TRAFFIC PLANNING REPORT

FOR THE

CITY OF CHATHAM

MARCH, 1968

...uw, Cather

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DE LEUW, CATHER & COMPANY OF CANADA LIMITED

De Leuw, Cather

CONSULTING ENGINEERS

March 25, 1968

His Worship Mayor Garnet F. Newkirk
and Members of City Council
Chatham, Ontario

Gentlemen:

We are pleased to submit, in accordance with the terms of our agreement, our updated Traffic Planning Report for the City of Chatham.

This Report contains our recommendations for the development of a major street system which will keep pace with anticipated urban development to the year 1986. A suggested program of construction staging, including preliminary cost estimates, is also contained herein. It is hoped that this recommended program will serve as a practical guide to City Council in establishing policy for roadway improvements over the planning period.

We appreciate this second opportunity to serve as traffic consultants to the City of Chatham, and wish to express our appreciation for the guidance provided us during the course of the study by the members of the Technical Co-ordinating Committee, and for the assistance and co-operation of officials of the City and of the Department of Highways, Ontario.

Respectfully submitted,

DE LEUW, CATHER & COMPANY OF CANADA LIMITED

A. Harvey

Alexander Harvey
Senior Vice-President

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TABLE OF CONTENTS

	Page Number
INTRODUCTION	1
Study Background	1
Scope and Objectives	1
Study Organization	2
Study Procedure	2
CONCLUSIONS AND RECOMMENDATIONS	4
Study Conclusions	4
Recommended 1986 Roadway Plan	4
Highway Connecting Links	5
Construction Staging and Cost Estimates	6
LAND USE AND URBAN DEVELOPMENT	8
Land Use Patterns - 1966	8
Development Since 1961	8
Population Projection	9
Land Use Projection	9
Distribution of Population and Employment	10
Vehicle Ownership	10
BASE DATA COLLECTION	11
Major Street Inventory	11
Origin - Destination Data	11
Traffic Volume Counts	11
Railway Train Counts	12
ANALYSIS OF TRAVEL DEMANDS	13
Traffic Generation	13
Interzonal Trip Distribution	15
Screenline Check	15
Summary	16
ASSESSMENT OF ROADWAY DEFICIENCIES	17
The River-Crossing Problem	17
The Railway-Crossing Problem	18
General Deficiencies	19
FORMULATION OF THE RECOMMENDED PLAN	20
Trial Schemes	20
Analysis of the Western Access Problem	22
Recommended 1986 Roadway Plan	23

TABLE OF CONTENTS (continued)

	Page Number
HIGHWAY CONNECTING LINKS	25
The Present Situation	25
Proposed 1986 System	25
Stage Development of Proposed System	26
CONSTRUCTION STAGING AND COST ESTIMATES	28
Stage I (1967-1972)	28
Stage II (1972-1980)	28
Stage III (1980-1986)	29
Cost Estimates	30
Cost Sharing	30
EXHIBITS	
APPENDIX "A" (Base Data Tabulations)	
APPENDIX "B" (Traffic Data Tabulations)	

LIST OF EXHIBITS

Exhibit No.

1. Location of Study Area
2. Existing Major Street Plan - 1966
3. Recommended Major Street Plan - 1986
4. Construction Program - Stage I (1967-1972)
5. Construction Program - Stage II (1972-1980)
6. Construction Program - Stage III (1980-1986)
7. Existing Lane Use - 1966
8. Probable Land Use - 1986
9. Traffic Zones and External Stations
10. Population and Employment - 1966 and 1986
11. Composite Travel Desires - Total Trips - 1966 and 1986
12. Composite Travel Desires - External to Internal Trips - 1966 and 1986
13. Composite Travel Desires - Through Trips - 1966 and 1986
14. Traffic Flow - 1966 and 1986
15. Network Capacity Deficiencies - 1966 and 1986
16. Trial Scheme No.1 - 1986 Traffic Assignment
17. Trial Scheme No.2 - 1986 Traffic Assignment
18. Recommended Scheme - 1986 Traffic Assignment
19. Western Access Alternative Alignments
20. Revised Bus Routes
21. Highway Connecting Links - 1966
22. Recommended Highway Connecting Links - 1986
23. Interim Highway Connecting Links - 1972 to 1980
24. Typical Sections

25-37. Intersection Improvements:

- 25. Park Avenue - Queen Street
  Park Avenue - Whitehall Street
- 26. Grand Avenue - Keil Drive
  Richmond Street - Keil Drive
- 27. Richmond Street - Lacroix Street
- 28. Richmond Street - Queen Street - Park Street - Centre Street
- 29. Bloomfield Road - Park Avenue
  Keil Drive - Park Avenue
- 30. Grand Avenue - Thames Street
- 31. Park Avenue - Lacroix Street
  Lacroix Street Underpass (C.N.R.)

LIST OF EXHIBITS (continued)

Exhibit No.

32. Lacroix Street - King Street
    Lacroix Street - Wellington Street
33. Queen - William Underpass (C.N.R.)
34. Queen Street - School Street - Centre Street
35. William Street - Park Street
    William Street - Wellington Street
36. Grand Avenue - Sandys Street
37. McNaughton Avenue - Sandys Street
    Sandys Street - Highway 40

LIST OF TABLES

Table No.		Page No.
1.	Summary of Cost Estimates	7
2.	River-Crossing Traffic - 1966	16
3.	River-Crossing Capacity	17
4.	Volume/Capacity Ratios - Existing Bridges	18
5.	Warrants for Protection of Level Crossings	18
6.	Cost Estimates - Stage I	32
7.	Cost Estimates - Stage II	33
8.	Cost Estimates - Stage III	34
A1.	Population, Land Use and Employment - 1966 and 1986	
A2.	Major Street Inventory	
A3.	Traffic Signal Inventory	
A4.	Unit Prices for Cost Estimates	
B1.	Trip Generation Equations	
B2.	Origin-Destination Tables - 1966 and 1986	
B3.	Exposure Ratings of Level Crossings	
B4.	Volume/Capacity Ratios - Existing Network	
B5.	Intersection Turning Movements	

INTRODUCTION

Chatham is a city of thirty-two thousand persons, located in the rich agricultural heartland of south-western Ontario. It is the county seat and major urban centre of Kent County, and as such serves as a trading centre for a number of nearby towns and villages such as Wallaceburg, Dresden, Thamesville, Ridgetown, Blenheim and Tilbury.

Highway and rail connections make Chatham readily accessible to the metropolitan areas of Detroit, Windsor and Toronto, as well as to Sarnia, London and Hamilton. Highway 401 bypasses Chatham approximately four miles to the south, while Highways 2 and 40 serve the city directly. Rail service is provided by the C.N.R., C.P.R. and C & O. Exhibit 1 shows the location of Chatham in relation to the Great Lakes region.

Although Chatham is a county seat, it is primarily identified as an industrial centre. The major industries are concerned with the processing of agricultural products from Kent County, and with the manufacture of trucks and automotive parts.

The city is bisected by the Thames River which flows in a south-westerly direction from its source north of London, emptying into Lake St. Clair some twenty miles downstream. Each summer numerous pleasure craft from Lakes Huron and St. Clair, and from the Detroit and St. Clair Rivers, are attracted up the Thames. Many of these boats stop to moor at one of Chatham's fine marinas.

Study Background

In 1961 the City of Chatham undertook its first comprehensive traffic planning study. A report was prepared summarizing the study findings, and outlining a recommended program of roadway improvements over the period from 1962 to 1981.

Since the completion of that report significant unforeseen industrial and commercial development has taken place within Chatham. This development has been primarily in the west end of the city, though one new industry has also located in the east end. As might be expected, traffic volumes have increased sharply since 1961, particularly traffic corssing the three bridges over the Thames River. This increase in traffic has created understandable concern over the adequacy of the recommendations of the 1962 Report.

In consequence of these developments, compounded by the need to locate a west-end highway access route to Highway 401, the Chatham City Council and the Department of Highways, Ontario agreed to a restudy of traffic requirements to the year 1986. This restudy was begun in June of 1966.

Scope and Objectives

The objectives of the study are stated in the Terms of Reference as follows:-

> " . . . . . to review and update the Traffic Planning Study completed by De Leuw, Cather Limited in 1962. This revision is considered

necessary because of the increased traffic volumes recorded on the major street system, including the three river crossings, and the changes in land use development and density, especially in the west end of the City, during the past five years."

This study has included a projection of land use development to the year 1986, with an estimate of travel demands over the twenty year planning period. The recommendations of the 1962 Report have been re-evaluated in terms of these revised traffic estimates.

This Report also includes a proposed program of staged construction of the recommended network, with corresponding cost estimates.

Study Organization

A Technical Co-ordinating Committee was formed for the purpose of directing and approving the procedures of the Study. Membership was drawn from the City of Chatham, Department of Highways, Ontario, Kent County and Dover and Raleigh Townships, and the committee was chaired by the City Engineer.

Through the efforts of the various Committee members, data and information vital to the completion of the Study were made available to the consultant. The opinions, criticisms and guidance which the Committee members contributed throughout the course of the Study were greatly appreciated.

Study Procedure

Since this was a "restudy" of traffic problems in Chatham, and therefore essentially an updating of a report which was completed some five years ago, it was felt that no new origin-destination surveys should be conducted. By revising the population and employment estimates up to 1966, and by undertaking an extensive program of intersection counts, it was possible to simulate a 1966 interzonal distribution of trips.

Expansion of travel demands to the year 1986 was done on the basis of urban development foreseen in a Land Use Report prepared by the City Planning Officer. This Report includes estimates of 1986 population and employment.

All traffic estimates were made for the three-hour evening peak period from 4:00 - 7:00 P.M. of a typical May/June weekday. The 1966 and 1986 trip tables were "loaded" onto the existing road network, and the resulting traffic volumes were factored accordingly to determine peak hour flows. Roadway capacity deficiencies were determined basically from an analysis of intersection capacities.

In the process of developing the recommended 1986 roadway plan, a number of trial solutions were assessed and compared. Comparison was made generally in terms of traffic service as indicated by assignments of the 1986 trip table. From this traffic analysis the most desirable scheme was selected.

The street widths, intersection layouts and other detailed features of the recommended plan were based largely on the demands of anticipated traffic flows.

Sound planning principles, however, play a necessarily important role in determining advisable widths of right-of-way, structures and underpasses, as well as street widths.

The proposed construction program is an attempt to stage the development of the road system in the most logical manner, while giving primary consideration to solving the most urgent capacity deficiencies in the early stages of development. This staging also allows for the relationship between growing population and increasing tax revenue, so that the annual budget for City roadway expenditures should be higher in later years than at present.

CONCLUSIONS AND RECOMMENDATIONS

Study Conclusions

The River-Crossing Problem

While traffic volumes on the three bridges crossing the Thames River have increased sharply since 1961, there is still reserve capacity. Before the end of the planning period, though, it is expected that this capacity will have been reached and exceeded. It is concluded that an additional bridge will be required by about the year 1982.

The Railway-Crossing Problem

According to warrants established by the Department of Highways, Ontario, there are several level crossings in Chatham which should theoretically be grade-separated. Unfortunately, grade-separation is not always feasible, either due to physical or financial limitations, or both.

A priority rating system was devised ranking the various level crossings in Chatham according to an exposure factor (a combination of rail and motor vehicle traffic volumes at the crossing). On this basis the two most heavily exposed level crossings in the City are the C.N.R. crossings of Queen-William Streets and Lacroix Street.

General Deficiencies

The most critical deficiency in the present street system exists on Richmond Street between Keil Drive and Queen Street, where the existing three lanes are simply not adequate to accommodate the traffic demand. Other serious overlodaings occur on Fifth Street, particularly between Wellington and King, and on the downtown streets and intersections in general, as well as on Queen Street from Richmond to School, and on Park Avenue from Lacroix to Queen.

By 1986 additional deficiencies can be expected along Grand Avenue, St. Clair Street (Grand to McNaughton), Thames Street, Keil Drive, Lacroix Street (Park to King), Wellington Street (Lacroix to Fourth), Queen Street (Park Avenue to Richmond) and in other locations as shown in Exhibit 15. In this exhibit, Park Avenue is shown to be deficient by 1986 from Queen Street to Whitehall Avenue, but it should be noted that this deficiency is based on the two-lane condition which existed at the time this analysis was made.

Recommended 1986 Roadway Plan

The two most striking features of the recommended major street plan for 1986, shown in Exhibit 3, are two new 4-lane arterial roads.

In the north-south direction a major arterial is developed by connecting the present alignments of Lacroix Street, south of the Thames River, and Sandys Street,

north of the river, with a 4-lane bascule bridge. The Lacroix Street crossing of the C.N.R. mainline is grade-separated by means of an underpass. A northward extension of Sandys Street as a 2-lane road connects this arterial with Highway 40 to the north.

In the east-west direction Park Avenue, which at present is a relatively undeveloped 2-lane road west of Queen Street, is improved to a major 4-lane arterial between Keil Drive and Whitehall Avenue. At either end of this arterial the existing two lanes are brought up to highway standards to provide western and eastern access routes to Highway 401 via Bloomfield Road and Communication Road respectively.

Other major features of the plan are a badly needed underpass of the C.N.R. crossing of Queen Street (including realignment of the Queen-William intersection), and 2-lane extensions of Keil Drive north to McNaughton Avenue, and south to Park Avenue. The southern extension crosses the C.N.R. at grade, involving minor relocation of an industrial spur line.

Improvements to traffic flow on congested downtown streets and intersections can be brought about through operational measures. Removal of the downtown bus-loading area from Fifth Street to Fourth Street, and installation of an overhead control signal on the Fifth Street Bridge to allow reversible operation of the centre lane during peak hours, will give additional capacity to Fifth Street.

The conversion of Queen, Centre and School Streets to one-way operation will have the effect of balancing the traffic load between Queen and Centre. Combined with the suggested redesign of the Queen-Richmond-Centre-Park intersection, smoother and less congested traffic flow should result.

Further operational measures such as installation of additional traffic signals or restrictions of on-street parking, while not covered by this report, can also be implemented to good advantage at the discretion of the City Traffic Co-ordinator.

Highway Connecting Links

The present highway connecting link designations are shown in Exhibit 21. Highway 2 passes through the City from west to east along Richmond Street, Keil Drive and Grand Avenue, connecting Chatham with Tilbury and Windsor to the west, and with Thamesville and London to the east. Highway 40 enters from the north from Wallaceburg and Sarnia, following St. Clair Street to Grand Avenue, whence it shares the Highway 2 alignment westerly to the intersection of Keil Drive and Richmond Street. A newly approved "eastern access" route connects Chatham with Highway 401 east via Communication Road and Park Avenue west to Queen Street.

The proposed 1986 system of highway connecting links, shown in Exhibit 22, would provide a direct connection from Highway 40 at the north end of Chatham to the interchange of Highway 401 and Bloomfield Road to the west of the City. This alignment connects with the proposed Lacroix-Sandys arterial by means of a new 2-lane link from the northern city limits around to the intersection of Sandys Street and Gregory Drive. The Highway 40 designation would then be carried

south on Sandys Street, across the new bridge and down Lacroix Street to Park Avenue. From this point the connecting link proceeds west on the improved Park Avenue, and then south to Highway 401 along a rebuilt 2-lane Bloomfield Road. It is recommended that the section of Bloomfield Road between Highway 401 and Park Avenue be assumed by the Department of Highways as a King's Highway.

