2.0 PLANNING FRAMEWORK

The PLANNING FRAMEWORK provides details on technical aspects of the Transportation Study, including future growth directions, existing system performance and travel demand forecasting. It describes the forecasting model development needed for predict future traffic conditions within the Study area.

2.1 FUTURE TRANSPORTATION DIRECTION

2.1.1 TRANSPORTATION PLANNING PRINCIPLES

The fundamental philosophy of a transportation master plan is formed by planning principles established specifically for the community. These principles are intended to address key issues, directions and strategies facing the Windsor area's future transportation system.

Principles are philosophical statements that support the overall vision of a community, in this case dealing with transportation. These philosophical statements, when considered in association with Official Plan policies and Transportation Study recommendations, establish the main basis or framework for decisions about the form, content and implementation strategies in the transportation plan.

The overall transportation vision for the Windsor area can be taken directly from the current Official Plan update. This offers a clear, single statement of what the community wants from its transportation system:

Provide a sustainable transportation system that enhances physical mobility and ensures that the economic, social and environmental needs of Windsor are being met.

Transportation planning principles for WALTS were first discussed by the Transportation Task Force at a September 25, 1997 workshop. Twelve principle topics were selected based on the main Strategic Themes of the Community Strategic Plan. With the input provided at the Task Force workshop, these topics have been translated into a series of inter-related Principles to be considered both by the WALTS study and the new Windsor Official Plan. These Principles are presented as follows in no particular order:

Sustainable Transportation System

Promote the achievement of a sustainable, efficient and effective transportation system that:

- meets the basic access needs of all members of the community safely and in a manner consistent with a healthy ecosystem.
- is affordable, operates efficiently, offers choice of transport mode and supports a vibrant economy, and;
- limits emissions and waste, and minimizes the consumption of non-renewable resources.

Community Transportation

Provide an accessible, affordable and available transportation system for all residents of the community.

Service to Business

Improve the access to community businesses for customers, employees and goods and services.

Transportation Demand Management

Create an environment in which all modes of transportation can play a more balanced role.

Modal Integration

Promote the inter-relationships between all modes of transportation to achieve a comprehensive, integrated transportation system.

Transportation System Efficiency and Affordability

Optimize the use of the existing transportation system.

Cross-Border Transportation

Provide cross-border facilities and services which provide effective, timely and convenient international transportation.

Transportation Plan Management

Implement and monitor the transportation plan to ensure management and performance goals and objectives are achieved.

2.1.2 POPULATION AND EMPLOYMENT GROWTH

Travel demands and patterns in the WALTS area will in part stem from the growth and location of new population and employment within the study area over the next 20 years (to year 2016). The resulting trip generation between home, work and other locations will impact on the area's transportation systems, creating needs for system improvements and demand management strategies.

Population

Within the City of Windsor, the population is expected to grow from 197,694 residents in 1996 to 213,217 residents by the year 2016 according to the City of Windsor Population Analysis (October 1996). This results in only 15,523 new residents in the City based on a medium growth scenario.

Other Official Plans were used to determine population growth in the five neighbouring municipalities within the WALTS study area. The result is an additional 34,248 residents in the surrounding municipalities by the year 2016, with most of this growth directed to the Town of LaSalle and Maidstone Township as shown in Table 2.1. Once again, these forecasts were provided from the existing Official Plans of each municipality, and extrapolated on a straight line basis through the three planning horizons where required.

In total, the WALTS study area is expected to grow by an additional 50,000 residents by the year 2016. Most of this growth (69%) is expected in the non-City area of WALTS, with the City taking about 31%. The data shows the rural municipalities continuing to collectively experience a higher rate of population growth compared to that of the City. This growth pattern is clearly shown on Figure 2.1, where population growth has been allocated across the WALTS area primarily into the five rural municipalities, plus Windsor's southerly (Roseland, South Windsor, Devon) and easterly (East Riverside, Sandwich East) planning districts. The Windsor Planning Department conducted this allocation based on the pattern of active development applications, Official Plan policies and general housing market trends.

Table 2.1 - Population Growth

Municipality	1996[1]	2001	2006	2016	Growth 1996-2016
City of Windsor	197,694	203,490	207,091	213,217	15,523
Town of LaSalle	20,566	22,344	25,280	32,400	11,834
Maidstone Twp.	11,770	11,939	13,133	18,900	7,130
Twp. of Sandwich South	6,618	7,445	8,375	10,500	3,882
Town of Tecumseh	12,828	13,434	15,200	19,300	6,402
Village of St. Clair Beach	3,705	4,955	6,205	8,705	5,000
TOTAL WALTS	**253,181**	**263,607**	**275,284**	**303,022**	**49,841**

One other source of population forecasting was compared to this information used in WALTS as a sensitivity test. Rural municipality population projections were available up to the year 2011 from the County's Restructuring Report by Prince Silani & Associates dated August 1996. However, it appears that this study was completed before the actual 1996 census population data was available. The result is that the Prince Silani population numbers for the year 1996 are 6,000 persons less than the actual 1996 population figures from Census Canada.

This in part results in the Prince Silani year 2011 forecasts being about 18,000 people less than the forecasts used in WALTS. The WALTS forecasts are best used in this transportation study because they are based on Official Plan polices, and because it is preferable in long range planning to favour higher population projections so that resulting recommendations and strategies are less sensitive to actual growth.

Technical Appendix 5 contains the detailed population allocation data.

Employment

Where people are employed within the WALTS area is another major determinant of traffic growth, patterns and characteristics. As with population forecasting, the source of employment forecasts for the City of Windsor was the October 1996

[1] *1996 base population from Census Canada*

Employment Analysis. This report estimated the City's employment growing by 21,553 positions between 1996 and 2016 in a high growth scenario, as shown on Table 2.2.

Employment forecasts for the five rural municipalities within the WALTS area were not readily available for this study. Employment in these areas was estimated as a percentage of total County employment, for which data was available. This methodology showed employment in the five rural municipalities growing by 11,650 positions between 1996 and 2016 as shown below:

Table 2.2 - Employment Growth

	1996	2001	2006	2016	Growth 1996-2016
City of Windsor	113,000	115,897	121,809	134,553	21,553
Other WALTS	15,150	18,100	21,400	26,800	11,650
TOTAL WALTS	**128,150**	**133,997**	**143,209**	**161,353**	**33,203**

As with the population forecasts, the employment data was allocated primarily to the City's planning districts shown on Figure 2.1, and traffic zones based on the existing employment pattern, known development proposals and Official Plan policies.

Technical Appendix 5 contains the detailed employment allocation data.

2.1.3 URBAN FORM

Over the next 20 years, future travel demands, infrastructure needs and management strategies in the WALTS transportation system will be influenced by the study areas built form. This "urban form" will establish the location and potential inter-relationships (i.e. travel distances) between major land use types (residential, employment, recreational, institutional) making up the urban, suburban and rural components of the study area. It will also dictate where and how external traffic, from both domestic and cross-border sources, will impact on the system.

This urban form also dictates what types of transportation modes will best serve the travel needs of the area. For example, a continued pattern of low density residential expansion into expanding suburban neighbourhoods will increase the need for conventional auto-oriented roadway links within these areas, and to other parts of the WALTS study area. Conversely, a stronger emphasis on more compact, or intensified development within existing urban and suburban communities can stimulate the use of alternative transportation modes over shorter travel distances.

The WALTS study had the distinct advantage of being conducted in association with the Windsor Official Plan update, called *Vision In Action.* This concurrent planning process allowed the City and surrounding land use and urban form issues to be dealt with in association with transportation needs. Based on Windsor area growth patterns arising from the Official Plan update, and stakeholder input from a July 24, 1997 transportation planning workshop, four urban form scenarios were considered for this study as discussed in **Technical Appendix 6**.

