in counters and kiosks, customs and immigration processing areas, as well as current and future expansion gauge capacity shortfalls in main terminal areas. Peak hour passenger demand volumes have been taken into consideration under all time horizons. The result has shown gaps in available capacity, which may affect the proposed multimodal development.<sup>6</sup> The trans-border check-in counters will require expansion near the end of the planning term (2025-2030), however, technology may continue to facilitate self-serve functions and therefore reduce and/or eliminate the shortfalls in check-in capacity.<sup>6</sup> Based on comprehensive analysis the following groundside capacity improvements have been identified and should be taken into consideration in proposing a new multimodal transportation centre);

1. The inbound and outbound Main Access Road (MAR) and Terminal Approach Road (TAR) require expansion to 4-lanes. In order to benefit from these expansions, the Airport Parkway should be widened to 4-lanes at a concurrent timescale and realigned as per figure 3.



Figure 3: Realignment of Airport Parkway- Curbside<sup>6</sup>

2. Roadway access from Paul Benoit Driveway needs to be realigned to augment accessibility between the terminal, Hunt Club road and the north field.
3. Improve the parking lot at the south side of the terminal building adding 796 new stalls in three levels, in accordance with plans for terminal expansion.
4. Transfer the Canada Reception Centre to the Airport Authority located at the east of the terminal.
5. Construct a remote surface parking lot and a new one-way access lane from the Airport Parkway. This may require a shuttle bus service to transfer passengers to the terminal.<sup>6</sup>



## 3.0 Study Area Analysis

### 3.1 Description

The study area for this project consists of approximately 118 hectares of land located to the north and east of the airport passenger terminal as depicted in Appendix B. The parcels have been labelled for ease of reference. Parcel E is a possible expansion of the study area which was considered early on. It was deemed unnecessary to include in the study area since the original study area boundaries include sufficient land for the purpose and objectives of this project. Parcel 4 has also been excluded from consideration since it is currently highly developed and is secluded from the remainder of the study area to the point that it would not fit within a transportation related comprehensive development scheme as set out in this project.

### 3.2 Existing Uses

Parcel 1 is currently occupied by employee parking, a Base Supply Depot owned by the Department of National Defence (DND), and a Transportation Safety Board of Canada (TSB) building. Parcel 2 features the Ernst & Young Centre (a large convention centre). The remainder of the parcel is forested natural area. Parcel 3 is a large undeveloped forested natural area. Parcel 4 is the smallest parcel and is currently occupied by the Gate Gourmet and the Hilton Garden Inn hotel. The hotel is currently undergoing expansion. Lastly, parcel 5 is a narrow and largely undeveloped piece of land. Two storage structures currently occupy this site, owned by the National Research Council (NRC). Appendix C shows the existing buildings. Table 1 shows the leasing and occupancy agreement information for the six tenants within the study area.

Tenant	Lease Expiry	Relocation
Ernst & Young Centre	January 31, 2057	No
Hilton Garden Inn	January 30, 2046	No
Gate Gourmet	April 30, 2016	No
Tenant	Occupancy Agreement Expiry	Relocation Clause
NRC	January 31, 2057	Yes
TSB	January 31, 2057	No
DND	January 31, 2077	Yes

Table 1: Tenants, lease and occupancy agreement expiry dates and the presence of a relocation clause in agreement<sup>7</sup>

### 3.3 Environment

#### 3.3.1

Development within and adjacent to airport lands can affect the general ecology of the site, but there are specific environmental concerns that threaten the safe operation of aircraft. This requires the OMCI AA to maintain a balance in its environmental management strategy that maximizes ecosystem function while maintaining the safety of its operations. This portion of the report provides an overview of the physical and regulatory development constraints that need to be taken into account when planning future development. Most of the information provided here is sourced from reports conducted by private consulting firms hired by the OMCI AA. Identified areas of significance include watersheds, soil conditions, climate, vegetation and wildlife, wildlife control, municipal servicing, and archaeological and heritage resources.<sup>8</sup> In 2008, an environmental performance report was conducted to evaluate the Ottawa Airport. The OMCI AA's main objectives under this document were to eliminate environmental impacts where possible, reduce the impacts when elimination is not possible and continuously improve results from all plans and programs.<sup>8</sup>

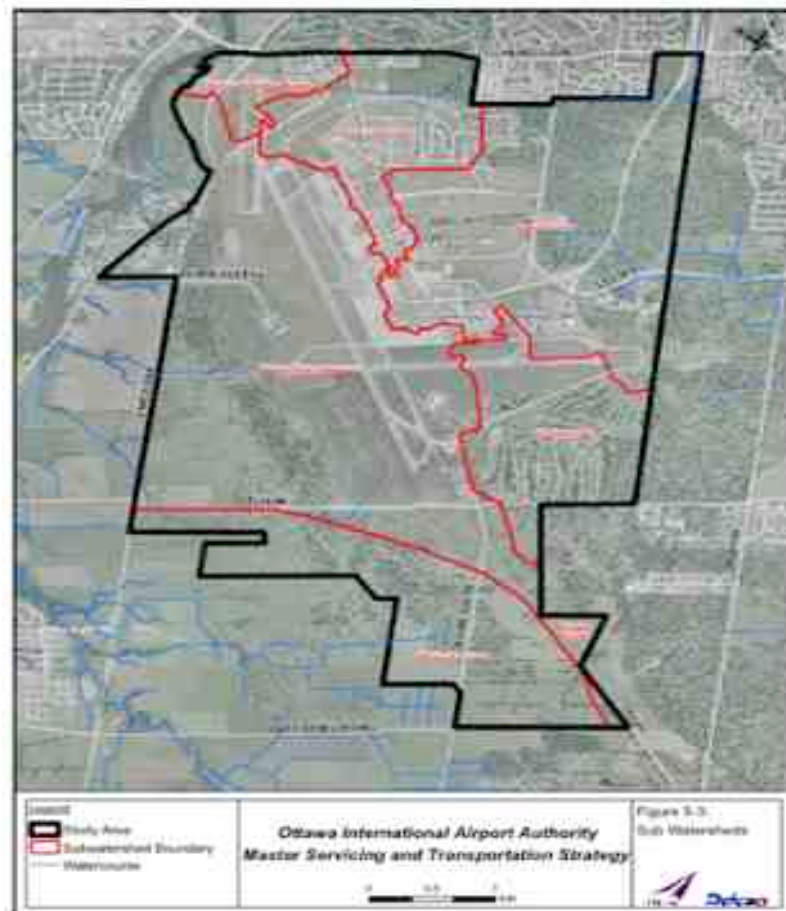


Figure 4: Map of the Ottawa Airport showing the watershed boundaries on site<sup>8</sup>

Wetlands are an essential component of ecosystems that contribute to the environment within and surrounding the airport. The airport lands drain into five principal watersheds. The watershed which encompasses the study area is Sawmill Creek as seen in Figure 4. Sawmill Creek drains a total area of 8900 ha and hosts a cool water fishery in the upper to mid reaches of the creek. Approximately 910 ha of the airport lands intersect with this watershed, which are located within the study area. The sand and gravel deposits within this watershed are permeable and facilitate regional groundwater recharge that is critical to the creek base flow. Some key issues associated with the Sawmill Creek watershed is the active downstream erosion of the creek channel that floods to areas outside the study area.<sup>9</sup>

### 3.3.2 Soil conditions

The airport is located in Uplands Sands, which is composed of shallow layers of organic matter, brown sand, grey sand, brown sand over deep yellow sand. The Uplands soils are broadly distributed giving them the widest range of all soils mapped in the area. The thickest deposits (15 to 20m) are found on airport lands. Within the Uplands soils the land is described as undulating with excessive drainage.<sup>10</sup>

### 3.3.3 Climate

The climate of Ottawa is humid continental, characterized by warm summers and severe winters, with considerable variability throughout the year. Precipitation is spread evenly throughout the year averaging 71 mm a month and 850 mm a year.<sup>10</sup>

### 3.3.4 Vegetation

The study area is made up of a variety of land classifications; including forested areas, vacant pastured land and lands occupied by buildings owned and operated by National Defense, The National Research Council (NRC) and the Transportation Safety Board. The main concern associated with vegetation is that it needs to be unappealing to wildlife and kept that way.<sup>4</sup>

### 3.3.5 Wildlife

New Canadian Aviation Regulations, in effect since 2006, outline requirements for airport wildlife planning and management. The OMCI AA implements a wildlife management plan to manage both lands on and in the vicinity of the airport. The OMCI AA monitors wildlife to avoid risk with aviation operations. In 2006, Beacon environmental prepared an airport wildlife management plan for the Ottawa Airport. Identifying and integrating management techniques into proposed design will promote safety by reducing hazard risks caused by wildlife on and in the vicinity of the airport.<sup>8</sup> Tools and techniques used that should influence planning:

1. Manipulating habitat and access to habitat at or near the airport.

2. Dispersing, removing or excluding wildlife from the airport.
3. Influencing land use decisions around the airport that may be a hazard to aircraft.
4. Developing systems to warn of bird strike potential.<sup>8</sup>

### 3.3.6 Wildlife control

Highly critical species found within and in proximity to the airport include the Ring-billed Gull, Canada Goose and the American Crow. Moderately critical species include the Rock Pigeon, Mourning Dove and the European Starling. Non critical species include the American Kestrel and Northern Harrier, Snow bunting, Barrow swallow and ground hog.<sup>8</sup>

General procedures for the different levels of wildlife significance have been identified. Passive management techniques should be implemented as part of the airports wildlife control program. These actions will decrease the overall attractiveness of the airport to wildlife and promote safety for the airlines. Some of the passive management techniques recommended include:

1. Bare un-vegetated areas will be minimized. The old runaway pavement should be removed or a long grass program implemented for these areas
2. Drainage features that are planned for the airport, if and when they are built, will have 4:1 side slopes, preferably with hard edges, and will be piped where feasible
3. No cash crops should be grown on lands owned by the airport authority
4. Any ponds could create a hazard to aircraft, methods should be employed to limit their attractiveness to wildlife
5. All garbage bins on site should be wildlife proof
6. Ensuring building heights and natural vegetation respect airport obstacle limitation surfaces as established by federal aerodrome standards or airport zoning regulations, whichever case applies;
7. Developing land uses and managing activities in a manner that reduces the attractiveness of these to bird species and populations that are hazardous to aircraft operations;

8.Restricting land uses, activities and the use of building materials that interfere with the performance of navigation aids and telecommunication; and

9. Developing land uses and managing activities in a manner that will not increase wildlife presence and elevate risks to aviation operations.<sup>8</sup>

### 3.3.7 Archaeological and heritage resources

According to the list of designated heritage properties in Ottawa there are no heritage resources located within the study area therefore no heritage will be impacted by development of the study area.

## 3.4 Existing Transportation

Existing public transit access is from a transit loop near the terminal, which connects mainly via the Airport Parkway (97 route) and to Leirtrim Rd (99 route). The 97 and 99 bus routes are the two main bus routes servicing the Airport lands. Route 97 runs from Downtown Ottawa directly to the Airport and utilizes the transitway from South Keys to Lincoln Field. There is a set of railway tracks which run along the eastern edge of the study area which would be used for the proposed O-Train service. If and when the O-Train station is built at the proposed Lester Station site, there will be a shuttle bus from Lester Station to the Airport, which would replace the route 97. This would allow airport passengers to reach the airport conveniently with cost savings for the city.<sup>11</sup> Appendix D shows the existing transportation links. Major roadways within and surrounding the study area include:

- Walkley Road (4-lane arterial);
- Hunt Club Road (4-lane arterial);
- Lester Road (2-lane arterial);
- Leirtrim Road (2-lane arterial);
- Bank Street (4-lane arterial);
- Albion Road (2-lane arterial/collector);
- Airport Parkway (a 2-lane arterial roadway with controlled access);
- Uplands Drive (a 2-lane collector providing access to Hunt Club Road and Lester Road);

Highway 416 is 11 km west with a direct connection to West Hunt Club Road. Highway 417 is 8 km east (with a direct connection to Hunt Club Road to be in place by 2015).

### 3.5 Airport Related Restrictions

#### 3.5.1 Noise Regulations AOIZ

The study area is located in the Airport Operating Influence Zone (AOIZ), which is a noise regulation particular to the Ottawa Macdonald-Cartier International Airport. The purpose of the AOIZ is to prevent lands adjacent to or in the vicinity of the airport from being used or developed in a manner that is incompatible with the safe operation of an airport or aircraft. According to Section 4.8.6 of the Ottawa Official Plan, within the AOIZ, new residential developments and noise sensitive land uses are prohibited, as they would interfere with the successful operation of the airport.<sup>12</sup> Amendment 76 of the Ottawa Official permits hotels and motels in the AOIZ as they benefit from convenient access to the airport and the impact of noise on people is reduced by the short duration of their stay [OP Amendment #36, November 30, 2005].<sup>12</sup> The study area, which is located in the AOIZ, presents an opportunity for commercial developments, hotels and motels, transportation uses and other non-noise sensitive uses. However, a noise control study may be required at or above the 25 line as mapped along physical features (see Appendix E for AOIZ and NEF/NEP Contour Lines).<sup>12</sup> In accordance with Section 4.8.6 of the Ottawa Official Plan a noise study control study includes but is not limited to:

- a. Consideration of all airport noises sources, including noise produced by aircraft run-ups and taxiing, the reverse thrust noise produced by landing aircraft, and helicopter noise;
- b. Consideration of noise from sources other than the airport, including roads, rail lines and industry;
- c. Details of the assessment methods, results, and recommendations for noise control measures, and provisions for how the measures will be secured through the conditions of approval of plans of subdivision and condominium, site plan or severance applications.<sup>12</sup>

#### 3.5.2 Use of Noise Barriers

Section 4.8.7 of the Ottawa Official Plan deals with Environmental Noise Control. The Ottawa Official Plan states "noise is regulated better by land use planning than by noise barriers".<sup>5</sup> The City of Ottawa makes an active effort to improve the streetscape of communities by providing where possible noise attenuation through land use planning and design. Noise barriers are discouraged by the City of Ottawa because members of the public see noise barriers as aesthetically unappealing as they can result in undesirable streetscapes and views.<sup>5</sup> Noise barriers other than topography are largely ineffective barriers for aircraft noise, as such, land use

decisions within the study area must consider the impact of noise on potential land uses.<sup>5</sup>

### 3.5.3 Obstacle limitation surface

Obstacle limitation surfaces for airports are utilized to prevent the height of any structures from becoming a hazard to the safe take-off, landing and maneuvering of airplanes. The obstacle limitation surfaces are divided into three categories: the outer take-off/approach surface, transitional surface and the outer surface (figure 5). The study area is located between the transitional and outer surface area and is not in line with the take-off/approach surface. The height restriction for buildings in the area described is 45 metres above the airport reference point, which has an elevation of 106.790m above sea level, Canadian Geodetic Vertical Datum – CGVD28.13 The high point within the study area is near the base supply depot along Paul Benoit Driveway (116m) gradually falling by an elevation change of about 10 meters to the low point at the eastern limit of the study area (100m)

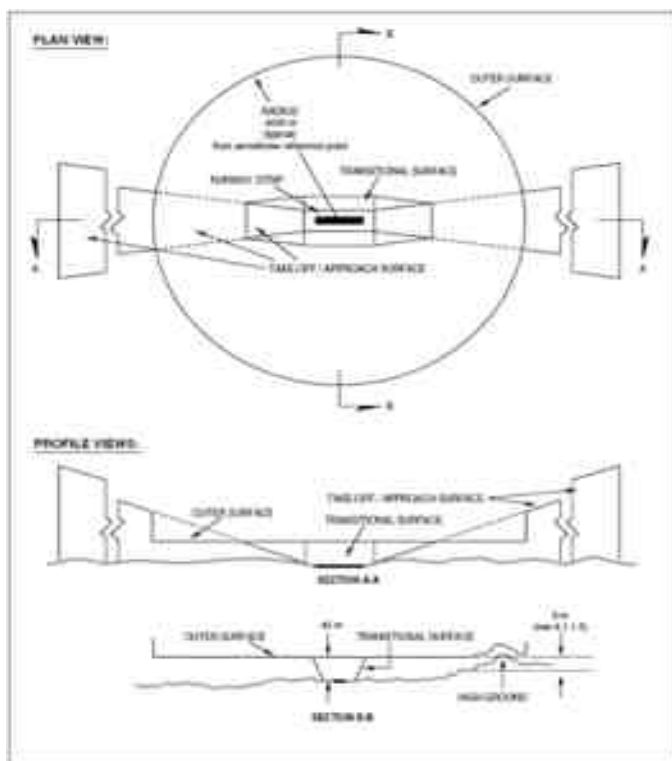


Figure 5: Airport obstacle limitation surfaces<sup>13</sup>

### 3.6 Municipal Servicing

Storm water management (SWM) facilities that service the study area are part of the Sawmill Creek watershed and SWM is mainly achieved by a pond that functions for peak flow and water quality control purposes. Future development, and land development applications will require upgrading to the pond to, maintaining groundwater recharge, controlling pollutants and their sources, minimizing runoff volumes, ensuring no increase in downstream erosion rates, and ensuring no increase in downstream peak flows for the 2 to 100 year flood events.<sup>9</sup> The study area contains water servicing infrastructure at the airport terminal (Parcel 1), along Research Rd, and newly built infrastructure at the Ernst and Young Centre. The area is serviced by water carried through a 600mm diameter concrete pipe, originating from the Ottawa South Pump Station to the south-east. The network of existing water infrastructure is shown in Appendix F. The water mains servicing the Ernst and Young Centre are 200mm diameter PVC pipes connected to the 300mm PVC pipe stemming from the south-east. The water mains servicing Parcel 1 range from 50mm to 300mm diameter piping, made from cast iron, ductile iron, and PVC.<sup>9</sup> Data obtained from the Master Servicing and Transportation Strategy prepared by Delcan, indicates that as of 2008 the peak water demand is 48L/s. The design for the water network is driven by the fire demands for the passenger terminal building which amounts to 65L/s.<sup>9</sup>

Existing wastewater infrastructure within the study area is servicing the airport terminal, the buildings along Paul Benoit Driveway, and the newly built infrastructure at the Ernst and Young Centre. The existing wastewater servicing network is shown in Appendix G. The Ministry of the Environment (MOE) Certificate of Approval for the airport outlet allows a peak discharge rate of 98L/s. The peak sewage flow rate for the campus would be 98L/s, which is equal to the allowable discharge rate (Delcan, 2011). Any new development in Parcel 1 would require an upgraded trunk sewer to remove the wastewater.<sup>9</sup>

The infrastructure built at the Ernst and Young Centre (Parcel 2) consists of a 150mm forcemain, a pump station (capacity to be added later), and a PVC gravity main with a 1200mm diameter.<sup>9</sup>

### 3.7 Surrounding Communities

The study area, located on airport lands, does not permit residential development due to noise restrictions (AOIZ) discussed in section 3.4. Development proposed should therefore take into consideration passengers, employees and surrounding communities. There are four main communities around the OMCIA: Riverside South, Leitrim, Blossom Park and Uplands which are shown in Figure 6.

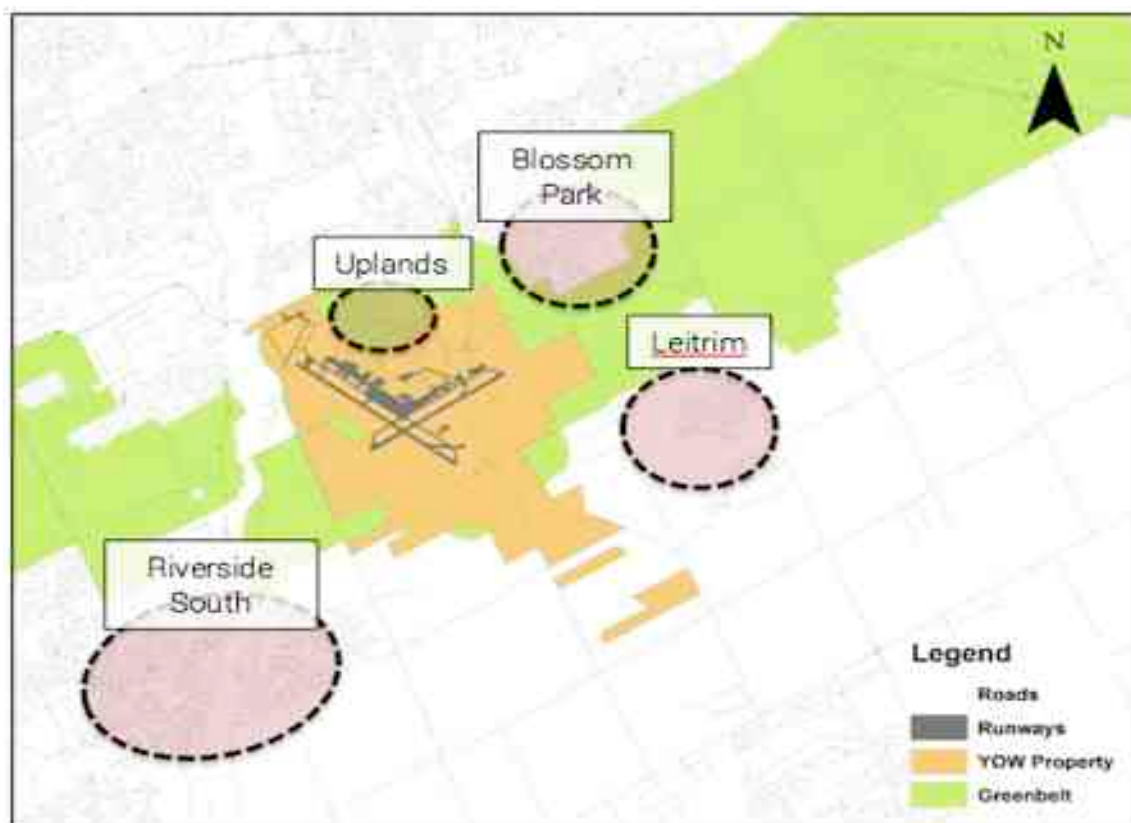


Figure 6: Communities Surrounding Airport

### 3.7.1 Riverside South

Riverside South was part of the former City of Gloucester and was incorporated into the City of Ottawa in 2001 as part of an amalgamation process. The community comprises an area of about 1800 hectares (4,500 acres) located south of the Ottawa Macdonald-Cartier International Airport and east of the Rideau River.<sup>14</sup> The boundaries that form the edges of the community are Leitrim Road to the north, the Rideau River to the west, a line half-way between Earl Armstrong and Rideau Road to the south and Bowesville Road to the east.<sup>15</sup> The first homes in the community were built in 1996. Riverside South is a fast growing community, which as of 2011 was home to just over 3,300 households with an anticipated 13.5% annual growth rate.<sup>15</sup> Riverside South is one of the three communities, together with Leitrim and the Nepean South, that make up the South Urban Area. According to forecasts from the Riverside South Community Design Plan the South Urban Area community will contain 61,000 households by the year 2021. In order to meet this forecast, the City's Official Plan encourages a compact form of development, and requires that the average density for detached, semi-detached and townhouse units be 29 units per net hectare.<sup>14</sup> The Riverside South Community Design Plan also forecasts that there will be 70,000 jobs located in the area by the year 2021. A market demand study

prepared on the basis of an analysis of existing and planned population, per capita income and expenditure patterns and potential capture by retail facilities within the Community, also concluded that there will be market support for 1,270,000 square feet of retail/commercial space within the Community.<sup>14</sup>

### 3.7.2 Leitrim

Leitrim is an urban community in the southern portion of the City of Ottawa. The community comprises an area of approximately 520 hectares located slightly south of the Ottawa Macdonald-Cartier International Airport in what was part of the former City of Gloucester. The boundaries that form the edges of the community are Leitrim Road to the north, Bank Street to the east, and Albion Road to the west. A roadway does not define the community's southern boundary, but the Earl Armstrong Road extension is close to the southern boundary of the community. The Ottawa Macdonald-Cartier International Airport is located to the north-west of the community.<sup>16</sup> Leitrim is also one of the three communities together with Riverside South and the Nepean South that make up the South Urban Area. The majority of Leitrim is undeveloped with the Leitrim Wetland surrounding the Community in the southwest, but there are existing commercial, institutional, industrial residential uses throughout the area. The Leitrim Community Design Plan projects an ultimate population of approximately 15,000 residents within the community, and approximately 5,300 dwelling units by the year 2021. According to the plan, 6,900 total jobs and 30,000 square metres of commercial retail floor space will also be located in the community upon the community's ultimate build up.<sup>16</sup>

### 3.7.3 Blossom Park

Blossom Park is located to north-east of the airport. It is a predominantly residential neighbourhood with a 2011 census population of 14,060.<sup>17</sup>

### 3.7.4 Uplands Community

Uplands or Airport-Uplands, is a community located in the south of the City of Ottawa. The boundaries of the community are the Hunt Club neighbourhood to the north, the Blossom Park neighbourhood to the east, the Ottawa Macdonald-Cartier International Airport to the south, and the Riverside South neighbourhood to the west. The community is home to the Canadian Forces Base Uplands, which houses about 500 military personnel and their families.<sup>18</sup>

## 4.0 Policy Framework

### 4.1 Federal Policies

Transportation is jointly regulated by federal and provincial governments, with municipalities as creatures of the province, taking on some delegated responsibility. Aviation, like rail and marine transportation, falls under federal jurisdiction as these modes of transportation are inter-provincial and international.<sup>19</sup> The federal government used to play a large role in regulating and shaping aviation in Canada, but with the sale of Air Canada and the civil air navigation system the federal government role has been limited to the ownership of land and infrastructure, leased to airport authorities, and the regulation of aviation safety.<sup>19</sup> Though air transportation is within federal jurisdiction, provincial and regional governments enact transportation policies within their own transportation jurisdiction, these different levels of government also work in collaboration to develop transportation policies that are comprehensive. Ontario's Provincial Policy Statement (PPS) allows a cross federal/provincial sharing of responsibility around noise protection, an important issue in airport regulation.

#### 4.1.1 National Airports Policy

The National Airports Policy (NAP) is a policy framework that clearly defines the federal government's role regarding the operation of airports. According to the policy, the federal government is responsible for maintaining the safety and security standards for all airports through policy-setting, airport transfer agreements, and airport certification and regulation. This policy framework also changed the role of the federal government from airport owner and operator to that of owner and landlord.<sup>20</sup> While the NAP allowed the federal government to continue playing its role as safety regulator, it transferred the responsibility of financial and operational management of the airports to Canadian airports authorities. NAP also presented an important step forward in improving the quality of services provided by airports as it imposed market disciplines on their development and operation.

### 4.2 High Speed Rail (Quebec City- Windsor)

Even though there is no single standard definition of high speed rail (HSR), it is generally thought of as separate rail lines built to support trains travelling at speeds of 250km/hr or existing lines upgraded to support trains travelling at speeds of 200km/hr.<sup>21</sup> In Canada, one such idea that has been considered is the development of a high speed rail line that would link Quebec City to Windsor passing through the major urban centers in the corridor such as Montreal, Ottawa and Toronto. This

proposal, if materialized, will potentially have an impact on other modes of transportation, including air transport, operating within the Windsor-Quebec City corridor. Previous results published in the Québec-Ontario High Speed Rail Project Study (QOHSRPS) report indicate that the introduction of a HSR service in the corridor could cause air carriers to lose 44% of their projected corridor ridership. In addition, this will also affect the operation of airports as the loss in ridership may result in increases to airline landing fees to compensate for reductions in airport charges.<sup>23</sup> The OMCIAA indicated a strong interest in a future connection to the Quebec City-Windsor High Speed Rail Corridor. The High Speed Rail (HSR) network proposed by the Ministère Des Transports Du Québec, the Ontario Ministry of Transportation, and Transport Canada, is not economically feasible in the current market conditions.<sup>24</sup> However, in the event that the market conditions improve and the project is initiated, the OMCIAA has indicated that the intermodal transportation centre should accommodate a potential connection to the HSR line, or the addition of a HSR station. The OMCIAA supplied a speculative location for a HSR connection to the OMCIA lands. The possible future connection would approach the airport lands from the west, cross the Rideau River at a future bridge along Fallowfield Road, then proceed under the north-west runway and connect to the land north of the airport terminal. Potential route alignments can be seen in Appendix H. The consideration for a future HSR connection was taken into account during the site analysis and site selection process for the intermodal transportation centre. It was one of the many factors analyzed to determine optimal site selection. Three of the potential sites contain adjacent land that could be utilized in the event of a future HSR connection. The development and long-term leasing of any adjacent land in later phases should consider a possible HSR connection as stipulated by the OMCIAA.

### 4.3 Provincial Policy Statement

Section 92 of the Constitution Act gives provincial and territorial governments the responsibility for overlooking intra-provincial and local transportation. This means that the provinces are responsible for planning for and regulating interurban road transport. Municipalities have been given responsibility for transportation within urban centres and development is guided through various transportation policies and guidelines.<sup>25</sup> In Ontario, the Provincial Policy Statement (PPS), Growth Plan and other plans and guidelines dictate transportation planning policies in the province. In particular, the PPS sets clear overall policy directions with which all municipal transportation policies are required to be consistent. With regards to airport planning, clauses within the PPS's Transportation Systems section affect land use planning in the vicinity of airports by regulating uses that are permitted in order to protect 'the long-term operation and economic role of airports ... and to prevent adverse effects from odour, noise and other contaminants'.<sup>26</sup> The PPS also affects planning for transportation to-and-from airports as it dictates planning for local transit systems and road infrastructure. Since the OMCIAA chooses to follow

the Planning Act for all but airside and airport facilities, the OMCIAA must ensure compliance with the PPS and by extension city land use policies in order to obtain development approvals including site plan approval, zoning approval and minor variances.

#### 4.4 Provincially Significant Wetlands (PSWs)

Provincially Significant Wetlands (PSWs) are areas identified by the Province of Ontario as being valuable wetlands in need of protection. PSWs are determined by a science-based ranking system known as the Ontario Wetland Evaluation System (OWES), a standardized point grade system, which assigns values to a range of factors (biological, social, hydrological, and special features) related to wetlands.<sup>27</sup> Wetlands that achieve 600 or more points, or 200 more points in either the Biological Component or the Special Component are designated as a PSW. Section 2.1 of the Provincial Policy Statement (PPS), precludes any development or site alteration within PSWs. As such, in considering any development applications, within or adjacent to a PSW, the approval authority is required to ensure that the PSW is appropriately protected from development. Therefore a proponent of a development application located within 120m of a natural heritage feature or significant wetland is required to submit an Environmental Impact Statement (EIS).<sup>28</sup> On January 28th, 2011 the Ontario Ministry of Natural Resources (MNR) identified the Lester Road Wetland Complex as a PSW. The Lester Road Wetland Complex is adjacent to the study area and contains a transportation corridor under consideration for future development.<sup>27</sup> Although most of the PSW is located outside of the study area, several pieces of the wetland fall into the study area as seen in Appendix I. Consideration will need to be given to PSWs and the 120m buffer zones identified within the study area when proposing development. The Lester Road Wetland Complex is adjacent to a future transportation corridor, which is a key component of the intermodal passenger terminal that the project group is proposing for the Ottawa Macdonald-Cartier International Airport (OMCIA). The proposed North-South LRT route, discussed further in section 4.9, has undergone an environmental assessment and lies almost entirely within the existing rail corridor. Projects approved under an Environmental Assessment (EA) are not subjected to the same restrictive natural heritage system policies of the PPS and the Ottawa OP as a development application submitted under the Planning Act. In addition, the EA for the proposed LRT has already considered and accounted for the natural values of the Lester Road Wetland Complex prior to its designation as a PSW. A report conducted by the Deputy City Manager of Ottawa notes that planning staff from the City of Ottawa have confirmed that the designation of the Lester Road Wetland Complex as a PSW does not create any new or serious obstacles to the proposed light rail transit (LRT) line.<sup>27</sup> This is important to the project team's proposal for an intermodal passenger terminal as it confirms that the proposed LRT route is not affected by the recent classification of the Lester Road Wetland Complex as a PSW.