The connecting link system is completed by extending the eastern access route westerly on Park Avenue to meet Highway 40 at Lacroix Street. The present alignment of Highway 2 is considered to be satisfactory, and no change is proposed.

The development of this highway connecting link system should take place in stages, in conjunction with the staged development of the recommended 1986 roadway network. The proposed staging is discussed in detail in the section of this report entitled "Highway Connecting Links".

Construction Staging and Cost Estimates

The development of the recommended 1986 roadway system must take place gradually, and for this reason the required construction should be planned in stages.

During Stage I (1967-1972) an attempt should be made to solve some of the most urgent problems. At the time this Report was being prepared the improvement of the eastern access route was near completion. Communication Road has already been constructed to Highway standards from Highway 401 to the eastern City Limits, and the widening of Park Avenue to four lanes from Queen Street to Whitehall is virtually complete. It is suggested that the next step in the development should be a 2-lane rexonstruction of Park Avenue from Whitehall east to the City Limits, including rechannelization of the Park-Whitehall intersection as shown in Exhibit 25.

The next item in the construction program should be the widening of Richmond Street to four lanes, with intersection improvements required at the locations shown in Exhibit 4. The final stage of this widening also includes reconstruction of the Richmond-Queen-Park-Centre intersection (see Exhibit 28).

The extensions of Keil Drive north and south should include improvements to the intersections of Keil-Grand and Keil-Richmond, as well as the creation of new intersections at Keil-McNaughton and Keil-Park Avenue. Improvement of Bloomfield Road is urgently required, and it is recommended that the Department of Highways undertake reconstruction of this 2-lane road from Highway 401 to Park Avenue as soon as possible during Stage I.

Stage I is completed with the widening to four lanes of Grand Avenue (Thames to Taylor) and Park Avenue (Queen to Lacroix), but during this period provision should also be made for acquiring sufficient right-of-way to allow for the construction of underpasses of the C.N.R. on Queen and Lacroix Streets. It would also be desirable for the City to purchase additional right-of-way along Wellington Street between Lacroix and Keil.

The first item in Stage II (1972-1980) should be the construction of the Queen Street underpass, for which Exhibit 33 shows a suitable alignment and profile.

At this time the intersection of Queen and William Streets would also be realigned as shown, and subsequent widening of William Street from Park to Wellington, and creation of the one-way system on Queen-School-Centre, would complete the improvements to the downtown access routes from the south and south-east.

The second phase in this stage should be the widening of Lacroix Street to four lanes from Park to Wellington, including construction of a C.N.R. underpass. This improvement would involve realignment to the east of the north approach of Lacroix Street to Park Avenue, in order to line up directly with the south approach. Channelization of the Lacroix-Wellington intersection and widening of Wellington to four lanes from Lacroix to Raleigh should follow.

The southern portion of the Highway 40 connecting link is completed by widening Park Avenue to four lanes from Lacroix to Keil, and improving the two lanes from Keil to Bloomfield Road, The final item of Stage II is the widening of Thames Street from Victoria to Grand, though preliminary planning for construction of the Lacroix Street Bridge should, by that time, be well in progress. For this purpose considerable residential property must be purchased along the alignment of the north approach, and sufficient time must be allowed for preparation of design drawings so that the bridge can be constructed for opening early in Stage III.

The construction of the Lacroix Street Bridge has top priority in Stage III (1980-1986), and this should be followed directly by the widening of Sandys Street to four lanes from Grand Avenue to McNaughton Avenue. The 2-lane extension of Sandys north to connect with Highway 40 should be completed some time before 1986, and since extensive residential development is planned for that area of the city, right-of-way for this extension must be acquired well in advance.

The only other major item in Stage III is the improvement of Queen Street from Park Avenue south to Indian Creek Road to provide a full four lanes. The City should also make allowance in any long range budget planning, however, for extensive repaving requirements throughout Chatham (see Exhibit 6).

Detailed cost estimates are presented later in the Report. For convenience the total costs estimated for each Stage of construction are summarized below in Table 1.

TABLE #1

SUMMARY OF COST ESTIMATES
(in thousands)

Stage	Cost Breakdown		TOTAL COSTS	Cost Sharing			
	Construction	Property		City of Chatham	Dept. of Highways	Dept. of Transport	C.N.R.
I	$ 1,511	$ 90	$ 1,601	$ 534	$1,067	-	-
II	2,041	475	2,516	718	736	$ 1,000	$ 62
III	2,194	314	2,508	865	1,643	-	-
TOTAL	$ 5,746	$ 879	$ 6,625	$2,117	$3,446	$ 1,000	$ 62

LAND USE AND URBAN DEVELOPMENT

The assumption that there exists a direct relationship between traffic generation and land use development is fundamental to the science of transportation planning. The exact nature of this relationship must be determined through analysis of data collected during the course of the traffic studies.

An important feature of the Chatham Traffic Restudy was the preparation by the City Planning Officer of a Land Use Report. This report summarizes 1966 land use, population and employment within the study area, and discusses and appraises the techniques used for forecasting urban development in Chatham to the year 1986. Exhibit 9 shows the study area boundary, and the traffic zones for which all land use and traffic data was compiled.

The following paragraphs briefly summarize the context of the Land Use Report.

Land Use Patterns--1966

The distribution of land uses in Chatham in 1966 are depicted in Exhibit 7. It can be seen that industry is concentrated in two areas of the City, the primary area being in the west end between the C.N.R. line and the Thames River. A number of large agricultural processing plants are located here, as well as automotive manufacturing installations. A secondary industrial area is growing up in the east end of the City between Park Avenue and the river.

Commercial development in Chatham is largely concentrated in the central business district, an area bounded by the river, MacGregor's Creek, William Street, Park Street, Queen Street, Wellington Street and Third Street. A second area of importance has sprung up in recent years, however, in the vicinity of the intersection of Grand Avenue and Keil Drive. Small retail outlets are scattered throughout the City.

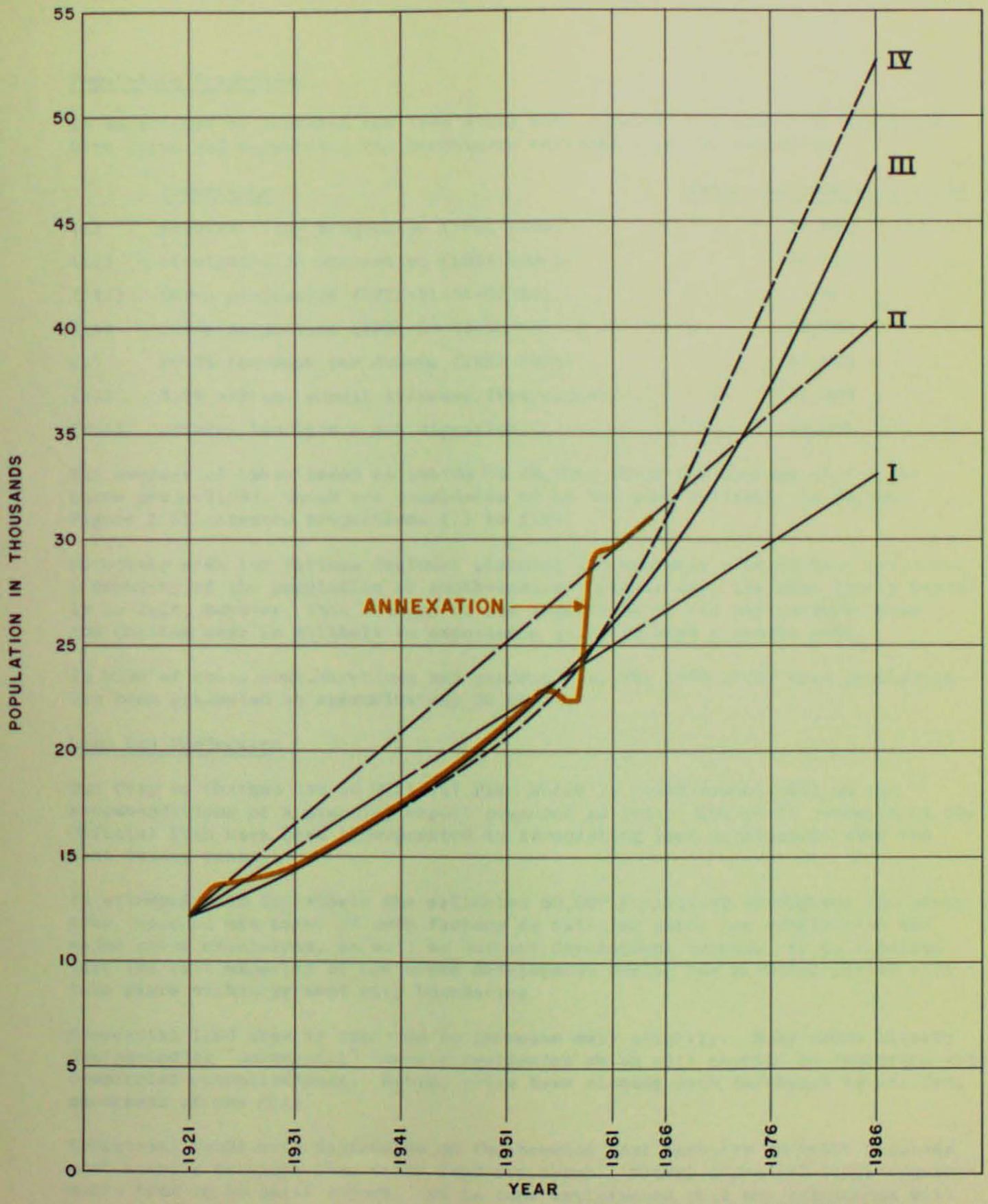
Residential development is spread fairly evenly throughout Chatham, with approximately 60% of the 32,000 residents living on the south side of the Thames. The fringe areas within the City limits are, as yet, largely undeveloped.

Development Since 1961

Since 1961 the population of the study area has increased at an average rate of about 1½% per annum, from 29,500 to the present 32,000. The most significant residential development during that period has been in the south-east corner of the City.

Employment opportunities over the past five years have grown at a much sharper rate, from 9,000 odd in 1961 to 11,500 in 1966, an increase of about 5% per annum. These statistics reflect in particular the establishment of two new automotive parts plants in the west end, an increase in the operations of the International Harvester Company, and the development of the Thames-Lea shopping centre and Union Gas Company office building in the vicinity of the Keil-Grand intersection. Another industry in the east end, Canadian Filters Limited, opened its plant shortly after commencement of this study.

FIGURE I



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De Leuw, Cather

POPULATION PROJECTIONS

Population Projection

In an attempt to forecast the 1986 study area population a number of techniques were tried and compared. The techniques employed were the following:-

	Techniques	Estimated 1986 Population
(i)	straight-line projection (1921-1955)	33,000
(ii)	straight-line projection (1921-1961)	40,000
(iii)	curve projection (1921-31-41-51-54)	47,800
(iv)	curve projection (1921-36-46-56-66)	52,000
(v)	35.5% increase per decade (1955-1965)	57,000
(vi)	3.3% average annual increase (Provincial)	61,500
(vii)	natural increase - net migration	46,000

The average of these seven estimates is 48,200, while the average of the two curve projections, which are considered to be the most reliable, is 49,900. Figure 1 illustrates projections (i) to (iv).

Forecasts made for various regional planning and economic studies have estimated a doubling of the population of south-western Ontario over the next twenty years. It is felt, however, that because of the impportance of its agricultural base the Chatham area is unlikely to experience quite so high a growth rate.

In view of these considerations and projections, the 1986 study area population has been estimated at approximately 50,000.

Land Use Projection

The City of Chatham has an Official Plan which is based essentially on the recommendations of a planning report prepared in 1957. The basic concepts of the Official Plan have been incorporated in forecasting land development over the next twenty years.

In attempting to distribute the estimated 50,000 population throughout the study area, account was taken of such factors as existing plans for subdivision and major sewer extensions, as well as current development trends. It is expected that the vast majority of new urban development during the planning period will take place within present city boundaries.

Commercial land area is expected to increase only slightly. Many areas already designated as "commercial" contain residences which will shortly be converted into commercial establishments. School sites have already been purchased in all four quadrants of the City.

Industrial lands were designated on the premise that industry normally requires much heavier services than other land-use types. Water, hydro and sewer requirements tend to be quite severe. It is thus anticipated that new industries will continue to locate in the existing western and eastern industrial areas, with the western sector continuing to dominate.

The 1966 labour force was expanded to 1986 in relation to the estimated population growth, and on this basis employment opportunities in 1986 are estimated at just over 17,000. This means, in effect, a decrease in the employment ratio from 36% in 1966 to 34% in 1986. The ratio in 1961 was only 30.6%.

Distribution of Population and Employment

In 1961, data on population and employment showed 59% of the former and 81% of the latter to be located south of the Thames River. This distribution has altered only slightly since that time, and with regard to employment, the southern portion of the City will continue to dominate in 1986 with 76% of employment being situated there as compared with 24% north of the river.

Conversely, residential development over the planning period will take place primarly in the "finge" areas of Chatham around the northern city limits. Of the 18,000 new residents, 75% will locate in those areas, with the remaining 25% locating south of Park Avenue. By 1986 it is expected that only 48% of the population will reside south of the Thames River, with 52% north.

Vehicle Ownership

The estimation of vehicle ownership in Chatham was not an easy task. Vehicle registration lists for the year 1966, obtained from R. L. Polk and Company, showed a total of 14,010 passenger vehicles registered in Chatham for that year. Of this total, 5,014 were owned by non-residents, while another 837 were registered to local used-car dealers.

This left a total residential vehicle ownership within the study area of 8,159, and with a population of 31,920 this yields a vehicle ownership ratio of 3.91 persons per car. The fact that the 1961 Traffic Report showed only 3.58 persons per car, with a total registration of 8,243, casts some doubt on the validity of the 1966 statistics. These figures tend to indicate a decrease in the general level of prosperity since 1961, and yet it has already been shown that the employment ratio in 1961 was less than 31%, while in 1966 there is 36% employment in Chatham.

For this reason, the total study area vehicle ownership for the years 1966 and 1986 were estimated by interpolating the previously estimated figures for 1961 and 1981. This procedure indicates vehicle ownership ratios for 1966 and 1986 of 3.42 and 2.78 respectively, with corresponding total vehicle ownership of 9,040 in 1966 and 18,100 in 1986.

BASE DATA COLLECTION

Major Street Inventory

An inventory of the 1966 major street system was compiled, in part from plans and drawings provided by the City Engineering Department, and in part from field observations and measurements. This inventory is tabulated in Appendix A, Table A2.

It should be noted, in reference to Table A2, that where data such as width of pavement, width of right-of-way, etc., are shown for a specific street section, they represent the predominant characteristic of that section.

Table A3 lists the locations of traffic control signals presently operating in Chatham, together with the signal phasings.

Origin-Destination Data

Basic patterns of trip origins and destinations used for this study were derived from three previous surveys:

(1) Telephone interview survey (internal) - 1961
(2) Truck Survey (internal) - 1961
(3) Roadside interview survey (external) - 1964.

The first two surveys were conducted in conjunction with the 1961 traffic study, while the latter was undertaken by the Department of Highways as part of the South-Western Ontario Highway Planning Study. The Highway 401 by-pass of Chatham was open at the time the external survey was done.

Traffic Volume Counts

An extensive program of traffic volume counts was undertaken for the Chatham Traffic Restudy. These counts fall basically into two categories:

(1) Automatic traffic recorder counts
(2) Manual intersection counts.