Selected Urban Form Scenario

Combining the *Vision In Action* process with WALTS provided an excellent opportunity to plan the Windsor area and its transportation systems together. Those involved in the *Vision in Action* process achieved a consensus on how development should be managed in Windsor. The resulting Windsor Development Strategy (March 1998) has the City accommodating new growth through practical and efficient land use management strategies that will promote a more compact form of development. According to this Strategy:

> *Compatible residential, commercial and employment growth would be directed to appropriate locations within existing and planned neighbourhood to reduce development costs and maximize the live-work relationship.*

For the purposes of this transportation study, this vision of future City growth must be viewed in light of suburban growth in the adjoining municipalities. Existing planning policies and development patterns suggest that this non-City growth within the WALTS area will occur through the expansion of new suburban neighbourhoods, most notably in north LaSalle and in the Tecumseh/St. Clair Beach area. This continued suburban expansion is expected to occur, at least for the next ten years, because:

- Windsor and area new suburbs are too new to see a massive market shift away from suburban single-family detached housing at relatively affordable prices;

- these same suburbs are also too new to experience massive redevelopment of any kind, especially to the extent that would change the low-density suburban community character of these areas;
- new retail marketing trends and formats (i.e. Big Box) are oriented to large-scale suburban site locations, and;
- there is currently no regional planning authority in the WALTS area to manage overall regional development patterns.

As a result of these suburban growth factors, and the City's development strategy, the urban form expected to evolve in the WALTS area over the next 20 years includes elements from three of the four scenarios considered in this study, namely;: *Suburban expansion of existing and planned low density residential neighbourhoods, and compatible, appropriate development of more mixed use and compact neighbourhoods with the City through infilling and redevelopment of existing areas.*

These growth forms will require two distinct, yet inter-related transportation systems to provide for the mobility of people and goods within the Windsor area:

Local Mobility to serve the mobility needs of the public within their neighbourhoods by means compatible with these neighbourhoods. This will involve a more balanced use of transportation modes with a stronger pedestrian orientation, and closer links between public transit and land use.

Regional Mobility to link these neighbourhoods together, and to regional economic centres, to the City Centre and to both domestic and international origins and destinations outside of the Windsor area.

2.2 EXISTING TRANSPORTATION SYSTEM PERFORMANCE

In describing the state of the current WALTS transportation system, the focus is to identify which areas of the system are currently a concern. This section begins with a brief description of the conditions that constitute a transportation system problem on roadways, the limitations and role of other transportation modes, and concludes with a description of trip-making characteristics within the WALTS area.

2.2.1 ROADWAY PERFORMANCE DEFINITIONS

Up to 93 percent of all travel within the WALTS area takes place on public roadways. Therefore, what constitutes a performance deficiency on a roadway is critical to the ultimate interpretation of the relative ability of the WALTS area transportation system to meet the needs of its residents. For the purpose of this study, two types of deficiencies have been addressed:

- Capacity Deficiencies, and;
- Operational Deficiencies.

Capacity Deficiency

Roadway capacity is identified by the maximum number of vehicles that a road section can handle under prevailing conditions, similar to the number of people that a bus can carry. Capacity deficiencies occur where the mid-block volume of traffic on a road section exceeds its service capacity (Volume/Capacity or V/C Ratio). This V/C Ratio is determined by the roadway's Level-Of-Service (LOS), which is a measurement of mobility on a roadway system. This mobility considers factors such as congestion, traffic interruptions, waits at intersections and overall traffic flow. LOS is measured by a grading system where "A" is the best LOS, and "F" is the worst. At "F", which indicates the roadway is operating at 100 % of its capacity, the road is unusable for any travel modes. LOS "E" operates at 90% (V/C of 0.90) of the roadway capacity, and LOS "D" operates at 80%. LOS indicates the extent of capacity deficiencies, and therefore when improvements should be made.

Many cities are now using Level-Of-Service (LOS) "E" to define their roadway capacities, meaning that a roadway section is deemed to be deficient when traffic volumes exceed 90% of the roadway capacity. This approach maximizes the use of existing roadway infrastructure before considering the need for infrastructure expansion (road widenings, extensions, new roads). It also accepts the concept of some traffic congestion growth as volumes are permitted to increase without associated major capacity improvements.

Following the WALTS principle of *Transportation System Efficiency and Affordability,* the Level-Of-Service should "optimize the use of the existing system". Therefore, specifically for the purposes of the WALTS study, LOS "E" was selected as the basis for developing roadway planning capacities. Once again, at this level, a roadway section is generally deficient when traffic volumes exceed 90% of the planning capacity of the roadway.

To articulate capacity related deficiencies, the upper limit of roadway service volumes must be defined. The service volumes shown in Table 2.3 have been selected specifically for the WALTS area to reflect its needs and expectations. The hierarchy of the road system on this table has been extracted from the Windsor Official Plan. Different grades of arterial and collector roadways are used based on the adjacent land use, presence of on-street parking, traffic signal spacing and other operational factors:

Table 2.3 - PM Peak Hour Planning Capacities

Functional Classification	Grade	Capacity Vehicles Per Hour Per Lane
Freeway		**1850**
Freeway Ramps	Fwy. to Arterial	**1300**
Highway or County Road	Rural	**1100**
Arterial	Class I	**900**
	Class II	**800**
Collector	Class I	**650**
	Class II	**500**
Local		**350**

Operational Deficiency

Operational deficiencies relate to intersection and roadway section operations, and can result from many factors including individual movement demands, green time allocation and the lack of left-turn or right turn lanes. The link volumes in this case do not necessarily exceed their service volumes.

2.2.2 EXISTING ROADWAY SYSTEM CAPACITY DEFICIENCIES

It is important to note that the transportation planning model developed for this Study **only addresses capacity deficiencies.** Operational and perceived safety deficiencies are typically too localized, and require more detailed models of site specific factors that cannot be reflected in a transportation master planning model.

Some operational problems and safety deficiencies in the transportation system were taken into consideration. These are important in this Study since they may point to areas where the roadway network is not functioning in the manner in which it was intended. Finally, the Study has examined some capacity improvements that have the potential to also reduce operational deficiencies. Capacity deficiencies were identified based on the screenline and roadway link analysis, which is summarized in the following sub-sections.

Existing Screenline Deficiencies

In transportation system planning, screenlines usually represent major barriers to travel such as rivers, rail lines, major highways or streets. In the case of WALTS, screenlines are shown on Figure 2.2 and listed as follows:

East-West Screenlines:

- South City Limit/County Road 42
- Prince/Totten/CPR/EC Row Expressway

North-South Screenlines:

- Huron Church
- CPR/Crawford
- Walker
- CNR/Jefferson
- East City Limit

Detroit River Screenline

Table 2.4 presents roadway volume/capacity data for the entire Windsor urban area at the screenlines. This is based on total traffic volume measured by City staff in the annual counting program, compared to the planning capacities previously shown in Table 2.3. This screenline V/C data is also summarized on Table 2.5 below.

Overall AADT traffic counts from the County were only available up to 1993. Extrapolation of this data was not believed to accurately portray existing traffic volumes and V/C ratios, but it also did not indicate any current capacity deficiencies in this component of the WALTS network, as discussed further in this sub-section.

Table 2.5 - Existing Screenline V/C Deficiency Summary

Screenline	#	Peak Directional Capacity	SB/EB Volume	NB/WB Volume	SB/EB V/C	NB/WB V/C
East City Limit	100	5400	2875	2525	0.53	0.47
CNR/Jefferson	200	8550	5200	4800	0.61	0.56
C&O Walker	300	15200	8100	8050	0.53	0.53
CPR/Crawford	400	4500	2850	2750	0.63	0.61
Huron-Church	500	10000	4375	4225	0.44	0.42
South City Limit – CR 42	600	13700	6375	5700	0.47	0.42
Prince/Totten/CPR/EC Row	700	20800	11875	11055	0.57	0.53
Detroit River		2750	1500	1300	0.55	0.47

The entries summarized above in Table 2.5 indicate that overall, there is excess capacity at screenlines across the City. However, the screenlines are long, and it is misleading to only consider the screenline in its entirety since there may be localized incidents of roadway over use or congestion. For example, on the Huron Church screenline, excess capacity on Riverside Drive at the north end does not contribute a benefit to Cabana Road some distance to the south. Therefore the screenlines were broken down into the groups of sub-screenlines on Table 2.4. Based on this data, sub-screenline volumes approaching or exceeding capacity are only found on:

- the C&O/Walker screenline on Seminole Street and Tecumseh Road east of Walker Road;
- the CPR/Crawford screenline on Wyandotte Street east of Crawford Avenue;

- the South City Limit/County Road 42 screenline on Provincial Road north of Cabana Road, and;
- the Prince/Totten/CPR/EC Row screenline on Ouellette Avenue south of Tecumseh Road (southbound), Walker Road north of Grand Marais Road (southbound) and on Central Avenue north of the E.C. Row Expressway.

