TRAFFIC PLANNING REPORT

FOR THE

CITY OF CHATHAM

ONTARIO

SEPTEMBER 1962

DE LEUW, CATHER & COMPANY OF CANADA LIMITED

CONSULTING PROFESSIONAL ENGINEERS

TORONTO

OTTAWA ST. JOHN'S

TRAFFIC PLANNING AND PARKING REPORT

CITY OF CHATHAM

SEPTEMBER, 1962

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CONSULTING PROFESSIONAL ENGINEERS
1491 YONGE STREET
TORONTO 7, ONTARIO
WALNUT 5-3124

September 19, 1962.

The Mayor and Council,
The City of Chatham,
Ontario.

Traffic Planning Report
for the
City of Chatham

Your Worship and Gentlemen:

In accordance with the terms of our agreement, we are pleased to submit this, our Traffic Planning Report for the City of Chatham.

This Report contains our recommendations, together with preliminary cost estimates, for the development of a major street system over the coming twenty years. It is intended that this proposed plan serve as policy for the City, providing Council with the background information necessary for the decisions that will provide the City of Chatham with an economical and efficient street system.

In addition, the findings and recommendations arising out of our Parking Study are contained herein, as a guide for the provision of additional parking facilities in the City, particularly in the business districts.

We appreciate this opportunity to serve the City of Chatham, and wish to express our appreciation for the assitance and co-operation rendered us by Officials of the City and by Officials of the Department of Highways of Ontario, during the course of the study.

Respectfully submitted,

DE LEUW, CATHER & COMPANY OF CANADA LIMITED

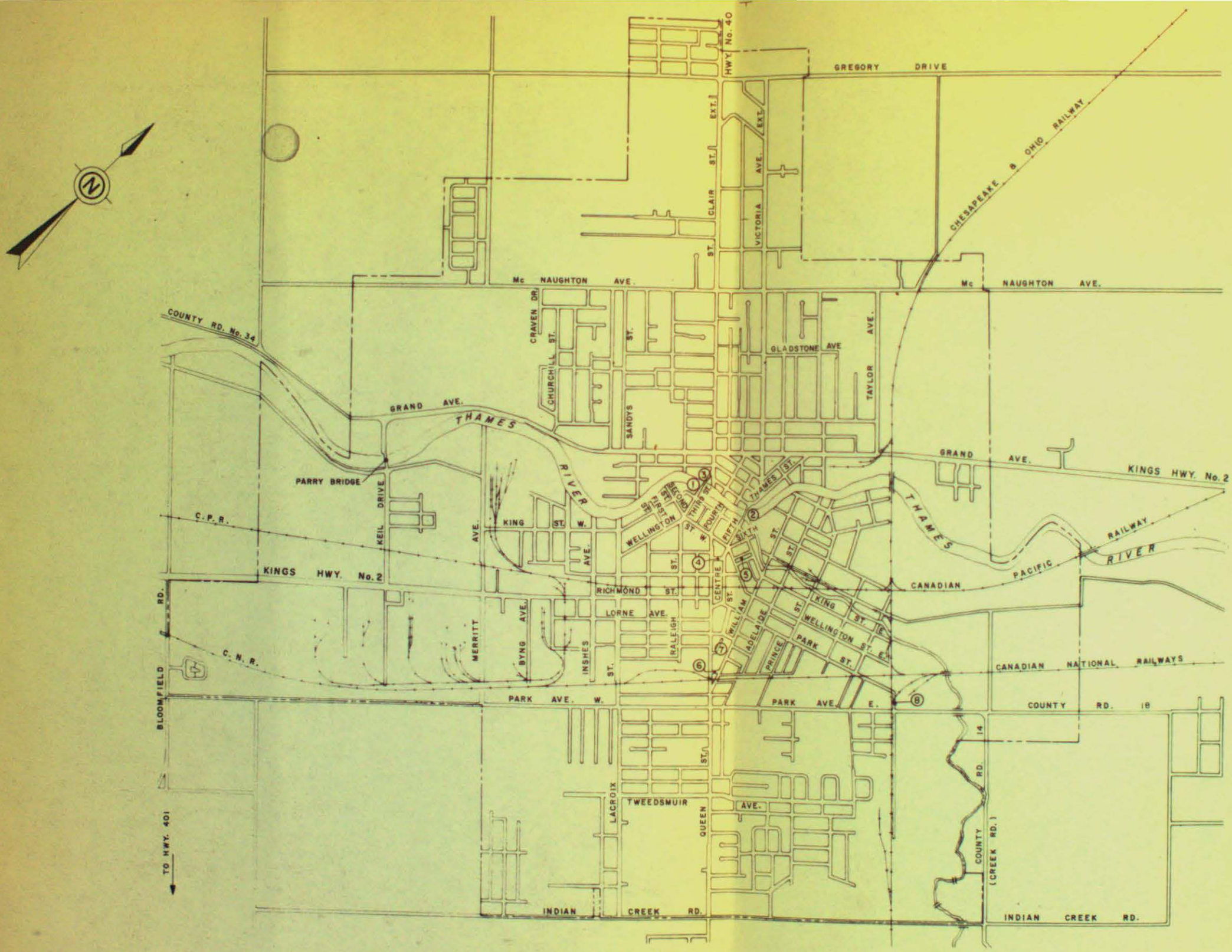
A. Harvey.

A. Harvey,
Vice-President.

I N D E X

LIST OF TABLES

LIST OF EXHIBITS



CITY OF CHATHAM
TRAFFIC PLANNING REPORT

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SECTION I

OBJECTIVES, SCOPE AND PROCEDURES

Introduction

In the Spring of 1961 a Technical Co-ordinating Committee, with a membership of City, County and Provincial Officials, was set up to prepare the Terms of Reference and scope for a traffic study in Chatham, and to select a Consultant to carry out this study. De Leuw, Cather & Company of Canada Limited was appointed as the Consultant and began work on the study in June 1961.

Objectives

The purpose of the study was to gather sufficient information on all of the many influences affecting present and future traffic in order that a complete analysis of this traffic could be made. Based on the analysis, a report was prepared outlining a programme to improve present traffic operations and to meet the expanding traffic needs up to the year 1981.

In brief, the report covers the following:

(1) Nature and location of a Major Road System;

(2) Timing and preliminary cost estimates of construction necessary to develop this Major Road System;

(3) Recommendations for the improvement of parking in the downtown area.

Scope

The area covered by the study is the City of Chatham within its present boundaries. Included in the study is the Highway system in the vicinity of Chatham as far as it is affected by or is affecting the Major Street System of Chatham

Procedure

Description of Study Procedure:

The procedure followed for this traffic study is charted page No. 2 . The following studies have been undertaken within this framework:

STUDY PROCEDURE FOR CITY OF CHATHAM TRAFFIC PLANNING REPORT

ANALYSIS OF EXISTING ROAD SYSTEM YEAR 1961

- INTERSECTION COUNTS
- CONGESTION INDEX
- TRAVEL TIME STUDIES
- DELAY MAPS

EVALUATION OF TRAFFIC DEMANDS YEAR 1981

- ORIGIN & DESTINATION SURVEYS
- EXISTING LAND USE, POPULATION & EMPLOYMENT DISTRIBUTION
- TRIPS GENERATED BY POPULATION & EMPLOYEES
- FUTURE LAND USE, POPULATION & EMPLOYMENT DISTRIBUTION (YR. 1981)
- TRIPS GENERATED BY FUTURE POPULATION & EMPLOYEES (YR. 1981)

DEVELOPMENT OF MAJOR STREET PLAN

- ALTERNATE STREET PLANS
- ASSIGNMENT OF 1981 TRAFFIC DEMANDS
- INTERSECTION IMPROVEMENTS
- COST ESTIMATES
- STAGING OF CONSTRUCTION

Analysis of Existing Road System:

This section of the study deals with the collection of facts and the interpretation of these facts to describe the service that the existing road system gives today's traffic. The following are some of the more important data collected:

(1) Traffic counts at intersections and at the Thames River Bridges;

(2) Average speed of traffic on approximately twenty miles of major streets;

(3) Origin and destination data;

(4) Data on population and employment by districts;

(5) Data on existing land use by district.

The analysis of the origin and destination survey results enables one to determine the number of trips caused by different types of land use. For this purpose the City has been divided into small districts called zones and all data are related to these zones. (See Plate No. 5,).

Evaluation of Future Land Use:

The future land use is evaluated for the year 1981. This evaluation is based upon an estimate of future population and employment. The most likely location for this population to work and live is determined by an expansion of existing land use, and a study of trends, using in this process the Official Plan, known plans for sewers and other utility locations and measured and assumed densities of population and employment.

Evaluation of Future Traffic:

The combination of this future land use data with the trip generation data from the previous chapter enables us to evaluate the future traffic demands. These demands are expressed as trip demands between the several zones into which the City is divided and it can be considered as a translation of the future land use into future traffic.

Development of a Major Street System:

After the trip demands were determined for the year 1981 the road system as it exists today was analyzed and expanded to be able to cope with this future traffic.

Parking Report:

The Parking Report follows a similar system of analysis as described above for the Traffic Report. The first step was to determine from the existing data the number of spaces available and the use made of these spaces. An analysis was thereafter made of the demand for the year 1981 and an estimate was made of the number of new spaces needed. The exact location and design of the new off-street parking spaces is dictated by opportunities as they present themselves over the years to come.

SECTION II

MAJOR CONCLUSIONS AND RECOMMENDATIONS

Major Streets

1. No new bridges are needed over the River Thames to handle the 1981 traffic provided that the roads and intersections leading to and from these bridges are improved.

2. Connections are needed to and from Highway No. 401 interchanges and these connections are best made by connecting Indian Creek Road to Highway No. 401 over Bloomfield Road and County Road No. 14 (Creek Road).

3. Greatly improved arteries in the north-south direction are needed. These arteries should be connected to the three existing bridges. This results in the following recommendations:

   (a) The extension of Keil Drive as a two-lane road in a northerly direction to McNaughton and in a southerly direction to Indian Creek Road.

   (b) The connection of St. Clair Street to Lacroix Street over Third Street and Wellington Street widened to four lanes.

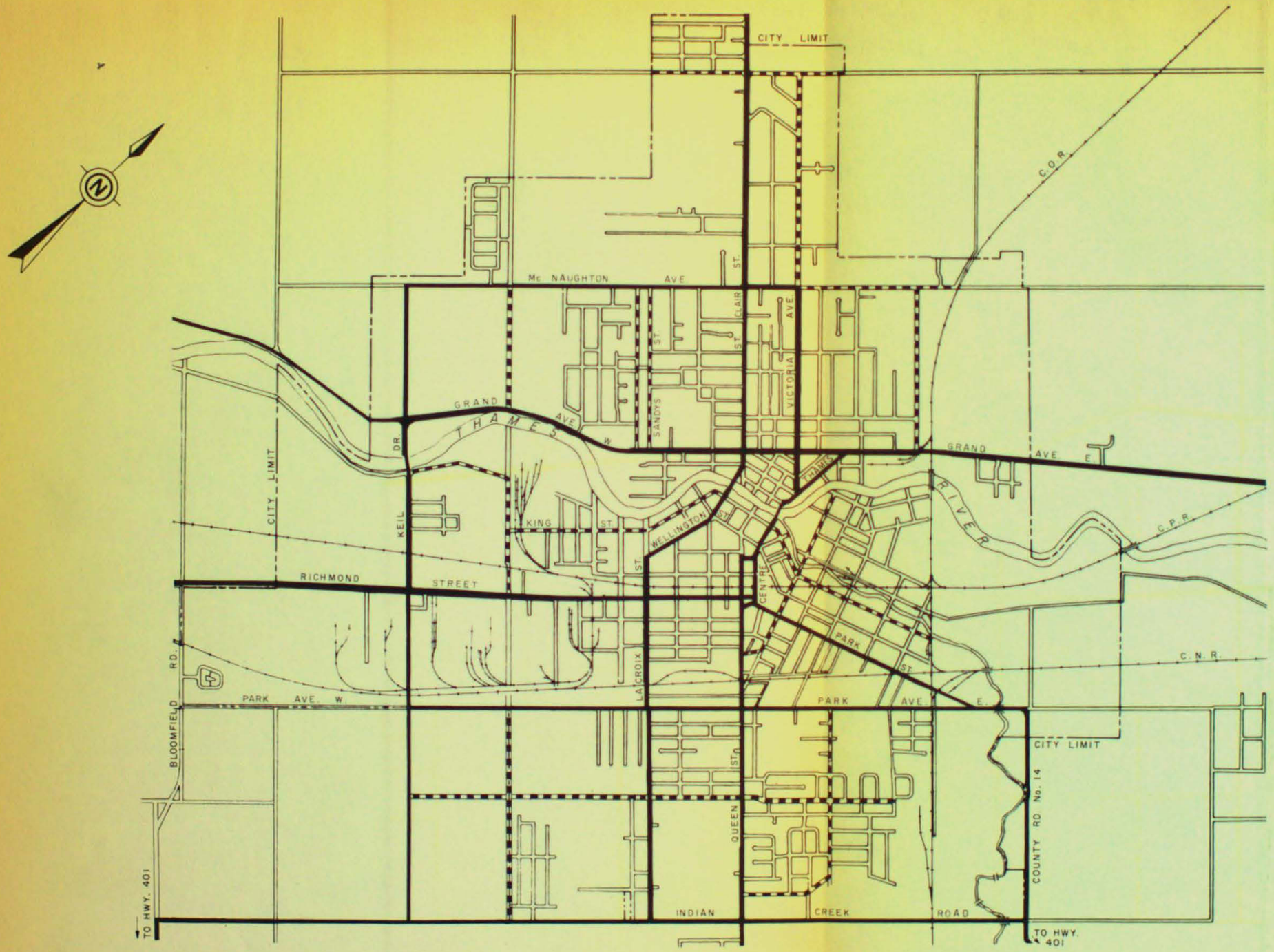
   (c) The connection between the Central Business District and Queen Street to be improved by making Queen Street and Centre Street a pair of one-way streets and by the improvement of intersections at Fifth and Wellington and Queen and Richmond. The construction of a four-lane underpass under the C.N.R. Railroad and the relocation of the connection of Queen Street to William Street close to the existing intersection of Queen and College are to be included in the improvement of Queen Street.

4. Important improvements needed on roads in an east-west direction will be the improvements of McNaughton Road, Grand Avenue, Richmond, Park Street, Park Avenue and Indian Creek Road. A detailed description of the recommended improvements is given in Table No. 1, Pages 11 - 13.

Staging and Cost Estimate

It is reccmmended that the streets in Chatham be classified as shown on Plate No. 1, and that the construction and reconstruction of the major aterial streets be implemented in three stages as shown on Plate No. 2.

PLATE 1



LEGEND

- MAJOR STREETS
- COLLECTOR STREETS
- LOCAL STREETS
- CITY LIMITS

CITY OF CHATHAM
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MAJOR STREET PLAN

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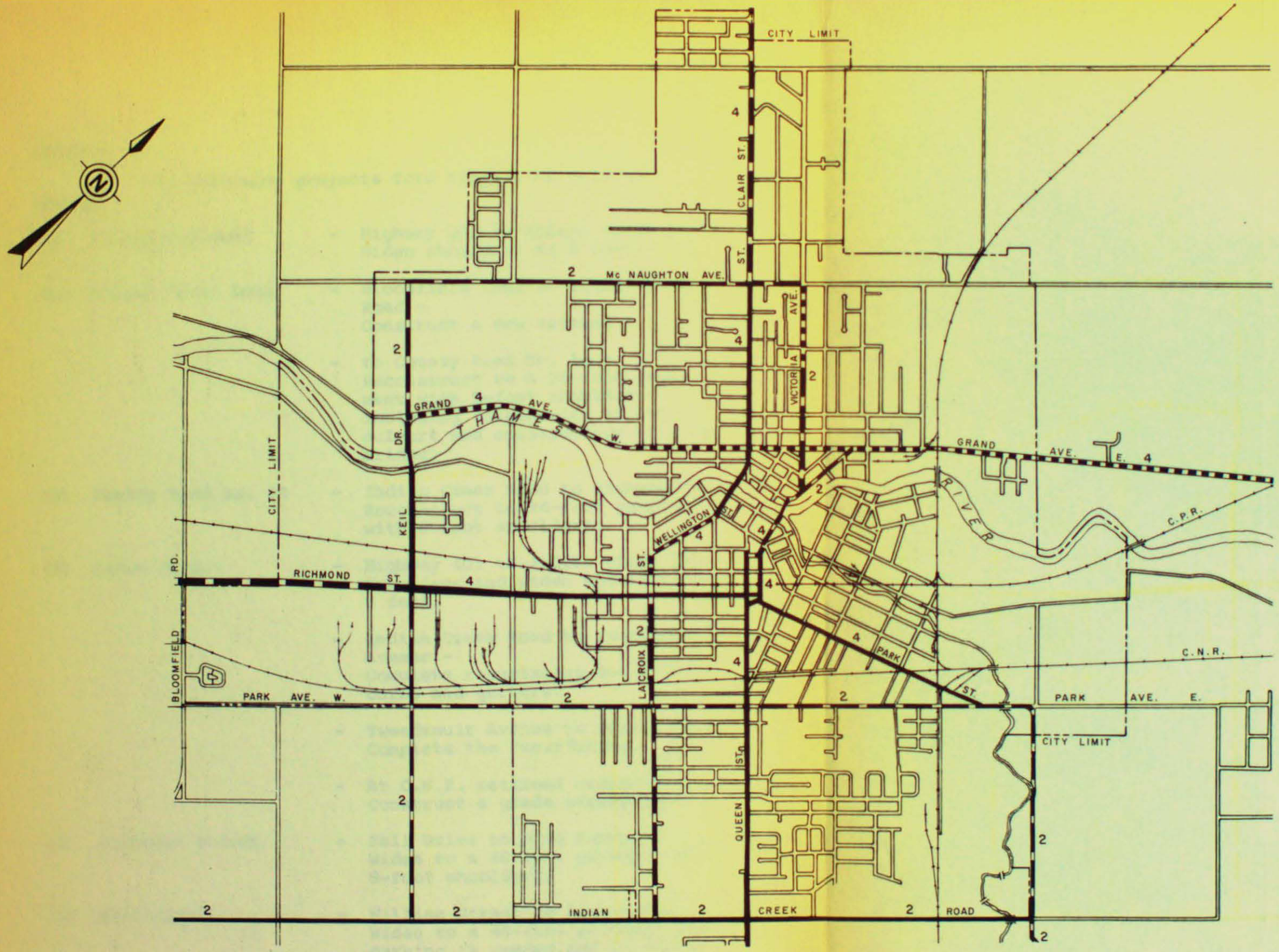
PLATE 2



LEGEND

STAGE I

STAGE II

STAGE III

4 DENOTES NUMBER OF LANES TO BE CONSTRUCTED

CITY OF CHATHAM
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STAGING OF CONSTRUCTION

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Stage I:

The following projects form Stage I of this programme:

(a)	Bloomfield Road	- Highway 401 to Indian Creek Road - Widen shoulders to 8 feet.
(b)	Indian Creek Road	- Bloomfield Road to Indian Creek Road - Construct a new section
		- to County Road No. 14 - Reconstruct to a 24-foot pavement with 8-foot shoulders including lengthening of one culvert and construction of a new bridge.
(c)	County Road No. 14	- Indian Creek Road to Highway 401 - Reconstruct to 24-foot pavement with 8-foot shoulders.
(d)	Queen Street	- Highway 401 to Indian Creek Road - Resurface and widen shoulders to 8 feet.
		- Indian Creek Road to Tweedsmuir Avenue - Complete resurfacing and install curbs and gutters.
		- Tweedsmuir Avenue to School Street - Complete the resurfacing.
		- At C.N.R. railroad crossing - Construct a grade separation.
(e)	Richmond Street	- Keil Drive to Byng Avenue - Widen to a 48-foot pavement with 8-foot shoulders.
(f)	Park Street	- William Street to Park Avenue - Widen to a 48-foot pavement where parking is needed and to 24 feet elsewhere. To be included in this project is the widening of Whitehall Street or a diversion near Whitehall Street.

(g) Centre Street - Park Street to Wellington Street - Resurface

(h) Intersections - Richmond Street and Queen Street.

- Wellington Street and Third Street -

- Third Street and King Street- Further completion of the intersection

- Lacroix Street and Richmond Street

- Grand Avenue and St. Clair Street - Further completion of the intersection

The total cost of this Stage, excluding right-of-way and the grade separation of C.N.R. and Queen Street, is estimated at $826,500.00.

Stage II:

The following projects form Stage II of this programme:

(a) County Road No. 14 (Creek Road) - Indian Creek Road to Park Avenue - Reconstruct to a 24-foot pavement with 8-foot shoulders.

(b) Richmond Street - Bloomfield Road to Keil Drive - Resurface and widen to 48 feet.

(c) Park Avenue - Merritt Avenue to Lacroix Street and Queen Street to County Road No. 14 (Creek Road) - Reconstruct to a 24-foot pavement with 8-foot shoulders.

- Lacroix Street to Queen Street - Resurface and complete widening.

(d) Lacroix Street - Indian Creek Road to Wellington Street - Resurface (See explanation on Page No.7 .

(e) Fifth Street - Wellington Street to Thames Street - Resurface

(f) Thames Street - Victoria Avenue to Grand Avenue - Resurface

(g) Victoria Avenue - Thames Street to Gladstone Avenue - Resurface

(h) St. Clair Street - Grand Avenue to City Limits - Resurface.

(i) McNaughton Avenue - Keil Drive Extension to Craven Drive - Resurface and widen shoulders to 8 feet. Construct a new bridge over drain at Baldoon Road.

- Craven Drive to Taylor Avenue - Resurface.

(j) Keil Drive - Indian Creek Road to Richmond Street and Grand Avenue to McNaughton Avenue - Construct new extension with a 24-foot pavement and 8-foot shoulders. Construct overpasses at Canadian National Railway tracks and Park Avenue West.

(k) Intersections - Keil Drive and Richmond Street

- Wellington Street and Fifth Street

- Thames Street and Victoria Avenue

- Thames Street and Grand Avenue

The total cost excluding right-of-way of this Stage is estimated at $956,900.00.

Stage III:

The completion of the street system will necessitate the following construction:

(a) Lacroix Street - Indian Creek Road to Tweedsmuir Avenue - Reconstruct to a 24-foot pavement with 8-foot shoulders

- Tweedsmuir Avenue to Wellington Street - Reconstruct to a 44-foot pavement with curbs and gutters. Construct a subway under the Canadian National Railway tracks.

(b)	Wellington Street	- Lacroix Street to Third Street - Reconstruct to a 44-foot pavement with curbs and gutters
(c)	Grand Avenue East	- St. Clair Street to Thames Street - Resurface and install new curbs and gutters
		- Thames Street to Albert Road - Reconstruct to a 44-foot pavement with 8-foot shoulders.
(d)	Grand Avenue West	- For 1.2 miles west of St. Clair Street - Resurface and construct new curbs and gutters.
		- Remainder to Keil Drive - Resurface.
(e)	Queen Street	- Highway No. 401 to Richmond Street - Resurface.
		- Richmond Street to School Street - Resurface and install new curbs and gutters.
(f)	Bloomfield Road	- Highway No. 401 to Indian Creek Road - Resurface.
(g)	Indian Creek Road	- Bloomfield Road to County Road No. 14 (Creek Road) - Resurface.
(h)	County Road No. 14 (Creek Road)	- Highway No. 401 to Park Avenue - Resurface.
(i)	Park Avenue	- Bloomfield Road to County Road No. 14 (Creek Road) - Resurface
(j)	Richmond Street	- Keil Drive to Queen Street - Resurface.
(k)	Park Street	- Queen Street to Park Avenue - Resurface.
(l)	Victoria Avenue	- Gladstone Avenue to Gregory Drive Resurface.

The total cost excluding right-of-way of this Stage is estimated at $1,442,400.

The total cost of the completion of the Major Street System including repaving but excluding right-of-way is $3,225,800.00.

A cost breakdown is given on Tables 1(a); 1(b); and 1(c) on Pages 11,12,13 , showing the various costs by stages on each street section.

Parking:

With regard to Chatham's present and future parking needs, the following observations are made:

1. Increase in activities in the Central Business District over the twenty-year study period will cause an increase in demand for parking space of approximately 660 spaces.

2. The location of additional spaces needed should be as close to the core of the Central Business District as possible, as walking distance has a profound effect on the use of parking spaces. The acceptance by the public of the Central Business District as the main commercial centre of the City is affected by the availability of parking space located at a convenient walking distance from the destination of the parker.

3. Generally, no need for the removal of parking exists except at the streets near Fifth Street and Third Street Bridges. To facilitate traffic movements, parking should be removed from Third Street between the Thames Bridge and Wellington, and from Fifth Street between Wellington and King.

TABLE 1(A)

STAGE I CONSTRUCTION COSTS

(with 25% contingencies where applicable)

Project	Roadway	Structure	Re-Surface	Total	Outside City	Inside City		Authority
						Con.Link	City Street	
Bloomfield	15,900			15,900				County
Indian Creek Rd.	159,400 61,200	40,700		159,400 101,700	159,400		101,700	County City
County Rd.No.14 to Indian Creek								
Alt. 1	229,000	48,400		277,400	277,400			County
Alt. 2	226,000			226,000	226,000*			County
Alt. 3	230,000			230,000	230,000			County
Richmond	151,400			151,400			151,400	City
Queen	55,400 46,300		27,400	82,800 46,300	46,300		82,800	City County
Park	92,900			92,900			92,900	City
Centre			7,000	7,000			7,000	City
Richmond & Queen	65,200							
Grand & St.Clair	4,500							
Richmond & Lacroix	2,000							
Third & Wellington	17,600					4,500		
Third & King	5,000			94,300			89,800	City
Total								
Alt. 1	905,800	89,100	34,400	1,029,300	437,800			
Alt. 2	902,800	40,700	34,400	977,900	386,400			
Alt. 3	906,800	40,700	34,400	981,900	390,400	4,500	587,000	

* Excluding Queen Street Underpass and William Street Intersection

TABLE 1(b)

STAGE II CONSTRUCTION COSTS

(including 25% contingencies where applicable)

Project	Roadway	Structure	Re-Surface	Total	Outside City	Inside City		Authority
						Con. Link	City Street	
County Rd. 14	7,500 48,800			7,500 48,800	48,800		7,500	City County
Richmond	151,400		8,300	8,300 151,400	8,300		151,400	County City
McNaughton	36,800	21,200	23,100	81,100			81,100	City
Park Avenue	58,300		7,500	65,800			65,800	City
Lacroix			21,400	21,400			21,400	City
Fifth			12,500	12,500			12,500	City
Thames			5,000	5,000			5,000	City
Victoria			8,800	8,800			8,800	City
St. Clair			48,100	48,100			48,100	City
Keil Drive	229,000 81,200	166,000		395,000 81,200	81,200	395,000		City County
Keil & Richmond Fifth & Wellington Thames & Victoria Thames & Grand	15,500 2,100 1,300 3,100		)	22,000			22,000	City
Total	635,600	187,200	134,700	956,900	138,300	395,000	423,600	

TABLE 1 (c)

STAGE III CONSTRUCTION COSTS

(including 25% contingencies where applicable)

Project	Roadway	Structure	Re-surface	Total	Outside City	Inside City		Authority
						Con. Link	City Street	
Grand Avenue E. of City Lim.	110,200			110,200		110,200		D.H.O.
From East City Limits to Merritt	104,800					104,800		City
From Merritt to Keil Drive			11,600	116,400		11,600		City
Queen			40,300 28,500	40,300 28,500			40,300 28,500	City County
Park Street			20,300	20,300			20,300	City
Bloomfield			17,400	17,400	17,400			County
Indian Creek Rd.			46,600 16,600	30,000 33,200	46,600		16,600	County City
County Rd. 14 Alt. 1 Alt. 2			1,900 64,100	 66,000	 64,100		1,900	City County
Richmond			40,700	40,700		40,700		City
Park Avenue	7,100		21,800 18,600	47,500	21,800		25,700	County City
Lacroix	126,000	700,000		826,000			826,000	City
Wellington	48,800			48,800			48,800	City
Victoria			17,100	17,100			17,100	City
Total	396,900	700,000	345,500	1,442,400	149,900	267,300	1,025,200	

SECTION III

ANALYSIS OF EXISTING ROAD SYSTEM (YEAR 1961)

Intersection Capacity

The ability of a street system to move vehicles is directly dependent upon the traffic capacity of its intersections. A detailed study of 26 major intersections in Chatham during evening peak periods was conducted to determine the capacity of each. Analysis of the results of this study pointed the way to improvements to the existing intersections.

The following outlines the method of obtaining field data, and of determining capacity.

(a) Inventory of Intersections:

For the purpose of capacity calculations, an inventory of all intersections selected for traffic counting was made. This inventory established the following facts:

(i) Width of approach pavements;

(ii) Lane Markings and widths;

(iii) Observations of the use made of each traffic lane by the traffic;

(iv) Location and length of bus stops;

(v) Volume of bus traffic, if significant;

(vi) Length and type of parking restrictions at intersection approaches;

(vii) Type of parking (angle or parallel);

(viii) Record of names of streets, landmarks, important land uses at the intersection corners;

(ix) Location of traffic signals and other control devices;

(x) Location of sidewalks, pedestrian crossings, etc.;

(b) Traffic Counts:

The traffic counts at the intersections

were recorded at 15-minute intervals and counts were taken from 4:00 to 6:00 p.m. The peak hour was determined by grouping the four highest consecutive quarterly hour counts together. All directions were counted separately, eg. at a normal four-legged intersection, left-turning, through, and right-turning traffic was counted separately for each approach. The total number of trucks, approaching the intersection on each of the legs was also counted. Trucks include those vehicles with dual rear tires and heavier. Trucks lighter than dual rear tire trucks, for example, pick-up trucks, are counted as passenger cars.

The peak hour volumes and percentage of left and right turns for all approaches were summarized.

(c) Capacity Calculations: (Table 2, Page 16)

The ability of an intersection to handle traffic is called its traffic carrying capacity. This capacity depends upon many factors. These factors can be grouped into two categories:

(i) Prevailing circumstances:

The prevailing circumstances influencing the capacity of an intersection are width of traffic lanes, availability or lack of separate left and right turn lanes, location or lack of curb parking, bus stops, etc. For each intersection that was counted, above factors were determined as described under (a) of this section.

(ii) Traffic distribution:

The number of left turning, right turning and through traffic using the intersection is counted as described under (b).

The capacity of an intersection to move traffic is not an absolute value. When an intersection is handling the maximum volume of traffic that could possibly get through,a satisfactory level of service is not provided. To set a standard, the Highway Capacity Manual indicates that satisfactory service is given by an intersection when 95% of the traffic using it is not delayed for more than one red light period. This volume of traffic taxing an intersection to this condition is defined as practical capacity.

The intersections are rated according to above standards. A rating of 1.00 means that the counted traffic volumes are equal to the practical capacity. A

TABLE 2

INTERSECTION DEFICIENCY RATING

(based on evening peak hour conditions July 1961)

No.		Rating based on Peak Hr.	Rating based on Peak 1/4 Hr.
1.1	King & Adelaide	0.50	0.61
2.1	King & William	0.70	0.85
3.1	King & Sixth (no counts taken)	-	-
4.1	King & Fifth	1.10	1.27
5.1	King & Fourth (no counts taken)	-	-
6.1	Wellington & Third	0.65	0.87
7.1	Wellington & Fourth	0.65	0.72
8.1	Wellington & Fifth	0.95	1.12
9.1	School & Queen	0.85	1.04
10.1	Thames & Fifth	0.80	0.90
11.1	Thames & Victoria	1.35	1.45
12.1	Grand & Thames	0.90	1.00
13.1	Grand & Victoria	0.70	0.85
14.1	Grand & St. Clair	0.97	1.15
15.1	Grand & Sandys	0.60	0.72
16.1	McNaughton & St. Clair	0.47	0.55
17.1	Grand & Keil	0.86	1.14
1.2	Tweedsmuir & Queen	0.77	0.82
2.2	Park Ave. & Queen	0.88	1.05
3.2	Park Ave. & Lacroix	0.68	0.96
4.2	Richmond & Keil	1.07	1.52
5.2	Richmond & Merritt	0.92	1.81
6.2	Richmond & Lacroix	1.53	2.55*
7.2(a)	Richmond & Queen	1.00	1.25
7.2(b)	Park St. & Queen	0.93	1.12
8.2	Park St. & Centre	0.50	0.62

*When "Rating" is more than 1.60, the intersection is taxed considerably beyond itscapacity, resulting in excessive delay and congestion.

The Ratings shown in the second column indicate the increased deficiency which occurs for quarter hour peak periods within the peak hour.

rating smaller than 1, for instance 0.75, means that the counted volumes are 75% of the capacity. A rating larger than 1 indicates congestion. The severity of the congestion is indicated by the amount the rating is over 1.00.

When the rating reaches 1.40 to 1.60, possible capacity is reached. This rating indicates that no more traffic can possibly be handled and that to handle more traffic, prevailing circumstances have to change, for instance, by means of widening or removal of parking, or by changing the traffic distribution favourably. This can be achieved by prohibiting left turns.

The ratings described above form one way of measuring the congestion on the streets. A second way is outlined in section (d) below.

A further study revealed that a considerable number of short peak conditions (less than one hour) occurred at various spots throughout the City. To point out these conditions, a new "peak hour" was determined using the highest quarter hour peak as a basis and the deficiency rating for each intersection re-calculated. The "maximum ratings" shown on Table 2 are determined by using this "short peak".

(d) Congestion of Existing Streets:

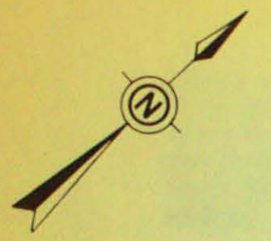
As a second means of determining congestion on existing major streets throughout Chatham, travel time investigations were conducted.

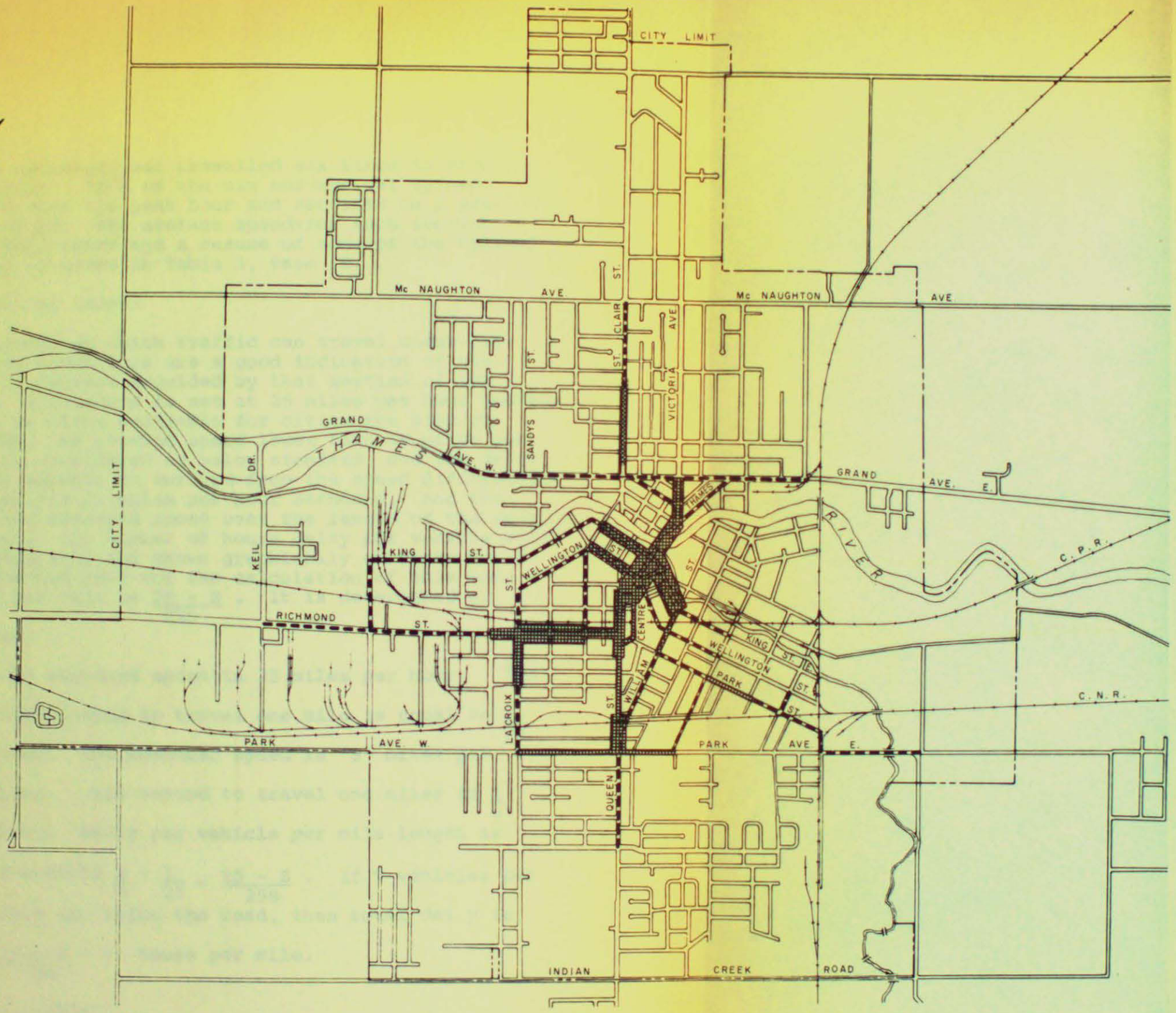
From the representative average travel times and the peak hour traffic volumes a measurement of the congestion and delay through the City can be prepared and is recorded graphically on Plate No. 3. The following surveys and calculations were necessary to prepare this Plate:

(i) Travel Time Investigations:

Travel times were recorded over approximately 20 miles of City roads in Chatham. This record was obtained by driving a passenger car over predetermined routes at speeds similar to the average speed of the traffic using the route. The time needed to reach control points was determined with a stop-watch with 0.01 of a minute accuracy. Easily identified locations, such as railroad crossings and intersections, were used as control points. The survey was undertaken during the peak hour, and each

PLATE 3





LEGEND

SCALE OF VEHICLE HOURS DELAY PER MILE

A STREET SYSTEM IS CONSIDERED DEFICIENT IN CAPACITY WHEN THE AVERAGE SPEED OF TRAFFIC IS UNDER 25 MILES PER HOUR. DELAY, CAUSED BY DEFICIENCY, IS SHOWN BY LINE WIDTH REPRESENTING RATE OF DELAY, IN TOTAL NUMBER OF HOURS PER MILE, TO ALL TRAFFIC COUNTED ON A WEEKDAY, DURING PEAK HOUR IN JULY 1961.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

CONGESTION INDEX PEAK HOUR – 1961

route concerned was travelled six times in each direction. Each of the six surveys was spread evenly over the peak hour and recorded on a prepared form. The average speeds for each section were calculated and a resume of some of the typical speeds is given in Table 3, Page 19.