A.T.R. counts had been made periodically since 1961 on the Parry, Third Street and Fifth Street Bridges, and it was decided to intensify this counting program over the study period to obtain detailed data on daily, weekly and seasonal fluctuation of river-crossing traffic. For this purpose one counter was rotated from bridge to bridge at one week intervals.

Manual "turning movement" counts were made at a total of forty-five street intersections in the City of Chatham. Of this total, twenty-seven had already been counted by the City Traffic Co-ordinator in September and October of 1965. The remaining eighteen were completed on June 17, 1966. All of these counts were made on Fridays, and covered the 4:00-7:00 p.m. peak period.

The intersection counts provided the basis for drawing up the 1966 traffic flow map shown in Exhibit 14.

Railway Train Counts

A program of 12-hour train counts had been conducted for the 1961 traffic study at all level crossings in Chatham. More recently the only counts of this nature which have been made were those taken by the City Engineering Department at the C.N.R. crossing of Queen and William Streets. These latter counts showed train volumes at that crossing to be, for the average weekday, 28% higher than comparable volumes in 1961.

It was confirmed, through discussion with local officials, that since 1961 no radical changes have been made in the general patterns of rail service to and through Chatham. It was thus considered reasonable to estimate 1966 rail movements by simply applying a broad growth factor of 1.28 to the 1961 counts.

A tabulation of estimated 1966 train movements is given, together with exposure factors and priority ratings for the major level crossings, in Appendix B, Table B3.

ANALYSIS OF TRAVEL DEMANDS

Traffic Generation

Internal Automobile Trips

The relationships which exist between traffic generation and characteristics of land use, population and employment seem to vary from city to city, depending on the size of the city, its economic character, available transportation facilities, topographical features and many other considerations. For this reason these relationships are generally derived empirically for each different area that is studied.

In the 1961 Chatham Traffic Study, data collected in the telephone interview survey was analysed to relate trip generation rates to two basic sets of socio-economic parameters:

(1) zonal vehicle ownership by one-car, two-car and three-car families.
(2) zonal employment and vehicle ownership.

The first set of relationships was used primarily to estimate city-wide trip generation, and was wholly dependent for its validity on an accurate estimate of vehicle ownership. It was found in 1961 that the total trips estimated in this manner were within 3% of the factored origin-destination survey results.

The second set of relationships, which are dependent to a far lesser degree on the accuracy of estimated vehicle ownership, were used basically as a tool to predict zonal production and attraction of trips. The city-wide production and attraction were then factored according to the total previously estimated by method (1). Amazingly enough, before factoring these totals already checked within 2½% and 1% respectively of the "control" total.

Since there is some doubt concerning the accuracy of the 1966 vehicle ownership estimates, it was decided that traffic generation should be estimated primarily on the basis of zonal employments, where errors in vehicle ownership figures are less dangerous. The relationships used for this purpose are tabulated in Appendix B, Table B1.

It should be noted that the factors shown in Table B1 represent internal automobile trips only, for the 4:00-7:00 p.m. period of an average July weekday. All other internal auto trips not covered by the "work", "home" or "shop" categories have been estimated as a percentage of total internal auto trips. These percentages, which vary by zone, were determined from the 1961 O-D survey.

Internal Truck Trips

As a result of the 1961 Truck Survey internal truck trip generation had

been estimated for each zone. Since no new truck survey was conducted in 1966, it was felt that the best way to account for these trips would be to consider that they would play the same relative role per zone in the total traffic picture for 1966 as they did in 1961. They were thus estimated for each zone as a percentage of automobile trips.

External and Through Trips

The estimation of external traffic was not such a simple matter. Since the Highway 401 by-pass had been opened to traffic between the times that the 1961 and 1964 surveys were conducted, it was necessary to somehow relate the two sets of data.

The first step was an estimation of "through" traffic for 1966, and this was made by applying an average Provincial growth factor of 1.11 to the measured 1964 through traffic movements. Then, since the 1964 survey had been conducted in the inbound direction.only, it was possible to determine from the survey tabulations only zonal attractions of external trips, but not productions. The following procedure was thus devised for estimating 1966 production and attraction of external trips:

(1) determine 1964 external attractions, by zone, from survey tabulation.

(2) compare the results of (1) against zonal external attractions shown in the 1961 trip table.

(3) from (1) and (2) determine zonal growth rates of external traffic from 1961 to 1964 (12% per annum average).

(4) extrapolate growth rates found in (3) to estimate 1966 external attractions.

(5) compute from 1961 data zonal ratios of external production to external attraction.

(6) apply the ratios computed in (5) to the results obtained in (4) to estimate 1966 external productions.

(7) re-estimate total external production and attraction for 1966 by subtracting estimated through trips from actual 1966 volume counts at or near the external stations.

(8) using the external trip totals from (7) as controls, factor the zonal estimates from (4) and (6) accordingly.

1986 Traffic Generation

The estimation of traffic generation for 1986 followed a procedure similar to that described for estimating 1966 trips. Zonal employments and populations projected in the Land Use Report were applied to the equations of Table B1 to estimate internal automobile trips, and the zonal truck trip percentages were considered to remain constant from 1961 through to 1986 (note that the basic patterns of land use do not change appreciably from 1961 to 1986, so that zones which were primarily industrial in 1961 remain so throughout the planning period, and similarly for commercial

zones, etc.).

In estimating 1986 external traffic it was assumed that external trips would constitute a percentage of total trips generated by each zone, the percentage being the same as that which resulted from the 1966 traffic estimate. Through traffic, which constitutes a relatively minute proportion of total Chatham traffic (approx. 4%) was simply doubled from 1966 to 1986.

Interzonal Trip Distribution

There are various theories as to the ways in which trips distribute themselves throughout an urban area. The most common factors influencing trip distribution appear to be the relative attractions of various possible zones of destination, and the degree of resistance to travel (i.e. - time, distance, cost) between origin and destination.

In the majority of large metropolitan transportation studies an attempt is made to derive a mathematical "model" to simulate trip distribution, employing parameters which vary according to the trip purpose. For cities the size of Chatham, however, the use of such a model is not usually practical. The cost of developing and using a model is quite high, and the effect of parameters such as travel time can be extremely unpredictable when measures are relatively small.

The method used for estimating the 1966 and 1986 distributions of trips in Chatham is known as the Furness Iteration Technique. The 1961 origin-destination trip table was used as a basic foundation, with interzonal trip interchanges being factored up by an iteration process on the basis of 1966 zonal trip productions and attractions. In some cases, where a zone showed unusually heavy development from 1961 to 1966, hand adjustment of the iterated trip table was required.

A similar procedure was used to project the 1986 trip table. In this case the simulated 1966 table was used as the base for projection, and interzonal trip interchanges were iterated to the estimated 1986 zonal trip productions and attractions. Some hand adjustment was again applied to the trip table where discretion warranted it.

Screenline Check

Only one screenline was established for the purpose of checking the accuracy of the simulated 1966 trip table, this screenline being the Thames River. The estimated river-crossing traffic was easily extracted from the 1966 trip table, and this figure was compared to the actual volumes counted on the three bridges during the 4:00-7:00 p.m. period of an average weekday. This comparison is presented in Table 2.

TABLE #2

RIVER-CROSSING TRAFFIC - 1966

Source	Period	Bridge			
		Parry	Third St.	Fifth St.	Total
A.T.R. Counts	May-June	2670	4090	2960	9720
	July-August	2420	3980	2680	9080
	September-October	2540	4320	2880	9740
Simulated Distribution	July				8560

One of the purposes of carrying out the program of A.T.R. counts on the three bridges was to establish the peak month, or months, of traffic demand. It was concluded from analysis of the counts that the peak in Chatham does not occur in July, as previously assumed, but either in the late spring or early autumn months.

It was considered that the design period should be either May-June or September-October, and the river-crossing demand for the evening peak period was thus taken to be 9730 vehicles. As shown in Table 2, the simulated 1966 trip distribution estimated a demand of only 8,560 vehicles. To compensate for the fact that the distribution under-estimated this demand, a correction factor of 1.14 (= 9730/8560) was applied to both the 1966 and 1986 simulated trip distributions. The final trip tables used for network analysis are presented in Appendix B, Table B2.

In assigning these trips to existing and trial roadway networks it was appreciated that traffic demand other than that crossing the river would be, to some extent, over-estimated. Due allowance was made when assessing expected roadway capacity deficiencies.

Summary

It is expected that total traffic on Chatham streets will increase from 1966 to 1986 by 63%, while river-crossing traffic will grow during the same period by 69%. The total river-crossing demand during the 4:00-7:00 p.m. period of an average May-June weekday in 1986 will be approximately 16,600 vehicles, while the peak hour volume will be 6,600.

Of the total 1986 traffic it is interesting to note that approximately 60% is local in nature, while external trips comprise 36% and through traffic is a mere 4%. Exhibits 11, 12 and 13 illustrate composite travel desires within and through the study area for the years 1966 and 1986.

ASSESSMENT OF ROADWAY DEFICIENCIES

The River-Crossing Problem

Analysis of recent traffic counts and projection of future traffic demand indicate that before the target planning year of 1986 additional river-crossing capacity will be required.

In the 1961 traffic study it was predicted that between the years 1961 and 1981 traffic volumes on the three Thames River bridges would increase at an average annual rate of 2%. In fact, the growth of this traffic over the past five years has been at an average rate of 6% per annum, so that in 1966 there was a volume of 9,730 vehicles during the 4:00-7:00 P.M. period, as compared with 7,200 in 1961. One reason for this rapid increase is undoubtedly the recent industrial and commercial development in the west end of the City. It is also believed that a generally higher level of prosperity, as evidenced by the increased employment ratio, has resulted in more frequent trips by the residents of the study area.

Looking ahead to 1986 it is anticipated that river-crossings will increase at an average rate of slightly less than 3% per annum, reaching a level in 1986 of 16,600 vehicles during the three-hour peak period. Analysis of traffic counts taken on the bridges over the past five years indicates that volumes during the evening peak hour vary from about 38% to 44% of the 4:00-7:00 P.M. flows, the average being approximately 40%. Application of this factor gives a 1986 peak hour demand of 6,600 vehicles.

On each of the three bridges, adjacent intersections at either end are spaced at no further than 1,200 feet apart. It has therefore been assumed, in assessing peak hour capacity of each crossing, that the limiting factor is the approach capacity of these intersections. Capacities have been calculated according to the techniques described in the Highway Capacity Manual (1965), with results as shown in Table 3.

TABLE #3

RIVER-CROSSING CAPACITY

Direction	Bridge	Adjacent Intersection	Approach Capacity (V.P.H.)
North-bound	Parry	Keil Dr. & Grand Ave.	1000
	Third St,	St. Clair St. & Grand Ave.	1400
	Fifth St.	Thames St. & Victoria Ave.	1100
	TOTAL		3500
South-bound	Parry	Keil Dr. & Riverview Dr.	1100
	Third St.	Third St. & King St.	700
	Fifth St.	Fifth St. & King St.	650
	TOTAL		2450
Two-way	TOTAL		5950

These capacities were compared against the 1966 two-way peak hour counts and the assigned 1986 traffic volumes. The resultant volume/capacity ratios are tabulated below.

TABLE #4

VOLUME/CAPACITY RATIOS - EXISTING BRIDGES

Bridge	Design Capacity	Peak Hour Volume		V/C Ratio	
		1966	1986	1966	1986
Parry	2100	1070	2100	0.51	1.00
Third St.	2100	1640	2800	0.78	1.33
Fifth St.	1750	1190	1700	0.68	0.97
TOTAL	5950	3900	6600	0.66	1.11

The 1986 V/C ratio of 1.11 is evidence that the present bridge capacity will be insufficient to withstand the anticipated traffic demand by the end of the planning period. In fact it is expected that capacity will be reached by about the year 1982.

The Railway-Crossing Problem

The level of protection warranted at the various railway level crossings in Chatham has been established in terms of the "exposure" factors. These factors are computed as the product of the average daily traffic on the cross-street and the average daily trains on the railway. The exposure factors and a priority rating for grade separation are listed in Appendix B, Table B3.

In establishing priority for grade separation, reference was made to the warrants presently in use by the Department of Highways, Ontario. These warrants are tabulated below.

TABLE #5

WARRANTS FOR PROTECTION OF LEVEL CROSSINGS

Facility	Exposure Factor	Trains per Day	Protection Warranted
Single track, all roads	2,500		Flashing lights
Single track, all roads	50,000		Automatic Gates
Mainline and siding	35,000		Automatic Gates
Double track, 2500 v.p.d.:			
Feeder roads	150,000	≧50	Grade Separation
Other roads	100,000	≧40	Grade Separation

Strict adherence to these warrants, however, would indicate that, on the basis of the exposure factors shown in Table B3, there are already seven railway crossings in Chatham which warrant grade separation. Unfortunately, at many of the crossings in Chatham the construction of a grade separation would be impractical. This is particularly true in terms of the C.P.R. line, where grade separations would involve considerable disruption to property access and prohibitive sight restriction at nearby intersections (e.g. the C.P.R. crossing of Lacroix Street, which is within about 400 feet of the Lacroix-Richmond intersection).

The two crossings which rate highest priority are the C.N.R. crossings of Queen-William and Lacroix Streets. Not only are these the two most heavily exposed level crossings in the City, but they are both subject to regular shunting operations on a double-track section of the C.N.R. mainline. Resultant traffic queues on Queen, William and Lacroix Streets are reportedly frequent, long and annoying.

At all other level crossings in Chatham automatic gate control should give adequate protection within the planning period.

General Deficiencies

General capacity deficiencies throughout the existing street system have been analysed in terms of measured and predicted peak hour turning movements at the major intersections. Table B4 in Appendix B lists volume/capacity ratios for major street segments in terms of intersection approaches. As in the case of the three bridges, capacity calculations followed the techniques recommended in the Highway Capacity Manual.

The most critical deficiencies are along Richmond Street (Keil to Queen), on Queen Street (Richmond to School) and on downtown streets such as Fifth and King. Capacity has also already been reached on Park Avenue (Lacroix to Queen), Wellington Street (Fourth to Fifth) and Third Street (Wellington to King).

By 1986 overloading of traffic can be anticipated on a number of streets other than those already mentioned. Besides the three bridges, present capacity is expected to be deficient on St. Clair Street (Grand to McNaughton), Grand Avenue, Keil Drive, Lacroix Street, Queen Street and others, as shown in Exhibit 15.

FORMULATION OF THE RECOMMENDED PLAN

Trial Schemes

In an attempt to devise the best roadway system to accommodate travel demands anticipated by 1986, a number of trial schemes were assessed. These schemes incorporated combinations of a number of improvement features being considered for solution of the following basic problems:

(1) Provision of additional river-crossing capacity.

(2) Location of a north-south arterial road in the west end to connect Park Avenue and Richmond Street (in combination with a routing of the Highway 401 "Western Access" route).

(3) Desirability of one-way routings in the downtown area, and possible creation of a pedestrian mall along King Street.

All other problems were considered supplementary to the above, and generally amounted to a question of whether or not a given street should be widended to four lanes.

The possibility of widening one or more of the existing bridges was briefly considered. Since the most serious capacity deficiency is expected to occur on the Third Street crossing, this would be the most likely bridge to widen. This widening would, of necessity, have to extend back up St. Clair Street at least to McNaughton, and further down Third, Wellington and Queen Streets. Not only would all this widening be extremely costly, particularly in terms of right-of-way acquisition, but loadings on the signalized intersections would be tremendous. This idea was discarded as being an undersirable solution.