Riverside Drive East volumes are a concern on all N/S screenlines, but this is more an issue of roadway use and classification than of capacity, as discussed further. With excess capacity at all other screenlines, there are localized deficiencies where one or two arterials across a screenline may be overloaded, but the rest are under-utilized.

1996 Link Deficiencies

Since some roadway links do not cross screenlines, individual roadway links were also investigated. The entire WALTS network was analyzed to see which links, in 1996, had PM peak hour volumes that were close to or exceeded their planning capacity. This analysis considers the peaking characteristics of a roadway segment, and its directional split as well. Figure 2.3 shows the location of 1996 PM peak hour capacity deficiencies, with the most critical LOS F segments listed on Table 2.6.

Table 2.6 - 1996 Roadway Link Deficiencies at LOS F

Roadway Segment	From	To
Wyandotte Street West	Cameron Avenue	Janette Street
Tecumseh Road	Central Avenue	Jefferson Boulevard
Ouellette Avenue	Erie Street	Eugenie Avenue
Dougall Avenue	Eugenie Avenue	E.C. Row Expressway
Dougall Avenue	Shepherd Street West	ETR Rail Line
Goyeau Avenue	Erie Street East	Giles Boulevard East
Howard Avenue(Note)	Lens Avenue	E.C. Row Expressway
Walker Road	Tecumseh Road	Grand Marais Road
Walker Road	Highway 401	North Talbot Road
Grand Marais Road	Walker Road	Central Avenue
Central Avenue	Grand Marais Road	Rhodes Drive
Dominion Boulevard	Northwood Street	Labelle Street

(Note) Howard Ave. was advanced to LOS E with completion of improvements in 1997.

Note:

Riverside Drive East is carrying traffic volumes greater than desired for this roadway classificatio

Legend

- LOS A - C
- LOS D
- LOS E
- LOS F

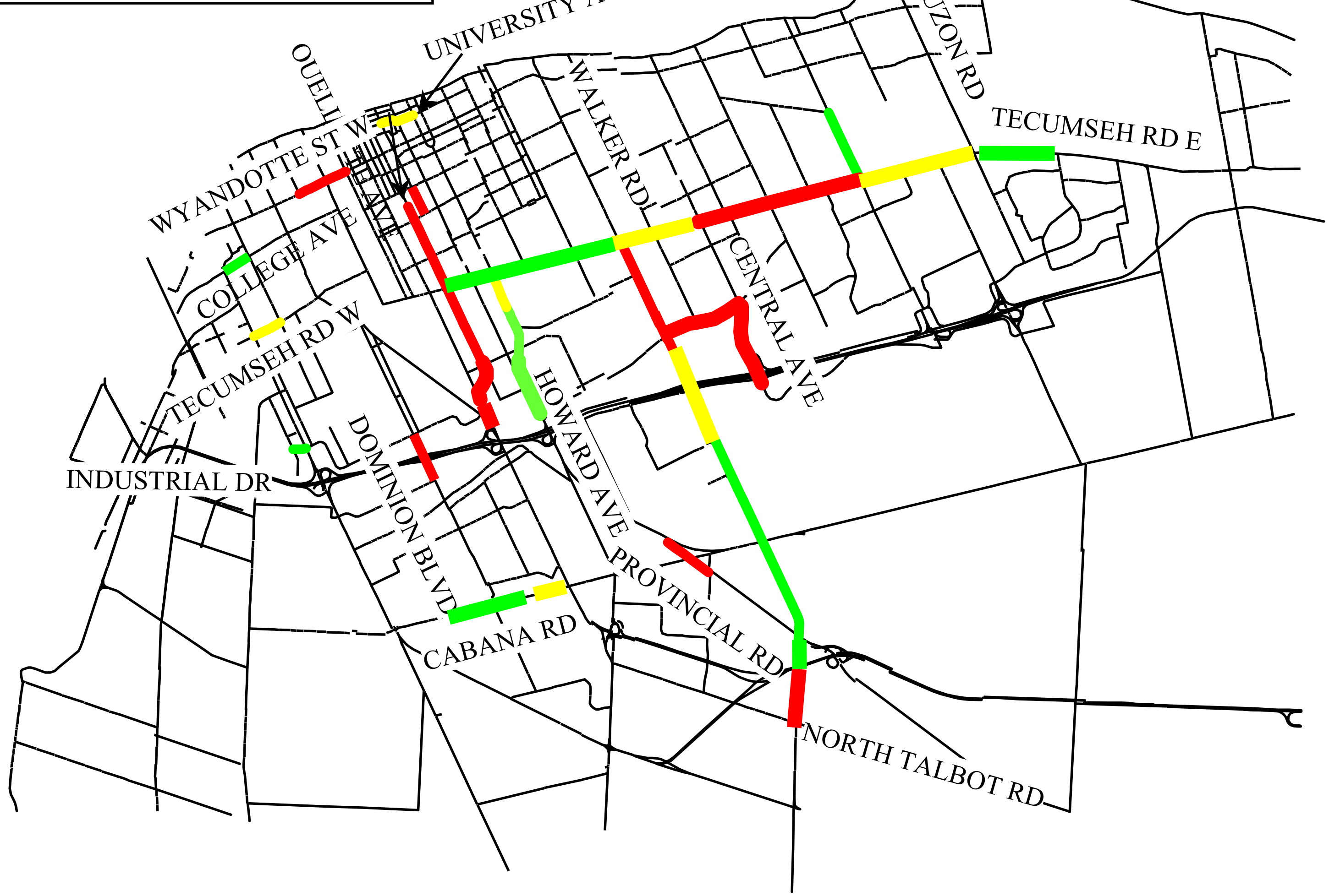


Figure 2.3
Existing Link-based Deficiencies
(based on City Counts)

Provincial Road	Division Road	Sixth Concession Roadf
Walker Road	Highway 401	North Talbot Road

Roadway Classification-Related Deficiencies

As noted earlier in Section 2.1.1, capacity deficiencies occur when mid-block traffic volumes exceed a roads designated service volume. This service volume is established based on the designated classification of the road, which reflects how the road is being used (volumes, speeds, access, adjacent land use).

There are two roadway sections in the WALTS system where their existing classification does not reflect their actual function. As a result, these sections are carrying traffic volumes greater than desired for these types of roads.

These classification-related deficiencies are found on **Riverside Drive East and Riverside Drive West**. However, unlike the links in Table 2.6, these apparent deficiencies relate more to how these roadway sections are classified and used, rather than the pure volume/capacity measurement. Both are classified as Scenic Parkways, but owing to their continuous east-west continuity, they experience traffic volumes more commonly associated with Arterial roads.

These types of deficiencies can usually be solved by reclassifying the roadway to a more appropriate service level, or by introducing traffic calming measures to change how the route is being used.

Existing Suburban Roadway Deficiencies

The designated planning capacity for highways and County roads is 1,100 vehicles per hour per lane. This is based on two lane roads with no or little side friction (abutting land uses) in primarily rural areas. Available traffic data (Average Annual Daily Traffic) from Essex County for the year 1993 indicate traffic volumes well below this planning capacity, and so no current capacity deficiencies are noted on suburban and rural highways and County Roads, with one exception:

- **County Road 11** (7th Concession Road) - between Highway 401 and North Talbot Road is a two-lane facility operating at LOS F based on information provided by Essex County.