## 4.5 Airport Urban Design Guidelines

The Airport Urban Design Plan (AUDP) intends to provide a set of guiding principles for appropriate development of the Ottawa Macdonald-Cartier International Airport (OMCIA). The design plan takes into consideration all issues that may affect the Airport's future development. The Plan also provides directives for the implementation of consistent improvement across different employment sectors of the Airport. The AUDP's goal is to deliver a vibrant design standard that is best suited for the OMCIA properties and implement a quality approach that differentiates various employment sectors by retaining an adaptive and flexible outlook.<sup>29</sup>

### 4.5.1 Plan Perspective and Subject Lands

The OMCIA is located 13km south of Ottawa's Downtown and it is considered the most important entryway to the Nation's Capital. Not all OMCIA land properties are included in the AUDP. The Plan is instituted based of five essential perspectives as follows;

- 1- Canada's Capital Context
- 2- Greenbelt Context
- 3- International Airport Context
- 4- Economic and Economic Context
- 5- Municipal Infrastructure Context

The OMCIA aims to employ a design approach where the Airport performs as a multi-functional precinct that adequately symbolizes the Nation's Capital, offers a distinctive social and landscape appeal and contributes to the region's economic success.<sup>29</sup>

### 4.5.2 Overview of Land Categories

The AUDP identifies three levels of land categories,

- Level 1- Employment Sectors: includes Commerce and Business Campus Zone- Needs to improve the range of uses and tenants while increasing opportunities for the airside.
- Level 2- Airport Core Area and Paul Benoit Driveway (formerly Canadair Private) Frontage: Needs improvement, should optimize the character and key features of main terminal.
- Level 3- Airport Gateway and Limebank Frontage Employment Zone: requires better-quality detailing, non-airside properties, strong gateway setting that empha-

sizes the distinctiveness of the Airport.

Not all the Airport lands will be developed in the similar fashion. The Airport's land design approach may differ depending on its public visibility and its contribution to National Capital entryway.<sup>29</sup>

4.5.3 Ottawa AUDP Primary Structuring Goals and Vision Constraints and opportunities of the Plan are identified and acknowledged. With feedback from stakeholders the Primary Structure Goals were generated;

- 1- Protection of primary airport function
- 2- Fostering balanced and innovative economic leadership
- 3- To achieve responsible integration of urban fabric and ecological landscape
- 4- Enhance airport as primary gateway to Nation's Capital and significance to the region
- 5- To create unifying brand, identity, and connective tissue

Secondary Structure Goals were generated that include landscaping, signage, built form and envelop architectural details, parking etc. Design guidelines influence the AUDP in creation of a multipurpose and dynamic airport representing distinctive cultural, natural, and economic leadership that the Nation's Capital merits. There are two campuses of the Design Guidelines within the study area: the Terminal Area Campus and the Airport Gateway Campus. Each of these have their own objectives and associated design guidelines.<sup>29</sup> The goals and objectives for these campuses are summarized below further detailed applicable design guidelines are located in Appendix J.

#### 4.5.4 Terminal Area Campus

In terms of land area, this is one of the smaller sub-campus identified for the Airport Urban Design Plan (outline in Figure 7). Despite its size, it is the most prominent and important campus. The focal point of this development zone is the Passenger Terminal Building, along with its associated uses. Sensitive articulation and integration of the passenger terminal facade, parking and ground transportation and general airport facilities needs to be considered to foster a meaningful experience. In addition, key components, such as airside real estate, aviation related and airside commercial uses and support services, should be protected in this area.<sup>29</sup>



Figure 7: Airport Urban Design Guidelines Campuses<sup>29</sup>

#### Goals & Objectives

- Protect this campus for future development that will consist of expansions to the Passenger Terminal Building, and groundside facilities.
- Accommodate within the Terminal Complex the integration of a future LRT station; and use this link to strengthen the bond between the Airport, the City and Region.
- Recognize the potential for other significant development opportunities such as high-end hotels, and restaurants integrated into the Terminal Area Campus.
- Ensure adequate protection for the long term expansion of the terminal building and its associated uses and facilities.
- Recognize the core function of the area and ensure it will not be compromised by other types of development.

- Notable government building landmarks are potentially unique and their displacement should be carefully considered and managed.
- Facilitate potential for a transportation intermodal centre that may include the LRT, Inter and Intra-city bus service, and high speed rail.<sup>29</sup>

#### 4.5.5 Airport Gateway Campus

The Airport Gateway Campus acts as the primary entranceway to the OMCIA and, thus represents a key opportunity for a ceremonial entrance to and from the passenger terminal building. In essence, it is the airport's "front door". A significant gateway feature/theme consisting of both hard and soft landscaping elements and the potential integration of public art is desirable to crystallize the priority of the corridor as a capital arrival.<sup>29</sup>

The campus is bisected by the Airport Parkway, and a key distinguishing feature is the natural landscape consisting of heavily treed areas and upland forest vegetation as can be seen in Figure 7. To the extent possible, the natural features of this sub-campus will be retained. Specifically, the woodland character will be preserved along the Airport Parkway itself, creating a significant green buffer between the entrance roadway and future development. This presents a challenge for commercial development of airport land near the Parkway as it limits signage and marketing potential of these sites.<sup>29</sup>

No direct access to individual development sites will be allowed off of the Airport Parkway. Access to future development parcels will occur off of Lester Road (for lands south of the Airport Parkway) or Uplands Drive (for lands north of the Airport Parkway). The lands north of the Airport Parkway will incorporate the revised access road system leading to the terminal building. As such, the recently completed CE Centre may be the primary development within this northern area of the Airport Gateway Campus, and act as an anchor for future complementary uses.<sup>29</sup>

The airport's existing air cargo zone is located in the western portion of the Airport Gateway Campus – west of Alert Road. While this area is substantially built out, there are some opportunities for expansion of airside uses. Such development will match that which exists today – large utilitarian buildings adjacent to large aircraft parking aprons. Given the limited capacity for growth within this area, future cargo activity may have to locate within other sub-campus – such as in the vicinity of Paul Benoit Driveway, the Limebank sub-campus or the aerotech sub-campus.<sup>29</sup>

#### Goals and Objectives

- Protect and enhance the current primary, and/or acknowledge any alternative entranceway alignment, to the Ottawa International Airport and preserve the forested, natural greenbelt landscape character that frames the Parkway. The gateway should offer a ceremonial entrance experience to the terminal

building and towards downtown Ottawa.

- Woodland character and vegetation will be preserved wherever possible along the Airport Parkway; creating a green buffer between the entrance roadway and future development
- No direct access off Airport Parkway will be permitted and development sites should be accessed through internal road networks.
- Support the existing air cargo zone within this campus and accommodate strategic airside expansion opportunities that are limited in this campus.<sup>29</sup>

The full list of urban design guidelines applicable to the Terminal Area Campus and Airport Gateway Campus can be found in Appendix I.

#### 4.6 Ottawa Macdonald- Cartier International Airport Master Plan

##### 4.6.1 Master Plan Objectives

The chief purpose of the Airport Master Plan is to identify and protect sufficient lands to safeguard sustained functioning and service quality in the expansion of the airport to 2030 and further. The plan also defines the long-term development of facilities that will be necessary to support the OMCIA to meet its strategic objectives while efficiently accommodating the needs of travelers and the region it serves. The plan works not only as an outline for the development of the Airport's physical infrastructures; it also offers a snapshot of its current facilities, settings and capabilities; studies future needs and establishes the land use plan for the Airport. The Master Plan addresses passenger terminal, airfield, cargo, ground transportation systems, airport environment and environmental impact, employment and business areas, support and auxiliary facilities that are necessary to enhance the overall operating productivity of the Airport.<sup>30</sup>

##### 4.6.2 The OMCIA 2008 Land Use Plan Designations

Our study area is comprised of the following land use designations according to the Airport Master Plan (2008)<sup>29</sup> (as seen in Appendix K):

###### Commercial aviation/ Non-Aviation Employment Area

The purpose of this land use designation is to maximize the ability of the airport lands to be developed for both aviation and non-aviation uses. As a result, a variety of mixed uses that are related to both aviation industries such as car rentals, airside cargo, and flight schools; and non-aviation uses with typical business park characteristics such as restaurants, light manufacturing, athletic and indoor recreational centers, research and development, etc. are allowed on these lands.

#### Government Employment Area

Land masses within the Government Employment Area are currently occupied by airport agencies as well as by Federal government departments such as the National Research Council, DND (Department of National Defence), Canada Aircraft Services Hangar, and Transportation Safety Board Laboratories.

#### Terminal Area

The Terminal Area constitutes lands that are related to the airport passenger and aviation operations. This area is comprised of the terminal building, curb frontage, road systems, terminal surface access and parking facilities.

#### 4.6.3 Strategic Direction

From a strategic standpoint the Airport planning forecasts long-term development of the Ottawa Airport with focus on the following topics:

- The socio-economic profiles of the local and regional communities that the Airport serves
- The type of aviation activity that is envisioned to serve throughout its planning perspective
- The continuous work with different levels of government, the public and major stakeholders
- To ensure the safe operation of the airport
- To champion environmental management
- To provide a dynamic milieu where creative personnel can contribute to the viability and socio-economic progression of the community
- To foster leadership in sustainable planning, administration and operation of the airport industry

#### 4.6.4 Policy and Governing Framework Affecting the OMCIA and Corresponding Lands

The City of Ottawa's Official Plans from both 2003 and 2008 reflect the 1997 RMOC plan, which was created prior to transferring the airport from the federal government to OMCIAA (see Figure 5). As a result a number of policy inconsistencies have been identified between the Airport Land Use Plan and the former policies. It is understood that these policy inconsistencies will be excluded through coordination between governing authorities in order to pave the way for the future development of the Airport lands.<sup>29</sup>

## 4.7 National Capital Commission Greenbelt Master Plan

In both the Greenbelt Master Plan (1996) and the Greenbelt Master Plan Review (2013), the main land planning policy document of the NCC, OMCIA is described as the capital's international gateway and a major attraction requiring special planning attention.<sup>31</sup>

The Ottawa Macdonald-Cartier International Airport and the NCC have reached an agreement regarding the exclusion of Airport lands from the "Greenbelt" designation on the condition that leased Airport lands and subleased lands south and west of the airport will be protected to create a natural link. The agreement, finalized in November 2013, also includes the protection of the Lester Wetlands as a Core Natural Area and the future identification and inclusion of the Leirrim Wetlands (as Core Natural Area), including linkages to the Pine Grove Sector to the North.<sup>31</sup> Core Natural Areas protect ecologically sensitive habitats, including provincially or globally significant wetlands. The primary goals of Core Natural Areas are to protect biodiversity and ecosystem health and improve it. This designation allows low-impact multi-use trails or boardwalks, ecological research, low-impact federal training activities and existing residential and non-residential facilities that do not have a permanent negative impact on ecosystem health. The agreement only affects the study area through the PSWs identified earlier.<sup>31</sup>

## 4.8 City of Ottawa Official Plan

### 4.8.1

Ottawa City Council adopted the City of Ottawa Official Plan (OP) in 2008. The City of Ottawa is committed to sustainability and this theme is prevalent throughout the OP. The City of Ottawa defines sustainable development "as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs". All future development within the City of Ottawa including future development on the airport lands should try to achieve the goal of being sustainable.<sup>5</sup>

The City of Ottawa is committed to creating a better-balanced transportation system that places greater emphasis on transit, cycling and pedestrian facilities to improve mobility and access for all citizens. The OP is a tool that is used to help the City achieve the goal of a multi-modal network. The OP encourages land-use patterns that reduce the need to travel great distances across the city and encourages alternatives to automobile travel. The OP encourages all new developments to incorporate pedestrian friendly features as it reduces dependence on the automobile and improves universal accessibility, as described in section 2.3.1(8).<sup>5</sup>

The development of an intermodal passenger transportation centre on airport lands would help the City of Ottawa achieve its goal of improving the Capital Region's transportation network. An intermodal passenger terminal would connect

the airport to the rest of the city and offer passengers the opportunity to use an alternative to the automobile to travel to and from the airport. This would greatly improve the sustainability and customer service aspects of the airport, which would result in a net positive gain for the airport's authority's image and revenue stream.<sup>5</sup> Although the lands of the Ottawa Macdonald-Cartier International Airport are subject to federal jurisdiction the Ottawa OP establishes land use designations for the OMCIA and the surrounding area. The majority of the OMCIA lands are designated urban area and the City of Ottawa's comprehensive OP Zoning By-law should be considered as much as possible.<sup>5</sup>

The OMCIA lands are given their own area designation, known as Macdonald-Cartier International Airport. Section 3.10.1 of the Ottawa OP states permitted uses in the Ottawa Macdonald-Cartier International Airport Designated lands as follows:

- a. Civilian or military airport with a broad range of aviation related uses including: a commercial civilian airport, a general aviation aerodrome; air cargo distribution centres; [Amendment #76 September 09, 2011]
- b. Uses permitted in Employment Areas as described in Section 3.6.5; [Amendment #14, September 8, 2004]
- c. Hotels and related commercial uses. [Amendment #76, OMB File #PL 100206, September 27, 2011]

Proposed development not in areas reserved for core aviation functions and environmental protection will require more detailed land use plans to be reviewed by stakeholders including the City of Ottawa. Design guidelines and technical studies will also be required. Development proposals may also be considered on a case-by-case basis for approval without a concept plan if constraints are adequately addressed and uses are consistent with the existing Airport Master Plan (Amendment #76, OMB File # PL100206, September 27, 2011).

The specific designation of the OMCIA in the OP recognizes the important role the airport plays as a transportation, economic and employment gateway within the National Capital Region.

#### 4.8.1 Airport Zoning Regulations

The Ottawa Airport Zoning Regulations (OAZR) are federal regulations under the Federal Aeronautics Act these apply to all lands, including public road allowances adjacent to, in the vicinity of the airport or in line with runways. The regulations are the means through, which to:

1. Limit the height of new buildings, structures and objects, including natural growth,

2. Prohibit within the Outer Limitation Surface, electronic interference with any signal or Communication to or from an aircraft or any facility used to provide services to aeronautics;
3. Restrict land uses and activities which attract birds that create a hazard to aviation activity.

The OAZR also apply to lands outside of the "Airport Vicinity Development Zone" where these lay within the runway approach surfaces.<sup>5</sup>

#### 4.8.2 City of Ottawa Zoning By-law 2008-250 Consolidation

Zoning by-laws control the use of land in the City of Ottawa and put the OP into effect and provide for its day-to-day administration. The lands outlined in the study area currently fall into two Zoning By-law categories (1) Air Transportation Facility (2) Environmental Protection (EP3). The majority of land owned by the airport authority is in the Air Transportation Facility Zone and is within the urban boundary. There is high potential for development at the north and west portion of the OMCIA land because it is within the urban boundary and is serviced by municipal utilities.<sup>5</sup>

##### T1A-Air Transport Facility Zone (Sec-207-208)

The majority of the study area is zoned as Airport Transport Facility. The purpose of the Airport Transportation Facility Zone is to permit air transportation facilities and aviation-related uses and to permit a range of employment uses and airport-related commercial industrial uses at the Ottawa Macdonald-Cartier International Airport. In accordance with Section 207 (1) of the By-law, airport and related facilities, light industrial uses, parking garages, parking lot, truck transport terminal, and warehouse are permitted in this zone. In addition, the T1A subzone also permits; Automobile rental, bank, bank machine, bar, convenience store, drive-through facility, emergency service, gas bar, hotel, office, museum, municipal service center, park, place of worship limited to a prayer room, personal service business, post office, research and development centre, restaurant, service and repair shop, technology industry, training centre. Section 208 (1).<sup>5</sup>

In the T1A subzone, ancillary uses are also permitted as follows: amusement center, place of assembly, recreational and athletic facility, retail food store, and retail store provided they are located in a building containing an airport passenger terminal. The maximum allowable floor space index for an office or a hotel in the T1A subzone is 2.0.5

It is important to note that the City of Ottawa can amend the zoning to allow for a greater range of complementary uses. The project group recommends that the City of Ottawa work with the Airport Authority to examine new uses that could be implemented as this area continues to grow and develop.

#### EP-Environmental Protection Zone (Sec. 183-184)

The EP Zone is a buffer that surrounds the OMCIA lands that are zoned as Airport Transport Facility. The purpose of the EP-Environmental Protection Zone is to: (1) Recognize lands which are designated in the Official Plan as Significant Wetlands, Natural Environment Areas and Urban Natural Features that contain important environmental resources which must be protected for ecological, educational and recreational reasons; (Bylaw-2012-334), (2) Permit only those uses which are compatible with and assist in the protection of the environmental attributes of these lands, or are in keeping with applicable Official Plan policies; and (3) Regulate development to minimize the impact of any building or structures within these environmental areas. In the EP Zone environmental preservation, education and forestry operations are permitted subject to the provisions of subsection 183 (2).<sup>5</sup>

### 4.9 Ottawa Transportation Master Plan (Draft), 2013

The City of Ottawa's Draft Transportation Master Plan (TMP) was released to the public on October 9th, 2013. The TMP is the City of Ottawa's blueprint for planning, developing and operating its walking, cycling, public transit and road networks over the next twenty years.<sup>3</sup> The vision of the TMP is "To enhance our quality of life by supporting social, environmental, and economic sustainability in an accountable and responsive manner."<sup>3</sup> The TMP addresses two themes: (1) The expansion of rapid transit and transit prioritization networks, and (2) The development of rapid transit and transit stations into multimodal hubs integrated with the surrounding community. The draft TMP is strongly focused on affordability and prioritizes projects based on financial criteria and fiscal constraints. As a result of financial considerations the City of Ottawa proposes two network plans:

- The 2031 Rapid Transit and Transit Priority Concept; and
- The 2031 Affordable Rapid Transit and Transit Priority Concept.

#### 4.9.1 Rapid Transit and Transit Priority Concept (2031 RTTP)

The 2031 Rapid Transit and Transit Priority Concept (RTTP) consist of both approved and proposed projects including an O-train station at the Ottawa Macdonald-Cartier International Airport. This station would be part of a larger rail transit network that would connect the City of Ottawa from North to South (see Figure 8). The 2031 network may not be fully implemented by 2031 as Ottawa City Council's priorities and the City of Ottawa's fiscal position changes with time. However, Ottawa City Council adopted a motion on November 26th, 2013 to amend the North-South Corridor Environmental assessment to allow for a diesel O-train extension to Bowesville Road with new O-train stations at Gladstone, Walkley, South Keys, Leitrim and Bowesville.<sup>32</sup> As part of the addendum to the North-South Corridor Environmental Assessment, the City of Ottawa will work with the Airport Authority to develop an

extended scope of work that includes a jointly funded analysis of potential future alignment options that would maximize ridership from the Airport and surrounding employment uses, while providing necessary service to the growing community south of the Airport.<sup>32</sup> As a result of this it is important for the City of Ottawa to protect lands that would be required for the eventual implementation of the O-train extension, such as through the transfer of transit corridors or rights of ways through planning application approvals, or the purchase of surplus railway right-of-ways and selected utility corridors (e.g. hydro lines) as they become available.<sup>3</sup> The 2031 RTTP concept is the final goal that the City of Ottawa envisions for its transportation network but it may not be implemented within a reasonable time frame, so it is important the Airport Authority look at all the available options to improve its immediate connection to the city (e.g. bus lanes).



Figure 8: Rapid Transit and Transit Priority Concept in relation to the Ottawa Macdonald-Cartier International Airport<sup>3</sup>

**4.9.2 Affordable Rapid Transit and Transportation Priority Network**  
The City of Ottawa recognizes that large infrastructures projects can be costly and that they should be as affordable as possible. Due to financial considerations, the TMP recommends the implementation of a subset of the 2031 RTTP Network Concept, called the Affordable RTTP Network (see Figure 9).<sup>3</sup> The Affordable RTTP Network will provide the City with many of the same benefits of the 2031 RTTP within the City's projected funding envelope.<sup>3</sup> The prioritization of rapid transit projects was a result of a complex exercise that evaluated each project on several factors such as ridership gains, opportunities for land use intensification, congestion reduction and operating cost savings.<sup>3</sup> The Affordable RTTP Network does not include a LRT connection or O-train connection to OMCIA but bus lanes are proposed for the Airport

Parkway from Hunt Club Road to OMCIA. The capital cost of the bus lanes proposal is included in the City's road budget as it would be part of a road-widening project. The road-widening project for the Airport Parkway is explained in further detail in section 4.9.3.



Figure 9: Affordable Rapid Transit and Transit Priority Concept Map in relation to the Ottawa Macdonald-Cartier International Airport.<sup>3</sup>

#### 4.9.3 Road Network Development Report

The Road Network Development Report recommends improvements to Ottawa's road network and outlines the details on when and why certain roads are projected to be built, and how they fit within the City's affordability framework.<sup>33</sup> Analysis in this report was carried out in accordance with Phases 1 and 2 of the Municipal Class EA process, which deals with project need and justification and evaluation of alternative solutions. The objectives of the Road Development Report are to:

- Identify road improvements required by 2031;
- Provide an estimate of the costs of these projects;
- Determine the priority of each project; and
- Develop a package of affordable projects for implementation, in light of financial constraints.<sup>33</sup>

#### 4.9.4 Airport Parkway Road Improvements

A traffic and safety audit conducted by the City of Ottawa found the Airport Parkway

to be a high-risk road and as a result new light standards were added in 2007-2008. The Transit Master Plan (2008) recommends widening 7km of the Airport Parkway between Hunt Club Road and Macdonald-Cartier International Airport. The project would widen the Airport Parkway from two to four lanes, including northern realignment south of Hunt Club Road. The rationale behind the road widening is that it would accommodate growth in Riverside South and Leirtrim and improve access to and from the Ottawa Macdonald-Cartier International Airport. The widened road would be able to accommodate bus lanes, which would significantly improve bus service to the airport. The total capital cost estimate of this project is \$31,400,000 with construction costs accounting for \$16,000,000. The TMP also recommends the widening of the Airport Parkway from two to four lanes between Brookfield Road and Hunt Club Road, the total capital cost estimate is \$36,200,000 with construction costs accounting for \$18,500,000.<sup>33</sup> This would accommodate increased traffic and improve access to and from the Ottawa Macdonald Cartier International Airport.

The Road Development Report also found that both Albion Road and Lester Road are predicted to operate well above capacity by 2031. This is due to the fact that these roads form the shortest path for trips to the Airport Parkway, which is the most direct route to the downtown from the South Urban Community. The congestion on these roads will not only impact local residents but will also affect the usefulness of downstream capacity increases to the Airport Parkway. The report recommends five alternative solutions to address the issues around downstream capacity (see Figure 10):

- Widen Lester Road and/or Albion Road;
- Construct an Albion Bypass to the Airport Parkway;
- Widen Conroy Road;
- Improve connections to Limebank Road; and
- Intersection improvements and traffic calming.<sup>33</sup>

The Road Network Development Report recommends the widening of Lester Road between the Airport Parkway and Bank Street as the preferred alternative as this option can be implemented at relatively low cost without having to purchase additional property. The widening of Lester Road will accommodate growth in Riverside South and Leirtrim and divert traffic from Albion Road. The widening of Lester Road has a total capital cost estimate of \$16,800,000 with base construction costs totalling \$8,600,000. The Road Network Development Report also recommends the implementation of additional traffic calming measures along Albion Road north of Lester Road. However, the Road Network Development Report does not recommend the construction of an Albion Bypass as part of the TMP because it would require

a large amount of property to be acquired from the National Capital Commission and the construction of new structures under Lester Road, the O-Train extension, and the Parkway. In addition the proposed alignment of the bypass travels through sensitive wetlands that would be damaged by the presence of a new road.<sup>33</sup> In conclusion, the road network will be improved to increase capacity on the Airport Parkway, which will leave enough room for dedicated bus lanes. Express bus service that utilizes these bus lanes will serve as an important component of a successful intermodal passenger terminal.

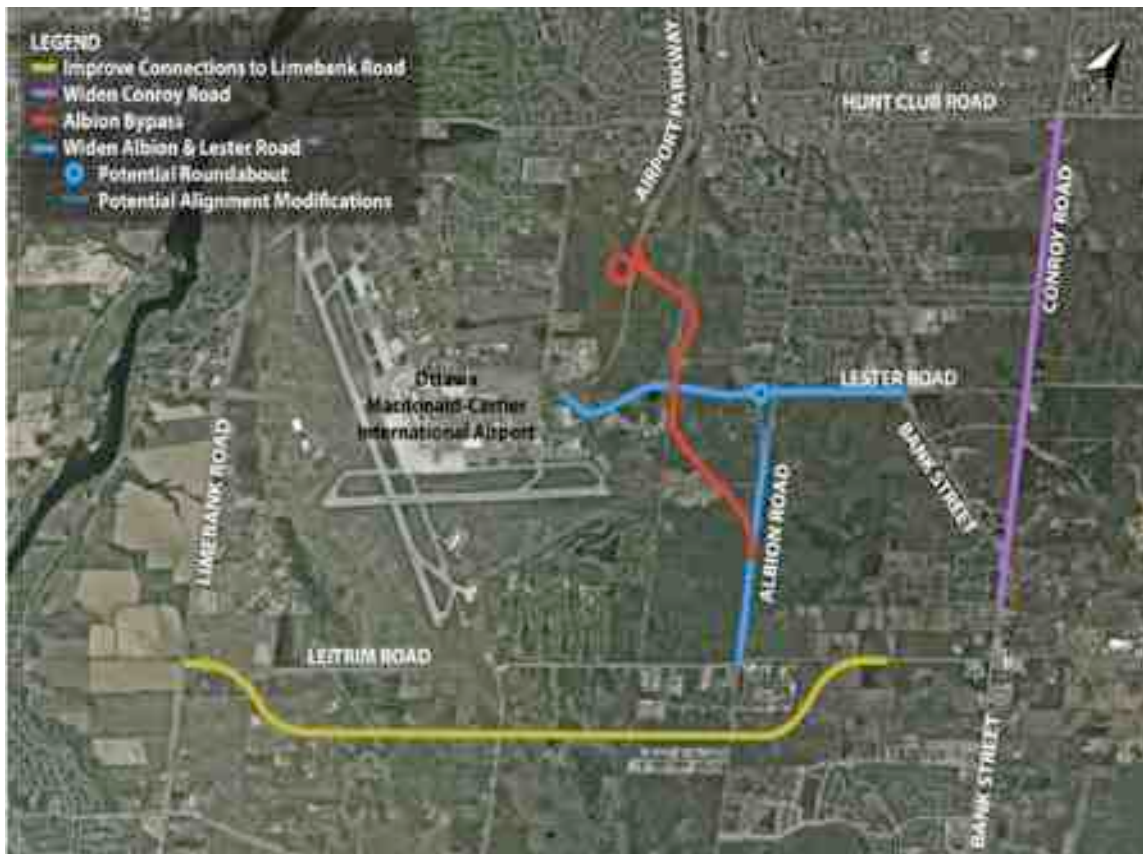


Figure 10: Alternative South Urban Area Road Improvements.<sup>33</sup>



## 5.0 Airport Concepts

There are several concepts which have formulated and continue to shape theories on airport planning which are important to consider in a bid to design a multi-modal transportation centre which will enhance the Ottawa Airport while making the airport more accessible to the Ottawa region. "If steps are taken quickly, there is an exciting opportunity to structure much more efficient communities and to harmonize air and other modes into a great intermodal transport system for the future." - Conway (1977, p. 2) -

Just as the location of waterfront wharves, railroad stations and regional highway systems were once the primary transportation networks influencing urban development, in The Airport City and the Future Intermodal Transportation Systems H.M. Conway asserts that the airplane is the present dominant mode of transportation that will shape development patterns. Conway cautioned that much of the development around airports is unplanned and disorganized but that through proper planning the opportunity to create efficient intermodal transportation systems exists.<sup>34</sup> Conway's ideas and concepts for larger scale commercial airports as multi-modal transportation hubs and centres for a variety of airport related office/ industrial park and cargo distribution centres is likely a possible development option for most cities.



Figure 11: Aerotropolis as envisioned by airport theorists including John Kasarda and Ashford, Mumayiz and Wright.<sup>35</sup>

In *Airport Engineering - Planning, Design, and Development of 21st Century Airports* Fourth Edition by Ashford, Mumayiz, & Wright acknowledge the pioneering airport city planning and design work of Conway, and explain the rise of the Aerotropolis concept from the original more basic role of the airport.<sup>35</sup>

Airports have traditionally served as a point of change of travel mode by passengers and freight. While airports have grown larger and more sophisticated over time, their basic function did not change until the 1990s with the onset of globalization. Ashford, Mumayiz, & Wright cite the internet, satellite communication and navigation and a global shift in politics as the instruments of change causing many airports to outgrow their original transportation centre role to become major multi-modal nodes. Important to the concept of the airport city and the Aerotropolis is the standing of the city as a global city. Based on the 1998 work of the Globalization and World Cities Study Group and Network (GaWC), Ashford, Mumayiz, & Wright list the economic, political, cultural and infrastructural characteristics of the global city. Further referencing the 2008 city rankings work of the GaWC, Ashford, Mumayiz, & Wright list and illustrate the world's global or alpha cities indicating that London and New York stand out as the only ALPHA ++ cities and Toronto emerging as the only Canadian example of global city with a ranking of ALPHA.<sup>34</sup> Just as Conway noted that most airport development was unplanned, so too do Ashford, Mumayiz, & Wright observe that airport-centric development has initially been ad hoc.<sup>34 & 35</sup> With strong air traffic growth and nearby commercial and employment development, Ashford, Mumayiz, & Wright indicate that ten airports have evolved to major nodes taking on many of the functional and spatial characteristics of a traditional central business district and can be characterized as an Aerotropolis. Aerotropolis is simply a term used to describe the airport-centric city.<sup>35</sup>

Ashford, Mumayiz, & Wright point out that the importance of non-aeronautical revenue generation for airports, the need of developers for affordable commercial development land and constant growth in air passenger and air cargo traffic. Airports, acting as a catalyst for landside business development, combined with existing transportation infrastructure and land availability are the main factors that have caused the creation of airport cities or the Aerotropolis (see figure 11). The Aerotropolis, largely emerging ad hoc and spontaneously as a result of municipal and transportation planning practices, has given rise to traffic congestion, parking shortage, lack of public transportation and safety concerns.<sup>35</sup> "Building appropriate multi-modal ground transit systems and locating commercial facilities consistent with the form and function of the Aerotropolis would contribute substantially to the emerging needs of business, more efficient cargo and passenger flows, and the future competitiveness of urban areas."<sup>35(p.671)</sup>

John Kasarda is one of the leading advocates of the airport city concept. "North Carolina business professor John Kasarda, who coined the term "Aerotropolis," said that in order to be economically successful in the future, airports could no longer afford to follow

the “spontaneous, haphazard” development pattern of the last few decades. Because airports are congested and running out of land – and because their patrons arrive without cars – these new, high-end business centers will have to be nodal and mixed-use.”<sup>36</sup>

Fulton (2008) asks the question “What land use creates the more pedestrians than any other?” The answer: airports.<sup>36</sup>

“Every single person who arrives at an airport from out of town arrives without a car. At many airports, the first vehicle in which people ride after landing is a train of some sort. So what’s the rush to put them into cars? A “new urbanist airport” may seem like an oxymoron. But according to aviation planning experts speaking at the American Planning Association conference in Las Vegas, such design principles may be the key to the sustainable airport of the 21st Century.”<sup>36</sup>

Peter Calthorpe coined the term “transit oriented development” and usually this is in reference to developments along bus or train routes but can this also include airports? Denver international and Dallas/Fort Worth International airport are examples of airport developments with planned transit stops to connect the airports with the downtowns. When asked about the possibility of a New Urbanist Aerotropolis, Elizabeth Plater-Zyberk provided Ørestad in Denmark as an example and stated that getting a train there is the first thing you have to do.<sup>37</sup>

In contrast, Chiambaretto, Baudelaire, & Lavril state that “Intermodal products are generally not attractive enough to attract significant numbers of passengers, however, in part because of their complexity.”<sup>38(p.50)</sup> Chiambaretto, Baudelaire, & Lavril offer combined air-rail tickets utilizing through baggage handling, coordination of timetables and delay guarantees as techniques which may increase passengers willingness to pay but caution that business and pleasure travellers have different expectation and attitudes toward intermodal travel.<sup>38</sup>

While developers, the public and likely many urban planners have hailed airports as one of the ultimate LULUs (locally undesirable land uses) only appropriately located on the urban fringe, they have, in contrast, been the catalyst for nearby residential development. Kasarda admits that large airport projects double as large public infrastructure investment programs bringing in new roads and services which make the airport area attractive to developers.<sup>37</sup> Efficient multi-modal ground transportation to offset the externality of increasing road traffic congestion is an important and integral part of first-class modern airport planning.<sup>35</sup>

Airport Type	Airport Function					
	Passenger/ Cargo Loading & Unloading	Multi-Modal (Rail & Road)	Terminal Retail Facilities	Multi-Functional Airport Centric Development	Mixed Use Airport Centric Developmnet	CBD Func- tion/ Airport- Centric City
Basic	●	○				
Airport Village	●	○	●			
Airport Community/ City (Inside Fence)	●	●	●	●		
Airport TOD (Inside and/ or Outside Fence)	●	●	●	●	●	
Airport City/ Aer- otropolis (Outside Fence)	●	●	●	●	●	●

Table 2: Airport functions required to develop given airport theories

● Required ○ Optional

Table 2 summarizes the progression of airport types from basic passenger and cargo handling centres to Aerotropolis based on the types of functions or land uses contained inside and outside the airport grounds. Ottawa Macdonald-Cartier International Airport (OMCIA) contains a variety of retail services at its terminal and is multi-functional with a mix of government and private airport related businesses operating on or near the airport grounds. Based on the criteria summarized in Table 2, OMCIA can best be characterized as an airport village due to the lack of a multi-modal hub or centre to integrate the airport related land uses on and in proximity to the airport and in relationship to the city centre and CBD.

