Canadian Transportation Research Forum

Le Groupe de Recherches sur les Transports au Canada

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PROCEEDINGS of the 29th Annual Meeting

ACTES de la 29ième Conférence annuelle

Victoria
B. C. / C.-B.
May 15-18,
15 au 18 mai,
1994

Transportation and Growth Management in the Greater Toronto Area

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1. INTRODUCTION

In keeping with many of the world's major metropolitan areas, Greater Toronto is faced with continuing challenges in providing sustainable transportation.

To be sustainable in the long term, I suggest that a transportation system should be:

- **capable** of delivering the required capacity and performance;
- **renewable**, which ultimately means using solar energy or, failing this, a relatively inexhaustible energy source such as nuclear fusion;
- **compatible** with the kinds of places we want to live in;
- **clean**, so that environmental quality is maintained or enhanced; and
- **affordable** in terms of capital and operating/maintenance costs.

In short, sustainable transportation is not only renewable and clean in terms of its energy and environmental impacts, it also has to deliver the required performance, cost-effectively and in manner which does not degrade the quality of our living places.

This paper provides a brief look at the major challenges and opportunities to achieve more sustainable urban transportation, focussing on the greater Toronto Area. Growth trends over the past 30 years and projected for the next 30 years are examined and their implications discussed. Growth

management prospects are reviewed, focussing on **land use, networks,** and **system management**, and conclusions are drawn regarding the outlook.

2. CHALLENGE AND RESPONSE

2.1 MAJOR CHALLENGES

Major GTA transportation challenges mirror the dark side of sustainability requirements.

In terms of system management, they include:

- **financial constraints** which have limited our ability to provide needed improvement and expansion of the area's transit and road systems;
- resulting **supply/demand imbalances** as demand has outstripped supply and congestion levels have increased; and
- **deferred maintenance** with growing concerns regarding impacts on safety and efficiency as well as higher costs which will be incurred in the future because of further system deterioration.

Environmental challenges include:

- **negative impacts on air, water and soil quality,** major contributions to local pollution, global warming, acid precipitation and high-level ozone depletion;
- **resource consumption**, including land, agricultural capability and energy; and
- **neighbourhood disruption**, including congestion, sterilization of large areas for parking and major roads, separation of activities beyond the human scale, and accidents.

Transportation also poses significant challenges to the GTA economy, including:

- **economic inefficiency** in terms of lost person-hours and delayed goods movements, valued at hundreds of millions of dollars per year;

- **lost jobs and income** because of delays in system construction and related urban developments; and

- a resulting **loss of competitive advantage** relative to other metropolitan areas in North America and abroad.

It is not an exaggeration to say that current urban trends and transportation system attributes in the GTA do not meet the area's needs appropriately and are not sustainable.

2.2 ACTION LEVERS

There are, of course, a substantial number of things which can be done to address this situation, some of which take more investment than others, and some of which will require a significant amount of innovative thinking and political will. For convenience, these action levers are grouped under three headings:

1. **Land Use**: more compact, mixed land use which leads to shorter trips, supports the use of public transportation, walking and cycling, and reduces dependency on automobile trips; this requires coordinated planning and delivery of land use/infrastructure on a continuing basis, over a period of decades;

2. **Networks**: continuous and appropriately designed and located networks of roads, rapid transit lines, walkways and bikeways, including streetscapes which are more conducive to transit, walking and cycling;

3. **System Management**: operational, regulatory and pricing measures to encourage more efficient use of the transportation system and its cost-efficiency in meeting the mobility requirements of people and goods as well as their vehicles.

2.3 THE URBAN TRANSPORTATION BALANCE

As illustrated in Exhibit 1, there are very substantial interactions among these three groups of policy levers. For example, changes in the form, density and mix of land uses can greatly reduce overall vehicular travel effort by allowing transportation needs to be met effectively through pedestrian, cycling and transit movements, and through auto and truck trips which are, on average, shorter because various activities are located closer together. Transportation demand management can significantly reduce peak period travel demands, particularly by single occupant discretionary auto trips. The

combined effects of land use and demand management initiatives can, in turn, reduce the requirements for network expansion, since overall vehicular travel effort is reduced, and transportation infrastructure is used more efficiently.