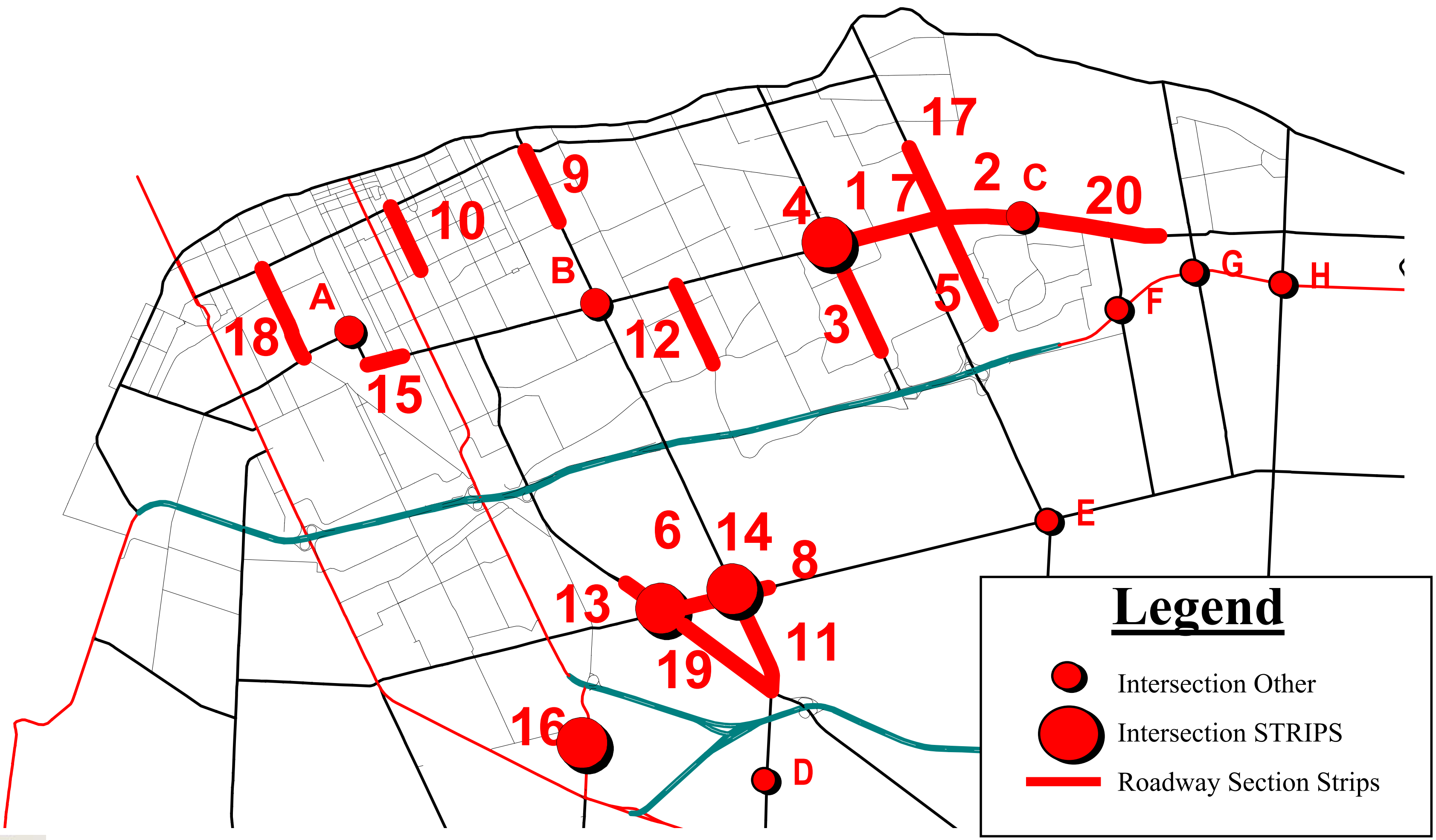
Other suburban roads in the immediate vicinity of the City boundary experience relatively high traffic volumes, but not beyond the planning capacity set for this Study (LOS E). This is because some of these more urbanized major roads have four lanes with signals, and in fact operate as arterial roads. A prime example is Tecumseh Road East in the Town of Tecumseh between the City boundary and Lesperance Road. In 1997, this road section carried the highest traffic volumes in suburban areas area of up to 21,000 vehicles daily (extrapolated from 1994 data)[2]. However, this portion of Tecumseh Road has four lanes with signals and operates as an urban facility. In fact, it is classified as a Class II Arterial in the WALTS traffic forecasting model, with a planning capacity of 800 vehicles per lane per hour.

The 21,000 daily trips on this portion of the road equates to 2,100 vehicles per hour (10%). Existing data also shows a 60% peak direction on the road, resulting in a directional peak of 1260 vehicles or 630 per lane. This is well below the 800 planning capacity. However, since the resulting V/C ratio of 0.79 is LOS D, and with continued growth in and east of the Tecumseh/St. Clair Beach urban area, future capacity deficiencies are expected on this and other similar suburban roads. This will be documented in the next part of this report dealing with future WALTS needs.

2.2.3 ROADWAY SYSTEM OPERATIONAL DEFICIENCIES

Roadway operational deficiencies were identified in the City of Windsor's Strategic Roadway Improvement Priority Study (STRIPS), and by the County Engineering Department based on development pressures, public perceptions and annual road needs analysis. Using the STRIPS results and plus County observations, the locations of current operational and capacity problems are shown Figure 2.4. Current operational deficiencies at key intersections, namely those operating an unacceptable level of service, are listed as follows:

[2] *Traffic Analysis Report: Tecumseh Road east Reconstruction - Jefferson to Banwell Road, March 1996), E. Fearnley Ltd. for LaFontaine, Cowie, Burratto, and Associates.*



WINDSOR VISION IN MOTION
WINDSOR AREA LONG RANGE TRANSPORTATION STUDY

Figure 2.4
Strips Capacity Deficiencies

Stanley Consulting

Table 2.7 - Operational Deficiencies

Intersection No. (from Figure 2.4)	Location
4.	Tecumseh Road East/Jefferson Blvd.
6.	Provincial Road/Cabana Road East
14.	Division Road/Walker Road
16.	North Talbot Road/Howard Avenue
A.	Tecumseh Road West/Crawford Avenue
B.	Tecumseh Road East/Walker Road
C.	Tecumseh Road East/Forest Glade Drive
D.	North Talbot Road/Walker Road
E.	County Road 17/County Road 42 (Division Rd.)
F.	Banwell Road/County Road 22
G.	Lesperance Road/County Road 22
H.	Manning Road/County Road 22

2.2.4 TRANSIT SYSTEM LIMITATIONS

Transit Windsor services generally provide a reasonably effective transit service within the City. However, the role and importance of transit within the City appear to be understated. This is reflected in limited reference in City policies and in lower service levels and higher than average transit fares. While Windsor is undoubtedly an automobile-oriented and dependent City, public transit is an important element in the City's infra-structure.

These issues, along with those related to community transportation (CTAP), boundary re-structuring and de-regulation can be considered as strategic transit system deficiencies within the context of transit's future direction and performance expectations over the next 20 years. These strategic deficiencies can be described under four categories.

Strategic Transit Windsor Limitations

Socio-Economics - The economic recession reduced employment, disposable income and overall travel demand. It also changed the employment profile with more part-time versus full-time employment. This has altered travel and commuting patterns with many more trips being taken during off-peak and evening hours when transit service has traditionally not been as attractive.

The declining birth rate and aging population affects two of public transit's key ridership markets. With the lower birth rate comes fewer trips by children and students. However, at the other end of the age scale, older citizens tend to use more public transit and other forms of community transportation, especially between seniors housing, the downtown and major retail areas.