## 6.0 Comparative Case Studies

### 6.1 Introduction

Most airports of considerable size around the world are served by some form of high-capacity public transit infrastructure. Although every airport differs in annual passengers, regional context and terminal design, an intermodal transit centre of some form is always present with this high-capacity service. Under this project, it was important to examine a variety of cases from around the world to identify their best aspects as well as some lessons to learn from their implementation.



Figure 12: LYS Airport and high speed rail station<sup>39</sup>

The airports have been analyzed with two goals in mind. The first is to determine the mode of transit service that is appropriate for YOW given its basic characteristics: annual passengers, surrounding population, and distance to the centre of the city. The second is to determine the characteristics of the intermodal centre based on terminal context, range of transportation modes and adjacent commercial development. A summary of the comparison of all airports using all analysis criteria is provided in Appendix L.



Figure 15: SEA Airport transit line<sup>42</sup>

## 6.2 Case Selection

### 6.2 Case Selection

Taking into account the long term nature of this project, the 2044 forecast of 12 million annual passengers for YOW was considered the benchmark when identifying comparable airports. Case studies have been chosen to reflect the range of transit services and inter-modal transit centres for airports of various sizes around this benchmark. We have selected:

- Airports of a comparable size to see what scale and technology are appropriate for YOW's ultimate build-out
- Airports of a greater size to learn from the largest and best practices around the world for intermodal transit facilities
- Airports of a smaller size to gather short term ideas for the interim years

Very small airports and/or non-international airports were avoided because they did not compare well to YOW's build out size, and often did not include a high quality public transit service. The largest international airports, including new Asian airports were also avoided because they tend to be single phase airport megaprojects that do not compare well to the phased expansion that Ottawa plans to undergo in the coming decades.

Twelve airports from around North America and three international airports have been selected, as shown in Table 3.

Table 3: Case study airport locations and codes

Airport Name	Location	Airport Code
Edmonton International	Edmonton, Alberta	YEG
Minéta San José International	San José, California	SJC
Lyon-Saint Exupéry Airport	Lyon, France	LYS
Oakland International	Oakland, California	OAK
Lambert-St. Louis International	St. Louis, Missouri	STL
Calgary International	Calgary, Alberta	YYC
Portland International	Portland, Oregon	PDX
Lisbon Portela Airport	Lisbon, Spain	LIS
Vancouver International	Vancouver, B.C.	YVR
Salt Lake City International	Salt Lake City, Utah	SLC
Oslo International	Oslo, Norway	OSL
Seattle-Tacoma International	Seattle, Washington	SEA
Toronto-Pearson International	Toronto, Ontario	YYZ
Miami International	Miami, Florida	MIA
San Francisco International	San Francisco, California	SFO

Figure 14: Vancouver's Skytrain Canada Line near YVR-Airport Station<sup>41</sup>

### 6.3 Case Study Analysis by Transit Mode

This analysis aims to determine the appropriate mode of transit service for the Ottawa Airport based on the annual passengers, surrounding population, and distance to the centre of the city of the case studies. Frequency of service is also analyzed. The details of each airport are shown in table 4, as sorted by annual passenger count. Ottawa is included in its present state and at the build out horizon for reference:

This analysis aims to determine the appropriate mode of transit service for the Ottawa Airport based on the annual passengers, surrounding population, and distance to the centre of the city of the case studies. Frequency of service is also analyzed. The details of each airport are shown in table 4, as sorted by annual passenger count. Ottawa is included in its present state and at the build out horizon for reference:

#### 6.3.1 Service Population

Service populations range from just above 1 million, which is comparable to Ottawa today, to upwards of 6 or 7 million. Every city with a population above 2 million is served by a rail transit service of some kind. Since Ottawa's population is expected to approach 2 million by the 2044 planning horizon, it would seem appropriate to expect an air-rail link by that time as well. Until the city reaches that size however, a bus-to-train service would seem appropriate.

Looking at Table 4 it also becomes evident that comparing airport transit services by service population alone is not appropriate. Calgary, for example, experiences double the passengers of Edmonton, even though they are very similarly sized cities. Seattle, at 33 million passengers per year, compares well to Toronto in its throughput despite the fact that Toronto's population is almost 2 million more. These disparities exist because some airports act as regional or transcontinental hubs due to a variety of other factors like geography (Seattle's pacific-rim location) or industrial growth (Calgary's natural resources sector). Due to this unclear relationship, annual passengers must be analyzed in tandem to service population in this analysis.

Table 4: Case Studies sorted by Annual Passenger Count

Case Study	Service Population (Millions)	Annual Passengers (Millions)	Distance from downtown	Primary Mode of Transit
Ottawa (2013)	1.2	4.6	13 km	Bus to Train
Edmonton	1.2	6.7	26 km	Bus to Train
San José	2	8.4	4 km	Bus to Train
Lyon-S.E.	2.9	8.4	20km	High Speed Rail, Light Rail (see figure 12)
Oakland	7 (Metro)	10.1	14 km	People Mover to Light Rail (2014)
Ottawa (2044)	1.9 <sup>45</sup>	12.1	13 km	N/A
St. Louis	2.9	13.3	16 km	Light Rail
Calgary	1.2	13.6	17 km	Bus
Portland	2.3	14.3	14 km	Light Rail (figure 13)
Lisbon	3	15.3	7 km	Light Rail
Vancouver	2.3	17.6	13 km	Light Rail (see figure 14)
Salt Lake City	2.3	21	6.4 km	Light Rail
Oslo	1.5	22.1	35 km	High Speed Rail
Seattle	3.9	33	22 km	Light Rail (see figure 15 & 16)
Toronto	5.6	35	23 km	Bus to Train, Express Rail (2015)
Miami	5.6	39.5	13 km	People Mover to Light Rail
San Francisco	7 (Metro)	44.5	21 km	Light Rail (see figure 17)

### 6.3.2 Annual Passengers

As seen in Table 4, case study airports range from the smaller Edmonton International Airport with 7 million passengers, to Miami and San Francisco with closer to 40 million passengers. While all of these are larger than the current YOW passenger count at 4.6 million, many of them compare favourably with its ultimate build out at 12.1 million passengers.

Airports that are slightly larger than YOW (Edmonton, San José) currently provide bus service connecting to rapid transit, similar to Ottawa. Once the annual passenger count reaches 10 million however, all case study airports (with the exception of Calgary) provide a direct air-rail link. It can be said then that once Ottawa reaches these numbers in the in the 2030-2040 horizon, a light rail connection servicing the terminal would be appropriate.

The two cases that include High Speed Rail are important to note, because they aren't necessarily the highest among the case studies in terms of annual passenger counts. The presence of HSR is more a reflection of their European location, surrounded by extensive HSR networks and higher overall population densities. More detail is included later in this report on these facilities.

### 6.3.3 Distance from Downtown

Like service population, the relationship between the distance an airport is from the downtown of its service city and the type of transit that is provided is not always clear. Among airports with a smaller passenger flow like Edmonton and San José, the distances range from 26 km to 4 km, respectively, yet they are still served by buses only. Among the larger airports however, express or high-speed rail service is sometimes included if the distance to the downtown is too far. Oslo and Toronto (in 2015) reflect this situation. Ottawa is located within a reasonable 13 km from its city center so a light rail service seems appropriate based on the comparable airports.

### 6.3.4 Frequency

It is also important to look at the frequency of service provided when analyzing transit service. Table 5 shows the fifteen case studies as sorted by the mode of transit served, including the frequencies for each available service. Ottawa's present bus service is included at the top for reference.

While Ottawa's bus frequency is comparable to or better than some of the other bus-transit case studies shown in Table 5, service frequency will have to improve once a light rail line is constructed. To be comparable with these cases, light rail service in Ottawa should provide a 15-minute frequency to the airport terminal at a minimum for peak hours.

Table 5: Frequency of service for case study airports, sorted by primary transit mode

Airport	Primary Transit Mode	Frequency (minutes)
Ottawa (Current)	Bus	15 to 30
Edmonton	Bus	30 to 60
San José	Bus	15 to 30
Calgary	Bus	30
Oakland	People Mover to Light Rail (2014)	4 (People Mover) 5 to 15 (Light Rail)
St. Louis	Light Rail	12 to 20
Portland	Light Rail	15 to 30
Lisbon	Light Rail	6 to 9
Vancouver	Light Rail	6 to 20
Salt Lake City	Light Rail	15 to 20
Seattle	Light Rail	7.5 to 15
Miami	People Mover to Light Rail	Unknown (People Mover) 10 to 30 (Light Rail)
San Francisco	Light Rail	15
Toronto	Express Rail (2015)	15
Lyon-S.E.	High Speed Rail, Light Rail	15 (Light Rail)
Oslo	High Speed Rail	10

The range of frequencies common for air-rail links reflects peak and off peak hours similar to a regular transit service, however peak hours for airports can be quite different from commuter peak hours. Any service that reaches YOW will have to take this into account as well.

#### Key Observation

*For airports of up to 10 million passengers per year, most are served by a bus service accessing a nearby rail station. Above 10 million passengers however, almost every airport has a light rail service connecting the terminal to the downtown core. Many of these are comparable with Ottawa in terms of proximity to downtown and service population at Ottawa's buildout. Services frequencies for these cases average around 15 minutes.*

The purpose of this analysis is to determine the finer details of the intermodal centre based on the various terminal contexts, range of transportation modes and adjacent commercial developments that exist in the fifteen case studies. Table 6 shows a summary of these features, sorted by the type of available transit service.

#### 6.4 Case Study Analysis for Intermodal Characteristics



Figure 17: SFO light rail station<sup>44</sup>



Figure 13: PDX light rail station<sup>40</sup>



Table 6: Intermodal Characteristics of Case Studies sorted by Primary Mode of Transit

Airport Code	Transit available	Terminal Context	Other Modes	Commercial Development
Ottawa	Bus	N/A	N/A	No
Edmonton	Bus	N/A	N/A	No
San José	Bus	N/A	N/A	No
Calgary	Bus	N/A	N/A	No
Oakland	People Mover to Light Rail (2014)	Elevated, at terminal	No	No
St. Louis	Light Rail	Underground, at terminal	No	No
Portland	Light Rail	At grade, at terminal	No	No
Lisbon	Light Rail	Underground, at terminal	Bus	No
Vancouver	Light Rail	Elevated, between terminal and parkade	No	Yes
Salt Lake City	Light Rail	At grade, at terminal	Bus	No
Seattle	Light Rail	Elevated, past the parkade	Bus	No
Miami	People Mover to Light Rail	At terminal (people mover), at grade	Bus, Passenger Rail	Yes
San Francisco	Light Rail	Elevated, at terminal	Bus	No
Toronto	Express Rail (2015)	Elevated, between terminal and parkade	Bus, Regional Bus	No
Lyon-S.E.	High Speed Rail, Light Rail	At grade, 400m away from terminal (HSR and Light Rail)	N/A	No
Oslo	High Speed Rail	Underground, at terminal	Bus, Regional Bus, Passenger Rail	No

#### 6.4.1 Terminal Context

The location and inter-terminal connection of a transit service is one of the most important aspects of its design. Looking at Table 6, the specific routing and structural characteristics (elevated, at-grade, etc.) of the tail track near airport stations in the case studies varies with technology and terminal design among the light rail serviced airports. What is constant across the case studies is that the light rail station is located immediately adjacent to or very close to the airport terminal itself. This should be deemed as essential for any plans regarding YOW's terminal context for its transit service.

It is assumed that any bus service to an airport terminal will use the terminal access roads and departures/arrivals ramps to access the terminal, so they are not included in this part of the analysis.

#### 6.4.2 Other Modes of Transportation

Surprisingly, other modes of transit are not always accommodated for across the fifteen case studies. This likely reflects the tendency for transit operators to shift bus services away from airport property after light rail is implemented to gain operational efficiencies. In general, it is the largest airports (Toronto, Miami, Oslo) which include the widest variety of modes. Airports of Ottawa's size that are close to the downtown likely do not need the additional regional connections through passenger rail and regional bus services that those cities require.

This category did not include specific infrastructure for active transit, as it is common knowledge that the vast majority of airport-bound passengers aren't able to arrive via these modes. Facilities for walking and cycling should be considered a priority for Ottawa based on the significant employment population of the airport as well as the population of the surrounding neighbourhoods.

#### 6.4.3 Commercial Development

It was difficult to explicitly identify whether surrounding airport development was related to the installation of transit service at many of the case study terminals. For the purposes of this category, only airports which advertised specific adjacent developments in conjunction with transit investment were labelled positively. Miami's commercial development plans are discussed later in the report.

#### *Key Objectives*

*For airports with a direct rapid transit connection, the vast majority of cases show an intermodal centre that is either inside or directly adjacent to the terminal itself. Some are also served by regional bus services, and the largest European examples have high speed rail connections as well. Commercial developments on airport lands that have been developed as related projects to transit implementation are surprisingly uncommon.*

## 6.5 In-depth Analysis of Selected Case Studies

### 6.5.1 Vancouver International Airport (YVR)

Although YVR serves more than three times the passengers as YOW, it is a good Canadian comparison because it is located a similar distance from downtown, and has recently completed a rapid transit service to the city. YVR has also won 'Best Airport in North America' in its class for the last 4 years, so it should be considered a best practice comparison.



Figure 18: YVR on Sea Island, Richmond, BC<sup>46</sup>



Figure 19: Vancouver Transit Map including airport spur<sup>47</sup>

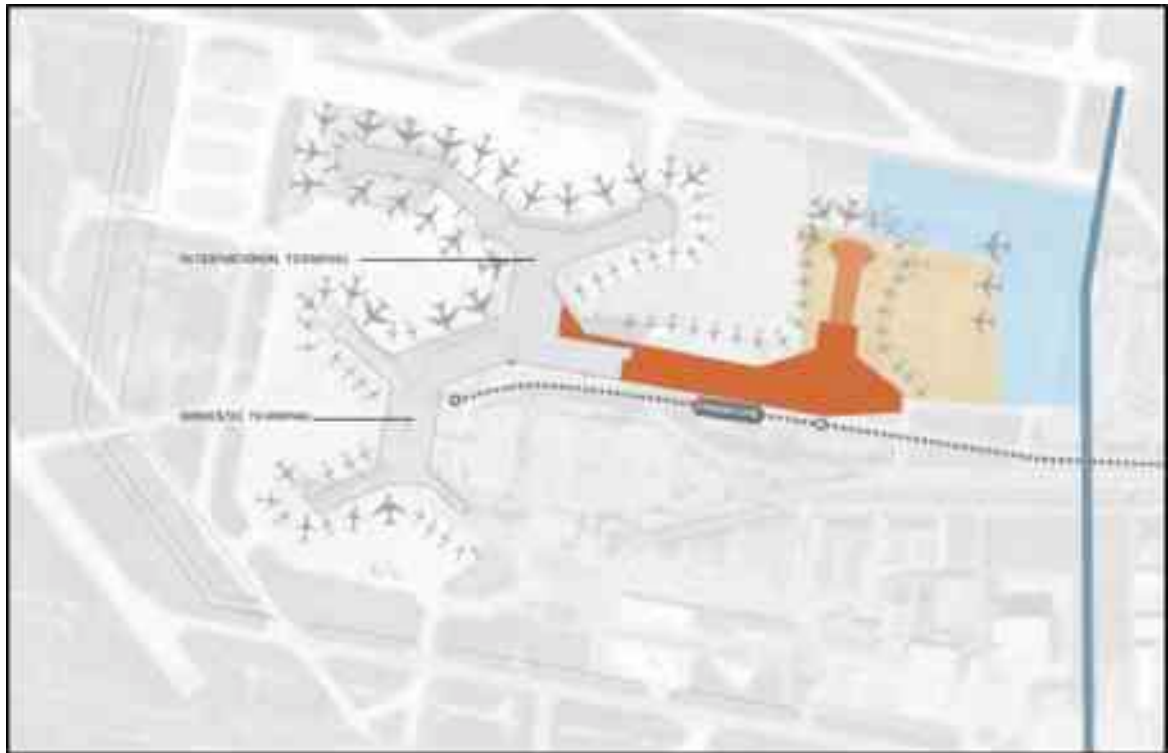


Figure 20: YVR terminal expansion map with transit stations<sup>48</sup>

The transit hub at YVR is a terminus station for the Canada Line, a rapid transit service that was completed in 2009 and arrives every 6-20 minutes depending on the time of day. As seen in to Figure 19, the airport section of the line is its own spur off of the main line servicing Richmond to the south. This spur was paid for entirely by the airport authority at a cost of \$300 million. Travel between the stations on this spur line is currently free of charge and accesses long term parking, so it can be said to also act as a people-mover of sorts for hte airport lands.

The station is located immediately adjacent to the international and domestic terminals, between the drop-off areas and the parking garage. The long term vision of the airport includes another terminal station to the east (as seen in Figure 20).

While the scope of the Canada Line and YVR is considerably larger than Ottawa, its location within the terminal should be kept in mind for this project, as well as the dual role it plays in both airport lands circulation and regional transport.



Figure 21: YVR-Airport Station, with above-grade connections to domestic and international terminals<sup>49</sup>

### 6.5.2 Oslo International Airport

The Oslo Airport (OSL) is an interesting example of a very successful ground transportation system. OSL serves over 21 million passengers per year and is located 45 kilometres north east of downtown Oslo. Constructed in 1998, the original plan for the airport included the focus on a quality rail station and transportation system, as well as high standards of design due to its national significance as Norway's largest airport.

#### Ground Transportation System: Design and Connectivity

One of the major advantages that OSL has over other airports is that its ground transportation system was master planned and built in its entirety along with the airport. The rail station is located adjacent to the terminal building with seamless access from the departures and arrivals areas thereby avoiding deterrents like transfer to shuttle buses or having to go outside into the elements. One needs only to pick up their baggage and take a short walk through the terminal to reach the escalator to the train station platform. Currently OSL is undergoing some renovations and expansion of the terminal building and rail station which is scheduled to be completed in 2017. The expansion of the terminal will occur on the opposite side of the rail station and once complete, the train station will be centrally located directly in the middle of the new terminal building (See figure 22).

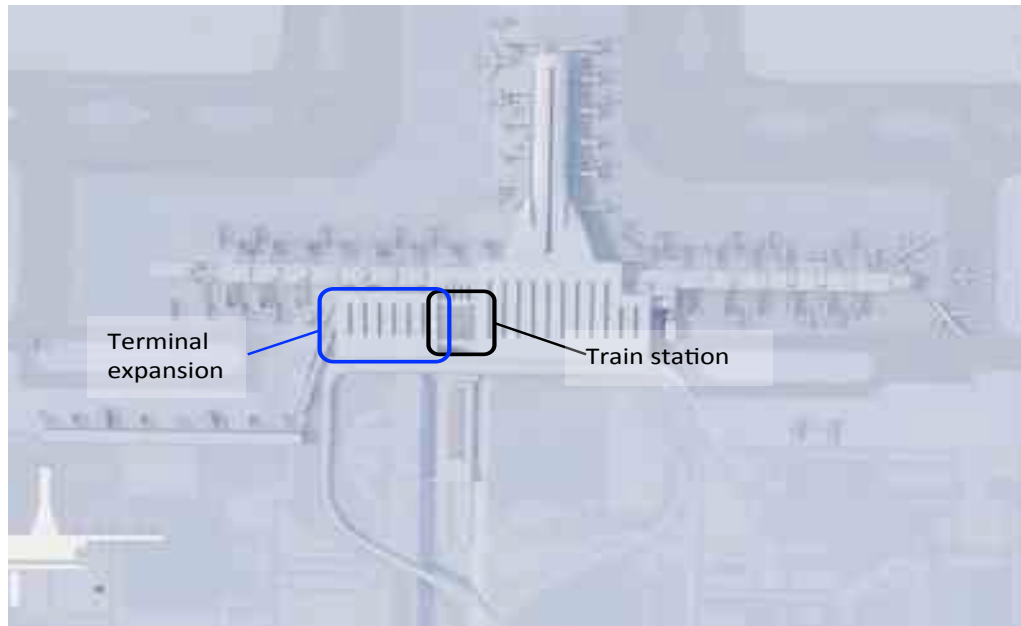


Figure 22: Entrance to train station from departures and arrivals<sup>50</sup>

The most successful mode of transportation to and from the airport is the publicly owned express rail Flytoget. It operates high speed trains every ten minutes from downtown Oslo and the airport with a total of nine stops. It takes about 19 minutes to travel between downtown Oslo and the airport. In 2012, it accounted for 32% of trips all trips to and from the airport.<sup>52</sup> The company maintains profitability with 150 million NOK recorded in 2012.<sup>52</sup> The airport is also serviced by Norway's national railway system which also acts as a feeder for long-haul flights. OSL is also serviced by six public and private bus companies one of which operates an express bus between the airport and downtown OSL every 20 minutes. Finally, taxi service and car rental are located inside the terminal building.

#### Propensity to Take Public Transit

In 2002, the Transportation Research Board (TRB) conducted a study on transportation mode share at OSL to examine the distribution of mode share between business, non-business, domestic, and international passengers. Naturally, the findings showed that domestic travellers were most likely to prefer public transit at OSL with just over 70% taking rail or bus while foreigners were slightly less likely at just over 60% (see figure 23).<sup>51</sup>

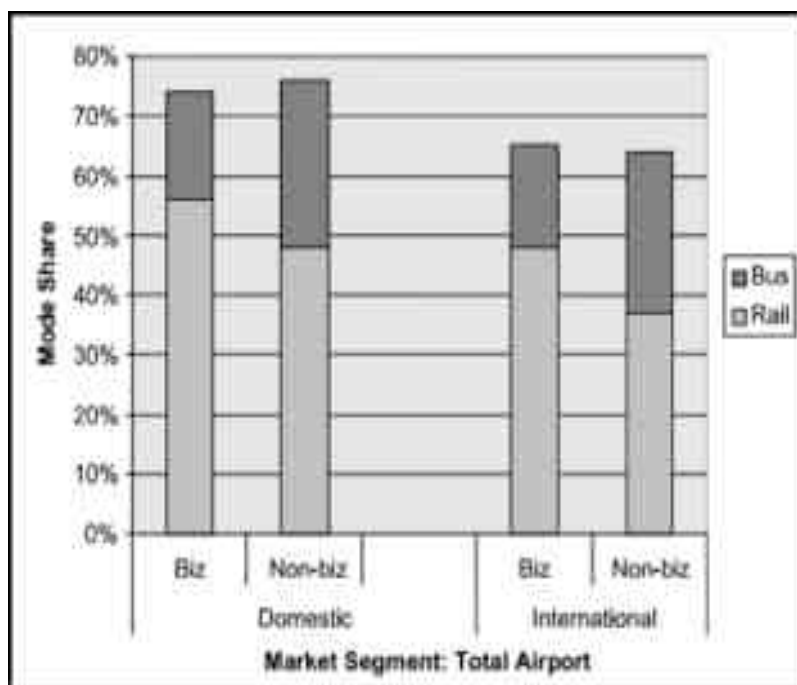


Figure 23: Comparison of mode share between international and domestic flights<sup>51</sup>

### Lessons for Ottawa

Although OSL cannot be directly compared to YOW due to differences in scale of operations and construction stages, it serves as a good example of what is possible in the future. YOW doesn't have the luxury of building the airport anew with an integrated transit terminal but all efforts should be made to locate the transit hub as close to the terminal building as possible in an attempt to mimic the seamlessness of passenger movement from air to ground transit which was achieved at OSL. The TRB study showed that the most likely travellers to take public transit are those travelling domestically. This is good news for Ottawa since about 74% of passenger traffic through YOW is domestic compared to 46% at OSL. Finally, the idea of an airport of "national significance" is taken seriously at OSL in that it was even part of the parliamentary decision which brought OSL into existence. YOW along with the City of Ottawa and the NCC should consider partnering in order to achieve a high degree of excellence in architecture, design, and display of Canadian culture given that it represents Canada's capital region.

### 3.5.3 Miami Intermodal Centre

The Miami Intermodal Center (MIC) is an intermodal transportation hub located approximately 2 km east of the Miami International Airport (MIA). It is an excellent precedent for an intermodal transportation hub that is not directly adjacent to the airport terminal. The MIA services over 39 million passengers a year and is located 13 km from downtown Miami.



Figure 24: Rendering of the MIC and rail station<sup>53</sup>

The newly constructed MIC project was estimated to cost \$2 billion USD and will provide connectivity between all forms of ground transportation available in the county. The MIC project includes the Miami Central Station (rail), a rental car centre, rapid bus service, and major roadway improvements. The Florida Department of Transportation is also pursuing private and/or public sector joint development projects to enhance the MIC's economic viability. The MIC will become the county's main transportation hub and will provide safe and efficient intermodal connectivity between MIA and South Florida's businesses and area-wide activity centers, as well as serve as a transfer point for resident commuters.<sup>55</sup>

#### Connection to MIA

Having an off-site intermodal transportation hub adds an extra transfer point for passengers travelling to the airport. It was important for the MIA to establish a seamless connection spanning the 2 km distance to the MIC. The MIA accomplished this goal by constructing the MIA Mover.<sup>55</sup>



Figure 25: Connection of the MIC to the MIA<sup>54</sup>

The MIA Mover is a light rail automated people mover (APM) offering express service between the MIA and the MIC. It provides service every 2 minutes between the hours of 5:00 am and midnight, with an on demand call-button service for the remaining hours. The MIA Mover benefits air travellers as well as airport employees commuting to the MIA. It is estimated that 30 percent of vehicular traffic was removed from the roadways and passenger traffic at the terminal curb-fronts was also reduced.<sup>55</sup>

#### Land Development Opportunity

Similar to the OMCIAA, an important goal for the MIC project was a land development strategy to offset the costs of the project. The Florida Department of Transportation hoped to offset capital and long-term operating costs of the MIC through joint private and/or public sector development

The joint development component of the MIC project consists of public and private ground lease development opportunities. It can use up to 1.4 million square feet of mixed-use development that may be built in conjunction with the Miami Central Station. Possibilities include: offices, hotel and meeting space, parking, ancillary retail and restaurants. The Florida Department of Transportation may either lease or sell these joint development parcels to a private developer or another public agency. The associated development will offer a platform for a true public-private partnership where the MIC Program and private development are mutually supportive, creating transportation and economic opportunities that benefit the area.<sup>55</sup>



## 7.0 Stakeholder Consultations

The Ottawa Macdonald-Cartier International Airport is Canada's National Capital airport and its development affects a wide variety of stakeholders including the public. The geographical location of the airport and the political organization of the OM-CIA required a diverse and extensive stakeholder consultation process. The project group identified and contacted several key stakeholders to gather their opinions and feedback on a proposed intermodal transit terminal on airport lands. The project group spoke with staff from the City of Ottawa, OC Transpo, and the National Capital Commission.

### 7.1 City of Ottawa

The City of Ottawa indicated that it does not have an official position on the development of an intermodal terminal but acknowledged that the intermodal transit centre does support existing municipal policies and is in compliance with the City of Ottawa's Official Plan. Also discussed was the potential future of light rail transit (LRT) service and high-speed rail (HSR) service in the City of Ottawa. It was indicated that the City is looking towards 2031 as a timeline for the O-train expansion and that the LRT will be integrated sometime after 2031. The outcome of the spur line will be decided by 2031 and is dependent upon transit service demand and cost factors. It was suggested that a HSR route going through or adjacent to the Greenbelt would be the best idea to incorporate high-speed rail at the airport but the majority of Ottawa residents want a downtown HSR station. The City of Ottawa does not have an official position on the development of the intermodal terminal at the airport but staff have indicated that the development would support existing policies and offer a valuable service for Ottawa residents. In conclusion, the City of Ottawa recommended that the Ottawa Macdonald-Cartier International Airport Authority work with the City of Ottawa regardless on any future development as projects based on good planning principles will always try to incorporate the local community into the decision-making process.

### 7.2 National Capital Commission (NCC)

The NCC has final approval authority over capital arrival areas, Department of National Defense and National Research Council lands, and consultation rights on airside land use areas. To gather the perspective of NCC staff, the project team consulted with a group of planners from the National Capital Commission. NCC staff indicated that

they would like to see compliance with the urban design guidelines established jointly with the NCC as well as incorporation of some of the best practices implemented at other airports such as active urban areas, people oriented places, view sequences, distinctive places, public art installations and the development of high quality urban places, buildings and landscapes. This approach would require the redevelopment and/or removal of bland and outdated areas into interesting landscapes to use or view.

The NCC staff also offered their insight on the design and planning of the intermodal transit centre. They noted that connection to the terminal should be the primary design consideration in developing a multi-modal transportation centre, as the attractiveness of using public transportation is dependent upon the convenience of the trip. Furthermore NCC staff noted that the intermodal transit centre development not only needs to improve service for airline passengers but also needs to encourage and promote commercial development as LRT creates greater demand for developable land and leads to greater investment in locations near stations. The development of a high quality commercial centre and community centre would increase ridership demand throughout the week, which would further support the intermodal terminal centre as a transit hub for the City of the Ottawa and the Airport. NCC staff also noted that the intermodal transit centre should accommodate external transit providers such as Megabus and Coach Canada. NCC staff are supportive of the idea of an intermodal transit centre at the airport but are concerned that the diverse locations of bus terminals and train terminals throughout the City of Ottawa poses a serious challenge to the intermodal terminal, as it would be difficult to get all the different transit services to align at one centre.

NCC staff also noted that any development that occurs on airport lands is likely to have an environmental impact on adjacent greenbelt property either through the cumulative effect of infrastructure or through development of sensitive lands such as wetlands. As a result of these concerns, new development should not fragment environmental landscapes such as wetlands, or important linkages as these are very important. NCC staff also noted that any development that takes places outside designated provincially significant wetlands (PSW) should proceed with caution to avoid impact on Blanding Turtles, a species at risk found in the area and because federal government policy on wetland conservation requires a zero net loss of wetlands for any project. Future development on airport lands should be done in consultation with the NCC because the airport is located adjacent to the Greenbelt and any development will likely have an environment impact on these lands.