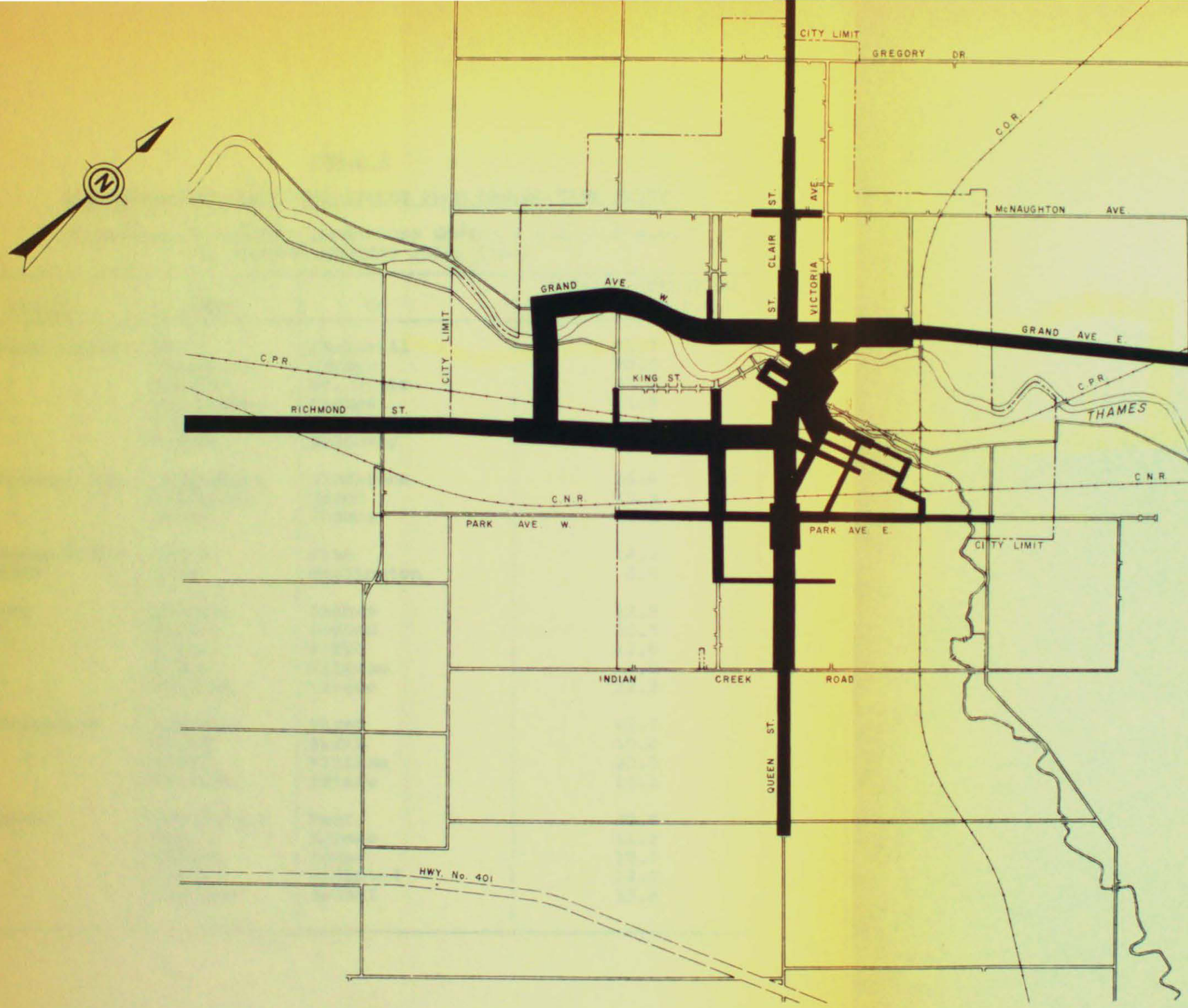
(ii) Congestion Index:

The speeds at which traffic can travel under prevailing conditions are a good indication of the rate of service provided by that section of the road. A standard is set at 25 miles per hour average speed as being desirable for cities the size of Chatham. An average speed lower than 25 miles per hour is considered as below standard, and the delay by one vehicle is derived from the speed differential between the 25 miles per hour standard, and the attained measured speed over the length of the section studied. The number of hours delay per vehicle mile is calculated and shown graphically on Plate No. 3. The formula used for the calculation of this hour delay per mile is $\frac{25 - S}{25S}$. It is determined as follows:

The standard speed is 25 miles per hour. The time needed to travel one mile is equal to $\frac{1}{25}$ hour. The measured speed is 'S' miles per hour. Time needed to travel one miles is $\frac{1}{S}$ hour. Delay per vehicle per mile length is therefore $\frac{1}{S} - \frac{1}{25} = \frac{25 - S}{25S}$. If V vehicles per hour are using the road, then total del y is $\frac{25 - S}{25S} \times V$ hours per mile.

(iii) Flow Diagram:

Plate No. 4 indicates the traffic flow from 4:00 to 7:00 p.m. on the major streets throughout the City.



LEGEND

2000 1000 500

SCALE OF VEHICLES COUNTED PER 3 HOUR PERIOD

TRAFFIC VOLUMES SHOWN REPRESENT TRAFFIC COUNTS FOR BOTH DIRECTIONS TAKEN ON A WEEKDAY BETWEEN 4:00 P.M. AND 7:00 P.M.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAFFIC FLOW DIAGRAM TOTAL TRAFFIC – 1961

DE LEUW, CATHER & COMPANY OF CANADA LIMITED CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

TABLE 3

REPRESENTATIVE OPERATING SPEEDS FROM TRAVEL TIME STUDY

(representing average conditions during 4 p.m. - 6 p.m. on typical weekday July, 1961)

STREET	FROM	TO	AVERAGE OPERATING SPEED - M.P.H.
Grand Avenue	Keil	Churchill	31.7
" "	Churchill	Sandys	20.9
" "	Sandys	St. Clair	23.2
" "	St. Clair	Thames	21.8
" "	Thames	Taylor	22.1
" "	Taylor	Kingsway	25.3
Victoria Ave.	McNaughton	Gladstone	26.6
" "	Gladstone	Grand	25.9
" "	Grand	Thames	13.1
Thames-Fifth	Grand	King	14.2
Fifth	King	Wellington	8.8
King	Merritt	Inshes	17.9
"	Inshes	Second	22.5
"	Third	Fifth	12.6
"	Fifth	William	7.0
"	William	Prince	22.3
Wellington	Lacroix	First	22.7
"	Third	Fifth	10.8
"	Fifth	William	20.0
"	William	Prince	15.1
Queen	Tweedsmuir	West	20.6
"	West	McLean	11.3
"	McLean	Lorne	19.7
"	Lorne	Richmond	12.8
"	Richmond	School	13.6

The traffic survey up to this stage described the use traffic makes of the existing street system. It can be concluded in summary that the street system generally has sufficient capacity to handle the traffic without much delay, except for locations near the river and railroad crossings. These locations are congested because of the fact that traffic tries to funnel into relatively few railroad or river crossings.

SECTION IV

ORIGIN AND DESTINATION SURVEY

Purpose of Origin and Destination Surveys

The before-mentioned surveys of the traffic operating on Chatham streets which determine the volumes, speed, parking habits, etc., are not sufficient in themselves to provide a basis for an estimate of future traffic demands throughout the City. Knowing or counting the volume of traffic passing a certain point does not give an indication of its origin and destination. The knowledge of origin and destination is, however, necessary for the following reasons:

(a) The traffic generated by existing land uses such as industrial, residential and commercial land uses has to be known and studied in order to assess the traffic pattern and demands generated by future land uses.

(b) The origin and destination study will indicate the general location where the traffic facilities are needed and it will also indicate those sections of the City that will show a major growth in traffic demands, caused by new real estate developments.

(c) The influence of future roads and road developments on the use of the existing street system cannot be determined without knowledge of the origin and destination of the traffic expected to use these new roads.

Type of Origin and Destination Surveys Conducted

To be able to determine the origin and destination of the drivers, the public has to be interviewed.

The following three types of origin and destination surveys were conducted. The information asked in all three surveys is similar. The method of contacting the drivers differs between the surveys.

1. External Survey:

   To determine the origin and destination of the traffic entering and leaving Chatham the Department of Highways of Ontario conducted a survey which consisted of the following:

   (a) Counting and classifying all motor vehicles entering and leaving Chatham;

(b) Roadside interviews of all drivers entering the City during either a twelve or sixteen hour portion of the day;

(c) In addition to the inbound interviews (b) outbound traffic was interviewed from 4:00 to 7:00 p.m. in order to arrive at complete two-directional information for this period.

These interviews were carried out by the Consultant for the Department of Highways of Ontario on all roads leading to the City. The survey stations were located near the City limits. (See Plate No. 5).

2. Internal Passenger Car Survey:

The drivers of passenger cars living within the City were contacted by telephone and questions were asked regarding travel as well as employment. The survey was restricted to passenger car trips from 4:00 to 7:00 p.m. on a weekday.

3. Internal Truck Survey:

Owners of trucks were contacted by mail questionnaire and questions were asked for the period of 4:00 to 7:00 p.m. for weekdays, regarding the movements of the trucks.

The combined results of these three surveys give a complete description of the travel habits in Chatham. It fully describes the traffic caused by the residents as well as that caused by through traffic.

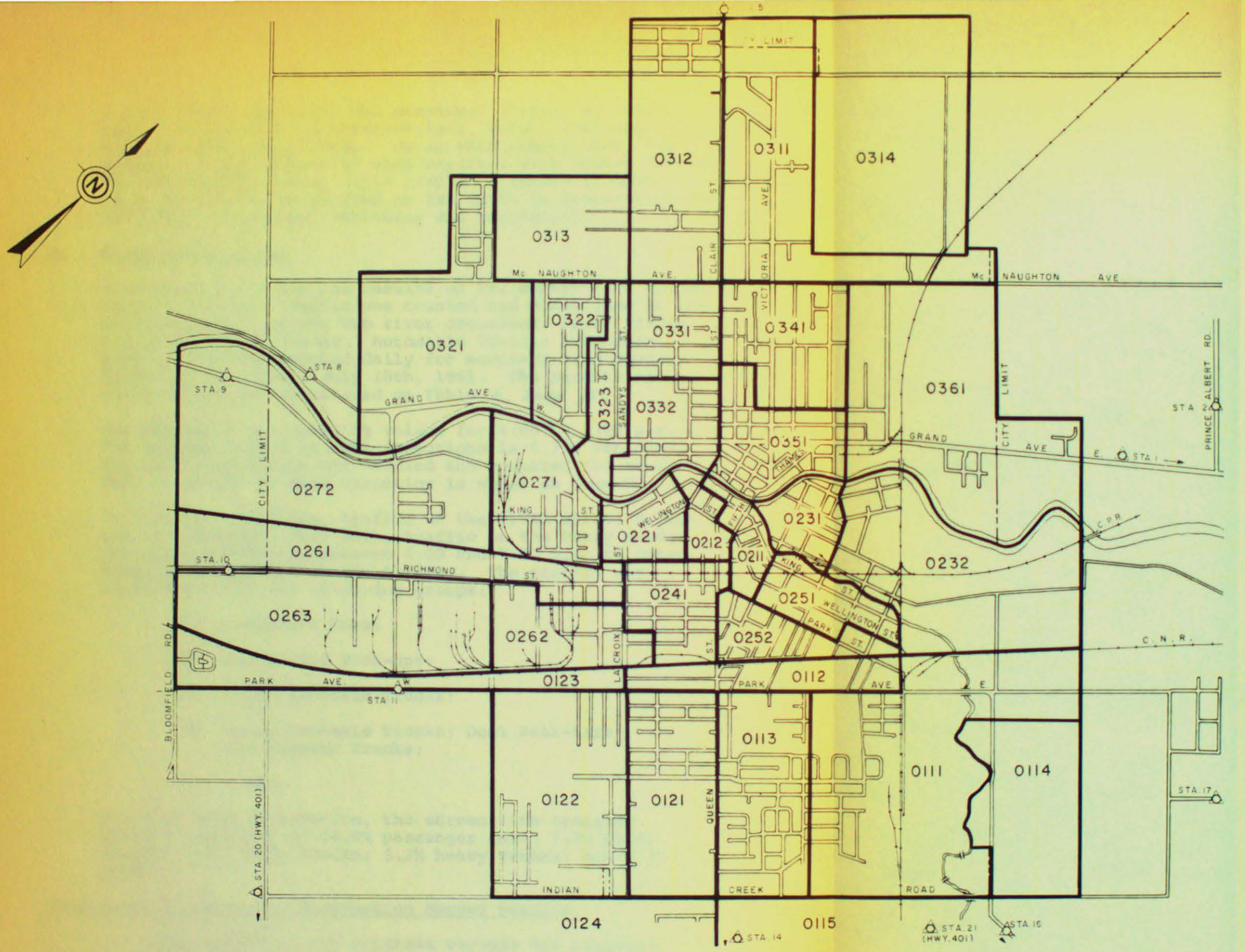
Compilation of Survey Results

1. Traffic Zones:

The data of the origin and destination surveys consisted of over 1,400 completed interviews from the telephone survey, 250 truck trip reports, and tabulations of the external vehicle trips. To be able to make use of IBM cards, the urban area of Chatham was divided into districts called traffic zones, as shown on Plate No. 5.

Considerations which were used to determine the location of boundaries of these zones were variations in land use, natural barriers such as the Thames River, and man-made barriers such as roads, railroads and the City limits.

PLATE 5



LEGEND

0322 INTERNAL ZONE NUMBER

STA 2 EXTERNAL SURVEY STATION

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

TRAFFIC ZONES

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

A so-called coding book was prepared, listing by traffic zone, the location of intersections, street addresses and well-known businesses. Using this coding book, the origin and destination of each reported trip inside Chatham was numerically coded. This enabled a record of each reported trip to be punched on IBM cards in preparation for the required sorting, expanding and tabulating.

2. Screen-line Counts

To compare and check the results of the survey with actual traffic volumes, traffic was counted and classified at the river bridges. At the two river crossings, Parry Bridge and Fifth Street Bridge, Automatic Traffic Recorders were located and checked daily for accuracy from Monday, July 17th to Friday, July 28th, 1961. The results of these counts are summarized on Table 4, Page 24.

The average river crossing volume for 4:00 to 7:00 p.m. for weekday travel in both directions is 6,734 vehicles. The hourly variation was studied and compared for each day. A sample of this variation is shown on Page 25 .

On Tuesday, July 25th, traffic on the Fifth Street Bridge, and on Wednesday, July 26th, traffic on the Parry Bridge was counted manually between 4:00 and 7:00 p.m. to determine classification of the traffic. The traffic was classified into the following groups:

(a) Passenger Cars;

(b) Panels and Pick-ups;

(c) Light two-axle Trucks;

(d) Heavy two-axle Trucks; Dual Rear-tire and heavier Trucks;

(e) Buses;

Based on this information, the screen-line crossing traffic consisted of 84.9% passenger cars; 7.7% panel trucks; 1.4% light trucks; 5.3% heavy trucks; and 0.7% buses.

Factoring of Origin and Destination Survey Results

The results of the separate surveys are compared to the screen-line counts discussed in the previous paragraph. All comparison is done on the basis of traffic volumes crossing the Thames averaged for the two-week survey period starting Monday, July 17th, 1961.

TABLE 4

SUMMARY OF TRAFFIC CROSSING THAMES RIVER

(Automatic Traffic Recorder Counts Taken in July 1961 During Survey Period)

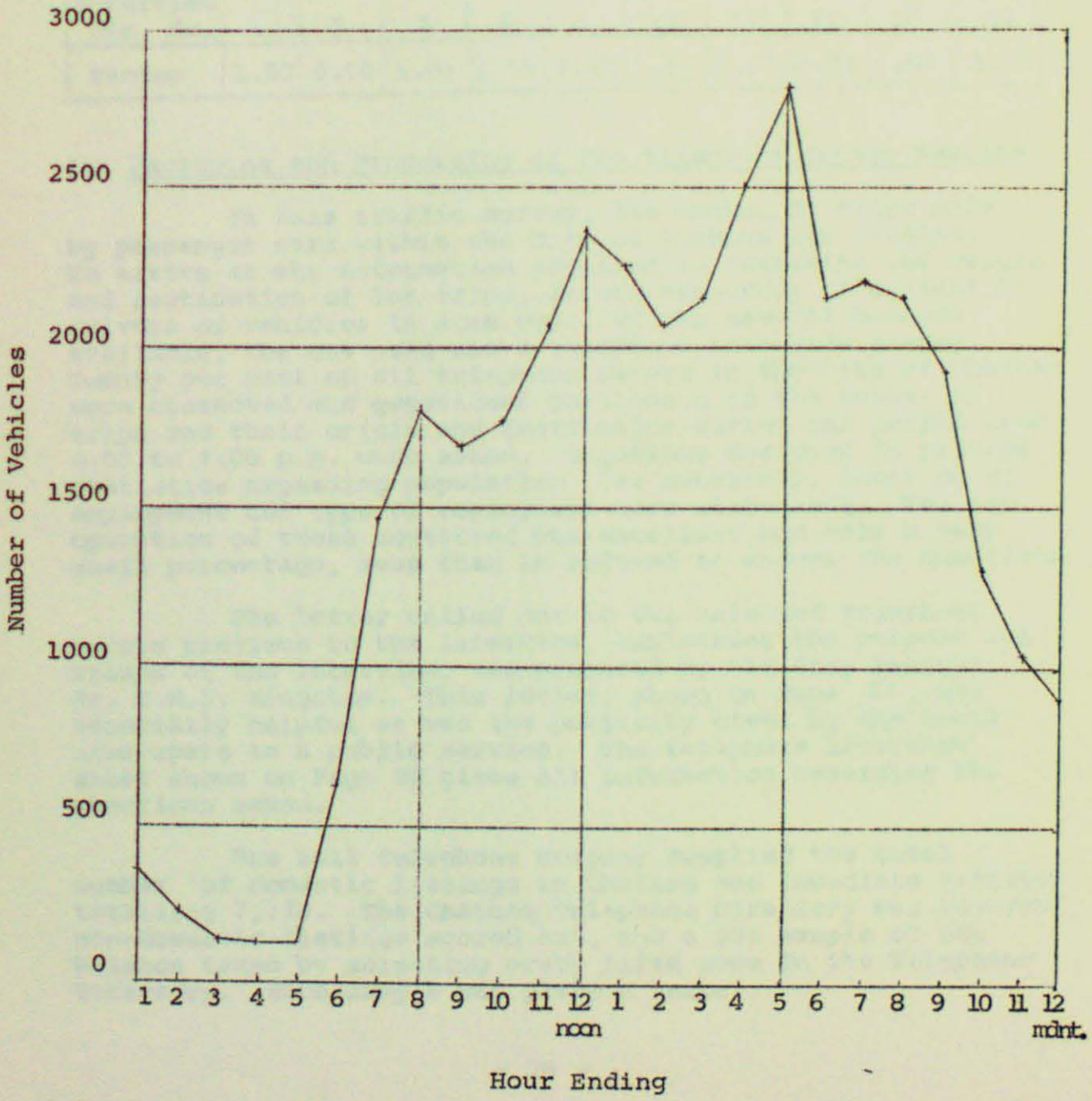
Date	Mon. 17th	Tues. 18th	Wed. 19th	Thur. 20th	Fri. 21st	Mon. 24th	Tues. 25th	Wed. 26th	Thur. 27th	Fri. 28th
24-hour volume	-	33,867	34,739	34,573	36,044	34,468	32,466	33,957	35,708	-
4 - 7 p.m. volume	-	6,589	7,016	6,805	7,152	6,557	6,405	6,546	7,378	6,422
Peak Hour volume	-	2,355	2,798	2,730	2,815	2,395	2,293	2,475	2,747	-
Peak Hour as % of 4 - 7	-	35.7	39.9	40.1	39.4	36.5	35.8	37.8	37.2	-
Peak Hour as % of 24 hr.	-	7.0	8.1	7.9	7.8	6.9	7.1	7.3	7.7	-
4 - 7 p.m. as % of 24 hour	-	19.5	20.2	19.7	19.8	19.0	19.7	19.3	20.7	-

HOURLY VARIATION OF TWO-WAY RIVER CROSSING TRAFFIC

(Crossing the Thames River, Friday, July 21, 1961)

Total 24-hour volume = 36,044 vehicles

Peak Hour volume = 2,815 vehicles



1. Factoring and Processing of the External Survey Results

The results of the Department of Highways' external survey were related to a day representing the average week-day traffic conditions during the two weeks of the telephone survey. Factors were determined to factor the results of the external survey (which was done on different days in the period of July 1961) to this average week-day. The resultant factors are:

Interview Sta. No.	1	2	5	8	9	10	11	14	16	17
Factor	1.07	0.98	1.04	1.09	2.15	1.14	0.97	0.93	1.04	1.08

2. Factoring and Processing of the Telephone Survey Results

In this traffic survey, the number of trips made by passenger cars within the City of Chatham was studied. To arrive at the information required to determine the origin and destination of the trips, it was necessary to contact the drivers of vehicles in some way. Of the several methods available, the one used was a telephone interview survey. Twenty per cent of all telephone owners in the City of Chatham were contacted and questioned pertaining to the number of trips and their origin and destination during the period from 4:00 to 7:00 p.m. were asked. Questions designed to provide statistics regarding population, car ownership, location of employment and type of employment were also asked. The co-operation of those contacted was excellent and only a very small percentage, less than 1% refused to answer the questions.

The letter mailed out to the selected telephone owners previous to the interview, explaining the purpose and reason of the interview, was prepared by the City Manager, Mr. T.M.S. Kingston. This letter, shown on Page 27 , was especially helpful as was the publicity given by the local newspapers as a public service. The telephone interview sheet shown on Page 28 gives all information regarding the questions asked.

The Bell Telephone Company supplied the total number of domestic listings in Chatham and immediate vicinity, totalling 7,770. The Chatham Telephone Directory was reviewed, non-domestic listings scored out, and a 20% sample of the balance taken by selecting every fifth name in the Telephone Directory. Each sample was given a number.

Copy of Letter Sent to Householders Selected For Telephone Interview.

Department of
City Manager

Chatham, Ont. July, 1961.

Dear Sir or Madam:

Re: Traffic Study

May we have your help? The City is conducting a very complete study of traffic in conjunction with the Department of Highways and your personal co-operation would be greatly appreciated.

Within the next few days you will be phoned and asked certain questions about your daily travel about the City and your downtown parking problems. This information is essential to our study in order that we may develop a sound and practical plan for future street and parking requirements.

A map of the central area is enclosed that you should keep handy as we will be referring to it during the telephone call to you.

Many thanks in advance for your kind assistance.

Very truly yours,

(signed) T.M.S. Kingston,
City Manager-Engineer

Encl
TMS:rdr

CHATHAM TRAFFIC SURVEY

Administrative Record

Interview	Call No.	Date	Time	N	R.
	1				
	2				
	3				
	4				
	5				
	6				

Report Complete------------------

Coded by-----------------------

Checked by---------------------

1. How many passenger cars owned by people at this address?
2. How many company owned or leased passenger cars used by people at this address?
3. How many persons live here?
4. Did any member of this household drive a passenger car between 4 - 7 p.m. today? no → Yes ↙

Telephone No.-------------------

Name------------------------------

Address---------------------------

Sample No.	
Zone	
Date of Travel	

Other employed members of household

Trip No.	Where did this trip begin 4 - 7 p.m. only	Where did this trip end?	Time of Starting	From	Purpose	To	Total No. in car	Sex M 1	Sex F 2	1 M	2 C	3 W T	4 G P	5 H	6 R U	Type of Business	Address of Place of work	Zone No.	Pers No.
				1 2 3 4	Work Home Shopping Other	1 2 3 4													
				1 2 3 4	Work Home Shopping Other	1 2 3 4													
				1 2 3 4	Work Home Shopping Other	1 2 3 4													
				1 2 3 4	Work Home Shopping Other	1 2 3 4													
				1 2 3 4	Work Home Shopping Other	1 2 3 4													

COPY OF

TELEPHONE INTERVIEW SHEET

USED FOR

CHATHAM O.D. SURVEY

Telephone Survey Interview Sheets were prepared by inserting the telephone number, name, address and sample number (1,560 samples were prepared). Field personnel were instructed on the procedure to be used during the telephone survey and given a copy of written instructions before interviewing began. The interview period was set at 7:15 p.m. to 9:15 p.m. and interviewing commenced on Monday, July 17th, 1961.

Because the survey was done during the summer vacation season (the last two weeks of July) it was found that 8% of the selected householders were not at home. Because a nearly one-year-old Telephone Directory had to be used, due to no other information being available, quite a percentage of telephone numbers were disconnected or people had moved out of the City. Telephone owners who had moved within the City kept the same telephone number.

A check of the homeowners' actual address against the one listed in the Telephone Directory was made during the telephone interview. To achieve a better sample, a second additional 5% sample was determined, bringing the total to a 25% sample of the Telephone Directory. The survey was stopped after interviewing of 20% of all households having a telephone was completed.

Because of the fact that telephone numbers are grouped in the Directory alphabetically under the name of the telephone subscriber and because of the fact that an unbiased sample is taken from this grouping, a geographically even distribution can be expected.

During the first week of the study period, the number of "Completed", "Refused" and "No-Answer" interviews were reviewed and the second week's interviews arranged in such a way that an equal sample for each day of the week was obtained. Sample telephone numbers which were called six times over three successive days were considered as complete and it was assumed that the occupants were out of town. At the end of the first week of interviewing, it was established that 8% of the completed interviews were "No-Answer" and the following week's sample was prepared with this in mind.

Completed Interviews by Day

Week of	Mon	Tues.	Wed.	Thur.	Fri.	Total
July 17-21	77	117	121	171	215	701
July 24-28	195	172	169	125	79	740
Total	272	289	290	296	294	1,441

No-Answer Interviews (called 6 times)	124
Total Completed Interviews	1,565
Total Completed Interviews as % of Total Telephone Listing	19.9%

Review of Sample

It was realized that a 20% sample was obtained of domestic telephone subscribers rather than a 20% sample of households in the City, and a check was made of the per cent of telephones per household. Results were as follows:

	Source of Information		Remarks
	Bell Telephone Co.	City Directory	
Number of Households	8,464	8,773	Bell Telephone Company figure based on Dominion Bureau of Statistics figure for persons/household.
Number of Telephones	7,770	7,675	Bell Telephone Company figure including some telephones outside City
Number of Telephones Per 100 Households	88	87	

It should be realized that the sample is biased somewhat insofar as the households not owning a telephone could represent definite different characteristics as far as car ownership, income and type of employment are concerned. Because of this bias, careful factoring methods are needed.

The population and employment information was factored by means of comparison between the number of households in a zone according to the City Directory, and the number of households contacted in the same zone.

By applying the foregoing procedure, the factored results of the telephone survey, as shown in Table 5 and Table 8 (1961 figures), were derived. (Pages 31 and 47, res.)

The basic information thus factored was obtained from the interview sheets by the following steps:

(a) Sorting by "home zone" and determining population and car ownership in each zone;

(b) Sorting by "employment zone" and determining the total number and classification of employees in each zone;

TABLE 5

FACTORED RESULTS OF TELEPHONE INTERVIEW SURVEY

For Employment Information see Table 8

Zone	Cars	Population	
	from intvws.	from intvws.	Assess. Rolls
0111	125	595	626
0112	245	1,110	928
0113	600	2,270	2,322
0114	0	--	--
0115	17	--	--
0121	520	1,820	1,819
0122	247	925	909
0123	113	615	605
0124	84	--	--
0211	182	860	510
0212	138	555	475
0221	348	1,020	1,011
0231	211	620	710
0232	201	760	997
0241	476	1,400	1,753
0251	285	1,500	1,278
0252	379	1,660	1,512
0261	122	360	323
0262	171	420	416
0263	10	--	18
0271	243	585	741
0272	135	195	424
0311	393	1,130	1,274
0312	126	485	529
0313	0	--	6
0314	0	--	--
0321	0	--	95
0322	378	1,200	986
0323	114	455	793
0331	396	1,550	1,396
0332	334	1,320	1,436
0341	653	2,330	2,110
0351	699	2,580	2,207
0361	295	1,150	1,267
Total	8,240	29,470	29,476

(c) Compiling employment and classification per "employment zone" from information received from Unemployment Insurance Commission and from contact with employees who employed a staff of more than ten.

The car registration and number of trips, however, cannot be factored in this way. As the non-owning telephone households are likely to own less cars than the other group, a bias exists here. This bias is taken out by using a factor obtained by comparing the number of cars owned by the persons interviewed to the number of cars registered in the zone.

The car registration was grouped by street name. The addresses were coded and the number of registrations for each traffic zone were compiled. Station wagons were not included in this list. Information from the Department of Highways stated that in Ontario for the year 1959, the total number of passenger cards registered was 1,647,379 of which 74,014 are dual purpose vehicles (station wagons and jeeps). For the year 1960 these figures were 1,732,933 of which 92,587 are dual purpose vehicles. This means that the registration for passenger cards in Chatham should be expanded by a factor of 1.055 to account for station wagons. The increase in registration for the years 1959 to 1960 is 1,732,933 ÷ 1,647,379 which is equal to 1.0519. The increase of the 1960 registration figures from January 1st, 1960, to July, 1961, is assumed to be 7/12 of 5.19%, i.e. 3%. The car registration figure was therefore expanded by a factor of 1.055 x 1.03 = 1.09.

The total passenger car registration for January, 1960 is 7,563, therefore, for July, 1961, the figure is 7,563 x 1.09 = 8,240. The number of cars contacted was 1,415 and therefore the overall factor would be 8,240 ÷ 1,415 = 5.82. However, it was noted that individually, in 7 of the zones, the deviation from this ratio was large enough to adversely affect the average factor. These zones then, were not considered in calculating the overall factor,which revised equals 6.04. This factor was used individually for those 7 zones with the large deviation and also for those zones which had no sample or cars registered.

The number of trips in each zone obtained from the telephone interviews, was factored according to the following list:

Home Zone	Trip Factor	Home Zone	Trip Factor
0111	6.28	0261	4.89
0112	7.40	0262	5.90
0113	6.11	0263	6.04 no sample
0114	6.04 non registered	0271	6.74
0115	6.04*	0272	6.04*
0121	5.38	0311	5.89
0122	6.04*	0312	5.74
0123	7.08	0313	6.04 no sample
0124	6.04*	0314	6.04 no sample
0211	6.04*	0321	6.04 no sample
0212	6.91	0322	6.41
0221	6.04*	0323	6.04
0231	5.30	0331	5.57
0232	6.08	0332	6.53
0241	7.02	0341	5.42
0251	5.71	0351	5.13
0252	6.12	0361	6.04*

*Zones where deviation from average was too high and overall factor used instead of individual factor.

Comparison of Telephone Survey Results with Screen-line Counts

The results of the telephone survey were factored as explained in the foregoing chapter. The traffic volumes crossing the river according to the factored results of the telephone survey were calculated and compared to the river crossing classification.

Classification Counts:

4:00 - 7:00 P.M.	Fifth St. Bridge	Parry Bridge	Total
Southbound	2187	1008	3195
Northbound	2578	1243	3821
			7016

The average according to the Automatic Traffic Recorders for the ten working days was 6,734. To represent average conditions, the results of the classification counts were multiplied by the factor 6734 ÷ 7016 = 0.96.

The following classification counts resulted for passenger cars only:

4:00 - 7:00 PM	Fifth Street Bridge	Parry Bridge	Total
(Passenger Cars Only)			
Southbound	1826	842	2668 x 0.96 = 2561
Northbound	2228	1057	3285 x 0.96 = 3154

The screen-line comparison for passenger cars is given in the following table:

Description	North-bound	South-bound	Both Directions
Classification Count Passenger Car x 0.96	3154	2561	5715
External Factored for Average Day	989	1215	2204
	2165	1346	3511
Internal Factored for Average Day	1652	1175	2827
Percentage of Coverage	76½%	87½%	80½%

The comparison of the total results of the traffic survey, internal and external combined, against the traffic counts, regarding passenger cars only, is as follows:

Description	North-bound	South-bound	Total
Classification Count	3154	2561	5715
External Survey Results	989	1215	
Internal Survey	1652	1175	
	2641	2390	5031
Coverage	84%	93%	87%

Description of Internal Truck Survey

Letters, together with truck trip questionnaires, requesting similar information as outlined for the telephone survey and designation as to type of vehicle were sent to over 250 companies in Chatham. The following sampling procedure was used:

Sampling Procedure:

A list of commercial owners in the City of Chatham was used as a basis for sampling.

This list included station wagons, pick-up trucks, panel trucks, etc., vehicles registered at car dealers, vehicles registered by owners in Chatham but not in use in Chatham.

It was decided that only owners of two or more vehicles would be contacted and a letter and interview form was prepared.

A review of the commercial vehicle listing gave results as follows:

All commercial vehicles	2,651
Vehicles owned by persons with 2 or more vehicles	2,140
Vehicles owned by persons with 1 vehicle (would cover most station wagon and pick-up truck owners)	511

The 2,140 vehicles owned by persons with two or more vehicles were reviewed and all car dealerships were removed. Fleet owners were contacted by telephone and requested to advise the number of vehicles not engaged in local work. Those vehicles were removed from the sample, leaving a total of 984 vehicles for which forms were prepared.

A letter explaining the purpose of the survey and a questionnaire as shown on Pages 36 and 37 were prepared and mailed to the truck owners.

The results were as follows:

Copy of Letter Sent to Truck Owners.

Dear Sir:

The City of Chatham is conducting an official truck traffic survey.

The purpose of this survey is to collect factual data to form a basis for the planning of new and improved traffic ways for Chatham.

According to motor registration records, you or your firm registered two or more commercial vehicles in 1960. The City of Chatham needs your assistance, and one set of sheets has been enclosed for each driver in your employment.

Please distribute one set of sheets to each of your drivers, have them complete the data for the hours 4:00 to 7:00 p.m. only on July , 1961.

A self-addressed and stamped envelope is enclosed for your return mailing of the completed trip reports. The name of your firm or your signature is not required.

The City of Chatham appreciates your co-operation in this survey.

Yours very truly,
DE LEUW, CATHER & COMPANY OF CANADA LIMITED

H. J. Edens
Director of Traffic Survey.

Copy of Questionnaire Sent to Truck Owners

CHATHAM TRAFFIC STUDY

Trip Report:

Check one below:

Vehicle is: passenger car ( )

panel or pickup ( )

2 axle truck no dual rear tires ( )

2 axle truck with dual rear tires and all larger trucks and combinations ( )

Check one below:

Vehicle is used for: Home Delivery ( )

Commercial Delivery e.g. factory to store ( )

Taxi, bus or limousine service ( )

Other ( )

Note Trips in period from 4 - 7 p.m. only

TRIP STARTED	TRIP ENDED

If additional space is required, use other side of this sheet

Day of Survey	Mon. 24th	Tues. 25th	Wed. 26th	Thurs. 27th	Fri. 28th	
Owners mailed	41	59	58	32	67	257
Vehicles	180	180	181	181	181	903
Codable forms ret'd	71	51	52	35	44	253
% returned	39%	28%	29%	19%	25%	28%
Veh. used 4 - 7	59	36	32	13	24	164
Out of town	12	13	20	21	19	85
Not in use	0	2	0	1	1	4

Coding:

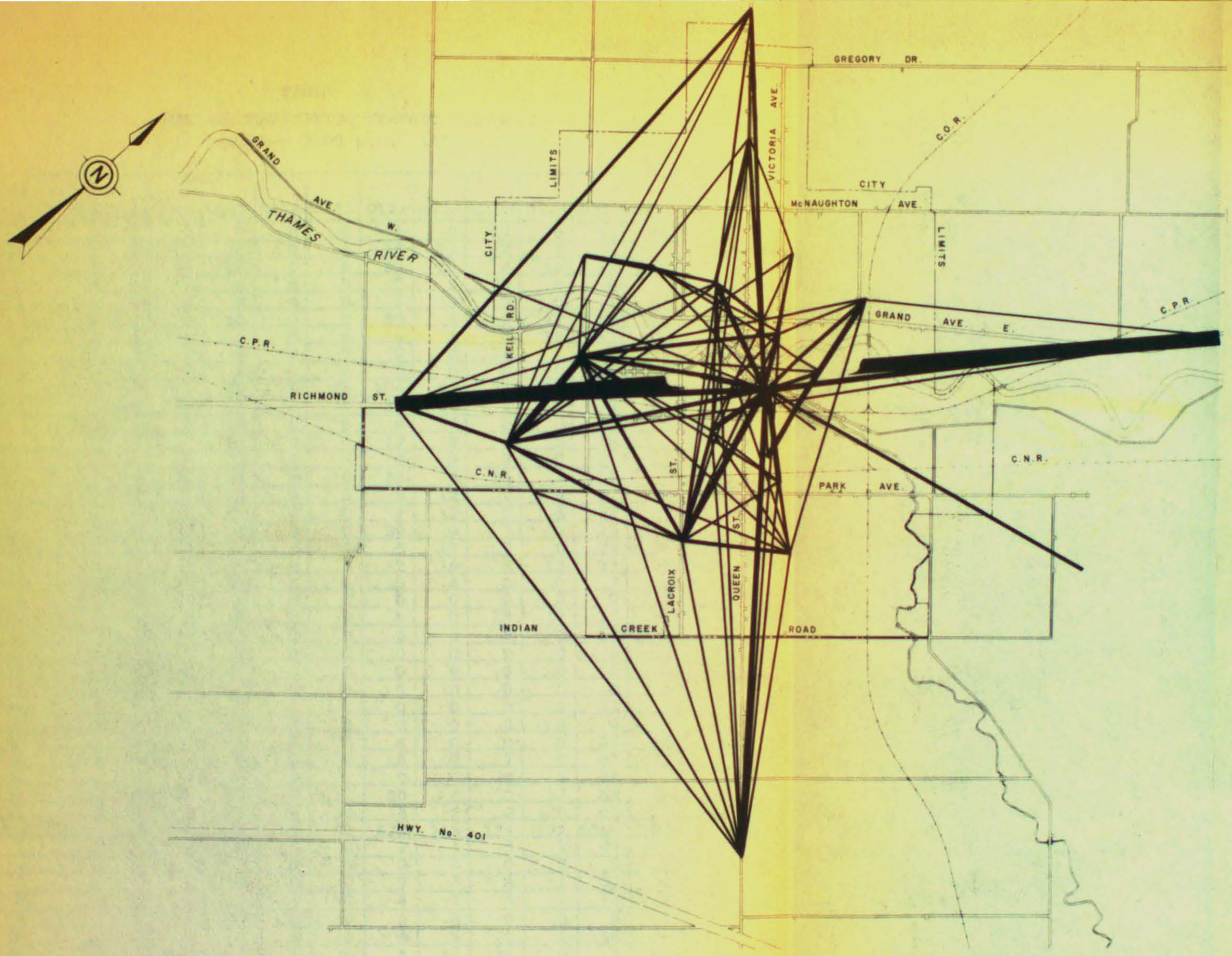
The results of the survey were keypunched on IBM cards and movements between zones sorted.