Population/Housing Market - For the purposes of the WALTS., a medium population growth scenario is viewed as the most likely and would see the population increase by 50,000 by 2016, with only 15,523 of this growth in the Windsor urban area served by Transit Windsor. In terms of housing needs, the number of units in Windsor is forecasted to increase by 14,424 from 1991 to 2016, representing an annual increase of approximately 576 units. Seventy-one percent (71%) of this increase would be in low density, single family units with 17% as medium density and 12%, high density. Low density development represents 10-12 units per hectare, medium, 30 to 40 units per hectare, and high, 60 to 100 units per hectare. This trend continues the low density characteristics of previous Windsor development patterns.

This situation will continue to present difficulties for transit to serve efficiently and will place pressure on the ability of the transit system to continue to achieve its current high R/C ratio without excessively increasing transit fares.

City Economy - The auto industry has fueled much of Canada's economic recovery over the past three years with Windsor-area auto plants being selected over U.S. sites to supply the North American market. This positive economic news has bolstered the Windsor economy and serves to keep local incomes higher than average as well as reinforce the importance of the automobile for local travel within Windsor.

The opening of the Casino in 1995 has also provided a boost to Windsor's economy through increased tourism. This could have a beneficial effect on Transit Windsor ridership and charter revenues. However, the use of Casino shuttle parking provided by a private operator limited the benefit that providing this service could have had, either in terms of reduced municipal cost or improved transit service, on the municipal cost to operate the City's own transit system. Effective December, 1998, Transit Windsor took over the shuttle service, and future use will determine the financial benefits to Transit Windsor operations.

The elimination of MTO funding may not result in a financial loss to the City, depending on the results of other changes in responsibilities between the Province and the Municipality. Decisions regarding priority for and provision of public transit should not be influenced by availability of MTO funding - transit has always been a municipal responsibility. The introduction of MTO funding in early 1970's was intended to provide initial help to improve transit services and infrastructure. However, the elimination of the MTO funding presents an appropriate time to consider how to increase the Revenue/Cost or Net Cost target for the transit system. This in turn would continue to improve the management and administration of the transit system.

<u>Municipal Policies</u> - The importance of the automobile in the Windsor economy, while positive, presents a challenge from a transportation, quality of life and sustainable environment standpoint. There has been a tendency to downplay the significance of public transit as a part of the City's infrastructure.

As has been amply demonstrated through experience in other urban centres, excessive reliance in transportation planning, urban/suburban and industrial/commercial development on the automobile can have a detrimental effect on the quality of life in cities. The automobile is the single biggest contributor to air pollution. Car-dependent neighbourhoods and lifestyles are now beginning to be questioned in terms of their contribution to urban crime and violence. Urban sociologists now feel that previous planning concepts have created cold, unfriendly, inhospitable housing developments and malls that are beyond human scale, that are so impersonal and detached that residents have lost that feeling of community.

These same features have also made public transit use unattractive and difficult to serve. Neo-traditional development styles, such as those being considered in the east end of Windsor (East Riverside), represent an attempt to recover those lost values and will support the use of public transit. In fact the City’s new Development Strategy (March 1998) includes a direction that will “*promote walking, cycling and transit use by encouraging better connections between neighbourhoods.”*

Transit Windsor Operational Review

In the early 1990's, Transit Windsor's service levels and related financial performance was deteriorating. In order to determine the reasons for this performance, and to attempt to reverse the downward ridership patterns, the City conducted an operational review of Windsor Transit. A number of strengths and weaknesses were identified during the review process. The weaknesses, or deficiencies, that relate to the WALTS study are listed as follows:

- Service standards are out of date and not being used (but these were subsequently updated in 1998);
- Terminal facilities are obsolete or poorly located (but 1 of 3 was replaced and upgraded in 1998 since the Operational Review);
- Service corridors duplications and the number of circuitous routes, and;
- The need for time transfers on the system.

2.2.5 CYCLING AND WALKING SYSTEM LIMITATIONS

Many factors influence an individuals decision to walk or cycle. The U.S. Federal Highway Administration[3] has identified a three-tier hierarchy of factors that influence the choice to bicycle. These factors are described below:

- **Initial Considerations**: Attitudes, values, and perceptions of individuals and society affect the initial consideration of whether to bicycle or walk, or not. Individuals must overcome the status quo of relying on the automobile for travel. Some people never seriously consider bicycling or walking as an option, with time and distance often cited as reasons not to bicycle or walk. Still, a majority of trips are made under 15 km in urban areas, manageable on a bicycle, and about a third are less than 2 km, manageable on foot. Cycling or walking are sometimes viewed as "uncool" or a drop in social status. There are also situational constraints such as needing a car for work, transporting bulky items or dropping off passengers. A small proportion of the population may not have the physical capability to ride a bicycle or walk.

- **Trip Barriers**: If initial considerations are favourable, trip barriers are then considered. Trip barriers include the fear of traffic, real or perceived, the weather, and the terrain. Providing bikeways, walkways and trails can help to

3 *The National Bicycling and Walking Study - Final Report (Report No. FHWA-PD-94-023, 1994)*

overcome some of the safety issues, along with education and enforcement programs, and safety campaigns.

- **Destination Barriers**: If trip barriers are overcome, destination barriers are then considered. Destination barriers include lack of adequate infrastructure at the trip end such as pedestrian versus car-oriented building access, secure parking for bicycles, change and shower facilities. Less tangible destination barriers include the lack of support from co-workers and employees including their attitude, subsidized parking and travel expenses that do not include bicycles, lack of flexible hours or a formal dress code.

In terms of cycling, specific limitations to this mode of transportation in Windsor were identified in the Bicycle Use Development Study in 1990, and include:

- **Auto Dominance** - in the Windsor area means residents are highly unlikely to change to cycling, regardless of the benefits.
- **Road System** - is designed for auto rather than bicycle use;
- **Direct Travel Barriers** - include the E.C. Row Expressway and railway yards; requiring cyclists and pedestrians to use inefficient sidewalk and roadway routes.
- **Construction Costs** - associated with roadway widenings or exclusive bike lanes are a factor in building these types of facilities;
- **Traffic Conditions** - on roadways caused by high speeds, high truck volumes, visual clutter, street parking and intersection turning movements can all be detriments to safe pedestrian and cycling activities along these routes and adjacent pedestrian traffic, and;
- **Public Acceptance -** of new bicycle facilities requires promoting the concept of on-road cycling, which is often difficult for recreational cyclists to accept, and requires investment in education and enforcement.

The Bicycle Use Development Study (BUDS) proposes a master routing plan based on a hierarchical network of bikeways and recreationways. Since adoption in 1990, priority has been given to opening off-road recreationways and trails, most notably the Ambassador/Assumption/Centennial, West Windsor, College Avenue and Russell Street Recreationways, plus the Ganatchio Trail and Walker Homesite Trail. These routes facilitate and attract bicycle use in specific areas of the City, most notable in the east and west ends.

The BUDS study to date has been implemented as planned based on available City funding and matching funding (infrastructure program funding and MTO subsidies). Most of the major recreationways are in place. The priority now is on development of the remaining planned north/south recreationways, plus the major on-road bikeways. Concerns raised about bicycle facilities along Riverside Drive East and Lauzon Road/Parkway, both being major elements of the BUDS planned bicycle routing system, will also have to be resolved.

In summary, while the past eight years has shown definite progress in bicycle facility and trail development, some project approval obstacles have also hindered further development. The originally intended BUDS concept of a continuous, inter-connected cycling route system in Windsor may be affected if solutions are not found.. This system was originally proposed to encourage more citizens to cycle more often, and over greater distances as a recreational pastime and viable alternative to automobile use. The complete BUDS system will be required if this objective is eventually to be reached. This need, coupled with changes in suburban development patterns since 1990, supports a review of the BUDS concept, recommendations and standards as part of a Bicycle Use Development Study update.

In terms of walking, the main limitation to this most basic mode of transportation can be a lack of suitable walking surfaces and trail linkages. Without sidewalks, pedestrians are forced onto roadways or shoulders. Also, pedestrians and those using mobility aids can be hindered by a lack of curb-cuts and ramps at appropriate locations, lack of adequate sidewalks along busy roads, vehicular barriers that also restrict those with mobility aids, limited crosswalk locations and signal timing that favours vehicles over pedestrians.