The result of such initiatives, if effectively coordinated, can be significant gains in transportation sustainability.

2.4 INITIATIVES FOR SUSTAINABLE TRANSPORTATION

This is illustrated more fully in Exhibit 2, which shows more detailed types of initiatives which can be taken to improve urban structure/design policies, transportation infrastructure, and various types of transportation management and improved technology. The manner in which each such initiative is likely to improve urban travel sustainability, which is described in terms of some 14 measures, is illustrated, with a large circle showing a major impact and smaller circles showing less significant impacts.

While the emphasis in this paper is on growth management, which is interpreted to mean both urban development growth and transportation demand growth, transportation infrastructure initiatives are also illustrated since these interact directly with the other two types of action levers.

3. GTA GROWTH TRENDS

Before discussing specific initiatives in the GTA to achieve more sustainable transportation, it is useful to put these remarks in context by summarizing relevant GTA growth trends and some of the major factors underlying them.

3.1 THE LAST 30 YEARS

As shown in Exhibit 3, while the growth in GTA population over the past 30 years (1961-1991) was very substantial (101%), employment grew even more (171%) and the growth in daily trips was larger yet (189%). The number of daily vehicular trips per capita increased by about 44%, average work trip length by about 26%, and car ownership per capita by 70%.

There were a number of important factors creating this explosive growth, including the following:

- following the unprecedented drop in fertility in the mid-1960's (which marked the end of the 1946-1966 "baby boom") the average household size dropped significantly (from 3.8 persons in 1961 to

2.8 in 1991) as fewer children were born, more women joined the work force, and the number of adults per household increased with correspondingly more travel generated;

- increasing prosperity since World War II generated higher real incomes and greater car ownership which meant that growing numbers of people used automobiles for their trips to work and for other purposes;

- during the same period, the construction of freeway networks and the demand for quicker and more reliable door-to-door deliveries produced a major shift of goods movement from rail to truck, adding additional vehicular demand on top of the burgeoning passenger travel by road.

The significant increase in average trip length resulted from a number of addition factors, including the following:

- the greater scale of the Greater Toronto Area in 1991 versus 1961;

- rapid household formation by the baby boomers, most of which occurred on "greenfields" land in low density residential suburbs, in response to regulatory and market forces and was increasingly distant from many job locations, particularly those in central areas;

- difficulties in living close to work when there are two or more workers per household, often with widely separated job locations.

As can be seen from Exhibit 3, the fact that each person in 1991 was making on average 44% more trips than in 1961 and each trip was, on average, 26% longer, means that the transportation system had to cope with about 81% greater demand **from each person** in terms of vehicle-km than it did 30 years earlier. Compound this by the 101% growth in population in the GTA and the transportation problems we are now facing become somewhat easier to understand.

3.2 THE NEXT 30 YEARS

Projected trends in the same variables are summarized in Exhibit 4, for the period 1991-2021.

Considerable population and employment growth is expected (57% and 64% respectively), with commensurate increases in daily trips. The average work

trip length is expected to continue increasing, from 14.4 to 17.3 km (a 20% increase) if existing low density suburban development trends continue; a smaller (16%) increase to 16.7 km is anticipated if more compact, mixed use "nodal" development can be achieved. The number of daily vehicular trips per capita is expected to increase slightly by about 2%.

The increased travel demand is expected to be driven by continuing but much smaller declines in average household size, a high proportion of working adults in the population, plus continuing but slower increases in real incomes and car ownership. Growth rates of other contributing factors are also expected to be more moderate: for example, the rate of entry of women into the labour force is reaching saturation levels and, as noted earlier, the demand for first home purchase by baby boomers will start slackening off at about the turn of the century. Similarly, the shift of goods movement from rail to truck is saturating and is not expected to fuel the growth of truck traffic as much as previously.

Speaking somewhat simplistically, and assuming that future immigration levels remain similar to average levels during the past few decades, it is possible that the next ten or fifteen years may be the most challenging in terms of meeting rapidly growing transportation requirements. After that, the imperative for more and more new facilities/services may slacken somewhat although citizens of the day will be faced with greater costs for maintaining and operating a larger transportation system, possibly without the added tax revenues of a rapidly growing population.