It was thus concluded that the best solution to providing additional river-crossing capacity would be the construction of a new bridge The problem then was to determine which location would best serve the traffic demand. The following crossings were analysed in terms of traffic service:

(1) Bloomfield Road extension, with western by-pass to Highway 40 north.

(2) Merritt Avenue extension to connect with Baldoon Road.

(3) Lacroix Street extension to connect with Sandys Street.

(4) William Street extension to connect with Taylor Avenue.

(5) Communication Road extension to connect with Prince Albert Road.

The traffic assignment shown in Exhibit 16 gives an indication of the loadings which could be expected in 1986 with a combination of bridges (1) and (5). Since both of these bridges are remote from the problem area, they offer negligible relief to the congestion on the Third Street bridge. The Bloomfield Road Bridge might be expected to divert about 600 vehicles per peak hour from the Parry Bridge,

while the Communication Road Bridge would offer similar relief to the Fifth Street Bridge. Congestion on Third Street would remain a problem.

By constructing a bridge in the east end of the city, closer to the downtown area than Communication Road, traffic would be diverted primarily from the Fifth Street Bridge. Exhibit 17 shows the kind of traffic loading which might be achieved by connecting William and Taylor Streets. This connection is undesirable because it is indirect, and would involve considerable damage to a fine residential area south of the river. Furthermore, any new crossing east of the Fifth Street bridge cannot be expected to divert any significant volume of traffic from Third Street.

The optimum location of the proposed new crossing was now reduced to the section of the river between the existing Parry and Third Street Bridges. There are two obvious possibilities, already described as alternates (2) and (3). Of these two, the Lacroix-Sandys connection is preferred because of its proximity to Third Street and the downtown area, and because of the difficult intersection between Merritt Avenue and Grand Avenue in relation to the alignment of the Thames River at that point. Exhibit 18 illustrates a probable assignment of traffic to a roadway scheme which includes a bridge connecting Lacroix and Sandys Streets.

The advantages of a Lacroix-Sandys connection become increasingly apparent with further analysis. This crossing allows for the construction of a badly needed north-south arterial route close to the downtown area of the City. From preliminary investigation it would appear that both Lacroix Street and Sandys Street could be widened to four lanes with little real difficulty, and by extending Sandys Street northward past McNaughton Avenue this arterial could be connected direcly to Highway 40. Access to the Central Business District from the south-west could be made via Lacroix and Wellington Streets.

Analysis of possible locations of a north-south arterial connection between Park Avenue and Richmond Street lead to an obvious conclusion, that Keil Drive should be extended southward. This extension has the decided advantage over an extension of Merritt, Bothwell or any other street, because it connects directly with the Parry Bridge. For this reason, Keil Drive should effectively divert west-end oriented traffic from Queen and Lacroix Streets. It is further concluded that traffic between the industrial west-end and the residential areas south of Park Avenue should be encouraged to use Park Avenue between Queen Street and Keil Drive.

The possibility of converting the Third Street and Fifth Street Bridges to a one-way pair was considered as an alternative to widening Third Street, as discussed earlier in this section. To complete this system it would also be necessary to have Thames Street and either King or Wellington Streets operate one-way. Although such a scheme might effectively balance the traffic load between the Third and Fifth Street Bridges, patterns of traffic circulation which are already cumbersome would become almost intolerable to the motoring public. The river presents an unfortunate barrier to effective one-way operation in the immediate downtown area, and for this reason such a scheme is not recommended.

The creation of a pedestrian mall on King Street is likewise not considered

feasible, primarily because of the proximity of the river. The heavy traffic load presently using King Street would be forced onto Wellington Street, which is already loaded close to its capacity. The street system in the downtown area of Chatham simply does not lend itself to creation of a pedestrian mall.

The one area where one-way operation could be very effective is on Queen and Centre Streets, between Richmond and School Streets. Exhibit 34 illustrates the proposed operation. By converting Queen Street to one-way southbound, Centre Street to one-way northbound and School Street to one-way westbound, the presently heavy load on Queen Street could be evenly distributed around the one-way system. This scheme fits logically to the recommended intersection of Richmond-Queen-Centre-Park Streets (Exhibit 28), and would result in greatly improved circulation of traffic between the downtown and the south and south-east areas of the city.

Analysis of the Western Access Problem

The "Western Access Problem", as such, is a matter of determining the best routing to connect Highway 40 to the interchange of Highway 401 and Bloomfield Road.

The present routing of Highway 40, as shown in Exhibit 21, enters Chatham from the north on St. Clair Street, with Connecting Link Agreement on St. Clair to Grand Avenue, Grand Avenue to Keil Drive and south on Keil to Richmond Street. Assuming that this portion of connecting link were to be retained, the problem would reduce itself to establishing an alignment from the Keil-Richmond intersection to the Highway 401-Bloomfield interchange. For this purpose three basic alternatives have been studied.

Referring to Exhibit 19, Line A follows the present alignment of Bloomfield Road to Highway 2, whence it follows Highway 2 to Keil Drive. The expected 1986 peak hour volume on Bloomfield Road is 600 vehicles two-way, so that two lanes would suffice. As a King's Highway connection, however, it is considered that the crossing of the C.N.R. mainline must be grade-separated, causing disruption of access to residences along this road. This residential property then would either have to be expropriated, or some alternate provision of access would be required. The loading on Highway 2 from Bloomfield to Keil (1300 v.p.h.) would require widening of that section of the road from three to four lanes.

The problem of disruption to residential access could be avoided, at some additional expense, by constructing a new section of two-lane roadway on either of the alignments shown approximately in Exhibit 19 as A1 and A2. In either case it is assumed that the C.N.R. crossing would be grade-separated and that Highway 2 would be widened as previously described.

The construction costs involved in Lines A, A1 or A2 are estimated in the vicinity of $1,250,000 with full reconstruction of Bloomfield Road, or a minimum of $900,000 with only repaving of Bloomfield.

Line B, as shown, follows Bloomfield Road, Park Avenue and an extension of Keil Drive. On Bloomfield and Park two lanes would be sufficient, whereas the Keil Drive extension with a grade-separated crossing of the C.N.R. would have to be

built to four lanes (peak hour volumes of approximately 1500 vehicles could be expected over this section of the road). The grade-separation of the C.N.R. crossing would be extremely expensive to construct because of its proximity to Park Avenue (400 feet). With an overpass, Keil Drive and Park Avenue could only be interconnected by means of ramps, while with an underpass the intersection would be in considerable "cut", requiring retaining walls or realignment of Park Avenue.

The construction costs involved in Line B with full reconstruction of Bloomfield Road are, with an overpass, about $1,850,000., and with an underpass $1,550,000. With only repaving of Bloomfield Road these costs might be reduced by about $350,000.

Line C, in terms of traffic service, is essentially similar to Line B. While it has the advantage of a full four-legged intersection between Keil and Park, it requires construction of a lengthy section of new two-lane road. The grade separation problem at the C.N.R. and Park Avenue is the same as for Line B. With an overpass, construction of this alternate would cost over $2,000,000., while the underpass scheme would cost $1,700,000.

In summary, it can be seen that any of the proposed alternatives is extremely costly, with a minimum of close to $1. million construction being involved. It becomes obvious that the optimum alignment of the western access route must now be determined in consideration of overall traffic requirements. Further analysis is presented in the following sections.

Recommended 1986 Roadway Plan

The recommended 1986 roadway plan is presented in Exhibit 3. This plan shows a 4-lane arterial road following the alignments of Lacroix Street and Sandys Street from Park to McNaughton Avenue, connected by a 4-lane bridge across the Thames River. It is assumed that this bridge would be a bascule-type in keeping with tradition in Chatham, and on the recommendation of the Federal Department of Transport. The C.N.R. crossing of Lacroix Street should be grade-separated by means of a 4-lane underpass.

At the south end of this 4-lane road, Lacroix Street should be maintained as a 2-lane arterial from Park Avenue south to Indian Creek Road, while at the north end it is recommended that Sandys Street be extended as a 2-lane arterial to connect at the northern City Limits with Highway 40.

In the east-west direction it is suggested that Richmond Street and Park Avenue be improved to 4-lane arterial standard west of Keil Drive, with the Richmond Street widening being carried east to Queen Street, and Park Avenue being widened to Whitehall Street. Included in the widening of both these roads would be re-channelization of all major intersections.

It is recommended that the extension of Keil Drive south to Park Avenue not be constructed to highway standard, but be built as a 2-lane road with a level crossing of the C.N.R. mainline and spur. The suggested profile is shown in Exhibit 29. Keil Drive should also be extended north from Grand to McNaughton as a 2-lane arterial, to keep pace with anticipated development in the west-end of the city.

An important feature of this plan is the proposed underpass on Queen Street of the C.N.R. mainline. The plan and profile suggested for this underpass are shown in Exhibit 33, and involve a realignment of the Queen-William intersection as shown.

Other street widenings and intersection improvements are proposed as means of increasing capacity in specific problem areas such as:

(1) Grand Avenue - Thames to Taylor

(2) Wellington Street - Lacroix to Raleigh

(3) Thames Street - Victoria to Grand

(4) William Street - Park Street to Wellington

(5) Queen Street - Park Avenue to Indian Creek Road

Besides the conversion to one-way operation of Queen-School-Centre, two major operational improvements are recommended, both dealing with congestion on Fifth Street. First, it is suggested that the bus-loading area between King and Wellington be moved from Fifth to Fourth Street. This matter was discussed at length with the owner of Chatham Coach Lines and the City Traffic Co-ordinator, and it was concluded that the bus routes presently operating in the City could be revised as shown in Exhibit 20. This revision would require provision for left-turning buses from King Street north onto the Fifth Street Bridge.

Another operational improvement recommended is the establishment of reversible operation of the centre lane of the Fifth Street Bridge. This could be achieved through installation of an overhead signal control, so that two traffic lanes would always be available to the peak direction of flow.

Further operational measures such as parking restrictions, or installation of additional traffic control signals, are left to the discretion of the Traffic Co-ordinator. Such measures can be applied in specific instances where future traffic volumes indicate the need for additional peak hour capacity or traffic control not covered by the recommendations of this report.

HIGHWAY CONNECTING LINKS

The Present Situation

At the time the Chatham Traffic Restudy was commenced in 1966, connecting link agreements were in force on St. Clair Street, Grand Avenue and Keil Drive, as shown in Exhibit 21. The paved roadway on each of these routes was four lanes withthe exception of Grand Avenue (Highway 2) east of Thames Street, which was and still is three lanes from Thames to Van Allen, and two lanes east of Van Allen.

Prior to the completion of this study, City Council was faced with an urgent decision concerning the routing of a connecting link between downtown Chatham and the newly designated eastern access route (Communication Road). The choice was clearly between Park Avenue and Park Street, and the choice was put to the Consultant. It was advised that, in view of foreseeable future development of Chatham and the fact that it is the only through east-west route in the City south of the Thames River, Park Avenue would offer the best alignment for the eastern access connecting link.

In a letter to the Mayor of Chatham, dated June 29, 1967, the Minister of Highways of Ontario indicated that his Department would be willing to consider a request from the City for a connecting link agreement on Park Avenue from the City Limits to Queen Street. That section of road has since been widened between Queen Street and Whitehall Street from two lanes to four lanes.

Proposed 1986 System

With the basic routing of the eastern access route already established, the major problem remaining in regard to highway connecting links is to determine the best alignment of a western access route connecting Highway 40 to the interchange of Highway 401 and Bloomfield Road.

In the preceding section of this report some rather lengthy discussion has been devoted to a preliminary analysis of possible alternate alignments between the Highway 401-Bloomfield interchange and the intersection of Keil Drive and Richmond Street. It was shown that construction costs for any one of these alternatives would be upwards of one million dollars.

In consideration of traffic demand, an analysis has been made of the distribution of expected 1986 trips entering the City on Highway 40 and the Bloomfield Road. The results are tabulated below:

	from Highway 40	from Bloomfield Road
to Chatham : downtown	16%	18%
north-west	23%	13%
north-east	11%	7%
south-west	15%	30%
south-east	12%	13%
TOTAL DESTINED	77%	81%
to Highway 2 east	2%	11%
Highway 40 north	-	6%
Highway 2 west	4%	-
Bloomfield Road south	3%	-
Queen Street south	9%	1%
Communication Road south	5%	1%
TOTAL THROUGH	23%	19%

These statistics not only illustrate the importance of "destined" traffic in relation to "through" traffic, but also show that the areas of Chatham west of St. Clair Street and Queen Street draw appreciably more external trips from these two entry points than do areas to the east. The Lacroix-Sandys arterial is ideally situated to provide access from both Highway 40 and Bloomfield Road to all areas of Chatham, including the downtown, with particular favour towards the heavier demands of the western portions of the City.

The question of whether or not the connection between Lacroix Street and Bloomfield Road should be made along Richmond Street or Park Avenue is purely a matter of economics. Regardless of whether or not Lacroix Street is a connecting link between Richmond and Park, it has already been concluded that its crossing of the C.N.R. should be grade-separated. By routing the western access along Park instead of Richmond a second grade-separated crossing of the C.N.R. west of Lacroix Street can be avoided, and an effective saving of at least one million dollars can be realised. The recommended routing of the Highway 40-western access connecting link is shown in Exhibit 22.

To complete the connecting link system it is recommended that the eastern access route be extended eastward along Park Avenue to Lacroix Street. No realignment of Highway 2 is suggested, since the present routing is apparently adequate. Realignment of this route along Richmond to Lacroix, across the Lacroix Street Bridge and eastward on Grand Avenue might be considered optional, but would not really be an improvement over the present alignment.

Stage Development of Proposed System

Since the Lacroix Street Bridge, as outlined in the final section of this report, is not recommended for construction until Stage III (1980-1986), it is proposed that the western access route be developed in two stages.

The first stage would follow the alignment shown in Exhibit 23. Subject to approval by the Department of Highways, the proposed routing could be

designated almost immediately, and certain improvements to the roadways involved could be commenced in Stage I of the construction program (1967-1972). This first stage would achieve its final improved state sometime in the period from 1972 to 1980. Only the widening of Wellington Street to four lanes between Lacroix and Raleigh Streets would be redundant to the recommended 1986 western access route, which represents the second and final stage of development.

CONSTRUCTION STAGING AND COST ESTIMATES

Stage I (1967-1972)

The proposed program for construction of Stage I is shown in Exhibit 4. At the time of writing, the widening of Park Avenue between Queen and Whitehall Streets is near completion, and it is suggested that the next item in this stage be the two-lane reconstruction of Park Avenue from Whitehall to the City Limits. This will complete the connection to the eastern access route (Communication Road), Proposed channelizations of the intersections at Queen Street and at Whitehall Street are shown in Exhibit 25.

The most seriously deficient street in Chatham at the present time is Richmond Street. The widening of this street should be given high priority in the Stage I program, and could be accomplished in two steps, if necessary. The first step involves the section from Keil Drive to Lacroix Street, including some reconstruction at both of those intersections (see Exhibits 26 and 27). In the second step the widening to four lanes is extended through to Queen Street and should include full reconstruction of the Richmond-Queen-Centre-Park intersection (see Exhibit 28).

It is to be hoped that the reconstruction of Bloomfield Road from Highway 401 north to Park Avenue will receive early priority in the Department of Highways' construction program. The condition of this road is presently in a deplorable state. In order to maintain a highway standard, the intersection of Bloomfield and Park should be channelized according to the plan shown in Exhibit 29.