The results of the truck mail survey were compared to the classification counts of the screen-line crossings and based upon these results an expansion factor of 4.00 was determined.

1961 Origin and Destination Data

The results of the several surveys,combined, resulted in the 1961 Origin and Destination information as shown on Table 6 , and graphically on Plate No. 6. Table 6 is shown on pages 39 - 42.

PLATE 6



LEGEND

500 150-250 100-150 50-100

SCALE OF TRIPS PER 3 HOUR PERIOD

TRIPS SHOWN ARE COMPUTED FOR AN AVERAGE WEEKDAY FOR THE PERIOD BETWEEN 4:00 P.M. AND 7:00 P.M. TRIPS SHOWN ARE BOTH DIRECTIONS COMBINED.
VOLUMES BELOW 50 ARE NOT SHOWN.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAVEL DESIRE LINES -1961-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

TABLE 6

ORIGIN-DESTINATION TRAFFIC VOLUMES

4:00 - 7:00 p.m. 1961

From ↓ Zone / To → Zone	0111	0112	0113	0114	0115	0121	0122	0123	0124	0211	0212	0221
0111	0	8	0	0	0	5	0	4	6	13	18	7
0112	8	27	37	0	0	15	12	7	7	76	4	6
0113	4	40	28	0	6	33	10	4	18	41	28	0
0114	0	0	0	0	0	0	6	0	0	6	0	0
0115	0	0	0	0	0	0	0	0	0	6	0	6
0121	0	4	18	0	0	20	9	0	11	69	16	5
0122	4	6	12	6	6	16	6	8	18	12	18	4
0123	4	7	0	0	0	0	4	21	0	27	0	4
0124	6	7	6	0	0	5	0	6	0	18	0	0
0211	14	56	70	6	16	104	53	34	18	111	19	42
0212	10	21	22	0	0	22	24	0	6	39	17	4
0221	7	5	0	0	0	4	0	0	0	30	6	0
0231	6	7	12	0	0	12	0	0	5	48	4	0
0232	0	10	12	0	7	4	0	0	0	12	12	6
0241	11	30	42	0	0	33	6	11	12	58	4	16
0251	13	16	16	0	0	5	12	7	0	27	4	12
0252	0	15	12	0	0	4	12	0	6	36	8	27
0261	6	4	6	0	0	20	6	7	6	15	7	6
0262	10	30	18	0	0	5	12	7	0	29	11	20
0263	0	7	35	0	0	32	18	8	12	32	7	12
0271	0	15	19	0	0	22	4	0	0	7	4	0
0272	6	11	0	0	0	0	0	0	0	0	7	0
0311	0	6	4	0	0	6	0	13	12	17	6	6
0312	0	0	12	0	0	5	0	7	0	18	0	6
0313	0	0	0	0	0	0	0	0	0	0	0	0
0314	0	0	0	0	0	0	0	0	0	0	0	0
0321	0	4	0	0	0	0	0	0	0	0	6	0
0322	0	6	0	0	0	0	0	0	13	32	0	0
0323	0	0	0	0	0	0	0	0	0	4	7	0
0331	0	0	6	0	0	6	0	0	0	34	4	0
0332	6	4	6	0	0	16	7	7	0	67	20	6
0341	0	4	5	0	0	0	0	0	5	46	56	11
0351	4	15	12	0	11	30	6	0	17	53	35	5
0361	0	74	14	6	6	5	6	0	0	63	0	0
Total Int.	119	439	424	18	52	429	213	151	172	1046	328	211
1	1	2	10	1	2	3	1	3	1	44	12	9
2	0	3	1	0	0	0	0	0	0	5	2	0
5	2	8	12	0	0	9	3	4	1	33	20	7
8	0	2	3	1	0	4	1	4	1	13	4	3
9	0	4	0	0	0	0	0	0	0	9	9	0
10	5	8	9	0	0	8	2	1	2	58	4	2
11	0	2	9	0	0	5	11	15	0	7	2	1
14	8	23	29	2	6	11	5	8	7	66	8	12
16	6	2	3	0	0	0	1	1	1	8	5	1
17	6	2	9	2	0	2	0	1	0	39	3	2
Total Ext.	28	56	85	6	8	42	24	37	13	282	69	37
Total	147	495	509	24	60	471	237	188	185	1328	397	248

TABLE 6

ORIGIN-DESTINATION TRAFFIC VOLUMES
4:00 - 7:00 p.m. 1961

From Zone ↓ To Zone →	0231	0232	0241	0251	0252	0261	0262	0263	0271	0272	0311	0312
0111	0	0	7	0	10	6	0	0	0	6	0	15
0112	19	10	40	8	10	22	6	4	15	7	18	0
0113	5	7	18	19	18	0	6	6	7	6	12	0
0114	0	0	0	0	0	0	0	0	0	4	0	0
0115	0	0	0	0	12	0	0	0	0	0	0	0
0121	20	8	22	5	12	5	6	5	11	0	6	0
0122	0	0	10	0	0	12	0	6	12	0	0	0
0123	0	0	0	6	0	7	0	8	0	7	0	0
0124	0	0	6	0	12	5	0	0	0	4	6	10
0211	29	22	94	57	61	32	33	8	38	10	51	30
0212	18	6	18	22	4	0	25	0	7	6	22	0
0221	0	4	7	12	6	6	10	0	6	0	4	12
0231	6	0	4	9	6	0	0	0	11	5	0	6
0232	0	4	22	4	6	0	0	0	0	0	11	5
0241	11	10	0	22	4	32	7	4	7	0	0	6
0251	0	12	19	35	10	14	8	0	0	0	12	6
0252	6	6	14	10	8	4	12	0	14	0	0	0
0261	11	6	15	23	11	10	19	25	27	5	0	12
0262	0	12	0	10	6	39	14	6	7	4	12	0
0263	5	18	11	11	20	20	6	18	14	6	23	0
0271	23	0	7	6	0	13	11	0	13	0	12	12
0272	5	0	0	0	4	4	0	6	11	0	8	0
0311	0	0	0	0	5	6	6	0	6	6	12	0
0312	0	5	9	0	0	6	0	0	0	0	6	12
0313	0	0	7	0	0	0	0	0	0	00	0	0
0314	0	0	0	0	0	0	0	0	0	0	0	0
0321	0	6	7	0	0	0	0	0	0	0	0	0
0322	0	0	6	0	0	0	0	0	13	0	0	0
0323	6	4	11	6	6	6	0	0	12	0	6	12
0331	0	0	11	0	4	0	4	11	15	6	6	22
0332	16	10	14	29	14	0	4	0	13	0	22	12
0341	5	12	15	5	0	5	0	5	5	0	0	38
0351	5	4	17	0	6	0	10	5	52	11	18	22
0361	5	4	4	18	6	20	14	0	19	12	11	18
Total Int.	195	170	415	317	261	274	201	117	335	105	278	250
1	6	7	13	9	8	11	6	4	10	2	4	4
2	0	0	0	0	1	0	0	0	0	0	0	0
5	9	9	17	8	8	10	11	10	8	6	17	17
8	0	2	6	3	2	3	8	7	2	6	1	1
9	2	0	2	2	4	0	0	2	2	7	4	2
10	10	7	11	3	7	24	11	15	16	4	6	1
11	0	1	5	7	2	2	0	0	1	0	0	0
14	8	12	23	14	14	11	8	8	8	0	9	2
16	4	4	4	5	6	3	10	0	2	2	1	0
17	6	6	5	10	9	3	1	0	1	1	1	0
Total Ext.	45	48	86	61	61	67	55	46	50	28	43	27
Total	240	218	501	378	322	341	256	163	385	133	321	277

TABLE 6

ORIGIN-DESTINATION TRAFFIC VOLUMES

4:00 - 7:00 p.m. 1961

From Zone / To Zone →	0313	0314	0321	0322	0323	0331	0332	0341	0351	0361	Total Int.
0111	0	0	0	0	4	6	0	0	0	12	127
0112	0	0	0	6	6	17	11	5	29	88	520
0113	0	0	0	0	0	16	0	9	15	26	382
0114	0	0	0	0	0	0	0	0	5	0	21
0115	0	0	0	0	6	0	0	0	11	6	47
0121	0	0	0	0	0	0	12	0	5	0	269
0122	0	0	0	0	0	0	19	11	0	0	186
0123	0	0	0	0	0	0	7	5	0	0	107
0124	0	0	0	0	0	0	0	0	0	0	91
0211	0	0	0	32	6	41	30	73	92	60	1342
0212	0	0	0	13	11	4	0	38	39	6	404
0221	0	0	0	0	0	0	0	11	5	0	135
0231	0	0	0	6	0	11	11	17	10	0	196
0232	0	0	0	0	0	0	10	5	10	4	144
0241	0	0	0	19	0	6	45	47	26	23	492
0251	0	0	0	0	6	4	11	16	19	24	308
0252	0	0	0	0	6	0	18	4	5	4	231
0261	0	0	0	26	12	0	0	16	16	26	343
0262	0	0	0	13	0	4	4	11	29	4	317
0263	0	0	0	38	6	39	26	38	26	28	516
0271	0	0	0	0	6	11	7	11	27	12	242
0272	0	0	0	13	0	6	6	0	6	10	103
0311	0	0	0	6	0	11	18	8	0	6	160
0312	0	0	0	19	0	17	13	33	10	24	202
0313	0	0	0	0	0	0	0	0	0	0	7
0314	0	0	0	0	6	0	0	0	0	0	6
0321	0	0	0	0	0	0	0	0	0	0	23
0322	0	0	0	17	0	10	26	5	19	6	153
0323	0	0	0	4	0	6	0	8	16	4	118
0331	0	0	0	4	12	6	6	8	26	21	212
0332	0	0	0	19	14	18	16	0	18	0	358
0341	0	0	0	11	4	15	5	4	27	15	298
0351	0	0	0	19	6	26	30	46	66	45	576
0361	0	0	0	6	0	6	6	0	31	4	358
Total Int.	0	0	0	271	111	280	337	429	588	458	8994
1	0	1	3	6	4	10	7	14	21	28	267
2	0	0	0	0	1	0	0	0	7	2	22
5	0	1	2	6	8	12	11	14	19	10	312
8	0	0	2	4	3	1	4	4	16	2	113
9	0	0	0	7	2	0	4	0	4	4	70
10	0	0	0	8	7	10	10	14	18	10	291
11	0	0	0	0	0	0	0	0	1	1	72
14	0	0	0	6	2	6	11	17	28	8	380
16	0	0	0	1	0	0	2	4	2	0	78
17	0	0	0	4	1	6	4	4	7	3	138
Total Ext.	0	2	7	42	28	45	53	71	123	68	1743
Total	0	2	7	313	139	325	390	500	711	526	10737

TABLE 6

ORIGIN-DESTINATION TRAFFIC VOLUMES

4:00 - 7:00 p.m. 1961

From Zone / to Zone →	1	2	5	8	9	10	11	14	16	17	Total Ext.	Total
0111	3	0	2	1	0	1	4	3	1	8	23	150
0112	15	10	2	10	2	11	3	31	3	19	106	626
0113	5	2	6	2	0	8	3	23	6	6	61	443
0114	1	0	1	1	0	0	1	0	1	1	6	27
0115	0	0	0	0	0	0	0	6	0	0	6	53
0121	9	2	1	3	2	9	4	18	4	0	52	321
0122	2	0	3	1	2	0	13	19	1	4	45	231
0123	2	0	4	1	2	1	15	15	2	5	47	154
0124	2	0	1	3	0	2	0	4	1	0	13	104
0211	118	7	100	53	11	97	10	141	29	70	636	1978
0212	16	3	17	16	11	18	4	31	8	11	135	539
0221	2	0	6	1	0	8	0	10	1	7	35	170
0231	14	1	4	2	4	8	1	16	4	7	61	257
0232	3	0	6	2	4	6	2	6	0	2	31	175
0241	6	1	12	12	3	24	7	34	6	13	117	609
0251	11	4	11	6	11	8	5	19	4	10	89	397
0252	4	3	6	0	2	8	0	12	0	7	42	273
0261	14	6	19	20	2	58	2	34	7	18	180	523
0262	11	1	11	12	4	14	7	20	10	8	98	415
0263	14	3	22	17	9	52	2	43	5	19	186	702
0271	18	0	15	1	7	12	1	27	2	1	84	326
0272	1	0	5	6	4	11	0	3	0	1	31	134
0311	2	1	14	0	4	1	1	8	1	1	33	193
0312	3	0	20	3	2	5	1	10	2	1	47	249
0313	0	0	1	0	0	0	0	0	0	0	1	8
0314	0	0	0	0	0	0	0	0	0	0	0	6
0321	2	0	0	1	0	1	0	6	0	0	10	33
0322	2	2	4	1	2	5	0	3	0	0	19	172
0323	0	0	2	2	4	1	0	4	1	0	14	132
0331	7	0	14	4	0	6	0	6	1	7	45	257
0332	18	1	24	16	11	32	2	30	6	7	147	505
0341	6	0	10	6	0	3	0	24	5	3	57	355
0351	23	4	24	13	2	23	1	23	5	9	127	703
0361	24	5	12	4	2	16	1	17	1	2	84	442
Total Int.	358	56	379	219	107	449	90	646	117	187	2668	11662
1	4	2	8	2	0	377	0	19	5	4	421	688
2	3	2	1	0	0	2	0	1	2	7	18	40
5	12	1	1	0	1	52	0	19	4	4	94	406
8	5	0	5	0	0	7	0	2	1	6	26	139
9	8	1	3	0	0	8	0	11	1	3	35	105
10	313	2	55	3	0	4	0	28	3	9	417	708
11	3	0	1	0	0	0	0	2	1	0	7	79
14	13	0	27	14	0	22	0	14	1	2	93	473
16	6	0	4	2	0	1	0	2	1	4	20	98
17	7	0	5	1	0	21	0	5	1	2	42	180
Total Ext.	374	8	110	22	1	494	0	103	20	41	1173	2916
Total	732	64	489	241	108	943	90	749	137	288	3841	14578

SECTION V

EVALUATION OF TRAFFIC DEMAND
EXISTING AND FUTURE CONDITIONS

The City of Chatham is located in the heart of a rich farming area in south-western Ontario and a good part of its prosperity is due to its function as a market city catering to the needs of Kent County and as a centre where agricultural produce is processed for marketing.

Highway service is provided by Highway 2 to the east and west, and by Highway 40 north to Wallaceburg and Sarnia. In a short time, Highway 401 will be opened 3-1/2 miles south of the City Hall, so that Chatham will have first class highway connections to the main concentrations of urban population in southern Ontario. Three railway lines serve the City providing both freight and passenger service to points in Canada and the United States.

Chatham's proximity to Rondeau Provincial Park and the beaches of Lake Erie makes it an important service centre for tourist traffic.

To determine the traffic demands as will exist in 1981 in Chatham, first, several factors were studied influencing this demand. Discussed are:

1. Land use.
2. Population.
3. Employment.
4. Motor vehicle registration.

For each of these four factors, a thorough study was made of 1961 conditions. This study was detailed to areas of the City described by the traffic zones. (See plate No. 5, Table No. 8). The existing trends were then extended to describe 1981 conditions. In this process, much valuable assistance was given by the officials of the City and Province.

After this study, the origin and destination survey results were used to determine the number of passenger car trips generated in the City as a whole (Item 5) and the number of passenger car trips generated by each zone in the City (Item 6). The calculation was done for the years 1961 and 1981 and resulted in the number of passenger car trips in and out of each zone in 1981. The 1981 traffic demands caused by trucks and External traffic is described in Items 7 and 8. Item 9 completes this study with a short discussion of the distribution of this 1981 traffic between the zones.

1. Land Use

Plate #7 shows the land use in 1961 in a generalized way. Plate #8 shows the probable land use in 1981. It should be noted that also this is a generalized picture produced solely for the purpose of this traffic study and should not be interpreted as a firm plan for development.

In general, the land use is similar to that of today's with some increase in various uses to account for anticipated increase in population and economic activity. Not all the land within the City Limits has been shown as coming into urban uses by 1981, since a far larger population and level of economic activity would be required to make this necessary.

Table # 7 shows the acreage under residential, commercial and industrial uses and the total acreage per zone in 1981. The balance could be vacant or under municipal, institutional or public uses.

2. Population

The population of Chatham today is 29,500 persons and the distribution per zone is shown on Table 7.

Annexation took place at the end of 1958, prior to which the population within the City Limits had reached a peak of about 23,000 and did not increase because of the shortage of land for development.

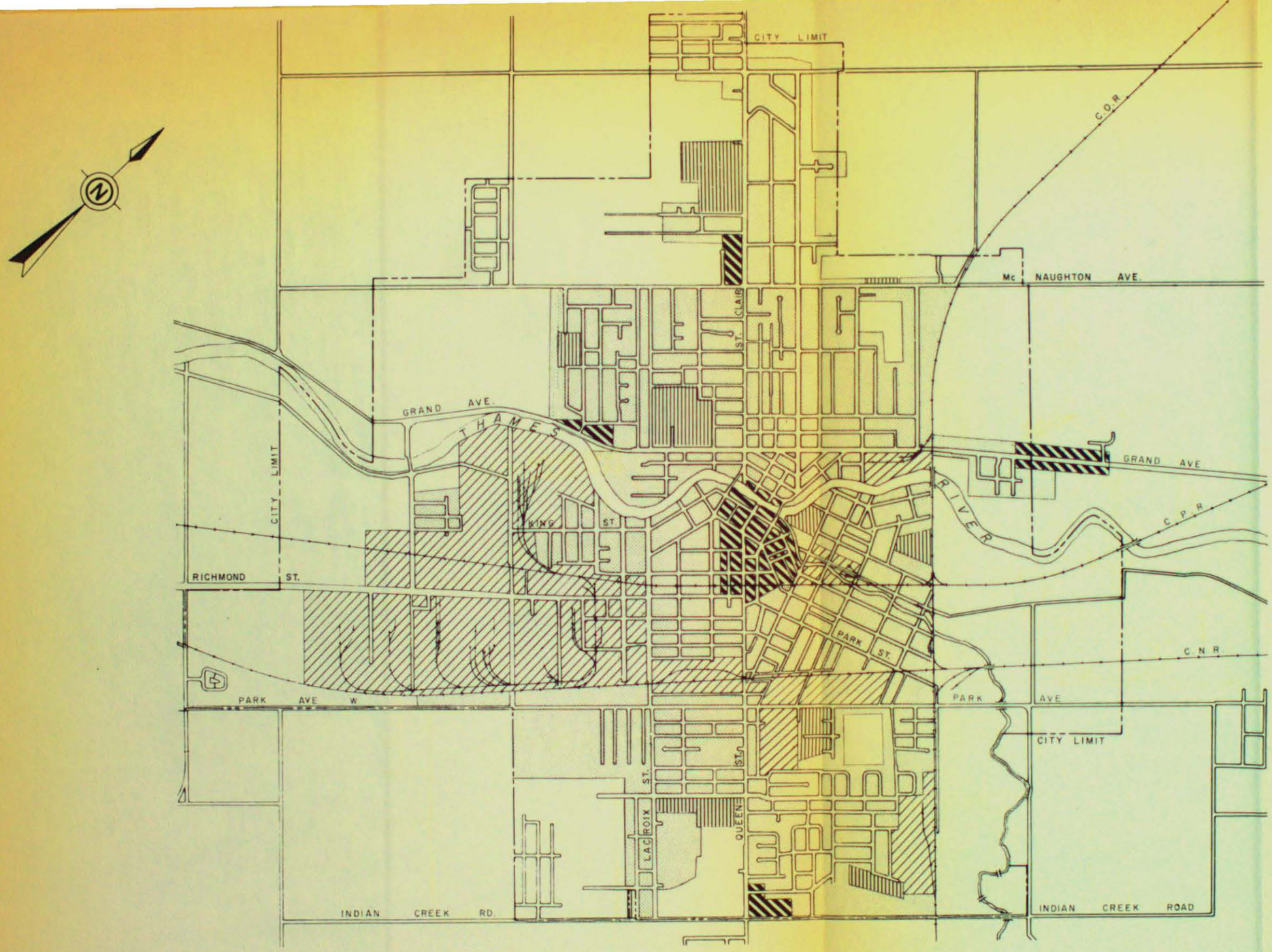
The projected 1981 population has been estimated at 42,000 persons. This represents a growth of about 42 percent over the present population and was obtained by averaging the results from several recognized methods of population forecasting.

The population increase of 12,500 persons was distributed by considering three types of residential zones and present and assumed 1981 densities (per net residential acre) for each type. The types were:

1. Zones fully developed
2. Zones partly developed
3. Zones with no development in 1961.

Densities in type 1 zones were generally raised slightly to a range of from 25 to 35 persons per net residential acre. However, three particular zones in areas suggested for re-development were raised to the 40 to 45 density level. Zones of type 2 were similarly treated, but with an

PLATE 7



LEGEND

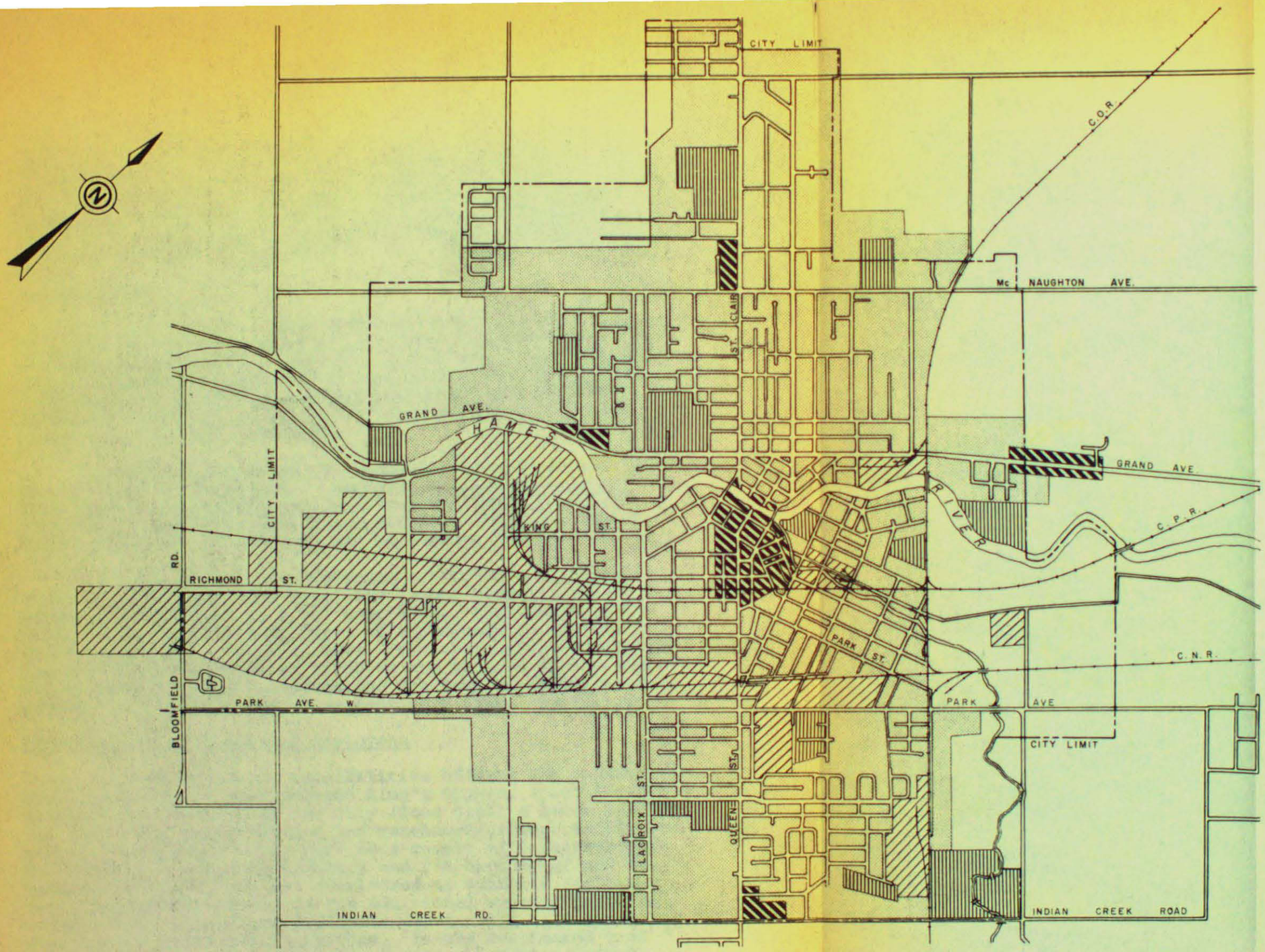
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- MAJOR OPEN SPACES AND INSTITUTIONAL

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

EXISTING LAND USE
- 1961 -

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

PLATE 8



LEGEND

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- MAJOR OPEN SPACES AND INSTITUTIONAL

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

PROBABLE LAND USE
- 1981 -

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

upper limit of 23 persons per acre applied to the existing developed land. A density of 15 persons per acre was used in the undeveloped parts of type 2 zones and to type 3 zones, although in both cases the land available was more than was needed and assumptions were made as to where development would take place. The resulting 1981 population distribution is shown on Table 7, page 46.

3. Employment

In 1961 the labour force obtained from the factored telephone survey of 9,000 employees represented about 31 percent of the population. However, it was felt that this percentage was a little low and showed the results of abnormal unemployment. The corresponding percentage for Kent County in 1956 was 35 percent and it was decided to use this as representative of 1981 conditions.

In the course of the telephone survey, information was obtained on employment. Employment was broken down into four groups: Manufacturing, Warehousing, Transportation, Commercial, and Governmental and Professional. This breakdown is shown by zone and by sex of employee on Table 8, page 47.

Using the 1981 population of 42,000 and a labour force of 35 percent, the resulting labour force is 14,700 persons, an increase of 5,700 over 1961. This number was broken down into the four types of employment on the basis of the percentages found in 1961. For the purpose of assigning the worker increase of 5,700 to the various zones, the first two (Industrial employees) and the last two types of employment, (Commercial and Government) were taken together..

Distribution of Industrial Employees

Because of the possibilities offered for industrial development by the area between King's Highway 2 and the CNR lines at the west end of the City (Zone 0263) a large part of the additional manufacturing and warehouse/transportation employees was located here, both as a result of increased worker density in existing industry and the opening of new developments. This area was considered as suitable for heavy industry and the balance of the additional manufacturing and warehouse/transportation employees was located in light industrial areas at lower densities. It was considered that zones 0232, 0261 and 0272 would receive the bulk of added development and the small balance was distributed to all other zones on the basis of present employment to total employment. Zones that are now or would be mainly residential were ignored in this distribution. The results of the distribution are shown on Table 8. (Columns for year 1981), page 47.

TABLE 7

POPULATION, LAND USE AND EMPLOYMENT
For Years 1961 & 1981

Zone	Population		Total Acres Gross		Resident Net Acres		Commercial Net Acres		Industrial Net Acres		Employees Manu. and W/T		Employees Comm. and G/P		Male and Female Total	
	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981
0111	626	1325	504	504	52.8	86.8	-	2.5	21.0	21.0	42	42	33	91	75	133
0112	928	983	88	88	33.0	33.0	1.4	1.4	41.6	41.6	387	447	155	76	542	523
0113	2322	2458	216	216	130.3	130.3	5.0	8.0	11.7	11.7	47	55	65	385	112	440
0114	-	75					-				5	5	11		16	5
0115	-	130					-				14	14	11		25	14
0121	1819	2891	222	222	97.1	131.6	1.8	4.8	0.1	0.3	50	50	33	341	83	391
0122	909	2685	307	307	42.0	142.0	0.5	3.5	10.1	10.3	7	7	79	191	86	198
0123	605	879	123	123	62.5	68.5	1.0	1.5	8.2	8.2	66	66	119	56	185	122
0124	-	45					-				6	6	10		16	6
0211	510	540	38	38	2.5	2.5	7.7	17.6	0.7	0.7	216	250	1576	3152	1792	3402
0212	475	504	36	36	10.3	10.3	6.3	7.7	3.6	3.6	97	113	374	748	471	861
0221	1011	1070	56	56	41.2	41.2	0.5	3.0	-		7	7	7	131	14	138
0231	710	753	60	60	21.0	21.0	1.6	1.6	5.0	6.0	65	76	164	59	229	135
0232	997	1055	337	337	49.3	49.3	0.5	1.5	43.0	58.8	109	424	81	87	190	511
0241	1753	1856	101	101	45.8	45.8	9.2	9.2	17.2	18.0	186	215	451	541	637	756
0251	1278	1354	78	78	40.4	40.4	5.6	5.6	10.3	10.3	109	126	181	103	290	229
0252	1512	1601	79	79	40.1	40.1	2.8	2.8	9.2	12.6	50	50	127	125	177	175
0261	323	342	145	145	17.5	17.5	10.2	10.2	68.0	88.0	415	835	181	30	596	865
0262	416	441	122	122	17.0	17.0	4.5	4.5	85.4	85.4	308	356	118	37	426	393
0263	18	18	325	325	-	1.0	7.8	7.8	189.7	289.0	947	1940	46	100	993	2040
0271	741	784	117	117	36.9	36.9	-	1.5	44.7	44.7	90	90	162	65	252	155
272	424	448	277	277	13.5	13.5	3.0	3.0	85.5	100.5	35	350	36	35	71	385
0311	1274	2758	306	306	153.0	226.1	3.3	3.3	0.5	0.5	42	42	5	191	47	233
0312	529	2406	426	426	34.8	149.8	-	9.3	-	1.0	24	24	57	329	81	353
0313	6	956			0	64.0	-		-	0	-	17	21	74	21	91
0314	-	950			0	64.0	-		-	0	-	17	-	74	-	91
0321	95	1164	375	375	2.0	72.0	-	3.0	-	0.5	6	6	7	231	13	237
0322	986	1044	96	96	62.6	62.6	4.4	4.4	1.1	1.1	32	32	26	113	58	145
0323	793	1057	92	92	60.2	61.8	2.2	2.2	4.5	4.5	23	23	25	66	48	89
0331	1396	1844	96	96	64.0	65.6	4.0	4.0	2.6	2.6	97	97	78	117	175	214
0332	1436	1521	102	102	33.0	33.0	2.2	2.2	1.2	1.5	80	93	327	121	407	214
0341	2110	2235	167	167	128.3	128.3	2.0	4.5	0.5	0.5	24	24	67	226	91	250
0351	2207	2337	124	124	65.7	65.7	6.8	6.8	10.6	10.6	222	253	277	184	499	442
0361	1267	1741	352	352	98.6	104.6	7.5	7.5	31.9	31.9	186	184	117	110	303	294
Totals	29476	42250	5367	5367	1455.5	2026.2	101.8	144.9	707.9	865.4	3994	6341	5027	8189	9021	14530

TABLE 8

EMPLOYMENT DISTRIBUTION BY ZONE
For Years 1961 & 1981

Zone	Manufacturing				Commercial				Warehouse and Transportation				Government and Professional				Total Employees			
	Male		Female		Male		Female		Male		Female		Male		Female		Male		Female	
No.	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981	1961	1981
111	35	35	-	-	7	20	-	-	7	7	-	-	26	71	-	-	75	133	-	-
112	342	390	-	-	57	30	25	8	45	57	-	-	66	30	7	8	510	507	32	16
113	34	40	-	-	35	180	18	80	13	15	-	-	6	50	6	75	88	285	24	155
114	5	5	-	-	-	-	-	-	-	-	-	-	11	-	-	-	16	5	-	-
115	6	6	-	-	11	-	-	-	8	8	-	-	-	-	-	-	25	14	-	-
121	45	45	-	-	11	80	5	40	5	5	-	-	12	125	5	96	73	255	10	136
122	-	-	-	-	33	80	26	50	7	7	-	-	7	20	13	41	47	107	39	91
123	47	47	11	11	85	40	19	8	8	8	-	-	15	6	-	2	155	101	30	21
124	6	6	-	-	5	-	5	-	-	-	-	-	-	-	-	-	11	6	5	-
211	120	139	31	36	662	1320	501	828	57	66	8	9	305	675	108	329	1144	2200	648	1202
212	57	66	13	15	140	280	87	140	22	26	5	6	103	220	44	108	322	592	149	269
221	7	7	-	-	-	40	-	30	-	-	-	-	-	36	7	23	7	83	7	55
231	24	28	17	20	26	6	17	5	24	28	-	-	68	25	53	23	142	87	87	48
232	52	210	19	74	55	60	6	5	38	140	-	-	20	20	-	2	165	430	25	81
241	164	190	6	7	248	300	113	105	16	18	-	-	71	100	19	35	499	608	138	148
251	38	44	-	-	63	36	10	5	71	82	-	-	108	60	-	2	280	222	10	7
252	30	30	5	5	36	35	-	-	15	15	-	-	78	78	13	12	159	158	18	17
261	277	560	102	170	118	20	53	8	31	75	5	30	10	-	-	2	436	655	160	210
262	246	285	11	13	88	27	21	5	44	50	7	8	9	5	-	-	387	367	39	26
263	824	1614	78	140	30	65	5	8	38	152	7	34	6	16	5	10	898	1847	95	192
271	85	85	-	-	6	2	-	-	-	-	5	5	37	15	119	48	128	102	124	53
272	28	280	-	-	30	30	6	4	-	70	7	-	-	1	-	-	58	381	13	4
311	31	31	-	-	-	100	-	70	11	11	-	-	5	15	-	6	47	157	-	76
312	17	17	-	-	28	160	24	135	7	7	-	-	-	24	5	10	52	208	29	145
313	-	10	-	-	10	30	11	35	-	7	-	-	-	6	-	3	10	53	11	38
314	-	10	-	-	-	30	-	35	-	7	-	-	-	6	-	3	-	53	-	38
321	6	6	-	-	-	130	-	80	-	-	-	-	7	15	-	6	13	151	-	86
322	20	20	7	7	-	-	5	10	5	5	-	-	21	90	-	13	46	115	12	30
323	12	12	-	-	13	30	7	16	11	11	-	-	5	16	-	4	41	69	7	20
331	63	63	-	-	34	50	5	5	34	34	-	-	27	40	12	22	158	187	17	27
332	48	56	12	14	38	14	37	10	15	17	5	6	66	27	136	70	167	114	240	100
341	24	24	-	-	17	60	27	70	-	-	-	-	17	70	6	26	58	154	33	96
351	116	135	10	11	154	105	52	30	80	93	16	19	36	25	35	24	386	358	113	84
361	55	54	-	-	55	50	17	10	103	102	28	28	45	45	-	5	258	251	45	43
Total	2864	4550	322	523	2095	3410	1102	1835	715	1123	93	145	1187	1932	643	1011	6861	11015	2160	3514

Distribution of Commercial and Government, Professional Employment

As a first step it was assumed that the present commercial and government/professional employment in the Central Business District would double by 1981. Although no regional shopping centres are expected to develop in Chatham, allowance was made for the development of four local shopping centres throughout the City, each of which was allotted 150 employees. The balance was distributed to all other zones on the basis of the ratio of each zone's 1981 population to total 1981 population. The resulting distribution is shown on Table 8, page 47.

4. Motor Vehicle Registration

For 1961 Chatham has a population of 29,476 with 8,243 passenger car registrations. The ratio of persons per passenger car is therefore 3.58. The average ratio for persons per passenger car for Ontario is 3.40. The 1981 Ontario ratio has been estimated by the Department of Highways at 2.80 persons per vehicle. The Chatham registration ratio for 1981 is estimated at $\frac{3.58}{3.40} \times 2.80 = 2.94$. The population of Chatham for 1981 is estimated at 42,000. The number of passenger cars in Chatham in 1981 is therefore based upon foregoing estimates $\frac{42,000}{2.94} = 14,450$. The ratio of persons per car for the several zones the City is divided into, is determined by the existing persons per car ratio for 1961, and reduced by a factor of $\frac{2.94}{3.58} = 0.82$. A revision is made for those zones already having in 1961, a low car ownership ratio and this revision is made on a sliding scale. The zones with a low ownership ratio will show a lesser change in the car ownership ratio than zones with a high ownership ratio. The resultant 1981 persons per car ratio is shown on Table 9, page 49.