3.3 TRENDS, PROBLEMS AND OPPORTUNITIES

There are a number of implications to be considered regarding these trends:

- growth rates are likely to be slower, relative to those during the past three decades and it is possible, depending on immigration rates, that Canada's and Ontario's population levels may tend to stabilize in the 2020 decade and subsequently, with a resulting shift in public policy emphasis from meeting the needs of growth to serving the requirements of an aging population with stable or declining tax revenue;

- the type of urban development which occurs over the coming three decades will have a major impact on transportation requirements and cost-effectiveness, including the real challenge of matching urban concentration centres (nodes) with junction points in the rapid transit and commuter rail networks rather than the highway

network only, which occurred for some suburban centres initiated during the 1950's and 1960's;

- growth of broad-band, interactive telecommunications and computer technology will make it more convenient for workers in information industries to telecommute (work at home) or telework (work at a nearby office location hooked into the information network) for one or more days per week, thereby reducing peak period travel demand growth;

- there will be increasing demand management and related regulatory actions to reduce discretionary use of automobiles by single occupants during peak periods in our large urban areas, encourage much greater use of transit, walking and cycling, and also to develop automobiles, transit vehicles and trucks which produce zero emissions and use more sustainable forms of energy;

- all of these actions will have to be accomplished within extremely tight financial limits, while Canadians wrestle with public and private sector debts for the next one or two decades and while we attempt to maintain and improve Canada's economic efficiency and competitiveness.

Clearly, while there are significant opportunities, managing this process will be a major challenge.

4. GTA GROWTH MANAGEMENT PROSPECTS

A number of the more recent planning and management initiatives taken in the Greater Toronto Area to address these challenges are discussed briefly under the three headings of land use, networks, and system management.

4.1 LAND USE

There is general agreement as to what kind of urban form provides the maximum potential for sustainability. Pedestrian- and transit-supportive cities are characterized by:

- a compact urban form, with average densities of at least 4,000 persons per square kilometre;

- concentration of development in mixed-use nodes and corridors, (e.g. placing shops and services near all residential areas and creating focal points for public transit routes);

- orientation of buildings close to and facing the street, with parking minimized and/or place away from the area between the building and the street;

- a continuous road grid providing 600-800 meter spacing between arterial and/or collector roads and maximum walking distances of about 400 meters from interior sites to main roads/transit routes;

- wide sidewalks and other pedestrian amenities.

These principles have been reflected in a number of design documents. The Province of Ontario released in 1992 a document titled ***Transit-Supportive Land Use Planning Guidelines*** to help those responsible for urban development make it more transit-supportive. These guidelines are being observed by all five regional municipalities and many of the 30 area municipalities in the GTA, including rapidly growing suburban areas such as Burlington, Markham and Vaughan.

Exhibit 5 summarizes three generic urban forms prevalent in the GTA and other Canadian cities. It can be seen that average densities drop off sharply from the central city (City of Toronto, 6550 people/km^2) to the post-World War II suburban community (typified by North York, 3178 people/km^2) to the more recent suburb (represented by Markham, 1690 people/km^2) and the transit ridership per capita drops off proportionately, while car ownership and metres of road per capita increase as the density decreases. In designing policy initiatives to make urban form more pedestrian- and transit-oriented, these three situations present distinctly different challenges, and have prompted a range of initiatives.

Central Urban Areas

In older core areas, the challenge is to protect the existing character of the urban form, retain downtown employment, retain or increase downtown population and enhance the transit, pedestrian and cyclist environments.

The City of Toronto has protected downtown neighbourhoods using traffic calming techniques, has successfully encouraged development of more housing in the core area, has carried out urban design projects to beautify the streetscape, and has created many pedestrian-transit linkages and

underground walkways. For trips remaining within Toronto's Central Area (about 10 km^2 in extent) walking is the most commonly used mode (38%) followed by transit (32%) auto (24%) and bicycle/other (6%).

Older Suburban Areas

In the post World War II suburbs such as much of North York, policies are needed to increase densities, create mixed-use nodes and corridors, and improve pedestrian access and the pedestrian environment. These are being applied in North York's "downtown" along Yonge Street between Highway 401 and Finch Avenue to the north.

