



# **NORTH–SOUTH CORRIDOR LRT PROJECT**

**(Rideau Centre to Barrhaven Town Centre)**

## **ENVIRONMENTAL ASSESSMENT Problems and Opportunities and Alternative Solutions Analysis**



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**McCORMICK RANKIN**  
CORPORATION



**Hatch Mott  
MacDonald**

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# 1.0 Introduction

This document consists of the needs and justification for the North-South Corridor LRT Project and the definition and analysis of alternative solutions to the undertaking. The needs and justification section explores the planning framework and looks at anticipated growth in relation to existing and proposed transportation infrastructure. It culminates in a problem and opportunity statement. The second component of this report is the identification and assessment of alternative solutions to the undertaking that address the problem statement. This section of the report defines alternative solutions, lists criteria and the analysis methodology, describes the analysis in detail and provides a summary table and recommended alternative. This is a key element in any environmental assessment process and is the first step in the subsequent identification of alternative methods that will be analysed in detail and then evaluated.

## 2.0 Background: Problems and Opportunities

### 2.1 Planning Framework

#### 2.1.1 Transit in Ottawa

The current transit philosophy for the City of Ottawa has been well documented in the 1997 Regional Official Plan and more recently in the new City of Ottawa's Official Plan (Approved by the Ontario Municipal Board in May 2003). The fundamental transportation strategy to support the future growth of the City is a continued focus on transit. Transit priority measures together with new and expanded rapid transit service are intended to support a substantial increase in the use of public transit and a reduced reliance upon automobile travel particularly during peak travel periods. Plans call for increasing the percentage of all trips made by transit from current levels of approximately 17 percent, city-wide in the peak hour, to 30 percent of all motorized modes by 2021. This objective ensures that transit will continue to play an increasing and substantial role in meeting the growing travel needs of the population.

The doubling of the share of transit use is considered ambitious and the City has identified complementary policies and measures to enhance the relative attractiveness of transit over private automobile use. A supporting document to the Official Plan, the Transportation Master Plan outlines critical transportation policies, facilities and services required to meet its transit use objectives and ensure the travel needs of its residents and business community are accommodated in the context of the development pattern outlined in the Official Plan.

A cornerstone of the transportation policies outlined in the Official Plan is the support for the continued development of a rapid transit network and transit priority network. Rapid transit service has evolved as it has developed over time in this region. It currently provides a convenient, fast, and frequent public transportation service featuring high carrying capacities. Rapid transit operates on its own right-of-way as a separate system or in shared corridors. When operating on its own right-of-way, transit services are isolated from the delays encountered by general mixed transit-traffic operations on the arterial road network and are therefore more efficient and attractive to users. Ottawa's Rapid transit network consists of an interconnecting system of existing and planned rights-of-way and corridors in which a rapid-transit facility, such as a Transitway, O-Train rail line, or streetcar may be located.

#### 2.1.2 Rapid Transit Appraisal Study

The *Rapid Transit Appraisal Study* prepared in the early 1970's, identified the future direction and priorities for transit facilities in the former Regional Municipality of Ottawa-Carleton, the now amalgamated new City of Ottawa. At that time, the region had a population of 472,000 and an employment base of 214,000 with jobs primarily located in the downtown area. The study was based on the need to accommodate a future population of 750,000 persons. The Rapid Transit Development Programme was prepared in 1981 and resulted in the development and construction of the initial 31 km of the Transitway (from Baseline Road in the southwest to Blair Road in the east and Hunt Club Road in the southeast). Construction of the remainder of the project was completed in 1996 and has since been expanded to include new stations, park & ride lots, dedicated bus-lanes and more recently the O-Train pilot project which was opened for service in 2001.

### 2.1.3 Official Plan

The City of Ottawa's Official Plan was completed following an extensive study process referred to as the "Ottawa 2020 Initiative". Ottawa 2020 followed a two-year planning process to examine options in managing the growth and the changes the City will experience over the next twenty years. Ottawa 2020 provided the Official Plan with the foundation and guiding principles to establish the land use, community design, transportation and infrastructure policies necessary to direct the physical development of the City. The City's Official Plan is based on population growth of approximately 50% by 2021, about 400,000 new residents over current levels of 800,000, and an employment growth of more than 270,000 jobs over the same planning horizon which reflects an approximate 55% increase over current employment levels (480,000 jobs).

The Official Plan sets forth a strategy to direct growth to locations that will accommodate a mix of land uses and a compact form of development. This form of development will support a high-quality transit service thereby increasing overall transit use and make better use of existing roads and other infrastructure rather than expanding the existing road infrastructure and/or building new roadway facilities.

A number of policies contained in the City's Official Plan focus on a transportation system that emphasizes transit, walking and cycling. The policies that support transit development and have a direct impact on this environmental assessment are briefly outlined below:

- The City will protect corridors for future development of rapid transit service to serve the growth needs for travel. Schedule "D" of the Official Plan protects for a north-south rapid transit service linking the downtown core of Ottawa with the Macdonald-Cartier International Airport, Riverside South and Barrhaven. The corridor extends along a north-south axis with the most northerly and southerly alignments yet to be determined. Section 2.3.1 - Policy 18
- The City's policy for the introduction of rapid transit service is to "introduce rapid-transit service at an early stage in the development of new urban communities. As these communities mature, they will ultimately be served by the extension of full rapid-transit facilities". Section 2.3.1 – Policy 19. Currently, development is proceeding south of the Airport (in Riverside South) and continued development of the South Urban Centre is well underway. Opportunities exist to influence travel behaviour through the introduction of high quality transit service and encourage and promote alternative modes of transportation and reduce the dependency of residents on private automobile use.

### 2.1.4 Transportation Master Plan

The City of Ottawa's Transportation Master Plan (TMP) was completed in September 2003 and was prepared as a supporting document to the Official Plan. The TMP recognizes the growth management goals outlined in the Official Plan and strives to minimize the future need for new and widened roads while avoiding levels of congestion that would result in unacceptable implications for Ottawa's quality of life and economy in terms of delay to persons and goods, air pollution and road safety. A key cornerstone of the TMP is its adoption of a Transportation Vision - ***"In 2021, Ottawa's Transportation system will enhance our quality of life, respect the natural environment, enhance the economy, and be managed in a responsible and responsive manner."***

The Transportation Master Plan also outlines four strategic directions that are essential to achieving this vision:

- Focusing on Transit
- Influencing travel demand for travel
- Making efficient use of resources
- Forging a community partnership

The Transportation Master Plan's focus on transit is highlighted by its commitment to almost double the mode split for transit (the proportion of all motorized trips served by transit during peak traffic conditions) from its current level of approximately 17 percent to 30 percent by the end of the planning horizon of 2021. The City also plans to maximize the efficiency and people-moving capacity of the existing systems to reduce the need for new infrastructure and achieve the modal shift objectives while minimizing the costs associated with increased road congestion and preserving public health. The Plan also supports the addition of infrastructure and services that are required to encourage desired modal shifts, prevent unacceptable roadway congestion and delay and minimize neighbourhood traffic infiltration and air pollution. Continued support is expressed for more transit-oriented communities and expanded public transit services and facilities making the system more accessible to residents.

The transportation strategy to service future growth and development patterns is outlined in the Transportation Master Plan through its commitment to action on key initiatives and issues. Key among these are:

- "the City will add infrastructure and services to provide the substantial increase in transit capacity that will be required due to population growth and transit modal split increases"<sup>1</sup>
- "the City will add infrastructure and services to meet quality of service objectives for all users of City roads..."<sup>1</sup>
- "the City will give priority to the enhancement of transit service when setting priorities for all infrastructure projects, and particularly for those that serve developing communities"<sup>2</sup>
- "the City will expand the transit route network to serve increasing numbers of passengers as the City grows and as the transit modal split increases"<sup>3</sup>
- "the City will undertake necessary measures to minimize any interruption to the O-Train service while it is being upgraded as part of the priority plan for a north-south rail rapid transit from Lebreton Station to Leitrim Road Station"<sup>3</sup>
- the City will maintain high-quality roadway connections and rapid transit services to the Ottawa Macdonald-Cartier International Airport"<sup>4</sup>
- "the City will encourage alternatives to automobile travel to protect and enhance air quality"<sup>5</sup>

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<sup>1</sup> City of Ottawa Transportation Master Plan, September 2003 – section 4.4.

<sup>2</sup> City of Ottawa Transportation Master Plan, September 2003 – section 7.1.

<sup>3</sup> City of Ottawa Transportation Master Plan, September 2003 – section 7.2.1.

<sup>4</sup> City of Ottawa Transportation Master Plan, September 2003 – section 11.1.

<sup>5</sup> City of Ottawa Transportation Master Plan, September 2003 – section 12.



The above policy statements extracted from the Transportation Master Plan represent significant support for the extension of rapid transit service from the downtown core to the Macdonald Cartier International Airport, Riverside South and across the River into the Barrhaven community.

### **2.1.5 Rapid Transit Expansion Study (RTES)**

The purpose of the Rapid Transit Expansion Study (RTES) was to develop a long-range strategic plan for rapid transit in Ottawa, taking into consideration the region-wide growth projections. The Rapid Transit Network formed the basis for the transit component of the Transportation Master Plan.

The recommended Rapid Transit Network that came out of this study included the following elements that are most relevant to this study:

- Electrified light rail (LRT) to replace the existing O-Train service, and extended south to the airport and Riverside South, and then west to the South Nepean town centre;
- LRT service through downtown Ottawa connecting the O-Train corridor to Rideau Street, Montreal Road, and the Blair Transitway Station;

The study, adopted by council in February 2003, recommended fast-tracking the Riverside South to Centretown component, and recommended developing an Implementation Strategy that would include timelines, funding and partnership options, and financial implications.

### **2.1.6 Ottawa Rapid Transit Expansion Program (ORTEP)**

The Ottawa Rapid Transit Expansion Program followed up on the RTES Report by developing the recommended Implementation Strategy, including timelines, funding and partnership options and financial implications. The project included the development of detailed descriptions of each corridor, costing, identification of all planning, design and construction steps, and identification of potential funding sources and financing alternatives. A major recommendation coming out of ORTEP was to continue to endorse the \$750 million O-Train Expansion LRT as its first priority transit project.

### **2.1.7 Riverside South Rapid Transit Study**

This study examined potential corridors, technologies and cross-sections for extending rapid transit service to the planned Riverside South community and to the Ottawa airport. The study explored different land use and alignment concepts through community.