5. Trip Generation - Number of Passenger Car Trips Generated in City in 1961

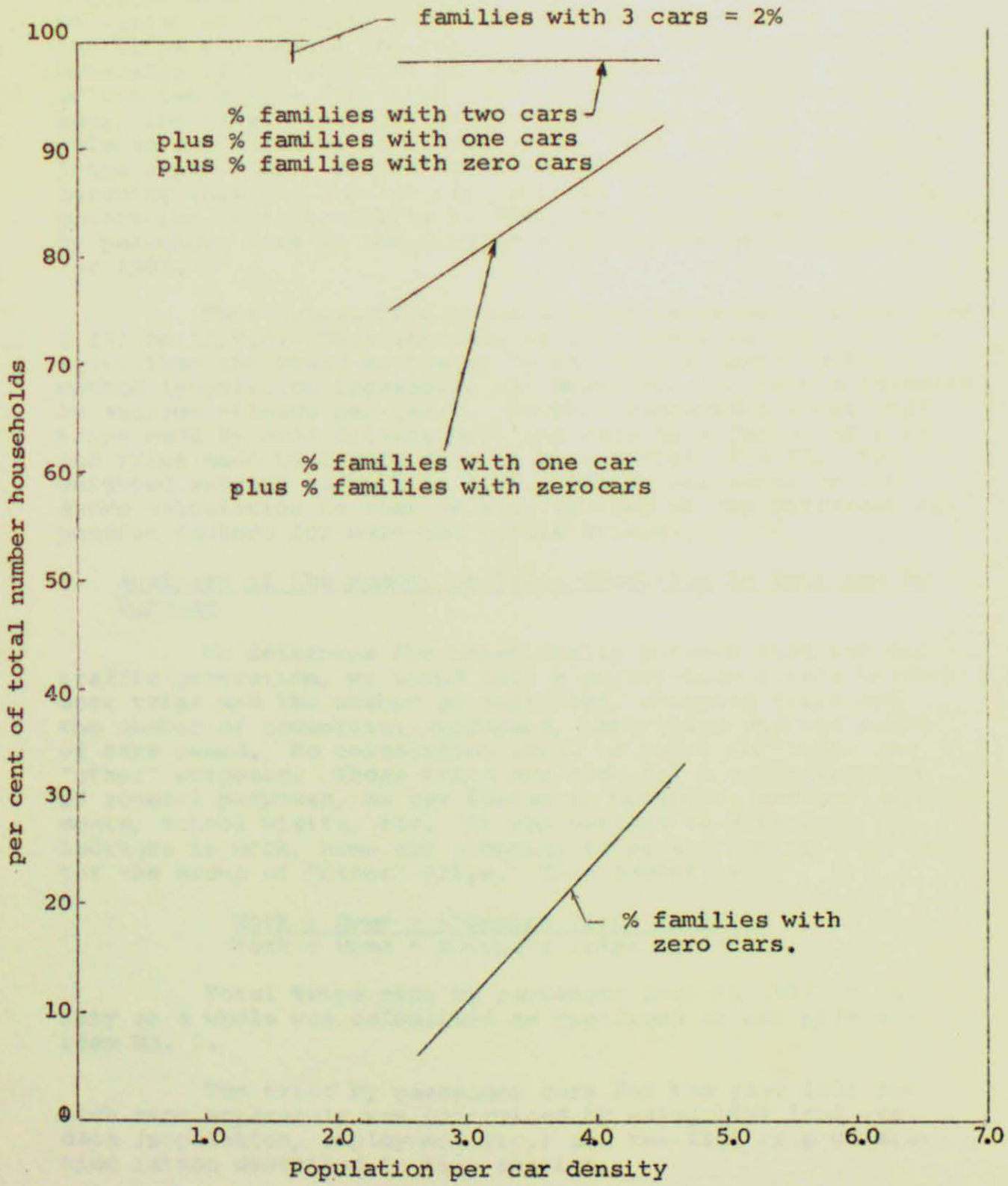
To study the number of internal trips generated by all passenger cars in the City, the following analysis was made of the telephone survey results:

The relationship was studied between the ratio of population per car of the zones and the number of families with zero, one, two or more cars per family. Based upon these figures, this relationship is shown graphically on page 50. The next step was to determine the number of trips made by each type of family as for instance one car and two car families, separated by male and female drivers. The number of

TABLE .9

Zone	1961 Persons/Pass.Cars	Adjusted Car Ratio
0111	4.95	4.00
0112	4.10	3.29
0113	3.87	3.11
0114		3.00
0115		2.89
0121	3.50	2.84
0122	3.65	2.96
0123	5.30	4.27
0124		3.00
0211	2.80	2.36
0212	3.44	2.77
0221	2.90	2.38
0231	3.40	2.74
0232	4.90	3.92
0241	3.70	2.98
0251	4.30	3.48
0252	4.00	3.23
0261	2.64	2.25
0262	2.43	2.09
0263		3.00
0271	3.10	2.50
0272	3.20	2.57
0311	3.30	2.66
0312	4.20	3.38
0313		2.93
0314		2.64
0321		2.69
0322	2.60	2.19
0323	6.90	5.62
0331	3.66	2.86
0332	4.35	3.51
0341	3.20	2.58
0351	3.20	2.61
0361	4.30	3.48
		2.96

PER CENT DISTRIBUTION OF 0, 1, and 2
CAR FAMILIES, IN RELATION TO CAR OWNERSHIP



trips for each type was plotted against the car ownership ratio of the zone and the graph on page 52 resulted. This graph shows a slight variation in trips per male for one car families and no variation for trips per male or female for two car families. The trips per female for one car families is increasing as car ownership of the district increases. Based upon the information on the two graphs described above and the car registration by zone, the total passenger traffic generated in 1961 was re-calculated and found to be within 3% (as well for male as female trips separately), of the factored telephone survey results. Assuming that one and two car families will have similar trip generation characteristics in 1981, then the generation of trips by passenger cars in the City as a whole, can be calculated for 1981.

This calculation shows a total increase in trips from 7,375 to 12,914. This increase of 1.76 times is equal to the ratio that one would arrive at by use of the three factor method (population increase x car ownership increase x increase in average mileage per year). Further comparison shows that trips made by male drivers will increase by a factor of 1.69 and trips made by female drivers by a factor of 2.20. The weighted average of both is 1.76. The significance of the above calculation is that we have arrived at two different expansion factors for male and female drivers.

6. Analyses of the Number of Trips Generated by Zone and by Purpose

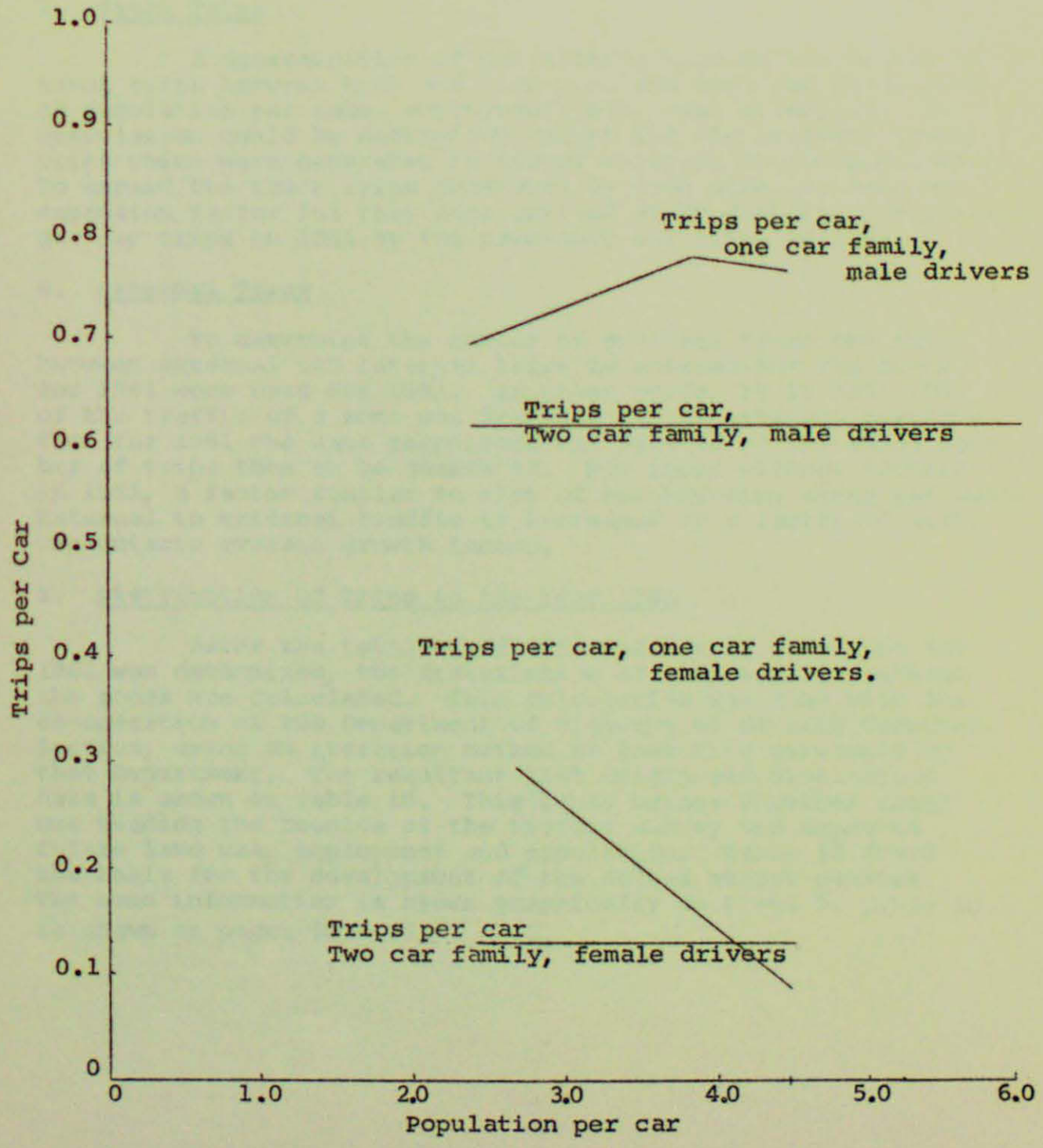
To determine the relationship between land use and traffic generation, we found that a correlation exists between work trips and the number of employees, shopping trips and the number of commercial employees, home trips and the number of cars owned. No correlation could be found for trips for "other" purposes. Those trips are made for a conglomeration of several purposes, as for instance, business, medical appointments, school visits, etc. It was decided to determine the increase in work, home and shopping trips and use this to factor the group of "other" trips. This factor is

$$\frac{\text{Work + Home + Shopping Trips in 1981}}{\text{Work + Home + Shopping Trips in 1961}}$$

Total trips made by passenger cars in 1981 in the City as a whole was calculated as described in the previous item No. 5.

The trips by passenger cars for the year 1981 for each zone separately was determined by using 1981 land use data (population, employment etc.) and the 1961 trip generation ratios described in this section.

TRIP GENERATION PER CAR PER DRIVER,
MALE OR FEMALE, RELATED TO
POPULATION PER CAR



The resultant total generation for male and female drivers separately, was compared to, and adjusted to the total trips made by passenger cars in 1981 as calculated in item 5, bringing into account this way, increased car ownership different for male and female, respectively.

7. Truck Trips

A determination of correlation between the number of truck trips between 4:00 and 7:00 p.m. and land use data, such as population per zone, employment, etc., was attempted. No correlation could be determined except for the delivery truck trips which were generated in direct relation to the population. To expand the truck trips generated by each zone, we used an expansion factor for that zone arrived at by dividing the passenger car trips in 1981 by the passenger car trips in 1961.

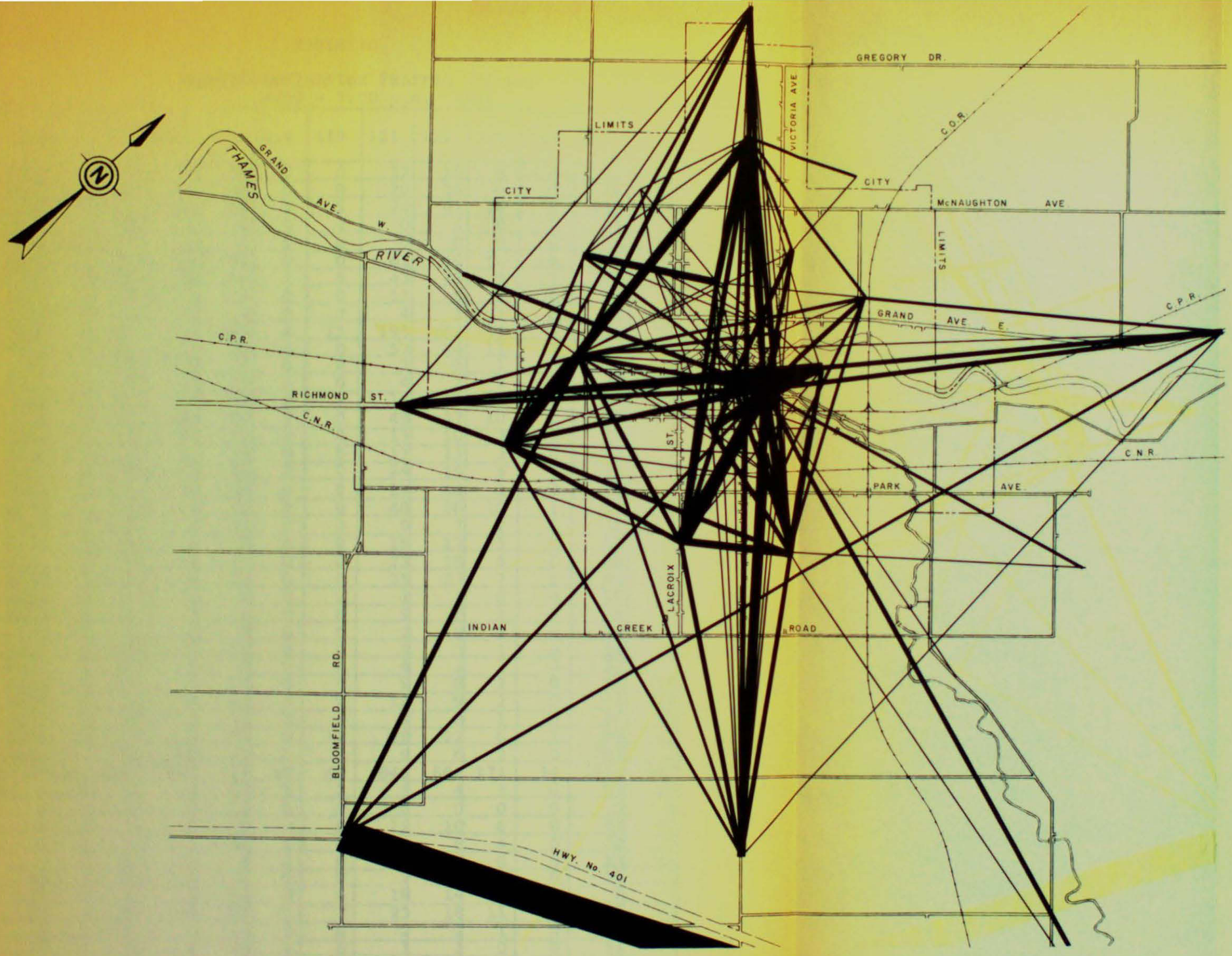
8. External Trips

To determine the number of external trips the ratio between external and internal trips as existed for the zones for 1961 were used for 1981. In other words, if in 1961 20% of the traffic of a zone was destined to the external stations then for 1981 the same percentage was assumed of the total number of trips then to be generated. For zones without traffic in 1961, a factor similar to that of neighbouring zones was used. External to external traffic is increased by a factor of 2.16, the Ontario average growth factor.

9. Distribution of Trips in the Year 1981

After the total traffic in and out of each zone for 1981 was determined, the distribution of this traffic between the zones was calculated. This calculation was done with the co-operation of the Department of Highways of Ontario Computer Section, using an iteration method of factoring developed by that Department. The resultant 1981 origin and distination data is shown on Table 10. This table brings together under one heading the results of the traffic survey and expected future land use, employment and population. Table 10 forms the basis for the development of the future street network. The same information is shown graphically on Plate 9. Table 10 is shown on pages 54 - 57.

PLATE 9



LEGEND

500 150-250 100-150 50-100

SCALE OF TRIPS PER 3 HOUR PERIOD

TRIPS SHOWN ARE COMPUTED FOR AN AVERAGE WEEKDAY FOR THE PERIOD BETWEEN 4:00 P.M. AND 7:00 P.M. TRIPS SHOWN ARE BOTH DIRECTIONS COMBINED.
VOLUMES BELOW 50 ARE NOT SHOWN.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAVEL DESIRE LINES -1981-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

TABLE 10

ORIGIN-DESTINATION TRAFFIC VOLUMES
4:00 - 7:00 p.m. 1981

Zone	111	112	113	114	115	121	122	123	124	211	212	221
0111	5	16	19	0	0	22	18	4	1	31	33	4
0112	13	15	44	0	0	20	15	4	0	75	5	6
0113	19	56	66	0	5	78	61	16	1	110	114	14
0114	0	0	0	0	0	0	5	0	0	4	0	0
0115	0	0	0	0	0	0	0	0	0	4	0	6
0121	15	14	51	0	0	61	48	12	1	127	43	13
0122	10	10	36	7	5	43	33	9	1	90	30	9
0123	3	3	10	0	0	12	9	2	0	25	8	3
0124	1	0	4	0	0	4	3	1	0	8	3	1
0211	47	62	165	6	15	195	153	39	4	215	46	80
0212	21	27	72	0	0	57	44	11	1	86	47	9
0221	4	5	12	0	0	3	3	1	0	51	13	2
0231	4	4	13	0	0	4	3	1	0	25	8	2
0232	10	13	38	0	7	13	10	2	0	74	24	8
0241	24	28	86	0	0	48	37	10	1	93	9	26
0251	9	10	33	0	0	13	10	3	0	30	5	13
0252	5	13	19	0	0	17	13	3	0	55	15	41
0261	8	13	29	0	0	24	19	5	1	18	17	4
0262	7	8	24	0	0	17	14	3	0	23	8	12
0263	19	22	68	0	0	48	38	10	1	64	23	34
0271	3	5	10	0	0	9	7	2	0	6	6	2
0272	5	9	19	0	0	15	12	3	0	11	11	3
0311	5	4	18	0	0	23	18	5	0	38	8	14
0312	8	5	27	0	0	35	27	7	1	60	12	22
0313	1	1	2	0	0	1	1	0	0	10	3	2
0314	1	1	2	0	0	9	6	2	0	6	3	2
0321	2	3	8	0	0	2	2	1	0	45	15	8
0322	0	3	1	0	0	5	3	1	0	24	6	1
0323	0	2	0	0	0	4	3	1	0	22	5	0
0331	3	1	10	0	0	9	8	2	0	54	16	3
0332	3	2	12	0	0	11	9	2	0	63	18	4
0341	2	3	5	0	0	3	2	1	0	56	84	13
0351	5	9	19	0	11	29	22	6	1	59	49	5
0361	7	69	23	7	6	9	6	2	0	101	1	1
Int. Total	269	436	945	20	49	843	662	171	14	1763	688	367
Sta. 1	5	2	16	1	2	5	4	3	0	50	25	17
2	1	3	2	0	0	0	0	0	0	8	4	0
5	7	7	21	0	0	12	10	6	0	47	41	9
8	1	2	15	1	0	7	6	4	0	20	9	5
9	0	4	0	0	0	0	0	0	0	13	19	0
10	5	5	15	0	0	5	4	3	0	50	2	2
11	3	2	10	0	0	18	14	9	0	9	2	2
14	16	21	50	1	7	23	18	11	1	95	15	20
16	5	2	14	0	0	2	2	1	0	13	11	2
17	6	1	20	1	0	1	1	0	0	51	4	3
20	6	3	19	0	0	9	7	4	0	52	6	2
21	6	3	18	0	0	4	3	2	0	51	6	2
Ext. Total	61	55	150	4	9	86	69	43	1	459	144	64
Comb.Total	330	491	1135	24	58	929	731	214	15	2222	832	431

TABLE 10
ORIGIN-DESTINATION TRAFFIC VOLUMES
4:00 - 7:00 p.m. 1981

Zone	231	232	241	251	252	261	262	263	271	272	311	312
0111	2	4	16	8	14	3	4	7	3	3	13	12
0112	11	15	43	6	8	10	5	9	11	9	15	14
0113	9	13	55	30	50	12	14	23	12	11	45	43
0114	0	0	0	0	0	0	0	0	0	3	0	0
0115	0	0	0	0	11	0	0	0	0	0	0	0
0121	11	15	43	9	21	14	14	25	15	14	18	17
0122	8	10	30	6	15	10	10	18	11	10	13	12
0123	2	3	8	2	4	3	3	5	3	3	4	3
0124	0	1	3	0	2	1	1	1	1	1	1	2
0211	36	52	202	85	102	35	45	77	37	33	127	123
0212	20	29	44	38	8	7	32	54	7	6	39	38
0221	3	4	14	16	9	5	10	17	5	5	22	21
0231	2	2	12	4	4	2	2	2	2	2	8	8
0232	4	7	36	13	14	4	4	8	4	4	23	22
0241	13	18	1	27	5	14	10	17	17	12	8	8
0251	5	7	74	30	10	4	5	9	4	3	17	17
0252	7	10	24	12	11	6	10	18	7	6	1	1
0261	12	18	18	17	10	14	26	46	15	14	27	26
0262	5	7	4	6	8	8	9	16	8	7	11	10
0263	14	20	13	17	24	21	27	45	23	21	30	29
0271	4	7	7	6	4	5	10	17	6	5	10	10
0272	9	12	12	11	6	10	17	29	10	9	18	17
0311	2	3	11	2	5	6	4	6	6	6	27	25
0312	3	4	16	2	7	9	5	10	10	10	41	40
0313	1	1	2	2	2	1	2	4	2	1	15	15
0314	2	2	2	2	2	0	1	2	1	0	24	23
0321	4	5	11	4	4	13	3	6	14	13	24	24
0322	3	4	13	3	4	5	1	1	5	5	10	10
0323	2	3	12	3	3	4	0	0	5	4	9	9
0331	5	7	15	12	9	4	6	10	5	4	27	26
0332	6	9	17	14	10	5	7	12	5	4	31	30
0341	7	11	20	5	1	3	3	6	3	2	37	36
0351	4	5	21	1	5	16	10	16	17	16	37	35
0361	5	8	7	22	8	18	13	22	20	18	38	36
Int. Total	221	316	756	415	400	272	313	538	294	264	770	742
Sta. 1	6	11	26	9	10	10	7	18	7	11	13	9
2	0	0	0	0	2	0	0	0	0	0	0	0
5	9	16	29	10	11	10	17	41	7	11	53	37
8	1	1	11	4	2	5	13	30	3	5	3	2
9	1	2	3	2	6	4	1	4	3	4	11	7
10	5	9	18	4	4	15	18	44	9	16	11	7
11	1	1	9	9	3	1	0	0	1	2	0	0
14	11	20	42	18	20	7	12	30	4	7	18	12
16	4	8	8	7	8	3	8	19	2	4	2	1
17	4	8	5	9	13	2	1	2	1	2	2	1
20	4	7	2	0	8	6	4	11	4	7	2	1
21	4	8	5	8	4	2	4	11	1	2	3	2
Ext. Total	50	91	158	80	91	65	85	210	42	71	118	79
Comb.Total	271	407	914	495	491	337	398	748	336	335	888	821

TABLE 10

ORIGIN-DESTINATION TRAFFIC VOLUMES

4:00 - 7:00 p.m. 1981

Zone	313	314	321	322	323	331	332	341	351	361	Total
0111	1	1	3	1	1	6	5	4	7	17	288
0112	1	3	4	4	4	12	11	4	22	69	487
0113	3	3	9	3	2	19	18	14	23	61	1012
0114	0	0	0	0	0	0	0	0	3	0	15
0115	0	0	0	0	6	0	0	0	11	6	44
0121	2	2	10	1	0	17	15	11	4	1	664
0122	1	1	7	1	0	12	11	8	3	1	481
0123	0	0	2	0	0	3	3	2	1	0	129
0124	0	0	0	0	0	1	1	0	0	0	41
0211	3	20	56	27	21	58	54	94	136	91	2541
0212	10	5	19	20	16	4	4	58	67	11	911
0221	3	3	6	1	0	1	1	13	7	2	262
0231	1	2	2	1	1	6	5	6	6	2	146
0232	2	5	5	3	2	16	16	18	19	4	432
0241	4	1	11	11	9	35	32	51	32	30	728
0251	1	3	3	3	2	7	7	12	17	21	337
0252	1	1	1	3	3	12	11	4	6	5	341
0261	4	2	24	16	12	10	9	14	30	29	531
0262	4	2	34	8	6	12	11	13	16	10	331
0263	11	6	96	22	17	33	30	35	45	27	933
0271	1	1	9	6	4	4	3	5	11	11	196
0272	3	1	15	10	8	6	6	9	19	19	344
0311	15	27	14	10	8	27	25	30	8	27	427
0312	23	41	21	15	12	42	39	46	13	42	655
0313	11	3	24	11	8	10	10	6	5	3	160
0314	3	12	3	2	1	6	5	22	10	14	171
0321	34	5	32	54	42	36	34	10	28	12	498
0322	14	3	38	6	4	12	12	6	19	6	228
0323	13	2	33	5	4	11	10	6	17	5	197
0331	12	7	24	10	8	11	10	3	18	9	348
0332	14	9	25	12	9	12	11	4	22	11	403
0341	7	33	6	7	5	10	10	4	27	15	427
0351	7	1	20	11	8	27	25	36	58	41	632
0361	4	30	10	3	3	8	8	1	39	5	558
Int. Total	213	235	566	287	226	486	452	549	749	607	15898
Sta. 1	4	4	9	5	7	13	12	18	22	29	390
2	0	0	0	1	1	1	1	0	8	2	34
5	12	17	35	9	11	17	16	17	23	12	580
8	0	0	0	4	5	2	1	5	18	2	177
9	3	2	7	6	7	3	3	1	5	7	123
10	3	2	9	6	8	6	5	10	16	6	322
11	0	0	0	0	0	1	1	1	2	2	103
14	6	6	12	4	5	12	12	23	33	12	604
16	0	0	0	1	1	2	1	5	2	0	138
17	0	0	0	1	2	5	5	5	7	2	165
20	0	0	3	4	5	10	10	7	7	7	217
21	3	2	3	5	5	7	6	1	11	13	205
Ext. Total	31	33	78	46	57	79	73	93	154	89	3058
Comb.Total	244	268	644	333	283	565	525	642	903	696	18956

TABLE 10

ORIGIN-DESTINATION TRAFFIC VOLUMES
4:00 - 7:00 p.m. 1981

Zone	1	2	5	8	9	10	11	14	16	17	20	21	Ext. Total	Comb. Total
0111	3	1	4	2	0	5	4	16	4	4	2	6	51	339
0112	13	10	2	9	2	10	3	26	3	15	1	5	99	586
0113	9	4	14	8	0	17	12	48	12	13	5	18	160	1172
0114	1	0	1	0	0	0	0	0	0	1	0	0	3	18
0115	0	0	0	0	0	0	0	8	0	0	0	0	8	52
0121	11	2	7	6	5	6	21	46	6	6	5	3	124	788
0122	10	2	6	6	4	6	19	43	6	6	4	3	115	596
0123	6	0	4	3	2	3	10	21	3	3	2	2	59	188
0124	0	0	0	0	0	0	1	2	0	0	0	0	3	44
0211	165	13	165	93	19	115	16	211	48	85	57	101	1088	3629
0212	33	8	38	38	25	25	8	63	17	21	16	16	308	1219
0221	4	0	12	2	0	14	0	19	2	6	2	8	69	331
0231	7	1	5	2	4	5	2	10	2	4	3	3	48	194
0232	14	1	9	4	8	10	3	22	4	7	5	6	93	525
0241	6	2	17	17	5	23	10	47	9	14	12	12	174	902
0251	12	5	12	7	11	5	5	19	5	8	6	6	101	438
0252	6	4	9	0	3	6	0	16	0	7	6	4	61	402
0261	27	6	35	26	12	53	3	57	9	14	22	12	276	807
0262	8	2	12	11	5	21	3	21	5	7	3	5	103	434
0263	27	5	38	35	15	70	10	71	17	23	11	17	339	1272
0271	7	2	9	7	3	14	1	15	2	4	6	3	73	269
0272	10	2	14	10	5	20	1	22	3	5	8	5	105	449
0311	6	1	35	3	6	6	2	18	3	4	2	1	87	514
0312	11	2	60	6	11	9	3	31	6	8	4	2	153	808
0313	2	0	13	2	2	2	0	9	2	0	2	0	34	194
0314	2	0	15	2	2	2	0	9	2	0	2	0	36	207
0321	3	0	18	2	5	6	2	15	3	2	2	2	60	558
0322	2	2	4	3	4	4	0	5	1	0	1	1	27	255
0323	1	1	4	2	4	4	0	5	1	0	1	1	24	221
0331	8	0	14	9	4	8	1	12	3	3	7	4	73	421
0332	20	1	31	22	8	18	1	28	6	8	15	10	168	571
0341	9	0	14	9	0	3	0	34	7	4	1	0	81	508
0351	22	3	25	13	2	15	1	25	5	7	10	8	136	768
0361	34	8	17	6	3	16	1	27	1	1	6	4	124	682
Int. Total	499	88	663	365	179	521	143	1021	197	290	229	268	4463	20361
Sta. 1	6	2	4	0	2	101	0	24	11	4	54	2	210	600
2	5	5	2	0	0	3	0	2	5	13	0	2	37	71
5	15	2	2	0	0	21	0	35	9	7	106	15	212	792
8	6	0	9	0	0	8	0	0	0	11	9	4	47	224
9	17	2	6	0	0	17	0	24	2	7	0	0	75	198
10	17	2	30	0	0	5	0	2	4	2	0	3	65	387
11	5	0	2	0	0	0	0	2	2	0	0	0	11	114
14	26	0	56	29	0	22	0	26	2	4	6	2	173	777
16	13	0	9	4	0	0	0	4	2	9	2	0	43	181
17	13	0	9	2	0	17	0	9	2	2	0	2	56	221
20	50	2	78	9	0	2	0	4	2	6	6	670	829	1046
21	2	2	13	6	2	3	2	2	0	0	811	4	847	1052
Ext.Total	175	17	220	50	4	199	2	134	41	65	994	704	2605	5663
Comb.Total	674	105	883	415	183	720	145	1155	238	355	1223	972	7068	26024

SECTION VI

DEVELOPMENT OF THE MAJOR STREET PLAN

General

In developing a major street system capable of satisfying traffic demands for the coming twenty years, certain basic factors have been considered as forming the framework for the design of the street system. These factors are:

1. Activity generated by the present industrial, commercial and residential areas.

2. Effect on this activity by the further development and enlargement of such uses over the next twenty years.

3. Traffic service to be provided by the street network.

4. Presence of natural and man-made barriers such as the Thames River and the railway lines.

The first two factors have been accounted for in the traffic generation and origin-destination studies. Using the results of the 1961 origin-destination survey and data on land use, population and employment, certain relationships were established between trips moving between traffic zones, trips entering or leaving each zone, and the types of land uses within each zone. These relationships were then applied to the anticipated land use in 1981 and as a result the future movement of traffic between the various part of the City was estimated.

In establishing the level of traffic service of the system under development an important consideration is that it should provide ready access to the industrial, commercial and residential districts of the City. In so doing it should preserve and strengthen the character of residential areas, and enhance the function of the Central Business District as the focus for the community's many activities.

Natural or man-made barriers are generally a source of traffic congestion and an important objective in planning a network is that it should relieve congestion at such locations and prevent such a situation developing at others.

Finally, it must be recognized that the resulting network in addition to being efficient from a traffic service viewpoint, should also be financially and economically feasible.

The River Crossing Problem

Study of the flow plan and delay map shows that the Thames River is the most important single obstacle to traffic movements. In 1961 35% of all the traffic to and from the Central Business District in the 4:00 to 7:00 P.M. period crossed the river, as did 42% of the total City-wide traffic movement in the same period. The 1981 figures are 33% and 36% respectively. As the number of river crossing facilities remains limited, traffic has to concentrate at relatively few locations. In the development of the street system the first question to answer was: "In the coming twenty years will the three river bridges be sufficient or will there be a need for additional ones?"

The following table shows the twenty-four hour two-way volumes using the river bridges in 1961 with Third Street open; in 1962 with Third Street closed; and the 1981 volumes assigned to all three:

Description	24-Hour Two Directional Traffic Before Closing of Third St.	24-Hour Two Directional Traffic After Closing of Third Street	Assigned 1981 Traffic Volumes (Factored from 4-7 p.m. to A.A.D.T.)
Parry Bridge	8,000	11,750	14,700
Fifth St. Bridge	14,250	22,750	19,000
Third St. Bridge	12,250	-	15,000
	34,500	34,500	48,700

The percentage increase of traffic for the year 1981 compared to the year 1961 is: for the Parry Bridge 84%; for the Fifth Street Bridge 33%; and for the Third Street Bridge 22%. The total river crossing traffic will increase in those twenty years by 41% which is less than the increase of 79% in the total number of trips made within the City of Chatham by external and internal traffic in the same time period.

The difference is caused by the fact that Highway 401 will draw away a considerable amount of external traffic that was using Highway 2 previously. The existence of Highway 401 will divert about 13,500 vehicles per day from the river crossings in the year 1981. Without this diversion the City would have to contemplate the construction of two extra traffic lanes over the river.

Comparison of traffic volumes in Columns 2 and 3 of the above table shows that the 1962 volumes at Parry and Fifth Street Bridges are of similar order as the volumes assigned to all three in 1981.

It is recognized that the congestion at the two bridges,with Third Street under construction in the year 1962, is a situation which can only be tolerated as a temporary condition. Such congestion cannot be envisaged as acceptable on a permanent basis. This congestion will be caused by growth in traffic at all three bridges, ten or fifteen years from now, unless remedial action is taken.

Two alternatives are possible to prevent this situation. One, by the building of additional bridges, and two, by the widening, channelizing and general improvement of roads leading to and from the existing bridges.

The first alternative would involve construction of another moveable bridge structure. It is quite difficult to find an acceptable location in the central part of the City where such a structure could connect up to through streets, new or existing, at both sides. The cost of such a structure would be approximately $1,000,000.00, and its construction in the coming twenty year period would be only warranted if the improvement of the existing streets would fail to give results. Study reveals that considerable improvement can be made in the capacity of the roads leading to and from the existing bridges and that if such improvments are implemented a new bridge structure is not necessary for the coming twenty years.

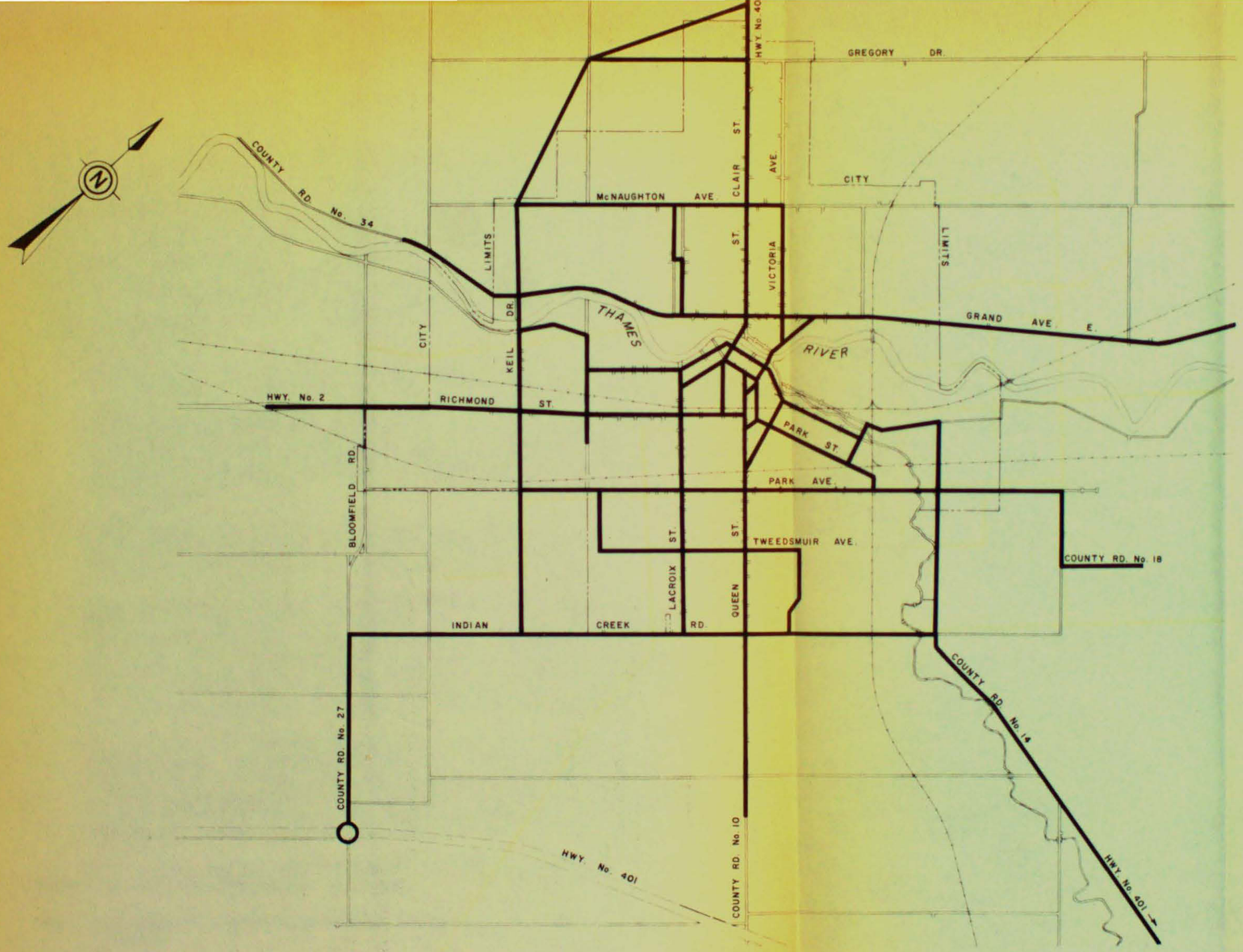
It should be realized that the closing of one of the river bridges for extensive maintenance work in the future could cause considerable congestion and that later in the twenty year period a temporary bridge structure might be needed if a bridge had to be closed for a long time.

Thus, in addition to the four factors mentioned above as setting the framework for the development of the street system there is a fifth one - the conclusion that no additional river bridges are necessary within the twenty year period under study.

Development of Trial Major Street System

To ascertain if future traffic demands can be satisfied, a trial road system was developed as a basis for assignments of the estimated 1981 movements between districts. (See Plate No. 10). This consisted of the existing road system (including the Third Street Bridge) with the

PLATE 10



LEGEND

ROAD SYSTEM USED FOR TRAFFIC ASSIGNMENTS

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

TRIAL ROAD SYSTEM

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addition of a connection between Highway 40 at the northern City limits and Keil Drive, and a connection from Keil Drive down to Indian Creek Road. Included also were connections between the two Highway 401 interchanges and the street system of the City of Chatham over existing county roads. These connections were made over Bloomfield Road to Indian Creek, and over County Road No. 14 (Creek Road), to Park Avenue and Park Street in the eastern part of the City. With the assistance of the Department of Highways' Computer Section, traffic assignments were made to the road system as follows:

1. 1961 Origin and Destination data were assigned to the road network as existed in 1961 (Third Street Bridge closed). (See Plate No. 11). The results of this assignment were compared to the traffic counts as shown on the 1961 flow map. (Plate No. 4). Except for some minor differences a good correlation existed between counted and assigned traffic volumes. (Compare Plate No. 11 to Plate No. 4).