### 7.3 OC Transpo

OC Transpo is overseen by the City of Ottawa and is responsible for providing a comprehensive public transit service to nearly one million people in the Ottawa area. OC Transpo currently provides public transit service to the Airport in the form bus route 99 and route 97. OC Transpo does not have an official position on an

intermodal transit centre at the airport and supports the recommendations made in the 2013 Ottawa Transit Master Plan. Staff noted that the airport may not be an ideal location for intermodal transit centre that serves the entire Ottawa region as its location is too far from downtown Ottawa, which is where the majority of passengers wish to go. However, an intermodal transit centre at the airport would provide benefits to the airport and the surrounding community as it would provide the local community of Riverside South with access to rapid transit and Ottawa residents with improved transit access to the airport. OC Transpo already provides airport passengers with a reliable and direct service with route 97 as it uses the transitway for the majority of the trip to travel from downtown to the airport. The issue may not be with the bus service that OC transit offers but rather an issue of communication as a majority of airport passengers may not be aware of the service that OC Transpo offers to the airport. It was also noted that many travellers might not feel comfortable travelling on the bus to the airport because they feel that their luggage may intrude on other passengers as it takes up space on the bus. Issues with travelling on public transit could be improved by offering passengers real time information, customer service improvements such as being able to talk to a live customer service representative and improved bus shelters that protected customers from the elements outside. There was support for ultimately building an intermodal transit centre in the future but the financial cost of building an LRT spur line is too high at the moment (\*an estimate of \$200-300 million for a LRT spur line was made). Independent studies conducted by OC Transpo have found that building an LRT spur to the airport would exceed the costs of any perceived benefits. A spur line would cost OC Transpo more than extending bus service even with labour costs added in because the infrastructure costs of the spur line are so high. The best option going forward would be to improve bus service in the interim period by offering infrastructure improvements such as High Occupancy Vehicle (HOV) lanes on Airport Parkway and by offering customer service improvements such as providing customers with easily accessible real time information.

#### 7.4 Ottawa Macdonald- Cartier International Airport Authority (OMCIAA)

The Ottawa Macdonald-Cartier International Airport Authority is the client and the primary sponsor of this study. OMCIAA has provided the goals and vision for this project. Further consultation with the OMCIAA indicated that development surrounding the intermodal transit centre should primarily focus on offering services to air travelling passengers such as park-n-fly facilities, hotels and convention centers, and rental car centres. Secondary development surrounding the airport should offer uses that serve the general public and the local community such as office space, light industrial space, gas stations and community centres. Lastly development surrounding the intermodal centre should offer general-purpose retail such as shopping centres to serve both air travelling passengers and local residents. An intermodal transit centre will attract development and niche markets may be available

for airport commercial development. Comments were provided on each of the parcels in the development study (See Appendix B). Comments on each respective site are listed below:

#### Terminal Adjacent Area (Parcel 1)

It was indicated that this site seemed to be the ideal location for the terminus station of the O-Train line. There was some discussion over whether it was possible that this station could be part of a "loop" system, but it was determined that the turning radius for the O-train is too wide. There was not much discussion about commercial development surrounding this site, but that the small building that partially covers the site (The Transportation Safety Board) could be moved at a small cost.

#### Central Site (Parcel 2)

It was indicated that this site would be appropriate for an O-Train station with surrounding "tier 1" or "tier 2" commercial development. This site has good road access, visibility, and is not located too far from the airport to have an automated people mover (APM). It must also be taken account that the redirection of the Airport Parkway north of the Ernst & Young Centre will change the spacing of this site significantly.

#### Gateway East Site (Parcel 3)

It was indicated that this area is not particularly marketable because it doesn't have good road access, as it would require one way in and one way out from the Airport Parkway. It also has poor visibility since a tree buffer is required along Airport Parkway. It was suggested that this site could be leased to a federal agency such as the National Capital Commission or the Centre for Surface Transportation Technology (CSTT) could be relocated to this site to make more airside room for the future extended runway since they do not require visibility from the road.

#### Southern Site (Parcel 4)

It was noted that the hotel located on this site would be expensive and impractical to move and that the corner of this site will be affected by phase 5 of the terminal expansion.

#### Department of National Defense Lands (Parcel E)

The Department of National Defense currently owns this parcel of land. It was noted that the land could be acquired by OMCI AA in the future for light industrial uses, specialized retail, business park uses. It could also provide some public uses serving the Uplands community to the north. It was also noted that this site might be good to acquire for the long term as the site has frontage on Uplands road and is located adjacent to the growing community in Uplands.

## 7.5 Summary of Stakeholder Consultations

The overall impression gathered from the stakeholders is that they did not have an official position on the project but are supportive of the overall vision and goals of an intermodal transit centre. The majority of our stakeholders agreed that an intermodal transit centre located at the airport would provide a valuable service to both air travelling passengers and Ottawa residents. The intermodal transit centre represents a great opportunity to improve the City of Ottawa and its international airport. The majority of the concerns that were raised are related to cost or technicalities of the idea. The stakeholder consultation process was an important part of our project as it allowed us to gather valuable insight from the key stakeholders who would be affected by this project. The concerns that were raised in the stakeholder consultation process have been considered in the design options for the intermodal transit centre.



## 8.0 Design Concepts

The design concepts seek to maximize non-aeronautical revenue, improve the ground transportation system and enhance the passenger experience by developing an Intermodal Transit Centre on currently underutilized land. Two design concepts have been proposed based on the draft Ottawa Transportation Master Plan, 2013 transit network concepts. The City of Ottawa has identified two transit network plans in its transit master plan (See Figure 26). The 2031 concept would see an O-train spur line servicing the airport passenger terminal and the 2031 affordable concept would run along the eastern edge of airport property with no rail service being offered to the passenger terminal.<sup>3</sup> The two design concepts developed by the project group are based on the transit networks proposed in the City of Ottawa 2013 draft Transportation Master Plan. Design Concept A takes advantage of the proposed O-train extension identified in the 2031 transit network concept. Using the parcels in Appendix B as a reference, the intermodal transit centre for Proposal A would be located on parcel 1, directly adjacent to the airport passenger terminal. Design Concept B is based on the Affordable 2031 transit network concept and would offer an alternative to the O-train to service the airport passenger terminal. The intermodal transit centre would be located on site 3, adjacent to the exiting railway and would be served by the City's planned extension of the Confederation Line. The intermodal transit centre in Concept B would incorporate a Personal Rapid Transit service, which would offer passengers a direct connection from the intermodal transit centre to the airport passenger terminal. Overall, both designs seek to enhance passenger experience and maximum non-aeronautical revenue by improving intermodal connectivity and developing adjacent airport lands.

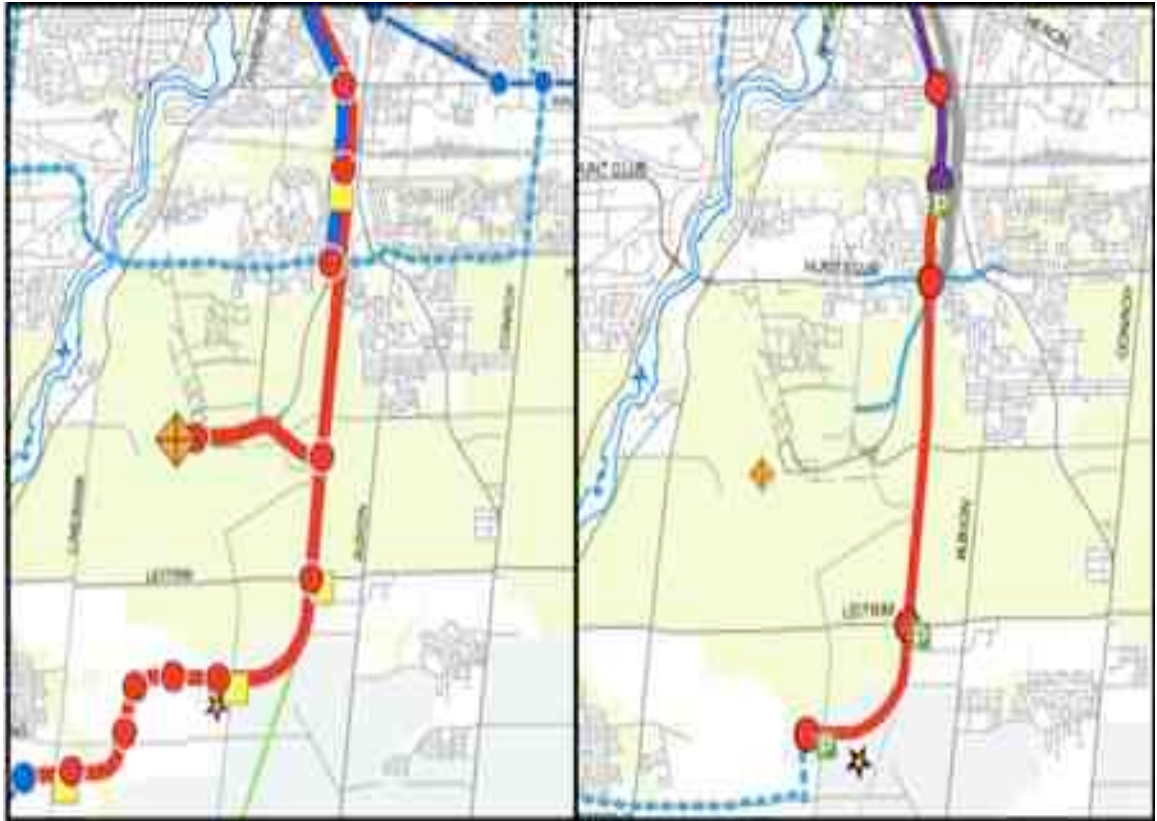


Figure 26: Spur line scenario (left) and non-spur line scenario (right)<sup>3</sup>

## 9.0 Concept A- Airport Terminal Intermodal Centre

### 9.1 Vision & Objectives

The spur rail line option dramatically enhances airport accessibility for passengers, employees and visitors, while greatly expanding the revenue-generating capacity of the study area with several supporting land uses. The project proposal is to be carried out under a transit infrastructure development scenario that includes the airport spur line connecting the airport lands with the rest of the city by O-Train (see figure 27). The transit centre will be located adjacent to the airport terminal and a secondary station will be included to service new land uses near the Ernst and Young Centre.



Figure 27: The O-Train today

This option prioritizes the needs of transit-using airport passengers by bringing them directly to the main terminal by rail transit. This will improve the overall modal split for the airport in favour of rail transit over the existing bus service, and provide a comparable service to many international airports around North America. The alignment of the spur line and two new stations within the study area form the basis for the complimentary developments in this project option. The general plan is shown in Appendix N.

## 9.2 Development Areas

### 9.2.1 O-Train Service

The spur line is envisioned as a single-track alignment with two new stations, as seen in Appendix M. The origin of the spur line would be the North-South transit corridor identified in the 2013 Draft Transportation Master Plan. Service to the airport would come from the future South Keys Station to the north of the airport lands. Frequencies would ideally range from 15 minutes (peak hours) to 20 minutes (off-peak), based on the recommendation from the case study analysis and information provided by OC Transpo. Based on the frequency of the entire north-south line, this would allow for every second or third train traveling along the network to travel to the airport terminus station. As transit demand grows at the airport and in surrounding municipalities served by the transit line, these frequencies should be re-examined.

### 9.2.2 Terminus Station Activities

This station serves as the primary intermodal transfer point for passengers and airport employees travelling from the rail platform to the terminal structure. As seen in Figure 28, it also serves as the focal point for the transit oriented development to the north. Leading away from the station, a pedestrian mixed-use path travels northwest towards Kiowa Private Drive and Leckie Private Drive. This mixed use path linking the Intermodal Centre and the business park is 30m long and takes approximately 1 minute to walk.



Figure 28: Concept A - Development site for the Intermodal Centre

New office and R&D buildings face the terminal with landscaping and easy pedestrian access. The buildings will be used for research and development and related office uses, and will include small retail/restaurant space aimed to serve the tenants of the building complex. Parking will be located at the back of the buildings and in surrounding parking lots to the north. Existing employee parking will be relocated to the Ernst and Young Station precinct at Parcel 2.

### 9.2.3 Ernst and Young Centre Station Activities

To the north of the station area will be a long-term parking parkade and employee parking lot amounting to approximately 1500 parking spaces. Space in these lots will also be designated for Park-n-Fly facilities as well. A pedestrian and cyclist connection will be made underneath the overpass from the station south towards the Ernst and Young Convention Centre which is approximate 5 minute walk. Across Uplands street at Parcel 5, a gas station, hotel, office and food service outlet expand the range of uses for this area (see figure 29).



Figure 29: Concept A - Ernst & Young Centre Station and surrounding lands

## 9.3 Site Specific Policy Constraints

The City of Ottawa's 2011 Draft Transportation Master Plan includes an airport spur in its '2031 Network' of rapid transit lines.<sup>3</sup> Although it is not proposed under the current funding regime, this airport spur was the basis for a spur line with a station located adjacent to the existing and future terminal identified in this proposal.

Buildings proposed will need to be under the Obstacle Limitation Sur-

face Identified as 45m above the airport reference point. All buildings proposed for this option are 8 storeys or less, and therefore stand below the 45m maximum height even at the highest point of our study area near Paul Benoit Driveway which is approximately 10m above the airport reference point. Since OMCIA chooses to follow the Planning Act for all but airside and airport facilities, proposed development is subject to the provincial development control processes. Parcels 1, 2, and 5 fall in areas zoned as Transportation Facility Zone in the City of Ottawa Official Plan. The uses proposed are allowable under the Transportation Facility Zone designation discussed in the background section under the City of Ottawa Official Plan, with the exception of retail uses. An amendment to the T1A zoning bylaw will be required to permit retail uses not attached to an airport terminal or within a hotel.

Provincially Significant Wetlands (PSW) within the study area have been left untouched. The PSWs within the study area and their respective 120m buffers represent a valued natural landscape that could be affected by development within the buffer. An Environmental Impact Statement would identify any developable land within the buffer that carries zero adverse impacts on the PSW.

The Airport Urban Design Plan: Guidelines are to be followed as closely as possible as they represent a collaboration between the OMCIAA and the NCC regarding the design of future airport development. Deviations from the Airport Urban Design Plan: Guidelines are identified in discussion of parcel specific development.

## 9.4 Strengths, Weaknesses, Opportunities, and Constraints (SWOC) Analysis

A SWOC analysis was conducted for parcels 1, 2, and 5 as a whole with the following results:

Strengths (Internal)	<ul style="list-style-type: none"> <li>- Immediate terminal access for transit users</li> <li>- No additional transfers for transit service from downtown</li> <li>- Requires only one grade-separated crossing of the Airport Parkway (O-train)</li> <li>- Alignment of the rail spur is mostly on undeveloped land</li> <li>- Active transportation connections to the communities to the north and east of the study area</li> </ul>
Weakness (Internal)	<ul style="list-style-type: none"> <li>- Difficult alignment of westbound Airport Parkway access roads</li> <li>- Crossing of the Airport Parkway may have an impact on the "Capital Arrival" concept by the NCC</li> <li>- Track alignment alongside the Airport Parkway may cut off the lands to the north from further development</li> </ul>
Opportunities (External)	<ul style="list-style-type: none"> <li>- Zoning allows for a wide variety of commercial, R&amp;D and transport-related uses</li> <li>- Transit service could drive redevelopment of the base community to the north</li> <li>- Transit station nodes could promote transit oriented development as a new community hub</li> <li>- Connection to the base community to the north increases overall connectivity</li> </ul>
Challenges (External)	<ul style="list-style-type: none"> <li>- Requires funding for the spur line, which is not provided for under the current transportation plan</li> <li>- Passenger demand at the full build out of the airport (13 million passengers) is lower than many other airports with direct rapid transit service</li> <li>- Due to the expense, improvements to airport transit access may be exclusively long-term under this plan</li> <li>- Amendment to the T1A zoning bylaw to allow for retail uses</li> </ul>

## 9.5 Intermodal Components

### 9.5.1 Case Precedents

The terminus station placement is a direct replication of the Portland (PDX), San Francisco (SFO) and Salt Lake City (SLC) airport transit connections. These terminals have the light rail transit line connecting at one end of the terminal building within easy access to the main departures and arrivals hall, as seen in Figure 30. From there, the track alignment generally travels parallel to the primary access road all the way to the edge of airport property. These cases were selected because they featured the closest train-to-plane connection for passengers using the rapid transit service.



Figure 30: Portland International Airport terminal with connecting LRT station (Shown in Yellow)<sup>56</sup>

The transit connections at Vancouver (YVR), Toronto (YYZ) and Seattle (SEA) airports also influenced the design of this option, though the terminus station placement is slightly different in these cases. YVR and YYZ both have their rail stations between the short term parkade and the main terminals, elevated above the departures level roadways (see Figure 31). This was deemed inappropriate for YOW because the O-Train cannot travel up steep grades. An above-ground station would also require a long section of elevated track, which might significantly add to the cost of the spur line.



Figure 31: Vancouver International Airport Terminal with connecting Skytrain Station (Shown in Yellow)<sup>57</sup>

The station at the Ernst and Young Centre was inspired by YVR's two non-terminal stations along its airport transit spur line. These stations are mostly surrounded by airport-related uses such as long-term parking, employee parking, Park-n-Rides and other airside uses. Some non-aeronautical uses have been planned for the station precincts as well – an outlet mall is currently under construction at one of the stations. Travel is free between the three stations on airport property, which supports airport-lands transit use.

### 9.5.2 Transportation Modes

#### O-Train Rail

The transit alignment for this option has been designed to best accommodate new features under the Phase C Roadway Plan and Phase 5 Airport Terminal Expansion Plan. From the approximately north-south alignment of the planned transit right of way, the line crosses the Northeast section of our study area, curving westward. At this point, the tracks will incline slightly towards an above-grade crossing over the existing airport parkway. After this crossing, the alignment parallels the new airport parkway route, with a station approximately 200m east of Uplands Drive. After crossing Uplands Drive, it will then continue slightly north of the future airport parkway for the duration of its route to the terminal. There will be conflicts at the two westbound entry/exit ramps at Uplands Drive and Paul Benoit Driveway, which may require the roads to be realigned more closely to the Airport Parkway. The terminus station will be placed immediately to the north of the new access ramps, with an above grade connection to the terminal itself. See Appendix M for an illustration of this alignment.

#### Local and Regional Bus

Development of a multimodal centre at the airport terminal should result in adjustments of local bus transit service to increase connectivity to the airport and the wider transit network. Local busses 144 Leitrim - South Keys and 147 Uplands – South Keys should be realigned to include a stop at the airport terminal station. Realignment of these routes would create a stronger connection between nearby communities and the airport lands including new employment and recreational opportunities. The existing 30 minute headway on these routes is standard for most City of Ottawa local routes and should be sufficient until neighbouring communities grow significantly.

Route 97 Airport – Bayshore & Bells Corner should be maintained as it offers connectivity to the airport from communities north-east of the airport and offers a connection to Hurdman station, one of Ottawa's major transit hubs. The 97 route would no longer move through the downtown following completion of the East West LRT line currently under development. Headway time on this route is currently 30 minutes during off peak hours and as little as 5 minutes during peak hours for the local bus transit network.

Route 99 Greenboro – Riverview/Manotick should have a stop at the airport terminal and should maintain its current route alignment south of the airport. This will main-

tain connectivity between the Airport and Riverview and Manotick. The current headway time for this route is 15 minutes during peak times and 30 minutes during off peak hours for the local bus transit network. Headway times for the 97 and 99 Routes are subject to change based on changed ridership patterns that may emerge following completion of the East West LRT line and the north-south rail line expansion.

#### High Speed Rail

The speculative location for a High Speed Rail (HSR) connection to the OMCIA lands would approach the airport lands from the west, cross the Rideau River at a future bridge along Fallowfield Road, and proceed under the north-west runway in a tunnel. Due to the length of High Speed Rail stations (up to 300m), the only conceivable location for an above-ground station in this option was parallel to the transit corridor in parcel 5, to the north of the airport terminal. After the HSR station, the track would again enter a tunnel until it surfaces east of the airport property. See Appendix M for an illustration of this alignment.

#### Automotive

The new Airport Parkway alignment will include an on and off ramp at Uplands Drive. All access to new development in parcel 2 will be from Uplands Drive. Leckie Private Drive will access new developments on parcel 1, next to the airport terminal.

At parcel 2, there is a parkade and two surface lots P3 and P4 with 1574, 113, and 60 parking spaces respectively. At Parcel 5 there is a surface lot, P2, with 94 spaces. Parcel 1 contains surface lot P1 with 124 spaces. The parkade located in Parcel 2 will be dedicated to long term parking and employee parking.

#### Active Transportation

It is difficult to increase active transportation rates for airport passengers, however, there is an opportunity with this concept to grow the active transportation mode share for airport-lands employees and surrounding residents. Firstly, the streetscapes of the new development parcels will be designed with pedestrians and cyclists as a priority. Wide sidewalks and mixed-use paths will connect the buildings in each parcel and make clear connections to the new transit stations on airport property, the details of which will be discussed in the following sections. External connectivity will be improved as well, with mixed-use trails accessing the communities to the east of parcel 3 and to the north of parcel 1. These plans are illustrated in Appendix M.

## 9.6 Development Concepts

### 9.6.1 Terminal Station Precinct (Parcel 1)

#### Land Use

The development of Parcel 1, adjacent to the north of the airport passenger terminal, consists of the intermodal centre, five new structures for research and development uses, and a surface parking lot with 124 parking spaces. The layout is shown in Figure 32.



Figure 32: Concept A - Parcel 1 Land Use

The development proposes five new structures for research and development use. Building number 4 is recommended to be the last phase of the build-out as it will remove an existing employee surface parking lot and it is the optimal site for the future addition of a HSR platform. Details for the six new proposed structures on Parcel 1, and the surface parking lot are shown in Table 7

Table 7: Concept A - Description of structures in Parcel 1

Building #	Land Use	Floor Space (m <sup>2</sup> )	Storeys	Parking Spaces
1	Research & Development	23,040	1	
2	Research & Development	6,000	4	
3	Research & Development	9,600	2	
4	Research & Development	6,900	2	
5	Research & Development	18,450	3	
6	Intermodal Transportation Centre	2,414	2	
P1	Surface Parking	1676*	At grade	124

\*13.5m<sup>2</sup> per parking space was used to calculate area (source: Parking Space Provision - Section 106 City of Ottawa Zoning By-Law)

### Urban Design

The design of the terminus intermodal transportation centre has will meet a high level of architectural standard and will reference the architectural character of the airport terminal. The site for the intermodal centre was selected to have the closest proximity to the airport terminal (See figure 33). The Terminal Station will be directly connected to the airport passenger terminal via an elevated walkway for passenger assistance. The distance to terminal is 57m and will take approximately 1 to 2 minutes to reach the expanded airport terminal at a walking speed of 1.5m/s. The new structure connected to the airport terminal will act as a retail concourse for passengers

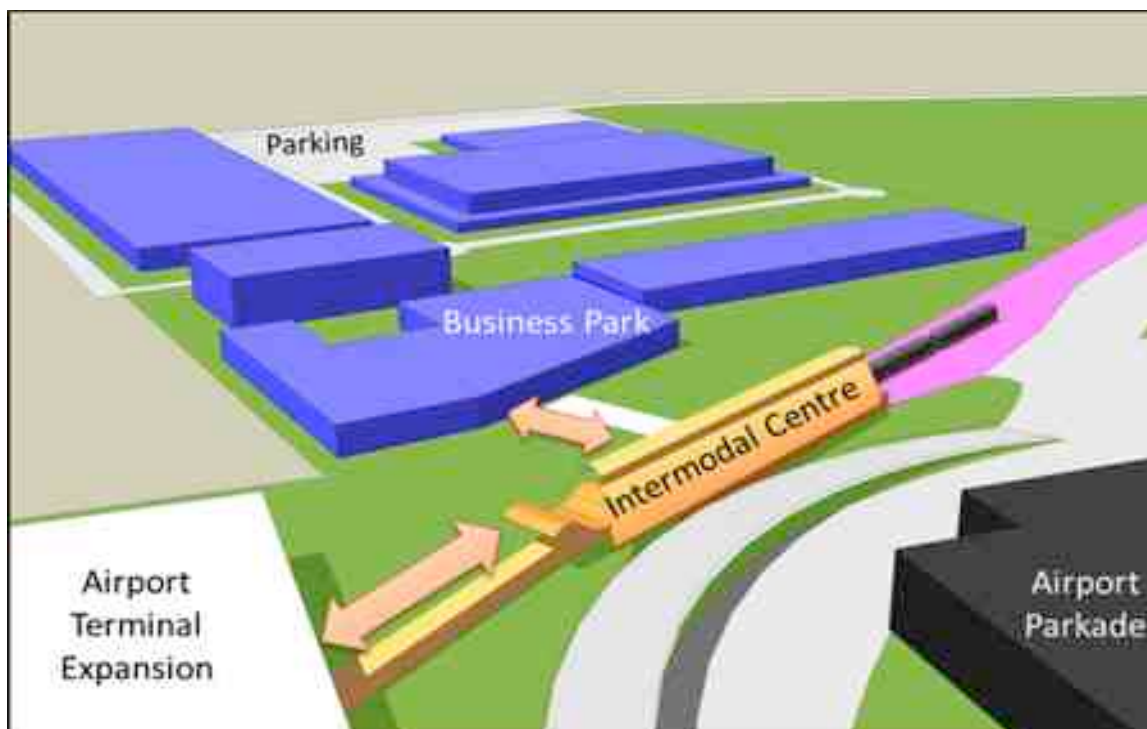


Figure 33: Concept A - View of Parcel 1 looking north from the Airport Passenger Terminal

It is important for the intermodal station to be visible from within the airport terminal, as well as along the sightlines from the Airport Parkway. The station will be a landmark seen during the "Capital Arrival", via the O-train and the Airport Parkway. The station may also act as a terminating vista during the "Capital Arrival" by properly aligning the future Airport Parkway.

The streetscape connecting the proposed office buildings north-west of the intermodal station will be designed to accommodate pedestrian and cyclist traffic by pedestrian walkway. The access to the roadways for the new office buildings will be from Kiowa Private and Paul Benoit Driveway.

The research and development buildings were designed with large massing in order to include office space, laboratories, and employee amenities that would require segregation. Although high standards of urban design were considered for this concept, some deviation from the Airport Urban Design Plan were required and are summarized in Table 8.

Table 8: Concept A - Deviations from Airport Urban Design Plan

Design Guideline	Explanation
Discouraging Large Surface Parking Areas in Key Locations	-Relocating employee parking -Potential for a 'Park and Ride' -Land north of Ernst and Young station available
Signage Restrictions	-A sign study may be undertaken to brand the area and ensure consistency with design objectives
Maintain Natural Character of Parkway	-the natural character of the parkway will be maintained or enhanced with the exception areas within walking distance of the transit stations where development is proposed adjacent to the station and tracks.

#### Servicing

The total developed area of 3.7 ha for Parcel 1 was used to calculate the approximate water and wastewater demand. An average water demand of 60,000L/gross ha/day, and an average sanitary demand of 50,000L/gross ha/day were the maximum servicing requirements used from the Infrastructure Master Plan 2007. The average water demand was calculated to be 224,000L/day. The average sanitary demand was calculated to be 187,000L/day.

The area in Parcel 1 appears to be currently serviced by gravity fed sanitary mains, therefore a pump station will not be required. Depending on the age and state of the sanitary sewer network in the ground for the development of Parcel 1, the existing sanitary infrastructure along Convair Private may be sufficient to carry the demand. If the demand is too great for the 450mm concrete sanitary pipe along Convair Private, an upgraded will be required.

The developed area of 3.7 ha is to be used while modelling the storm water demand. This area includes the footprint of the proposed structures, roads, and parking surfaces. The demand will fluctuate with different year storms used in the model. The development will include permeable landscaping infrastructure to capture and convey storm water in a low impact manner for onsite storm water management dependent on the demand calculate from the model.

#### 9.6.2 Ernst and Young Station Precinct (Parcels 2 and 5)

##### Land Uses

The development at the Ernst and Young Station consist of two Parcels: Parcel 2 and Parcel 5. Parcel 2 is located north of the Ernst and Young Centre, and Parcel 5 is located to the west, across Uplands Drive.



Figure 34: Concept A - Land uses surrounding the Ernst & Young Station

The development of Parcel 2 will consist of the Ernst and Young Station, six mixed-use commercial structures, four office buildings, two surface parking lots containing 173 spaces and one parkade containing 1574 spaces. The layout for the parcel is shown in Figure 34.

The Ernst and Young Station will be connected to a mixed office and retail structure (building 13) to the north that creates an indoor pedestrian connection to the central access street for the development. A description of the buildings and their subsequent land use is described in Table 9 and illustrated in Figure 35.



Figure 35: Concept A - Land use layout of Parcel 2

Table 9: Concept A - Description of structures in Parcel 2

Building #	Land Use	Total Floor Space (m <sup>2</sup> )	Storeys	Parking Spaces
13	Office/Retail	12,840	2 and 4	
14	Ernst & Young Station	1,584	1	
15	Mixed Commercial	3,306	1	
16	Mixed Commercial	960	1	
17	Mixed Commercial	960	1	
18	Mixed Commercial	1,320	1	
19	Mixed Commercial	1,260	1	
20	Mixed Commercial	2,100	1	
21	Office	59,772	2, 4, and	
22 (P5)	Parkade	39,902	1 and 3	1574
23	Office	6,240	2	
24	Office	10,044	2	
P3	Surface Parking	1528*	at grade	113
P4	Surface Parking	811*	at grade	60

\*13.5m<sup>2</sup> per parking space was used to calculate area (source: Parking Space Provision - Section 106 City of Ottawa Zoning By-Law)

The mixed use development of Parcel 5 to the west of Uplands Drive consists of a gas station, office building, a hotel, two food service outlets, and a surface parking lot with 94 spaces.

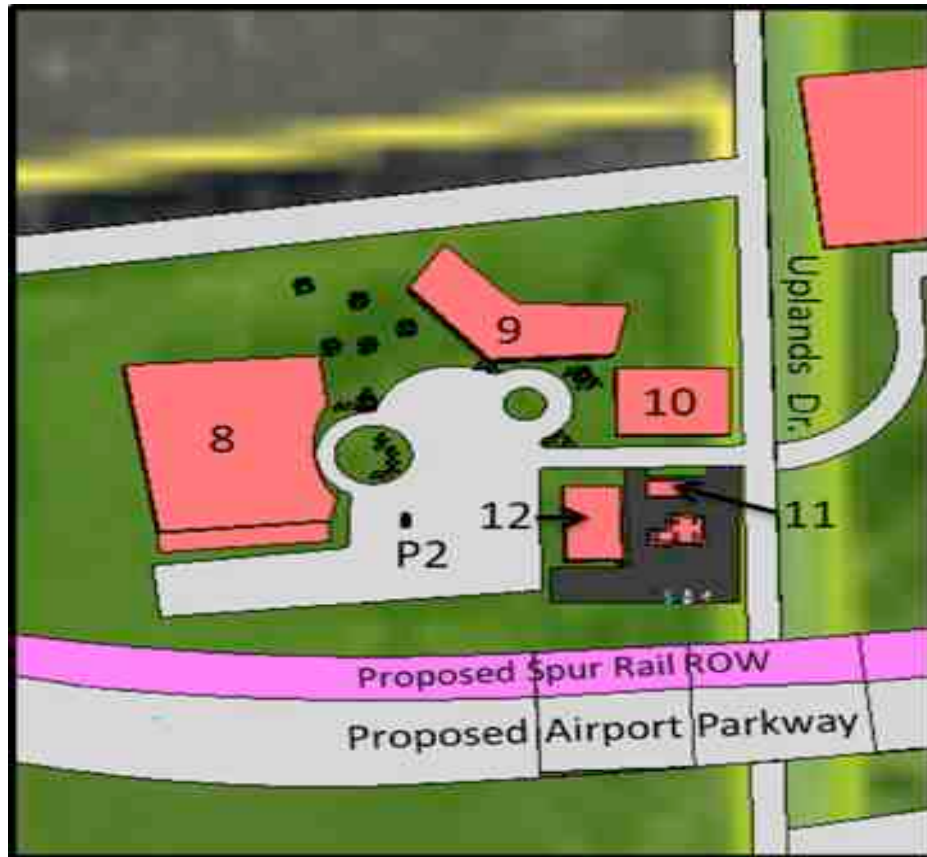


Figure 36: Concept A - Land Use Layout of Parcel 5

A description of the buildings for Parcel 5 and their land use is described in Table 10 and illustrated in Figure 36.