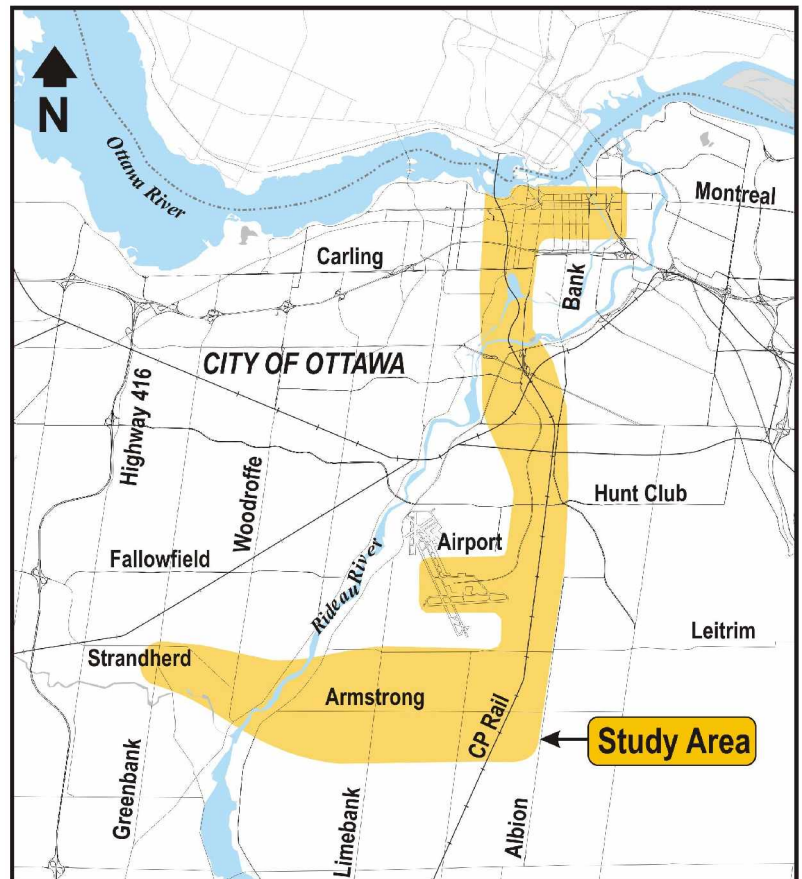
## 2.2 Existing Conditions

### 2.2.1 Study Area

The Study Area stretches from downtown Ottawa (Rideau Centre) to the South Urban Community. (Figure 2.1) The Study area encompasses a number of transportation generators including the central business district of downtown Ottawa. Approximately 1 in 5 job opportunities are located in the CBD. (80,000 jobs) The primary transportation generators within the study area are:

- Rideau Centre
- Carleton University
- South Keys
- Airport
- Riverside South Community
- Barrhaven Town Centre

The entire study area consists of a wide range of uses. Broadly speaking, the southern portion of the study area consists of, mixed density residential, developing communities, agricultural resource areas and open space. Institutional, employment, commercial and mixed density residential areas dominate the central and northern portions of the study area. Other significant features include the Macdonald-Cartier International Airport as well as a major regional retail centers in the downtown (Rideau Center) and at the current terminus of the Existing O-Train line near Johnson Road (South Keys Shopping Centre).



For summary purposes, traffic zones adjacent to the study area were grouped into a district system as presented in Figure 2.2. The grouping of these zones were carried out based on an understanding of individual travel markets within the study area, zonal demographics, as well as the possible catchment area associated with various access points to the existing and possible future expansion of transit service in the corridor.

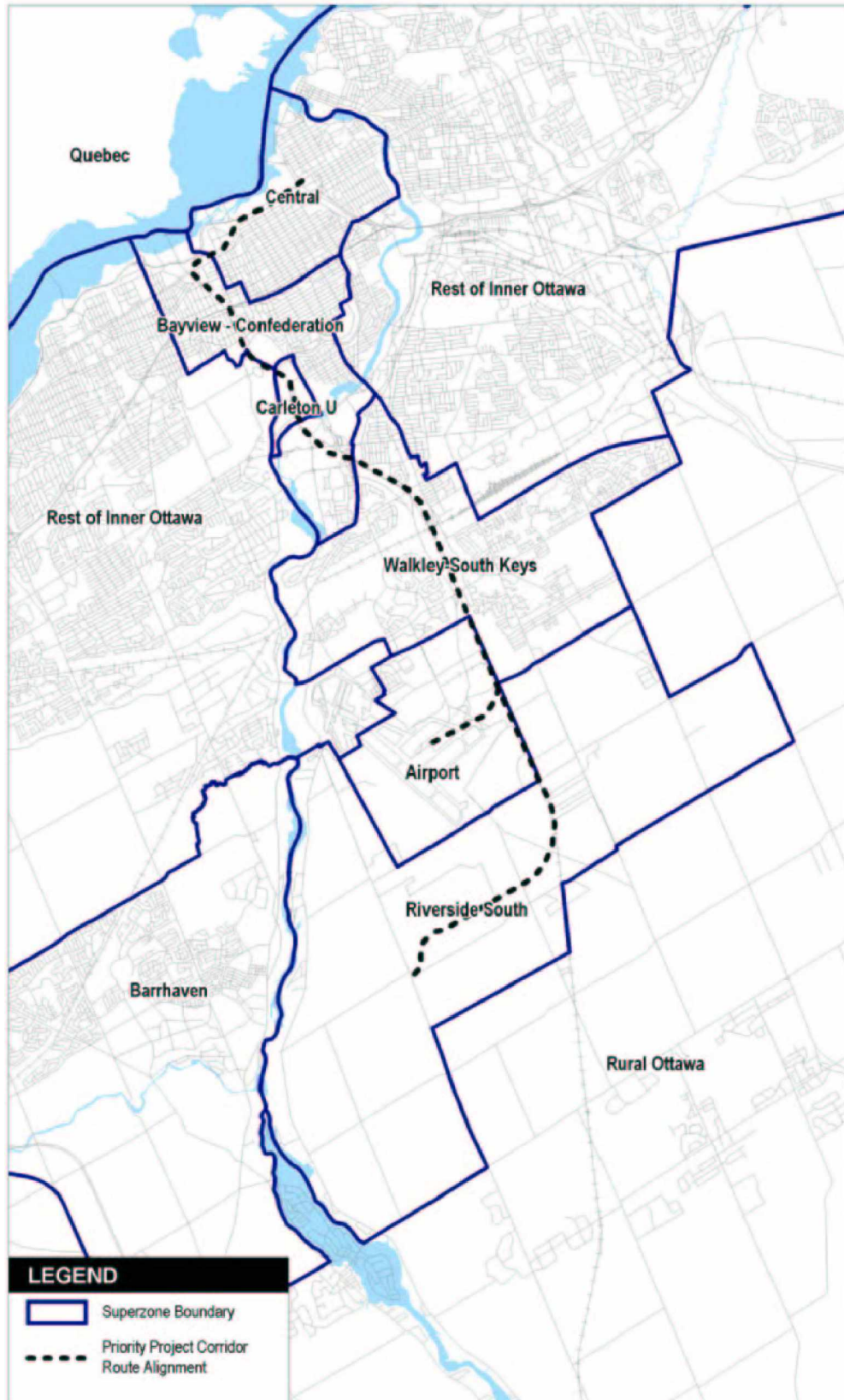


Figure 2.2 - Traffic Zones Grouped into Districts

## 2.2.2 Existing Population and Employment

As presented in Table 2.1 - Existing Population and Employment, the existing O-Train (Greenboro to Bayview) serves a 2001 population of approximately 97,000 (District 2,3 and 4) and employment within the service area is approximately 50,900. The current 2001 population within the study area is 199,100, approximately one quarter of the City of Ottawa population. Employment within the corridor is significant (206,000 jobs) and represents approximately 41% of the total employment in the City of Ottawa.

**Table 2.1 - Existing Population and Employment**

	POPULATION		EMPLOYMENT	
	2001	% of Total	2001	% of Total
<b>District</b>				
1. Central	56,900	29%	131,700	64%
2. Bayview- Confederation	37,600	19%	34,100	17%
3. Carleton University	0	0%	5,200	3%
4. Walkley-South Keys	59,400	30%	11,600	6%
5. Airport	2,200	1%	3,300	2%
6. Riverside South	4,200	2%	3,100	2%
7. Barrhaven	38,800	19%	17,000	8%
<b>Study Area Corridor</b>	<b>199,100</b>	<b>25%</b>	<b>206,000</b>	<b>41%</b>
8. Orleans/ Kanata	160,400	20%	22,000	4%
9. Rest of Inner Ottawa	365,000	46%	214,800	43%
10. Rural Ottawa	76,100	10%	55,000	11%
<b>City of Ottawa - Subtotal</b>	<b>800,600</b>	<b>100%</b>	<b>497,800</b>	<b>100%</b>
11. Gatineau/Outaouais	277,100		77,600	
<b>National Capital Area</b>	<b>1,077,700</b>		<b>575,400</b>	

\* Source – City of Ottawa

## 2.2.3 Existing Transportation Infrastructure and Service

### Transit Network

The City's current Transit route network is made up of six components:

- Transitway service
- O-Train service
- Main line service
- Local service
- Express service
- Employment area service

The Transitway service has high frequency, high-capacity rapid transit bus routes running on an exclusive right of way. The rapid transit system stretches from east of Blair in the east to Woodroffe/Baseline in the west and to South Keys in the south. Rapid Transit quality service with dedicated bus lanes and bus priority measures extend the reaches of the Transitway to the main suburban nodes of Kanata, Stittsville, Orleans, Barrhaven and the Airport.

The O-Train service is a high-capacity rapid transit rail service first introduced as a pilot project in the fall of 2001. It is a diesel rail transit service that is operated on a leased Canadian Pacific Railway branch. The total length is 8 km between Bayview and Greenboro passing five stations.

Main line service consists of regular routes operating all day, seven days a week generally not on the Transitway but for long distances on city streets. They connect communities, activity centers and other transit focal points. As the rapid transit network expands some of these main line service routes will be replaced by new rapid transit lines.

The City's local service is composed of feeder bus routes that connect residential and employment areas to rapid transit terminals.