Two-lane extensions of Keil Drive north from Grand to McNaughton, and south from Richmond to Park, are important features of the Stage I program. The construction of these roads could, of course, be timed according to the staging of urban development in the west end of Chatham. Reconstruction of the Keil-Grand intersection should be co-ordinated with the northern extension. The southern extension will require that the industrial railway spur be raised (see Exhibit 29), in order to permit a smooth level crossing of the C.N.R. mainline.

The widening to four lanes of Grand Avenue (Thames to Taylor) and Park Avenue (Queen to Lacroix) can be delayed until the latter part of Stage I. During the period from 1968 to 1972 preliminary plans should be underway, however, for design and construction of the C.N.R. underpasses on Queen and Lacroix Streets. At both locations considerable property must be acquired by the City.

Stage II (1972-1980)

Early in Stage II, design and construction of the Queen Street underpass of the C.N.R. mainline should be undertaken. Exhibit 33 shows a suitable alignment and profile for this grade separation, and a possible realignment of the Queen-William intersection.

Improvements to the access route to downtown Chatham from the south and south-east will be completed with the widening of William Street from Park Street to Wellington, and rechannelization of the intersections at either end of School

Street, leading to establishment of the Queen-School-Centre one-way system (see Exhibit 34).

The second major item in Stage II involves reconstruction of Lacroix Street, the first stage in development of the Lacroix-Sandys arterial. Construction of the C.N.R. underpass and realignment of the Lacroix Street-Park Avenue intersection should precede the widening of Lacroix from Park to Wellington. By channelizing the Lacroix-Wellington intersection as shown in Exhibit 32, and widening Wellington Street to four lanes from Lacroix to Raleigh, significant improvement to the access route to downtown from south-west Chatham could be achieved.

The connecting link from Lacroix Street to the western access (Bloomfield Road) should be completed in the latter part of Stage II. It is recommended that Park Avenue be widened to four lanes from Lacroix to Keil, and that the remaining section from Keil to Bloomfield be rebuilt to two-lane highway standard.

The final construction item recommended for Stage II is the widening of Thames Street (Victoria to Grand) to four lanes. This widening will then complete the improvements to the downtown access route from the north-east (Grand, Thames and Fifth).

In addition to the construction program proposed for the period from 1972 to 1980, it is strongly suggested that City Council make the required preparations for the construction early in Stage III of the Lacroix Street Bridge. The north approach of this bridge passes through a residential area, so that considerable property expropriation will be necessary. At least two to three years' time should be allowed for negotiations, anf for preparation of design drawings.

It is also advised that sufficient right-of-way (86 feet minimum) be reserved early in the planning period for the proposed Sandys Street extension.

Stage III (1980-1986)

Construction of the Lacroix Street Bridge should be commenced as soon as possible in Stage III, aiming towards completion by about 1982. Other features of the Lacroix-Sandys arterial, such as channelization of the Grand-Sandys intersection and reconstruction of Sandys Street to four lanes from Grand to McNaughton, should be staged for completion simultaneous with the opening to traffic of the new bridge.

The extension of Sandys Street north from McNaughton Avenue could probably be delayed until the latter part of Stage III. The timing of this construction will likely, however, be dependent upon the rate of development of the north-west area of the City. Prior to completion of this extension, the Highway 40 designation could be carried south on St. Clair Street to McNaughton Avenue, west on McNaughton to Sandys and then south on the recommended Sandys-Lacroix connecting link.

As the residential areas south of Park Avenue develop, it is suggested that Queen Street be reconstructed to a full four lanes from Park south to Indian Creek Road.

The City would also be well advised to allow for, in addition to the construction program proposed for Stage III, extensive repaving requirements on a number of major "unimproved" streets throughout Chatham (see Exhibit 6). The present condition of pavements on those roads is generally good to excellent, and it is thus felt that major repaving can probably be delayed until Stage III.

Cost Estimates

Costs for carrying out the proposed construction program have been estimated on the basis of unit prices and land and property costs currently prevailing in Chatham. These unit prices were supplied by the City Engineer, and are listed in Appendix A, Table A4.

The cost estimates were prepared on the general assumption that streets will be constructed to standards similar to those shown in Exhibit 24. It is appreciated that optimum right-of-way widths, as shown, cannot always be provided for a given pavement width. This matter was discussed with the City Engineer and, consequently, the property costs as shown in Tables 6, 7 and 8 are based on "probable" widths of right-of-way.

Tables 6, 7 and 8 list total estimated costs by construction stage. It should be noted that "property" costs comprise both land and building expropriation.

Cost Sharing

The sharing of construction and property costs among the participating agencies is estimated as follows:

(1) Roadway and Bridge Construction

	Highway Connecting Links	Other Urban Streets
City of Chatham	25%	66 2/3%
Department of Highways	75%	33 1/3%

(2) Land and Property Acquisition

	All Streets
City of Chatham	66 2/3%
Department of Highways	33 1/3%

(3) Railway Grade-Separation

	Highway Connecting Links	Other Urban Streets
Federal Board of Transport	80%(max.$500,000)	Same
Canadian National Railways	5% (max.$31,500)	Same
City of Chatham	25% of remainder	66 2/3% of remainder
Department of Highways	75% of remainder	33 1/3% of remainder

The estimated sharing of total costs are shown in Tables 6, 7 and 8, and in summary, by construction stage, in Table 1.

TABLE #6

COST ESTIMATES - STAGE I

(1967 - 1972)

Item	Description	Cost Breakdown			Cost Sharing			
		Construction	Property	Total Costs	City of Chatham	Dept. of Highways	Dept. of Transport	C.N.R.
Park Avenue (Queen to Whitehall)	Widen to 4 lanes	$280,000	-	$ 280,000	$ 70,000	$ 210,000	-	-
Park Avenue (Whitehall to City Limits)	Reconstruct 2 lanes	44,000	-	44,000	11,000	33,000	-	-
Richmond St. (Keil to Queen)	Widen to 4 lanes	231,000	90,000	321,000	214,000	107,000	-	-
Bloomfield Rd. (Hwy. 401 to Park Avenue)	Reconstruct 2 lanes	500,000	-	500,000	-	500,000	-	-
Keil Drive (Richmond to Park Avenue)	Construct 2 lanes	200,000	-	200,000	133,000	67,000	-	-
Keil Drive (Grand to McNaughton)	Construct 2 lanes	124,000	-	124,000	73,000	51,000	-	-
Park Avenue (Lacroix to Queen)	Widen to 4 lanes	60,000	-	60,000	15,000	45,000	-	-
Grand Avenue (Thames to Taylor)	Widen to 4 lanes	72,000	-	72,000	18,000	54,000	-	-
TOTAL		$1,511,000	$90,000	$1,601,000	$534,000	$1,067,000	-	-

TABLE #7

COST ESTIMATES - STAGE II

(1972 - 1980)

Item	Description	Cost Breakdown			Cost Sharing			
		Construction	Property	Total Costs	City of Chatham	Dept.of Highways	Dept.of Transport	C.N.R.
Queen-William Underpass	Grade Separation of C.N.R.	$840,000	$420,000	$1,260,000	$486,000	$243,000	$500,000	$31,000
Queen-School-Centre Streets	Intersection improvements	18,000	-	18,000	12,000	6,000	-	-
William St. (Park St. to Wellington)	Widenmto 4 lanes	18,000	-	18,000	12,000	6,000	-	-
Lacroix Street Underpass	Grade separation of C.N.R.	633,000	55,000	688,000	62,000	95,000	500,000	31,000
Lacroix St. (Park Ave. to Wellington	Widen to 4 lanes	170,000	-	170,000	43,000	127,000	-	-
Wellington St. (Lacroix to Raleigh)	Widen to 4 lanes	74,000	-	74,000	18,000	56,000	-	-
Park Avenue (Lacroix to Keil)	Widen to 4 lanes	150,000	-	150,000	38,000	112,000	-	-
Park Avenue (Keil to Bloomfield)	Reconstruct 2 lanes	108,000	-	108,000	27,000	81,000	-	-
Thames St. (Victoria to Grand)	Widen to 4 lanes	30,000	-	30,000	20,000	10,000	—	-
TOTAL		$2,041,000	$475,000	$2,516,000	$718,000	$736,000	$1,000,000	$62,000

TABLE #8

COST ESTIMATES - STAGE III

(1980 - 1986)

Item	Description	Cost Breakdown			Cost Sharing			
		Construction	Property	Total Costs	City of Chatham	Dept.of Highways	Dept.of Transport	C.N.R.
Lacroxi Street (Wellington to Grand)	Construct 4-lane Bascule bridge and approaches	$1,275,000	$215,000	$1,490,000	$463,000	$1,027,000	-	-
Sandys Street (Grand to McNaughton)	Widen to 4 lanes	144,000	9,000	153,000	42,000	111,000	-	-
Sandys Street (McNaughton to Hwy. 40)	Construct 2 lanes	400,000	90,000	490,000	160,000	330,000	-	-
Queen Street (Park Ave. to Indian Creek Road)	Reconstruct 4 lanes	75,000	--	75,000	50,000	25,000	-	-
Major Repaving	As shown in Exhibit 6	300,000	--	300,000	150,000	150,000	-	-
TOTAL		$2,194,000	$314,000	$2,508,000	$865,000	$1,643,000	-	-