2. 1961 Origin and Destination data and 1981 data were assigned to the trial road system shown on Plate No. 10 and the results for 1981 is represented on Plate No. 12.

   The traffic assigned to the new network for 1961 and 1981 was compared and generally it was found that traffic throughout the City will increase by a constant factor of 1.50. The total number of trips in the City increases by a factor of 1.79 and the difference of 29% is accounted for by traffic using the new routes provided by means of the 401 interchanges and the Keil Street extension.

   The connection between Highway 40 and Keil Drive proved unsuccessful in attracting traffic. Its assigned traffic volumes for the year 1981 were low (approximately 100 vehicles per peak hour per direction) which was considered insufficient to warrant the building of a road at this location. within the coming twenty years.

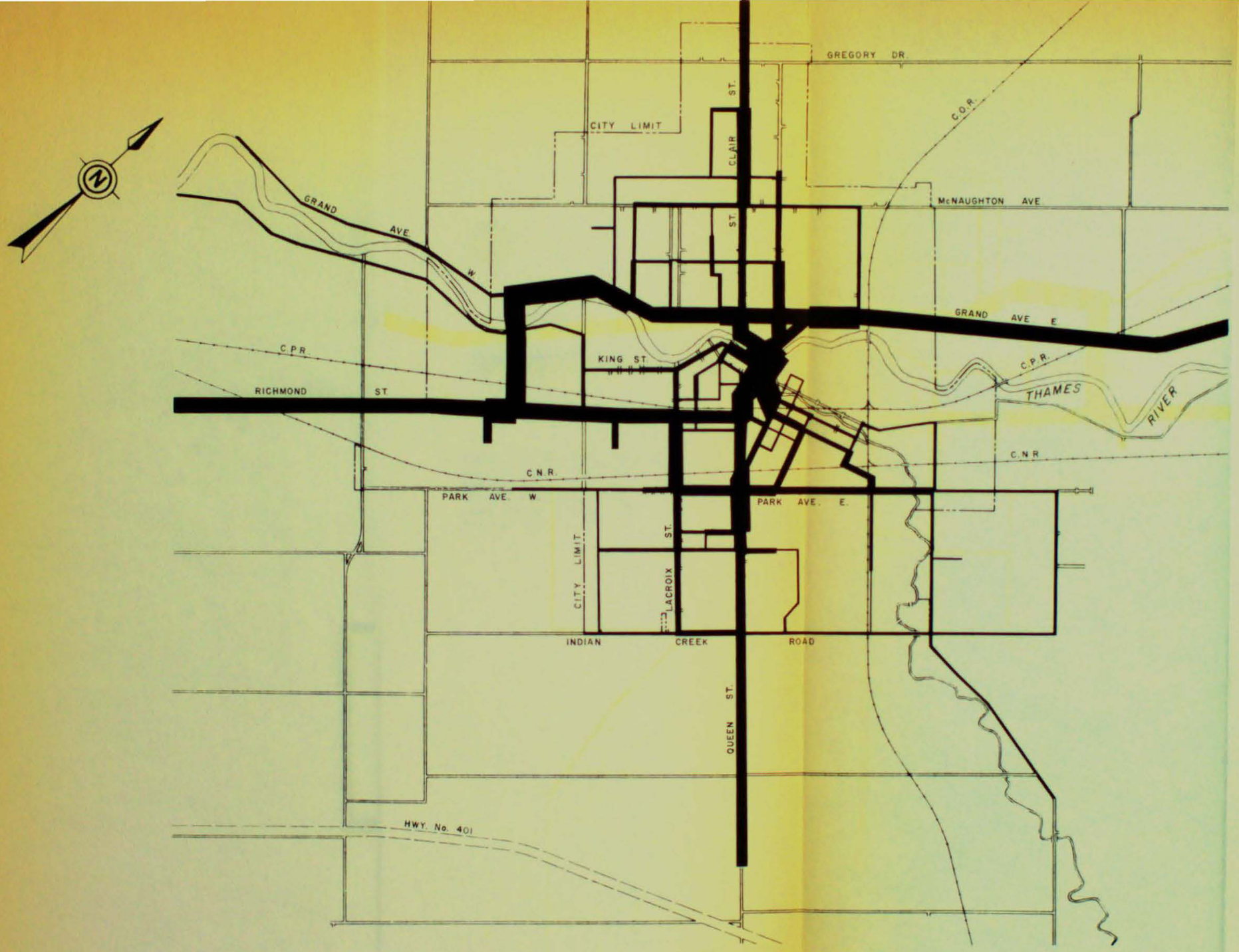
1981 design hour volumes for all major intersections were determined as follows:

(a) The 1981 assignment provided intersection approach volumes;

(b) Throughout the City traffic increases with a factor of 1.50;

(c) Except near the bridges over the Thames River, it was reasoned that the distribution of left and right turning traffic would remain similar to 1961 conditions;

PLATE 11



LEGEND

2000 1000 500

SCALE OF VEHICLES ASSIGNED PER 3 HOUR PERIOD

TRAFFIC VOLUMES SHOWN REPRESENT THE RESULTS OF THE ORIGIN DESTINATION SURVEY ASSIGNED TO THE TRIAL ROAD SYSTEM AND INDICATE TRAFFIC MOVEMENT IN BOTH DIRECTIONS FOR AN AVERAGE WEEKDAY BETWEEN 4:00 P.M. AND 7:00 P.M.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAFFIC FLOW DIAGRAM TOTAL TRAFFIC – 1961

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PLATE 12

LEGEND

2000 1000 500

SCALE OF VEHICLES ASSIGNED PER 3 HOUR PERIOD

TRAFFIC VOLUMES SHOWN REPRESENT THE RESULTS OF THE ORIGIN DESTINATION SURVEY ASSIGNED TO THE TRIAL ROAD SYSTEM AND INDICATE TRAFFIC MOVEMENT IN BOTH DIRECTIONS FOR AN AVERAGE WEEKDAY BETWEEN 4:00 P.M. AND 7:00 P.M.

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAFFIC FLOW DIAGRAM TOTAL TRAFFIC – 1981

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(d) Traffic at intersections influenced by the opening of Third Street Bridge and by the extension of Keil Drive was determined from a more detailed analysis of the computer results.

Study of the design hour volumes for the several intersections in this trial system showed that it is possible to provide sufficient capacity by means of channelization and widening. The conclusion of this traffic assignment was, therefore, that the trial system which consisted mainly of existing streets which are able to handle the 1981 traffic volumes, provided that the streets are widened and intersections channelized. No new construction on new right-of-way is necessary to any great extent within the City of Chatham to take care of the twenty year traffic increase.

The following step, therefore, is to decide which intersections should be channelized and what type of channelization used.

The following considerations influenced the chosen system of widening and channelization:

1. The Importance of the Central Business District:

The Chatham Central Business District is one of the most important sections of the City. The Central Business District employed in 1961 approximately 2,300 people and is, as an employment area, comparable to the industrial area in the western part of the City, which employed an equal number. The total employmentin the City was 9,000 people. Half of all the employment is therefore concentrated in the Central Business District and the industrial area combined, and divided about equally over these two areas. The same characteristics are apparent from the number of trips generated by those districts. The Central Business District was the beginning or end of approximately 2,500 trips in the 4:00 to 7:00 P.M. period and the industrial area, of approximately 2,100 trips.

Because of the importance of the Central Business District the existing road system has historically been focused on it which has the advantage of providing direct access to this shopping and employment area. It should be noted that, on the other hand, this has the disadvantage, as the City grows, of attracting more and more through traffic into the area. Through traffic is defined in this case as traffic that has no origin or destination in the Central Business District but travels through it, for instance, traffic from the southern part of Chatham to the northern part. To enable the Central Business District to

compete with outlying shopping centres, it is necessary to greatly improve the flow of traffic, and as well the amount of parking provided within the downtown area. This improvement has to take into account the following considerations:

(a) A new system should be designated to keep through traffic out of the Central Business District. The reason is that over the years this amount of traffic will grow considerably and will interfere with the traffic that is origined or destined to the Central Business District.

(b) The roads leading to and from the Central Business District should be improved to keep this part of the City accessible to the increased traffic.

2. The Connection of the Street System north and south of the Thames River:

While studying the street system of the City of Chatham it becomes immediately apparent that the road system north of the River and the one south of the River has practically no contact with each other. North of the River, St. Clair Street forms the main artery in a north-south direction. The most logical place to cross the River to reach the Central Business District from the north is the use of the Third Street Bridge located on the extension of St. Clair Street to the south.

From the southern part of the City the most logical route for northbound traffic is Queen Street. This street ends into a number of downtown streets and among others, Fourth Street and Fifth Street. There is at present, no through connection from the northern part to the southern part of the City. Traffic desiring to move between these two parts of the City travels on streets in the downtown section of Chatham near either Fifth or Third Street Bridges. The treatment of the major arterial roads leading to or from these two bridges located in and close to the Central Business District is therefore of utmost importance to the City and its Central Business District. Two alternative schemes for this treatment were considered.

1. A system of one-way streets whereby Third Street becomes one-way southbound and Fifth Street becomes one-way northbound.

   The implications of this system were studied by means of a traffic assignment to the road system involved and capacity calculations were made at the intersections and where necessary intersections were widened or channelizations designed.

2. The other alternative is to keep both streets two-way but to widen and channelize intersections and thus provide a through route along Lacroix, Wellington, Third Street and St. Clair, and along Queen Street, Centre Street, Fifth Street and Thames and Victoria Avenue.

   In this case, also, assignments were made and capacities calculated and where necessary, channelizations and widenings were designed.

The analysis showed that the improvements achieved with making the two bridges one-way do not compensate for the disadvantages of longer travel times and distances and the resultant interference with the downtown circulation pattern. It is felt that the second system of improvements to the road system by means of channelizations only is more satisfactory and does not disrupt the traffic pattern that exists today.

After it was concluded that it was best to improve the road system by means of channelization only, a choice had to be made between putting more emphasis on the Lacroix to St. Clair route as against Queen Street to Victoria Avenue route.

The Third Street Bridge is four lanes wide; the Fifth Street Bridge is only three lanes wide and cannot be easily widened. The emphasis is therefore placed on the western route over Third Street.

There are other reasons for this choice. A route by-passing the Central Business District at its fringe would be created, taking out the so-called through traffic discussed before. Also this route would be located closer to the industrial area in the western part of the City and serves a part of the traffic originating or destined there. The resultant major street plan, as recommended, features a major north-south connection from Lacroix Street over Wellington and Third Street Bridge to St. Clair Street.

Queen Street will remain a main artery from the south into the Central Business District. Some through traffic will go from Queen Street over the Fifth Street Bridge to the east but this traffic is relatively small after Highway 401 will be in operation. The Fifth Street Bridge is meant, in the recommended system, mainly as a Bridge to serve the Central Business District from the north-eastern

part of the City. Further study of the schemes made it apparent that it is desirable to connect the industrial area near Keil Drive to the eastern interchange of Highway 401 and to the eastern part of the City. This traffic will use the intersection of Richmond Street and Queen Street and an awkward situation exists at this location. As can be seen in Table 2, the capacity deficiency at these intersections of Richmond and Queen, Queen and School, and Centre and Park is considerable and will still be worse in 1981.

The solution is to make Centre Street and Queen Street one-way between School Street and Park Street. An improvement in this district by any other means than one-way streets would involve considerable costs in widening and the subsequent need for right-of-way. The two one-way streets are located close together with sufficient side streets to enable traffic coming from the wrong direction to reach an address without delay.

A bridge over the Thames River not yet discussed in this Section of the Report is the Parry Street Bridge. Its traffic volumes are expected to decrease considerably after Highway 401 is opened. The through traffic on Highway 2 then, for a very large percentage, will be diverted to Highway 401. However, the growth of the western part of the City will more than compensate for this decrease in traffic. Parry Bridge will mainly function as a bridge enabling traffic from the western industrial area to reach the northern part of the City. This bridge will also be important for the traffic coming from Highway 40 intending to travel west, either to Tilbury or to the interchange at Highway 401 and Bloomfield Road.

To facilitate traffic to and from Highway 401 the extension of Keil Drive has been proposed. This new construction was included in the trial road system for the purpose of assignment of traffic. This assignment of traffic showed that a sufficient number of vehicles will make use of this new section of road, warranting its construction.

The traffic volumes between Highway 401 and the City east of Chatham are small. Improvement of County Road No. 14 (Creek Road),by means of adequate shoulders, is needed. Improvements of the alignment of County Road No. 14 (Creek Road) near Highway 401 is advisable. The road crosses McGregor Creek twice at this location. The cost of upgrading the existing alignment including the widening of the bridges is estimated to be equal to the improvements of the alignment near a new right-of-way to the north of the Creek.

Intersection Improvements

Improvements are needed to enable the intersections of the recommended major street plan to handle future increased traffic. Three main routes in a north-south direction are evident in the major street plan and the intersection improvements are discussed in that order.

1. The route over Parry Bridge and Keil Drive extended in a southern direction until it meets Indian Creek Road. On this route the intersections studied are:

   (a) Keil Drive and Grand Avenue (Highway No. 2) (See Plate No. 13)

   A new approach is added to this intersection in the form of an extension of Keil Drive in a northern direction between Grand Avenue and MacNaughton Avenue. No other changes are needed to handle design hour volumes.

   (b) Keil Drive and Richmond Street (Highway No. 2) (See Plate No. 14)

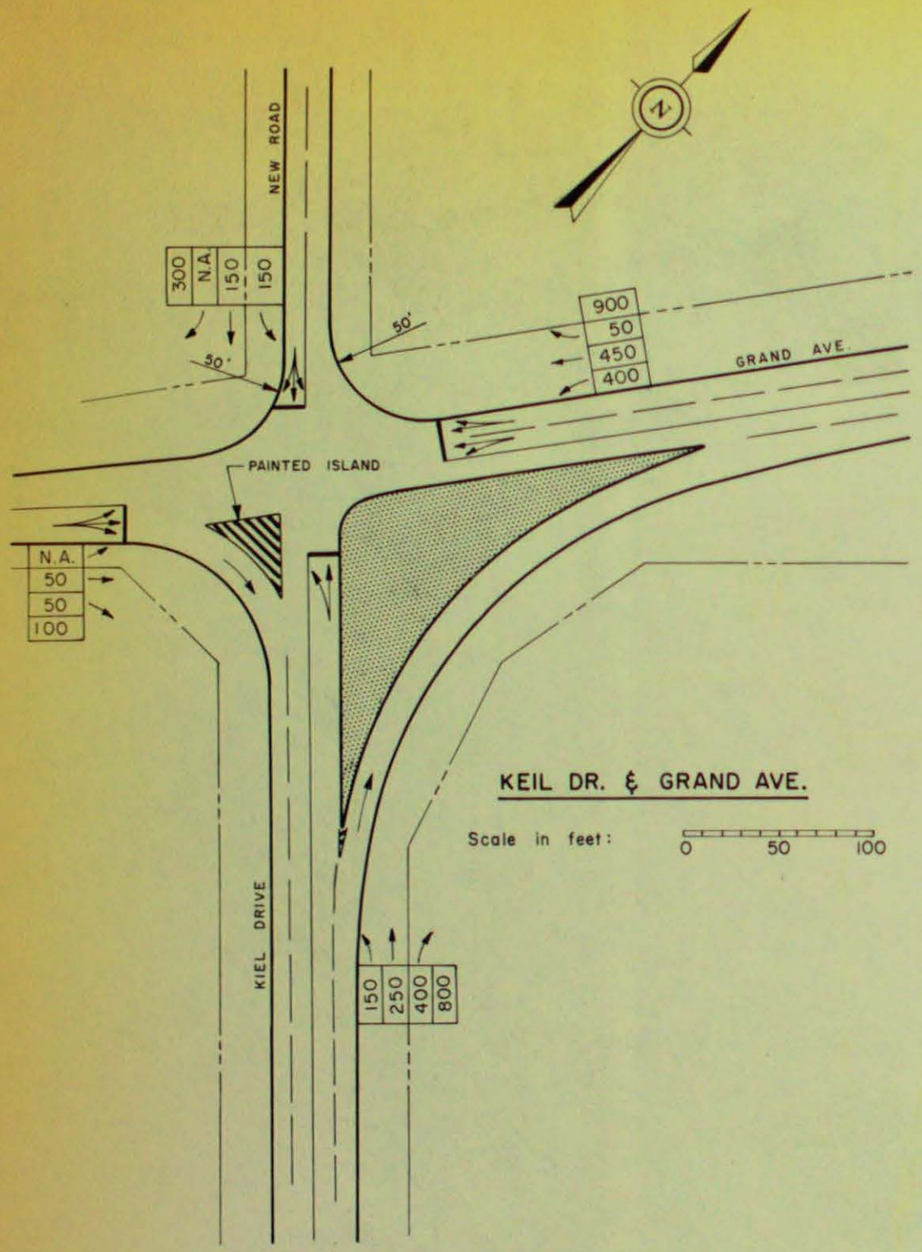
   Keil Drive is extended in a southerly direction. The traffic distribution and traffic volumes expected to occur in 1981 were determined from a more detailed analysis of the results of the traffic assignments. It is recommended that at this important intersection a channelization of high capacity be constructed and that any intermediate construction should be staged to fit into the recommended ultimate design.

   (c) Keil Drive and Park Avenue (See Plate No. 15).

   The extension of Keil Drive crosses the railroad and a railroad grade separation is required here as the spur lines and main lines are located beside each other at different elevations so that a level crossing is not practical.

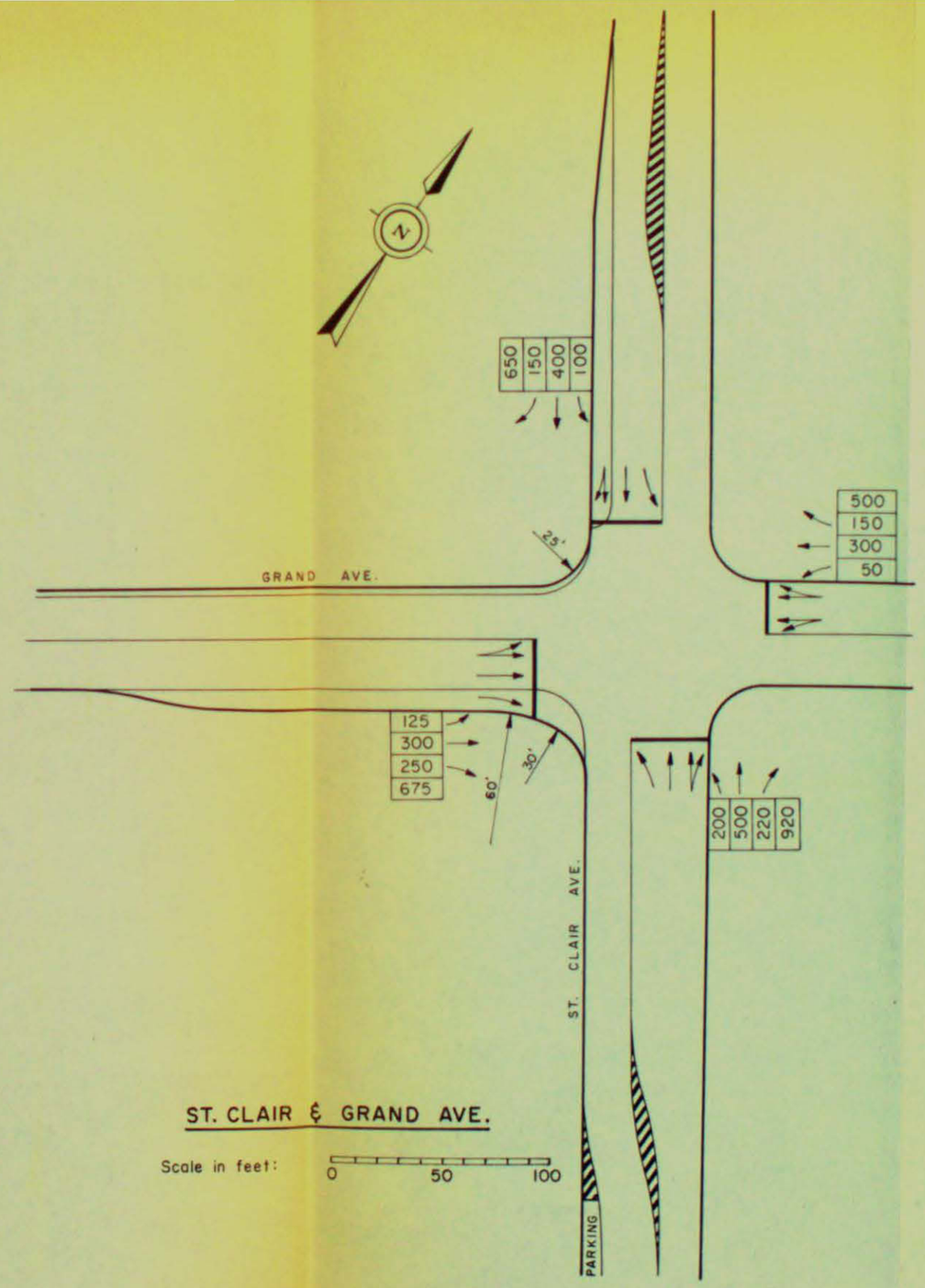
   Park Avenue is located too close to the railroad to make an intersection at-grade between Park Avenue and the Keil Drive extension possible. The conclusion is that at Park Avenue a grade separation is also needed. The connection between Park Avenue and Keil Drive is formed by means of a half cloverleaf as shown on Plate No. 15.)

PLATE 13



KEIL DR. & GRAND AVE.

Scale in feet: 0 50 100



ST. CLAIR & GRAND AVE.

Scale in feet: 0 50 100

LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

910 TOTAL
360 RIGHT TURNS
550 THROUGH
0 LEFT TURNS
} 1981 DESIGN HOUR VOLUMES

N.A. NO TRAFFIC ASSIGNED

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

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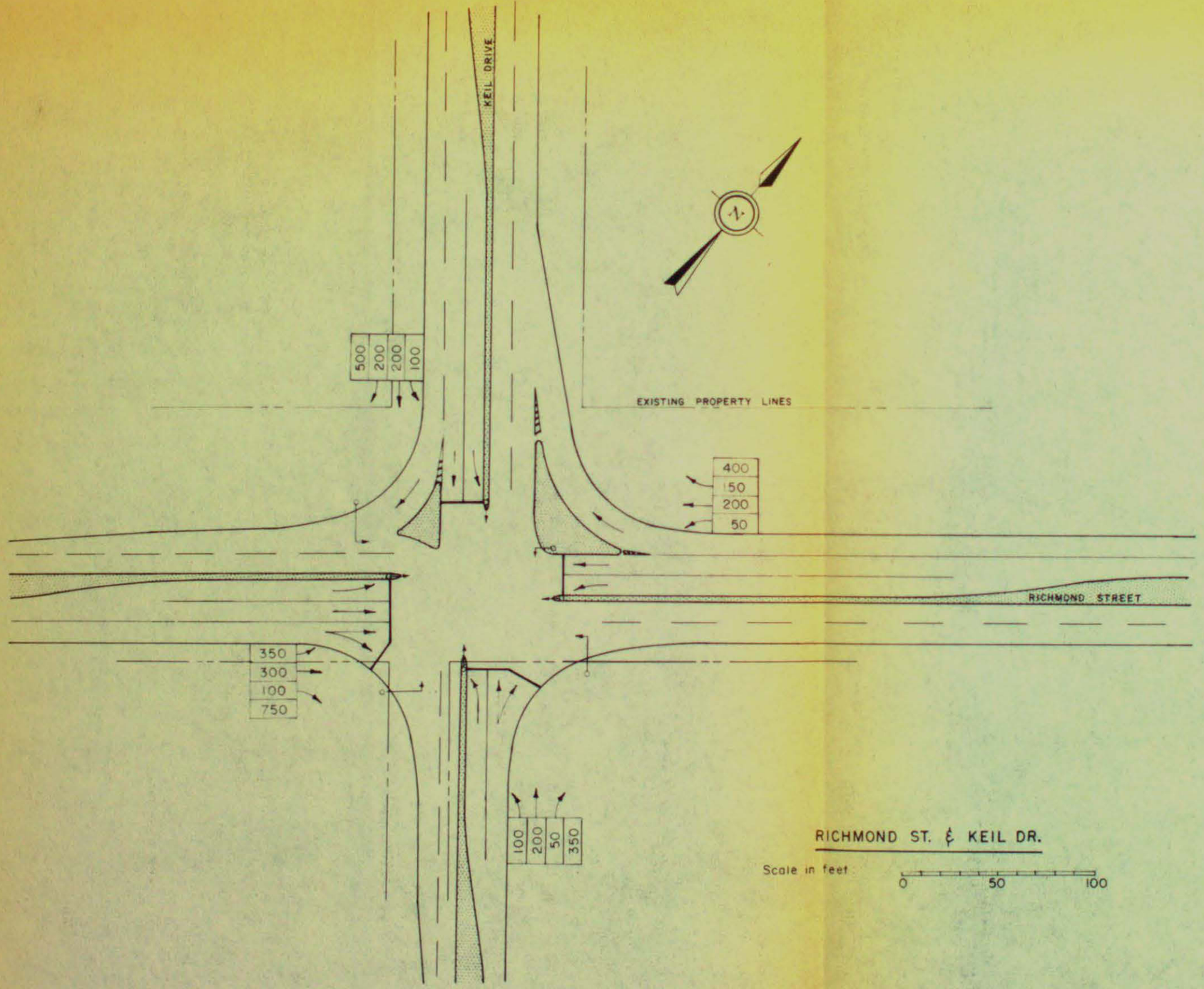
PLATE 14



RICHMOND ST. & KEIL DR.

Scale in feet 0 50 100

LEGEND

EXISTING PROPERTY LINE

CURB AFTER RECONSTRUCTION

EXISTING CURB TO BE REMOVED

CURBED ISLAND

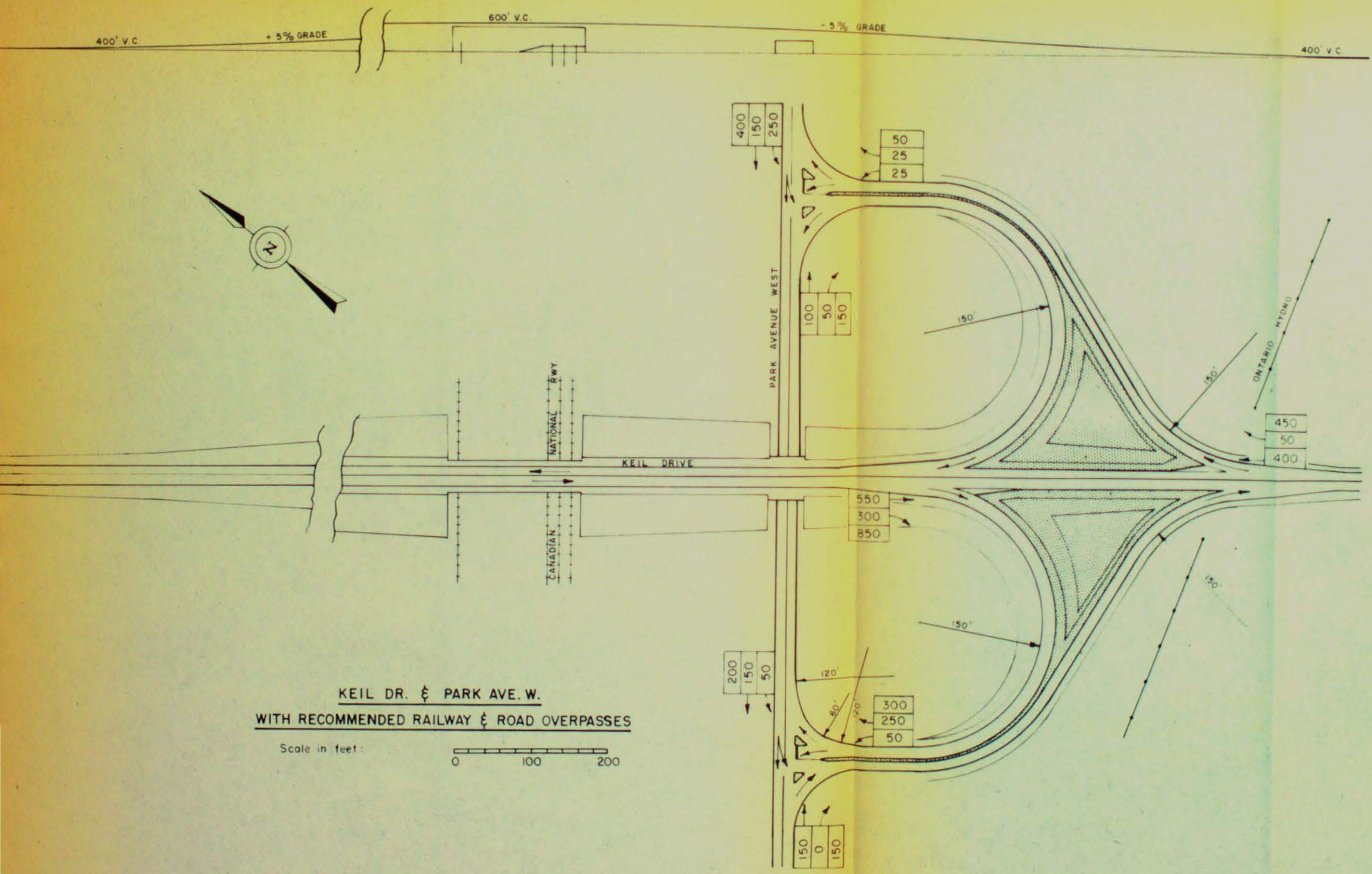
910	TOTAL	1981 DESIGN HOUR VOLUMES
360	RIGHT TURNS	
550	THROUGH	
0	LEFT TURNS	

N.A NO TRAFFIC ASSIGNED

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

PLATE 15



KEIL DR. & PARK AVE. W.

WITH RECOMMENDED RAILWAY & ROAD OVERPASSES

Scale in feet: 0 100 200

LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

1981 DESIGN HOUR VOLUMES

910	TOTAL
360	RIGHT TURNS
550	THROUGH
0	LEFT TURNS

N A — NO TRAFFIC ASSIGNED

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

(d) Indian Road and Keil Drive:

This intersection will be of a simple type. A channelization by means of a right turn lane to allow easy movement from Keil Drive in the direction of Bloomfield Road should be included in the design.

2. The next main north-south connection is the route over St. Clair, Third Street, Wellington and Lacroix. Channelizations and improvements are needed at the following intersections:

Grand Avenue and St. Clair: (See Plate No. 13)

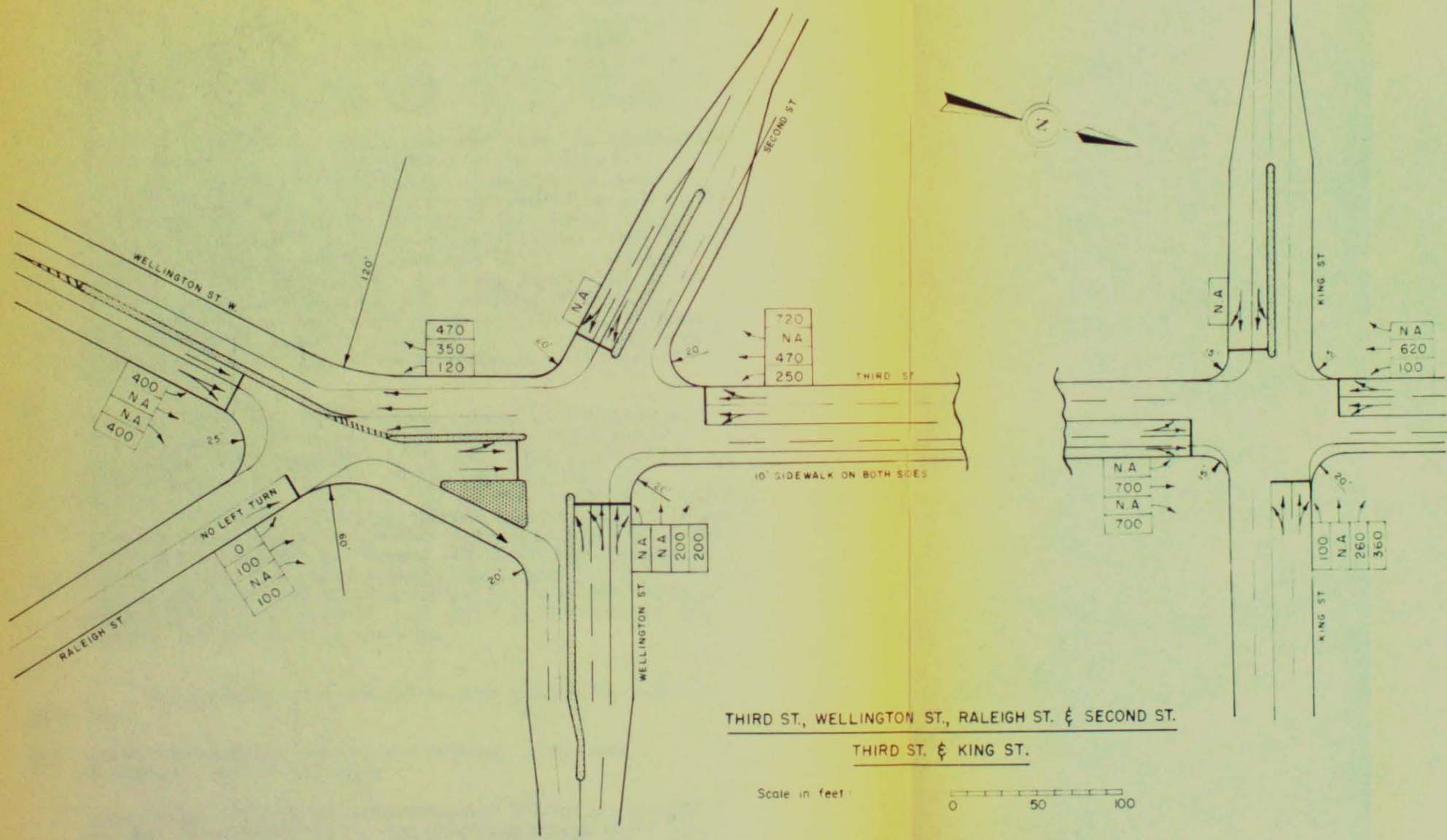
The intersection is presently congested and after the opening of the Third Street Bridge, heavy left-turning traffic can be expected from St. Clair northbound in the direction of Grand Avenue westbound, and similar right turns in the opposite direction. Field inspection showed that it is practical to improve this intersection by providing special facilities for the above-described traffic.

This results in the recommendation to construct a left-turn lane in the northbound St. Clair approach and a right turn lane in the eastbound Grand Avenue approach. The simple measure of adding the two extra lanes provides an increase in intersection capacity of 30%.

Third and King and Third and Wellington: (See Plate No. 16)

This is the next important group of intersections on this route. The intersection of Third and King is improved by means of widening of King Street approaches in addition to the widening of Third Street to 42 feet as already constructed by the City. This existing widening allows for four narrow traffic lanes of 10 feet each. The widening of the approach of King Street at the west side is done to improve the overall capacity of the intersection. The traffic volumes at this approach are low, but the time saved when handling this minor traffic is beneficial to the main traffic stream in the north-south direction. It s construction can be delayed until congestion is apparent. The left turn from the Third Street Bridge to King Street is handled from the through lanes and the use of advance green signals will be advantageous here. In case this traffic interferes too much with the capacity of the intersection, either a left turn lane has to be provided or this turn has to be prohibited and this traffic transposed to the Third Street and Wellington Street intersection.

PLATE 16



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

1981 DESIGN HOUR VOLUMES

910	TOTAL
360	RIGHT TURNS
550	THROUGH
0	LEFT TURNS

N.A NO TRAFFIC ASSIGNED

THIRD ST., WELLINGTON ST., RALEIGH ST. & SECOND ST.

THIRD ST. & KING ST.

Scale in feet: 0 50 100

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

The intersection complex of Wellington, Raleigh and Third Street forms in effect today a five-legged intersection. By means of channelization, the recommended design divides this intersection into two separate intersections. The main traffic load on this route desires to go from Third Street into the direction of Wellington and the design facilitates this movement.

When one studies the overall street plan the connection of St. Clair and Lacroix appears as an obviously desirable feature. The need for creation of this through artery over Third Street is explained elsewhere in the Report, and it results from the need to make maximum use of the available three bridges. The only feasible direct connection between Third Street and Lacroix is over Wellington, and this street should be widened to four lanes. The intersection of Lacroix and Richmond will also need widening and considerable improvements as shown on Plate No.17. A railway underpass is needed in this artery separating Lacroix and the C.N.R.

3. The next important north-south artery to be discussed is the route over Victoria and Thames, Fifth Street and Queen Street and Centre Street. The route over Queen Street is the main access into the Central Business District from the south. The route from Highway No. 2 over Thames and Fifth Street is the logical access from the east into the Central Business District. The improvements needed at Thames and Grand and Thames and Victoria are of a minor nature (See Plate No. 17). The improvements at the southern part of this route along Queen Street are, however, of great importance to the traffic in the City of Chatham.

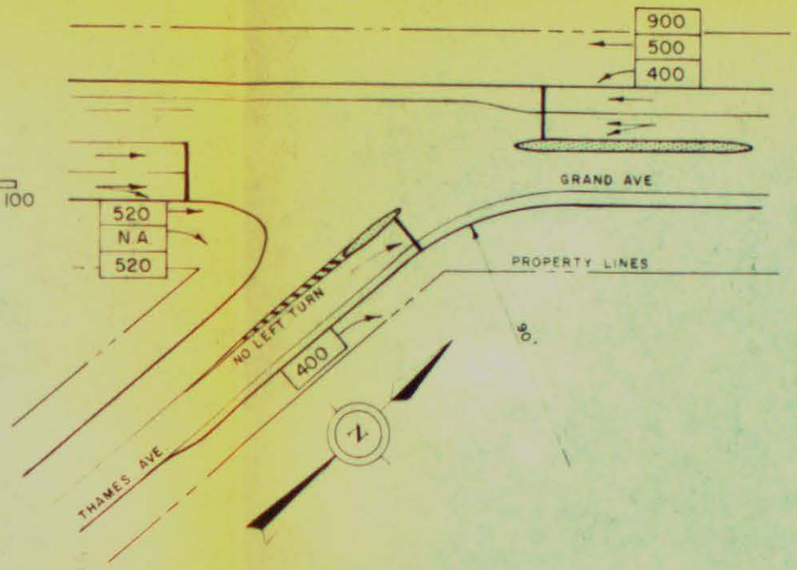
Improvements are needed at the following intersections:

(a) Queen and School; Centre and School; Queen and Richmond; Centre and Park.