Table 10: Concept A - Description of structures for Parcel 5 development

Building #	Land Use	Floor Space (m <sup>2</sup> )	Storeys	Parking Spaces
7	Office	11,400	4	
8	Hotel	6,783	8	
9	Restaurant	385	2 and 5	
10	Restaurant	300	2	
11	Gas Station	60	1	
12	Gas Bar	225	2	
P2	Surface Parking	1271*	at grade	94

\*13.5m<sup>2</sup> per parking space was used to calculate area (source: Parking Space Provision - Section 106 City of Ottawa Zoning By-Law)

### Urban Design

The design of the Ernst and Young station will have architectural resemblance to the intermodal centre located next to the airport by using the same architectural language and construction materials. This will create a consistent design of all the buildings on airport lands. The station at the Ernst and Young Centre will have pedestrian connections to the proposed parking structure to the north east, the Ernst and Young centre to the south, and both the proposed mixed use development to the north and to the west.

The proposed mixed commercial buildings immediately north of the station (buildings 15-20) will be street-oriented and situated as close as possible to the street along key frontages. The buildings along the frontage will match and create a common rhythm and continuous building frontage line.

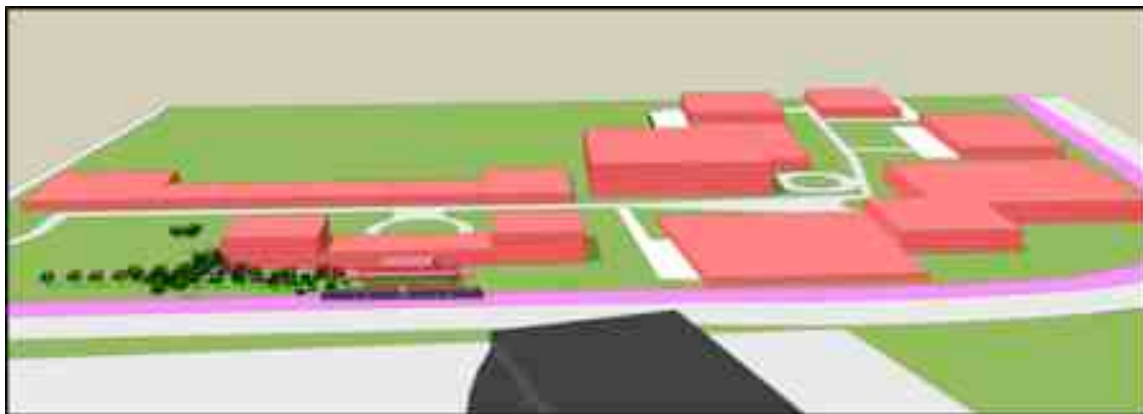


Figure 37: Concept A - View of Parcel 2 development, looking north from the Ernst & Young Centre

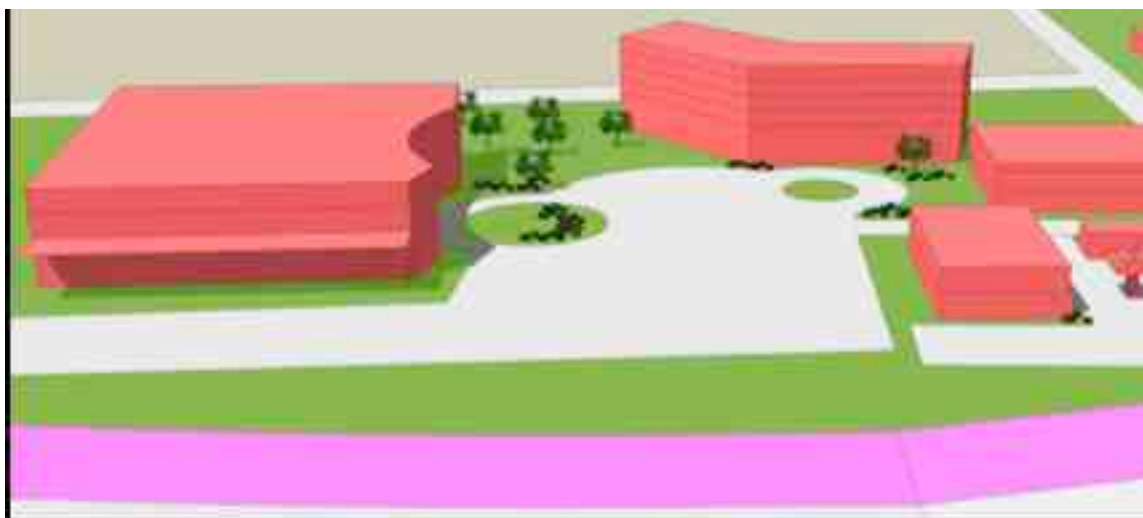


Figure 38: Concept A - View of Parcel 5, looking north from the Airport Parkway

The commercial buildings will host signage consistent with the design guidelines set out by the OMCA and the NCC. Any signs for a commercial establishment will be integrated with the architecture of the building and will not obstruct key sightlines from the Airport Parkway. The commercial buildings were massed at 1-2 storeys under the

assumption that the space will be used for retail. The parkade was designed at 3 storeys in order to accommodate a large number of spaces that would support a park and fly, employee parking, and future development.

All new surface parking areas proposed north of the Ernst and Young station are to include on site storm water management infrastructure. They will capture and convey storm water in a low impact manner.

#### Servicing

The total developed area of 5.9 ha for Parcel 2 and Parcel 5 was used to calculate the approximate water and wastewater demand. An average water demand of 60,000L/gross ha/day, and an average sanitary demand of 50,000L/gross ha/day were the maximum servicing requirements used from the Infrastructure Master Plan 2007. The average water demand was calculated to be 349,500L/day. The average sanitary demand was calculated to be 291,300L/day.

A new network of sanitary gravity sewers would need to be installed to connect to each new structure, and would then feed into a new wastewater pump station that could pump the wastewater north along Uplands Drive. Water services could be provided by connecting to the 300mm diameter water main emerging from Uplands Drive at Research Road. The water source for the water main originates from the Ottawa South Pump Station.

The developed area of 5.9 ha is used while modeling the storm water demand. This area includes the footprint of the proposed structures, roads, and parking surfaces. The demand will fluctuate with different year storms used in the model. The development will include permeable landscaping infrastructure to capture and convey storm water in a low impact manner for onsite storm water management dependent on the demand calculate from the model.

## 9.7 Summary

By placing the intermodal centre directly adjacent to the main terminal, the Airport spur line option and Airport Terminal Intermodal Centre will greatly enhance accessibility for airport-bound passengers and employees of the airport lands. Complimentary developments surrounding the two new stations will increase revenue generation for the airport authority and provide new employment and gathering spaces for Canada's capital. Neighbouring communities will also benefit from convenient public transit access through the airport spur line and improved active transit routes. This vision will bring the Ottawa International Airport up to international standards of accessibility, inter-modality and airport lands development; something that the Airport Authority can be proud of.

## 10.0 Concept B- Remote Intermodal Centre

### 10.1 Development Area

Development will take place on parcels 2 and 3 along Airport Parkway (See Appendix B). The first site is located adjacent to the existing railway tracks in the eastern corner of the study area and is approximately 12 hectares in size (outside wetland buffers). The Airport Parkway forms the western border of the site and Lester Road serves as the southern border of the site. This site will serve as the location of the remote intermodal transit terminal as it has good access to both the Airport Parkway and the existing railway. This site will be referred to as the Remote Intermodal Centre because the intermodal transit centre will serve as the centre and heart of the new development. The second site is located adjacent to the Ernst & Young Centre and is approximately 16 hectares in size (outside of wetland). The site is on the same parcel of land as the Ernst & Young Centre with Uplands Drive serving as the western border of the site and the Airport Parkway serving as the eastern border of the site. The development for this site will consist of a large community sports centre and a grocery store. This site will be referred to as the Airport Sports Centre Complex as the sports centre will serve as the heart of the new development.

### 10.2 Vision & Objectives

The primary purpose of this plan is to develop land use concepts that will maximize the development potential of the OMCIA lands in a sustainable manner and improve overall passenger experience. The primary objective of this plan is to optimize non-aeronautical revenues by developing currently underutilized land to its highest and best use while not compromising operations integral to aeronautical related operations. The secondary objective of this plan is to enhance overall passenger experience by improving transit service connections from the city-region to the Airport. The proposed uses and design ideas will also be consistent with the Airport Urban Design Plan and other relevant regulatory frameworks including the City of Ottawa Official Plan, the Airport Master Plan and the City of Ottawa Transportation Master Plan. It is hoped that upon implementation, this plan will deliver a range of socio-economic benefits for both the OMCIA and the City of Ottawa.

### 10.3 Site Specific Policy Constraints

The study area is currently designated as an Aviation and Non-Aviation commercial area. This designation permits for flexibility in the development of the lands

for a variety of commercial, light industrial and employment uses.<sup>5</sup> The variety of land uses include those that are usually associated with airports (such as car rentals, airside cargo, flight schools) and uses typically characteristic of businesses parks and community oriented commercial areas (such as offices, light manufacturing, restaurants, research and development laboratories and retail establishments).<sup>5</sup> Both the Remote Intermodal Centre development lands and the Airport Sports Complex development lands will consist of the uses listed above.

Both the Remote Intermodal Centre development lands and the Airport Sports Complex development lands are located adjacent to Provincially Significant Wetlands (PSWs). All proposed development on this site will respect the PSWs and will adopt mitigation measures where possible to limit any proposed risk that development could pose to the wetlands. The development of both study sites will limit development to within 120 meters of wetlands to avoid triggering an Environmental Impact Statement (EIS) as is outlined in the Conservation Authorities Act. The presence of the wetlands will not be a major obstacle to development as there is still large amount of property available outside of the wetlands (12 hectares for Site 1 and 16 hectares for Site 2). Furthermore, future development could take place within the wetland area of influence if an environmental impact statement (EIS) is completed.

A SWOC analysis was conducted for development sites 1 and 2 with the following results.

#### 10.4 Strengths, Weaknesses, Opportunities, and Constraints (SWOC) Analysis

## SWOC Analysis for Remote Intermodal Centre Lands (Site 1)

Strengths (Internal)	<ul style="list-style-type: none"> <li>• Proximity to railway allow for easy access to O-train network and future high speed rail network</li> <li>• Can be made accessible by all modes of transit</li> <li>• Intermodal Transit Centre can serve both the Airport and South Keys neighbourhood</li> <li>• Plot size is fairly large (12 hectares) and can accommodate various uses</li> <li>• Would not require the relocation of any buildings or tenants</li> <li>• Site has a lot of potential as it is currently undeveloped</li> <li>• Rail infrastructure costs would be significantly lower at this site as it does not require any major work to be done on existing railway</li> </ul>
Weakness (Internal)	<ul style="list-style-type: none"> <li>• Proximity to Provincially Significant Wetland will require an Environmental Impact Assessment</li> <li>• Area is currently covered by woodland.</li> <li>• Poor visibility from Airport Parkway could impact marketability of land</li> <li>• Pump station would be required to transport waste water off the site</li> <li>• There is nothing beyond the Ernst &amp; Young that attracts people to this area</li> <li>• Distance from the airport would require passengers to transfer between two modes (O-train and Personal Rapid Transit) to reach the main airport passenger concourse</li> </ul>
Opportunities (External)	<ul style="list-style-type: none"> <li>• Zoning allows for a wide variety of commercial, industrial and transportation uses but there are restrictions on retail uses</li> <li>• The draft Transportation Master Plan for the City of Plans outlines plans for the existing rail corridor to be developed for rail rapid transit (O-train or LRT)</li> <li>• Intermodal Transit Center Development can enhance and transform the Airport Gateway Campus Area into a destination</li> </ul>
Challenges (External)	<ul style="list-style-type: none"> <li>• Direct O-train connection depends on decisions made by Ottawa City Council and OC Transpo management</li> <li>• Airport Operating Influence Zone (AOIZ) prohibits residential and noise sensitive uses</li> <li>• Building height limits must respect airport obstacle limitation surfaces as established by the Airport Zoning Regulations.</li> <li>• Economic conditions and market opportunities could limit investment opportunities</li> <li>• Public transportation ridership demand could be too low to justify Airport station on the O-train network</li> </ul>

## SWOC Analysis for Airport Sports Complex Lands (Site 2)

Strengths (Internal)	<ul style="list-style-type: none"> <li>• Can be made accessible by all modes of transit</li> <li>• Proximity to Ernst &amp; Young Centre</li> <li>• Can provide additional parking for events at Ernst &amp; Young Centre</li> <li>• Site is located in municipal service area and can hook into extra capacity not being used by Ernst &amp; Young Centre</li> <li>• Plot size is really large (16 hectares) and can accommodate various uses</li> <li>• Would not require the relocation of any buildings or tenants</li> <li>• Better road access (Uplands Drive and Airport Parkway)</li> </ul>
Weakness (Internal)	<ul style="list-style-type: none"> <li>• Distance to airport terminal</li> <li>• Buffer of trees has to be maintained</li> <li>• Proximity to Provincially Significant Wetland will require an Environmental Impact Assessment</li> <li>• Airport Urban Design Guidelines does not recommend direct access to Airport Parkway but rather through internal road networks</li> </ul>
Opportunities (External)	<ul style="list-style-type: none"> <li>• Proximity to Ernst &amp; Young Centre would provide a great opportunity for permitted complimentary uses such as a hotel</li> <li>• Zoning allows for a wide variety of commercial, industrial and transportation uses but there are restrictions on retail uses</li> <li>• Intermodal Transit Centre Development can enhance and transform the Airport Gateway Campus Area into a destination</li> </ul>
Challenges (External)	<ul style="list-style-type: none"> <li>• Airport Operating Influence Zone (AOIZ) prohibits residential and noise sensitive uses</li> <li>• Building height limits can become an issue for future commercial development</li> <li>• Market conditions could limit investment opportunities</li> <li>• Public transportation ridership demand could be too low to justify rerouting the railway on the O-train network</li> </ul>

## 10.5 Intermodal Components

The City of Waterloo is planning a new multi-modal transit hub to accommodate local and regional traffic (pedestrians, cyclists, automobiles, buses, light rail transit) as well as intra-regional traffic (buses and commuter rail).<sup>58</sup> The Waterloo Multi-Modal Transit Hub is a mixed used development that will incorporate office, retail, residential, hotel, institutional, and civic uses with transportation. The development is envisioned to be a state-of-the art multimodal transportation facility that accommodates a diverse range of users arriving by different modes, functioning as the central point for moving residents and visitors throughout the Waterloo Region.<sup>58</sup> The Region of Waterloo Multi-Modal Transit Hub Urban Design Brief envisions that the transit hub will be:

- A place that provides a seamless and integrated transit node that recognizes the primacy of the transportation function in accommodating those arriving and departing by foot, by bicycle, by car, by bus, and by train.
- A place that is mixed in terms of land use activities with opportunities for retail shops, offices, residences, civic uses, community facilities, visitor accommodations, among other uses, that supports activity throughout the day in a safe, secure and comfortable fashion.
- A place that is universally accessible to all users, including those arriving by various modes of transportation, arriving from different directions to the site, as well as those with different special mobility needs.
- A place that incorporates green and sustainable choices in terms of both building and site design opportunities in respect to energy, water and air quality considerations.
- A place that provides a grand presence from the street for visitors arriving to Kitchener and that leaves a lasting impression for visitors.
- A place that includes a series of interconnected vibrant spaces that are animated with activities and spaces throughout all times of the day and that are legibly linked between activities and different transportation modes.<sup>58</sup>



Figure 39: Design Renderings for Waterloo Multi-Modal Transit Hub<sup>58</sup>

## 10.5.2 Transportation Modes

### Rail

The Remote Intermodal Centre will be designed to accommodate both light rail transit and heavy rail including commuter rail and high-speed rail as seen in Appendix O. The Remote Intermodal Centre will be built immediately adjacent to the railway tracks to take advantage of the planned extension of the O-train. The City of Ottawa has plans to extend the O-train south with five additional stations at Gladstone, Walkley, South Keys, Leitrim and Bowesville.<sup>3</sup> The Remote Intermodal Centre would be served by the extension of this line with the intermodal station being located directly between South Keys and Leitrim. This would allow passengers travelling from the downtown to directly connect to the airport with relative ease. The City of Ottawa also has plans to extend the Confederation line from Bayshore to Place D'Orléans, which would allow passengers travelling from the east and west end of the city to reach the airport by transferring to the O-train line.<sup>3</sup> This would be a great improvement over the current bus network that exists, as it would significantly decrease travel times and transfer times. The City of Ottawa plans to upgrade the O-train line to Light Rail Transit after 2031 and the innovative design of the Remote Intermodal Centre will allow for a seamless transition when that upgrade does eventually take place. The Remote Intermodal Centre will offer passengers a direct rail service to the airport, which is something the majority of passengers want. A survey conducted by Leigh Fisher for the Ottawa Macdonald-Cartier International Airport Authority found that 87.4% of passengers were in favour of Light Rail Transit and 58.7% of passengers said that they would use the LRT service if constructed.<sup>59</sup> The Remote Intermodal Centre will offer passengers a seamless experience with rail travel serving as the most important component of their journey.



Figure 40: Extension of Ottawa's Rail Network<sup>3</sup>

#### Local and Regional Bus Service

OC Transpo Routes 97 and 99 currently serve the Remote Intermodal Centre development site. These bus routes currently operate on 30-minute headways in off-peak hours and 20-minute headways during peak hours.<sup>60</sup> These bus routes provide airport passengers and employees with a direct connection to downtown Ottawa. The route 97 and the 99 provide a direct north-south connection from the Airport to the rest of the city and are currently the only OC Transpo bus routes servicing the airport lands. Passengers travelling from the east and west end of Ottawa currently have to use multiple transfers to reach the airport. However, the east-west connection may improve with the construction of a bridge connecting Riverside South and Fallowfield to the airport lands. There is currently no inter-regional bus service servicing the airport but plans to accommodate inter-regional bus service will be included in the design plan. The Remote Intermodal Centre will serve as a central transportation hub that will accommodate both local bus service and regional bus service including Megabus and Greyhound.

#### Personal Rapid Transit (PRT)

Personal Rapid Transit (PRT) is a fairly new and emerging alternative in the category of automated people movers. The best benchmark example of the usage of PRT at an airport is the Heathrow system. The system at Heathrow has been in operation since April 18, 2011. The infrastructure for a PRT system is made up of a guideway, stations and pod cars. The guideways can be at grade, below grade or elevated. Guideways are low profile being about 2 m wide and under 50 cm high.<sup>61</sup> Pod cars operate on demand and have a capacity of 3 to 4 passengers. The passengers choose the destination station and the pod car will then travel direct to the final destination by-passing any intermediate stations.<sup>62</sup> PRT operates at low speed typically at around 40 km/h.<sup>61</sup> A number of remote and pod mounted passenger safety features are designed into the PRT system including CCTV, black box and 2 way communication with central control, a pod collision protection system, emer-

gency foot escape routes, safety interlocks between the door, brakes and motor as well as smoke detectors and fire extinguishers. The theoretical capacity of a PRT system is 7200 passengers per hour per direction (pphpd) which compares to the 16000 pphpd capacity of a typical APM system. On an elevated system, PRT guideways need to carry a live load of less than 10 tons per span while an APM guideway span needs to support 4 x this weight. A PRT system including guideway, pods and stations costs in the range of USD 7-15 million per kilometre. The APM system at Toronto's Pearson International Airport cost approximately USD 60 million per kilometre.<sup>61</sup> IBI group (2013) projects that a rapid transit spur line to the airport would generate 250 airport passenger travellers during peak period.<sup>63</sup> The operational capacity of PRT systems has been observed to be about 300 to 400 passengers per hour per direction.<sup>61</sup> The projected demand of a rapid transit line to the airport is well within the operational capacity of a PRT system. Personal Rapid transit is an emerging cutting edge but proven system that is ideally suited for a remotely situated ground transportation centre at the Ottawa Macdonald-Cartier International Airport due to its low cost, operational capacity and leading edge design. The PRT system will follow the alignment depicted in Appendix P. It will have three PRT stations throughout the development: the Remote Intermodal Centre station, the Airport Sports Complex station and the Ottawa-Macdonald-Cartier International Airport station. The PRT system is highly flexible and it can be expanded further in the future at a relatively low cost.



Figure 41: Personal Rapid Transit Pod at PRT<sup>61</sup>

### High Speed Rail

The Remote Intermodal Centre will be designed to accommodate for the possibility of high-speed rail. The potential alignment of the high-speed rail corridor is shown in Appendix O. The rail corridor will remain underground after clearing the airport runway to avoid any other development and will connect with the intermodal transportation centre with an underground station. It will emerge above ground to the west of the ground transportation centre.

### Automobile Passengers

The Remote Intermodal Centre development lands and the Airport Sports Centre

Complex development lands are easily accessible to passengers travelling by private automobile. The Remote Intermodal Centre and the surrounding development will have two main entrances off the Airport Parkway. A traffic study will be required to assess the potential impact that the development could have on traffic patterns on the Airport Parkway. The Remote Intermodal Centre development will also include the construction of an internal road network, which will connect different properties of the development together. Each commercial building will also have its own parking for employees and customers based off the parking standards outlined in the City of Ottawa's Zoning Bylaw (3.2 parking spaces per 100m<sup>2</sup>, Commercial Development within 600 meters of a rapid transit station)<sup>64</sup>. The Remote Intermodal Centre will include a five-storey parking garage, which will provide 600 parking spaces and services for both airport passengers and employees of the surrounding development. The parking garage located adjacent to the Remote Intermodal Centre will charge users \$10.95 for a daily rate. This price is consistent with the Park-N-Fly Service offered on 3600 Uplands Drive but this it can increase if there is greater demand for the service.<sup>65</sup>

The Airport Sports Complex Centre development lands are easily accessible by automobile as the development is directly adjacent to the Ernst & Young Centre and Uplands Drive. Each development phase will include the construction of new drive-ways (Airport Sports Complex) or new internal road networks (Intermodal Centre), which will connect the properties to the larger community. A traffic study will have to be conducted to determine the potential impact that the development could have on traffic patterns on Uplands Drive. The Airport Sports Complex will have over 700 parking spaces for customers as based on the parking standards outlined in the City of Ottawa's Zoning By-law (4 parking spaces per 100 square metres, Community Centre within 600 metres of a rapid transit station).<sup>64</sup> The grocery store and commercial buildings located on the Airport Sports Complex Centre development lands will also have ample parking for customers and employees of the area. The proposed development is easily accessible by automobile but both sites encourage healthy community living by offering healthy activities, lifestyles and public transit options.

Table 11: Concept B- Parking Availability

Parking	Remote Intermodal Centre (including parking garage)	Airport Sports Complex	Grocery Store
Parking Spaces	1218	810	297

#### Active Transportation

The City of Ottawa Official Plan and the Ottawa Transportation Master Plan both place importance on encouraging on active transportation in the City.<sup>5</sup> Both the Re-

Remote Intermodal Centre development and the Airport Sports Centre Complex development will incorporate design features that encourage pedestrian and cyclist use. The developments will be designed to ensure that all pedestrian connections are direct, convenient, safe, comfortable and barrier free. The developments will provide clearly defined pedestrian linkages. The Remote Intermodal Centre's design will provide continuous pedestrian weather protection along the base of portion of all buildings and will provide appropriate separation for pedestrian movement along the railway tracks. Both the Remote Intermodal Centre and the Airport Sport Complex will incorporate defined bicycle parking areas and storage facilities. The Remote Intermodal Centre will also incorporate a multi-use trail that will connect the development with the neighbourhood of Blossom Park (See Appendix O). The multi-use trail will be approximately 500 meters in lengths and will accommodate both cyclists and pedestrians. The multi-use trail is expected to save passengers travelling from Blossom Park over 4km as it creates a direct route between the development and the neighbourhood.

## 10.6 Development Concepts

An overview map of the development for Concept B is provided in Appendix P.

### 10.6.1 Remote Intermodal Centre (Site 3)

The Remote Intermodal Centre development will incorporate several different land uses that are permitted in the commercial aviation/non-aviation area. The Remote Intermodal Centre will be designed to improve passenger experience by offering seamless transfers between different transit modes including commuter rail, high-speed rail, local and regional bus service, private automobile, walking and cycling. The Remote Intermodal Centre will be designed with the highest design standards as a transit facility that is convenient and easy to use. The Intermodal Centre will be two stories in height and have a total gross floor area of 134,000 square feet. The first floor will be the main lobby and boarding area for trains and buses. Passenger boarding for trains will take place on the first floor at the back of the development where the railway is located. The first floor will also have retail and real time information services for passengers. The Personal Rapid Transit station will be located on the second floor. The second floor will also include several amenities and services such as restaurants and cafes. The Remote Intermodal Centre can also be expanded underground in the future to accommodate high-speed rail. Way-finding signage that is clear and easy to read to help passengers navigate the area will be incorporated throughout the development.

The Remote Intermodal Centre will also incorporate a five storey parking garage that accommodates 600 parking spots into the development. The parking garage will be designed to provide for ease of circulation and way-finding on site. The parking garage will be integrated in the architectural style and detailing of the building and provide a high quality ground level interface with the public realm. The parking garage will also incorporate bicycle-parking areas with direct connections to bicycle storage areas. There is sufficient parking available near the Remote

Intermodal Centre that a car rental centre could be incorporated into the parking garage as a feature for air travelers and employees from the office & industrial park.

The Remote Intermodal Centre will also incorporate several sustainability measures including using Gold LEED standards, where appropriate. However, the development cannot fully incorporate all green features such as green roof, as it can attract wildlife including birds, which is detrimental to the operation of the airport. The Remote Intermodal Centre is intended to serve as a world-class transit facility that adds not only to the airport but the overall landscape of the City of Ottawa.



Figure 42: Rail Passenger Boarding Area<sup>58</sup>

#### 10.6.2 Office & Industrial Park

The Remote Intermodal Centre development will also consist of a commercial office and industrial park that is immediately adjacent to the intermodal centre (See Figure 43). The development will consist of 2 free standing commercial office buildings, a light industrial building with 2 integrated corner office buildings, a parking garage, and a restaurant for passengers and employees to enjoy.



Figure 43: Concept B - Office and Industrial Park

The proposal for the commercial office and industrial park development incorporates several features that are found at the Oxford Business Park located near Calgary's International Airport. The Oxford Airport Business Park is located in the Stoney Industrial Sector and is approximately 500 meters from Calgary International Airport. The Oxford Airport Business Park offers 4 million square feet of premier industrial, amenity, retail, office and hotel space and the convenience of onsite amenities for both employees and visitors.<sup>66</sup> The office park for the proposed development will be much smaller than the Oxford Airport Business Park as there is less land available at OMCA. The general design will be similar. The Remote Intermodal Centre office park will be designed to accommodate all modes of transportation and will encourage pedestrian connectivity between sites. The office park will be designed with the highest environmental sustainability standards in mind including adopting LEED standards, where applicable. The office park will add new life to the area and create a sense of place, as it will attract both employers and passengers alike to enjoy its amenities. The gross floor area and height of each building proposed for the office park is highlighted in the table in the next section.



Figure 44: Artist Rendering of Oxford Airport Business Park<sup>66</sup>

### 10.6.3 Airport Sports Complex (Site 2)

The primary purpose of the Airport Sports Complex development, shown in Figure 45, is to serve the community of Uplands, Blossom Park, Leitrim, South Keys, and Riverside South by offering a recreation centre and a large grocery store



Figure 45: Concept B - Airport Sports Complex and Grocery Store

The Airport Sports Complex and Community Centre will be modelled after the Brampton Soccer Centre in Brampton Ontario, which is one of the largest indoor sports facilities in the Greater Toronto Area and hosts a wide range of provincial and national tournaments and events (See figure 46). The Brampton Soccer Centre was built in 2007 with a total gross floor area of 156,000 square feet. The centre features four indoor field/sport pads with seating for 350 people and three bookable community rooms and two bookable boardrooms. The sports centre has facilities for a variety of sports including badminton, basketball, fencing, football, lacrosse, soccer, karate, volleyball and wrestling.<sup>67</sup> The Airport Sports Complex and Community Centre is proposed to be similar in size to the Brampton Soccer Centre and will feature 2 outdoor basketball courts and two outdoor soccer fields in addition to the indoor facilities offered by the Brampton centre. The sports centre will attract local residents from the surrounding neighbourhoods as well as the rest of Ottawa as the facility would be an excellent location to hold community and regional tournaments. A PRT station is proposed to be located within the sports centre for airport passengers looking for activity during connection delays as well as for ease of access for Ottawa residents. In addition to having a PRT station, the sports centre will have ample parking for visitors including tournament spectators and users of the facility.

The Airport Sports Complex and Community Centre development will incorporate a large grocery store on the site. The grocery store will be within a short walking distance (500 meters) of the PRT station and will have ample parking for

patrons. While not explicitly proposed in the initial cost conscious route for the PRT, a station could be added at the grocery store to enhance connectivity in the future.



Figure 46: Brampton Soccer Centre<sup>67</sup>

#### 10.6.4 Facilities and Services

The primary goal of the intermodal transit centre is to offer passengers an improved travelling experience with reduced travel times and seamless transfers. Since improved travelling experience consists of more than just enhancing connections and reducing times, additional services will be offered for greater customer service. The Remote Intermodal Centre will offer passengers a check-in baggage system, which allows intermodal passengers to drop off their luggage at the station to be later placed on their flight. This system will offer passengers the comfort of not having to carry baggage around throughout their journey by using a one-stop secure system. This system is currently being used at Frankfurt International Airport and is a great success as it allows passengers to drop off their flight luggage at the Luggage Check-in at the Air Rail Terminal.<sup>68</sup> The Remote Intermodal Centre will also offer passengers a variety of services that are commonly found in European train stations, including currency exchange services, information desks, lockers for luggage, arrival/departure boards, restrooms, coffee shops, gift shops, lounges for business travellers, and restaurants and bars.

#### 10.6.5 Gross Floor Area

Table 12: Concept B – Gross Floor Area

Building	Number of Floors	GFA (SQM)	Type of Development
Transit Centre	2	12000	Institutional
Restaurant	1	459.96	Office Commercial
Office Building (North)	4	10720	Office Commercial
Office Building (South)	4	10720	Office Commercial
Industrial Building	1	9940	Employment
Industrial Building- Office North	3	3300	Office Industrial
Industrial Building- Office South	3	3300	Office Industrial
Sports Complex	1	14994	Recreation
Grocery Store	1	6000	Food Retail
Total		71434	

#### 10.6.6 Servicing

The servicing needs for the proposed development were computed based on the theoretical water consumption and sanitary rates recommended in the Infrastructure Master Plan.<sup>69</sup> The water consumption rates (L/gross ha/day) for commercial, institutional and light industrial uses were 60,000, 15,000 and 20,000 respectively. A 50,000L/gross ha/day rate was used for computing commercial and institutional sanitary flow needs and a rate of 35,00 L/ gross ha/day was used for computing light industrial sanitary flow needs. To this end, the estimated average daily water requirement for the proposed development will be 848,000 liters. In addition, the proposed development will also generate a total daily sanitary flow of 900,000 liters. These rates apply to the proposal as a whole and as such include both the Remote Intermodal Centre development lands and the Airport Sports Centre Complex development lands.