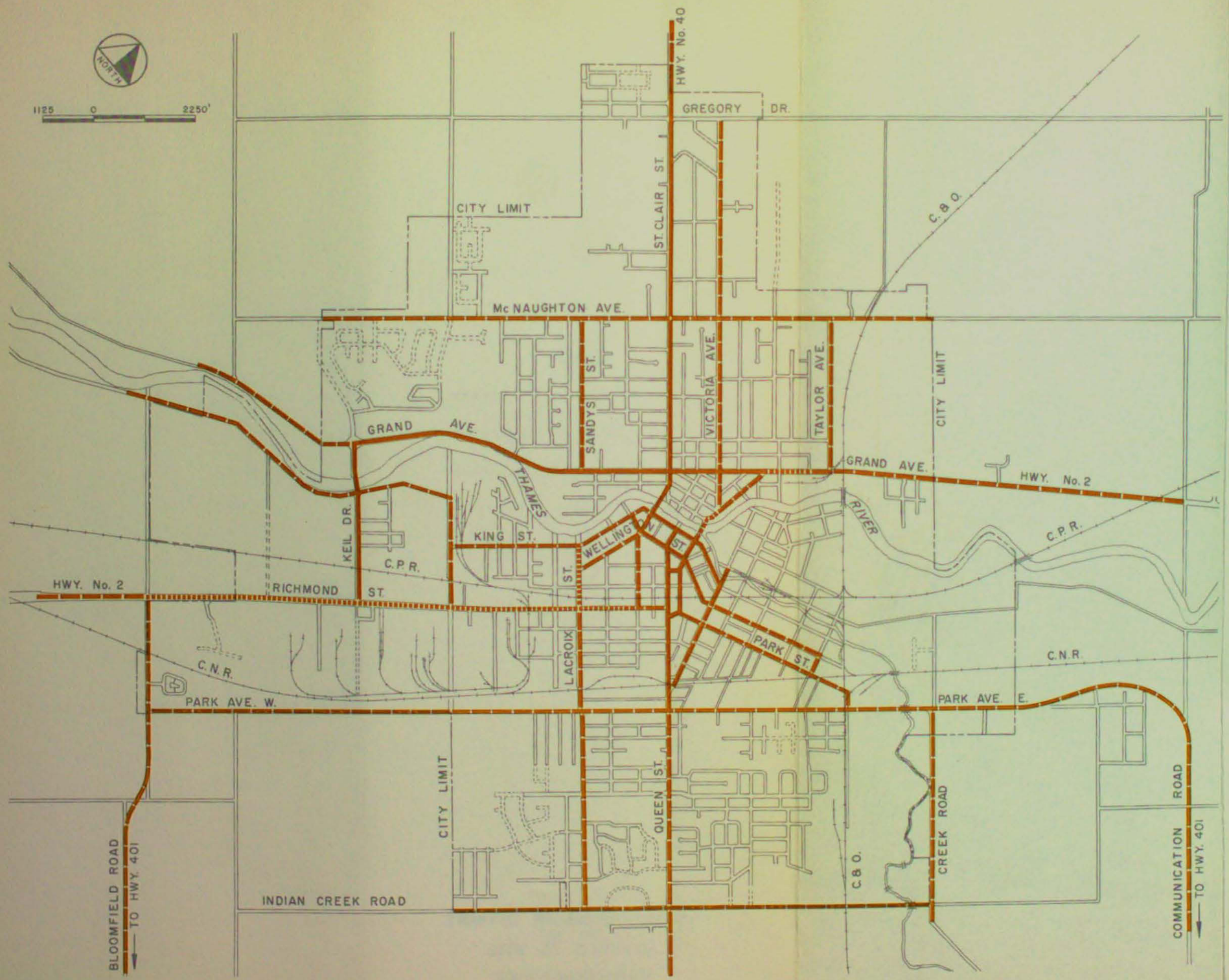
EXHIBIT
I

De Leuw, Cather

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

LOCATION OF STUDY AREA

EXHIBIT
2



LEGEND

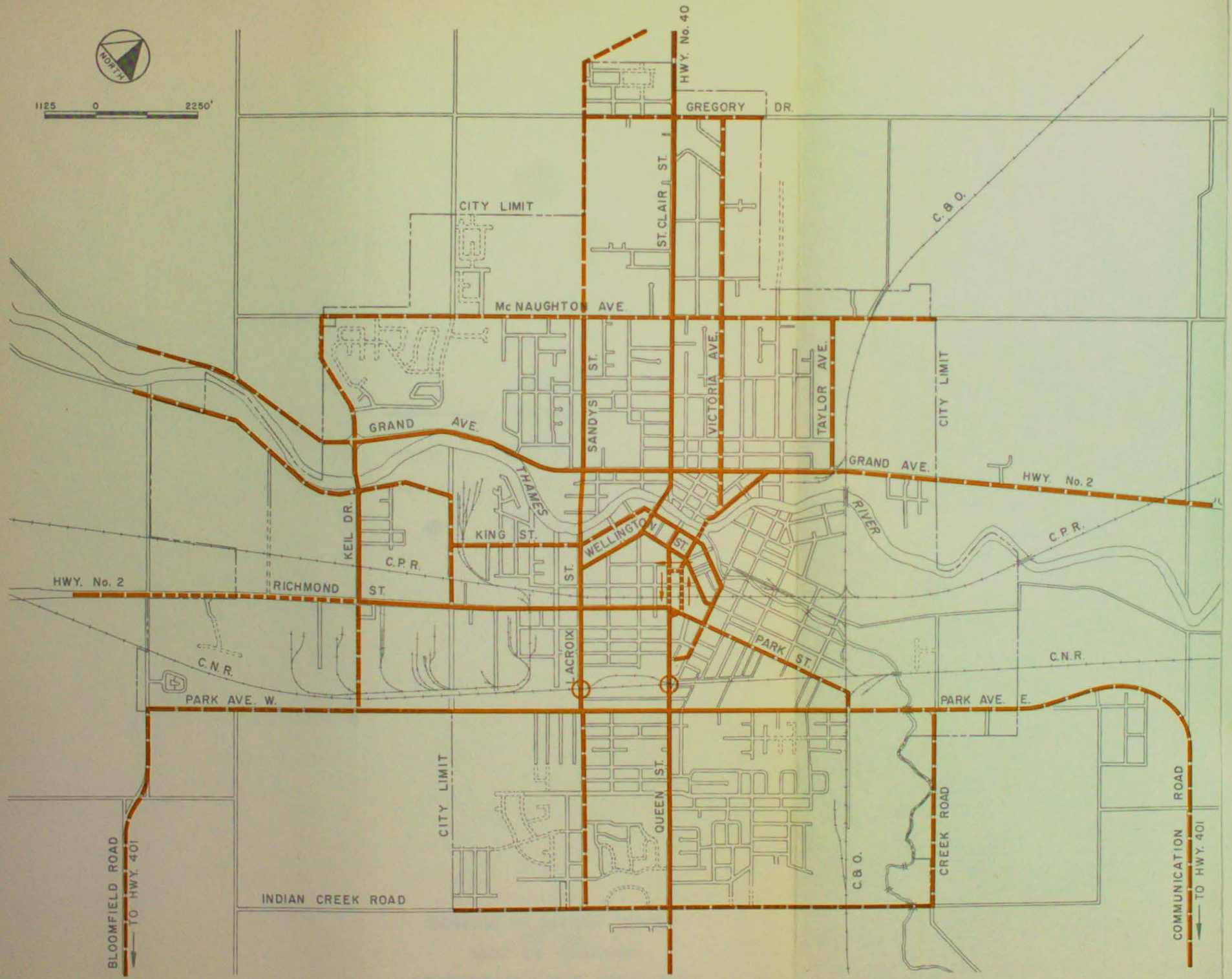
- 4 LANES
- 3 LANES
- 2 LANES

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

EXISTING
MAJOR STREET PLAN – 1966

De Leuw, Cather

EXHIBIT
3



LEGEND

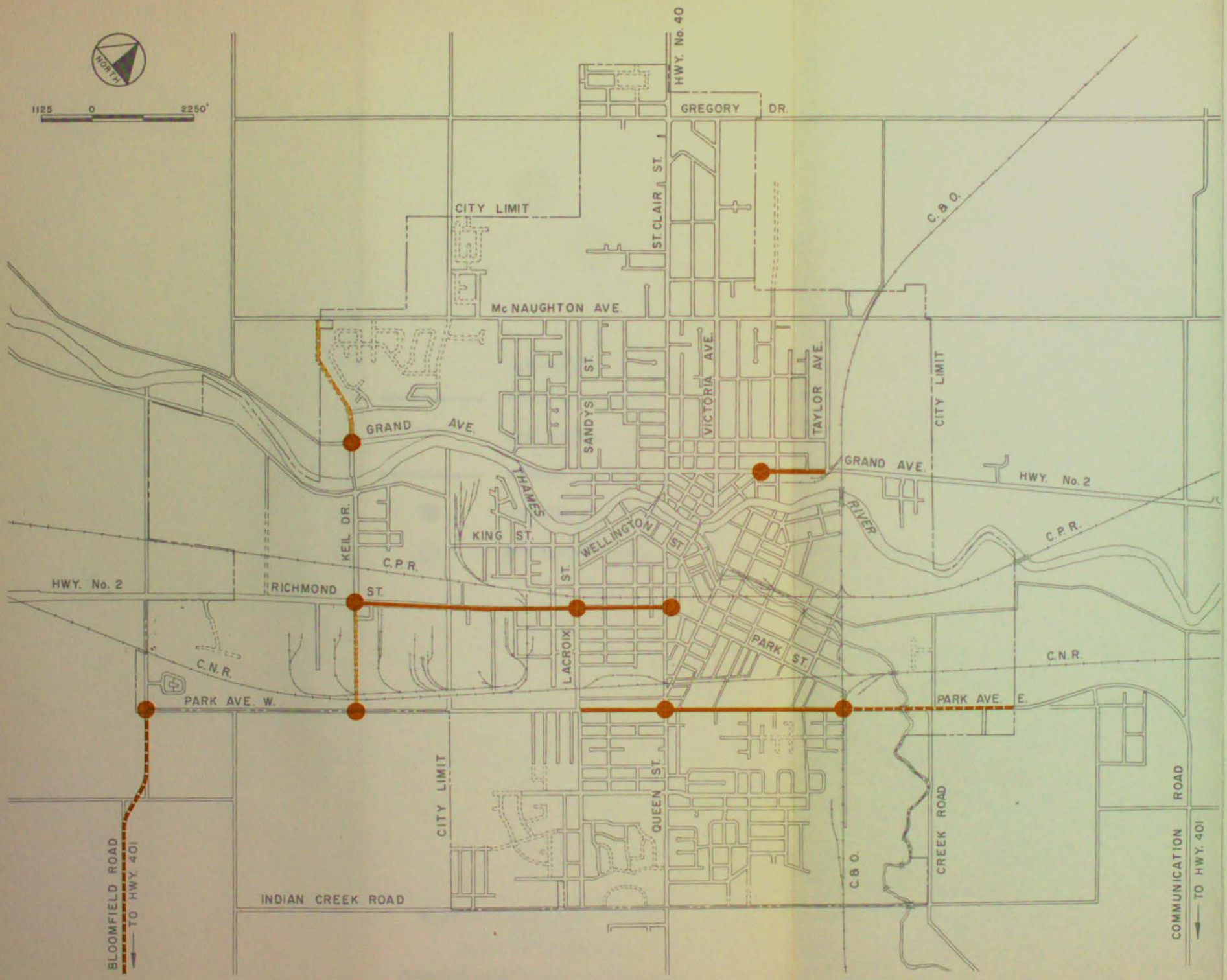
- 4 LANES
- 3 LANES
- 2 LANES
- ONE-WAY STREETS
- GRADE SEPARATION

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

RECOMMENDED MAJOR STREET PLAN – 1986

De Leuw, Cather

EXHIBIT
4



LEGEND

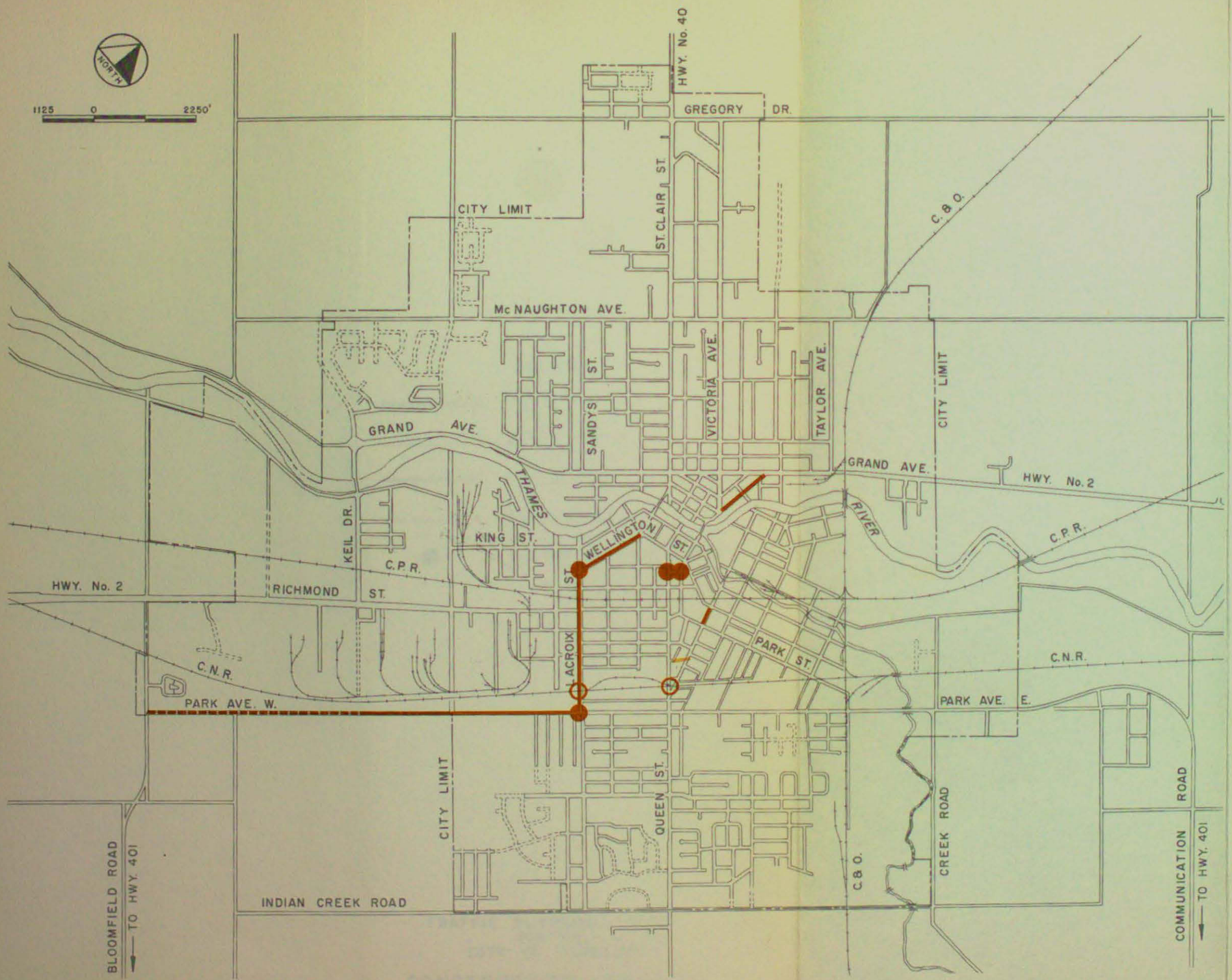
- WIDEN TO 4 LANES
- NEW 2 LANES
- IMPROVE 2 LANES
- INTERSECTION IMPROVEMENT

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

CONSTRUCTION PROGRAM
STAGE I – 1967 TO 1972

De Leuw, Cather

EXHIBIT
5



LEGEND

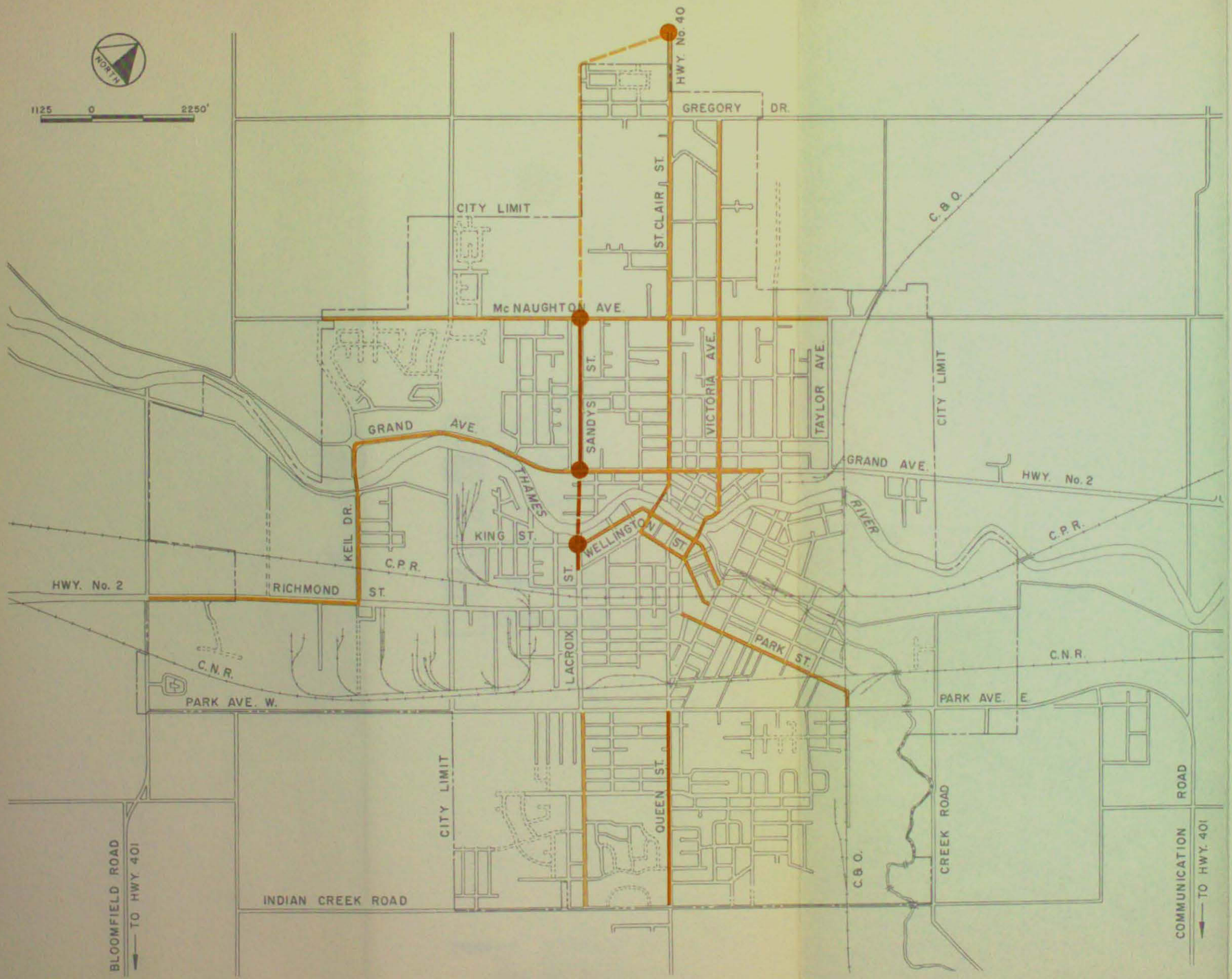
- WIDEN TO 4 LANES
- NEW 2 LANES
- IMPROVE 2 LANES
- INTERSECTION IMPROVEMENT
- GRADE SEPARATION