This total complex of intersections has been studied as one problem and it is our recommendation that the capacity and congestion problems at this group of intersections be solved by making Queen Street and Centre Street a pair of one-way streets. The use of one-way streets will solve traffic problems at Queen and School, and at Centre and School, without any additional right-of-way costs.

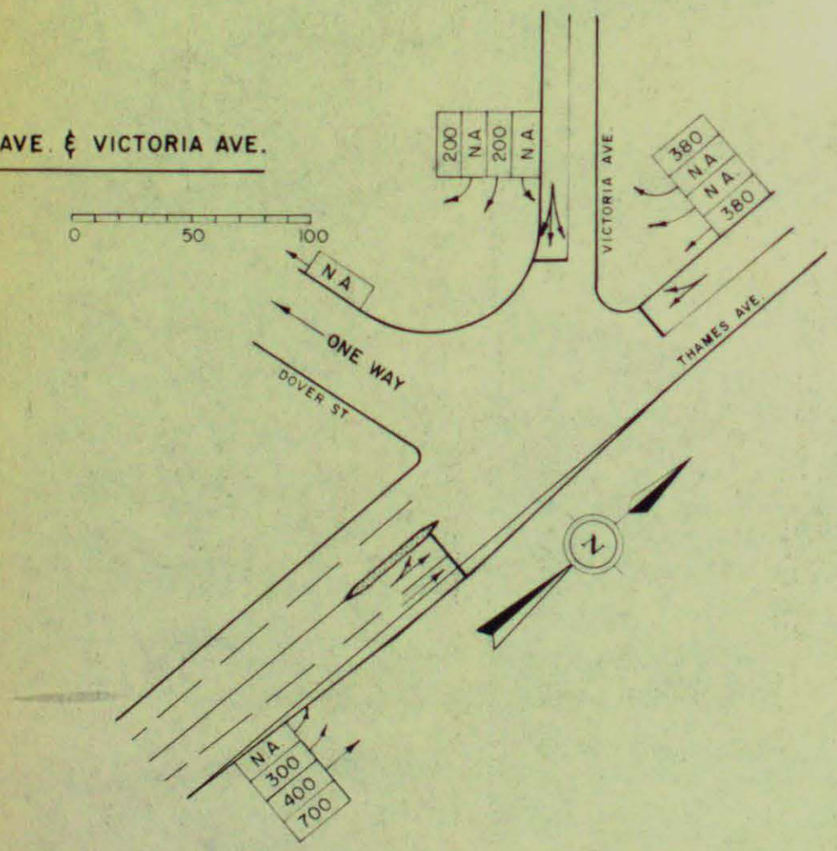
THAMES AVE. & GRAND AVE.

Scale in feet: 0 50 100



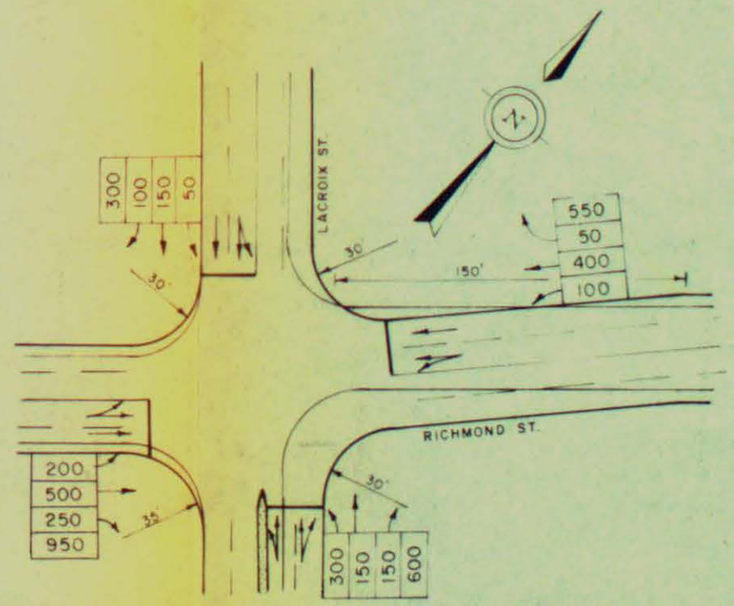
THAMES AVE. & VICTORIA AVE.

Scale in feet: 0 50 100



RICHMOND ST. & LACROIX ST.

Scale in feet: 0 50 100



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

910	TOTAL	1981 DESIGN HOUR VOLUMES
360	RIGHT TURNS	
550	THROUGH	
0	LEFT TURNS	

N A — NO TRAFFIC ASSIGNED

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

In that case at least rush-hour parking restrictions will become necessary in the future on Queen Street to provide sufficient capacity between Richmond and Queen.

A connection between Richmond from the industrial area in the western part of the City to the interchange at County Road No. 14 (Creek Road) would be desirable. The same applies for a connection between the Central Business District and this interchange, as this interchange will be used for traffic moving in an eastern direction to and from Chatham. Such a connection can be achieved by connecting Richmond Street to Park Street.

(b) Richmond and Queen.

Several solutions have been tried to provide an intersection for the traffic from Richmond Street on Queen, Centre and Park. The different solutions tried are shown on Plate Nos. 18,19,20 and 21.

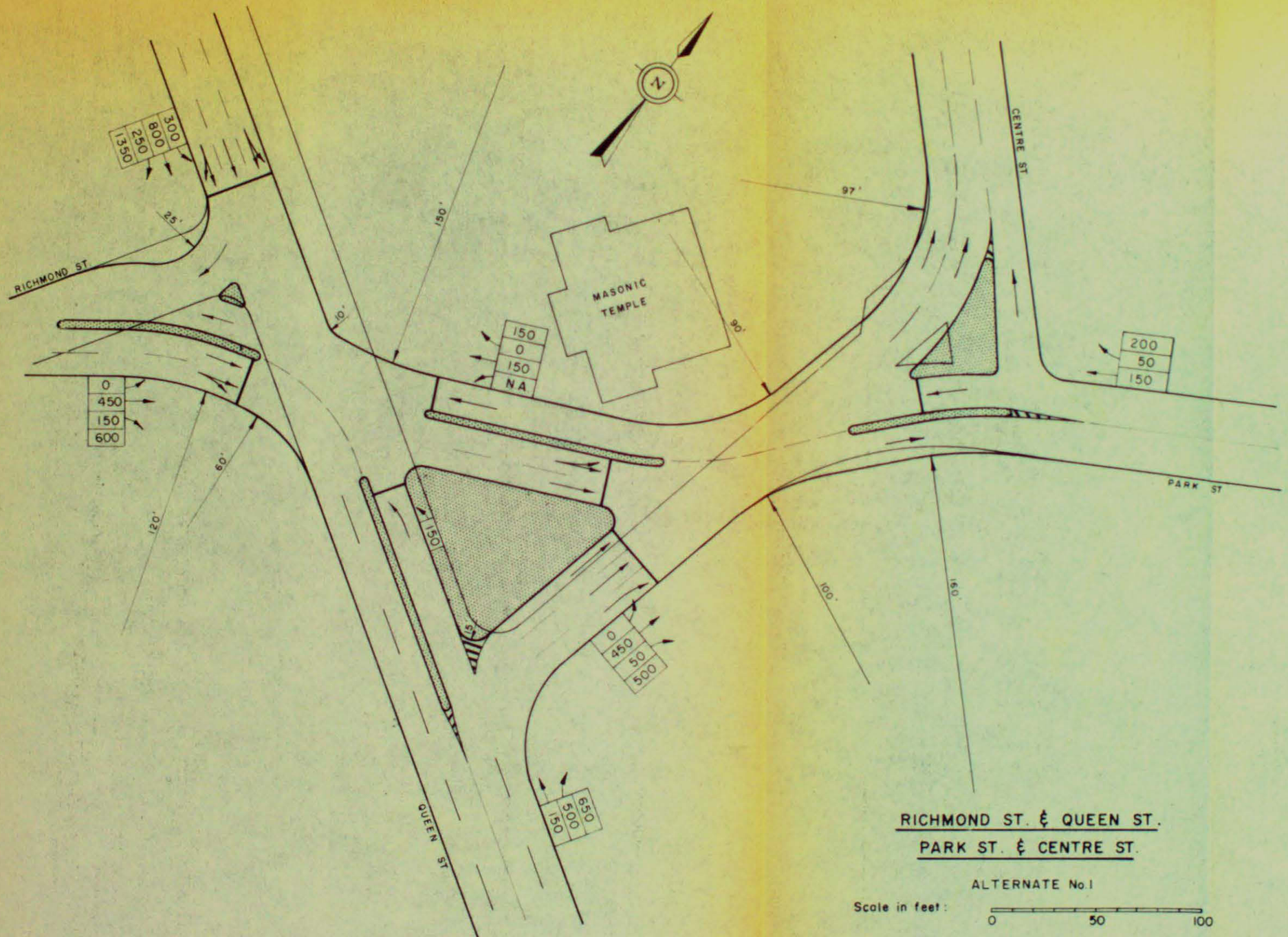
Cost estimates and capacity calculations have been made for each of the different possibilities tried. The main difficulty in providing a reasonable design in this location is the problem of connecting Queen Street, Centre Street, Park Street and Richmond Street together. Heavy traffic volumes turning left from Richmond Street to travel to the Central Business District are anticipated. Another difficulty is the fact that the Masons Building is in the way of a direct connection between Richmond and Park Street. All intersection designs tried start from the assumption that Queen Street and Centre Street can be made one-way streets. It would be impossible to provide a reasonable solution otherwise except at the cost of considerable property damages especially near the intersection of Richmond and Queen and also probably at the intersection of School and Queen.

In the case of two-way traffic, it can be expected that the intersections of Richmond and Queen and School and Queen will not operate in the future with parking during rush hours and parking would have to be removed from Queen Street.

The proposed one-way streets would have sufficient capacity to allow parking and parking need not be removed. Cost comparisons made for the construction cost and the ability to handle traffic leads to the recommendation of the intersection shown on Plate No. 21.

From a traffic engineering point of view, this intersection design is less desirable than the one shown on Plate No. 20, but because of the cost involved in the removal of several buildings, the design shown on Plate No. 21, is favoured.

PLATE 18



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

910 TOTAL
360 RIGHT TURNS
550 THROUGH
0 LEFT TURNS
} 1981 DESIGN HOUR VOLUMES

N A NO TRAFFIC ASSIGNED

RICHMOND ST. & QUEEN ST.
PARK ST. & CENTRE ST.

ALTERNATE No. 1

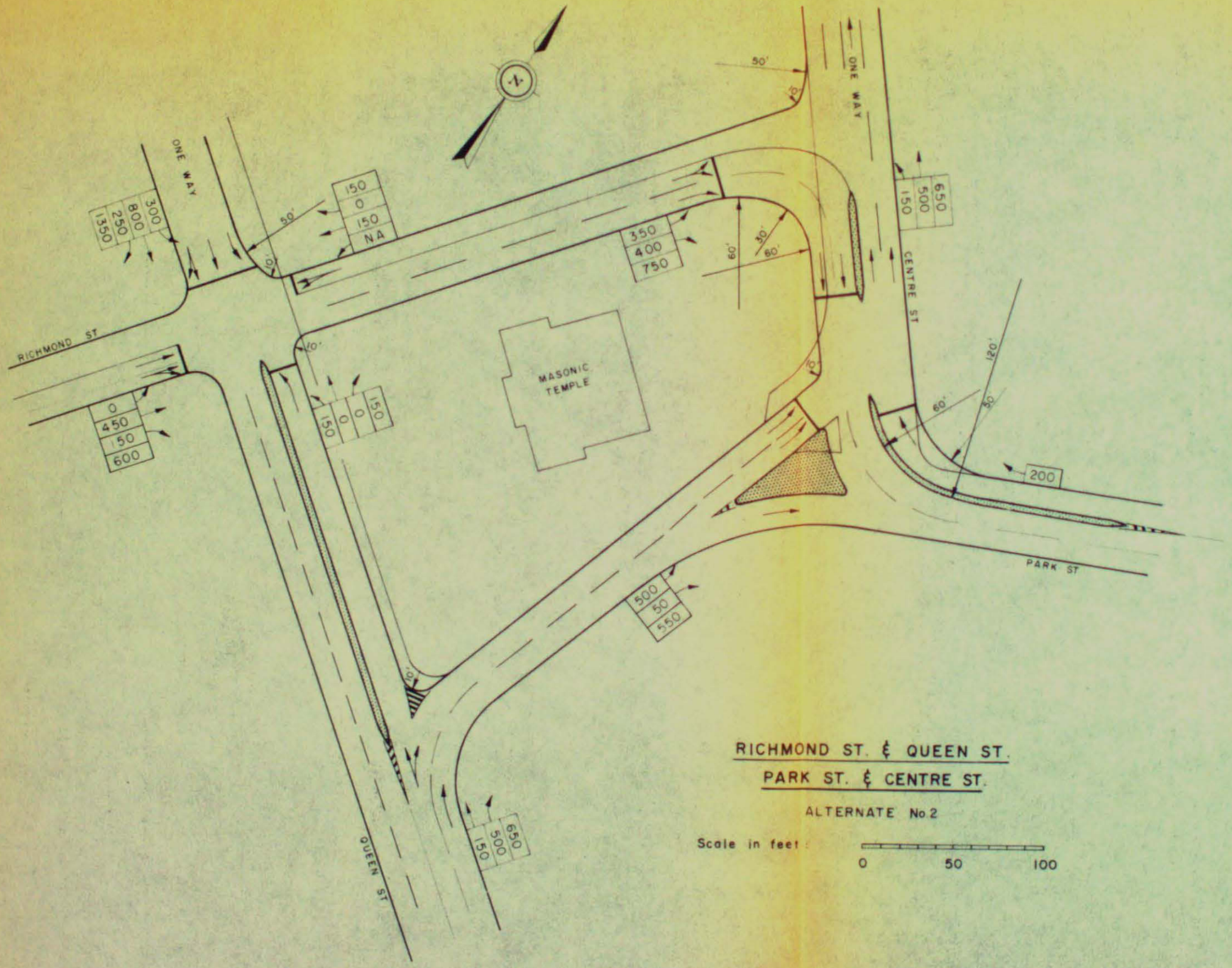
Scale in feet: 0 50 100

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

PLATE 19



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

910	TOTAL	1981 DESIGN HOUR VOLUMES
360	RIGHT TURNS	
550	THROUGH	
0	LEFT TURNS	

N.A. NO TRAFFIC ASSIGNED

RICHMOND ST. & QUEEN ST.
PARK ST. & CENTRE ST.

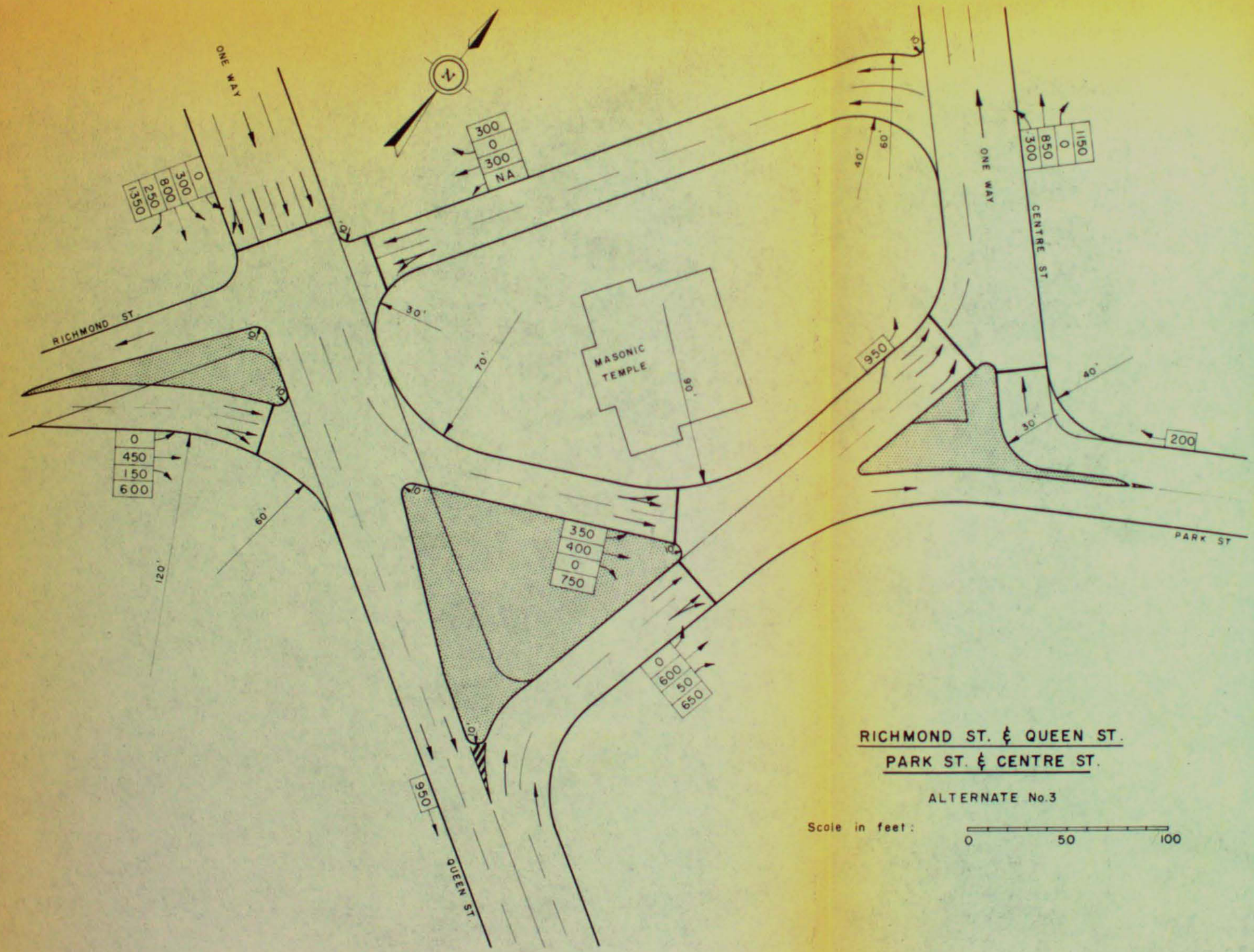
ALTERNATE No 2

Scale in feet: 0 50 100

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

910	TOTAL	1981 DESIGN HOUR VOLUMES
360	RIGHT TURNS	
550	THROUGH	
0	LEFT TURNS	

N A — NO TRAFFIC ASSIGNED

RICHMOND ST. & QUEEN ST.
PARK ST. & CENTRE ST.

ALTERNATE No.3

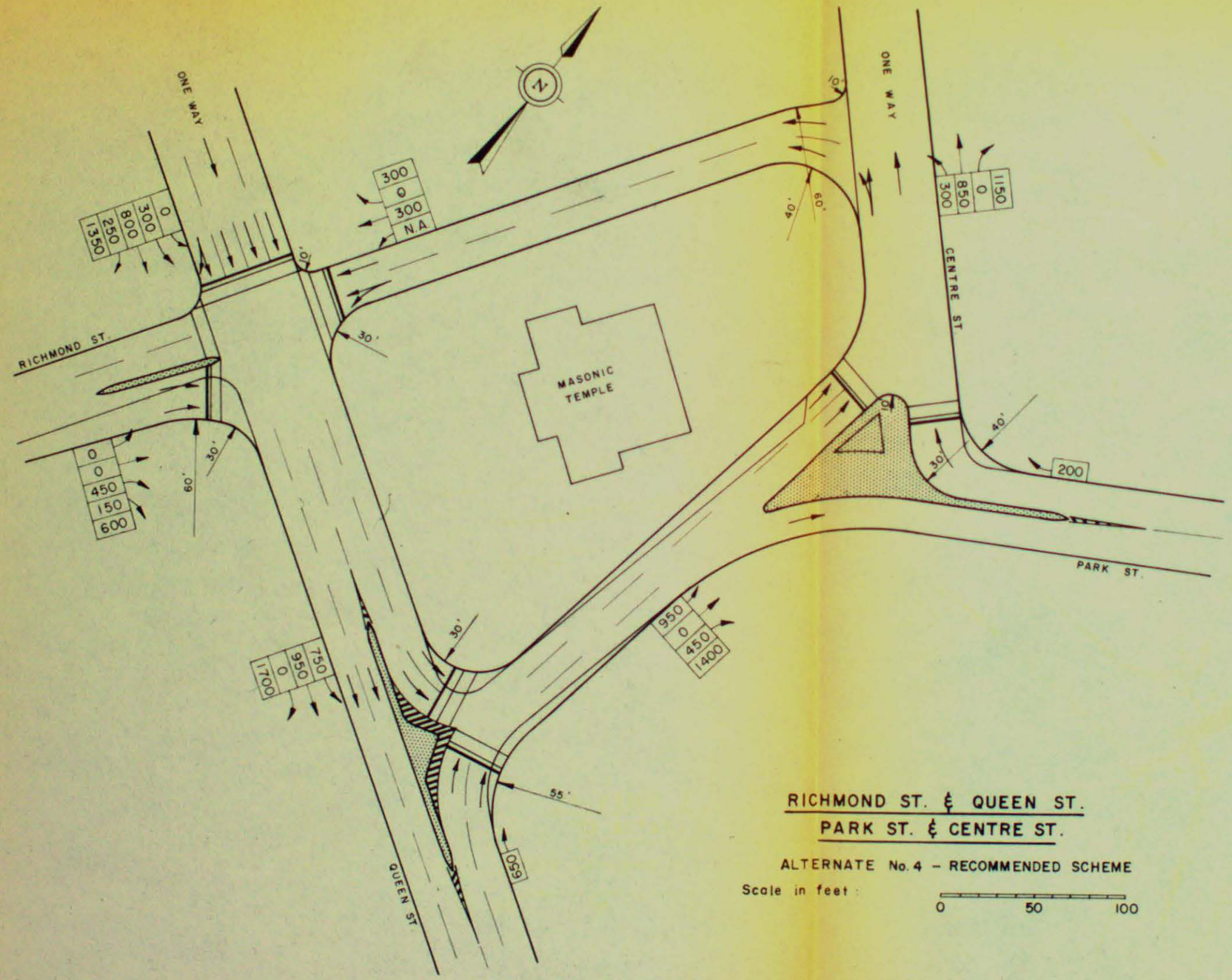
Scale in feet: 0 — 50 — 100

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

PLATE 21



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

1981 DESIGN HOUR VOLUMES

910	TOTAL
360	RIGHT TURNS
550	THROUGH
0	LEFT TURNS

N.A NO TRAFFIC ASSIGNED

RICHMOND ST. & QUEEN ST.
PARK ST. & CENTRE ST.

ALTERNATE No. 4 – RECOMMENDED SCHEME

Scale in feet: 0 50 100

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

(c) Fifth and Wellington:

This is another troublesome intersection. This is again, in effect, a five-legged intersection where Wellington from two directions, Fifth treet from two directions, and Sixth Street converge at one point. One solution to the improvement of this intersection would be to make Sixth Street one-way in a south to north direction. A second way which retains the use of Sixth Street as a two-way road is shown on Plate No. 22. The recommended design shown allows four-lane traffic on Fifth Street.

To achieve maximum capacity of Fifth Street between King Street and Wellington, all parking on Fifth Street should be removed. It is also advisable to move the bus stops located on the west side of King Street in such a way that the three buses stopped at this location are located midway between King and Wellington.

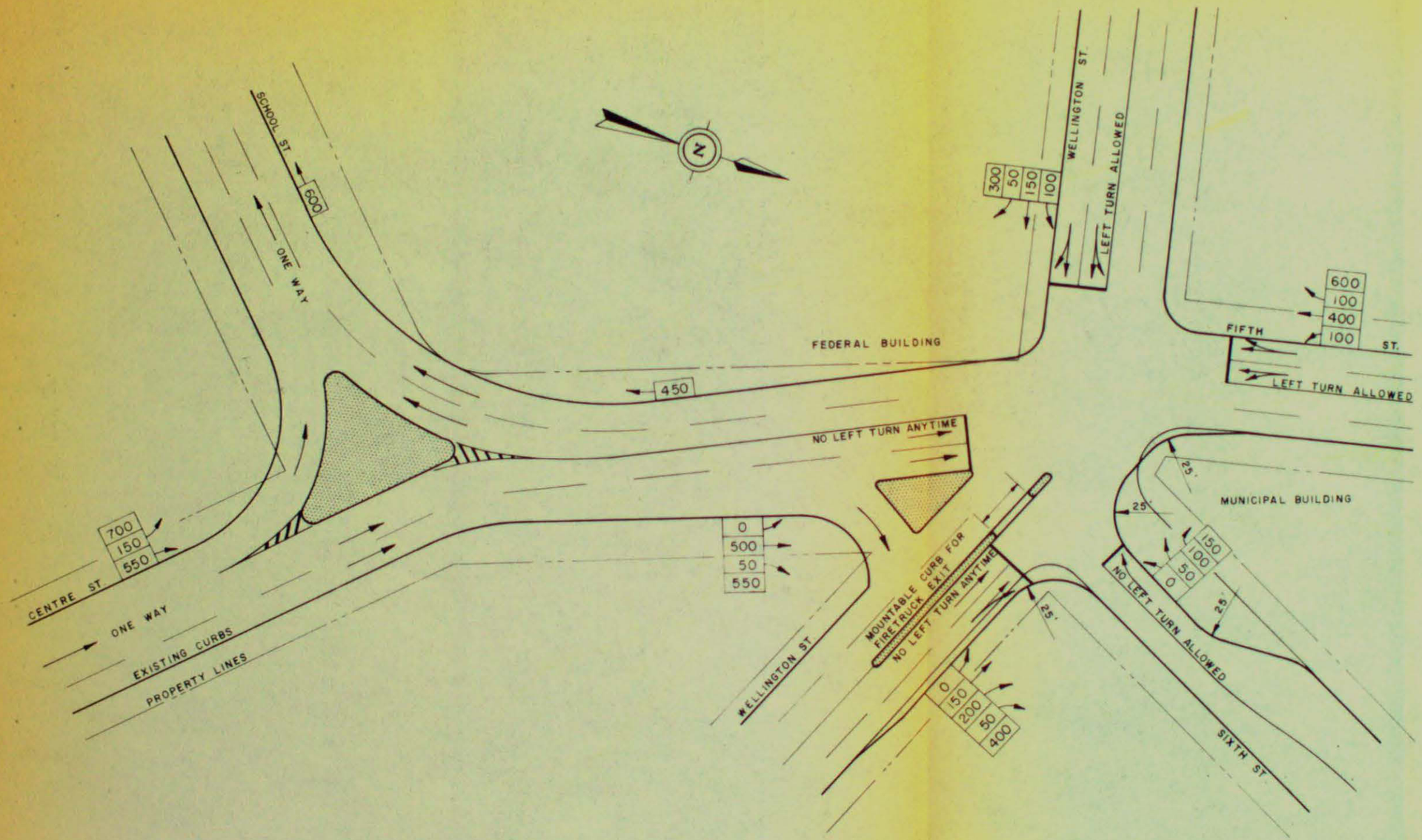
It would be worthwhile to discuss with the Transit Company the location of a downtown bus terminal in such a way that the bus stops at Fifth Street could be removed. Both bus stops north and south of the King and Fifth Street intersection are interfering considerably with the traffic on this important artery and an arrangement in the centre of the downtown area, for instance, at or near the market, might be worked out to the satisfaction of the Transit Company and the transit riders.

(d) Queen Street and William Street:

The improvement of Queen Street by means of a new underpass at the C.N.R. Railway crossings is under consideration. Such construction in combination with the above recommended intersection improvements along Queen Street will greatly facilitate traffic movements into downtown Chatham from the south. The building of this underpass would disconnect Queen Street and William Street.

William Street, at present, forms a convenient entrance road into the eastern part of the City and the eastern section of the Central Business District. William Street attracts according to the counts in 1962 33% of the total traffic crossing the railroad near Queen Street. Queen Street north of the railroad crossing attracts 66% or two-thirds of the traffic. It is obvious that as Queen Street attracts twice as much of the total railroad crossing traffic as William Street, Queen Street should dominate in the design of the new intersection with William Street.

PLATE 22



LEGEND

- EXISTING PROPERTY LINE
- CURB AFTER RECONSTRUCTION
- EXISTING CURB TO BE REMOVED
- CURBED ISLAND

1981 DESIGN HOUR VOLUMES

910	TOTAL
360	RIGHT TURNS
550	THROUGH
0	LEFT TURNS

N A — NO TRAFFIC ASSIGNED

CENTRE ST., WELLINGTON ST., FIFTH ST. & SIXTH ST.
CENTRE ST. & SCHOOL ST.

Scale in feet: 0 50 100

CITY OF CHATHAM TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

An intersection very close to the railroad crossing structure has been suggested. The disadvantages of this location are that considerably more construction costs and right-of-way costs are involved. In addition to this, the location is poor from a traffic engineering point of view. The intersection would be located at the lowest part of a 5% to 6% grade with all its unsafe possibilities, especially during the winter months. It is recommended that a new connection with William Street and Queen Street be created at the location of the intersection of Queen and College Streets. Such an intersection capable of handling the future traffic for twenty years is shown on Plate No. 23. The treatment is considerably cheaper, giving the same service to the traffic and is very much safer. Even in icy conditions no difficulty in starting of the traffic is to be expected.

Table No. 11 shows the capacity rating for 1981 conditions of the improved intersections. Also shown is the rating if no improvement is made. (Table 11 is on page 72.)
A rating higher than 1.00 indicates conditions gradually increasing in level of congestion until at a rating of 1.40 - 1.50 completely jammed conditions are indicated. Ratings higher than 1.50 indicate that more traffic desires to pass this location than can be accommodated.

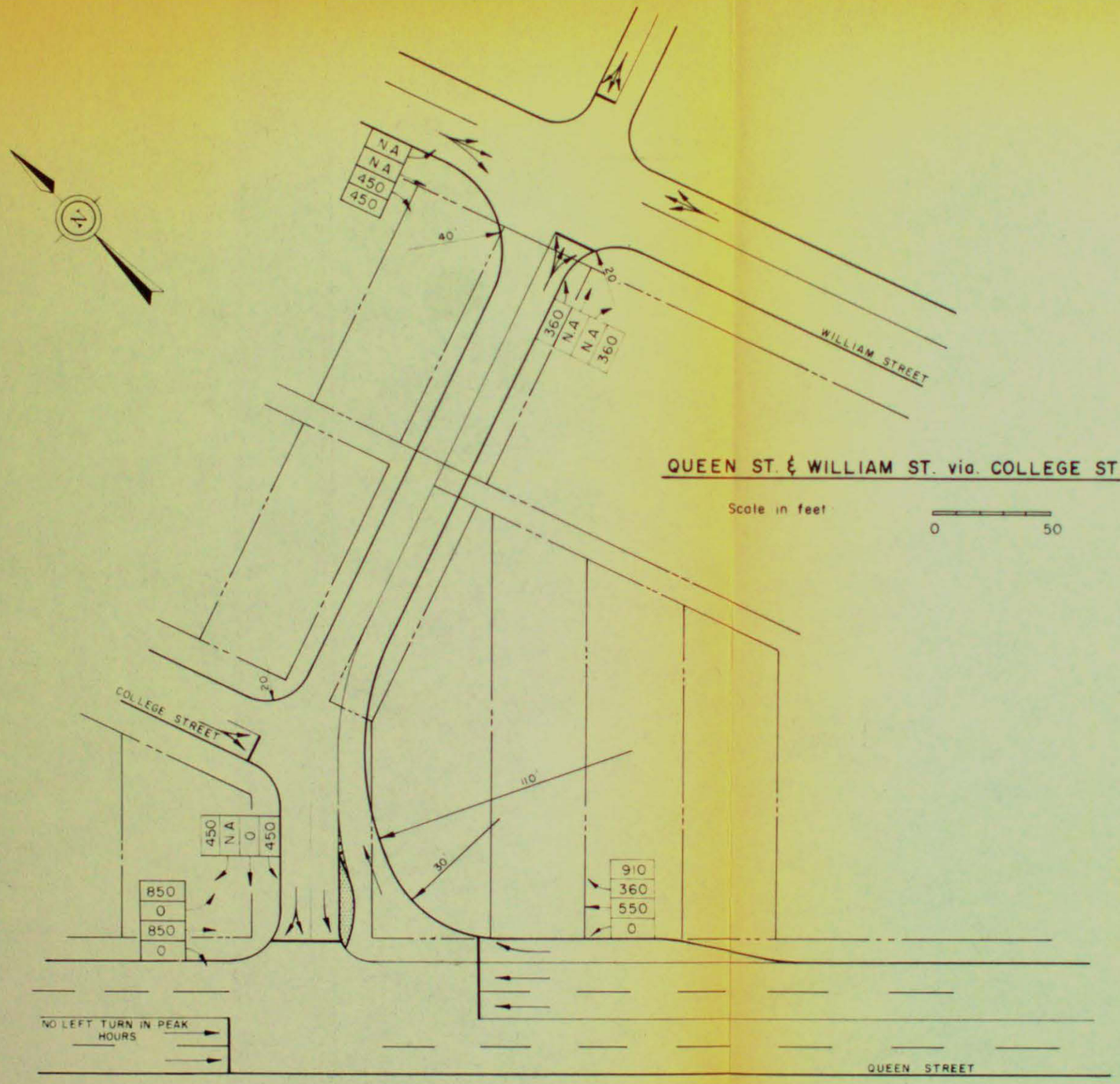
Staging of Construction

The network of major streets as discussed and shown on Plate No. 1 is planned to handle the increase in traffic for the coming twenty years. As this increase in traffic takes place gradually over the twenty-year period, the construction should be staged. The recommended staging of construction is shown on Plate No. 2, and described in Table Nos. 1(a); 1(b); and 1(c).

In the next paragraph the reasoning used to determine this staging of construction is discussed. It should be pointed out however that this staging has a certain flexibility. In case circumstances change the rate of construction can be slowed down or speeded up and priorities can be changed.

The following reasoning was used for the staging of construction programme:

PLATE 23



QUEEN ST. & WILLIAM ST. via COLLEGE ST.

Scale in feet

0 50

LEGEND

EXISTING PROPERTY LINE

CURB AFTER RECONSTRUCTION

EXISTING CURB TO BE REMOVED

CURBED ISLAND

910 TOTAL
360 RIGHT TURNS
550 THROUGH
0 LEFT TURNS
1981 DESIGN HOUR VOLUMES

N A NO TRAFFIC ASSIGNED

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

INTERSECTION IMPROVEMENTS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

TABLE NO. 11

INTERSECTION CAPACITY RATINGS

Intersection Location	Design Capacity Rating		
	Existing Intersections I961 Volumes	Existing Intersections 1981 Volumes	Design Improvements 1981 Volumes
King and Fifth	1.10	1.65	1.00
Wellington and Third	0.65	0.98	0.90
Wellington and Fifth	0.95	1.42	0.90
School and Queen	0.85	1.27	0.75
Thames and Fifth	0.80	0.65	0.65
Thames and Victoria	1.35	2.02	0.65
Grand and Thames	0.90	1.35	0.75
Grand and Victoria	0.70	1.05	0.72
Grand and St. Clair	0.97	1.45	1.10
Grand and Keil	0.86	1.29	0.74
Tweedsmuir and Queen	0.77	1.15	0.75
Park Avenue and Queen	0.88	1.32	1.00
Park Avenue and Lacroix	0.68	1.02	0.90
Richmond and Keil	1.07	1.60	1.05
Richmond and Merritt	0.92	1.38	1.10
Richmond and Lacroix	1.53	2.29	1.15
Richmond and Queen	1.00	1.50	0.63
Park Street and Queen	0.93	1.39	0.81
Park Street and Centre	0.50	0.75	0.66

Stage I:

As Highway 401 will be open for traffic near Chatham in the foreseeable future the connection between the street system of Chatham and the two Highway 401 interchanges already under construction has to be provided at an early date. Indian Creek Road forms the connection between the major street system and the roads leading to either interchange. Indian Creek road should be widened, paved and connected to Bloomfield Road. Improvements are needed also on Bloomfield Road and on County Road No. 14. After this construction is completed a direct connection between Highway 401 and several major roads of the City of Chatham is possible.

At present Queen Street already forms a major entrance into the Central Business District from the south. After the opening of Highway 401 this road will attract some additional traffic from Highway 401 over Indian Creek Road. The improvement of Queen Street should therefore have high priority. This improvement should take place in the form of the Queen Street - C.N.R. underpass and improvements of intersections on Queen Street and Centre Street. Queen Street forms an excellent route into the Central Business District of Chatham from the south but it is not as successful in facilitating traffic that wishes to cross the Thames River. The routes over Third Street Bridge and over Keil Drive will form better alternatives for traffic that desires to cross the river when the major street system as proposed is completed.

Tied in with the improvement of Queen Street should be the connection of Richmond to Park Street. At the same time the intersection of Lacroix and Richmond, the most congested intersection in the City should be improved.

Improvements on the north side of the river in Stage I are the widening over the full length of Highway 40, (St. Clair Street) to Grand Avenue. This widening is now completed except for further widening of the St. Clair-Grand Avenue intersection and provides a north-south connection from the northern end of the City into the Central Business District. This traffic will cross the River at Third Street Bridge and then turn left at either King Street or Wellington Street. The intersection channelizations on Third Street at the intersection with King and Wellington will provide sufficient capacity for this left turning traffic.

Stage II

The construction of either Keil Drive Extension or the improvement of the routes over the Third Street Bridge form the next stages of construction. The extension of Keil

Drive is chosen to have priority in the staging above the Third Street Bridge routing for the following reasons.

1. Bloomfield Road north of Indian Creek Road is not wide enough to handle truck traffic to and from the industries in the western part of Chatham. A direct truck route between the interchange at Bloomfield Road and the industries west of Chatham and in addition to Highway 40 north of the City, would be advantageous.

2. It is expected that the growth of new traffic that is generated by new developments in Chatham will be concentrated in the western part of the City as it is in this part of the City that the majority of the industrial and residential developments will take place. To provide for this new traffic Keil Drive Extension is better located than Third Street.

   The next stage of construction is therefore the extension of Keil Drive in a southerly direction until it meets Indian Creek Road, and in a northerly direction until it meets MacNaughton Boulevard. This includes the construction of an overpass over Park Avenue.