The express service is a direct-to-downtown bus route operating during peak periods to minimize the need for travelers to transfer between buses. The express service runs mostly to and from the suburban areas outside the greenbelt such as Orleans, Kanata and Barrhaven however, there are a few in older suburbs within the Greenbelt.

The employment area service is a reverse direction express route that generally takes riders away from the downtown; the reverse of the typical peak to employment areas.

### **Roadway Network**

The Road network within the study corridor represents an assortment of major arterial roadways serving north-south traffic to a major provincial 400 series highway (Queensway providing a major cross-town corridor (east-west traffic)). Further south, Hunt Club Road provides for additional arterial based cross-town traffic service along its east – west axis. North South traffic service is provided by Bronson Avenue – Airport Parkway which parallels the study corridor stretching from downtown Ottawa to the Airport. In the core of Ottawa, Bronson Avenue functions as a major urban arterial throughout its length, providing full access to adjacent property owners and has at grade signalized intersections. South of the Rideau River, the Airport Parkway functions with controlled access and full grade separation along much of its length.

Just outside the study corridor, Bank Street and Riverside Drive also provide north south capacity to neighbourhoods within and adjacent to the study area. Riverside Drive converges on the corridor just south of the Rideau River and intersects with Bank Street at Billings Bridge.

North of the Rideau River, the roadway system resembles a grid pattern with typical urban cross-sections, signalization and limited opportunities for expansion given the built urban form. The density of the network increases as one approached the downtown core.

South of Hunt Club Road, much of the arterial road service is accommodated with rural cross-sections, limited need for traffic signalization and the arterial spacing reflects of the current low density development patterns.



## 2.2.4 Existing Travel Demand

Existing transportation demand within the study area have been summarized along two major screenlines; namely the CNR East (LN 13) just north of South Keys and the Leirtrim (LN8) just south of the Ottawa Airport. Existing 2001 travel demand during the afternoon peak hour across these three screenlines is summarized in Table 2.2. The locations of these screenlines as they relate to the study corridor are shown Figure 2.3 and Figure 2.5.

**Table 2.2 - Existing PM Peak Hour (2001) Travel Demand**

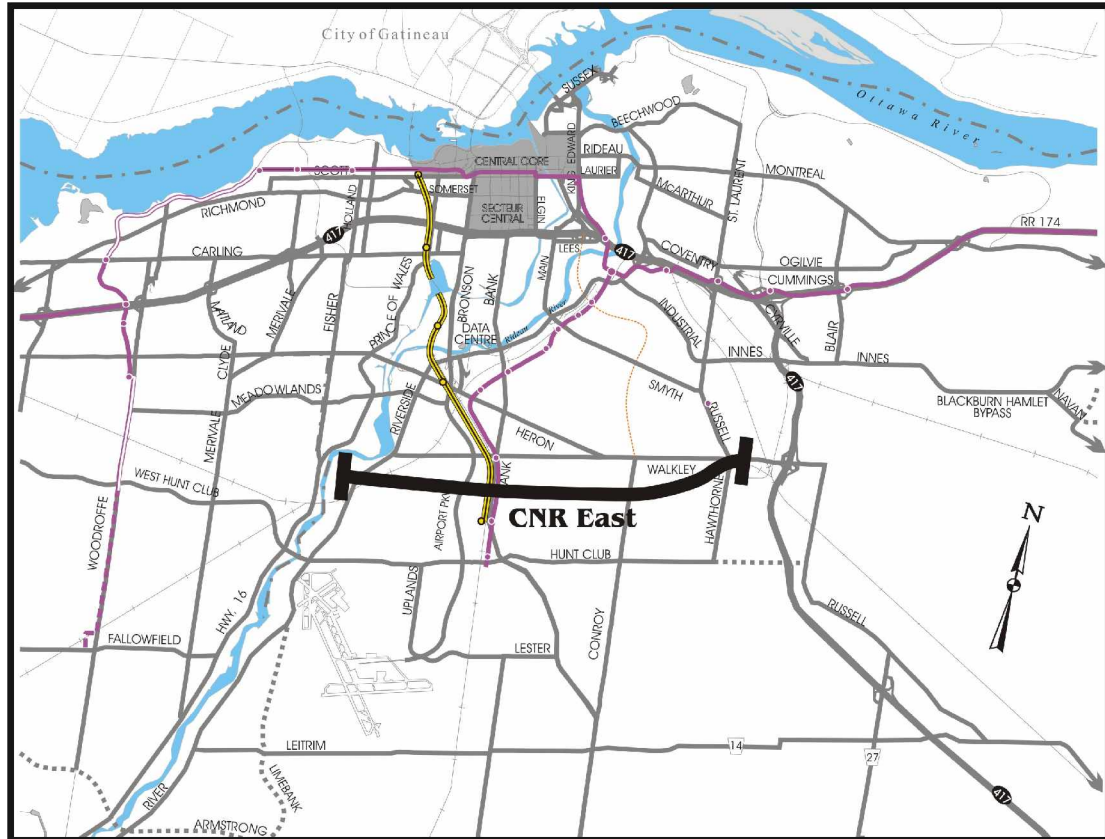
Major Travel Corridor	PM Peak Hour (2001) Travel Demand					
	Transit	Auto Person	Total	PCU Demand	Capacity	Volume to Capacity Ratio
CNR East	2,100	9,700	11,800	8,850	10,400	0.85
Leirtrim	20	3,100	3,320	3,600	5,200	0.70

Source: Transportation Master Plan & Annual Traffic Count Program Data

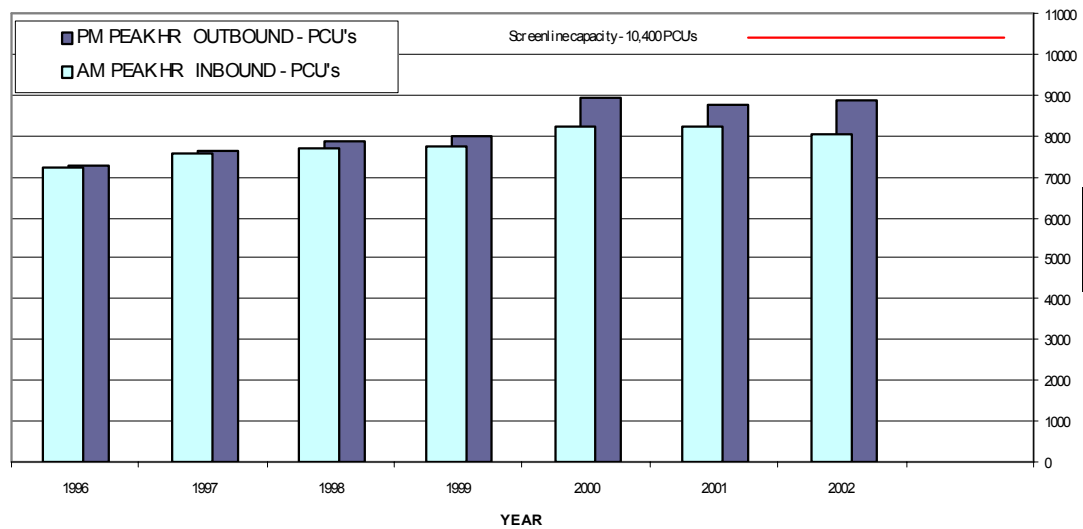
The CNR East Screenline follows the CNR railway corridor from Hawthorne Road in the east end to River Road at the west end of the screenline, is also currently experiencing congested roadway conditions during the PM peak hour. While the current capacity available across this screenline is distributed according to the carry-capacity of each of the major arterials, it is important to note that significant pressure exists along the western edge of the corridor as continued growth of the residential community south of the airport occurs. More recent traffic counts across the CNR Screenline indicate that the volumes have increased to almost 9,000 pcu's per hour (2002) during the PM peak hour.

Figure 2.4 provides a graphical summary of historical traffic flows crossing the CNR East Screenline. A review of this data indicates steady growth in traffic over that past five years. Existing roadway capacity has been estimated at approximately 10,400 pcu's and consequently the current volume to capacity ratio is approximately 0.87. Afternoon PM peak hour flows (outbound direction) are slightly larger than the morning AM peak hour (inbound direction) for each of the years where count data has been recorded. A review of the individual traffic count data reveals that almost two thirds of this vehicular demand, across the CNR East Screenline, is located between Bank Street and River Road.