Sidewalk and trail systems need to safely cross major physical barriers such as the E.C Row Expressway and Highway 401. Street layouts in new subdivisions can also act as barriers to walking, resulting from circuitous and/or dead end streets, making it more difficult to move around efficiently on foot.

2.2.6 ROLE OF OTHER MODES

In addition to roads, transit cycling and walking, three other modes make up parts of the WALTS transportation system. Their potential roles in the system are discussed as follows from a purely generic and conceptual perspective, and without the benefit of full feasibility, financial and market demand analysis:

Air Service

By its nature, air service provides for inter-regional, provincial and national transportation to and from the WALTS area. It does not serve the local or regional transportation needs of WALTS area residents. However, it does rely on inter-modal connections primarily with the area's roadway system.

With the transfer of Windsor Airport to new local ownership, this needs for surface accessibility and access will become more crucial. High roadway levels of service will be needed in support new airport site development initiatives. Similarly, continued business growth on and around the airport may also support new multi-modal transportation opportunities involving air, rail, road and transit.

Rail Service

As previously explained in the Existing Rail System section, the Windsor area is served by three Canadian mainline freight railways (CN, St. Lawrence and Hudson/CP and CASO), a local short-line operator (ETR) and a passenger rail service (VIA). Further rationalization and consolidation of rail operations may bring new opportunities for abandoned rail lines in the Windsor area.

<u>Retained Rail Lines</u> - This Study's analysis of the existing rail system concluded that the St. Lawrence and Hudson Railway line (part of CP) is most likely to be retained as the primary freight mainline into and out of the WALTS area, with access to the existing or a new cross-border rail tunnel. Continued operation of the CASO line is flexible, while passenger services on the CN line is expected to be consolidated with the CP operations and operate to the CASO station in Windsor (see previous sub-section 1.3.6). Whatever the final rationalization of WALTS rail service, it is likely that abandoned rail lines will become available for other uses. These uses may involve:

- expansion of short-line operations to serve area freight movement needs;
- further development of inter-modal operations, although abandonment of the CSX/CN line running along the west edge of the Windsor Airport reduces this opportunity;

- complete abandonment and reuse of rail lines as part of a "rails-to-trails" program to expand area trail systems, and/or;
- redevelop abandoned rail corridors as transit ways and/or multi-use trails.

Local Rail Service - The question of whether and how rail can be used in a local or area transportation system is dictated mainly by population size and density, both generally and along the service route(s). In terms of population, Canadian Urban Transit Association research on modal shift to transit has concluded that only large metropolitan centres have the population base to support large scale rapid transit systems (i.e. the GTA, Montreal Urban Community, Greater Vancouver, Calgary, Edmonton, Ottawa-Carleton).

Residential type and population density along rapid transit routes also influence whether such service is feasible. The following table highlights the density levels generally required to support various rapid transit systems:

Table 2.8 - Land Use Density and Transit Service

Residential Type	Density	Transit Service
Single Detached Homes	Very Low: < 7 upha (3 upac)	None
Small Lot Singles, Semi-Detached	Low: 35 upha (14 upac)	Regular Bus Service
Semi-Detached, Townhousing, Fourplexes, Apartment/Single Detached Mixes	Medium: 52 upha (20-25 upac)	wide array of transit including Light Rail Transit
Medium to High Rise Apartments, Townhouse/Apartment Mixes	High: 175-296 upha (65-120 upac)	any type

This information shows that a general residential density of at least 52 units per hectare is needed to support rapid transit. In Windsor, this would mean medium to high density nodes being located along transit corridor and transit centres. This is supported by a recent Institute of Transportation Engineers publication on Traditional Neighbourhood Development which states that to reduce vehicle traffic by up to 7 percent around transit corridors, a minimum residential density of 60 units per hectare (24 units per acres) is needed.[4]

High Speed Rail - Although there is continued interest in high speed rail (HSR) service in the Quebec City-Windsor corridor, no proposals have been forthcoming to date. Recent studies suggest that in the intermediate term, only the Quebec City-Toronto service is viable. In the long term, service to and through Windsor may use the CP corridor, but once again, not definitive concepts are available. In terms of longer term planning, HSR service through Windsor using the CP lines could provide new multi-modal linkage opportunities with the transit system and even the airport. Conversely, a new HSR route that would bypass the main Windsor area may provide fewer multi-modal opportunities.

In summary, rail abandonment does present new alternative transportation opportunities to the Windsor area, for example along the CN/VIA line connecting east Windsor with the downtown area. As a result, abandonment of that and any other continuous rail corridor should be considered for acquisition by the City in order to retain alternative use possibility. However, it is also recognized that the financial viability of transitway or LRT services within these corridors will be dependent on urban growth policies and actions capable of supporting rapid transit in a city of less than one-half million people. With this service reality in mind, the introduction of rapid transit service on abandoned rail corridors is not considered to be part of the WALTS area transportation system or the future transportation networks being evaluated in this study.

Marine Service

Like many port cities, Windsor can use its waterfront as an important transportation corridor. This can involve not only vehicular and passenger ferry service across the river to Detroit, but also shuttle ferry services and goods movement along the Windsor waterfront. Owing to the availability of east/west roadway capacity, marine shuttle service say from Tecumseh/St. Clair Beach to downtown Windsor would most likely be for pedestrian and cycling access.

[4] *Traditional Neighbourhood Development Street Design Guidelines, ITE Planning Council Committee 5P-8, June 1997.*

The two main issues facing marine service involve border control and cost. Marine transport officials have stated that cost saving are required to support marine operations.[5] Commercially viable ports such as Windsor also require greater financial independence from federal legislation in order to support a cross-border ferry or waterfront shuttle service.

Although ferry and shuttle services hold definite tourism and recreational opportunities for the Windsor area, they are not viewed as replacing the relative convenience offered by the parallel roadway system (unlike the travel time and convenience advantages offered by the SeaBus service linking downtown Vancouver with North Vancouver). These services would not be expected to divert significant volumes of traffic off roads, and therefore will not be included in the analysis of future transportation networks.

However, marine service on the Windsor area waterfront remain an important economic generator, and alternative to ground transportation. For example, aggregate storage on the east and west waterfronts means that these aggregate supplies are not all feed through the area roadway system. Another example of this marine transportation benefit is the existing international truck ferry located at the foot of Sprucewood Avenue off Maplewood Drive. This truck crossing facility provides an alternative to Bridge or Tunnel crossings, especially for hazardous goods.

2.2.7 EXISTING CORDON TRIP CHARACTERISTICS

Cordon surveys were performed at the periphery of the WALTS study area where County Roads, Provincial Highway, and International Gateways provide routes into and out of the WALTS area. Capturing this traffic at the boundaries was essential to understanding the role of the International Gateways, and the nature of the demand that crosses the study area boundary.

WALTS Area Cordon Survey

Over a two-week period commencing in mid-June, over 5,700 roadside interviews were conducted on the major linkages between the WALTS area and Essex County and the rest of the province. The purpose of this exercise was two-fold. The first was to get an accurate representation of the nature of the demand at the gateway locations.

[5] *Transportation Association of Canada: Transportation Forum No. 6, April 1995*

The second was to augment the Household Travel Survey's limited findings since it could not capture the travel patterns of non-residents. The cordon survey provided further information on drivers who live in, for example, Amherstburg and travel daily to Windsor for work. These surveys were performed for the same 3:00 PM to 6:00 PM periods as was done for the Household Travel Survey.

The following travel patterns were observed from the cordon survey:

- The average vehicle occupancy at the cordon was 1.4 people per vehicle. This was slightly higher than the occupancy observed in the Household Travel Survey;

- The Trip Purpose distribution in the cordon survey was found to be extremely similar to that in the Household Travel Survey, as shown on Table 2.9:

Table 2.9 - Trip Purpose Comparison

Trip Purpose	Cordon Survey	Household Travel Survey
Home-Based -Work (HBW)	45%	
Home-Based-Other (HBO)	41%	40%
Non-Home-Based (NHB)	13%	14%
Home-Based-School (HBS)	1%	
Home-Based-Work + Home-Based-School (HBW+HBS)	46%	46%

- The only mode of transport at the cordon was the private automobile.
- Aside from the mode share (100% private auto), the general travel characteristics observed at the cordon are remarkably similar to those observed in the Household Travel survey. This leads to the conclusion that regardless of the apparent urban/rural land use, the demand for travel is essentially the same throughout the WALTS study area.