   As this route will not be completed until several years after completion of Highway 401, a problem exists how to handle truck traffic from Bloomfield Road interchange. Study of the road map of the area shows that the travel time to reach Chatham from the Tilbury interchange is nearly equal using either Highway 2 or Highway 401. The distance over Highway 2 is slightly less than over Highway 401. Truck traffic from the western section of Highway 401 can therefore enter Chatham over Highway 2 without any inconvenience. From the east, truck traffic can enter over County Road No. 14, and thereafter over Indian Creek Road, Queen Street and Richmond. Bloomfield Road north of Indian Creek could be closed to truck traffic.

   As the reconstruction of Lacroix Street is planned for Stage III resurfacing is needed of Lacroix Street in the beginning of Stage II. Widening and reconstruction can be done after, or at the same time as reconstruction of Wellington Street between Lacroix and Third. An alternative is to reconstruct Lacroix Street at the end of Stage II, and, in this way, save maintenance cost at the expense of an earlier capital investment.

Stage III

The next stage is the connection of Lacroix to Third Street Bridge. To connect Lacroix to Third Street Bridge the widening of Wellington is necessary. However, it is possible

to create a temporary connection by means of providing a one-way route over Wellington in a north to south direction (this is therefore in the reverse direction as Wellington Street is used as a one-way street now). Raleigh Street will be used by the traffic in opposite direction. This traffic has therefore to make a left turn at the intersection of Richmond and Raleigh Streets. Widening of Richmond Street will provide the capacity to allow this left-turning traffic. When this left-turning traffic becomes too heavy to be handled, even on a widened Richmond Street, then the time has come to widen Wellington.

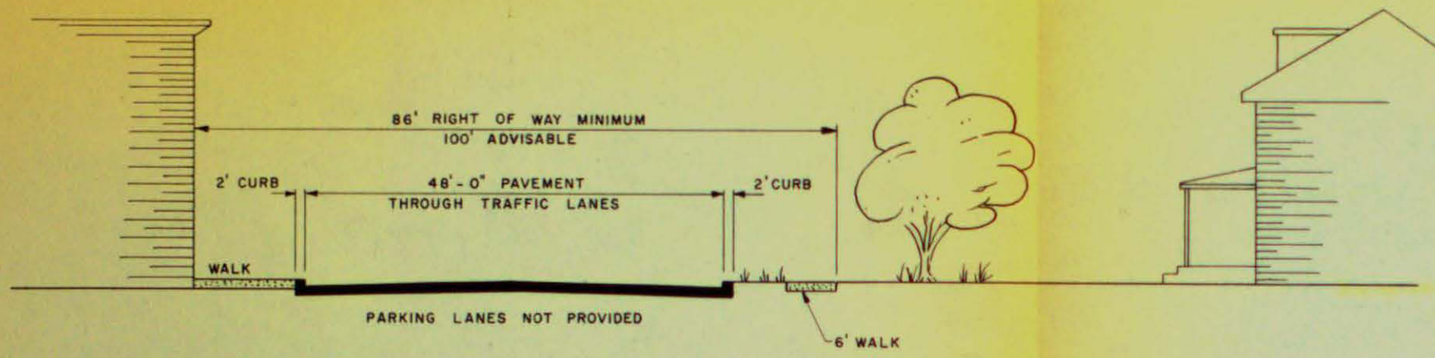
The street system will have to be developed further after this 20 year period. Some consideration should be given to the planning of the roads beyond the year 1981. By proper planning procedures it will be possible to avoid unnecessary difficulties in the location of roads and bridges beyond the year 1981. Three main aspects deserve attention:

1. A further extension of Keil Drive from MacNaughton to Highway 40 north of the City Limits of Chatham is proven not to be needed for the coming twenty years; however, it is good planning practice to keep space open for such a road if and when needed in the time beyond the twenty year period for which we are planning.

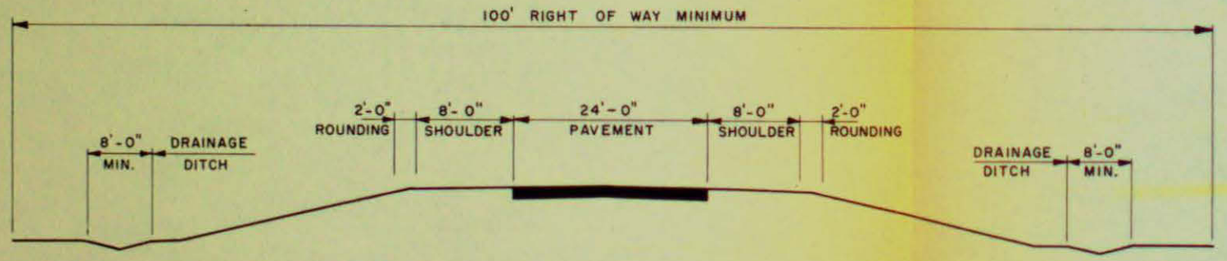
2. These same considerations are valid for locations of future bridges. While we have concluded that for the coming twenty years no new bridges are needed this does not mean that after this period the need will not arise. During this study, it became quite apparent that the two street systems north and south of the Thames River are poorly related to each other. The location for a new bridge in the built-up area of Chatham is difficult to find as such a new bridge needs long feeder roads from each side to be effective. Development of the land north of the Thames River on the extension of the right-of-way of Merritt Avenue should be planned in such a way that a future bridge and a future major arterial road over Merritt would be possible there.

3. To facilitate further widening, it is advisable that all major roads have more than 66 feet right-of-way. To achieve this, legislation should be adopted to cause new construction on major roads to be set back. The set back should be sufficient to make the requisitions of 100 feet right-of-way possible. On major roads without existing development, 100 feet right-of-way should be acquired.

   Plate No. 24 shows typical cross-sections for urban and rural roads of the type intended to be used in Chatham.



FOUR LANE UNDIVIDED HIGHWAY URBAN



TWO LANE HIGHWAY RURAL

C I T Y O F C H A T H A M
T R A F F I C P L A N N I N G R E P O R T

TYPICAL SECTIONS

Cost Estimate

A preliminary cost estimate of the proposed major road scheme has been prepared to determine capital required during the coming twenty years. These costs include resurfacing of roads necessary, due to deterioration resulting from traffic or weather conditions.

The cost estimate, divided into Stages I, II and III, assists the City of Chatham in developing a long-term budget. In addition to dividing the costs into three stages, an approximate division into the following classifications has been made: outside City Limits; Inside City Limits, connecting link; and inside City Limits not a connecting link. It should be noted that the classification for each individual project is the subject of ever-changing legislation. For this reason, these divisions must be considered as an approximate guide only.

The cost estimate for the major road scheme has been broken down into the following sections:

(a) Roadway Construction

This includes:
- excavation
- drainage for new roadway
- relocation of utility poles
- pavement
- granular base
- sodding
- concrete curb and sidewalk
- removal of existing concrete curb, sidewalk and asphalt

(b) Structures

This includes the cost of the bridges only and does not include approaches, which are included under "roadway construction".

The cost of each major intersection to be constructed or re-built has been estimated separately, and the cost of reconstructing the connecting roads is based on typical 100 foot sections. Each structure has been estimated separately on a square foot basis.

Tables 1(a), 1(b) and 1(c) summarize the costs for each project for each of the three stages.

The total cost of Stage I excluding right-of-way and the grade separation of C.N.R. and Queen Street is estimated at $826,500.00.

The total cost of Stage II excluding right-of-way is estimated at $956,900.00.

The total cost of Stage III excluding right-of-way is estimated at $1,442,400.00.

The total cost of the major street system including repaving, excluding right-of-way, is $3,225,800.00.

SECTION VII

RAILWAY CROSSINGS

Three main railway lines pass through the City of Chatham, these being: Canadian National Railways, branch line from London to Windsor; Canadian Pacific Railway, main line from Toronto to Detroit; and Chesapeake and Ohio Railway, branch line fron Blenheim to Sarnia. In addition, the Wabash Railroad has freight running rights over the Canadian National trackage, but does not pick up or set off cars in the City.

Because of their locations, operations at the Canadian Pacific Yard and the Chesapeake and Ohio Yard cause very little interference with vehicular traffic. However, this is not the case with the Canadian National grade crossings on Queen Street and William Street, and the Canadian Pacific crossing on William Street. These three crossings are located in close proximity to the railway stations and are blocked by train operations for considerable lengths of time. In order to assess the situation, special studies were carried out at the crossings early in August, 1961 when, for a period of one week, 24-hour observations were made of the number of trains per hour causing a blockage and the total time the crossing was blocked. Additional observations were made on the type of trains (passenger, through freight, etc.) and directions of movement. In the following table a summary has been made from the observations showing by day the total number of times and the total number of minutes each crossing was blocked between the hours of 7:00 a.m. and 7:00 p.m.

The reason the presentation has been made for the hours of 7:00 a.m. to 7:00 p.m rather than for the whole day is that it is during the former period most of the daily trips are being made and people are most conscious of delays. It should be noted that on the average day during the week the study was made, the Canadian National crossing at Queen Street was blocked for 58 minutes or 8% of the 12-hour period and that on Friday, August 4th, the actual figure was 80 minutes or 11% of the 12-hour period. Conditions at the Canadian National and William Street crossing were practically identical; because of their proximity, the two crossings can be considered as one.

While it is generally unsound to use measurements made during one week as being representative of the whole year, the nature of railway operations is such as to expect the observations to be reasonably representative. The conclusion can be reached that, on the basis of this survey, the condition at CNR-Queen and William insofar as traffic is concerned leaves much to be desired because of the importance

Crossing / Day & Date	Total No. Times Crossing Blocked 7 a.m.-7 p.m.			Total No. Minutes Crossing Blocked 7 a.m.-7 p.m.		
	CNR & Queen	CNR & William	CPR & William	CNR & Queen	CNR & William	CPR & William
W Aug. 2	31	27	17	51	50	28
T Aug. 3	40	38	18	62	61	30
F Aug. 4	50	47	19	80	78	34
S Aug. 5	31	29	10	66	64	23
S Aug. 6	17	12	9	30	24	17
M Aug. 7	37	34	27	58	54	34
T Aug. 8	43	33	19	58	56	21
Average for Week	36	31	17	58	55	27

of this crossing to vehicular movement.

The matter of determining which grade crossings should be grade-separated is one for which no satisfactory method has yet been devised. However, it is possible to arrange the crossings by means of a priority system based on what is known as the Exposure Factor. This represents the Average Daily Traffic on the crossing street multiplied by the Average Daily Number of trains. It does not take into account such features as speed of rail or highway traffic, sight distances, topography, accident records or construction costs, but can serve as a guide to identifying those crossings which deserve study in greater detail.

In the following table the Exposure Factor has been worked out for both 1961 and 1981 at the various crossings on the major streets. For 1981 assignment values are used. The number of train movements for 1981 is assumed to be the same as in 1961.
(Table is shown on Page 81)

The exposure factor rating shows that this railway crossing affects approximately twice the amount of traffic compared to the crossing of the C.P.R. line with Queen and Centre rated as second. Considering the heavy conflict of trains and traffic at this location significant delays are experienced here as also shown on the delay map (Plate No. 3). It is understood that the situation is presently under review by the City and Canadian National Railways. The grade separation of this crossing is warranted and is recommended as part of Stage I.

The grade separation of Queen and Centre and the C.P.R. Railway line is rated second. This grade separation appears economically not feasible considering the built-up character of the district and the close proximity of the Richmond and Queen Street intersection located only 200 feet from this Railroad. No grade separation is therefore recommended in our major street plan.

A grade separation of the C.N.R. and Lacroix is rated third. Its grade separation is recommended and it can be accomplished without too much difficulty. A grade separation of Keil Drive Extension and the C.N.R. is recommended for other reasons than delay only. Its construction is needed as a level crossing over the C.N.R. line and C.P.R. Spur line is not feasible because of different levels of those railway lines. In addition the creation of a level crossing in a newly constructed major artery is not advisable from a policy point of view, if it can be avoided. The grade separation of the C.P.R. and Keil Drive and the C.P.R. and Lacroix should be reconsidered after the development of the Major Street Plan is well advanced. Any right-of-way in the vicinity of these crossings should therefore be protected to make grade separation possible at some future date if needed.

The crossing of C.N.R. and C. & O. and Indian Creek have crossing signs as a protection. These two crossings will be on roads of the future Major Street Plan and are expected to experience a considerable increase in traffic and should therefore be protected by automatic equipment. The only non-automatically equipped crossing in the City is the crossing of C.N.R. and Colbourne. Installation of automatic equipment at this location would provide a uniform system of protection throughout the City of Chatham.

Exposure Factor Rating at Major Street Level Crossings

Railway	Street	Existing Protection	Trains Per Day	Vehicles Per Day		Exposure Factor (000's)		Rating	
				1961	1981	1961	1981	1961	1981
CNR	Lacroix	Flashing Lights, Bell	54	9000	12500	490	675	3	3
CNR	Queen)	Manual gates	57	19000	32500	1080	1850	1	1
CNR	William)								
CNR	St. George	Flashing Lights, Bell	20	1300	1300	26	26	13	18
CNR	Degge-Park	Flashing Lights, Bell	20	4700	7400	94	148	8	9
CNR	Sass	Crossing Sign	20	700	1500	14	30	17	17
CNR	Keil Dr.		25	--	7600	--	190	--	8
CPR	Keil	Flashing Lights, Bell	18	11400	16800	205	302	5	5
CPR	Merritt	Flashing Lights, Bell	18	1900	2200	34	40	12	15
CPR	Lacroix	Wig-wag, Bell	30	3800	8000	114	240	7	7
CPR	West	Wig-wag, Bell	30	2300	3700	69	111	10	11
CPR	Raleigh	Wig-wag, Bell	30	700	2500	21	75	15	12
CPR	Queen & Centre	Gates, lights, bell	30	17500	30100	525	903	2	2
CPR	Wellington	Wig-wag, Bell	30	2500	4300	75	129	9	10
CPR	William	Manual gates	31	6600	11300	205	350	4	4
CPR	King-Adelaide	Wig-wag, Bell	31	9000	8000	155	248	6	6
CPR	Princess	Wig-wag, Bell	30	140	170	4.2	5.1	20	21
C&O	Indian Creek	Crossing sign	8	1100	2700	8.8	21	19	20
C&O	Park Ave.	Flashing light, Bell	10	1300	2200	13	22	18	19
C&O	Park St.	Wig-wag, Bell	10	2500	5100	25	51	14	14
C&O	Colborne	Crossing sign	10	1500	3300	15	33	16	16
C&O	Grand	Flashing light, Bell	8	7100	7100	57	57	11	13

SECTION VIII

CONNECTING LINKS

The roads connecting the King's Highway in the City of Chatham are shown on Plate No. 25. Highway No. 2 is signed over two alternative routes. These routes are:

1. Over Richmond Street, Keil Drive and Grand Avenue west and east which is the regular Highway No. 2 route.

2. Over Richmond Street, School Street, Fifth Street and Thames Street to Grand Avenue, signed as Highway No. 2 alternate.

Highway 40 is signed as such over St. Clair Street, Union Street, Third Street and Raleigh Street, ending at the intersection of Raleigh and Richmond.

A connecting link agreement between the City and the Province covers only a part of the length of those routes and is shown on Plate No. 25.

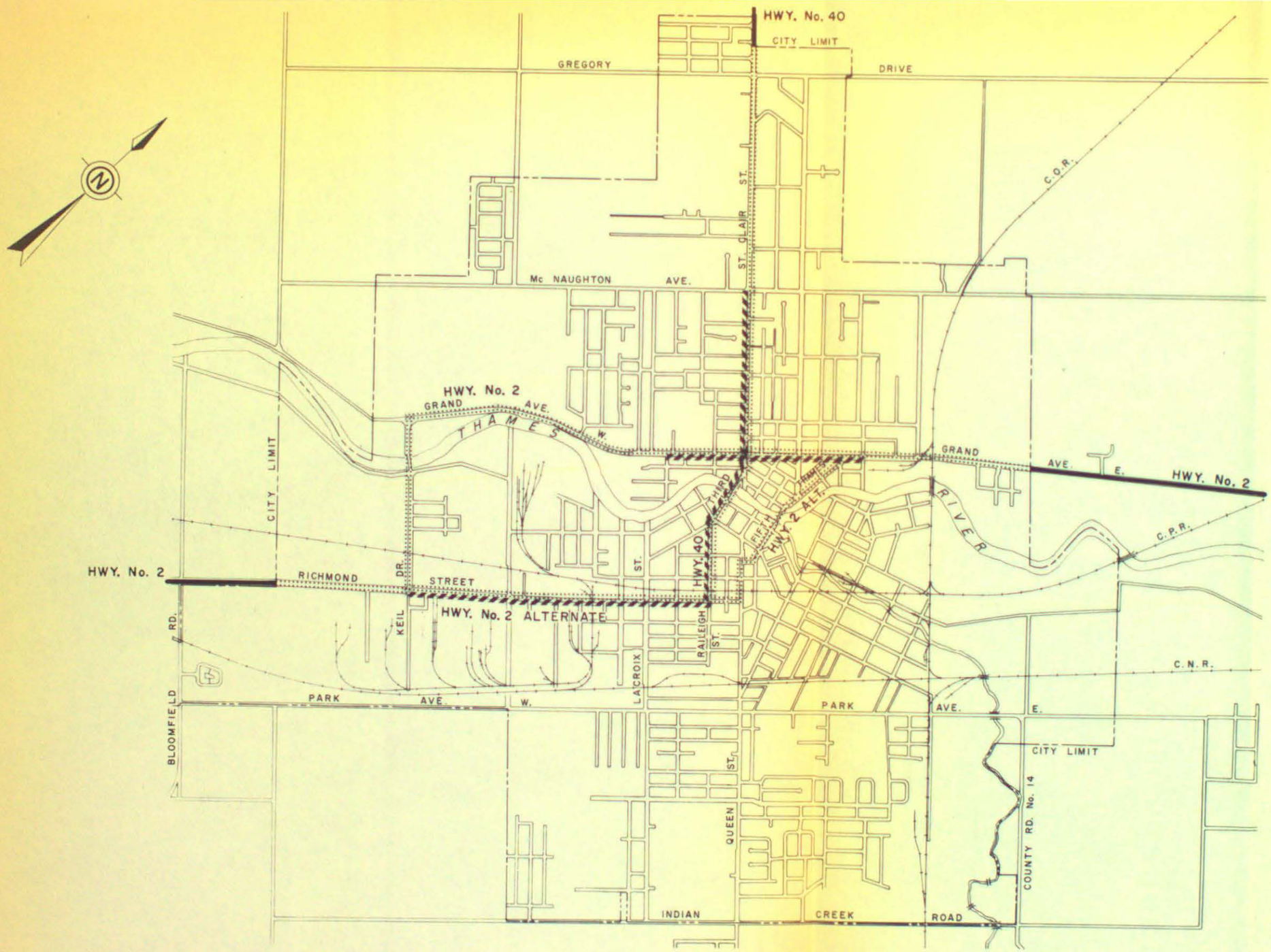
Suggested System of Connecting Links:

A connecting link's function is to bring traffic between sections of the King's Highway system through the City. A system of connecting links should therefore be designed to provide direct and logical routes for such traffic. Plate No. 26 shows the origin and destination of the external traffic for 1961 only, and Plate No. 27 shows the same for the year 1981. Plate No. 28 and Plate No. 29 show assignment of this external traffic to the street system and make a direct comparison possible between through and local traffic on the city streets. These Plates show that through traffic will form an important segment of the traffic on the Bloomfield - Keil Drive route. They also show that the very low percentage of traffic on the downtown streets is through traffic and that the majority of this traffic on these streets is local traffic.

The study of these Plates demonstrates that connecting links have no place in the downtown section of the City and wherever possible these connections should be made outside the Central Business District. The logical connection for Highway No. 2 traffic is the route over Grand Avenue. The Highway No. 2 alternate route system over Fifth Street and School Street should be discontinued and replaced by signs directing traffic to the Central Business District.

As far as Highway No. 40 is concerned, through traffic from this Highway is mainly oriented to Windsor.

PLATE 25



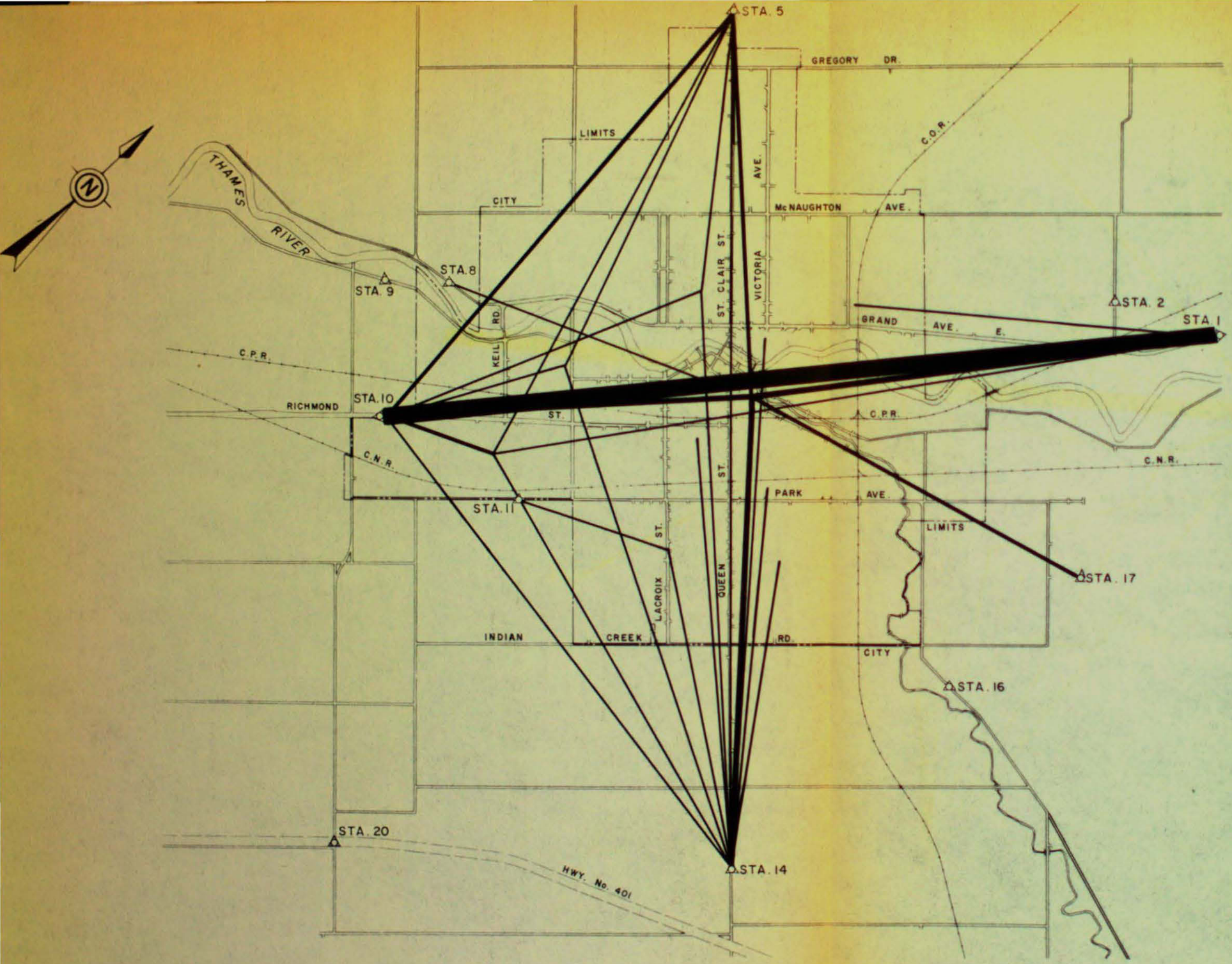
LEGEND

- KINGS HIGHWAY
- CONNECTING LINKS
- SIGNED ROUTES
- CITY LIMITS

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

EXISTING HIGHWAY CONNECTING LINKS

PLATE 26



LEGEND

500 150-250 100-150 50-100

SCALE OF TRIPS PER 3 HOUR PERIOD

△ STA. 2 EXTERNAL STATION No.

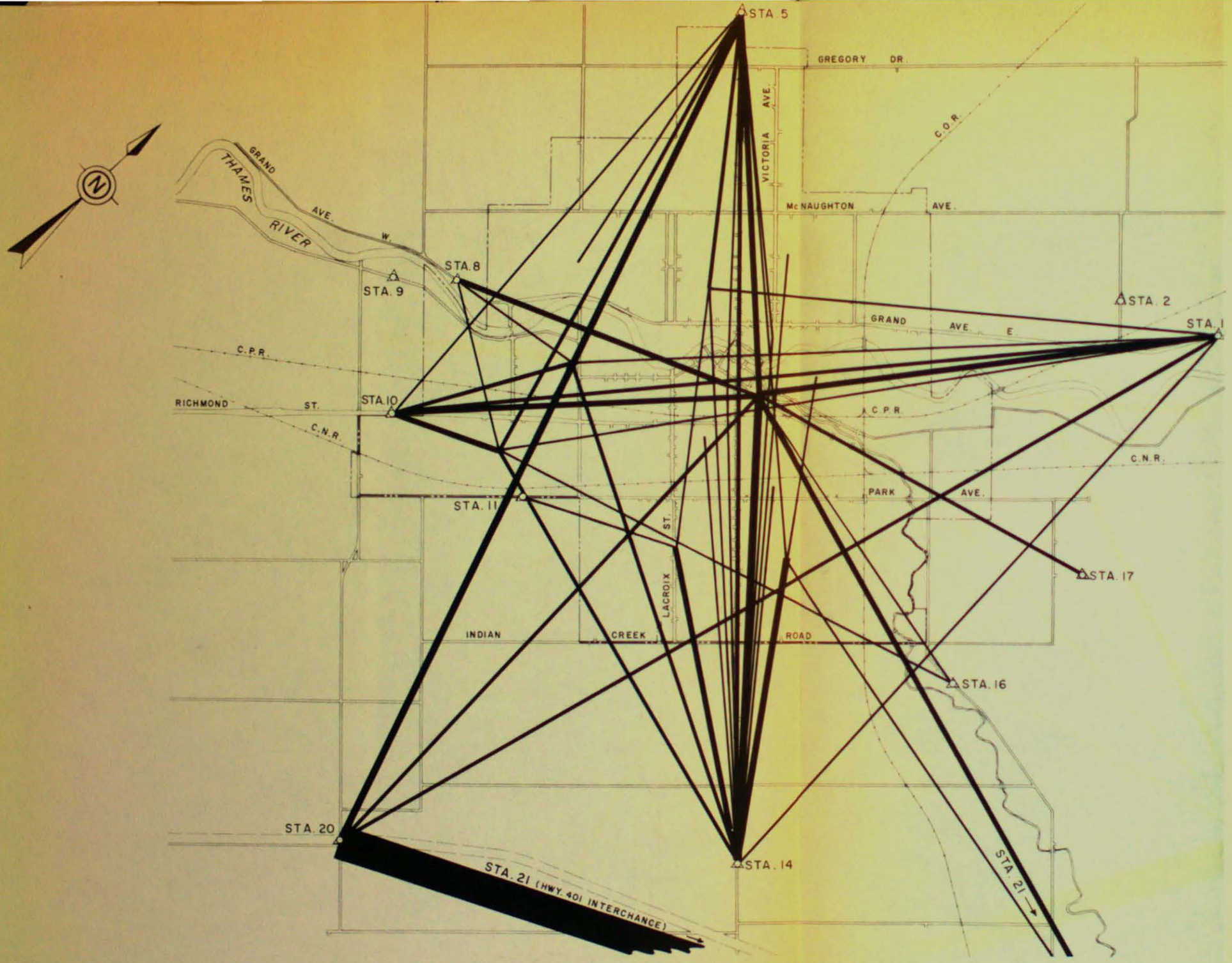
TRIPS SHOWN ARE COMPUTED FOR AN AVERAGE WEEKDAY FOR THE PERIOD BETWEEN 4:00 P.M. AND 7:00 P.M. TRIPS SHOWN ARE BOTH DIRECTIONS COMBINED.
VOLUMES BELOW 50 NOT SHOWN

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

TRAVEL DESIRE LINES
EXTERNAL TRAFFIC
-1961-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

PLATE 27



LEGEND

500 150-250 100-150 50-100

SCALE OF TRIPS PER 3 HOUR PERIOD

△STA. 2 EXTERNAL STATION No.

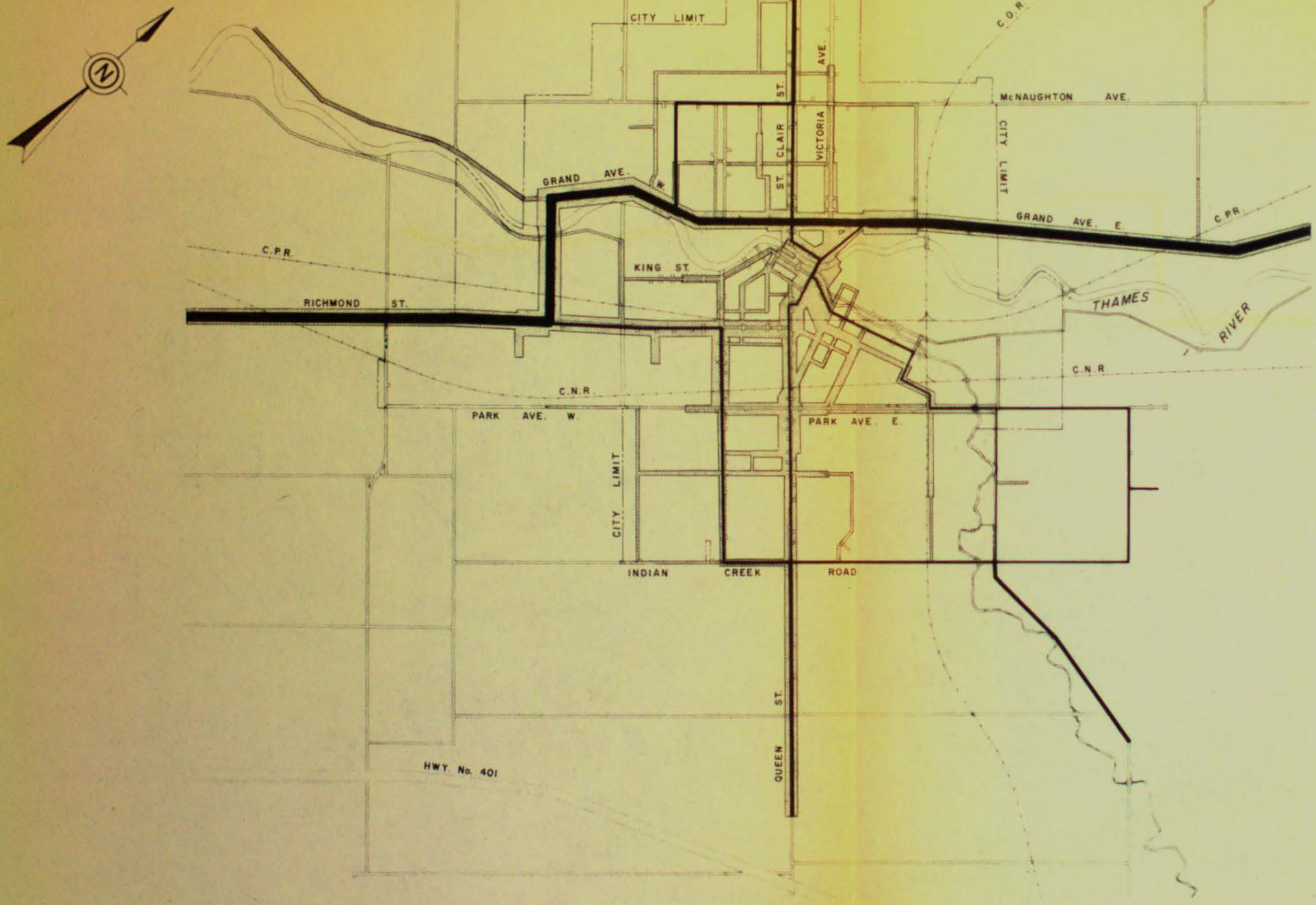
TRIPS SHOWN ARE COMPUTED FOR AN AVERAGE WEEKDAY FOR THE PERIOD BETWEEN 4:00 P.M. AND 7:00 P.M. TRIPS SHOWN ARE BOTH DIRECTIONS COMBINED.
VOLUMES BELOW 50 NOT SHOWN

CITY OF CHATHAM TRAFFIC PLANNING REPORT

TRAVEL DESIRE LINES EXTERNAL TRAFFIC -1981-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED · CONSULTING PROFESSIONAL ENGINEERS · TORONTO · OTTAWA · ST. JOHN'S

PLATE 28



LEGEND

2000 1000 500

SCALE OF VEHICLES ASSIGNED PER 3 HOUR PERIOD

TOTAL ASSIGNED TRAFFIC

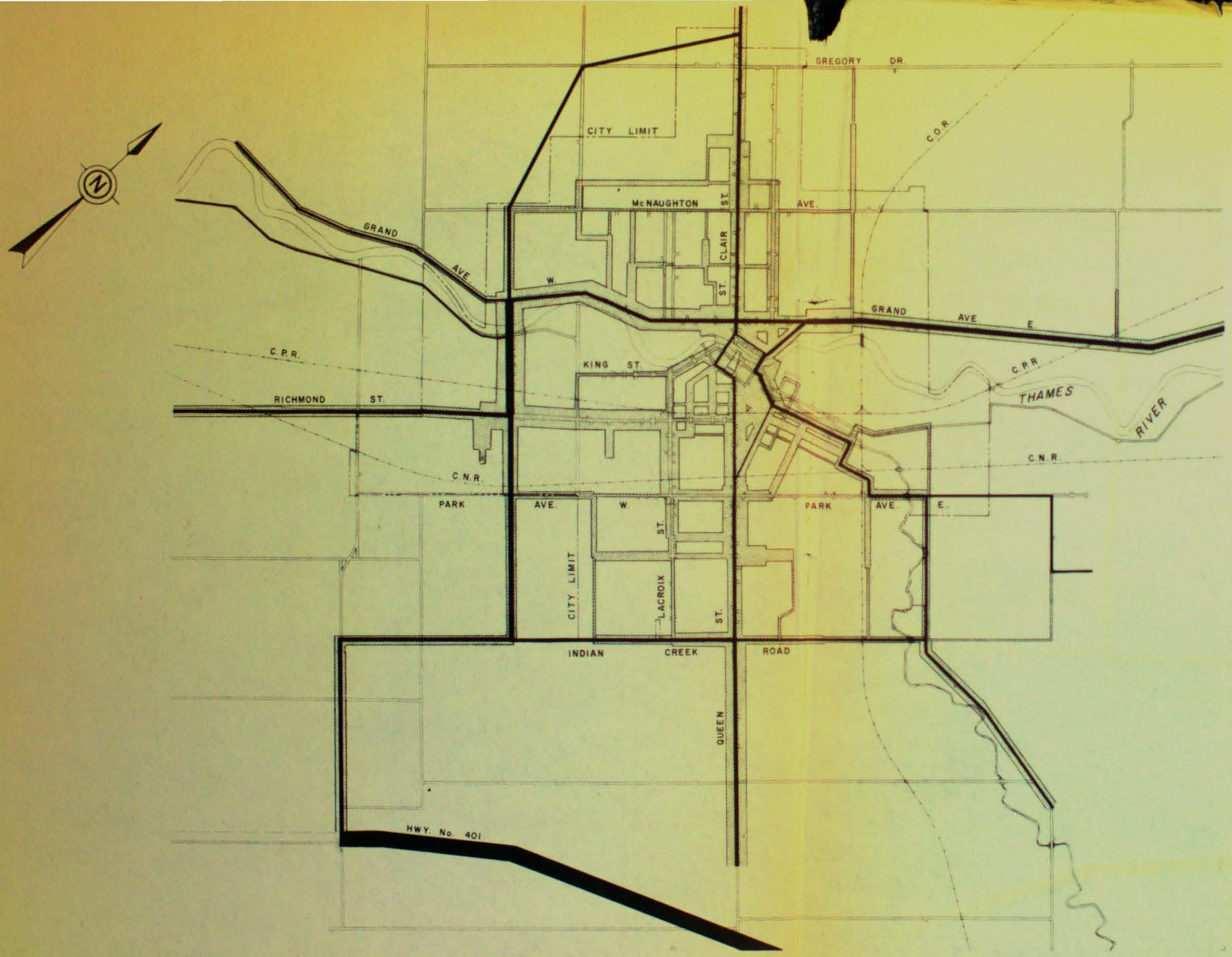
ASSIGNED EXTERNAL THROUGH TRAFFIC

TRAFFIC VOLUMES SHOWN REPRESENT THE RESULTS OF THE ORIGIN DESTINATION SURVEY ASSIGNED TO THE TRIAL ROAD SYSTEM AND INDICATE TRAFFIC MOVEMENT IN BOTH DIRECTIONS FOR AN AVERAGE WEEKDAY BETWEEN 4:00 P.M. AND 7:00 P.M.

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

TRAFFIC FLOW DIAGRAM
EXTERNAL TRAFFIC
-1961-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED • CONSULTING PROFESSIONAL ENGINEERS • TORONTO • OTTAWA • ST. JOHN'S



LEGEND

2000 1000 500

SCALE OF VEHICLES ASSIGNED PER 3 HOUR PERIOD

TOTAL ASSIGNED TRAFFIC

ASSIGNED EXTERNAL THROUGH TRAFFIC

TRAFFIC VOLUMES SHOWN REPRESENT THE RESULTS OF THE ORIGIN DESTINATION SURVEY ASSIGNED TO THE TRIAL ROAD SYSTEM AND INDICATE TRAFFIC MOVEMENT IN BOTH DIRECTIONS FOR AN AVERAGE WEEKDAY BETWEEN 4:00 P.M. AND 7:00 P.M.

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

TRAFFIC FLOW DIAGRAM
EXTERNAL TRAFFIC
-1981-

DE LEUW, CATHER & COMPANY OF CANADA LIMITED • CONSULTING PROFESSIONAL ENGINEERS • TORONTO • OTTAWA • ST. JOHN'S

The connection of Highway 40 to Highway 401 is a desirable feature. As Highway 401 will take the place of Highway No. 2 for most of the through traffic, it would be advisable to extend Highway No. 40 until it reaches Highway No. 401. A direct connection is then created for the communities on Highway No. 40, Sarnia for instance, to Highway 401.