**Figure 2.3 - CNR Screenline (LN 13)**

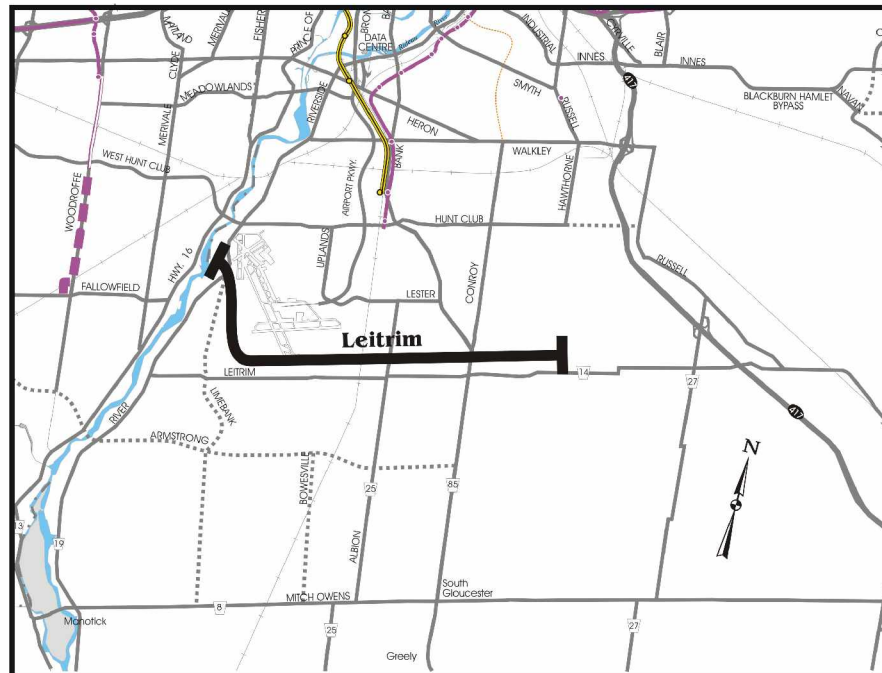


**Figure 2.4 - CNR East Screenline Historical Traffic**

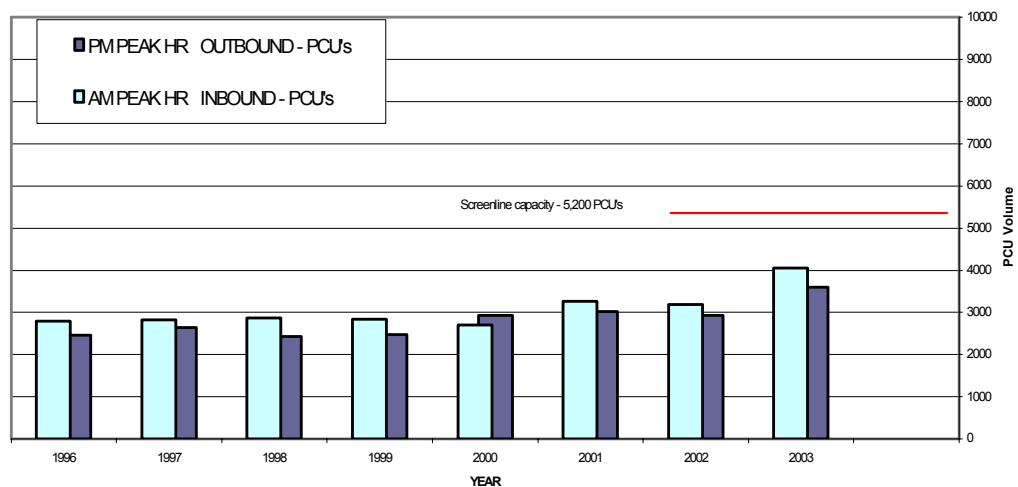


The Leitrim Screenline is currently under less stress than the more northerly screenlines having recorded as part of the TMP a volume to capacity ratio of approximately 0.70 during the PM peak hour. Approximately 85 percent of the travel demand crosses the Leitrim Screenline between Bank and River Road. The Leitrim Screenline as depicted in the schematic crosses Riverside Drive just north of Limebank and as a result the available roadway capacity is associated with Riverside Drive rather than the combined capacity of River Road and Limebank Road, which exist south of the Screenline. Historical traffic volumes expressed as PCU's are graphically summarized in Figure 2.6

**Figure 2.5 - Leitrim Screenline (LN 8)**



**Figure 2.6 - Leitrim Screenline Historical Traffic**





Vehicular traffic flows across the Leirtrim Screenline indicate that the morning AM peak hour is slightly higher than the afternoon peak hour. The 2003 traffic counts also indicate the AM peak hour traffic flow has increased to approximately 4000 pcu's per hour. Heavy truck activity during this period was slightly less than 200 vehicles per hour. The volume to capacity ratio, which is a measure of the level of congestion experienced on the roadways that traverse the screenline, has increased from 0.7 (2001-base year for TMP) to a current level of approximately 0.77 during the AM peak hour. This increase in congestion levels associated with north south traffic flow reflects the overall growth in the Riverside South Community over the past few years.

## 2.3 Growth Trends

### 2.3.1 Future Population and Employment

The City of Ottawa's Official Plan, approved in April 2003, provides clear direction on the magnitude and location of future growth. Over the planning period (to 2021) the City of Ottawa's Population is projected to increase by approximately 50 % from 800,000 to 1,200,000 persons, with employment to grow by roughly 55% from 480,000 to 750,000 jobs. While much of the urban growth is expected to be centred on the South Urban Centre, the North-South LRT Corridor as defined by Figure 2.2 experiences significant growth, and overall population levels are projected to increase by approximately 75% from 200,000 to 350,000 persons. Employment levels within the corridor are projected to increase within the South Urban Centre as well as the downtown. Overall corridor employment levels are projected to increase by approximately 45% from 205,000 to 300,000 jobs.

A tabular summary with more detailed population and employment levels are presented in Table 2.3 Future Population and Employment. The percentage share of population and employment of the total for the City of Ottawa within each of the established Districts provide an indication of the level of growth projected to occur throughout the corridor. For example as referenced in the table, approximately 25% of the current (2001) City population is located in the study corridor.

**Table 2.3 - Future Population and Employment**

District	Population				Employment			
	2001	% of Total	2021	% of Total	2001	% of Total	2021	% of Total
1. Central	56,900	29	65,700	19	131,700	64	168,300	54
2. Bayview – Confederation	37,600	19	48,600	14	34,100	17	43,700	14
3. Carleton University	0	0	1,400	0	5,200	3	5,900	2
4. Walkley – South Keys	59,400	30	69,500	20	11,600	6	16,300	5
5. Airport	2,200	1	2,600	1	3,300	2	6,000	2
6. Riverside South	4,200	2	54,000	16	3,100	2	22,700	7
7. Barrhaven	38,800	19	105,200	30	17,000	8	49,000	16
<b>Corridor Subtotal</b>	<b>199,100</b>	<b>25</b>	<b>347,000</b>	<b>29</b>	<b>206,000</b>	<b>41</b>	<b>311,900</b>	<b>42</b>
Orleans/Kanata	160,400	20	262,300	22	22,000	4	89,400	12
Rest of Inner Ottawa	365,000	46	400,100	34	214,800	43	274,200	37
Rural Ottawa	76,100	10	182,000	15	55,000	11	73,500	10
<b>City of Ottawa – Subtotal</b>	<b>800,600</b>	<b>100</b>	<b>1,191,400</b>	<b>100</b>	<b>497,800</b>	<b>100</b>	<b>749,000</b>	<b>100</b>

In 2021 the overall share of the total population within the North South Corridor will increase to 29%. Approximately 1/3 of the total population growth projected to occur across the City over the planning period (1,191,400 - 800,600 = 390,800) is located within the study area (347,000 - 199,100 = 147,900).

While employment within the corridor increases by approximately 45% over the planning period, its overall share of citywide employment remains relatively constant at about 42%. The study area is also projected to attract a similar proportion of the employment growth (311,900 - 206,000 = 105,900 new jobs in the corridor) of all employment growth over the planning period (749,000 - 497,800 = 251,200 total employment ~42% growth across the city).

### **2.3.2 Future Development Nodes within the Corridor**

Employment growth in the Central Area over the planning period is expected to add approximately 30,000 new jobs to the Central District; however its share of corridor employment falls from about 64 percent today to an estimate 55 percent at the end of the planning period. This reflects the importance of new employment growth throughout the study area and particularly in the south growth centres. The O-Train corridor provides for an ideal opportunity to service both employment and population growth throughout the corridor.

Both Riverside South and Barrhaven/South Nepean experience substantial growth over the planning period. The impact of growth in the Riverside South District results in its share of population increasing from 2 percent to approximately 16 percent of population in the study area with the addition of 50,000 residents over the planning period. As an employment centre, the Riverside South District also attracts approximately 19,600 new employments. West of the Rideau River in the Barrhaven/South Nepean community employment is projected to add approximately 32,000 new jobs. The growth in residential units for the Barrhaven/South Nepean District is projected to accommodate an estimated 68,600 new residents.

### **2.3.3 Future Travel Demand**

The Transportation Master Plan was carried out to identify transportation requirements to accommodate development and growth projected in the Official Plan over the next twenty years. Future afternoon peak hour travel demand across key strategic screenlines in the study area is presented in Table 2.4. The City of Ottawa's Master plan focuses on the afternoon peak period of travel to size both its transit and roadway infrastructure requirements as it best represents the period of the day where its transportation system experiences the most significant pressures in terms of congested travel. Future travel demand estimates have been based on detailed transportation modeling undertaken in concert with the growth assumptions approved in the 2003 Official Plan. The transportation modeling undertaken respects both a thorough understanding of the future development patterns across the city and in particular, within the study area, as well as key transportation policy objectives particularly those relating to modal share, the percentage of travel to be carried by public transit. Overall the Master Plan has forecast an approximately 55 percent growth in person travel demand across the city. In concert with this level of growth in person trip travel, it has been estimated that the requirement for auto travel will be limited to approximately 30 % of current demands. This level of auto travel growth highlights the role public transit will play throughout the planning period in meeting the travel needs of the city's residents and business community.

Additional roadway capacity necessary to maintain an adequate level of service on the arterial road system is documented in the Transportation Master Plan and includes expansions to Limebank,

Leitrim, Armstrong, Strandherd Roads and the crossing of the Rideau (2008), Albion Road (2021) and roadways outside the study area including Prince of Wales (2013). The planned roadway capacity improvements across each of the study area screenlines are as follows;

#### CNR Screenline

- Conroy Road widening from four lanes to six lanes from Walkley Road to Hunt Club Road
- Airport Parkway widening from two lanes to four lanes from Brookfield Drive to Ottawa's Macdonald Cartier International Airport. These capacity improvements are accompanied by ramp modifications at Walkley Road.

These roadway improvements will provide for an increase in sceenline capacity from a current level of approximately 10,400 pcu's to 12,400 pcu's.

#### Leitrim Screenline

- Bank Street widening from two to four lanes from Leitrim Road to the future Earl Armstrong Extension Road
- Albion Road widening from Lester Road to Earl Armstrong Road. In addition, Lester Road will be widened from two lanes to four lanes from the Airport Parkway to Albion Road.
- Riverside Drive widening from two to six lanes from Hunt Club Road to Limebank Road. Limebank Road is also widened from two to four lanes from Riverside Drive to Earl Armstrong Drive.

The additional roadway capacity across the Leitrim Screeline is approximately 3,400 pcu's per hour (an increase from current peak hour capacity levels 5,200 pcu's to 8,600 pcu's).

The travel demand estimates contained in Table 2.4 as documented in the Transportation Master Plan reflect a high level of transit ridership across the city. The overall travel demand across the CNR Screenline is projected to reach almost 21,000 persons during the PM peak hour. This represents an increase of approximately 75 percent over current (TMP) person trip flows of 11,800. The future 2021 planning horizon volume to capacity ratios associated with both the CNR and Leitrim Screenlines represent congested conditions across each of the screenlines during the PM peak travel conditions.