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

CONSTRUCTION PROGRAM
STAGE II — 1972 TO 1980

De Leuw, Cather

EXHIBIT 6



LEGEND

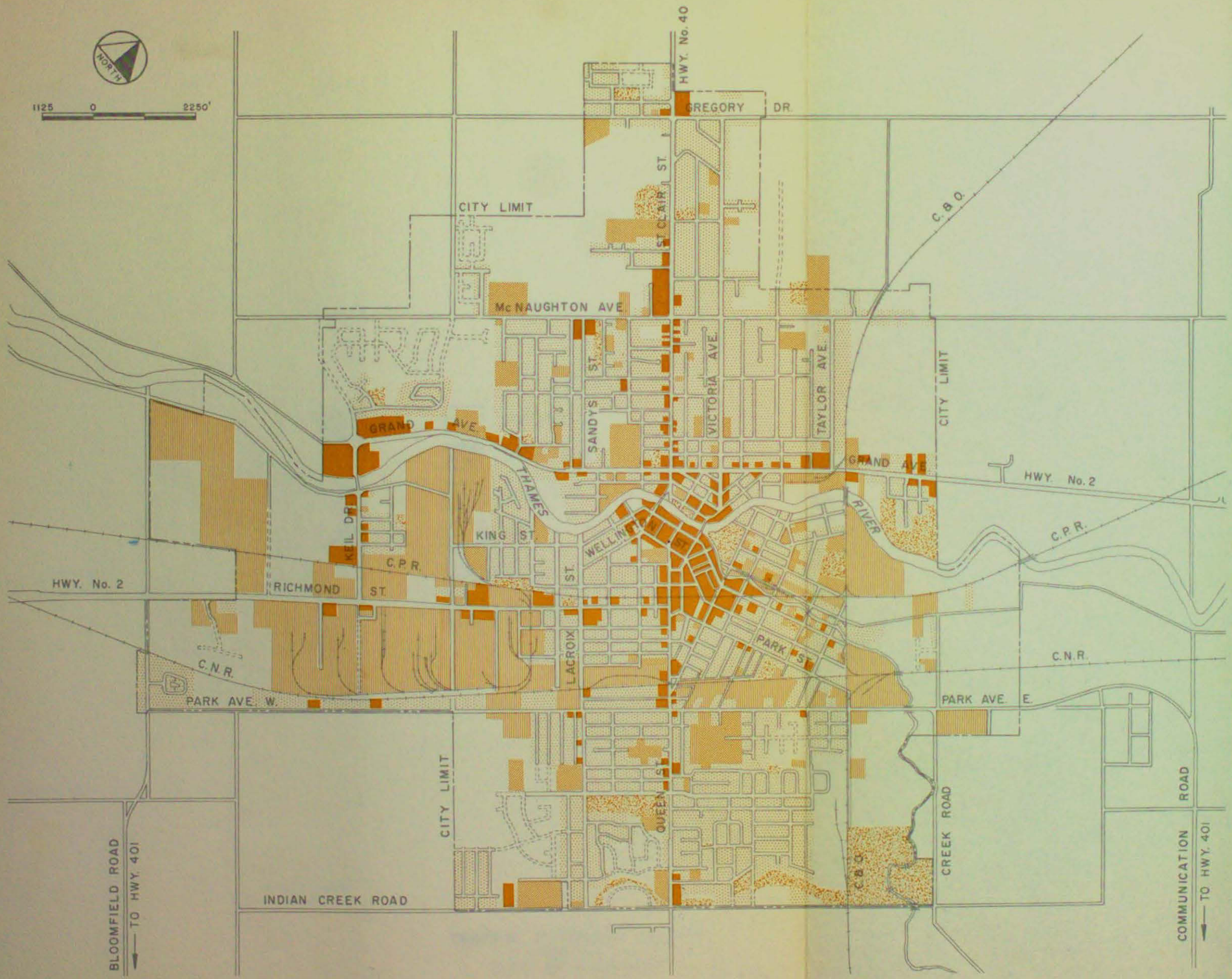
- WIDEN TO 4 LANES
- NEW 2 LANES
- NEW 4 LANES
- MAJOR REPAVING
- INTERSECTION IMPROVEMENT

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

CONSTRUCTION PROGRAM
STAGE III — 1980 TO 1986

De Leuw, Cather

EXHIBIT
7



LEGEND

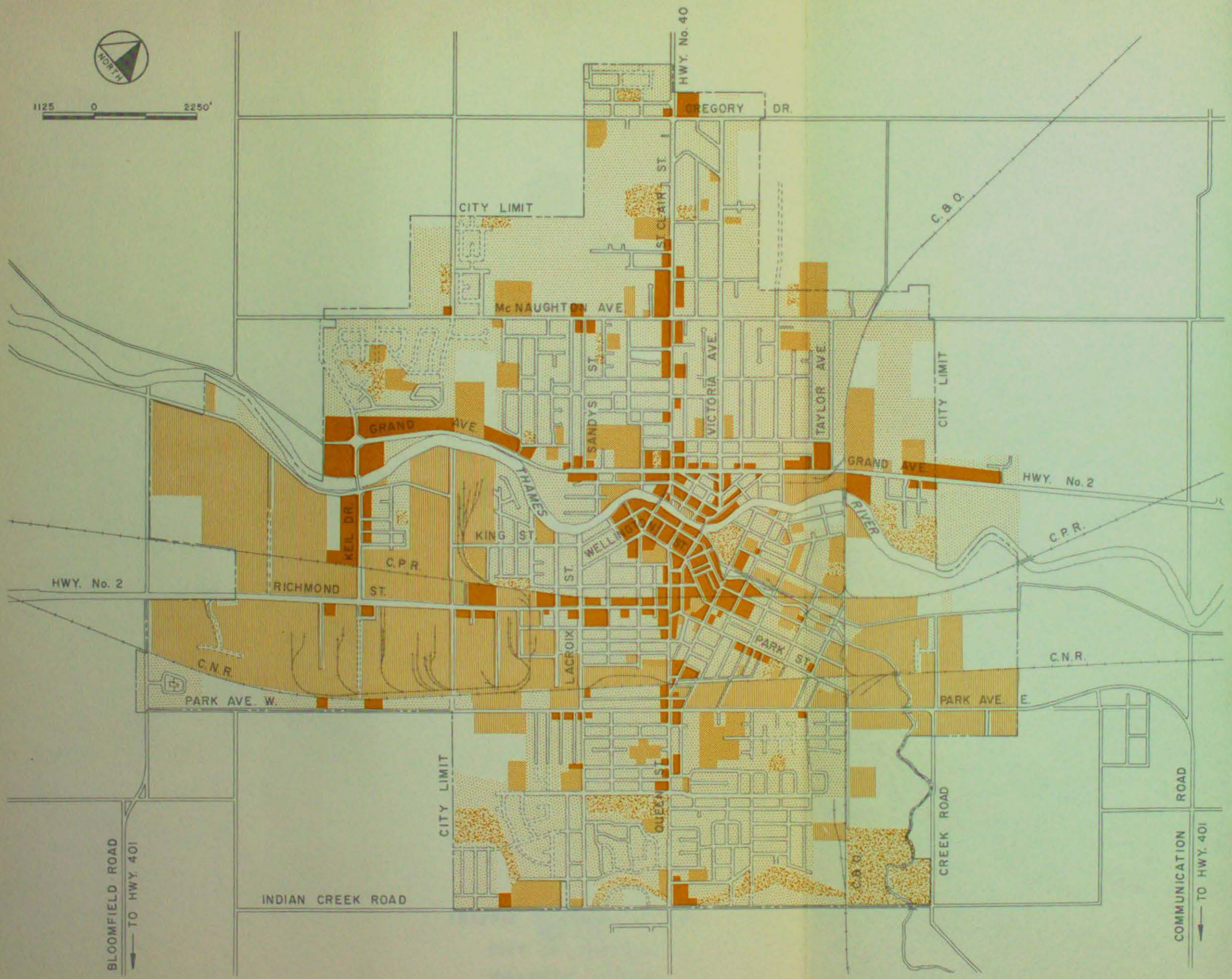
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PARKS
- INSTITUTIONAL
- AGRICULTURAL or VACANT

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

EXISTING LAND USE – 1966

De Leuw, Cather

EXHIBIT
8



LEGEND

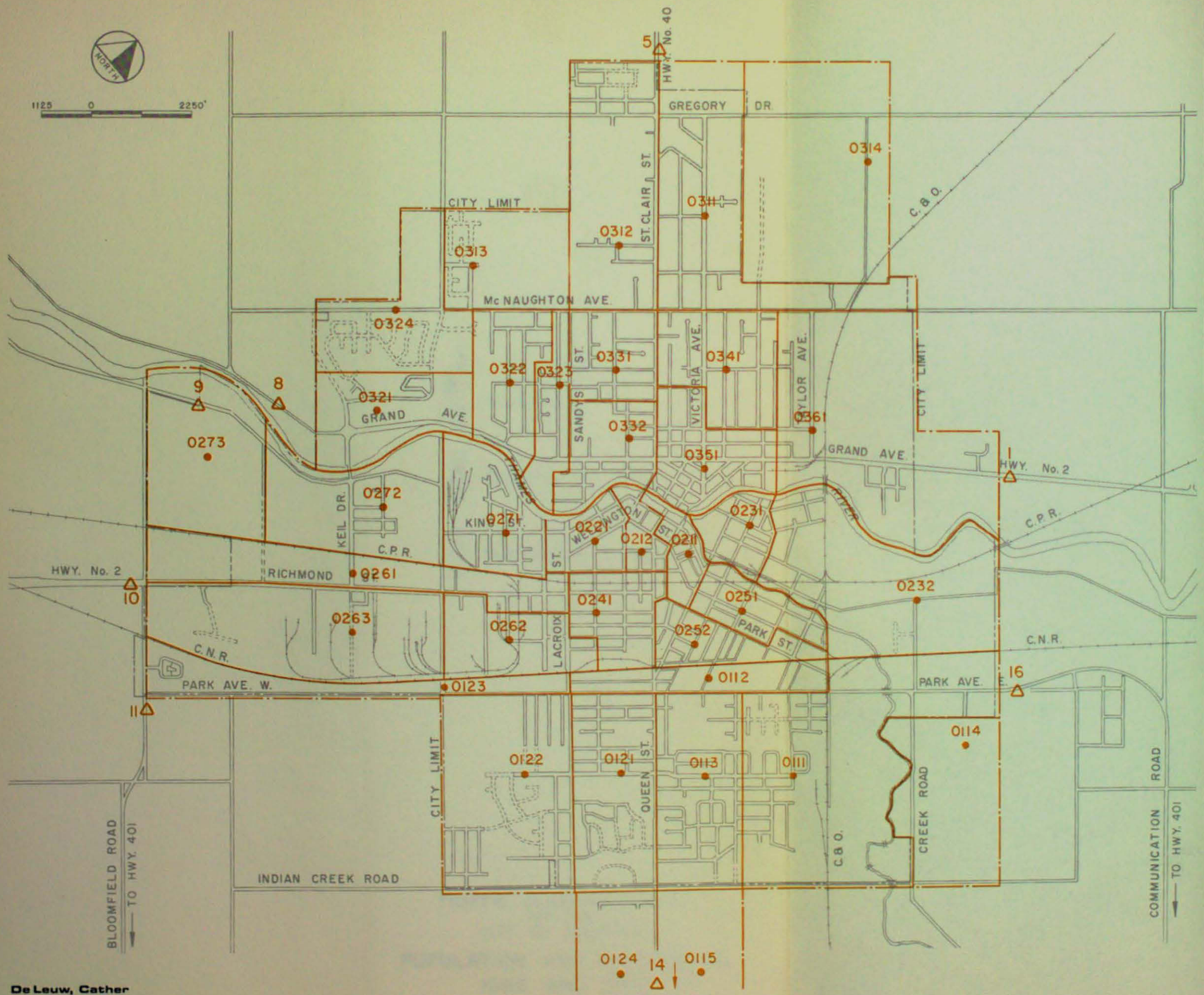
- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PARKS
- INSTITUTIONAL
- AGRICULTURAL or VACANT