The Metropolitan Toronto official plan has long encouraged the growth of suburban town centres. The new Official Plan sets out planning strategies for the "reurbanization" of Metro Toronto, encouraging intensification and the redevelopment of selected arterial roads into "main streets". It will also foster urban design which maximizes safety, accessibility and a liveable pedestrian environment.

New Suburban Areas

In peripheral growth areas which have grown rapidly during the past two or three decades, the priority is to discourage further urban sprawl and create more compact, balanced and diversified communities, planned according to transit-supportive principles. Official plans and transportation planning in the GTA, including newer suburban areas, are increasingly reflecting this approach.

Nodal Urban Structure

The Province of Ontario has created the Office of the Greater Toronto Area (OGTA) to address the problems of urban sprawl and encourage coordinated planning and delivery of urban development and infrastructure by the area's five regional governments and 30 area municipalities. A nodal urban structure concept has generally been accepted as the common goal. This emphasizes compact mixed-use redevelopment/development based on greatly expanded transit services but also allows for some additional greenfield development and growth in auto use. As summarized in Exhibit 6, the **nodal** concept has significant sustainability advantages over the trends (**spread**) concept in terms of transportation energy use and emissions; the **central** concept would have even more advantages but is generally considered too extreme in terms of land use and possible market impacts.

The Province of Ontario has also recently issued new ***Growth and Settlement Policy Guidelines*** which state that peripheral urban development should be restricted until areas within the existing urban envelope are fully developed. This and the ***Transit-Supportive Land Use Planning Guidelines*** document provide an excellent policy framework for more sustainable urban development.

4.2 NETWORKS

Capital expansion plans for transportation networks are not detailed here since the emphasis in this paper is on land use and transportation system management. The major thrust of current GTA infrastructure plans and programs is to expand the commuter rail (GO Transit) and municipal transit facilities/services very significantly, with less substantial expansion of the road network (in conjunction with transit priority/HOV lanes in many instances), the intent being to change the modal balance such that transit will carry a significantly increased share of travel in urbanized parts of the GTA. Ongoing financial constraints may curtail the rapid transit expansion program, however, such that relatively more emphasis may have to be placed on expansion of the commuter rail system and of the surface transit system, providing the latter with greater priority through transit priority/HOV lanes on major arterial roads. As the rapid transit expansion situation is clarified, hopefully during the next few months, it will be important to analyze the implications of the situation and determine the extent to which the transit priority/HOV lane network and related measures can effectively increase transit's market share, in conjunction with the ongoing GO Transit expansion and surviving parts of the rapid transit expansion program.

4.3 SYSTEM MANAGEMENT

Transportation demand management (TDM) is used here to describe various measures for moderating transportation demand by reducing the **amount** of vehicular travel (through shorter and fewer trips, more persons per vehicle), influencing its **timing** (to flatten peaks) and changing the **modal split** (to reduce the growth of discretionary auto trips so that the transportation system will be used more efficiently). While land use and network changes can contribute significantly to at least two of the above three objectives, we focus in this section on other measures such as flexible work hours/weeks and telecommuting to reduce peak period commuting travel; managing the supply and price of downtown parking and parking at other major destinations in order to encourage greater use of public transportation; providing real-time information to travellers both before and during their trip in order to encourage selection of the most appropriate travel mode and

travel route to make efficient use of the system; operational measures to encourage more efficient use of road space to carry people and goods rather than simply automobiles (including transit priority/HOV lanes and related measures); and possible introduction of road pricing, using electronic toll collection with higher toll levels during peak periods and on more congested facilities, thereby encouraging drivers to use the system more efficiently and, equally important, providing dedicated funding to help improve and maintain the transportation system.

A number of examples of TDM measures applied in the GTA, particularly in regard to travel to and from the Central Area, are provided below.

Flexible Hours and Telecommuting

Metropolitan Toronto and the City of Toronto introduced flexible hours over ten years ago and this resulted in a noticeable spreading of travel from the peak hours to the "shoulder" parts of the peak period. More recently, telecommuting (in which employees work at home or at a satellite office for one or more days per week with appropriate telecommunications links to the main office) has been increasingly practised, particularly in the "information industries" and according to some estimates may be expected to reduce the growth in peak period commuting trips to the Central Area by 0.3 - 2% during the coming decade and by as much as 3 - 10% over the next few decades.