Table 13: Concept B - Future Theoretical Daily Water Consumption/Demand Estimates

Type of Use	Area (Ha)	Average Day Demand Rate (m <sup>3</sup> /gross ha/day)	Average Day Demand (L / day)	Maximum Day Demand (L / day)	Peak Hourly Demand (L / day)
Commercial	12	60	720000	1080000	1944000
Institutional	3.2	15	48000	72000	129600
Light Industrial	4	20	80000	120000	216000
Total			848000	1272000	2289600

Table 14: Concept B - Future Sanitary Sewer Flow Estimates

Type of Use	Area (Ha)	Average Flow Rate (L/Ha/day)	Total (L/day)
Commerical	12	50, 000	6, 000, 000
INstitutional	3.2	50, 000	160,000
Light Industrial	4	35, 000	140,000
Total			900,000

## 10.7 Summary

In summary, Proposal B seeks to develop land use concepts that will maximize the development potential of the OMCIA lands in a sustainable manner that improves overall passenger experience. The proposed development is designed to improve passenger experience by offering seamless transfers between different transit modes including commuter rail, high-speed rail, local and regional bus service, private automobile, walking and cycling. The transit hub will serve as alternative to traditional auto-centric development and is consistent with the City of Ottawa's transit oriented development guidelines. The development is further from the Airport than Proposal A but this can be overcome through the adoption of visionary and cost-effective technology like the Personal Rapid Transit system, which can transport passengers

seamlessly between the transit hub and the airport passenger terminal. Overall the development can serve as a landmark for the City of Ottawa by creating a sense of place and offering residents and visitors alike high quality service and recreational opportunities.



## 11.0 Market Analysis

### 11.1 Purpose

The market analysis was conducted in order to place the proposed industrial and office space development within the overall context of the projected demand for space by 2031 (the farthest that the City of Ottawa's employment projections go). The product of the market analysis is a projection of the additional required office and industrial floor area for 2031 as well as a hypothetical annual floor area absorption from 2015 to 2031. Refer to Appendix Q for market analysis methodology data tables, assumptions, notes, and sources.

### 11.2 Current Conditions

Ottawa's overall 2013 third quarter vacancy in office space is above average at 7.6% with the suburban market slightly higher than the central. Current asking rent averages at \$15.74 per square foot (\$169.42 per square metre) with some variations across Ottawa's submarkets. In the short term, it is expected that rental rates will decline as landlords compete for tenants in a market which currently has 277,594 square metres of vacant space and 192,495 square metres of additional space coming to the market in the next several years.<sup>70</sup> In the third quarter of 2013, industrial vacancy in Ottawa experienced a slight decrease from last year to 6.3%. The average asking rent across all submarkets is for industrial space is \$8.74 per square foot (\$94.08 per square metre). Currently there is 171,499 square metres of vacant industrial space and 2,601 square metres under construction. Currently southern Ottawa's share of the total office and industrial floor area is 8.29% and 31.06% respectively.<sup>70</sup>

### 11.3 Results

The market analysis showed that, by 2031, there will be a demand for an extra 637,899 square metres of new office space and 660,724 square metres of new industrial space in the City of Ottawa. It will take about 6.8 years to absorb the current vacant and under-construction office space and 3.3 years for industrial space. When taking into account the space currently vacant and under construction (470,089 square metres for office and 174,100 square metres for industrial) this corresponds to a hypothetical absorption 69,249 square metres for office and 52,176 square metres for industrial in the entire Ottawa market.

Table 15 presents the number of years required to absorb the proposed floor areas by the market using the derived hypothetical absorption rates after currently vacant and under construction space is absorbed. The results of the market analysis should be read with caution. Since it is not within the scope of this project to conduct a thorough analysis of the marketability of the proposal, this analysis provides a simple market context for the proposed development.

Table 15: Floor Area Absorption (square metres)

	Office	Industrial
Annual Absorption	69,249	52,176
Option A Total Area Years	1,079,576 15.6	-
Option B Total Area Years	28,039 0.4	9,940 0.2

#### 11.4 Implications for Concepts

Given the abundance of currently vacant and under construction office space in Ottawa, the office portion of the development proposal should be a longer term consideration for the airport. Industrial development may be more attractive in the short term due to its lower vacancy however it does generate almost 50% less in rent per square metre than office development. There may be a possibility to exploit niche markets for office and light industrial tenants who highly value a location near the airport. The market analysis does not take this into account and thus presents results that may underestimate rate of absorption. Therefore, the proposed development may be a lot more marketable to as a results of potential niche tenants than the market analysis predicts.

## 12.0 Concept Comparison and Recommendations

### 12.1 Comparison of Concepts

This study proposes two distinct development options for the study area within the OMCIA lands. In Development Concept A, an O-Train spur line connects the airport terminal with the existing rail corridor to the east of the study area. Development in Concept A will take place in parcels 1, 2 and 5 of the study area (See Appendix B). The terminus intermodal centre will be constructed adjacent to the airport passenger terminal while a secondary transit station will be located north of the Ernst & Young Centre at parcel 2. The option provides instantaneous access to the Airport terminal while not requiring an extra transfer on airport property. Moreover, this plan introduces a variety of mixed uses for developing the study area and connecting to the communities to the north and east. The development includes commercial, retail, research and development, office buildings and transport related uses, as well as several surface parking lots and a parkade. The major drawbacks however, include the high price tag associated with the spur line (USD 70 M) as well as a challenging configuration of westbound Airport Parkway access roads. The whole concept is also completely dependent on the construction of the O-train spur line.

Concept B looks at a scenario without a spur line to the airport terminal and therefore places the intermodal centre next to the existing rail line on the eastern edge of the study area. This concept relies on a Personal Rapid Transit (PRT) system to connect the intermodal centre with the airport terminal. Due to its distance from the terminal and the need for a transfer from one mode to another to complete the journey to the terminal, this intermodal centre will also offer a wide variety of passenger amenities including a remote baggage check-in system. Development will occur on parcels 2 and 3 of the study area. Concept B proposes a range of land uses including, commercial office buildings, a light industrial development, a five story parking garage, a grocery store, and a community and regional sports complex.

What makes this option noteworthy is that there is no need for a spur line. In addition, the capital cost of the PRT system would be lower than the spur line at USD 21-45 million (based on an estimate of USD 7-15 million per kilometre). Some of the major drawbacks of this plan include the distance from the airport terminal, the need for a transfer to the terminal, and the need for access roads from the Airport Parkway which is contrary to the Airport Urban Design Plan.

A summary of the major strengths and weaknesses of both concepts is summarized in Table 16

Table 16: Comparison of the main strengths and weaknesses of concepts A & B

Concept A		Concept B	
Strengths	Weaknesses	Strengths	Weaknesses
Immediate access to the terminal for transit users	High cost of spur line	No spur line required	Father from airport terminal
No additional transfers on airport property	Dependent on realization and timing of spur line	Lower cost of PRT versus rail spur	Requires extra transfer
		Possibility of phasing	Airport Parkway access contrary to urban design guidelines

## 12.2 Recommendations

### 12.2.1 Recommendation 1: Pursue Concept A

Concept A is recommended as the preferred development option. Based on the research conducted throughout the course of the project, it was found that most airports locate their intermodal transportation centre as close as possible to the passenger terminal. The main reason for this is passenger convenience. Locating the intermodal transportation centre in proximity to the terminal maximizes the transit seamlessness of the passenger's journey to and from the airport. Maximizing passenger convenience is important in influencing travel behaviour.

The main reason behind improving intermodal connectivity anywhere is to influence the traveller's decision to use more efficient and sustainable modes of transportation. The benefits of this range from increased public health and a decrease in traffic congestion, to an increase in the amount of developable land which would otherwise be used for parking.

Precedent case studies have proven the success and efficiency of local and regional rail in many airports around the world. There are various supporting cases such as the airports in Portland, Oslo, San Francisco and Salt Lake City. In all the aforementioned cases, the airport terminal is connected to a light rail transit line providing easy access to airport departures and arrivals. Development of an intermodal transit center will also provide greater connectivity between the neighbouring communities and the airport as well as creating more opportunities for employment and recreational uses within the airport boundary.

It is acknowledged that the cost associated with spur line development is much higher than the non-spur PRT option. It is also acknowledged that implementation of such an

idea is politically challenging. But the absence of an effective transit system means that the efficiency gained in the air will be diminished once you are on the ground. Air travel is one of the quickest ways of overcoming distance. However, after the passenger leaves the terminal, an efficient and convenient ground transportation system should exist to maintain expediency in their overall journey to the passenger's final destination.

#### 12.2.2 Recommendation 2: Strengthen Partnerships

Partnerships with all levels of government and government agencies are crucial to the development of a world class airport. Convenient connectivity, flexible choices of different modes, coordination and cooperation among transportation providers and governmental agencies at all levels are key to ensuring a seamless service.<sup>71</sup> Very few airports can accomplish large scale development without the financial and political support of different levels of government. The OMCIA benefits everyone in the region by providing connectivity to the rest of the country and the rest of the world as well as being a regional economic driver. Therefore, all parts of the private and public sector have a stake in the success of airport. The OMCIA is also in a unique position of being a smaller airport but being one that serves the nation's capital. As a result, the need for support from all levels of government is essential in creating a world class facility.



## 13.0 Conclusion

The aviation industry has developed to become a vital part of the increasingly globalized world economy. Airports, as the basic underlying foundation of the industry, play an integral role in facilitating the growth of international trade, tourism and investment. These facilities also serve as fundamental economic drivers that foster trade and commerce at the national, regional and sub-regional levels. At the local level, airports are also one of the most important economic drivers for the vitality of any city.

Over recent years a range of changes in the marketplace have influenced the way in which airports deliver services. Increased expectations for amenity standards by customers have prompted airport authorities to upgrade their existing facilities to improve their customer experience. Now more than ever, airports are required to enhance the quality and breadth of their services to remain competitive in the market. The OMCIA, like other airports, is faced with a challenge to enhance its ground transportation system and improve the passenger experience. In addition, the OMCIA is seeking ways to optimize its non-aeronautical revenue. This is important for generating additional income required for financing airport infrastructure development projects and for covering long-term maintenance costs.

This report presented two innovative and comprehensive development concepts for the Ottawa Macdonald-Cartier International Airport Authority to consider as they plan for the future. Each development concept proposes alternative ways through which the OMCIA could simultaneously achieve its overarching goals of improving its ground transportation system, enhancing the passenger experience, and optimizing revenue from non-aeronautical activities. The development of these concepts evolved through an extensive research process that commenced with an in-depth analysis of existing physical conditions and the relevant policy and regulatory frameworks that guide development in the study area. This provided a summary of background considerations and contextual factors and helped to identify and map appropriate sites in the study area on which the proposed concepts could be developed. A series of consultation meetings with representatives from the project's key stakeholders such as the OMCIA, the City of Ottawa and the National Capital Commission were undertaken and a summary of the key findings were incorporated into this report. In addition, a case study analysis of good airport development comparatives from around the world and other national commercial developments was conducted to identify best international and national precedents that could be adapted to the

Ottawa context. This thorough research process contributed to the development of the two design concepts proposed (Concept A and Concept B) for the OMCIA to consider moving forward. An analysis of the strengths and weakness of each option were included in this report and Option A was recommended as the better alternative to be pursued by the OMCIA largely based on its main strength of maximizing passenger convenience.

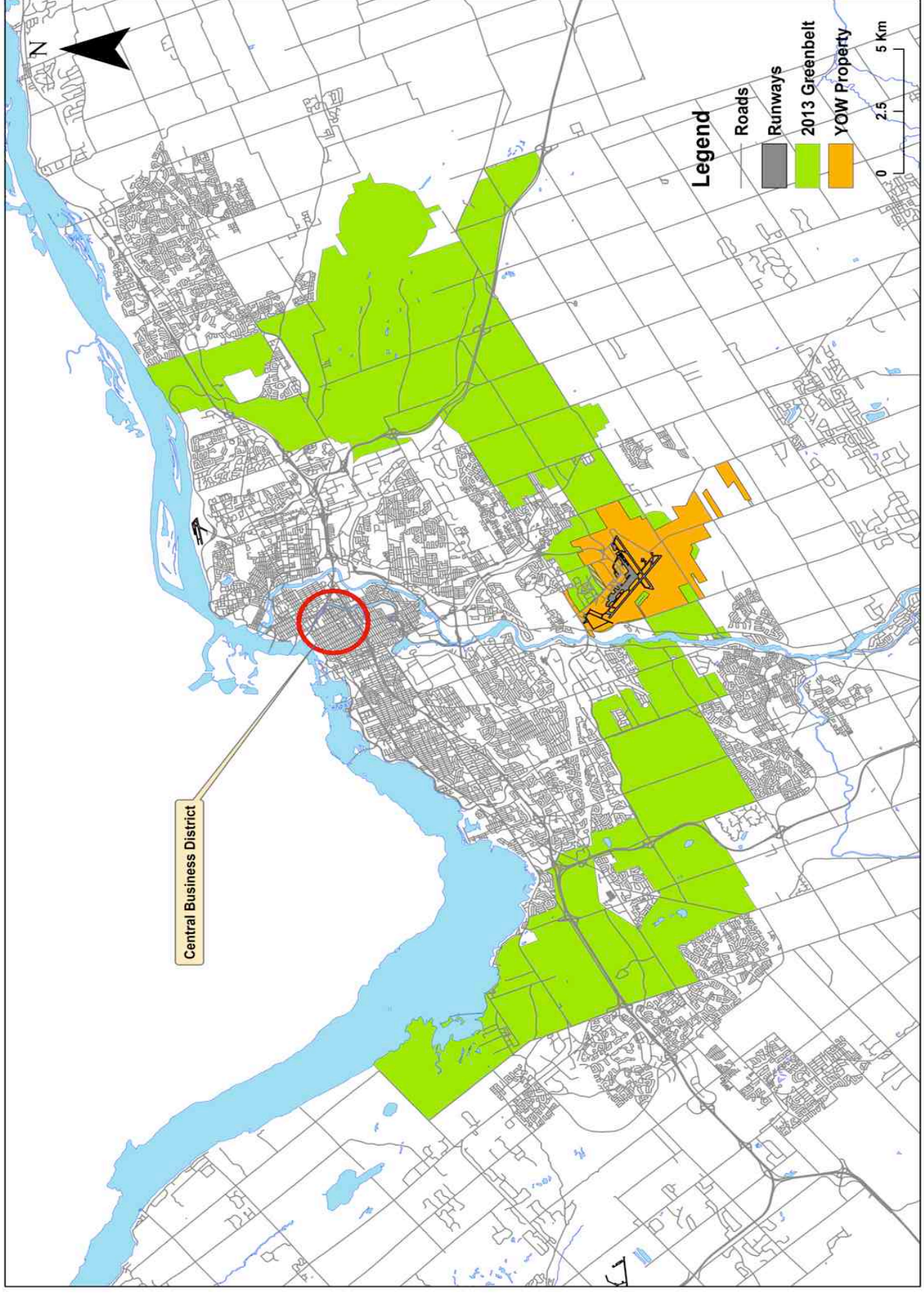
There are many reasons that make the realization of this proposal important for the OMCIA as well as for the other key stakeholders identified in this report. The proposal presents the OMCIA with a unique opportunity to provide better services for its customers and to capitalize on its existing land assets. This will secure the OMCIA's financial sustainability and self-sufficiency in the years to come and will also enable it to continue to play a key role as an important economic driver both in the Ottawa region and nationally. The OMCIA, in addition to serving the City of Ottawa, is the gateway to Canada's National Capital. Investing in infrastructure and services that enhance visitors' experience in the nation's capital is crucial for promoting Canada's unique image and character both nationally and internationally.

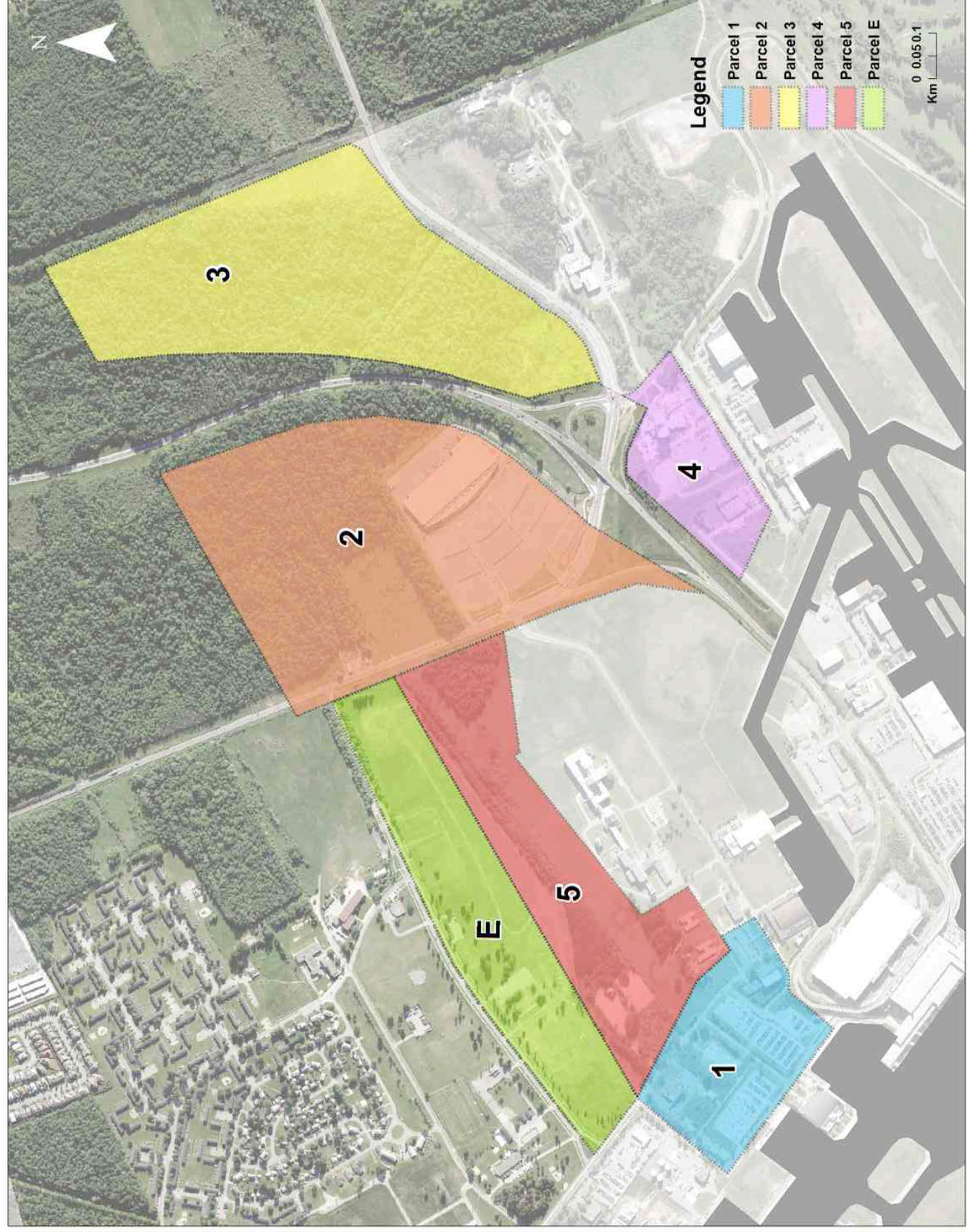
Aside from being a gateway to Canada's capital, the OMCIA also plays a major role in the economic development of Ottawa. Unlike most cities, the City of Ottawa is very fortunate to have its airport located relatively close to its central business district making it easily accessible to businesses and government offices. The success of this proposal will further increase Ottawa's strength as a competitive global hub and promote it globally as a top destination in which to work, play, study, visit and live. This is because the ability of the city to attract foreign investment, major events and conferences, as well as tourists is dependent on the airports multiple functions and services. The realization of the project will also benefit residents of Ottawa and the surrounding communities as it will create employment opportunities and provide them with better community amenities. All the project's stakeholders should thus work in close partnership to ensure the realization of this proposed development project.

## 14.0 Appendices

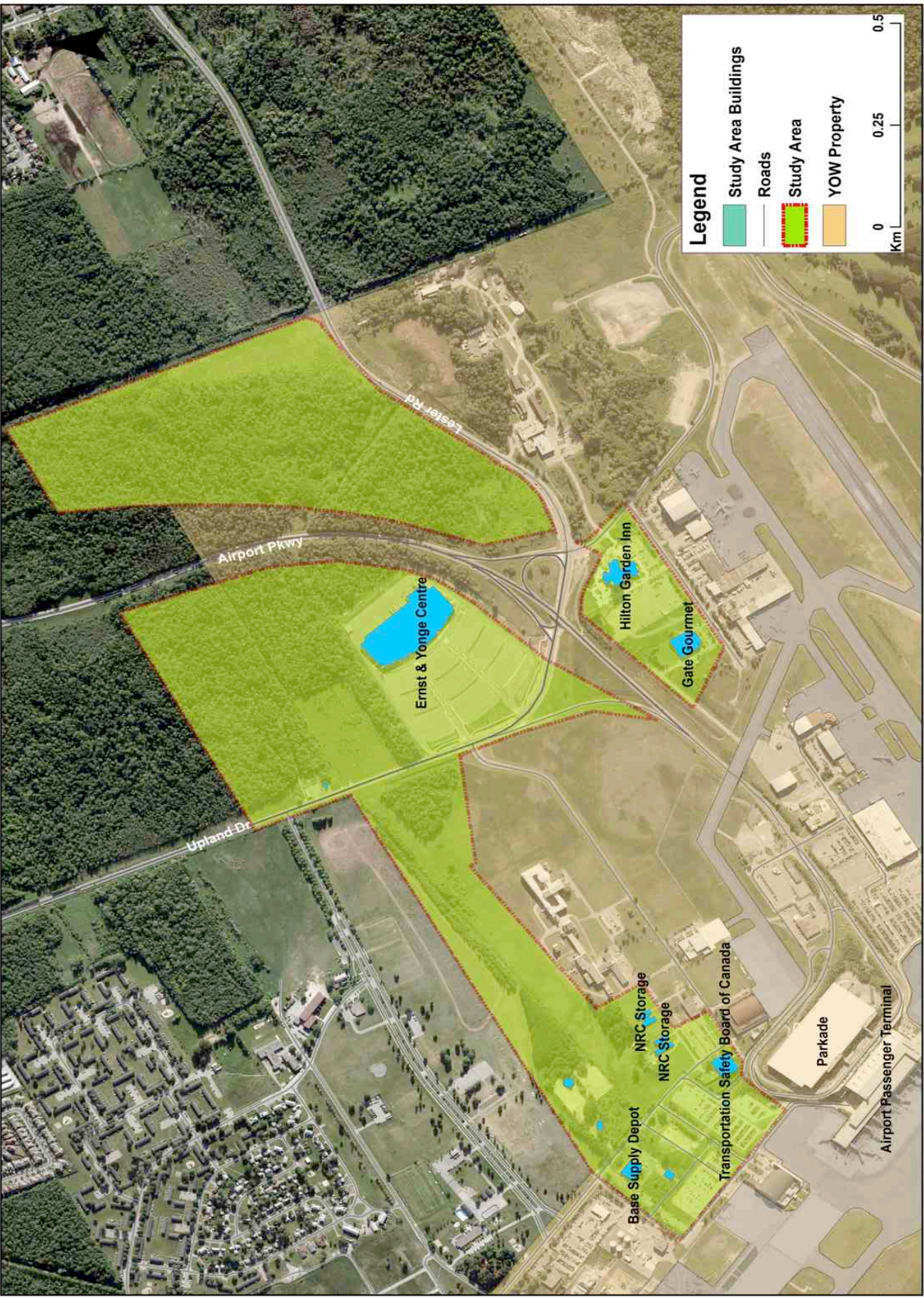
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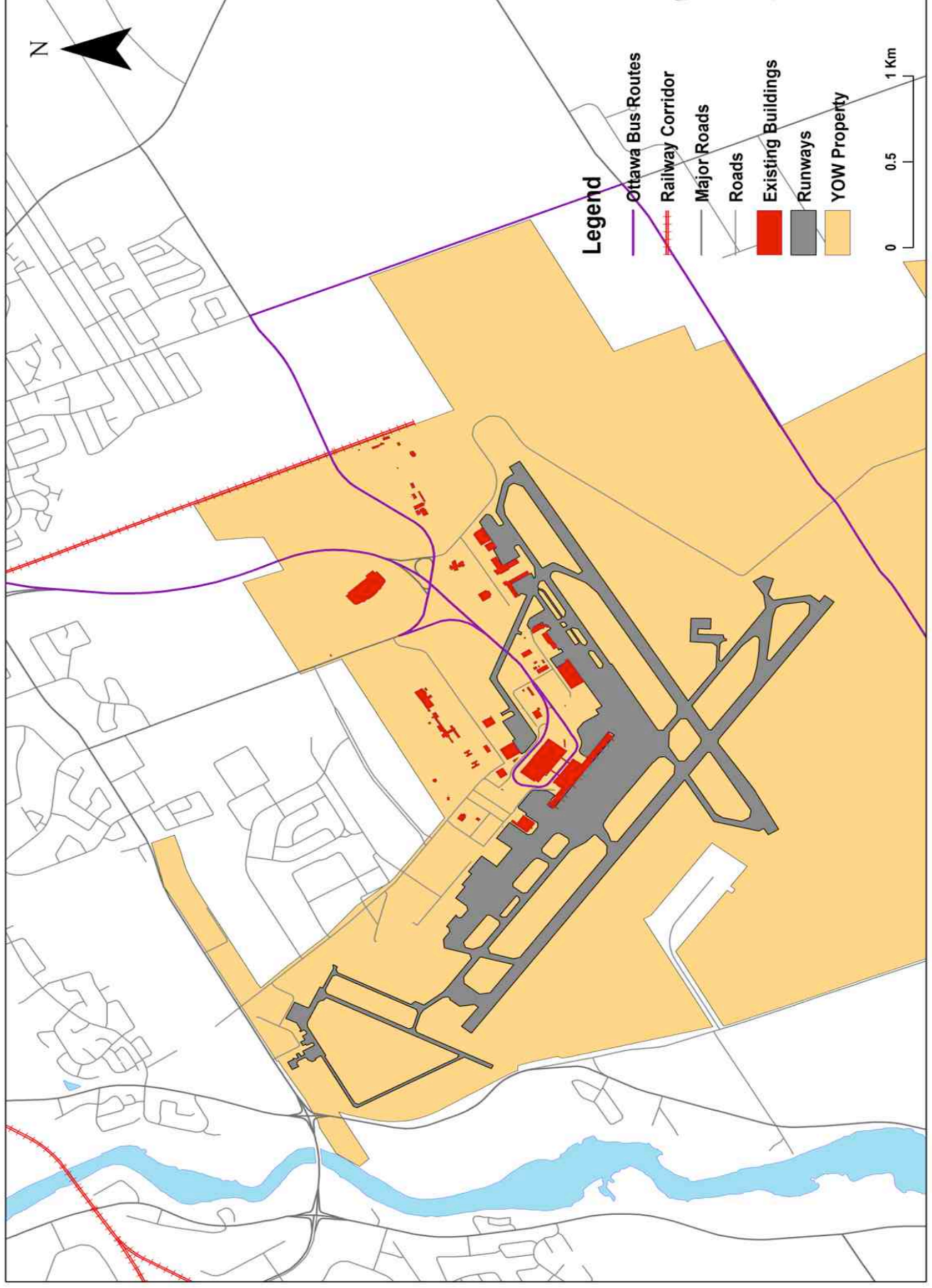