Cross-Border Travel

Cross-border surveys were conducted by Stantec Consulting in mid-September, 1997 at the Bridge and Tunnel as part of the WALTS study (see **Technical Appendix 7**). The purpose of these surveys was to gather updated information on the origin-destination patterns and trip purposes of travel between Canada and the US at the

Windsor/Detroit gateway. A summary of findings is provided as follows, with a more detailed report on the survey available under separate cover[6]:

- The total number of surveys of passenger traffic (which accounts for about 75% of the Ambassador Bridge Traffic and over 95% of the Tunnel traffic) met the target sample rate of 25%. There was some fluctuation in this rate by facility but not significant enough to alter the results.

- Commercial surveys were also targeting a 25% sample rate, but fell short for a number of reasons, including; 1) the physical limitations to stop trucks at the Tunnel and Bridge plazas, 2) inclement weather and 3) on-site geometric problems.

A large proportion of the truck traffic using the Ambassador Bridge is traveling to/from areas outside the SEMCOG (South East Michigan Council of Governments)or WALTS Study Area boundaries. Therefore, the detail of O-D information required is much less, hence the variance will also be much less, resulting in a smaller required sample. Based on our review of the data, the sample is adequate.

Passenger Traffic Highlights

- About 75% of the traffic crossing the border reported that either their "last stop" or "next stop" would be home. This indicates that a large proportion of the traffic surveyed is destined within a reasonable evening's drive from the border.

- About 37% of the traffic stream reported that the reason for their cross-border trip was travel between home and work.

- About 65% of the Ambassador Bridge traffic and over 75% of the Tunnel traffic reported that their cross-border trip is made at least once a week. About 37% of the Bridge traffic and 43% of the Tunnel traffic reported that they cross daily.

- About 92% of the passenger traffic surveyed had either an origin **or** a destination with the SEMCOG/WALTS area. About 76% of the passenger traffic surveyed

[6] *Survey Results: Cross-Border Survey of the Ambassador Bridge and Detroit/Windsor Tunnel, Stantec Consulting Ltd., September 1997.*

reported both trip ends within these areas, and about 8% reported that neither end of the cross-border trip was within the area.

- For traffic which reported either their cross-border trip was to and from points outside the SEMCOG/WALTS area, or their ultimate origin and destination were both outside the WALTS/SEMCOG area, about 90% were observed using the Ambassador bridge compared to about 10% at the Tunnel. This means that by far, most through passenger trips in the WALTS/SEMCOG area use the Bridge.

Commercial Traffic Highlights

The Tunnel and the Bridge were found to cater to very different types of commercial traffic, namely:

- Owing to size and other physical limitations, as well as company policies the use of the Tunnel by larger truck is limited. At least 80% of the trucks observed at the Ambassador Bridge were tractor-trailer combinations with one or more trailers, while at the Tunnel about 42% of the traffic stream were these larger vehicles.

- Private carriers appeared more frequently at the Tunnel, representing about 80% of the commercial stream, while at the Bridge it was split roughly 50/50.

- All commercial vehicles surveyed at the Tunnel were based either in Ontario, or Michigan, while at the Bridge about one-third of the commercial vehicles sampled were based in out-of-state/province locations.

- The Tunnel had a much higher preponderance of empty vehicles, with about half of those observed having no load. At the Ambassador Bridge, closer to 20% of the trucks were empty.

- Automobiles or articles made of metal accounted for about 50% of the truck commodities crossing at the Ambassador Bridge, and about 74% of those using the Tunnel.

- For the cross-border component of the trip, about 90% of the commercial traffic surveyed at the Tunnel reported an origin **or** destination within the SEMCOG / WALTS area, while at the Bridge this was only about 30%. About 80% of the Tunnel traffic surveyed reported both trip ends within these areas, while at the

Bridge only 14% of the trucks surveyed were traveling to and from the SEMCOG / WALTS area. In terms of through traffic reported as the cross-border trip, no trips were observed at the Tunnel in this category, while nearly half of those interviewed at the Bridge reported their last stop and next stop were outside the SEMCOG / WALTS area.

- For traffic that reported either their cross-border trip was to and from points outside the SEMCOG / WALTS area, or that their ultimate origin and destination were both outside the SEMCOG / WALTS area, nearly 100% were observed using the Ambassador Bridge. This shows that, as with passenger traffic, almost all the through truck traffic in the WALTS/SEMCOG area uses the Bridge

Cross-Border Survey Highlights

- Passenger traffic in the area is primarily traveling to and from points within the SEMCOG / WALTS area. Only about 8% of the travel was observed to be "through" trips.
- About 90% of the through trips were observed at the Ambassador Bridge.
- Nearly 40% of the passenger travel observed was a trip between the respondent's home and work.
- The Bridge carries about 11 times the number of commercial vehicles compared to the Tunnel on an annual basis.
- The majority of commercial traffic crossing the border (70%) is traveling to and/or from points outside the SEMCOG / WALTS area.
- The Tunnel is used almost exclusively by commercial movements within the SEMCOG / WALTS area.
- Commercial operators who had at least one end of their trip outside the SEMCOG /WALTS area were found to prefer the Bridge to the Tunnel by at least a 7:1 margin.

2.3 TRAVEL DEMAND FORECASTING

Forecasting existing traffic patterns into the future is an essential component of transportation master planning. The following is a summary of the process used, and the results obtained. Reference is made to **Technical Appendix 8** for a complete reporting of the forecasting methodology and results.

Future travel demands were estimated with the use of a computerized model built with the SYSTEM II traffic forecasting software. This model represents all major roadway facilities within and around the WALTS study area. Through the use of mathematical relationships, this model forecasts traffic volumes based on the existing major roadway network, changing local demographics, evolving land use patterns and local travel patterns (derived from travel surveys).

The WALTS model was calibrated to demonstrate how well it replicates existing travel characteristics. Because this calibration showed the WALTS model replicating actual conditions very well, it has become a valuable tool for forecasting future travel demands under various transportation network alternatives.

2.3.1 TRAVEL FORECASTING APPROACH

Development of the forecasting model began by dividing the WALTS study area into 464 internal Model Analysis Zones (MAZ), 13 external MAZ zones and 30 US MAZ zones. Using this aggregation of traffic generators, the subsequent modeling exercise involves four successive steps described as follows:

Trip Generation

In this first step, the model simulates the number of trips entering and leaving each traffic zone based on the volume and type of activity in the zone, such as the population, number of households and/or number of employees. This simulation is done for a 1996 base year so the results can be compared, or calibrated, with actual 1996 traffic counts. Forecasted values are then simulated for the years 2001, 2006 and 2016 based on population and employment forecasts by traffic zones prepared by Stanley Consulting and allocated by the City's Planning Department based on development applications, emerging Vision In Action trends (the Windsor Official Plan Update), existing Official Plan policies and the preferred urban form (see

Section 1.3) of the future city. Once simulated trips are produced for all traffic zones, this information is fed into the next modeling step.

Trip Distribution

In distribution, the traffic forecasting model simulates where trips originated and where they ended up based on the location of potential origins and destinations, and on the relative travel time between zones. The full set of volumes or trips going from each zone to each zone is determined by the model and passed on to the next step.

More specifically, the model uses a gravity-based trip distribution program. The trip productions and attractions generated by the program are converted into a matrix (trip table) of trips between zone pairs. The program then uses zone-to-zone travel friction to estimate the probability that trips produced from one zone will be attracted to another zone. This friction is calculated by the model's highway network programming. Trips are then distributed throughout the zones of the roadway network in an iterative process by trip classification; trip period, trip purpose, trip type and trip group. The final result is a trip table produced for each trip type.