Parking Management

Following completion of the Central Area Parking and Loading Study in the mid 1970's the City of Toronto acted to increase parking rates for all day parking in the Central Area relative to short term rates and to establish maximum as well as minimum parking requirements for various land uses in the area in order to encourage greater use of public transportation, particularly for commuting trips. Subsequently, similar measures have been taken by other municipalities in the GTA. At the same time, until the onset of the recession in 1990, market forces resulted in parking rate increases in Toronto's downtown area, also helping to encourage a shift from auto to transit.

Transit Priority and HOV Lanes

For major urban roads on which a significant proportion of person movements occur by transit (bus, streetcar) as opposed to private autos, the introduction of transit priority lanes and HOV lanes is an important means

of encouraging greater use of transit and higher automobile occupancy levels, both of which contribute to more efficient road use in moving persons and goods rather than catering primarily to private vehicles. At the same time, traffic signal priority and turning movement regulations can be used to provide greater ease of bus and streetcar movements, thereby encouraging greater use of these modes. Relevant measures of this type include previous introduction of the Bay Street Clearway and similar transit priority/HOV lanes on Eglinton Avenue and the Allen Roadway. The Metropolitan Toronto Transportation Department is currently implementing a very substantial network comprising some 600 km of HOV lanes throughout Metro Toronto, linking eventually to similar networks under development in adjacent municipalities and on provincial highways.

Communications and Information Systems

A number of important initiatives have been taken in the GTA to provide real-time information to travellers so that they can choose their travel mode and route to reduce travel time and increase travel time reliability. These include introduction of automated telephone information systems providing transit riders with information on the arrival times of buses at their local stops; e.g. the TTC Timeline System. Metropolitan Toronto has recently begun full scale operational testing of the Gardiner/Lake Shore Corridor Management System, which will provide motorists with real-time information on incidents/congestion ahead and advice on alternate routes to avoid the congestion. The Ministry of Transportation Ontario (MTO) has operated such freeway traffic management systems (FTMS) on the Queen Elizabeth Way, the Burlington Skyway and Highway 401 serving the GTA for a number of years with excellent results in terms of reduced accidents and delays and increased travel time reliability. Sophisticated intelligent vehicle highway systems (IVHS) are being developed to achieve similar objectives more widely throughout the area.

Road Pricing

The MTO is currently reviewing bids from two major consortia to build and operate Highway 407 (now under construction in an east-west corridor north of Highway 401) as a tollway some 68 km long, in order to provide increased funding and accelerate construction of this important facility and, at the same time, encourage travellers to use the facility more efficiently. Many metropolitan areas throughout the world are now planning or introducing road pricing schemes, and it seems likely that this will become increasingly common (possibly involving other major roads in the GTA within the coming one or two decades) in response to the dual needs for more effective

transportation demand management and more dedicated funding sources for infrastructure.

Conclusions

All of the above are examples of growth management measures which have already been introduced or are being planned or implemented in the Greater Toronto Area to encourage more efficient use of the transportation system and, in particular, to moderate the growth of single-occupant, discretionary auto trips in peak periods. It is reasonable to conclude that measures which have been taken, as summarized above, have contributed to the relative stability of peak period auto traffic entering Toronto's Central Area (as summarized in Exhibit 7) and that ongoing implementation of such measures, in conjunction with continuing increases in public transportation services and limitations in road capacity serving the Central Area, will lead to similar trends during the coming decades.

4.4 THE OUTLOOK

Major decisions and ongoing programs will determine the effectiveness of growth management to achieve more sustainable transportation in the Greater Toronto Area. Among these will be the publishing and implementation of a provincial urban structure policy for the GTA; development of an integrated land use/transportation plan and strategy for the entire GTA; decisions regarding the funding and timing/extent of the rapid transit expansion program; implementation of the transit priority/HOV network; timing and extent of ongoing commuter rail and major road expansions and related network improvements; and continuing actions to implement effective transportation demand/supply management measures, including possible more widespread implementation of road pricing during the next decade or two.