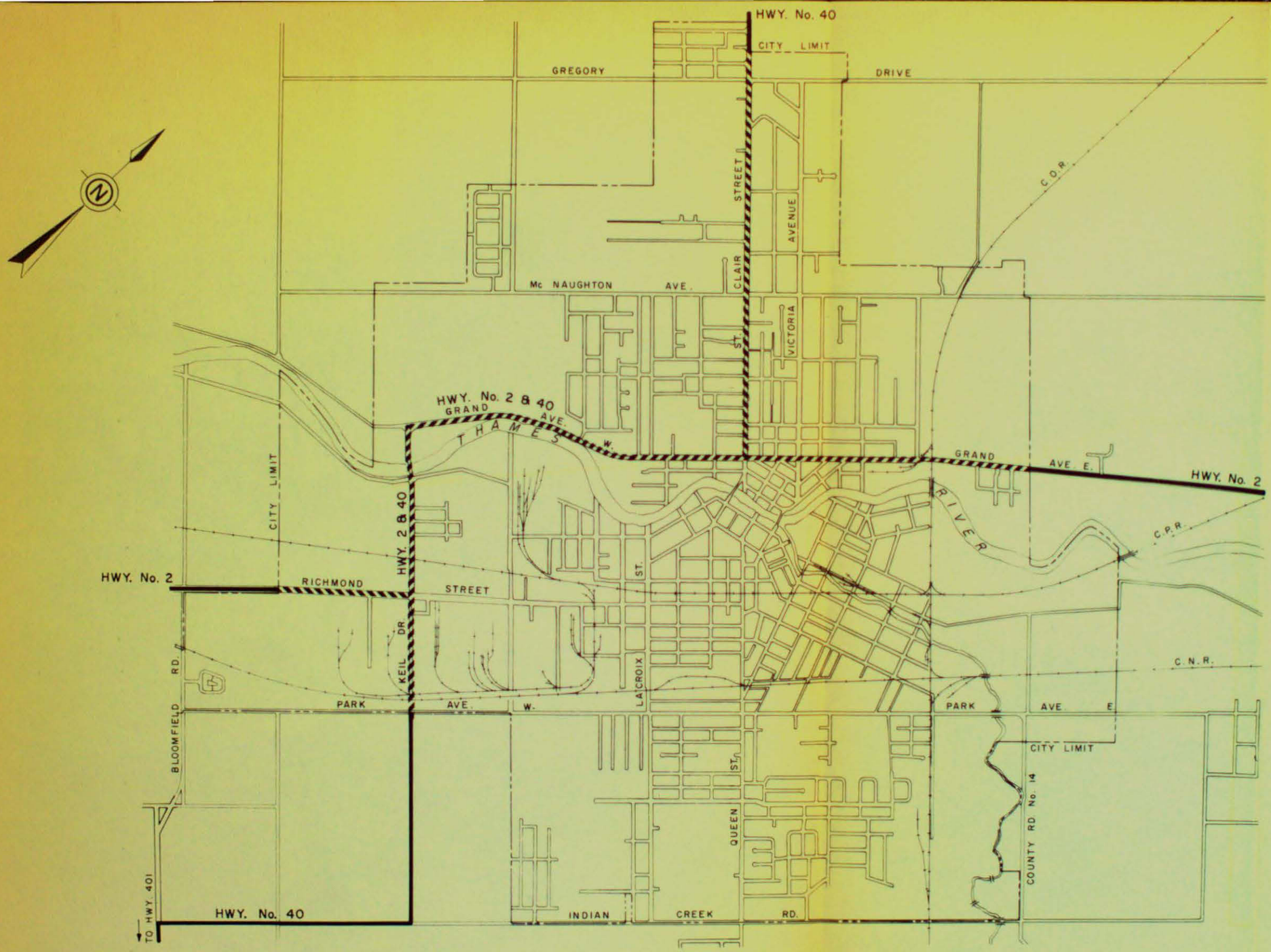
The traffic demand indicates that this connection should be provided on the west side of Chatham and the route for Highway 40 would be over St. Clair, Grand Avenue, Keil Drive, Indian Creek Road and Bloomfield Road. The last part of this route is located outside the City boundaries of Chatham. To make this link of Highway No. 40 to Highway No. 401 complete, this section south of Chatham should be assumed as King's Highway 40. The part over Keil Drive south of Richmond Street, to the City boundary, would become a new Highway 40 connecting link. The section over Keil Drive north of Richmond Street and Grand Avenue between Keil Drive and St. Clair Street would become a joint connecting link for Highway No. 2 as well as Highway No. 40. The suggested system of connecting links is shown on Plate No. 30.

Staging of Construction:

The designation of the connecting links for Highway No. 40 is affected by the staging of construction. As the extension of Keil Drive in a southerly direction is scheduled in Stage II, the connecting link for Highway No. 40 could remain as it is at present until the above extension is a reality. The connecting link for Highway No. 2 would be as shown on Plate No. 30, and as this is located on existing routes it is not affected by the staging of construction.

The signing which directs traffic on Highway No. 40 to Highway No. 401 westbound could be from the intersection at Grand Avenue and St. Clair Street over Highway No. 2 to Tilbury until the Highway 40 connecting link is completed, and from there to Highway 401. For Highway 401 eastbound, the signing could be from Raleigh Street and Richmond Street over Park Street and Creek Road, and for trucks over Queen Street and Indian Creek Road.

PLATE 30



LEGEND

- KINGS HIGHWAY
- CONNECTING LINKS
- CITY LIMITS

CITY OF CHATHAM TRAFFIC PLANNING REPORT

PROPOSED HIGHWAY CONNECTING LINKS

DE LEUW, CATHER & COMPANY OF CANADA LIMITED • CONSULTING PROFESSIONAL ENGINEERS • TORONTO • OTTAWA • ST. JOHN'S

SECTION IX

PARKING STUDY

Introduction

The development of a sound plan for efficiently serving automobile traffic depends as much on the provision of adequate terminal facilities as on the upgrading and development of the major street system. Parking has always been a problem to local authorities, particularly with respect to the Central Business District where land is costly and the use of several hundred square feet for the storage of each parked vehicle appears contrary to good reasoning. However, some reasonable balance of uses must be attained in order to safeguard the large investment in the downtown area, for without adequate parking facilities, those motorists who do have a choice may prefer to take their business to other areas where parking is available cheaply and in quantity.

In accordance with the Terms of Reference, a Limited Parking Study was conducted in Chatham concurrently with the Traffic Study. The results have given a clear picture of the extent and type of present facilities and their use. In addition, some indication has been obtained of the demand for parking for the Central Area as a whole, but, on the basis of this study's limitations, it is not possible to be more specific about the location of future demand and how this should be met in terms of the detailed development of certain facilities. In actual fact, the study went somewhat beyond what is considered a Limited Parking Study in that certain questions on parking habits were asked in the course of conducting the telephone interview survey for the Traffic Study. The information obtained was of value, but only by conducting more detailed studies, particularly a curbside interview of parkers, could more detailed recommendations be made regarding the size and location of parking facilities. The results of the present study demonstrate the problem and could form the basis for a definite plan of action by the City.

On the south side of the River the parking study covered the area bounded approximately by Second, Wellington, Queen, Park, William and the River. On the north side the study area was between Union, Grand, Victoria and the River. These two areas together are called the Central Area, while the term,Central Business District,has been used in reference to an area lying between the River and Wellington Streets between Third and William. The remaining part of the Central Area is called the fringe area.

Field Studies

(a) Inventory of Parking Spaces:

On July 5th and 6th, 1961, the number of curb and off-street parking spaces within the Central Business District and the fringe areas was surveyed, and the results categorized as to type, time limits and restrictions.

Off-street spaces were divided into two main groups - public and private. Public parking lots, available for use by the general public, were further subdivided into municipally-owned pay or free, and commercially-owned pay or free. Private lots, designated as those lots normally restricted to specific users, were subdivided into semi-private and strictly private lots. Semi-private lots were considered as those available to customers and clients and strictly private lots were those restricted to employees. (See Plate No. 31).

(b) Accumulation of Parking:

Accumulation studies were conducted in order to provide information on the hourly accumulation of vehicles parked downtown and the per cent use of capacity every hour for each type of facility. These studies were carried out on Friday, July 21st, and the following Saturday and Monday.

The survey was conducted by two men in a car traversing the Central Area from 8:00 a.m. to 6:00 p.m. and recording the number of cars parked each hour at each sampled facility. Additional information was obtained from the Duration Survey.

(c) Duration of Parking:

Duration studies were carried out to provide information on the length of time vehicles parked at the various types of facility.

Three men recorded the last three digits of each license number of vehicles parked in the Central Area at twenty-minute intervals from 8:00 a.m. to 6:00 p.m. on July 21st and 25th. At the same time observations were made on illegal parking (parking at prohibited spaces) of trucks and automobiles.

(d) Telephone Interviews:

As part of the Telephone Interview Survey, questions were asked of those parking downtown as to the purpose of trip, main destination after parking and length of time parked.

Results and Analysis of Field Studies

(a) Inventory of Parking Spaces:

The following Table is a summary of parking spaces available as of July 1961 in the Central area. The inventory has also been presented graphically on Plate No. 31.

(1) Curb Spaces

Metered	No. of Spaces
1 Hour unrestricted	156
2 Hour unrestricted	183
1 Hour: No parking 11:30 a.m. - 1:30 p.m. and 3:45 p.m. - 6:00 p.m.	10
12 Minutes unrestricted	4
30 Minutes unrestricted	45
3 Hours unrestricted	36
2 Hours: No Parking 6:00 a.m. - 10:00 a.m. except Sundays	46
	480

Free	
No restrictions	47
2 or 3 Hour max: 8:00 a.m. - 6:00 p.m. except Sundays and Holidays	76
1 Hour max: 8:00 a.m. - 6:00 p.m. except Sundays and Holidays	69
	192

(2) Off-Street Spaces

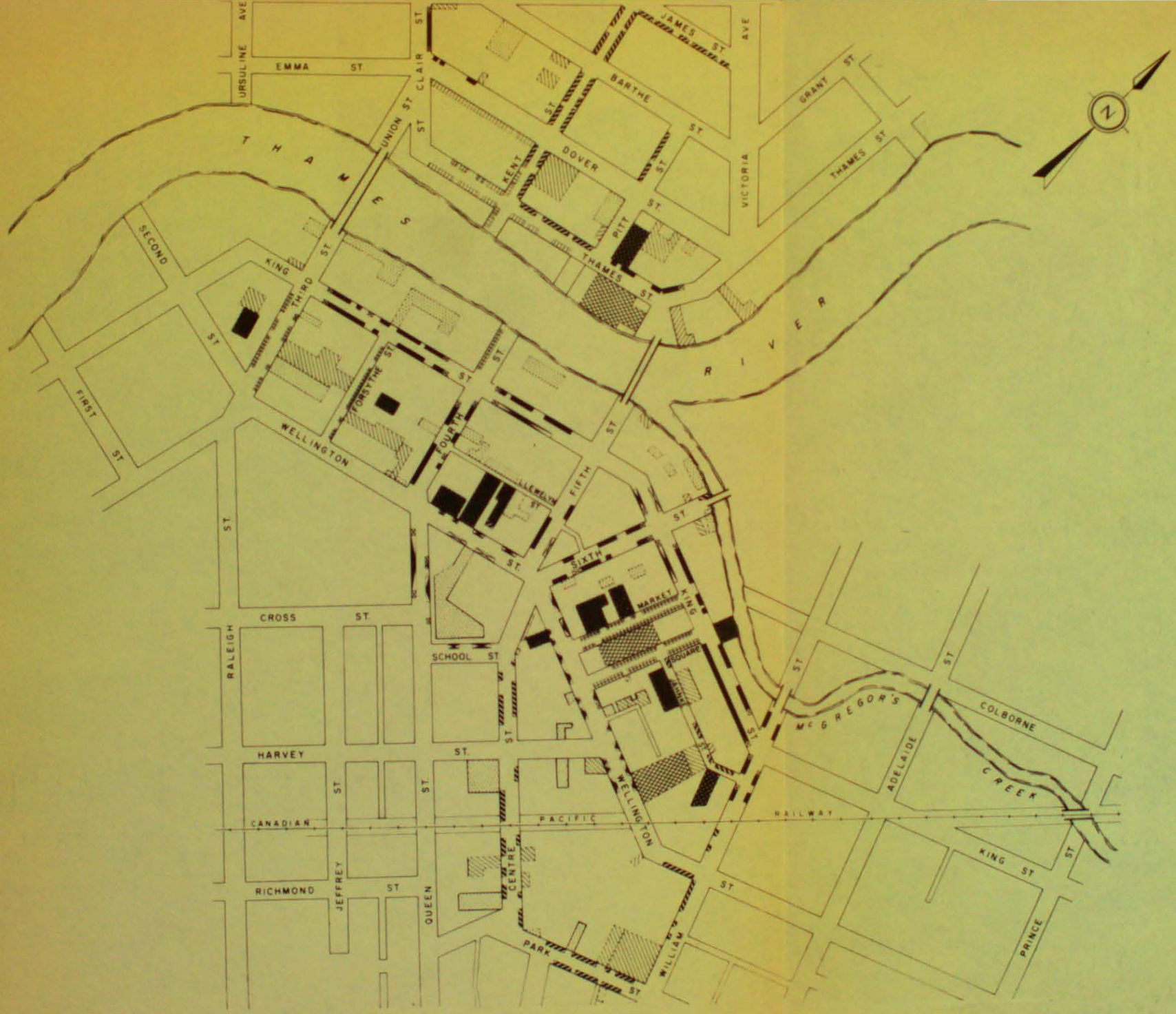
Public	
Municipal metered	131
Municipal free	235*
Municipal pay	121
Commercial pay	298
Commercial free	20
	805

* Includes 82 not in use during bridge construction.

Private	
Semi-private	493
Strictly private	484
	977

Total Off-street spaces	=	1,782	72%
Total Curb spaces	=	672	28%
Grand Total		2,454	100%

PLATE 31



LEGEND

PUBLIC

- PUBLIC MUNICIPAL METERED
- PUBLIC MUNICIPAL FREE
- PUBLIC COMMERCIAL PAY
- PUBLIC COMMERCIAL FREE

PRIVATE

- PRIVATE - SEMI PRIVATE
- PRIVATE - STRICTLY PRIVATE

CURB PARKING

- FREE PARKING
- TWO HOUR METERS
- ONE HOUR METERS
- TWELVE MINUTE METERS
- THIRTY MINUTE METERS
- THREE HOUR METERS

CITY OF CHATHAM
TRAFFIC PLANNING REPORT

INVENTORY OF PARKING SPACES - JULY, 1961

(b) Parking Accumulation:

The graph on Page 88 shows the parking accumulation on an average weekday throughout the downtown area. The accumulation rises to a morning peak of about 1,300 vehicles between 10:30 and 11:30 a.m., drops to about 1,100 vehicles during lunch hour and reaches a maximum of nearly 1,500 vehicles between 3:00 and 4:00 p.m. The pattern of accumulation can be considered as fairly typical for a city of this nature.

Because of the importance of Chatham as a regional centre, studies were also carried out on a Saturday to establish whether the demand was greater than on a weekday. The graph on Page 89 compares the Saturday and Average Weekday accumulation. It should be noted that in this comparison, strictly private lots have been excluded since, generally, these lots would not be used on Saturday. It can be seen that the Saturday accumulation is slightly higher in the morning, but the position is reversed in the afternoon. The maximum accumulation is about the same in each case: Saturday - 1,069 vehicles; Average Weekday - 1,016 vehicles. Thus, using the maximum on an Average Weekday as a basis for design will satisfy the needs of a Saturday.

(c) Duration of Parking:

The graphs on Pages 90 and 91 show the duration of parking at the various types of curb and off-street facilities and indicate the number of vehicles parked for a time equal to or less than a given duration expressed as a percentage of the total number of vehicles parked. For example, reading off the graph at Point A on page shows that 80% of the parkers at two-hour meters stayed 2¼ hours or less.

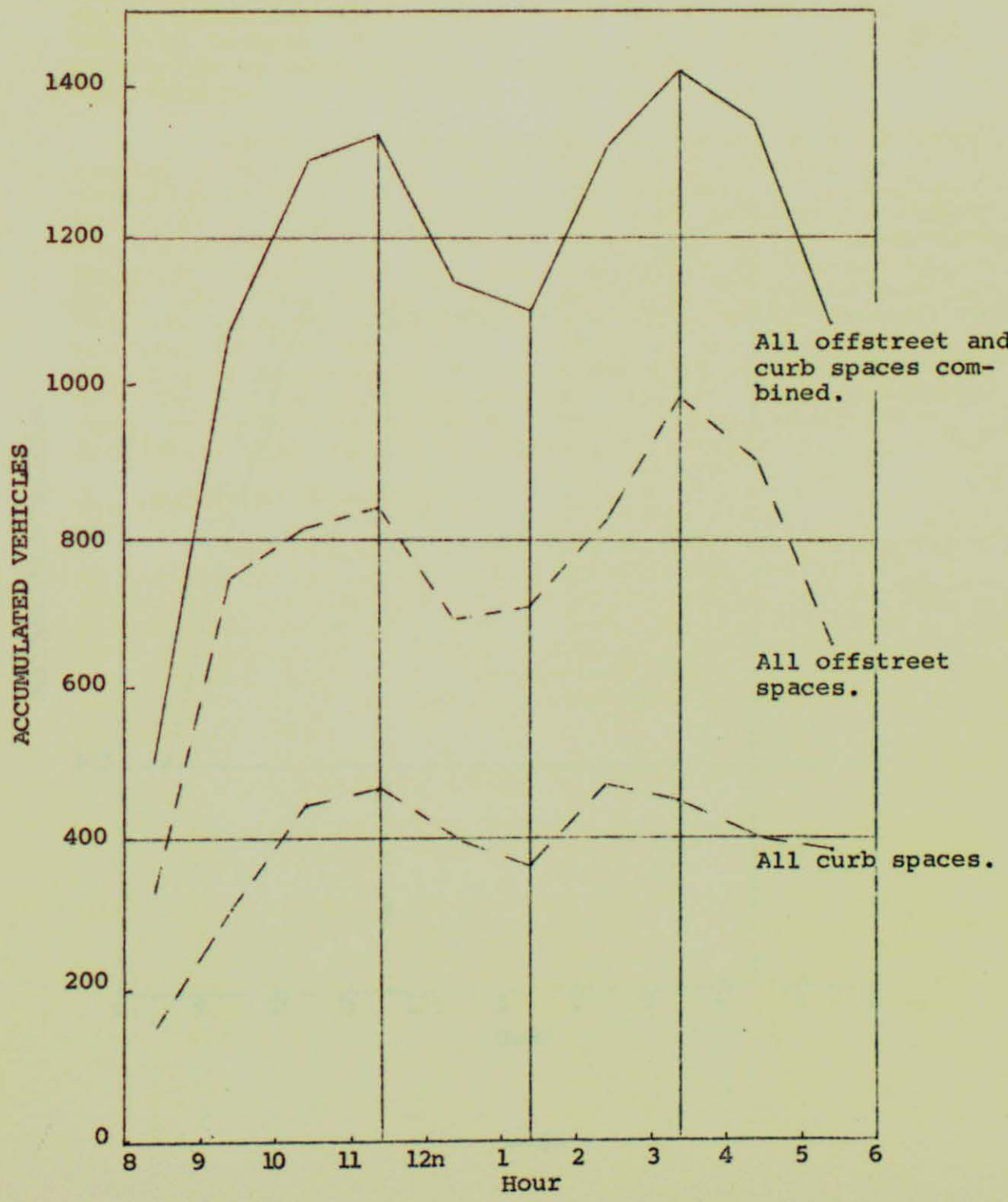
The following points are noted:

(i) As can be expected, parking duration at off-street lots is longer than at curb lots with one exception.

(ii) This exception is the duration at free curb spaces on the north side of the River. The curve characteristic is closer to the off-street curves and shows that these fringe area spaces are being used as long-term lots by persons working in the Central Business District.

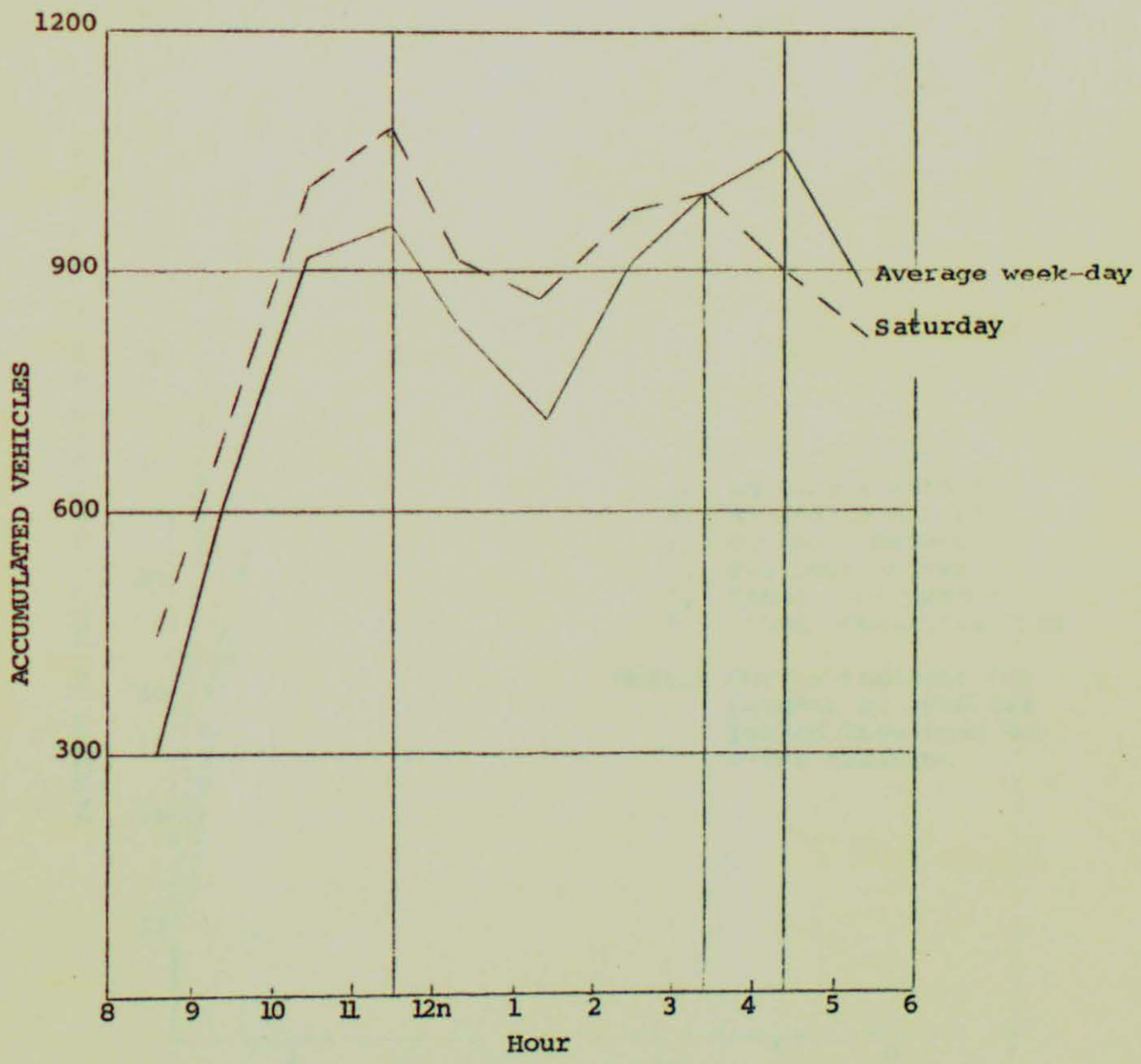
ACCUMULATION OF PARKING IN DOWNTOWN AREA

AVERAGE WEEKDAY

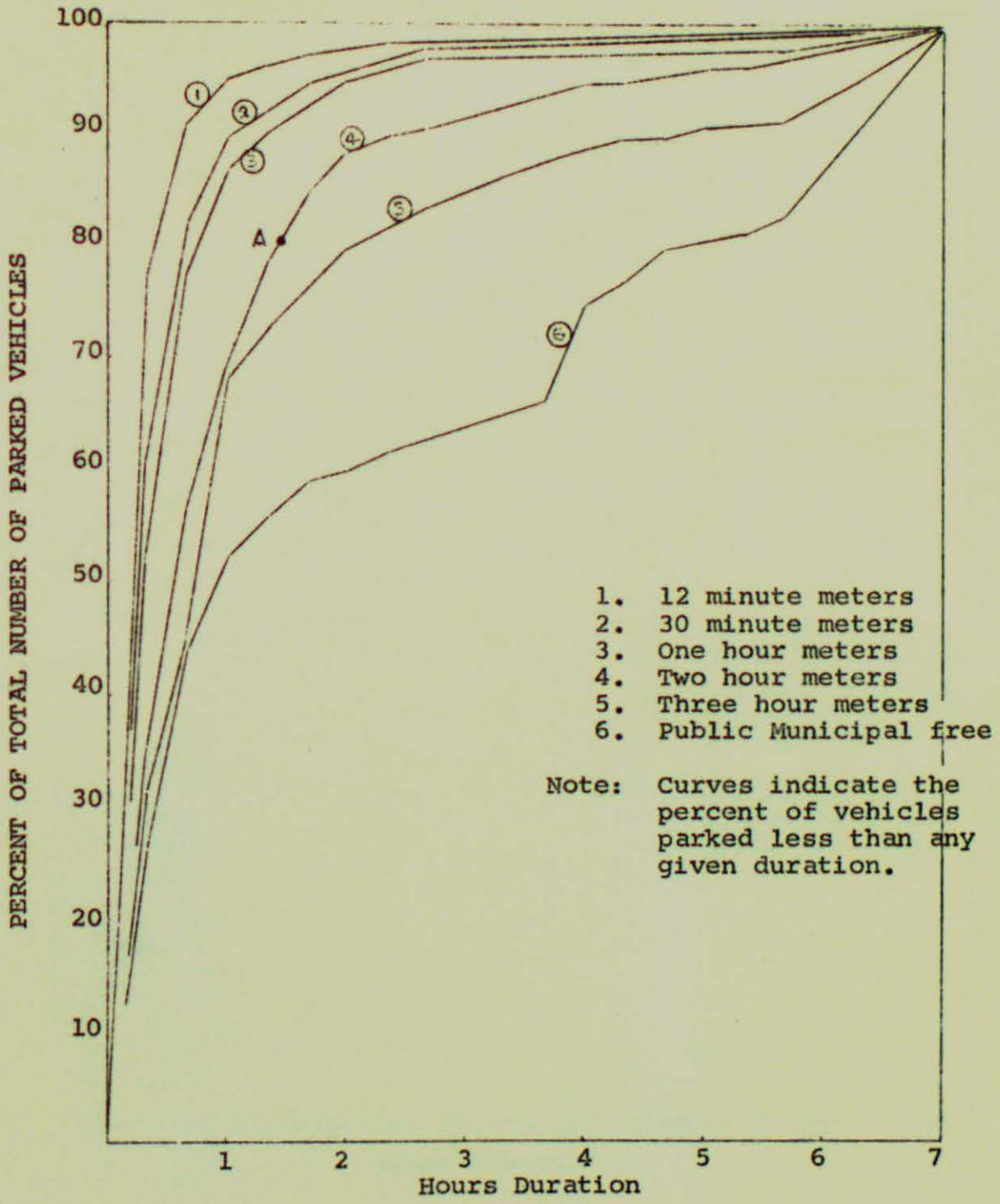


ACCUMULATION OF PARKING IN DOWNTOWN AREA

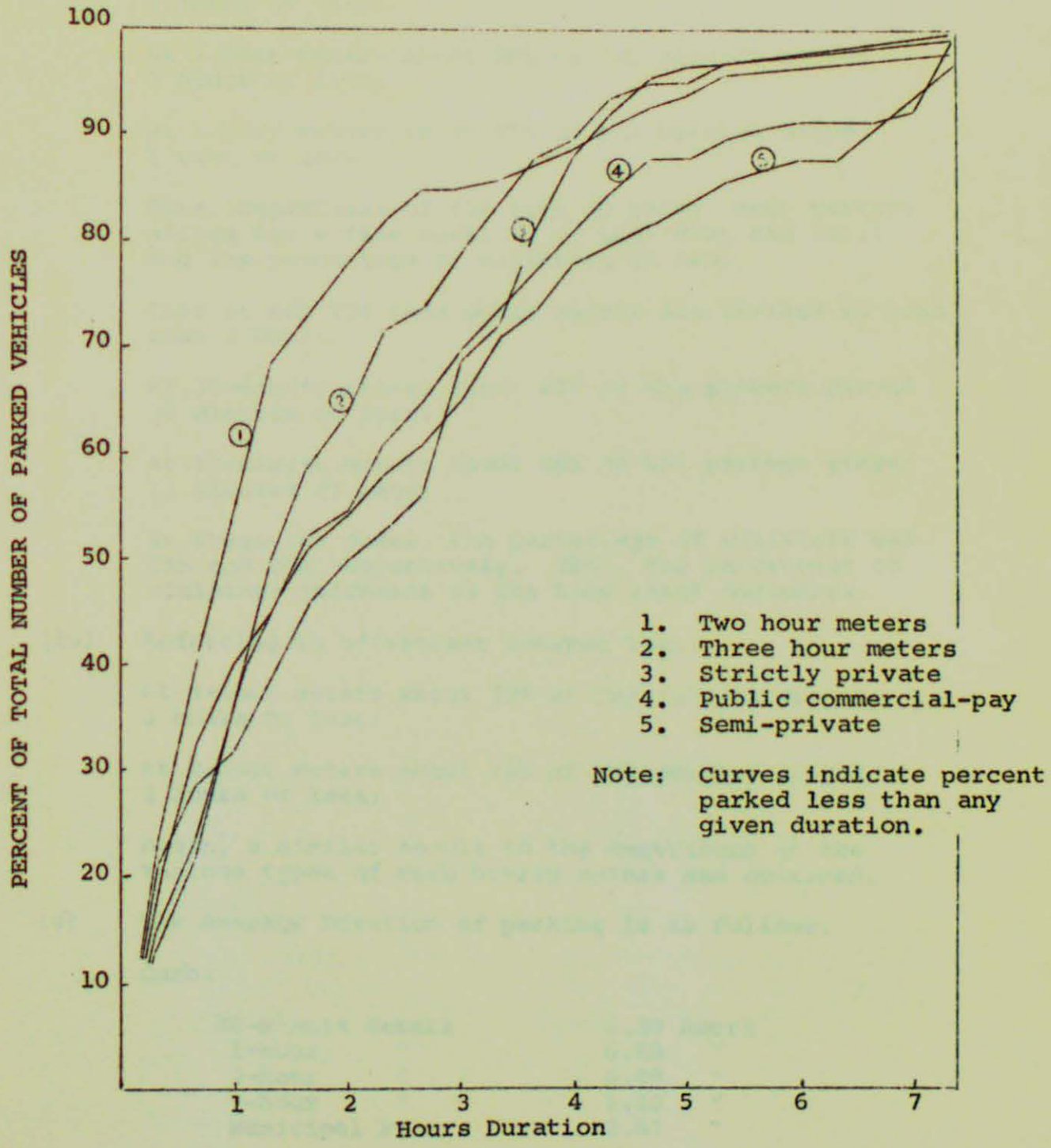
Comparison Between Average Week-day and Saturday
(Strictly Private Lots Omitted)



DURATION OF CURB PARKING IN DOWNTOWN AREA



DURATION OF OFF-STREET PARKING IN DOWNTOWN AREA



(iii) Referring to Curb Spaces:

At 3-hour meters about 86% of the parkers stayed 3 hours or less;

At 2-hour meters about 88% of the parkers stayed 2 hours or less;

At 1-hour meters about 87% of the parkers stayed 1 hour or less;

Thus, regardless of the type of meter, most parkers stayed for a time equal to or less than the limit and the percentage of violators is low.

This is not the case where meters are limited to less than 1 hour:

At 30-minute meters about 65% of the parkers stayed 30 minutes or less;

At 12-minute meters about 40% of the parkers stayed 12 minutes or less;

In these two cases, the percentage of violators was 35% and 60% respectively. Thus, the percentage of violators increases as the time limit decreases.

(iv) Referring to off-street metered lots:

At 3-hour meters about 79% of the parkers stayed 3 hours or less;

At 2-hour meters about 76% of the parkers stayed 2 hours or less;

Again, a similar result to the experience at the various types of curb hourly meters was obtained.

(v) The Average Duration of parking is as follows:

Curb:

30-minute meters	0.58 hours
1-hour "	0.68 "
2-hour "	0.98 "
3-hour "	1.20 "
Municipal Free	2.67 "

Off-Street

2 Hour meters	1.46 hours
3 Hour meters	2.00 "
Public Commercial Pay	2.44 "
Semi-Private	2.54 "
Strictly Private	2.70 "

While these averages are only a general indication of duration, they are consistent relative to the type and regulation of parking.

(d) Percent Use of Capacity:

On an over-all basis, 61% of all curb spaces and 55% of the off-street spaces were in use between 3:00 and 4:00 p.m. on the average weekday.

The meters at Market Square showed the highest consistent use throughout the day, ranging from 80 to 90 percent Curb spaces generally showed a fairly high percent use ranging from about 50 to 90 percent through the day. Off-street lots of all types were not as much used, with the approximate range being 35 to 60 percent.

(e) Telephone Interviews

From the telephone interviews it has been established that for trips originating within Chatham and destined to the Central Area, 69 percent were destined to the Central Business District, 10 percent to the north side of the River and 21 percent to other parts of the fringe area. As far as trip purpose is concerned, 45 percent were for work, 38 percent for shopping, and 17 percent were home and other trips. Trips in the last category include such purposes as visiting a doctor or making business calls. The average stay for work trips was 3.9 hours and for shopping trips, 1.1 hours.

(f) Illegal Parking

Illegal parking is the parking of vehicles at prohibited areas, such as close to intersections, opposite driveways or at hydrants, or double parking. Illegal parking was observed at various times on most streets throughout the Central Business District.

Demand and Supply 1961

The results of the Accumulation Survey show that in the Central Area the peak accumulation of vehicles in the afternoon is less than the total number of curb and off-street

spaces available. Thus, it would appear that there is no parking problem. This, however, is true only on an area-wide basis, and in fact, any motorist attempting to park in the heart of the Central Business District may have some trouble locating a vacant spot close to the store or office he wishes to visit. At such times, it is of little interest to him that vacant parking spaces are available five or six blocks away.

In order to ascertain the relative situation in the Central Business District, use was made of the results of the telephone interview survey. The demand,according to the telephone survey results, for parking during the afternoon peak in each of the three parking zones comprising the Central Business District was expressed as a percentage of the total demand in the Central Area. The total demand can be assumed equal to the total use and therefore the demand for each area can be estimated. This demand was compared to the accumulation in the peak hour. The following table summarizes the results for Parking Zones 7,8,9 (the Central Business District) and also for the area just north of the River.

Parking Zone 7	- 3rd Street, Thames River, Fourth Street and Wellington.
Parking Zone 8	- Fourth Street, Thames River, Sixth Street and Wellington.
Parking Zone 9	- Sixth Street, Thames River, C.P.R.. Tracks and Wellington.
Parking Zones 2 & 3	- Union Street, Dover Street, Thames River.

Zone 7 has a reasonably balanced situation in that the demand is close to the accumulation. Zone 8, however, has considerably more demand than the facilities provide and there is some imbalance in Zone 9, so it is evitable that the unsatisfied demand for space must be met in other surrounding areas which themselves may have little space to spare, or extensive parking may take place out of the fringes of the Central Business District requiring long walking distances to the ultimate destination. Long walking distances are usually acceptable to the all-day parker but are not satisfactory to the short-term parker who wishes to stay downtown a comparatively short time and have ready access to his car. Zones2 and 3 have considerably less demand than the actual number of spaces used and it is likely that long-term parkers with destinations in the Central Business District make full use of the free facilities on the north side of the River.

Demand and Supply 1981

In the Traffic Study, it was found that the number of trips destined to the Central Area will increaseby a factor of about 1.8 by the year 1981. Thus, there will be a similar increase in the demand for parking which, if unfulfilled, will discourage motorists from visiting the downtown if their needs can be met conveniently elsewhere. In a City such as Chatham, which acts as a commercial centre for the surrounding area, it is essential that full consideration be given to the parking problem in order to preserve the economic importance of the City.

It has been shown that at the present time there are sufficient spaces available throughout the Central Area, but the location of many of these spaces does not match the areas of greatest demand. In a limited parking study such as this, it is not possible to specify the exact number, location and type of new spaces that should be created to satisfy the 1981 demand. However, the fact that traffic destined to the Central Business District in 1981 will be 1.8 times today's obviously leads to an increase in parking demand of the same order.

The peak accumulation of nearly 1,500 vehicles between 3:00 and 4:00 p.m. in 1961 can be assumed as being indicative of the total parking demand, and it is shown from the Telephone Survey that about 72% of the demand in the Central Area occurs in the Central Business District, namely Parking Zones 7, 8 and 9. See Table on Page No. 94. If the expansion factor of 1.8 is applied to the total present demand, there will be a need for 2,700 spaces in 1981, and if the figure of 72% is applied about 1,900 spaces should be in or close to Parking Zones 7, 8 and 9. At the present time, these three Parking Zones contain approximately 1,300 curb and off-street spaces, leaving a deficit of 1,900 - 1,300 = 600 spaces to be provided over twenty years. To this figure must be added another 60 or so curb spaces which have been recommended for removal in the traffic study. In actual fact, some part of this demand can be met in the fringe areas around the Central Business District but the deficit is indicative of the order of the number of spaces needed.

The provision of needed parking space can only be brought about efficiently by the development of off-street parking lots. The creation of new spaces at the curb cannot be expected to solve the problem, not only because there is little length of curb left that has not already been so used, but particularly because this is no permanent solution. The basic purpose of the street system is to move traffic and the parking of vehicles at the curb should only be allowed as long as such an operation does not create congestion.

As far as location is concerned, every attempt should be made to develop lots within or close to the Central Business District so as to minimize walking distances. Over the last few years the City has constructed parking lots on the sites of demolished buildings on Wellington Street and it is recommended that such a policy be continued. Further development and consolidation might take place on Wellington Street and other lots could be located throughout the Central Business District and fringe areas as properties become available.

The use of properties behind the stores is an excellent way of providing parking at prime locations. The redevelopment of these properties should however be planned by the owners together or alternatively, the Municipality. Only by means of use of several of these backlots and uniformity of paving and lighting, can results be expected.

The provision of the 600-odd spaces can be realized if solving the problem is made the goal of the authorities and business men alike.