Travel Mode Split

Here, the model simulates the allocation of trips to cars, buses, cycling and walking. This is based on existing mode splits determined from the WALTS household travel survey (see Interim Report No. 1), and also takes into consideration the influence of the service provided by each mode (transit, cycling, walking) based on the attractiveness of the mode. Alternative "what if" attractiveness factors are also used in the model, for example to determine the impact of increasing the transit mode share from the current 3% of all trips, to 6% and even 9% by the year 2016. This split between car, bus, walking and cycling trips extends from one zone to another, with the result being four separate sets of trip volumes, one for each mode. The car results are passed on to the final modeling step. The alternative modal splits for bus, cycling and walking modes is also considered in assigning traffic.

Traffic Assignment

In assigning traffic, the model simulates the routing of trips on the roadway network based on the influences of congestion and delay, taking into consideration the number of lanes, the traffic volume versus the roadway capacity, number of border crossings, etc. This provides the final transportation network loadings for the model, which is the number of vehicles on each part of the network. It also provides associated information such as travel time, fuel use, air pollution and total vehicle miles traveled. This is all useful information in evaluating the impacts of various alternative transportation projects.

Setting up the WALTS transportation model is a very large undertaking. In the household travel survey, residents were asked about their travel behaviors in order to ensure that the model reproduces this behavior. Reproducing this existing behavior is called "calibrating" the model, where real world conditions are entered into the model. During calibration, the model is checked against these real world conditions. This is done by feeding the model the "existing land use description", namely; the existing amounts and types of population and/or employment activity within each traffic zone, and then comparing the model's resulting outputs with actual counts of existing traffic volumes. In this way, the model is set up to reproduce existing travel behavior as closely as possible.

Traffic is also modeled during the most difficult regular conditions, when volumes are highest on a recurring basis. In WALTS, the afternoon or PM peak is used. This ensured that the worst case conditions are being reproduced in an effort to solve associated transportation problems, rather than planning only towards "average" conditions.

In summary, the above-noted process is well established in comprehensive transportation master planning across North America. It is recognized both by the Ontario Ministry of Transportation, and the Transportation Association of Canada. In the case of WALTS, the SYSTEM II model is a DOS based model used extensively by Stantec Consulting. It is also used in other Ontario centres such as London, St. Thomas, Metro Toronto, and the Regions of Niagara and Waterloo. The City will be able to maintain the SYSTEM II model for future uses, and it is expected to meet the continuing transportation planning needs of the WALTS area.

2.3.2 FORECASTING MODEL DEVELOPMENT

Model development is conducted in three main steps:

1. Demographics -Population and employment data form an integral part of the modelling structure. This data describes the density and location of trip generators throughout the WALTS study area. Existing estimates were derived from 1996 census data and building permits. Future forecasts were derived from City of

Windsor forecasting studies and the Official Plans of the five adjacent municipalities.. The data is used in two ways:

- **Zone System** - The basic zone system used in this study is the City of Windsor's WUTS Traffic Analysis Zones (TAZ's). This system was first developed in the 1981 Windsor Urban Transportation Study (WUTS). For WALTS, since the study area limits are now different, the 67 internal TAZ's from WUTS were used as the basis for the WALTS traffic zone development.

  For improved arterial assignment loading, to isolate single land uses, and to provide more realistic access to the network, the TAZ system was disaggregated into 464 Model Analysis Zones (MAZ). Maps and other information of these additional systems are presented in **Technical Appendix 8**. For presentation, calibration and other summaries, the TAZ system was aggregated into 9 Super Analysis Zones (SAZ) as shown on Figure 2.5, resulting in the much more detailed MAZ shown on Figure 2.6.

- **Land Use -** To provide an observable and forecastable variable for use in predicting future trips, the land use data for WALTS was compiled into two uses; residential which was measured by population, and commercial, industrial, retail and government facilities which was estimated by the number of employees.

  The number of persons living in a given traffic analysis zone, and the number of persons employed in retail, non-retail, and home-based type employment were distributed based on census, Planning Department and other available data, and reflects growth trends preferred in the Windsor Official Plan update process (Vision In Action).

<u>2. Model Roadway Network</u> - A transportation model network is a strategic arrangement of links and nodes, structured to symbolically represent lines of travel and points of intersection in a transportation system. In a basic traffic system, links represent roadway segments, and nodes represent intersections.

The basis for the network model is all collector and higher class roadways within the City and surrounding study area. In addition, some critical local streets have been added to the model. Figure 2.7 illustrates the City streets that are in the transportation planning model.

3. Transportation Planning Data - Building a SYSTEM II transportation planning model requires demographic and roadway network data, plus a quantified knowledge of the travel characteristics and travel patterns of the residents of the City and surrounding area. Specific requirements include:

- trip generation rates, or equations;
- modal split;
- auto occupancy, and;
- trip tables for distribution and assignment.

This data was obtained from the WALTS household travel survey, roadside interview cordon survey and cross-border surveys conducted for this study (see Section 2.6).

Trip Types

The WALTS transportation model is designed to predict PM peak hour traffic volumes. The trips taken during this hour can be summarized by four classifications:

1. Home-Based-Work (HBW) - trips with one end at home and one end at the trip maker's place of employment;
2. Home-Based-Other (HBO) - trips with one end at home and the other end anywhere but the trip maker's place of employment;
3. Non-Home-Based (NHB)- trips with neither end at the trip maker's home;
4. Home-Based-School (HBS) - is included as a trip purpose because it accounts for about 25% of trips occurring specifically between 3:00 and 4:00 PM.

Each of these trip types has different trip characteristics and therefore produces different travel patterns. For example, individuals tend to travel further distances to work, than to shopping. It is important to be able to model these differences, as shown on Figure 2.8, so that city-wide travel is accurately represented.

Figure 2.8 - Trip Types

Trip Generation

Trip generation rates are factors that indicate the number of trips that occur to and from an area for every unit of associated land use. For WALTS, the rates are calculated in person trips per person for residential land use and person trips per employee for each of the employment land uses. These rates are determined for each of the above three trip types, by origins (productions) and destinations (attractions) by summing the total number of observed trips and dividing by the total amount of each type of land use.

Various statistical testing procedures are used to determine which trip rates would be used to represent specific zones. Home-Based-Work (HBW) travel are found to be best explained by the total employment at the origin, and the population at the destination. This same relationship best explains the trip generation of Home-Based-Other (HBO) travel. Non-Home -Based (NHB) travel is related to total employment at the origin and at the destination.

Mode Split

The SYSTEM II model assigns vehicle trips to the roadway network when a model run is performed. However, the trip generation rates discussed above are presented in terms of person trips. Therefore, it is necessary to convert the origin-destination table from a person trip table to a vehicle trip table. The first step in this conversion is to determine the mode split during the peak hour between auto and non-auto modes for each trip type.

Calculated mode split varies between the traffic analysis zones, usually due to the different socio-economic characteristics of the population within each Planning District, the nature of the employment within each of these Districts, and the availability of alternative modes of transportation. For trips contained within the WALTS area, generally auto use exceeded 80%. More specifically, the average auto share by trip type in the WALTS area will be determined through the model calibration (pending).

Auto Occupancy

The second step in converting from person trips to vehicle trips is to obtain auto occupancy values for vehicle trips. The household travel survey data is used to determine the mode split at the origin and destination at the Planning District level. Auto occupancy by trip type will be determined through the model calibration (pending).

External Trips

The household travel survey data provides a detailed database containing trip-making characteristics of WALTS residents. In addition to the trips that are made to points within the area, trips are also made to/from external locations including cross-border. As well, trips are made directly through the Study area with no internal stops.

External trips are classed into three categories:

- Internal-External (I-X), those trips which originate within the WALTS study area and terminate at a point outside;
- External-Internal (X-I), those trips which originate outside WALTS and terminate within WALTS, and;

- External-External (X-X), those trips that originate and terminate outside WALTS , but pass through it.

The cordon surveys provide the best insight into all aspects of external travel. The resulting external trip rates will be available from the model calibration (pending).