If, as seems likely, ongoing financial limitations significantly curtail network expansion, increasing emphasis will have to be placed on both urban structure growth management and transportation demand/supply management in order to achieve the system capability, compatibility, energy/environment sustainability, and financial affordability that will be required to meet the GTA's transportation requirements during the next three decades and beyond.

EXHIBIT 1
THE URBAN TRANSPORTATION BALANCE

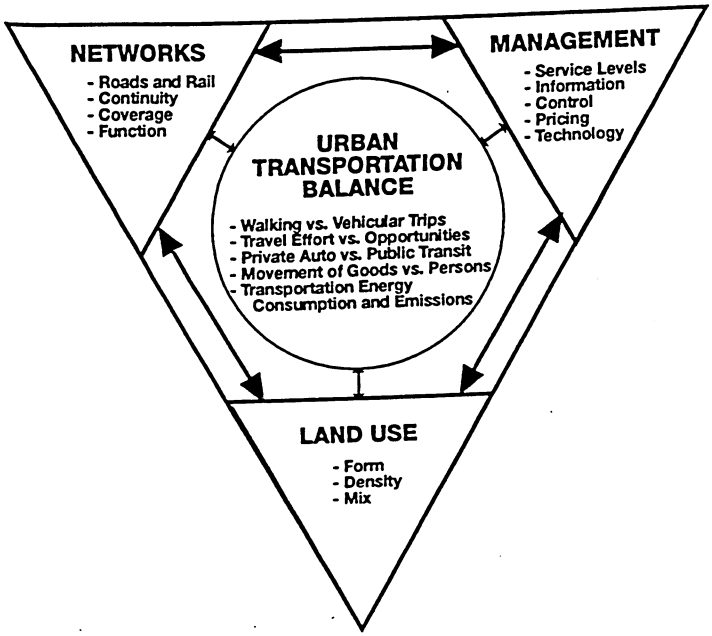

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EXHIBIT 2
SUSTAINABLE URBAN TRAVEL: INITIATIVES AND INTERACTIONS

Measures of More Sustainable Urban Travel / Major Types of Initiatives	REDUCED VEHICULAR TRAVEL EFFORT				GREATER CONSERVATION OF RESOURCES		IMPROVED ENVIRONMENTAL QUALITY		IMPROVED ECONOMIC EFFICIENCY		ENHANCED QUALITY OF LIFE		BROADENED LIFESTYLE CHOICES	
	Shorter Trips	More Walking	More Transit	More Cycling	Fossil Fuels	Farm-land	Air Emissions	Water Runoff	Less Conges-tion	Lower Transp'n Costs	Greater Safety	People Places	Housing Types	Travel Modes
URBAN STRUCTURE/DESIGN POLICIES														
• Compact Mixed Land Use	●	●	●	●	●	●	•	•	•	●	●	●	●	●
• Pedestrian-Friendly Streets	•	●	●	●	●	•	•	•	•	•	●	●	•	●
• Joint Transportation/Land Use Planning	●	●	●	●	●	●	●	●	●	●	•	●	•	●
• Dev. Nodes and Intermodal Transfer Nodes	•	•	●	•	•	•	•	•	●	●	•	●	●	●
• Parking Supply Management	•	•	●	•	•	•	•	•	●	•	•	•		•
TRANSPORTATION INFRASTRUCTURE														
• Continuous, multi-modal Arterial Roads	●	•	●	•	•		•		●	•	•	•		●
• High Occupancy Vehicle (HOV) Facilities	•	•	●	•	●	•	●	●	●	●	●	●	•	●
• Rapid Transit and Commuter Rail Networks	•	•	●		●	●	●	●	●	•	●	●	•	●
• Local Transit Improvements		•	●	•	•	•	•	•	•	•	•	●	•	●
• Cycle and Pedestrian Ways	●	●	•	●	●	•	●	●	●	•	●	●	•	•
DEMAND MANAGEMENT PRACTICES														
• Parking Price Management	•	•	●	•	•	•	•	•	●	•	•	•		•
• Congestion Pricing for Road Use	●	●	●	●	●	●	●	●	●	●	●	●	•	•
• Alternative Work Schedules			•	•	•		•	•	●	•	•	•		•
• Ridesharing		•			•		•	•	●	●	•	•		•
• Telecommuting	●	•	•	•	●		●	●	●	●	•	•	●	•
TRANSIT MANAGEMENT PRACTICES														
• Fare Integration and Schedule Coordination		•	●		•	•	●	●	●	●	●	●		●
• Transit Priority		•	●		•	•	•	•	•	•	•	•		•
• Traveller Information Systems	•	•	•	•	•	•	•	•	•	•	•	•		•
TRAFFIC MANAGEMENT PRACTICES														
• Advanced Traffic Management Systems	●	•	●		•		•	•	•	•	●	•		•
• Driver Information Systems	•	•	•	•	•		•	•	•	•	●			
• Traffic Calming		•	●	•							●	●		
CLEANER VEHICLE TECHNOLOGY DEVELT														
• Low-emission Vehicles			•		•		●	●				•		•
• Energy-Efficient Vehicles					●		•	•						•
• Emissions Monitoring/Testing Programs					●		●				•			
PUBLIC OUTREACH AND AWARENESS PROGRAMS	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Source: ***Urban Travel and Sustainable Development: The Canadian Experience***, prepared for Canada Mortgage and Housing Corporation by IBI Group, 1993