**Table 2.4 - Future PM Peak Hour Screenline Travel Demand**

Major Travel Corridor	Future PM Peak Hour Travel Demand					
	Transit	Auto Person	Total	PCU Demand	Capacity	Volume to Capacity Ratio
CNR East	8,600	11,500	20,800	11,500	12,400	0.93
Leitrim	4,000	8,200	12,200	7,700	8,600	0.90

\*Source: Transportation Master Plan

### 2.3.4 Ridership Projections

A detailed ridership study of the existing O-Train as well as possible system expansions was initiated in early 2004. This study was carried out to support environmental studies and initial and long term operations planning in the corridor. The analysis was undertaken for a number of interim planning horizons under several possible phased operating plans and various system expansion improvements. The ridership estimates focused on the AM peak hour operating conditions, a period which would reflect maximum fleet requirements based on both current and future ridership peaking characteristics. Consequently the results of the detailed ridership projections would be particularly useful in preparing cost estimates of various staging scenarios associated with further expansion of the LRT both north and south of its current operating system.

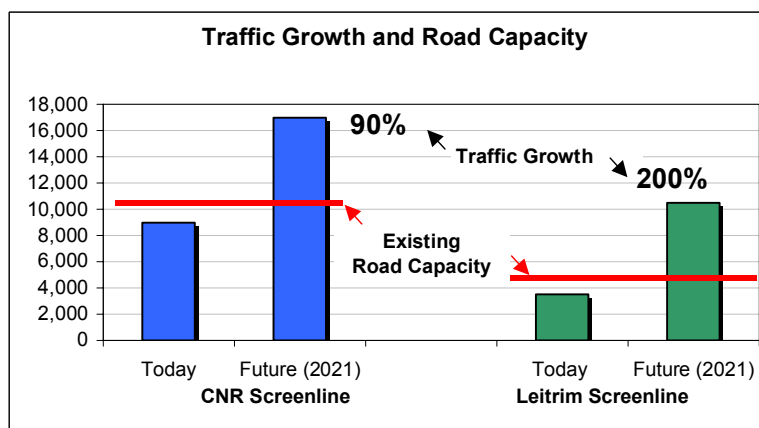
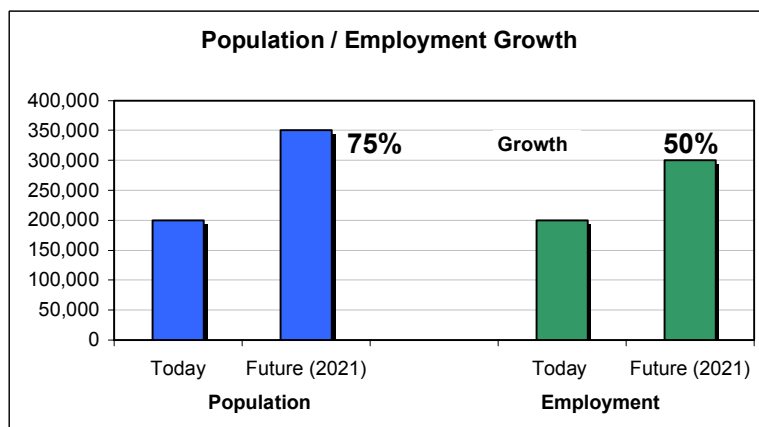
The ridership study also identified the influence a number of factors would have on both AM peak hour boardings as well as daily ridership levels achieved on the proposed LRT. Examples of factors which were identified for sensitivity testing include;

- the relative operating speeds attained on the LRT line versus those being achieved either on the Transitway and/or the adjacent road network. Baseline assumptions for the 2021 planning horizon indicated an operating speed for the LRT of approximately 35 km/hr over its length with the exception of the downtown where 20 km/hr speeds were applied throughout the downtown.
- the relative increases and differences in real travel costs for both transit and auto users. Key costs among auto user costs are fuel and parking costs. The base 2021 assumed auto costs to increase by approximately 20 % over current levels. The sensitivity analysis extended the level of increases in auto costs to reach an increase of approximately 50% over the planning period.
- the relative level congestion anticipated on the adjacent road network in the study area.

The Ridership Study has recently been completed and indicates that the daily ridership levels could be in the order of 60,000 to 70,000 riders (or more, depending on sensitivity factors) per day.

## 2.4 Problem / Opportunity Statement

- A population growth of 75% and a 50% increase in employment results in significant travel demand increases throughout the corridor. Existing transportation infrastructure is unable to accommodate this anticipated growth.
- Riverside South and Barrhaven/South Nepean experience substantial growth, with the addition of 115,000 residents over the planning period. Existing transportation infrastructure is unable to accommodate this growth.
- The Official Plan (OP) sets out a growth management strategy that emphasizes urban intensifications and increased mixed-use development centered on rapid transit as a means to address travel demand and to discourage the use of single occupancy vehicles for peak period travel. This strategy supports the vision of sustaining the natural environment, optimizing economic vitality and ensuring healthy communities by minimizing the future need for new and widened roads, while avoiding levels of congestion and air pollution.
- The Transportation Master Plan (TMP) establishes objectives for transit use that would see the overall peak hour transit modal split increase from 17% to 30%, thereby requiring measures to make transit more competitive relative to automobile use. The TMP identified an expanded rapid transit network as a key component to achieving this objective.



## 2.5 Purpose of the Undertaking

The purpose of the undertaking as defined in the approved Terms of Reference are:

- To respond to growth pressures by providing improved transportation in the study area; and
- To continue making Ottawa a liveable and economically viable City by providing a valuable tool for structuring and achieving land use, environmental and social objectives.

## 3.0 Alternative Solutions

The Ontario Environmental Assessment Act (OEAA) requires that a proponent provide a description of and a statement of rationale for alternatives solutions to the undertaking. Alternative solutions represent functionally different ways of addressing a stated transportation problem and/or opportunity while meeting the purpose of the undertaking.

Alternative solutions that have been identified in the Terms of Reference for assessment in terms of their ability to address existing and future problems and needs include the following:

- “Do Nothing”;
- Expand Arterial Roadway Network;
- Expand Rapid Transit Services Outside the Corridor;
- Expand Rapid Transit Services Within the corridor; and,
- Combination of Expansion of Arterial Road Network and Rapid Transit.

Alternative solutions have been defined at a conceptual level to articulate basic elements of the alternative and to enable an assessment their general impacts and benefits. Table 3.1 provides a summary description of the alternatives.

**Table 3.1 - Alternatives Solutions**

Alternative Solution	Description
<b>Do Nothing</b>	This alternative assumes <b>no expansion</b> of the road or transit system. Local roads would be built concurrent with property development but no new arterial capacity would be added.
<b>Expand Arterial Road Network</b>	This alternative represents the <b>road building</b> solution to the transportation problem in the study corridor. This Alternative could involve new roads, road widenings, geometric changes aimed at enhancing capacity or safety of road travel, or Traffic Management Systems (TMS). This alternative assumes that most of the growth in travel demand will be accommodated by roads.
<b>Expand Rapid Transit Services Outside the Study Corridor</b>	This alternative proposes that <b>rapid transit</b> solutions <u>outside</u> of the corridor will solve transportation problems <u>within</u> the study corridor. This Alternative assumes that Rapid Transit corridors are developed outside the Study Area with feeder bus service operating with the study area. Candidate Rapid Transit corridors include the Alta Vista Corridor and Smith Falls identified as part of the Rapid Transit Expansion Study, and an extension of the Southwest Transitway bringing it into proximity to the Study Area.
<b>Expand Rapid Transit Services Within the Study Corridor</b>	This alternative represents the <b>transit only</b> solution and assumes that the expansion of rapid transit within the corridor, on its own, will address the problem. This alternative assumes that most of the growth in travel demand will be accommodated by transit. No major arterial road expansions are assumed, however, local roads would be built to serve trips internal the communities within corridor.
<b>Combination of Expansion of Rapid Transit with limited Arterial Road Additions (TMP)</b>	This alternative consists of a combination of <b>rapid transit</b> and <b>road network</b> improvements to address the transportation problems in the study corridor. The “Combination Alternative” includes all planned roadway and transit improvements as documented in the Transportation Master Plan (TMP) including a north south rapid transit facility. For roadways, this Alternative includes expansions to Limebank, Leitrim, and Armstrong Roads (2008) and roadways outside the study area including Strandherd and the crossing of the Rideau (2008), Prince of Wales (2013) and Albion (2021) Roads. This project is the rapid transit component of this alternative. Separate class environmental assessments will be undertaken for the road projects identified in the Transportation Master Plan (TMP), if and when they are required.

## 3.1 Alternative Solutions Evaluation Methodology

### 3.1.1 Evaluation Criteria

Alternative solutions were analysed and evaluated based on four categories of criteria; Transportation System, Natural Environment, Policy and Planning and Socio-Economic Environment. Within each category, criteria were chosen that address the problem and opportunity statement and provide meaningful comparisons of conceptual level alternatives. These following criteria represent a refinement of the potential evaluation criteria identified in the Terms of Reference.

#### **Transportation System**

**Transportation Efficiency:** represents a trade-off between Volume to Capacity ratios and additional lanes requirements.

**Connectivity/Travel choices:** is a measure of connectivity within the system and the number of travel choices and alternative routes or redundancy in the system.

#### **Natural Environment**

**Natural Features:** represents potential impact on natural features based on quantity of infrastructure required and geographic distribution.

**Air Quality:** potential air quality impacts are assessed based on the number Passenger Car Equivalents and Volume to Capacity Ratios. Considering both factors recognizes that different approaches to the problem may be comparable, in general terms, from an air quality standpoint. For example, an alternative with a road expansion emphasis may have a higher number of PCU's but lower levels of congestion, while an alternative with a transit focus may have lower levels of PCU's but high levels of congestion.

#### **Policy and Planning**

**Urban Form/Current Development/Consistency with City Vision:** gauges the impact of alternatives on the urban form in the Study Area with particular emphasis placed on the three main developing centres of South Riverside, South Nepean Town Center, and Barrhaven.

**Transit Modal Split:** gauges the likelihood of the City achieving its citywide transit modal split of 30% based on estimated transit modal splits across the selected screenlines in the Study Area.

#### **Socio-Economic Environment**

**Direct Costs:** Direct costs include capital expense of construction, property, fleet purchase; operating and maintenance expenses, and life-cycle costs.

**Indirect Costs:** Indirect costs and benefits include travel time savings resulting from the project, costs associated with accidents, including person and property damage, public health (air quality and fitness related to walking), environmental impacts and mitigations, improved labour mobility/accessibility, impact on vehicle operating expenses, and economic opportunity.



### 3.1.2 Analysis of Alternatives

Based on the criteria selected, the alternatives were analysed in detail and then classed according to whether their impacts or benefits were better or worse than others or occupied the middle ground. A relative comparison approach was used.. Section 3.2 contains the detailed analysis of each alternative, and section 3.3 provides summary tables and a recommended alternative. The following section highlights key assumptions used for the analysis.