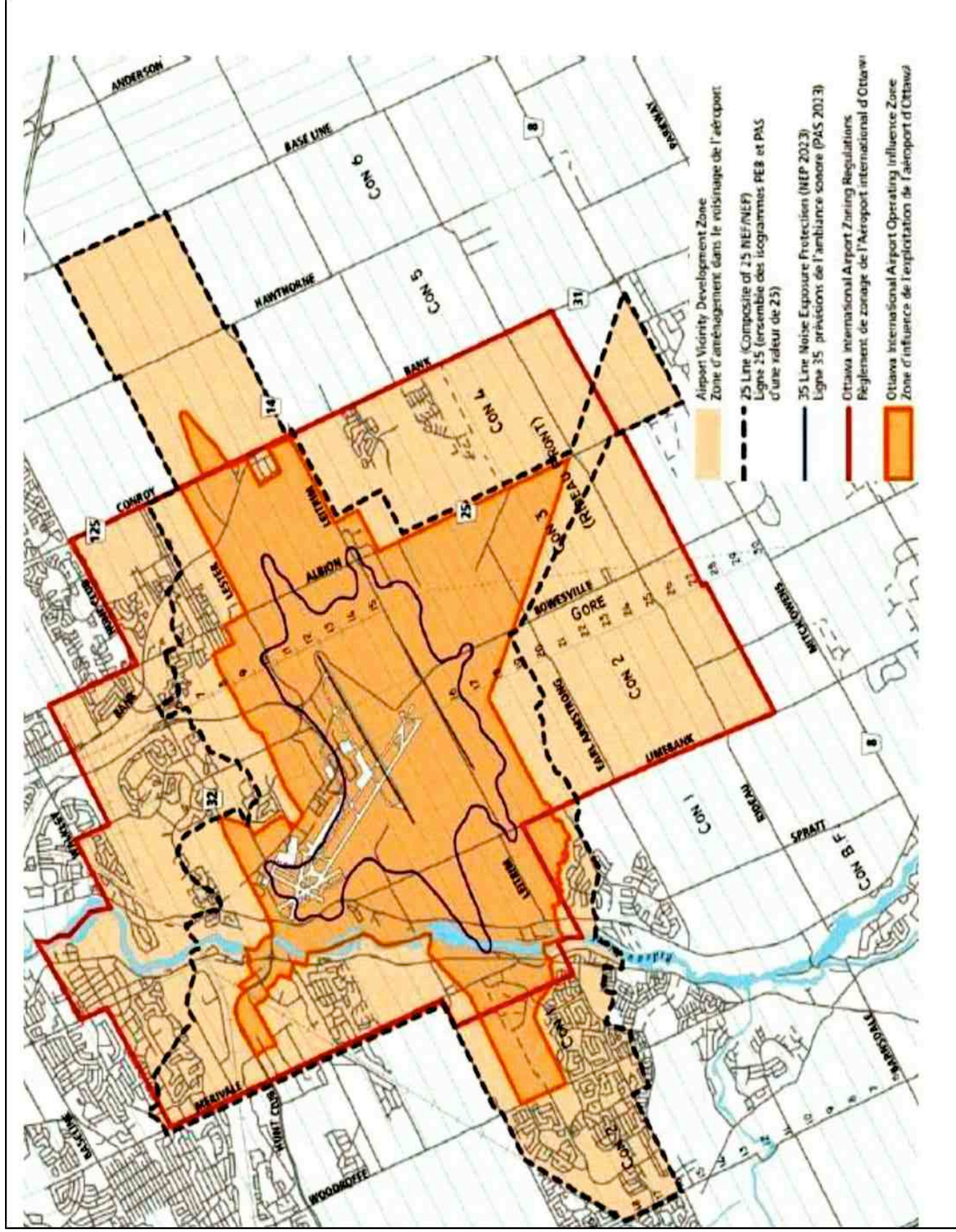
Appendix C- Existing Buildings

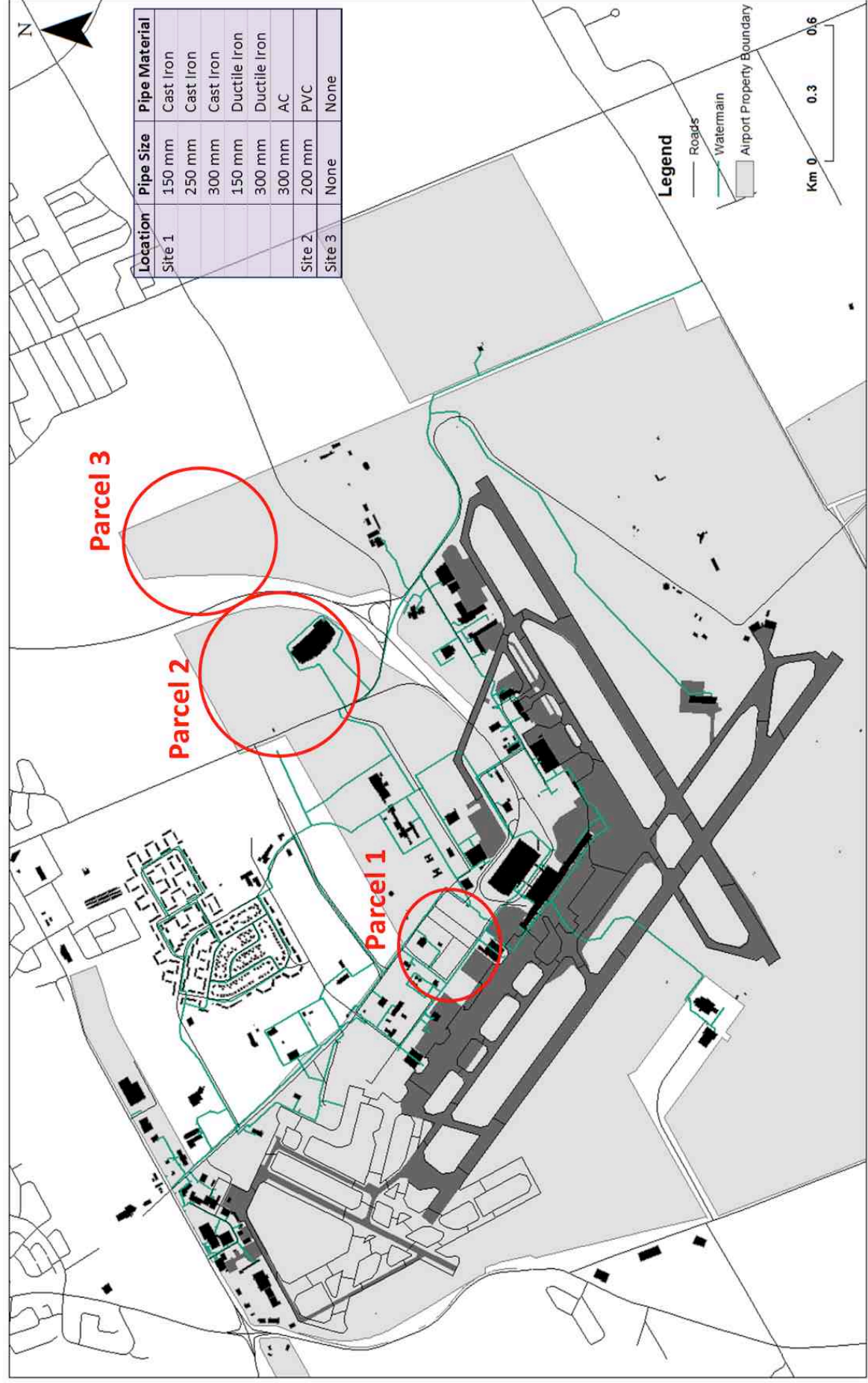


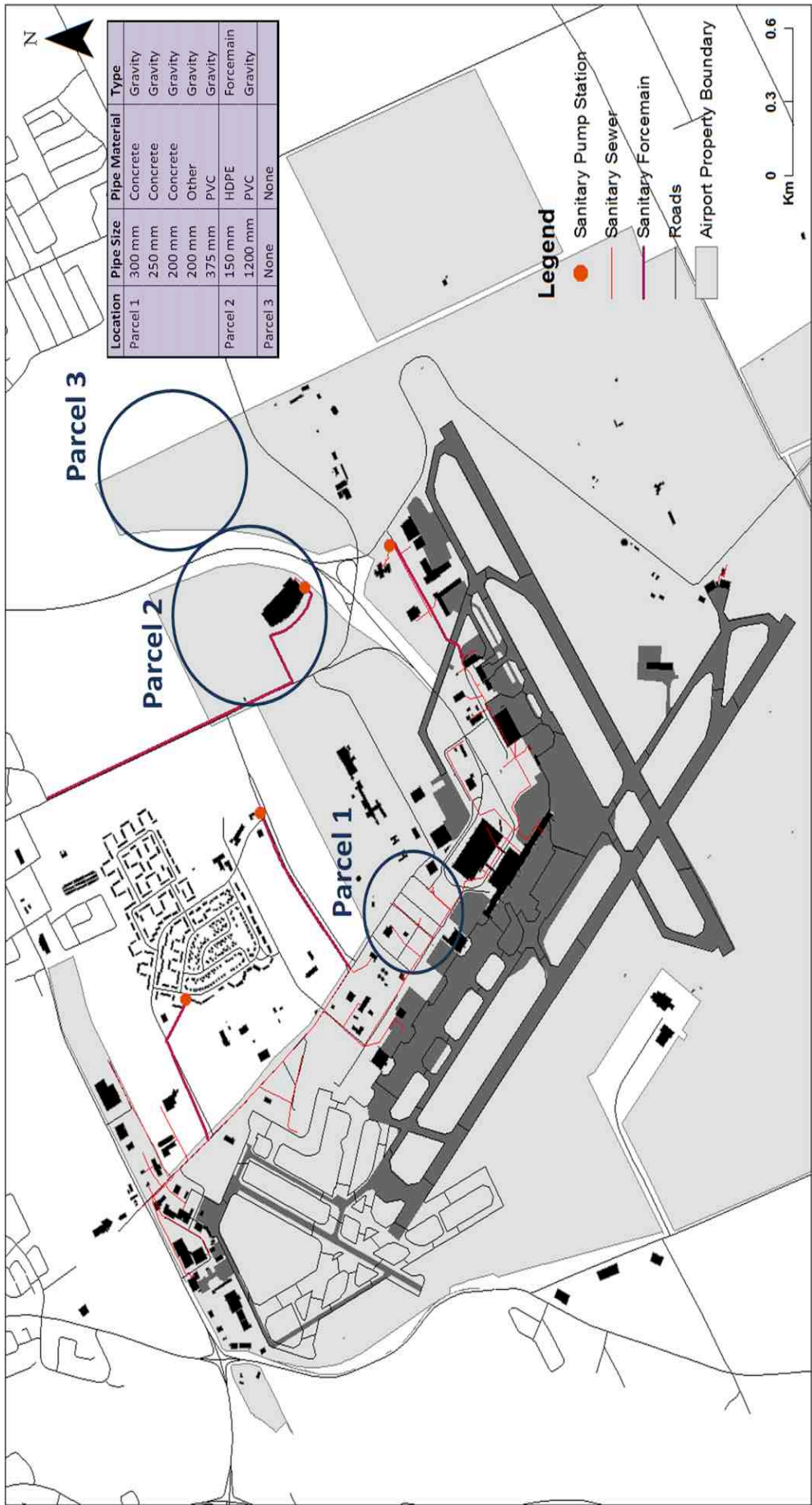
# Appendix D- Existing Transportation Links



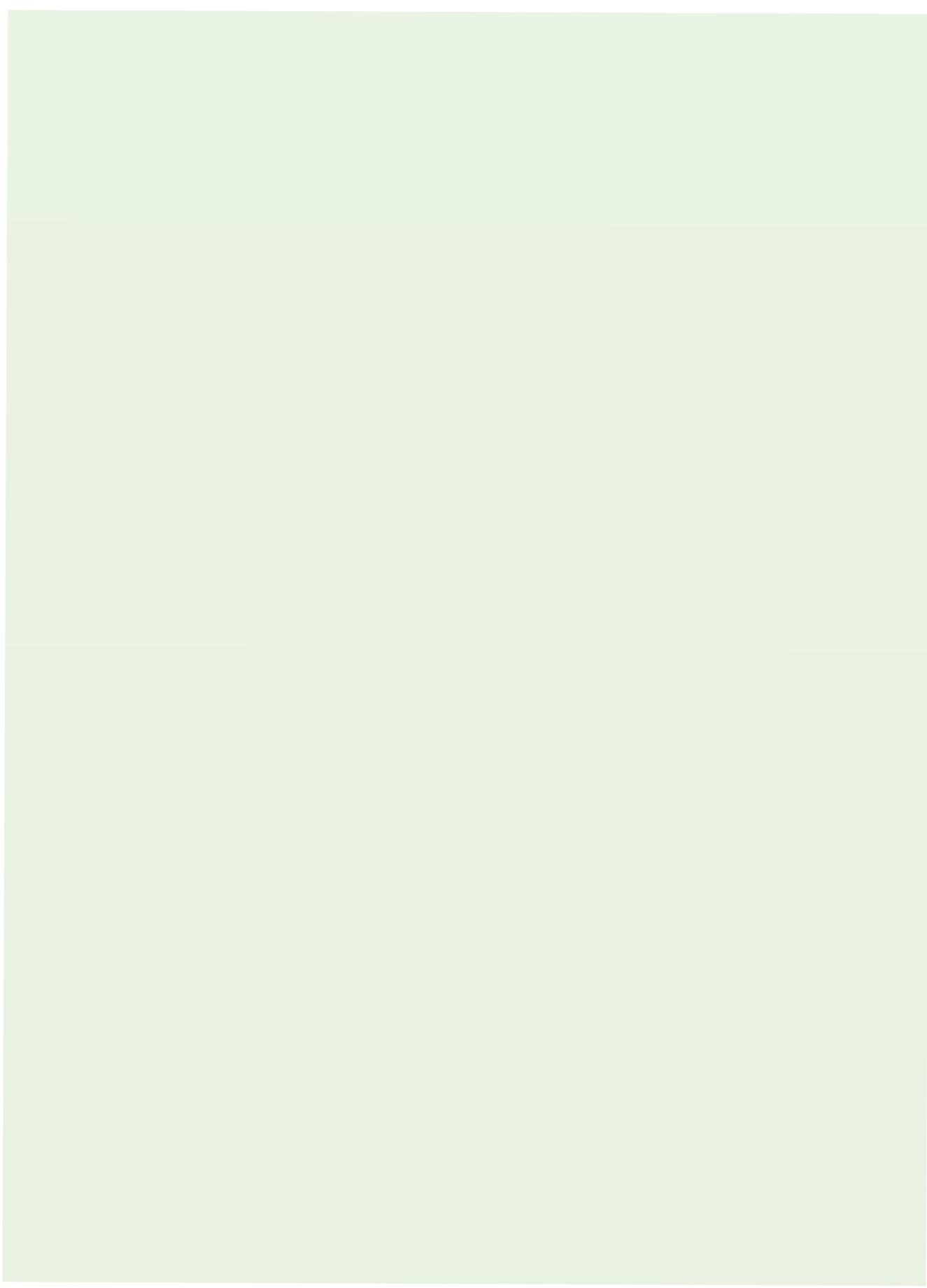
Appendix E - Ottawa Airport Operating Influences (AOIZ) and NEF/NEP Contour Lines

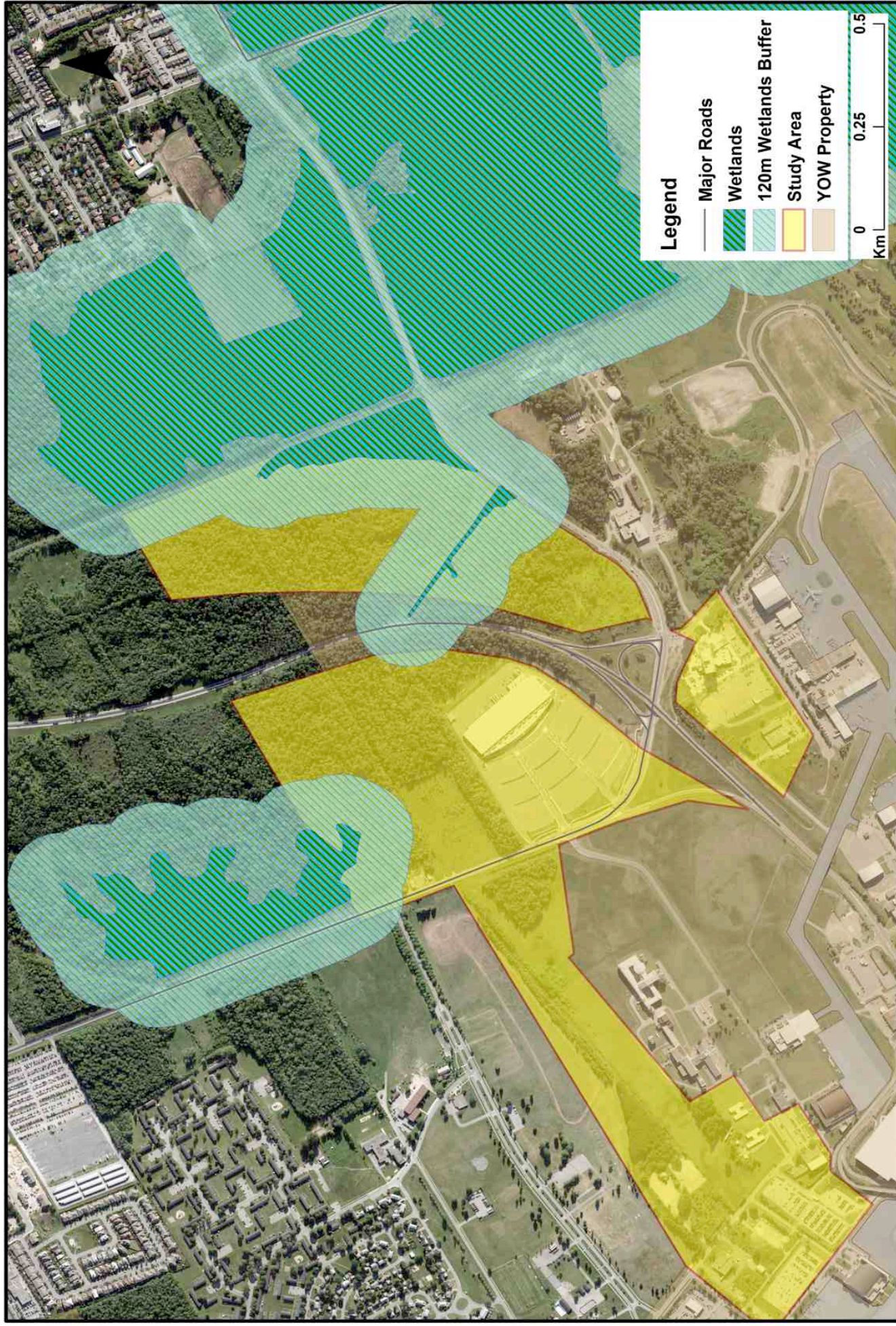






## Appendix H- Potential High- Speed Rail Corridor





## Appendix J - Urban Design Guidelines for Terminal Area and Airport Gateway Campuses

### 6.2 Gateways, Connectivity & Integration

The guidelines within this section address the connective tissue, public realm, identity and branding elements envisioned for the Airport. The focus of the following series of guidelines is on the life, activity and image created between and outside of buildings, and within the public thoroughfares, public realm and high visibility areas that may require the collaborative commitment of more than one organization and/or agency

#### 6.2.1 PRIMARY GATEWAY – AIRPORT PARKWAY

The application of the guidelines under this section should acknowledge the transitional nature and context of the Airport Gateway from a pastoral/rural character, to a transitional zone as you approach Lester Rd/Uplands Drive, and to the more urban setting around the terminal area. The associated treatments should respect the zone in which they are being applied.

##### Guideline 1: Develop Strong Iconic Gateway Treatments

This Capital Arrival route is the primary access leading to and from the Airport. The design effort expended along should be commensurate with this primary role in the hierarchy. The level of effort will take into consideration the nature of the proposed development, its scale, and the economic impact associated with high quality design. Encourage the development of strong iconic gateway treatments along Airport Parkway with the intent to:

- Landmark the arrival experience at and from a world class capital airport to the City;
- Landmark the arrival experience to the National Capital to the national capital international airport terminal area; and
- Recognize the first impressions left on first time visitors/dignitaries.
- Distinct, very high quality, iconic treatments are encouraged, to the extent feasible.

##### Guideline 2: Inter-agency Collaboration

The Airport Parkway spans a number of jurisdictions and these agencies should collaborate to develop an enhancement plan in both directions to better emphasize the arrival and departure experience.

#### Guideline 3: Attractive Gateway Signage Design

at the edge of airport property, but should limit the amount of light pollution. The Airport should develop a public art and commemorations policy and program. High quality public art should be present inside and outside the main terminal building.

#### Guideline 4: Street Lighting

Encourage unifying street lighting standard along the gateway route. Lighting should be designed and selected to minimize light pollution spilling into the Greenbelt, which is the gateway traverses. Lighting standards could be a sculpture in themselves and have the ability to carry pageantry and banners.

#### Guideline 5: Banner Design and Branding

Explore a template for banners on the light standards. This could offer a standardized template to add colour and animation, in a bold yet classy manner, along the gateway procession, to and from the airport. For example, showcasing the diverse cultural mosaic of Canada. Furthermore, efforts can be taken with local and regional tourism boards, economic development agencies and business organizations to use these banners to showcase major national capital and regional destinations, seasonal festivals, special events, facilities and even businesses. The signs or banners should be dynamic and be continually refreshed, and offer a potential advertising revenue stream to support further gateway route enhancements and on-going maintenance of the gateway. Collaborate with the NCC and the City to ensure banners can be mounted on NCC and City poles.

#### Guideline 6: Maintain Natural Character of Parkway

Maintain the natural forested character of the Airport Parkway as much as possible as an extension of the Greenbelt and its neutral and rural character.

### 6.2.3 STREETSCAPES, OPEN SPACE, BIKEWAYS AND PEDESTRIAN REALM

#### Guideline 1: Safe, Walkable Streets

Promote safe and walkable streets, open space connections, bike-ways and multi-use pathways that connect or link the sub campus areas.

#### Guideline 2: Common Light Standard

Establish common light standards with pageantry program, with potential for seasonal and special event advertising, and appropriate to the hierarchy of experience, and level of design effort in each sector.

#### Guideline 3: Natural Boulevards

Boulevards on internal local and collectors roads should consist of soft groundcover possibly integrated with Low Impact Design and/or bioswales where possible. Street trees should be generally located within these boulevards and be offset a minimum of two metres from the curb to accommodate snow storage and minimize salt damage. The planting of trees that are salt tolerant, low-maintenance and do not bear fruit is suggested.

#### Guideline 3: Attractive Gateway Signage Design

Create an enhancement plan that fosters a bold sense of arrival through the use of attractive signage design well blended into the natural landscape. Use of earth forms and native species/grasses can be used to integrate signage with the natural landscape. Creative use of coloured lighting for the gateway signage is encouraged.

#### Guideline 4: Urban Boulevards (Terminal Area, Not Approach)

In more urban/commercial settings, the boulevards can be a combination of softscapes and hardscapes and be an extension or connection to plazas, building entries/facades, sidewalk café's, etc.

#### Guideline 5: Street Trees

Street/boulevard trees should be spaced at consistent intervals, where possible, but should not obstruct site access and sightlines.

#### Guideline 6: Sidewalks

Sidewalks should be provided on at least one side of all major collector streets.

#### Guideline 7: Cycling Facilities

On-street bikeways should be integrated into the road design, where practical. To the extent possible, these should be linked major cycling commuter and recreational routes.

#### Guideline 8: Transit Stop Design

Transit stop locations and associated street furniture should be enhanced at strategic locations on arterial major collector roads to best delineate and link transit stops at key destinations, commercial centres and/or intensive employment areas.

#### Guideline 9: Traffic Calming

Traffic calming measures should be considered at key intersections to not only define the significance of those focal points, but also to establish pedestrian and other non-motorized forms of transportation as a priority.

### 6.2.4 INTERFACE & LANDSCAPE DESIGN

#### Guideline 1: Creativity and Variety

Creative use and blend of native species of varying textures, height and seasonal colour changes is highly encouraged.

#### Guideline 2: Native Species

Encourage the use of native, low maintenance, pest and disease-resistant species of trees and shrubs. Non-native species may be considered where appropriate, provided their use supports other design objectives.

#### Guideline 3: Key Intersection Treatments

Landscape treatments should be enhanced and/or intensified at key intersections into sub-campus areas.

#### Guideline 4: Species Selection Considerations

Select landscaping/vegetation must not be attractive to birds. Low maintenance and long living species are preferred. Mature tree heights should be considered relative to the Obstacle Limitation Surfaces constraints. Although native species are encouraged, non-native species, where appropriate is supported provided it supports other design objectives.

#### Guideline 5: Forest Character of Parkway (Approach only – not terminal)

Enhance, maintain and preserve, where feasible, the “forest” character adjacent to the Airport Parkway to screen buildings adjacent to the Parkway. This treatment along the Parkway should take into consideration the transition from the “forest” character to the more urban character in the approach to the terminal area (under both the current Parkway alignment or the potential future alignment).

### 6.2.5 PUBLIC REALM, AMENITIES & SENSE OF PLACE

#### Guideline 1: The Terminal Zone as Public Face

Special attention must continue to be given to the terminal zone as it is the public face to the airport. While facilitating the movement of high volumes of people and traffic, this has to be balanced with the opportunity to create a unique sense of place with a memorable and enjoyable experience that offers appealing architecture, pageantry, places to stop or rest, things to watch and comfortable spaces to navigate facilities from ground transportation through to the check-in and security gates. The tone and standard that has been already set needs to be maintained with continued efforts to further enhance the fine character that has been established to date. Future terminal area buildings need to be informed by and complement the style and tone and ensure that new terminal buildings are well connected/integrated with the existing buildings and public profile. Further enhancement and innovation is encouraged and supported.

#### Guideline 2: Creating Well Designed Spaces (Terminal only)

Create multi-functional, inviting, animated public open space/plazas. Where possible airfield viewing areas should be integrated within these spaces.

#### Guideline 3: Signage Design

Establish common signage design and a way finding sign program or replicate common icon or branding to landmark all airport business campuses and distinguish them from non-airport lands. This will help to create a distinct airport edge in relation to the surrounding urban community. In collaboration with others, establish a public art, interpretation and commemoration program for areas significant to the experience of airport lands, as resources permit.

#### Guideline 4: Connectivity (Terminal Only)

Promote opportunities for public open space systems to connect to restaurants, caf  s and urban plazas in key locations.

#### Guideline 5: Useable Recreational Spaces (Approach only)

Create outdoor/Indoor recreational facilities for use by local businesses and surrounding communities.

#### Guideline 6: Retail/Commercial Hubs (Terminal Only)

Facilitate commercial and personal service uses that cater to both staff in the employment parks as well as the surrounding community. The commercial/retail nodes should be concentrated around key intersections where these serve as entries into the various sub-campus.

### 6.3.1 SITE ACCESS & CIRCULATION

#### Guideline 1: Airside Opportunities (Terminal Only)

Maximize any and all airside opportunities. Priority must be given to airside accessible sites.

#### Guideline 2: Access from Airport Parkway (Approach Only)

Direct access to a development site from the Airport Parkway is strongly discouraged.

#### Guideline 3: Site Access

Individual site/lot access should be off internal roadways wherever possible. The number of driveway accesses should be minimized to protect and minimize interruptions to the pedestrian streetscape. Common or shared driveways/entries should be explored.

#### Guideline 4: Design for all Modes

Site design should address the needs of pedestrians and motorists, as well as cyclists. Safe and direct circulation routes should be provided with priority given to pedestrians.

#### Guideline 5: Service and Emergency Access

Consideration should be given to service and loading needs, as well as emergency vehicles. Circulation and on site logistics design will need to consider the intensity, number and size of delivery or transport vehicles that are anticipated for the intended use. Generally, vehicle and pedestrian traffic should be able to access and leave the site in a safe and efficient manner and minimize awkward turning movements.

#### Guideline 6: Loading

All loading and site logistics need to be contained on-site and may not spill over onto public streets.

Guideline 7: Pedestrian Priority

Ensure pedestrians do not have to cross driveways or stacking lanes to enter buildings from the street. Discourage parking or vehicular site access between buildings and the street. Provide secondary access to the building from parking lots where necessary.

Guideline 8: Drive Throughs

Where drive-through facilities are permitted, ensure best practices are implemented.

6.3.2 LANDSCAPING & STREETSCAPES

Guideline 1: Professional Qualifications

All landscape plans need to be prepared by a qualified Landscape Architect.

Guideline 3: Business Campus Setting (Approach only)

At minimum all development sites should achieve a campus style landscape design treatment that features large boulevards, strategic berming, trees and ground cover.

Guideline 4: High Visibility Areas or Routes (Terminal Only)

High quality landscaping, more urban in character using both hard and soft landscaping treatments are desired along high visibility areas or routes. These routes favour creative designs using a variety of textures, colours and size of planting material and ground cover, as well as attractive sidewalks lined with trees and strategically located seating areas. A 15 to 20% landscaped area should be targeted, portions of which do not have to be at grade; (soft or hard landscaping).

Guideline 5: Connectivity

All development sites must have internal connections to public sidewalks, where they exist.

Guideline 6: Non-Developed Areas

All non-developed areas should be left in a natural state and/or soft landscaped wherever possible. Native species and low maintenance landscapes are highly encouraged, and will need to be regularly maintained.

Guideline 7: Weather Protection

Effective landscaping should be used to shelter buildings and outdoor public/tenant areas from seasonal weather and prolong enjoyment of outdoor space.

Guideline 8: Take Advantage of Natural Assets

Wherever possible, site design should recognize and take advantage of the natural landscape assets of the site, such as existing trees, viewsheds, contours and water features.

Guideline 9: Take Advantage of Visual Opportunities

Buildings should be sited to complement the visual quality of the existing and planned

streetscape of proposed future buildings.

#### Guideline 10: Using Landscape to Enhance Site

Landscaping should be used as a major source of site enhancement and softening element to the physical scale and the amount of hard surfaces typical in business campus developments. Not only should landscaping be used to reduce the amount of hard horizontal surfaces, it can also be used to soften vertical surfaces such as breaking up large expanses of blank walls

### 6.3.3 SIGNAGE

Signs can reinforce the sense of quality of the employment parks through sensitive design, use of colour and material, and their placement at entrance areas and on the building façade.

#### Guideline 1: Ground Level Signage

Ground level signage is preferred and encouraged in the front yards and placed strategically throughout larger comprehensive sites, to identify the use and businesses within the building(s) or site and/or to assist in wayfinding.

#### Guideline 2: Lighting of Signs (Approach Only)

Preference is given to signs that are externally lit, while bright back-lit signs are to be avoided where possible.

#### Guideline 3: Sign Integration

Building or corporate identity signs can be integrated on the building facades, along roof lines or architectural elements, but should generally complement the architecture, scale, colour, materials and landscape design of the building and site. The building itself at key intersections could be a form of a sign/sculpture visible from grade. Rooftop advertising and signage intended to be visible from aircraft is discouraged.

#### Guideline 4: City of Ottawa Bylaws

Signs should be considerate of the City of Ottawa Permanent Signs on Private Property Bylaw. Signs should generally not obstruct key sightlines, driveways and/or intersections.

#### Guideline 5: Signage Along Airport Parkway (Approach Only)

In key locations on the building sites that face the Airport Parkway, backlit signage, especially on top of building facades or rooflines, is discouraged in order to maintain the natural forest preserve and dark sky characteristics. Animated signs are also discouraged in these locations. Ground level, carefully illuminated signage is preferred in these locations.

#### Guideline 6: Signage Along Commercial Corridors (Terminal Only)

Along key commercial corridors, animated and backlit signage will be permitted, but

has to also address Guideline 3.

#### Guideline 7: Compatibility

Signs should be compatible with the scale and visual character of the site, and complement the building and landscape design and not detract or overpower the building.

#### Guideline 8: Visual Coherence

A sign template should be prepared to establish a general framework for visual coherence within a business campus as well as to unify all airport sub-campuses. A professional designer should be engaged to develop a common signage design and plan.

#### Guideline 9: Wayfinding

Consistent interior and exterior directional signage is encouraged and will assist the orientation to pedestrians, cyclists and motorists relative to connections to the building or set of buildings, parking areas, service and open space amenities and directional control, where appropriate. A common design for wayfinding should be developed. Specific wayfinding designs for pedestrians and cyclists should consider best practices.

### 6.3.4 SETBACK CONSIDERATIONS

#### Guideline 1: Airside Access

For lots that have airside access, the minimum separation distances contained in Transport Canada document TP312E - Aerodromes Standards and Recommended practices - must be applied to the airside environment.

#### Guideline 2: Street Orientation

Buildings should be street-oriented and be situated as close as possible to the street along key frontages. Different buildings along these key frontages should match and create a common rhythm and continuous building frontage line.

#### Guideline 4: Sites Backing onto Airport Parkway (Approach only)

Generous rear yard setbacks for parcels backing onto Airport Parkway are required to protect the forest character of the Parkway and to screen buildings from being readily visible from the Parkway.

### 6.3.5 LIGHTING

#### Guideline 1: Light Standards

Establish consistent light standard and fixture options that are integrated with the overall architecture, urban design and landscape design. Establish specific lighting level criteria (e.g., lux, uniformity levels) for Airport roadways, pathways and sidewalks.

#### Guideline 2: Light Containment

Lighting should be contained and directed down, only toward areas of the site where it is needed and should not spill over to adjacent development and natural areas. Full cut-off type lighting is preferred and over-lighting a site should be avoided. Ensure interior and exterior spaces are illuminated having considered best practices in bird-friendly lighting. Energy efficient lighting solutions should be implemented where feasible

#### Guideline 3: Accent Lighting

Creative use of lighting should be used to accent and highlight the buildings, especially key focal points, architectural features or entries, as long as it does not create additional light spill over into the sky or adjacent properties. In addition, landscape features, such as fountains, integrated storm ponds, flagpoles, prominent trees, etc. can be strategically illuminated.

#### Guideline 4: Pedestrian Lighting

Lighting should focus on pedestrian areas, clearly identifying pedestrian routes and building entrances

### 6.3.6 SCREENING

#### Guideline 1: Use of Landscaping (Terminal only)

Intelligent use of landscaping (e.g., vegetation, berming, etc.) is encouraged to screen parking, large outside storage areas and drive-through service lanes that may be necessary.

#### Guideline 3: Screening of Outside Storage (Approach only)

In all other campus areas, where outside storage is permitted, the storage area needs to be completely screened from the public roadways, to the extent feasible.

#### Guideline 4: Loading Areas (Approach only)

Loading areas should be positioned in the building so that it is not visible from the street and public spaces or properly screened using building elements and/or creative landscaping.

#### Guideline 5: Mechanical Equipment

Mechanical equipment, vents and/or communication devices, either at grade or on top of roofs, should be hidden from ground level through the use of architectural components and/or landscaping.

### 6.3.7 PARKING

#### Guideline 1: Discouraging Large Surface Parking Areas in Key Locations

Key roads serving non-airside properties should discourage large surface parking areas immediately adjacent the frontage roadway, and a landscape strip or berm should be provided between the street and the

parking area, where parking is placed between the frontage road and the building.

#### Guideline 2: Parking Lot Lighting

Parking lot lighting levels should be uniform and minimize light pollution off-site. Lighting should be directed downwards only to the needed areas. Smart lighting systems that capture solar power and are connected to motion sensors that power down during inactive periods of the evening is one example of the desired innovative approaches.

#### Guideline 3: Minimizing Large Contiguous Surface Parking Areas

Large parking areas should be broken up with adequately sized landscape strips to minimize contiguous and vast spans of parking. The landscape strips should be designed to support the survival of trees and shrubs that are salt and drought tolerant or other alternatives that are attractive, yet low maintenance. These landscape strips can be integrated with low impact development components to help address on site storm water management.