LEGEND: Anticipated Impact of Initiative in Helping to Achieve Sustainable Urban Travel:
● Large Impact ● Moderate Impact • Modest Impact Negligible Impact

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EXHIBIT 3

HISTORICAL GTA[1] GROWTH: 1961-1991

	1961	1991	1961 - 1991 % Increase
• POPULATION	2,106,000	4,236,000	101%
• EMPLOYMENT	846,000	2,292,000	171%
• DAILY TRIPS	2,948,000	8,528,000	189%
• DAILY TRIPS PER CAPITA	1.40	2.01	44%
• AVERAGE WORK TRIP LENGTH	11.4 km	14.4 km	26%
• CAR OWNERSHIP PER CAPITA	0.30	0.51	70%

REASONS FOR MORE TRIPS PER PERSON

- MORE ADULTS PER HOUSEHOLD
- MORE WOMEN IN THE WORK FORCE
- HIGHER REAL INCOMES AND CAR OWNERSHIP
- GOODS MOVEMENT SHIFT FROM RAIL TO TRUCK

REASONS FOR LONGER TRIPS

- GREATER SCALE OF GTA
- RAPID HOUSEHOLD FORMATION
- HIGH LAND COSTS AND MORE SUBURBAN HOUSING
- MORE HOUSEHOLDS WITH 2+ WORKERS
- SHORTAGE OF RENTAL ACCOMMODATION

[1] INCLUDES THE REGIONAL MUNICIPALITIES OF DURHAM, HALTON, PEEL, YORK AND METROPOLITAN TORONTO

Sources: Transportation data are drawn from Statistics Canada, the 1964 MTARTS Survey and the 1986 and 1991 Transportation Tomorrow Surveys

EXHIBIT 4

ANTICIPATED GTA GROWTH: 1991-2021

	1991	2021	1991 - 2021 % Increase
• POPULATION	4,236,000	6,668,000	57%
• EMPLOYMENT	2,292,000	3,757,000	64%
• DAILY TRIPS	8,528,000	13,669,000	60%
• TRIPS PER CAPITA	2.01	2.03	2%
• AVERAGE WORK TRIP LENGTH	14.4 km	16.7 - 17.3 km	16 - 20%
• CAR OWNERSHIP PER CAPITA	0.51	0.55 - 0.6	8 - 18%

TREND INDICATORS

- SMALL, MORE ADULT HOUSEHOLDS
- SLOWER GROWTH OF INCOMES/CAR OWNERSHIP
- SATURATION OF FEMALE LABOUR FORCE LEVELS
- SLOWER RATE OF HOUSEHOLD FORMATION
- SATURATION OF RAIL-TRUCK GOODS MOVEMENT SHIFT

Sources: 2021 estimates of population and employment were prepared for the Office for the GTA by Hemson Consulting Ltd., 1993; future GTA trip attributes were estimated by IBI Group as part of recent transportation studies in the area.