### 3.1.3 Alternative Solutions Demand Assumptions

While Alternatives Solutions have been defined at a conceptual level, a sketch-level planning exercise was pursued to better articulate what the alternatives imply, in terms of transit modal share, roadway congestion levels (using the volume to capacity ratio as a measure of congestion), and additional road infrastructure requirements to meet projected transportation demand levels. The approach taken was to build on existing Transportation Master Plan (TMP) travel demand projections and to redistribute the demand to transit or auto trips depending on specific infrastructure elements associated with each of the alternatives.

This approach is limited in that it is a “zero-sum” effort and does not account for changes to overall travel demand. However, it does provide for a general comparison among the various alternatives under consideration. Two key screenlines in the study corridor, the CNR East and Leirtrim screenlines have been analysed in detail and the impact of each of the alternatives upon travel demand has been presented in Table 3.2 and Table 3.3.

Screenlines closer to downtown, such as the Inner Area screenline, which encompasses the entire downtown, were not included in the comparison because of the difficulty of isolating north south trips from all trips entering the downtown. However, a few summary conclusions for this screenline can be made. Given the largely built environment, roadway capacity expansion opportunities across this screenline are very limited beyond those already planned. A road only solution is therefore not a viable option for accommodating the transportation growth into the downtown. Transit solutions offer the greatest potential to accommodate travel demand in to and out of the downtown.

For the screenlines analysed, the travel demand, mode share, V/C ratios and the overall requirements for additional transportation infrastructure are highlighted and are further discussed as part of the assessment of the alternatives section which follows.

The road and transit travel demands for the “Existing Conditions” and the “Combination of Expansion of Arterial Road Network and Rapid Transit” alternatives are taken directly from the TMP. The travel demands have been presented for the PM peak hour, peak direction of travel (outbound) as it best represents the period of the day where the City’s transportation system experiences the most significant pressures in terms of congested travel. For the “Do Nothing” alternative, transit trips were shifted back to the roadway and converted to Passenger Car Units (PCU) on the assumption that the growth in travel demand would need to be accommodated by the existing roadway infrastructure. For this alternative, transit trips increase marginally resulting in a significant drop in transit mode shares. For the “Expand the Arterial Road Network” alternative, road capacity is increased to meet the travel demand forecast under the “Do Nothing” alternative. The Expand Rapid Transit Services within the Study Corridor alternative results in a considerable increase in roadway congestion levels and consequently higher transit mode share levels are achieved when compared with the combined road and transit option mode shares as identified in the TMP. For example, across the CNR East screenline, transit mode share rises to 45%, slightly higher than the 41% mode share documented in



the TMP (combined road and transit alternative). For the Expand Rapid Transit Outside the Study Corridor Alternative, transit mode share increases slightly and overall person trips in the corridor are reduced slightly as some person trips are attracted to improved transit facilities outside the corridor and consequently some of the demand no longer crosses either of the two screenlines.

**Table 3.2 - CNR East Screenline – Alternatives Comparison**

Alternative Solution	CNR East Screenline (PM Peak Hour Peak Direction)							
	Transit Trips	Auto Person Trips	Total Person Trips	Transit Modal Split	PCUs	Capacity	V/C*	Additional Lanes (both directions)
<b>2002</b>								
Existing	2,100	9,700	11,800	18%	9,000	10,400	0.87	N/A
<b>2021</b>								
Do Nothing	2,500	18,300	20,800	12%	16,800	10,400	1.62	N/A
Expand Arterial Road Network	2,500	18,300	20,800	12%	16,800	17,400	0.95	+14 lanes
Expand Rapid Transit Services Outside the Study Corridor	2,675	17,850	20,525	13%	16,450	10,400	1.58	0 lanes
Expand Rapid Transit Services Within the Study Corridor	9,300	11,500	20,800	45%	10,900	10,400	1.05	0 lanes
Combination of Expansion of Rapid Transit with limited Arterial Road Additions (TMP)	8,600	12,200	20,800	41%	11,500	12,400	0.93	+4 lanes (TMP)

**Table 3.3 - Leitrim Screenline – Alternatives Comparison**

Alternative Solution	Leitrim Screenline (PM Peak Hour Peak Direction)							
	Transit Trips	Auto Person Trips	Total Person Trips	Transit Modal Split	PCUs	Capacity	V/C*	Additional Lanes (both directions)
<b>2002</b>								
Existing	20	3,100	3,200	0.6%	3,600	5,200	0.70	N/A
<b>2021</b>								
Do Nothing	625	11,775	12,400	5%	10,600	5,200	2.04	N/A
Expand Arterial Road Network	625	11,775	12,400	5%	10,600	11,600	0.92	+14 lanes
Expand Rapid Transit Services Outside the Study Corridor	725	11,400	12,125	6%	10,325	5,200	1.98	0 lanes
Expand Rapid Transit Services Within the Study Corridor	4,400	8,000	12,400	35%	7,400	5,200	1.42	0 lanes
Combination of Expansion of Rapid Transit with limited Arterial Road Additions (TMP)	4,000	8,400	12,400	32%	7,700	8,600	0.90	+8 lanes (TMP)

\* Volume to Capacity ratios approaching 1.0 indicate severe roadway congestion. Ratios in excess of 1.0 are beyond the theoretical capacity of the roadway and suggest gridlock may occur. Volume to Capacity ratios are reported on a screenline basis and are therefore an average of all roadways. Travel demand and associated congestion will be better or worse at different

locations across the screenline. Notably, congestion is likely to be worse for roadways closer to the Rideau River where travel demand is greater.

## **3.2 Detailed Evaluation of Alternatives**

### **3.2.1 Do Nothing**

#### **Transportation System**

In carrying out an Environmental Assessment, the Do Nothing option is the base case against which all other alternative solutions are compared. The Do Nothing Option, in this case, presents significant challenges for the transportation system while incurring major indirect cost as a result of inaction. With growth anticipated in the northern section of the Study Area and significant growth occurring in the Southern Sections including the new communities of Riverside South, Nepean Town Centre, Leitrim and Barrhaven communities, the existing transportation system cannot accommodate the expected travel demand.

As shown in Table 3.2 and Table 3.3, shifting 2021 projected transit trips to the existing roadway system results in V/C ratios of 1.6 and 2.0 at the CNR East and Leitrim screenlines respectively. With no other improvements made or measures undertaken to address travel demand, the result is severe congestion on the roadways. Travel times will increase and the reliability and convenience of the system will decrease. As roadway capacity is neared or exceeded traffic flow becomes unstable and minor fluctuations in volumes or incidents can severely impact traffic operations. A Do Nothing option limits the potential of the overall transit system. Without improving transit service to the rapidly developing southern communities, the transit mode share will drop as vehicle trips increase. The existing bus service in the southern community will not serve the anticipated growth in simple capacity terms, and will not provide travel options and connectivity to land uses or to other components of the transit system required for a growing community. Under a Do Nothing option, existing transit service will rely on existing roads operating in mixed traffic. The expected congested conditions under a Do Nothing option will significantly impact the speed and reliability of the existing service.

A Do Nothing alternative does not serve freight, captive auto users (those who must use auto for a variety of reasons), or other roadway users including pedestrians, cyclists, on-street bus transit, and emergency vehicles.

#### **Natural Environment**

A Do Nothing option will have a lesser impact on natural environment features when compared to other alternatives. A Do Nothing option will inherently have a lesser impact as it implies that a facility will not be built and its direct impacts will not be realised.

The principal environmental impact of a Do Nothing option is expected to be on air quality. The Do Nothing option results in a high number of Passenger Car Units (PCUs) and the highest levels of congestion as compared to other alternatives. Considered together, this would result in the highest automobile exhaust emissions of the alternatives.

#### **Policy and Planning**

A Do Nothing option is contrary to a preponderance of policy and planning initiatives articulated by the City in its planning documents and actions and would hinder proposed future growth.

- At the two screenlines the estimated transit mode share ranges between approximately 5% and 1% as compared with the 32% and 41% transit mode shares identified in the TMP. With such a large potential new transit market eliminated from consideration, the likelihood of achieving the City's overall 2021 PM Peak hour mode transit mode split target of 30% is questionable.
- The Riverside South Community and South Nepean Town Center plans have integrated a rapid transit concept into their development plans. Both developments rely on both roadway and transit improvements to serve the travel demand.
- Section 2.3.1 Policy 19 "The City will introduce rapid-transit quality service an early stage in the development of new urban communities. As these communities mature, they will ultimately be served by the extension of full rapid-transit facilities." The City is following this policy by restricting the current development in Riverside South (south of the airport, east of the Rideau River) until such time that rapid-transit facilities have been initiated in the area which is being done in this study.

### **Social Economic Environment**

A Do Nothing alternative will have the lowest direct impact on capital costs and operation and maintenance costs as no new facilities are proposed. There would be indirect costs such as the slower movement of people and goods due to congestion, personal vehicle operating costs, lost opportunities for economic activities, development and redevelopment.

This alternative would not require any displacement of households, businesses or community services and facilities, and there would not be any effect on heritage resources. However, access to existing and planned commercial development, institutions, and other community facilities would not be improved. The increase in road congestion could also negatively affect business by reducing the mobility of people, goods and services to and from the area.

A Do Nothing alternative provides fewer travel choices and therefore will have a greater relative impact on lower income individuals or people with disabilities.

Walking is an integral part of the overall transit trip, and as such any decrease in transit use will likely result in a decrease in walking; assuming longer distance trips. As a result, transit use can be linked to more active lifestyles and the health benefits this entails. Under a Do Nothing option, there is expected to be less of a health benefit than with other alternatives.

## **3.2.2 Expand Arterial Road Network**

### **Transportation System**

Under the Expand Arterial Road Network alternative it is assumed that most of the growth in travel demand will be addressed by increased roadway capacity. This alternative would require 14 new lanes across both Leirrim and CNR East screenlines, representing the greatest increase in roadway capacity of the alternatives. This alternative matches travel demand with roadway capacity and therefore roadways will be at or near capacity but not overcapacity.

As with the Do Nothing alternative, this alternative limits the potential of the overall transit system by not serving new growth areas or providing connections to the existing systems. Under this alternative transit ridership is expected to be the lowest of the alternatives, as transit service and facilities remain

at existing levels while automobile travel remains an attractive option with well developed facilities and good connectivity.