#### Guideline 4: Pervious Surfacing

The use of pervious surface options that can support the weight, wear and tear of the anticipated vehicle traffic, is highly encouraged.

#### Guideline 5: Parking on Key Frontage Streets (Approach only)

Parking should generally be located away from the street front, in between buildings or at the rear of buildings. Parking, if located in between the building and the street, should be limited to one module/row of parking.

#### Guideline 7: Accessible Parking

Parking stalls should allow for easy access to building entrances, provide well defined pathway connections to the building, but remain secondary to pathways from the street, particularly in TA, ATC, and CC. Encourage parking rows to be perpendicular to the main building entrance to improve pedestrian movements.

#### Guideline 8: Winter Considerations

On site snow storage areas that are well-drained through overland escape routes or infiltration areas, should be considered adjacent parking areas and away from catch basins where possible.

#### Guideline 9: Shared Parking

Explore opportunities for shared parking where adjacent uses have complementary demand patterns.

### 6.3.8 ONSITE STORM WATER MANAGEMENT

#### Guideline 1: Best Practices

Integration of Low Impact Development (LID), Best Management

Practices (BMP) and Source Control Practices in the site design are highly encouraged to manage storm water on site. Recognize rainwater and snowmelt water as valuable resources. Favour approaches to stormwater that manage it first at source, second with conveyance methods, before end of pipe solutions are examined. Manage both quality and quantity to provincial standards.

#### Guideline 2: Roadway Storm Water Management

Internal on-site roadways and parking lots are encouraged to integrate bio-swales and overland conveyance to manage storm water run-off to feed rain-gardens or irrigation cisterns. Where appropriate, maintain rural road cross-section (e.g., ditches).

#### Guideline 3: Pond Design

Storm ponds should be integrated with the building landscape design and double as decorative landscape features or fountains. Pond designs should include native plant materials. Stormwater management facilities should be designed in such a way, as to minimize and reduce the risk associated with bird hazards on the airport. Infiltration of post development flows should be integrated into all site plans. However, small storm ponds may be necessary.

#### Guideline 4: Naturalized Areas

Adjacent natural areas will not be used for stormwater management unless if required to maintain or stabilize their pre-existing water regime.

#### Guideline 5: Impervious Surfaces

Minimize site and building impervious surfaces to the extent feasible.

### 6.3.9 SECURITY & FENCING

#### Guideline 1: Mandatory Fencing (Terminal only)

Security fencing is mandatory around all airside lots to protect the airfield zone. This security fencing needs to meet the Transport Canada requirements. Innovative alternatives will need to be explored with the Airport Authority and Transport Canada.

#### Guideline 2: Selective or Limited Fencing (Approach only)

Limited fencing is preferred in other locations to facilitate wildlife movement, unless user security dictates otherwise. If required, fencing should be contained only to areas that are required and blend into the overall landscape design character and the building design.

#### Guideline 3: Coordination and Standardization

Users are encouraged to collaborate with other adjacent tenants and the Authority to establish common fencing options within a sub-campus.

#### Guideline 4: Green Fencing

Where restricted public access is desired, a green fence or "living fence" planting approach alone or in combination with landscaping features such as a ha-ha (a ditch with a retaining wall) and the use of boulders and stones should be considered. Dense plantings and native trees and shrubs, including thorn-bearing shrubs should be considered. A green fence cannot be used to replace airfield security fencing, but may complement this security fence for the purposes of softening its appearance.

#### Guideline 5: Maintain Clear Sightlines

Clear sightlines should be maintained to outdoor gathering areas, patios, plazas, etc. to allow people to see and be seen from the buildings and the streets and optimize natural surveillance opportunities from buildings, roads and pathways.

#### Guideline 6: CPTED

In general building and site design should adhere to the principles of CPTED (Crime Prevention Through Environmental Design) to avoid retrofits, such as the recourse to unnecessary supplementary lighting.

### 6.3.10 BUILDING ENVELOPES & MASSING

#### Guideline 1: Encourage Verticality Where Possible (Terminal only)

Where building height restrictions are minimal, building envelopes should maximize development opportunities vertically and to landmark key intersections or gateways into sub-campuses.

#### Guideline 2: Areas of Moderate Height Constraints (Terminal only)

In areas where height restrictions are moderate (limited to 45m or less), building heights will need to be limited to below 45m (above the airport reference point).

#### Guideline 4: Building Envelope and Setback Considerations

Building envelopes must conform to the height restrictions established by the Obstacle Limitation Surfaces associated with the OMCA.

#### Guideline 5: Line of Sight and Other Operations / Implications (Terminal only)

Building envelopes must not obscure the line of sight between the Air Traffic Control Tower and the airport's manoeuvring area. In addition, building envelopes are to conform to any guidelines developed by NavCanada for their review through their Land Use Program - In accordance with their Submission Process. Wherever possible development yield should be maximized to make efficient use of developable envelopes, but considerate of NavCanada constraints.

#### Guideline 6: Shadows (terminal only)

Consider sun and shadow effects of buildings on the street and pedestrian environment

### 6.3.11 BUILDING DESIGN, ARTICULATION & ORIENTATION

#### Guideline 1: Creating A Sense of Place

Although no specific architectural theme has been established, each building should be designed to create a distinct sense of place, while reflecting modern building innovations and functions, and the users/activities that they accommodate.

#### Guideline 2: Use of Architectural Expression

Architectural features, window openings and creative use of exterior cladding materials should be used to emphasize key entry areas and other special building features and to reduce the large runs of blank walls. Use of awnings, canopies, and other architectural elements should be used to emphasize entrances.

#### Guideline 6: Focal Points and Landmark Locations (Terminal only)

Buildings located on corner lots and/or prominent locations should be designed as focal points to landmark these key locations. The building architecture should be expressive of the importance of the location. Moderate to high level of architectural detailing is expected in key high profile/landmark locations and destinations.

#### Guideline 7: Design Integration

Building design should flow and integrate well with the site landscaping, fountains, storm water management solutions, loading and parking areas, and open space networks.

#### Guideline 8: Street Orientation (approach only)

Buildings should generally address internal streets (within a sub-campus) as much as possible to help create an active pedestrian realm along the internal roadways. Airside oriented buildings are generally exempted from this requirement, and can address the internal streets only where practical.

#### Guideline 9: Tree Preservation (approach only)

Buildings should be located near and/or front onto internal roads, and away from Airport Parkway to maximize tree preservation adjacent Parkway.

#### Guideline 10: Building Articulation

Building design should be clean and attractive. Large or long runs of blank walls should be avoided. Articulating large buildings both vertically or horizontally plus use of different colours or materials should be used to break up large blank walls as well as add visual interest. Integrating fenestration, building entrances, banding, murals, entrance, material transitions, differentiated rooflines are all possible design strategies to offset dull building facades and create visually attractive buildings. These long single use exterior walls can be converted into an artistic canvas for public art and be strategically used for advertising opportunities and revenues.

### 6.3.12 MATERIALS

#### Guideline 2: Durability

Use high quality durable materials that can withstand severe weather extremes and

exposure; preferably locally available.

Guideline 3: Colour (Terminal only)

No limitations on colour use in key areas.

Guideline 4: Tones (Approach only)

In key locations, the use of natural and muted tones are preferred.

6.3.13 OTHER COMPONENTS

Guideline 1: Enclosed Garbage Storage

Garbage storage shall be fully enclosed and designed to minimize and mitigate attracting wildlife.

Guideline 2: Refuse Containers

Any outdoor staff or public areas shall have garbage containers that are bird and wildlife proof.

6.3.14 SUSTAINABLE DESIGN AND INNOVATION

Guideline 1: Integrated Design

Integrated building performance systems should be explored for all new buildings. Building design should consider harnessing the benefits of strategic solar orientation.

Guideline 2: Local Sourcing

Encourage use of building components that are fabricated and available in the local region and minimize use of products and materials from outside the region.

Guideline 3: Green Roofs

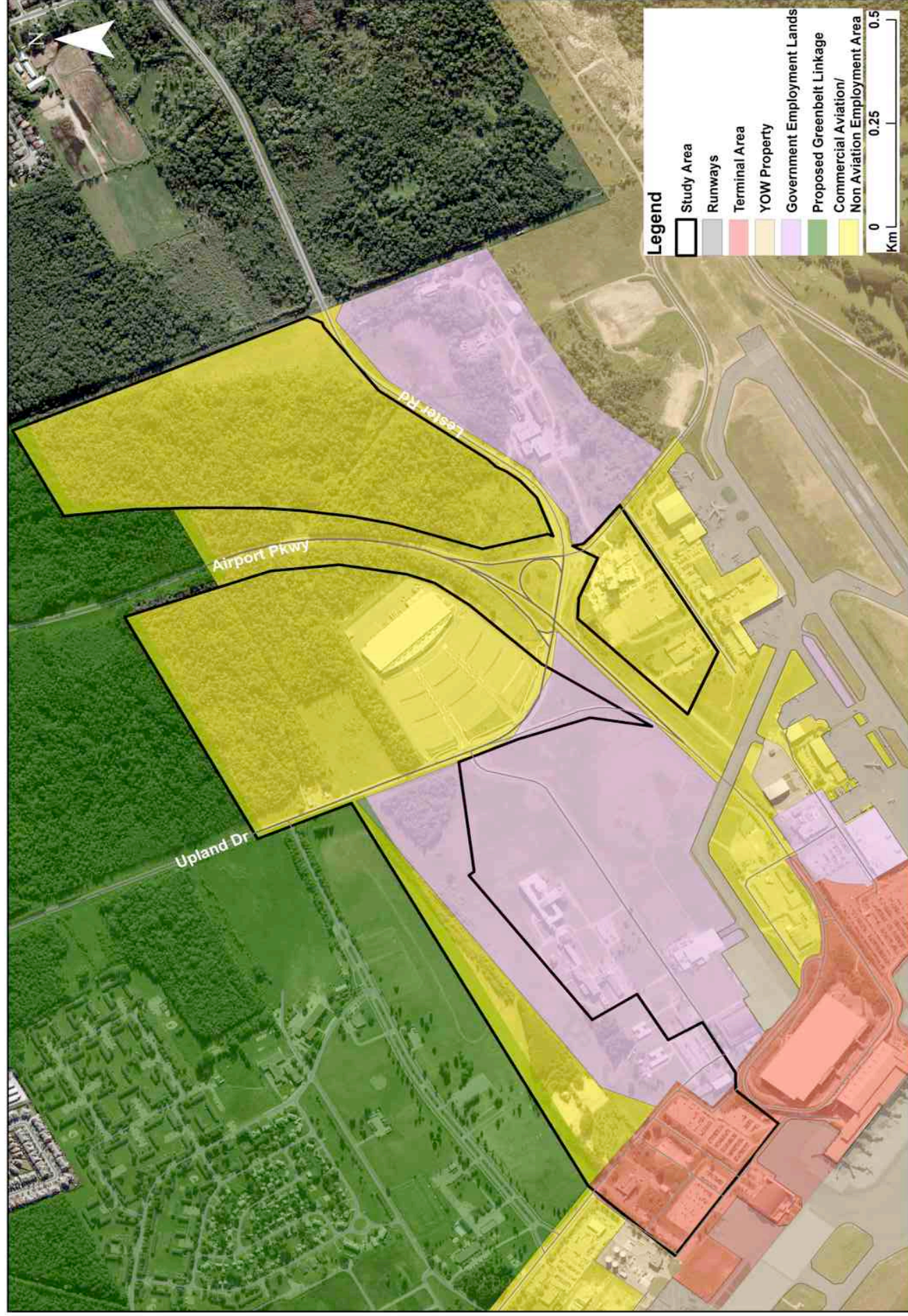
Encourage green roofs and roof gardens where feasible and economically viable, and require highly reflective roof surfaces in other cases, unless they conflict with airport operations. Where feasible, use rooftop retention to assist with site stormwater management measures.

Guideline 4: Certification

LEED certification or equivalent criteria is encouraged for all new business campus construction.

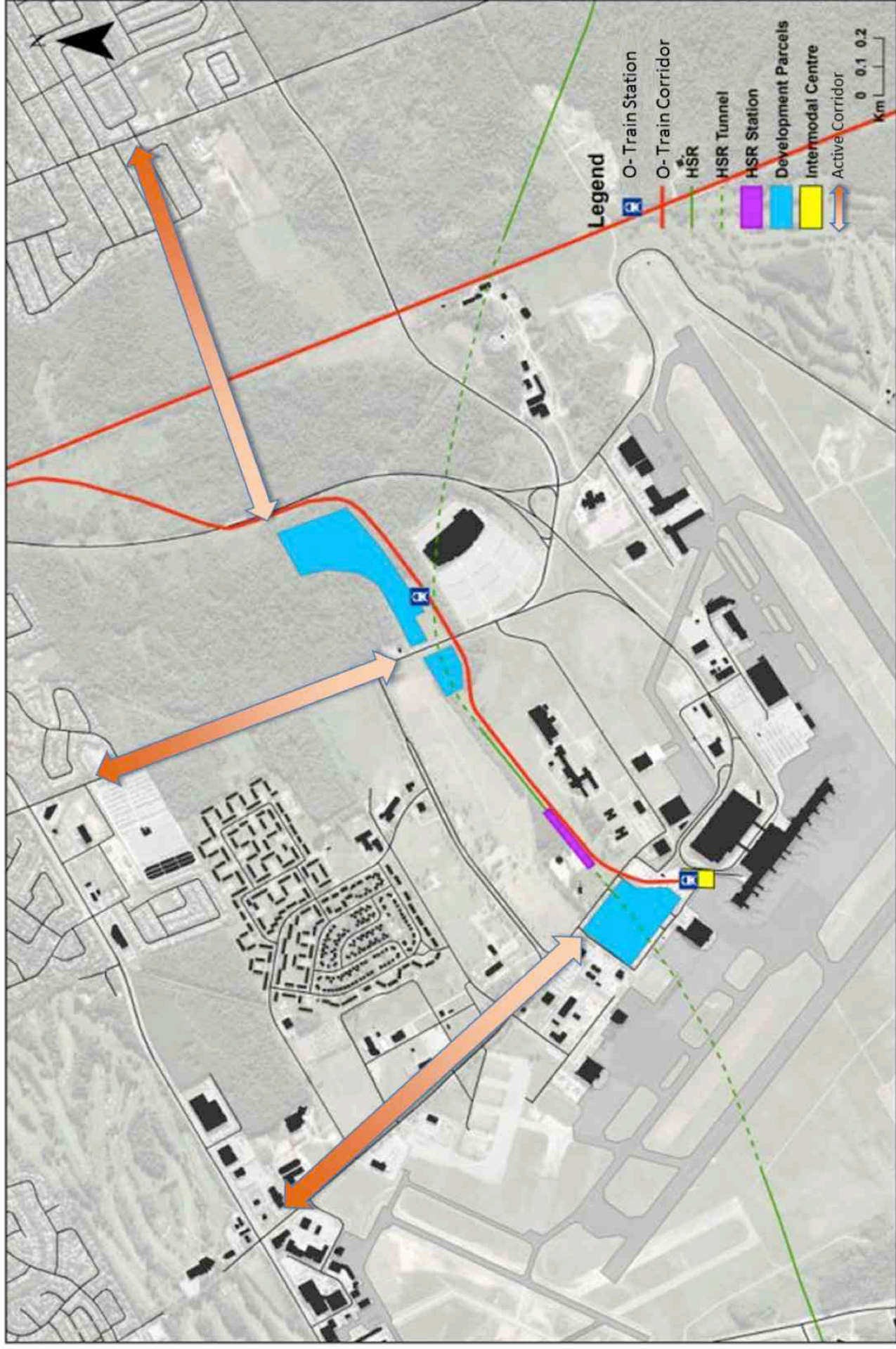
Guideline 5: Energy Innovation

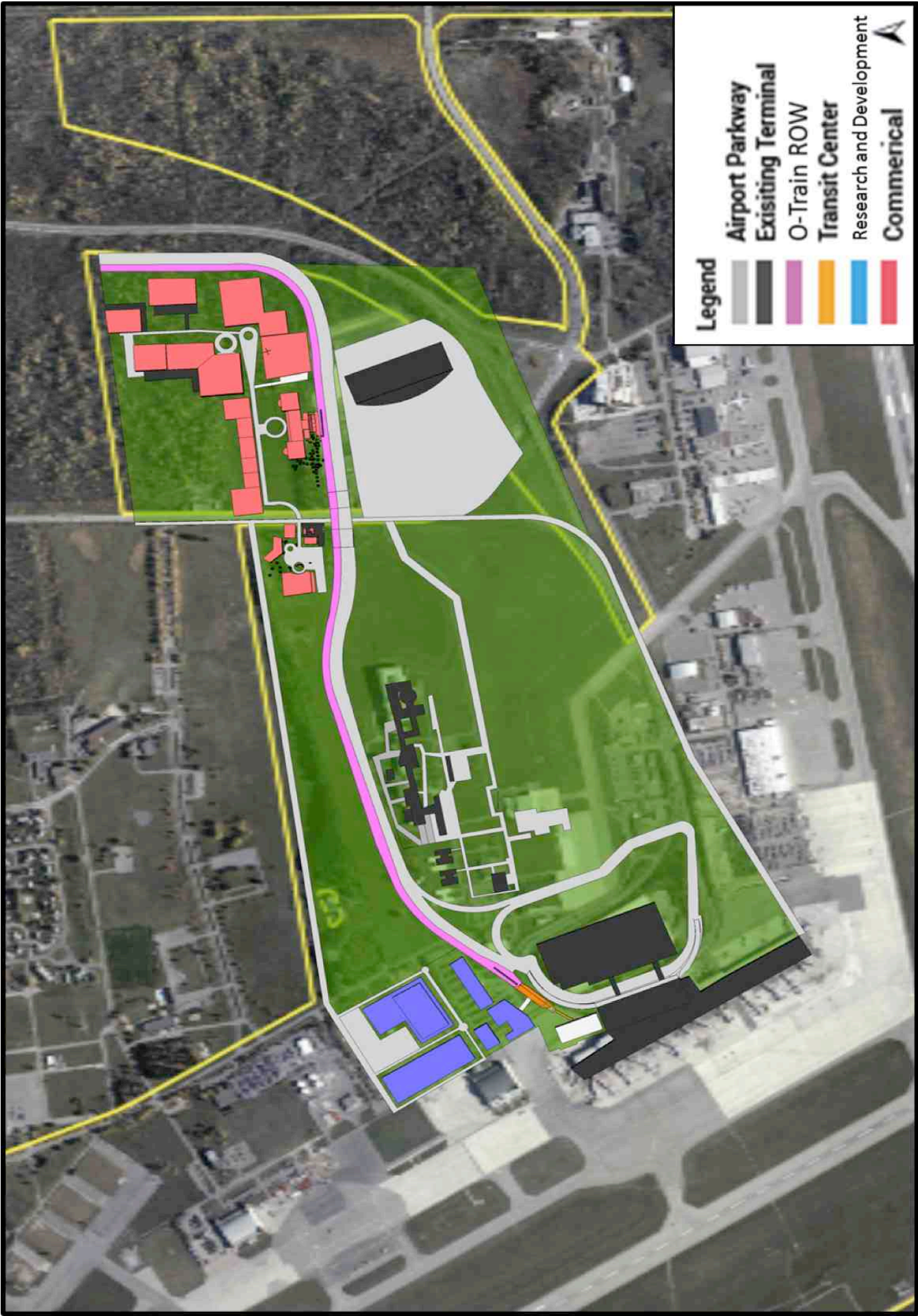
Buildings are encouraged to make use, where practical, of innovative energy and environmental best practices, such as passive and active solar technology, green rooms, convection, environmental waste water processing, water re-use systems, energy efficient lighting, etc.

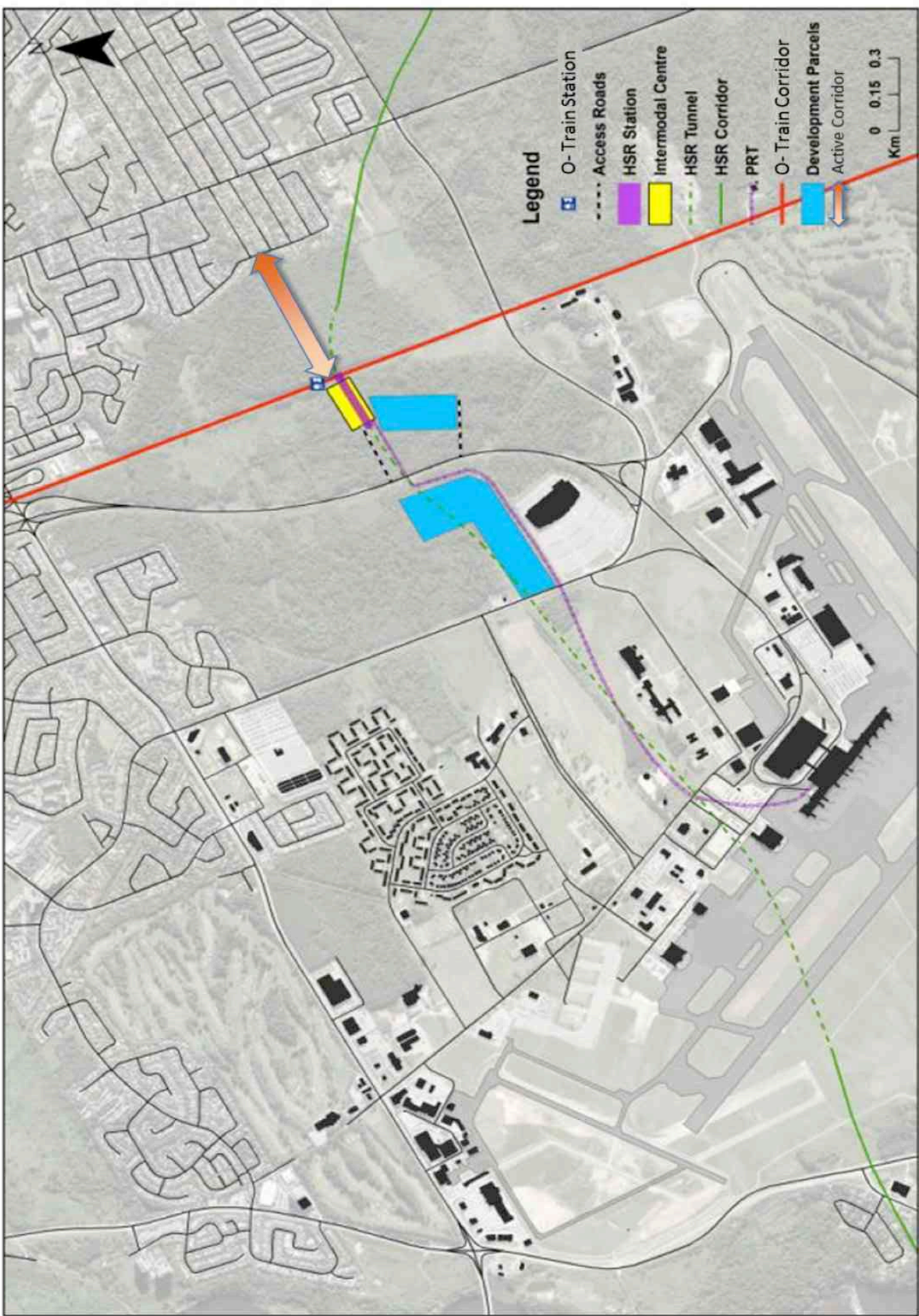


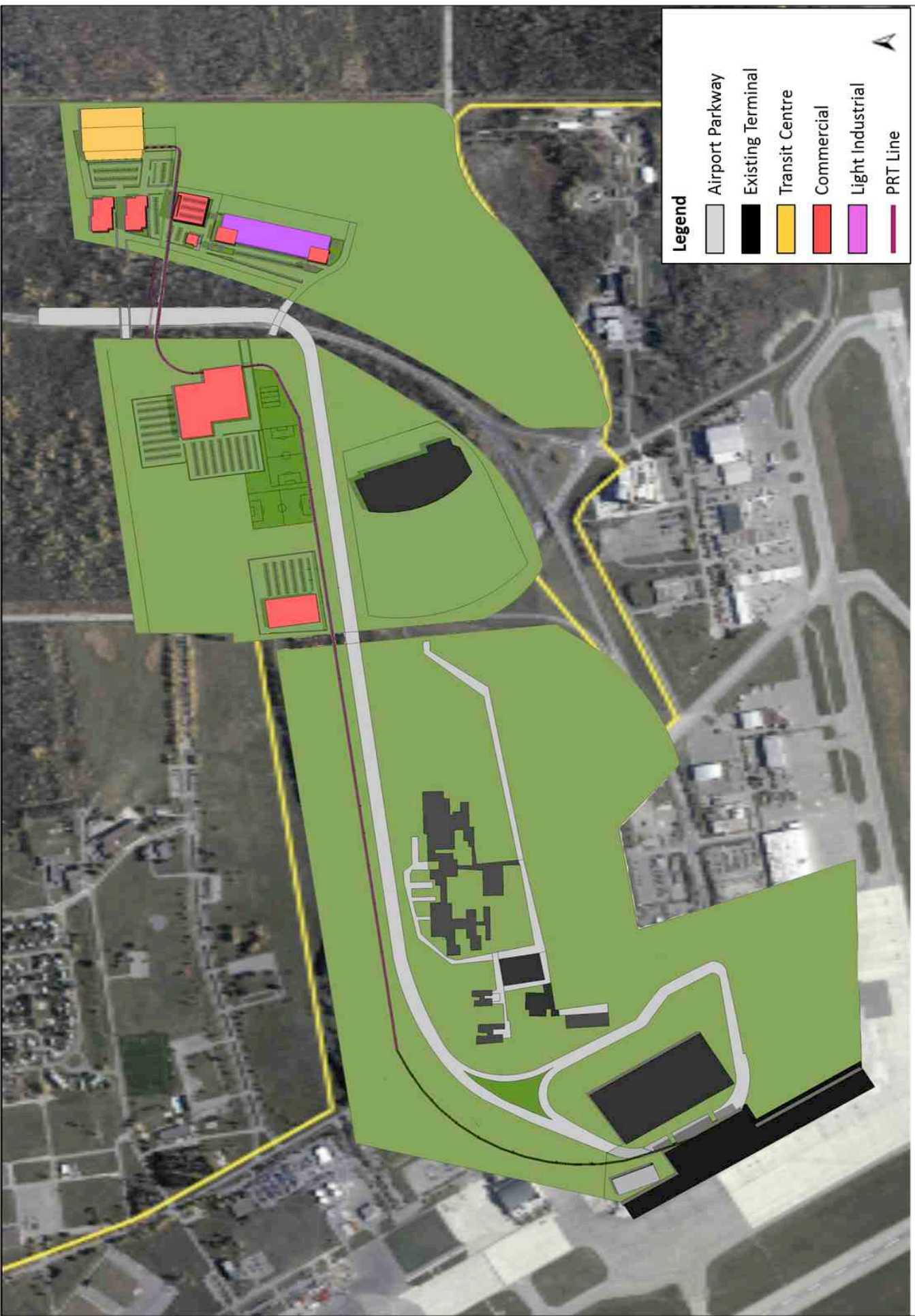
# Appendix L - Case Study Comparison Summary

Airport	Passengers (millions)	Service Population	Distance from downtown	Transit available	Frequency (minutes)	Terminal Context	Other Modes	Commercial Develop- ment
Ottawa	4.6	1.2 mil	10km	Bus to Train	5 to 7	N/A	N/A	No
Edmonton	6.7	1.2 mil	26km	Bus to Train	30 to 60	N/A	N/A	No
San Jose	8.4	2 mil	4km	Bus to Train	15 to 30	N/A	N/A	No
Lyon	8.4	2.9 mil	20km	High Speed Rail, Light Rail	15	N/A	N/A	No
Oakland	10.1	7 mil (Metro)	14km	People Mover to Light Rail (2014)	4	Adjacent to Ter- minal	No	No
St. Louis	13.3	2.9 mil	16km	Light Rail	12 to 20	Underground at two terminals	No	No
Calgary	13.6	1.2 mil	17km	Bus	30	Inside Terminal	No	No
Portland	14.3	2.3 mil	14kn	Light Rail	15 to 30	Underground at the edge of Ter- minal	Bus	No
Lisbon	15.3	3 mil	7km	Light Rail	6 to 9	Between terminal and parkade	No	Yes
Vancouver	17.6	2.3 mil	13km	Light Rail	6 to 20	Adjacent to Ter- minal	Bus	No
Salt Lake City	21	2.3 mil	6.4km	Light Rail	15 to 20	Past parkade	Bus	No
Oslo	22.1	1.5 mil	35km	High Speed Rail	10	2 km East of Ter- minal	Bus, Passenger Rail	No
Seattle	33	3.9 mil	22km	Light Rail	7.5 to 15	Inside Terminal	Bus	No
Toronto	35	5.6 mil	23km	Express Rail (2015)	15	Between terminal and parkade	Bus, Regional Bus	No
Miami	39.5	5.6 mil	13km	Light Rail	10 to 30	400m away from station	N/A	Yes
San Francisco	44.5	7 mil (Metro)	21km	Light Rail	15	Inside Terminal	Nus, Regional Bus, Passenger Rail	No









## Appendix Q – Market Analysis Methodology, Data Tables, Assumptions, Notes, and Sources

### Method

Year-to-date monthly employment figures were obtained from Statistics Canada's Labour Force Survey and averaged to produce an estimate for the number of currently employed individuals in the Ontario portion of the Ottawa-Gatineau Census Metropolitan Area. The City's projection for employment in 2031 was taken from the Transportation Master Plan [Draft] 2013. The difference between these numbers is the projected increase in employment by 2031.

Floor area per worker was obtained by breaking down the current employment by sector and dividing by the amount of currently occupied floor area by that sector within the City. Next, the projected increase in employment was broken down by sector and multiplied by the floor area per worker to obtain the increase in floor area demand by 2031. From this number the currently vacant and under construction floor area was subtracted to obtain the total new floor area required by 2031. Finally, dividing the increase in floor area demand by 16 years adds context to the proposed development showing a hypothetical yearly absorption for the entire City between 2015 and 2031.

Table A1: City of Ottawa Employment

Current Employment <sup>1</sup>	529,760
2031 Employment <sup>2</sup>	702,200
Projected Increase	173,440

Table A2: Current Floor Area per Employee (square metres)

	Office	Industrial
Share of Employment <sup>3</sup>	0.45	0.10
Employment 2013	238,392	52,976
Current Occupied <sup>4,5</sup>	3,384,272	2,549,910
Area per Worker	14	48

Table A3: Increase in Floor Area Demand by 2031

	Office	Industrial
Share of Employment <sup>3</sup>	0.45	0.10
Additional Employees by 2031	78,048	17,344
Space per worker	14	48
Increase in Floor Area Demand (2031)	1,107,989	834,824

Table A4: Hypothetical Annual Absorption, Vacancy, and Construction

	Office	Industrial
Increase in Floor Area Demand (2031)	1,107,989	834,824
Current Vac. <sup>4,5</sup>	277,594	171,499
Under Const. <sup>4,5</sup>	192,495	2,601
Total New Floor Area Required (2031)	637,899	660,724
Hypothetical Yearly Absorption (2013-2031)	69,249	52,176
Years Until 100% Absorption of Vac./Const.	6.8	3.3

### Assumptions

- 1) Industry employment shares will stay constant for the forecasting period.
- 2) Current floor area and number of workers in Ottawa represent a floor area per worker that will stay consistent for the forecasting period.
- 3) Ottawa and Gatineau have the same employment shares (needed in order to extract Conference Board of Canada's Share of Employment (2012) for the Ottawa-Gatineau CMA and use for only Ottawa).

### Notes

- 1) Current employment is derived from the year-to-date monthly average of employment within the Ontario portion of the Ottawa Gatineau Census Metropolitan Area.
- 2) Yearly absorption provided for context purposes only and does not imply a linear yearly absorption rate.
- 3) All areas expressed in square feet

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