EXHIBIT 5

GENERIC URBAN FORM AND TRANSPORTATION IMPLICATIONS

	Central City (City of Toronto)	Post-WWII Suburb (City of North York)	Recent Suburb (Town of Markham)
Population	635,395	562,564	153,811
Urban Form			
Size of Urbanized Area (km2)	97	177	91
Residential Density (people/km2)	6550	3178	1690
Employment Density (jobs/km2)	4323	2292	665
Transportation System			
Automobile Ownership (vehicles/1000 people)	388	450	555
Road Extent (m/person)	1.7	3.6	5.5
Transit Ridership (annual rides/person)	199	143	90

Source: ***Urban Travel and Sustainable Development: The Canadian Experience***, prepared for Canada Mortgage and Housing Corporation by IBI Group, 1993.

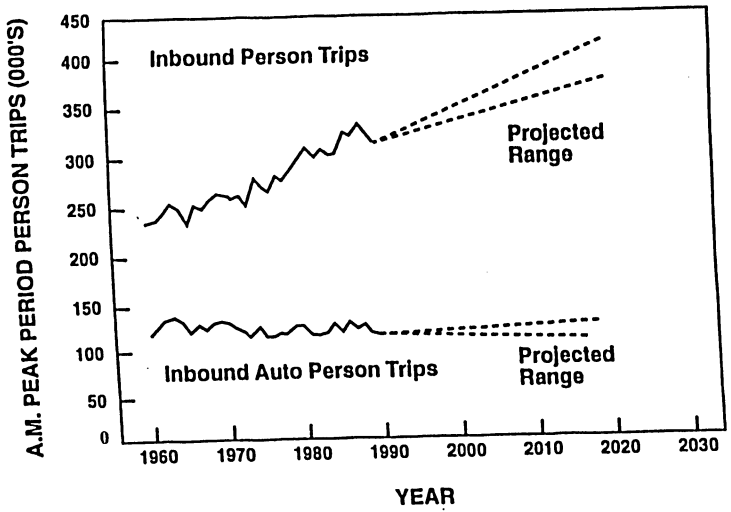
EXHIBIT 6
LAND USE: COMPARISONS OF GTA URBAN STRUCTURE CONCEPTS

	1986 BASE	2021 SPREAD	2021 CENTRAL	2021 NODAL
URBANIZED LAND (KM^2)	1,520	2,420	1,870	2,110
GTA EMP./POP. (M)	2.1/3.7	3.4/6.0	3.4/6.0	3.4/6.0
SUBURBAN REGIONS EMP./POP. (M)	0.8/1.5	1.7/3.6	1.2/2.2	1.6/3.2
METRO TORONTO EMP./POP. (M)	1.3/2.2	1.7/2.4	2.2/3.8	1.8/2.8
GROSS DENSITY ($POP./KM^2$)	3,800	3,900	5,040	4,470
RURAL LAND CONSUMED (KM^2)	1,520	+900 =2,420	+350 =1,870	+590 =2,110
NETWORK ADDITIONS				
• HIGHWAYS (LANE-KM)	-	2,035	784	1,024
• ARTERIALS (LANE-KM)	-	5,237	3,908	5,472
• RAPID TRANSIT (KM)	-	81	178	181
PERCENT TRANSIT (AM PEAK PERIOD)	25	26	35	29
AVERAGE TRIP LENGTH (KM)	13.4	15.0	13.2	14.3
TRANSPORTATION ENERGY CONSUMED (MJ IN AM PEAK PERIOD)	26.4	46.7	37.2	42.1
ANNUAL AUTOMOTIVE EMISSIONS (TONNES IN AM PEAK PERIOD)	1,900	5,200	2,600	3,000

Source: *Greater Toronto Area Urban Structure Concepts Study* prepared for the Greater Toronto Coordinating Committee and Office for the GTA by IBI Group et al., 1990.

EXHIBIT 7

PAST/FUTURE CENTRAL AREA TRAVEL TRENDS TO THE CENTRAL AREA OF TORONTO



Source: *Toronto Central Waterfront Transportation Study, Report 15* prepared for the Royal Commission on the Future of the Toronto Waterfront by IBI Group et al., 1991.