The existing bus service will not provide travel options and connectivity to land uses or other components of transit system required for a growing community. Existing transit service will rely on existing roads operating in mixed traffic, however, because the roadways are not expected to be as congested as is the case with alternatives bus performance will not be as greatly impacted.

### **Natural Environment**

An Expanded Arterial Road Network alternative is likely to have the greatest overall impact on natural environment features. New roadway corridors or expansion of existing roadways to accommodate the estimated need of 14 additional lanes across the screenlines has the potential to impact a wide range of habitat and environmental features given the footprint of the roadways and the wide geographic area that they cover. This alternative presents the greatest amount of impermeable surface area and will have associated impacts on water runoff and water quality issues.

The impact on air quality for this alternative is mixed. On one hand, along with the Do Nothing alternative, it results in the highest number of Passenger Car Equivalent of the alternatives and higher levels of vehicle emissions. However, this is tempered somewhat by the lower levels of delays expected under this option and therefore lower levels of emissions related idling and stop and go driving.

### **Policy and Planning**

While a roadway alternative does support the anticipated growth in the study area, it is otherwise at odds with City policy and planning initiatives in terms of the types of development pattern, environmental priorities, and quality of life.

- At the two screenlines the estimated transit mode share ranges between approximately 5% and 12% as compared with the 32% and 41% transit mode shares identified in the TMP. With such a large potential new transit market eliminated from consideration, the likelihood of achieving the City's overall 2021 PM Peak hour mode transit mode split target of 30% is questionable.
- The Riverside South Community and South Nepean Town Center plans have integrated a rapid transit concept into their development plans. Both developments rely on both roadway and transit improvements to serve the travel demand. A road alternative would support a more dispersed development pattern and would be less supportive of the "town center" concept.
- The City's policy is to introduce rapid transit quality service at an early stage in the development of new urban communities (OP Section 2.3.1 Policy 19). A road alternative will set development patterns and travel habits that are not conducive to higher levels of transit use. With an established development pattern it will be more difficult to retrofit transit at a later date.

### **Social Economic Environment**

This alternative has a significant and direct impact on capital costs and operation and maintenance costs as extensive roadway upgrades are envisioned (14 lanes across the screenlines). Constraints imposed by the river and the built environment limit the potential to add the required capacity in the corridor without significant social and environmental impacts.

This alternative has the benefit of accommodating a range of vehicle types (commercial, bicycle, etc.), and has the potential benefit of lower direct costs to public authorities as compared to a rapid transit facility. This alternative would provide access to existing and planned commercial development, institutions, and other community facilities. The increased road capacity enhances the vehicle mobility of people, and the mobility of goods and services to and from the area. It would require significant displacement of households, businesses or community services and facilities to accommodate new roadway corridors or expansions of existing corridors.

An Expanded Arterial Road alternative provides fewer travel choices and therefore will have a greater relative impact on lower income individuals or people with disabilities. As with the Do Nothing option, any decrease in transit use will likely result in a decrease in walking and likewise will enjoy less of a health benefit as compared to other alternatives.

### 3.2.3 Expand Rapid Transit Services Outside the Study Corridor

#### Transportation System

Three candidate corridors for rapid transit service outside the study area have been considered: the Alta Vista Transportation Corridor and Smith Falls Corridor, both identified as part of the Rapid Transit Expansion Study (RTES), and an extension of the Southwest Transitway that crosses the Rideau River and serves the South Riverside Community. RTES did not carry the Alta Vista Transportation Corridor or Smith Falls Corridor further, principally because of redundancy with the existing Transitway corridors such that there was limited potential for new ridership gains. The Alta Vista Transportation Corridor Environmental Assessment Study also considered the use of the corridor for rapid transit but ruled it out because it was too far east to effectively serve the bulk of development in the southeast sector of the city. It would also be difficult to intensify development on a rapid transit line in the AVTC, especially considering that more intense development and attractive travel demand generators are already in place along the current O-Train and Southeast Transitway corridors.

The three transit options outside the corridor do not provide strong connections between growth areas in the south of the study area and the downtown. All require out of direction travel, transfers, and longer travel times to the downtown. A portion of all trips will take place on conventional buses operating in mixed traffic or with some transit priority treatments. To estimate the impact on transit and roads, Auto Person Trips were diverted from the screenlines, to reflect movement to transit facilities west of the river, and transit mode share was increased slightly across the two screenlines to address the use of transit facilities crossing the screenlines but that are outside of the study corridor. The V/C ratios for the screenlines are 1.58 and 1.98 for CNR and Leitrim respectively.

#### Natural Environment

This alternative will have the lowest impact on the natural environment within the Study Area as the bulk of the transit facility infrastructure is beyond the area of consideration.

This alternative is estimated to result in fewer Passenger Car Units within the study area and as a result will have slightly lesser impacts on air quality than the Do Nothing. However, V/C ratios are high and congestion remains an issue.

#### Policy and Planning

- At the two screenlines the estimated transit mode share ranges between approximately 6% and 13% as compared with the 32% and 41% transit mode

shares identified in the TMP. This mode split is the same as the Do Nothing and Arterial Road alternatives and does not contribute to achieving the City's overall 2021 PM Peak hour mode transit mode split target of 30%.

- While consistent with the overall transit emphasis contained in the Official Plan, this rapid transit alternative simply does not serve the study area well. At least two potential corridors, Alta Vista and Smith Falls, have been considered and discounted by RTES. A Rapid Transit alternative was also evaluated and not pursued as part of the Alta Vista Corridor Study.
- This alternative will have some influence on urban form as some local transit service will have to feed the rapid transit systems outside the corridor. However, it will not be as significant and permanent as a rapid transit system within the corridor and therefore the influence on development patterns will be less pronounced.

### **Social Economic Environment**

This alternative has comparatively low direct capital costs and operation and maintenance costs within the corridor. However, indirect costs can be substantial as commercial uses are not served, travel times are greater, and development is hindered. The lack of arterial connections hinders freight movements and reduces mobility and connectivity for roadway users. This alternative provides some travel choices, albeit fairly limited and will have some benefit for lower income individuals or people with disabilities. Increased transit use will likely result in an increase in walking and will have a higher health benefit when compared to a no action or arterial road alternative.

## **3.2.4 Expand Rapid Transit Services Within the Study Corridor**

### **Transportation System**

The "Expanded Transit Service Within the Study Corridor" alternative assumes that rapid transit service, on its own, can serve the growing communities in the south of the Study Area. While local roads will be built in conjunction with land development, no major improvements to arterial roads, particularly serving north and south trips, are envisioned. Therefore, local access and transit within a community will be served, but longer trips in and out of the communities will rely on existing roadway facilities or the rapid transit system. Under this option, transit mode shares higher than any of the other alternatives are assumed. Despite transit mode shares on the order of 45% and 35% across the two screenlines, significant residual congestion remains on the roadways, with V/C ratios of 1.05 and 1.42. Feeder transit service to the rapid transit corridor will either be delayed by the congestion on the roads or additional transit priority measures will be needed to maintain the attractiveness of the transit service.

With the congested roadways anticipated under this alternative, transit will be a more attractive option and can have some travel time advantages over vehicular travel. This alternative does not enhance opportunities for freight, auto dependant users, or other roadway users.

### **Natural Environment**

The impact on the natural environment of the Expand Transit Services Within the Study Corridor is expected to be lower than most alternatives, but greater than a Do Nothing option. The impact on natural environment features is limited to the extent of the rapid transit facility and its area of influence.

This alternative has the lowest number of Passenger Car Equivalents of the alternatives and is expected to have lower levels of vehicle emissions. However, this is partially offset set by more congested roadways than under other alternatives.

### Policy and Planning

- At the two screenlines, the estimated transit mode share ranges between approximately 45% and 35% exceeding the 41% and 32% transit mode shares targets identified in the TMP. Higher transit mode shares across these two screenlines will make it easier for the City to meet the citywide target of 30%.
- The Riverside South Community and South Nepean Town Center plans have integrated a rapid transit concept into their development plans. Both developments, however, rely on both roadway and transit improvements to serve travel demand.
- This alternative is consistent with 'transit first' policy and could potentially radically affect the development patterns in the Study Area if no new arterial roadways are provided.

### Social Economic Environment

This alternative would provide transit access to existing and planned commercial development, institutions, and other community facilities but does not serve all travel demand. The increased transit capacity enhances the mobility of people to and from the area and provides travel choices. The lack of stronger arterial connections hinders freight movements and reduces mobility and connectivity for roadway users. Direct costs to the transit agency are comparatively high while the indirect benefits of transit can be substantial. A transit alternative can generate economic benefit to consumers through:

- Reduction and avoidance of road congestion, resulting in travel time savings for passengers
- Reduced costs associated with accidents, due to public transit's considerably lower rate of property and personal injury incidents
- Reduction in public health costs associated with air pollution caused by automobiles,
- Improved mobility for low-income workers
- Reduction in greenhouse gas emissions, which are increasingly being quantified as costs
- Reduction in personal vehicle operating costs, including fuel, oil, and maintenance expenses
- Raising property values in areas surrounding higher-order transit, and acting as a catalyst for development (or redevelopment)
- Reducing the requirement for land to be used for auto parking
- Potentially (evidence is preliminary) reducing public health expenses through encouraging more walking in travel patterns



### 3.2.5 Combination of Expansion of Rapid Transit with Limited Road Expansion

#### Transportation System

A combination expansion of rapid transit service and limited arterial road expansion (with an emphasis on the rapid transit component) provides a variety of travel choices and balances a range of facilities with travel requirements. A moderate enhancement of roadway connections in the south end of the city (as indicated in the Transportation Master Plan) serving the non transit needs of the southern growth communities provides for the mobility of goods and people who cannot use transit.

This alternative expands the potential of the overall transit system by serving new growth areas and providing connections to the existing transit systems. Under this alternative, transit ridership is expected to be very high, as transit service and facilities are expanded to meet growth in the area. The road components would only be added to serve the travel demands that cannot be accommodated by the proposed transit expansion. This project is the rapid transit component of this alternative. Separate class environmental assessments will be undertaken for the road projects identified in the Transportation Master Plan (TMP), if and when they are required.

#### Natural Environment

The impact on the natural environment of the Combination of Expansion of Arterial Road Network and Rapid Transit is of a lesser magnitude than the Expand Arterial Road Network alternative. To accommodate travel demand this alternative would need 4 and 8 additional vehicle lanes across the two screenlines (in the south end of the City), and a rapid transit facility, as compared to 14 lanes at both screenlines for the expanded roadways alternative. This alternative has the potential to impact a wide range of habitat and environmental features given the footprint of the roadways and the wide geographic areas that they cover. This alternative has fewer Passenger Car Equivalents than the arterial road alternative and is expected to have lower levels of vehicle emissions.

#### Policy and Planning

- At the two screenlines the transit mode share is consistent with what was assumed in the TMP and therefore the citywide transit mode share target of 30% is supported by this alternative.
- The Riverside South Community and South Nepean Town Center plans have integrated a rapid transit concept into their development plans. Both developments rely on both roadway and transit improvements as envisioned under this alternative.
- This alternative is consistent with the City “transit first” policy and meets travel demand through a balanced combination of road and transit.

#### Social Economic Environment

This alternative would provide access to existing and planned commercial development, institutions, and other community facilities. The increased road capacity and transit capacity enhances the vehicle mobility of people, and the mobility goods and services to and from the area. It may require the displacement of households, businesses or community services and facilities to accommodate new roadway or transit corridors or expansions of existing corridors. Increased roadway capacity serves a variety of users including freight, pedestrians, cyclists, on-street transit, and emergency vehicles.

An Expanded Transit Service within the Study Corridor alternative provides travel choices and will benefit lower income individuals or people with disabilities. Increased transit use will likely result in an increase in walking and will have a higher health benefit when compare to a no action or arterial road alternative.



### 3.3 Evaluation Summary

A “Do Nothing” alternative does not support the significant growth anticipated in the study area and would result in severe roadway congestion. Not only is it the City's policy to meet growing travel needs, its interest is also to shape development in the Study Area. While having the lowest direct cost, a “Do Nothing” alternative has significant indirect costs and impacts that outweigh potential short-term savings to the City including reduced economic opportunity and congestion related pollution.

The Expand Arterial Road alternative would require 14 additional roadway lanes that cannot be physically accommodated without significant social and environmental impacts. This alternative highlights the benefits and needs of roadways to support growth, while at the same time highlighting their impacts and limitations. A roadway option, physical constraints aside, could serve growing land uses and provides mobility for a range of users including automobiles, transit, cyclists, and freight. Large-scale roadway capacity enhancements, however, would have significant potential direct and ongoing environmental, quality of life, and property impacts. A roads only alternative supports the growth areas outlined in the Official Plan, but otherwise is significantly at odds with other policy and planning direction including the “transit fist” to shape development through early transit investment, citywide transit mode targets, environmental polices (particularly air quality), and current planning efforts for the Town Centres in the Study Area.

Expanding Rapid Transit Facilities outside the corridor does not address the transportation problem within the study corridor and does not provide the level of service and connections required to serve the growing communities in the corridor. Significant residual roadway congestion is associated with this alternative. Rapid transit outside the corridor would result in some redundancies with the existing system, would not directly serve the town centres, and would cause out of direction travel and longer travel times as compared with a facility located within the corridor.

Expanding Rapid Transit Facilities within the corridor does not fully address the travel demand and development needs in the corridor. Like the roadway option, this alternative has benefits and challenges. It can serve many of the land uses and trips in the Study Area and has the highest transit mode shares of the alternatives considered. It has strong environmental benefits through reduced motor vehicle use, but it also results in significant residual congestion on the roadways in the south end of the City. It does not enhance opportunities for freight, auto dependant users, or other roadway users. Transit alone cannot be expected to serve all trips and uses in the Study Area and therefore a transit only option will accommodate a large proportion of the transportation demand but will not provide for full mobility.

The combination alternative that expands Rapid Transit with limited expansion of the arterial road Network in the south end of the City provides for a balanced transportation system that fully meets the travel demand in the study corridor. The strong transit element broadens travel choices, reduces motor vehicle use, and serves as an important organizing principle for land uses in the Study Area. A complementary package of limited roadway improvements ensures that full ranges of users are served, and acceptable levels of congestion and mobility are maintained throughout the system. This alternative minimizes potential environmental impacts as compared to a roads only solution.

Table 3.4 summarizes key factors that contributed to the overall assessment and relative comparison of alternatives shown in Table 3.5.

Table 3.4 - Evaluation – Summary

Alternative Solution	Evaluation Criteria				Overall Assessment
	Transportation System	Natural Environment	Policy and Planning	Socio-economic	
<b>Do Nothing</b>	<ul style="list-style-type: none"> <li>Does not serve growth in travel demand</li> <li>Serve congestion on roadways</li> </ul>	<ul style="list-style-type: none"> <li>No direct impact on natural environment</li> <li>Air quality impacts related to congestion</li> </ul>	<ul style="list-style-type: none"> <li>Does not serve land uses or positively influence land development</li> <li>Does not support transit modal share target</li> </ul>	<ul style="list-style-type: none"> <li>No direct capital costs</li> <li>Congestion worsens in the corridor, causing considerably higher costs (delay, air quality, personal vehicle operating costs)</li> </ul>	<ul style="list-style-type: none"> <li>Does not address future travel demand and planned development in the corridor</li> <li>Severe congestion on the roadways</li> <li>Does not serve freight or other roadway users</li> </ul>
<b>Expand Arterial Road Network</b>	<ul style="list-style-type: none"> <li>Serves travel demand</li> <li>Serves a variety of roadway users (freight, cyclist, transit)</li> <li>Few travel options</li> </ul>	<ul style="list-style-type: none"> <li>Significant potential impact on natural environment</li> <li>Highest potential air quality impact through increased motor vehicle use</li> </ul>	<ul style="list-style-type: none"> <li>Serves land uses</li> <li>Not consistent with transit first policy to shape land development</li> <li>Does not support transit modal share target</li> </ul>	<ul style="list-style-type: none"> <li>Requires 14 new lanes. Physical constraints limit ability to build significant infrastructure expansion required.</li> <li>High direct and indirect costs including no reduction in emissions, accidents, public health costs, increased vehicle operating costs; some congestion savings and travel time savings</li> </ul>	<ul style="list-style-type: none"> <li>14 additional lanes required cannot be accommodated without serve social and environmental impacts</li> <li>Significant potential impact on natural environment</li> </ul>
<b>Expand Rapid Transit Services Outside the Study Corridor</b>	<ul style="list-style-type: none"> <li>Does not serve growth in travel demand</li> <li>Significant residual congestion on the roadways.</li> </ul>	<ul style="list-style-type: none"> <li>No direct impact on natural environment within the study area but would result in impacts outside of the study area.</li> <li>Air quality impacts related to congestion</li> </ul>	<ul style="list-style-type: none"> <li>Does not serve land uses or positively influence land development</li> <li>Does not support transit modal share target</li> </ul>	<ul style="list-style-type: none"> <li>No direct capital costs within Study Area. Congestion worsens in the corridor, causing considerably higher costs associated with congestion (delay, air quality, personal vehicle operating costs).</li> </ul>	<ul style="list-style-type: none"> <li>Does not address travel demand and development needs in the corridor</li> <li>Significant residual congestion on the roadways</li> <li>Does not serve freight or other roadway users</li> </ul>
<b>Expand Rapid Transit Services Within the Study Corridor</b>	<ul style="list-style-type: none"> <li>Does not fully address future travel demand and planned development in the corridor</li> <li>Significant residual congestion on the roadways.</li> <li>Does not enhance opportunities for freight and other roadway users</li> </ul>	<ul style="list-style-type: none"> <li>Strong environmental benefits through reduced motor vehicle, but it also results in significant residual congestion on the roadways</li> </ul>	<ul style="list-style-type: none"> <li>Can serve many but not all of the land uses</li> <li>Serve some of the development needs</li> <li>High transit modal share</li> </ul>	<ul style="list-style-type: none"> <li>Moderate direct capital cost. Moderate indirect costs including lesser reduction in emissions, accidents, public health costs, increased vehicle operating costs; some congestion savings and travel time savings</li> </ul>	<ul style="list-style-type: none"> <li>Does not fully address future travel demand and planned development in the corridor</li> <li>Significant residual congestion on the roadways</li> <li>Does not serve freight or other roadway users</li> <li>Minimizes environmental impacts</li> </ul>
<b>Combination of Expansion of Rapid Transit with limited Arterial Road Additions (TMP)</b>	<ul style="list-style-type: none"> <li>Meets travel demand with a variety of travel choices</li> <li>Full range of users are served, acceptable levels of congestion and mobility</li> </ul>	<ul style="list-style-type: none"> <li>Fewer direct impacts when compared to a roadway alternative</li> <li>Air quality benefits from high transit use and moderate levels of congestion</li> </ul>	<ul style="list-style-type: none"> <li>Supports transit modal share target and transit first principal</li> <li>Serve land uses and positively influences land development</li> </ul>	<ul style="list-style-type: none"> <li>Higher direct capital costs trade off against lower indirect costs as compared with other alternatives</li> </ul>	<ul style="list-style-type: none"> <li>Meets travel demand with a variety of travel choices</li> <li>Provides a balanced solution that serves development and the mobility needs of a wide variety of users</li> <li>Minimizes environmental impacts</li> </ul>

**Table 3.5 - Evaluation – Relative Comparison**

Alternative Solution	Transportation System		Natural Environment		Policy and Planning		Social Economic		Overall Result
	Transportation Efficiency	Inter modal Connectivity	Natural Features	Air Quality	Vision, Goals, Urban Form	Transit Modal Split	Cost	Indirect Cost	
Do Nothing	○	○	●	○	○	○	●	○	○
Expand Arterial Road Network	◐	◐	○	◐	◐	○	○	○	○
Expand Rapid Transit Services Outside the Study Corridor	○	○	●	○	◐	○	-	○	○
Expand Rapid Transit Services Within the Study Corridor	◐	◐	◐	●	●	●	◐	◐	◐
Combination of Expansion of Rapid Transit with limited Arterial Road Additions (TMP)	●	●	◐	●	●	●	○	●	●
Legend	● Better than others		◐ Middle Ground		○ Worse than others		“-“ no cost within corridor		

### 3.4 Recommended Alternative

The recommended solution is a Combination of Expansion of Rapid Transit service with limited additions to the arterial road system in the south end of the City. This project is the rapid transit component of this alternative. Separate class environmental assessments will be undertaken for the road projects identified in the Transportation Master Plan (TMP), if and when they are required.