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

PROBABLE LAND USE — 1986

De Leuw, Cather

EXHIBIT
9



LEGEND

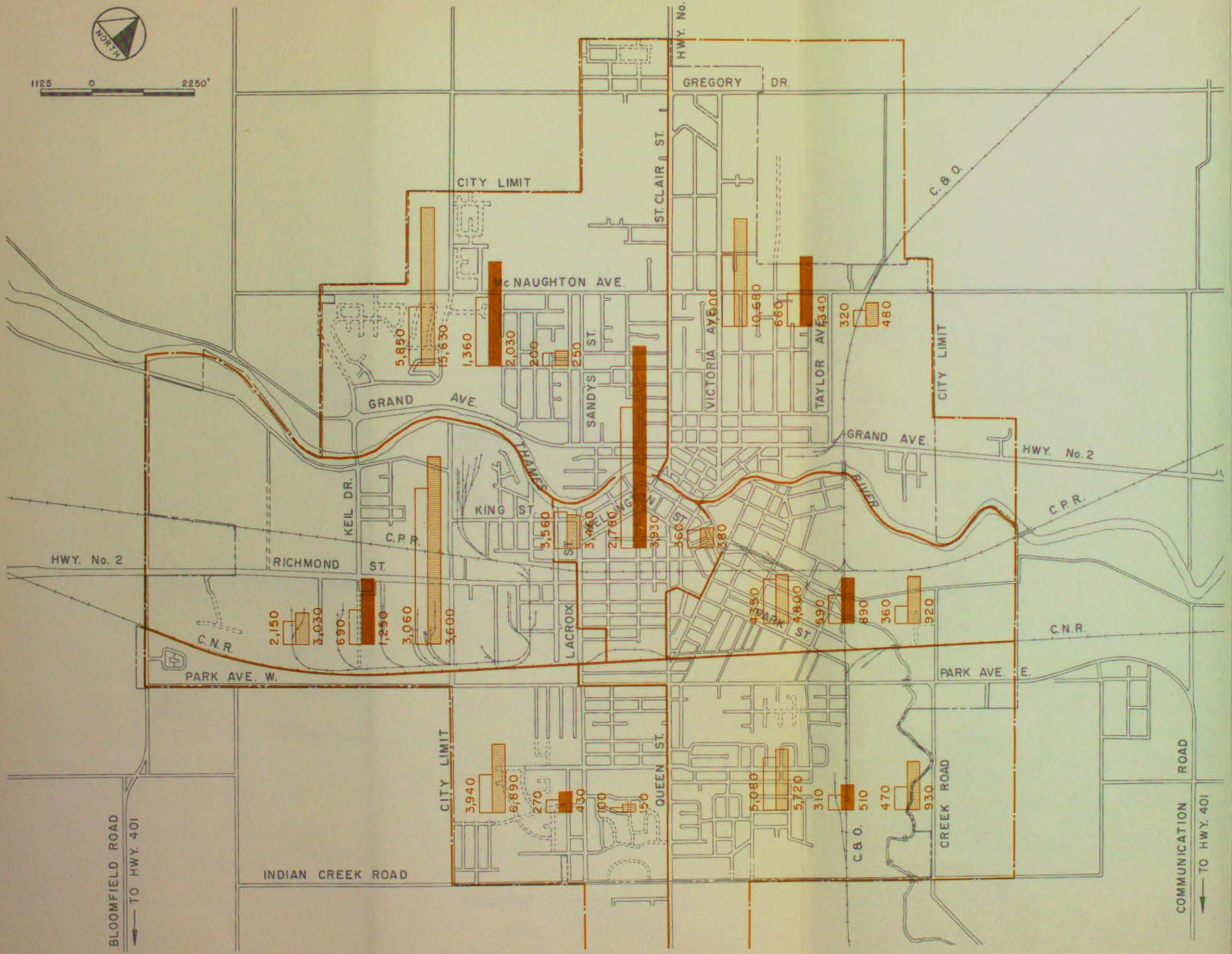
- STUDY AREA BOUNDARY
- ZONE BOUNDARY
- △ EXTERNAL STATION
- ● ZONE CENTROID

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

TRAFFIC ZONES AND EXTERNAL STATIONS

De Leuw, Cather

EXHIBIT
10



LEGEND

1966 1986

POPULATION

COMMERCIAL EMPLOYMENT

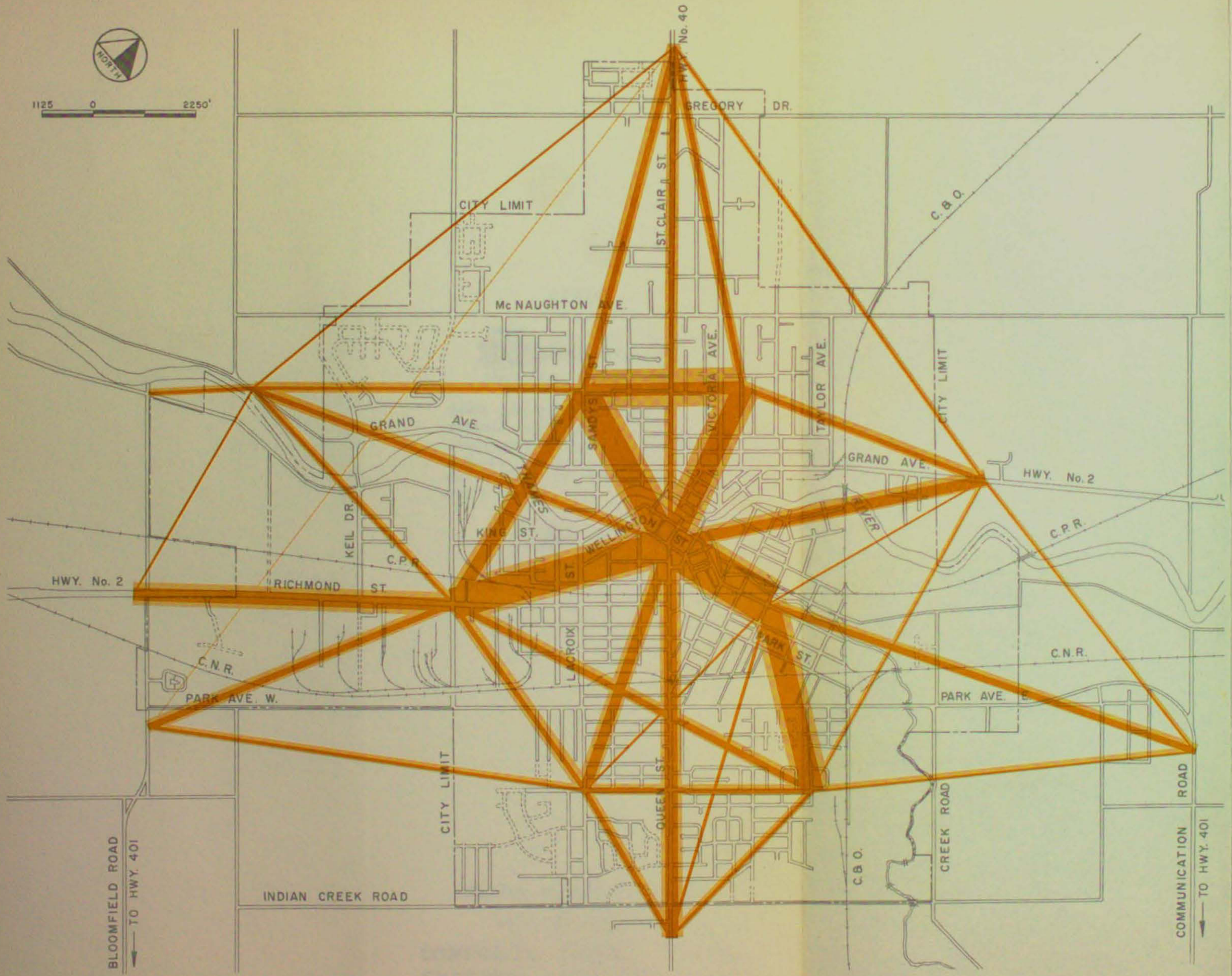
MANUFACTURING EMPLOYMENT

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

POPULATION AND EMPLOYMENT 1966 AND 1986

De Leuw, Cather

EXHIBIT
11



LEGEND

2000 1000 500 250

TRIPS PER P.M. PEAK HOUR

TRIPS ARE COMPUTED FROM AN AVERAGE MAY/JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

1966

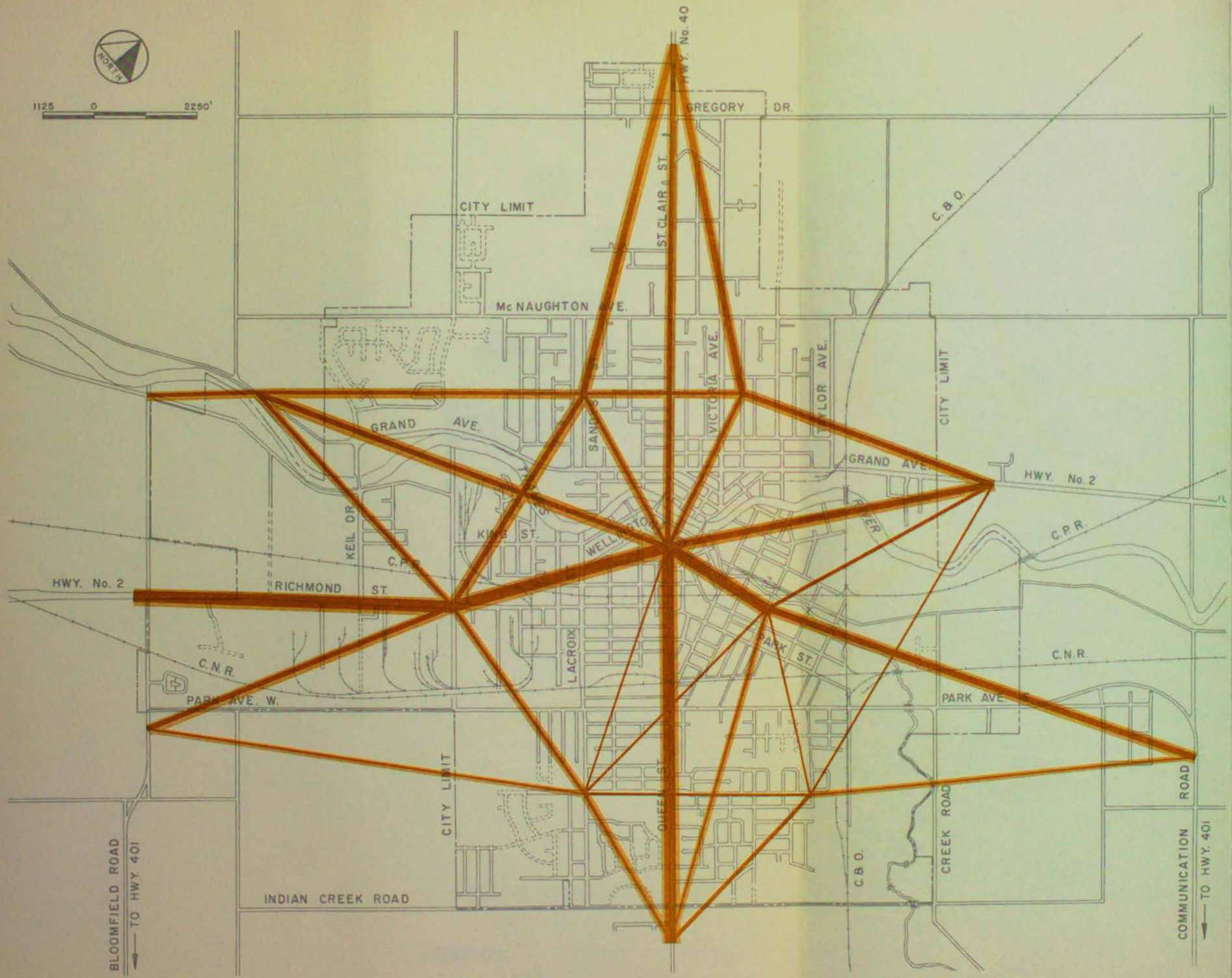
1986

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

COMPOSITE TRAVEL DESIRES TOTAL TRIPS – 1966 AND 1986

De Leuw, Cather

EXHIBIT
12



LEGEND

1000 500 250 50

TRIPS PER P.M. PEAK HOUR

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1966

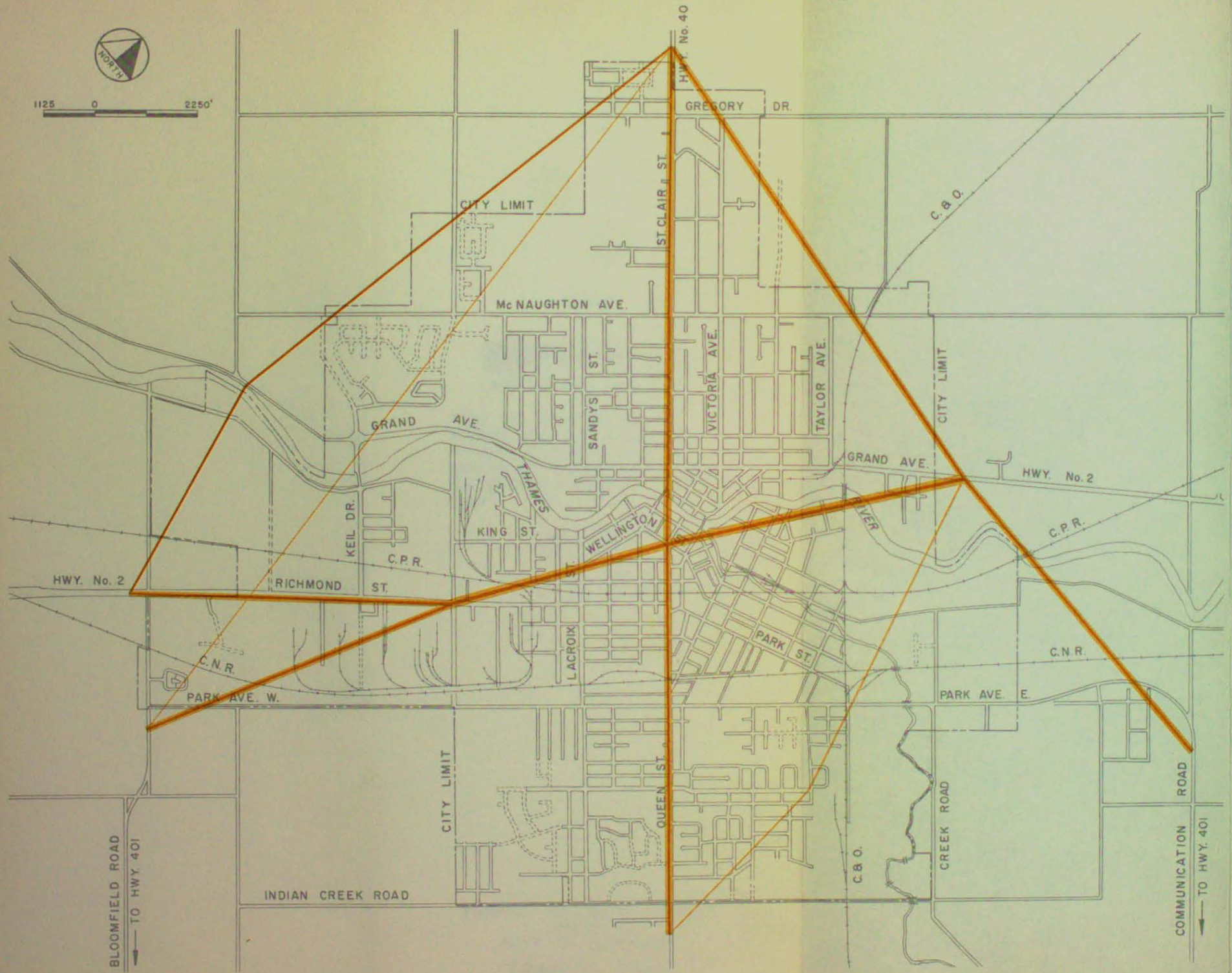
1986

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

COMPOSITE TRAVEL DESIRES EXTERNAL – INTERNAL TRIPS 1966 AND 1986

De Leuw, Cather

EXHIBIT
13



LEGEND

500 250 100 50

TRIPS PER P.M. PEAK HOUR

TRIPS ARE COMPUTED FROM AN AVERAGE MAY/JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

1966

1986

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

COMPOSITE TRAVEL DESIRES THROUGH TRIPS 1966 AND 1986

De Leuw, Cather

EXHIBIT
14

LEGEND

3000 2000 1000 500

TRIPS PER P.M. PEAK HOUR

TRIPS ARE COMPUTED FROM AN AVERAGE MAY/JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

1966

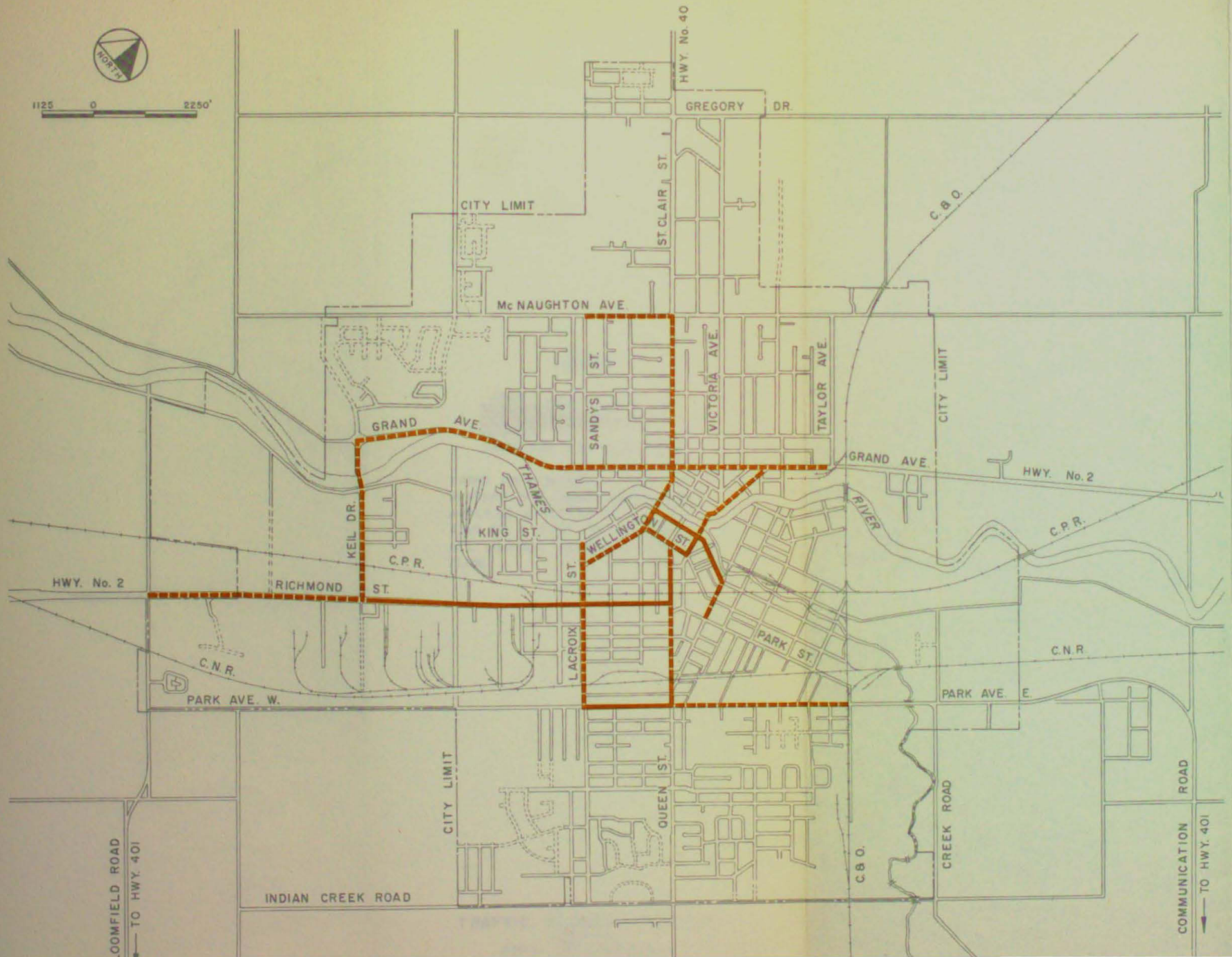
1986

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

TRAFFIC FLOW 1966 AND 1986

De Leuw, Cather

EXHIBIT
15



LEGEND

V/C > 1·00 — 1966

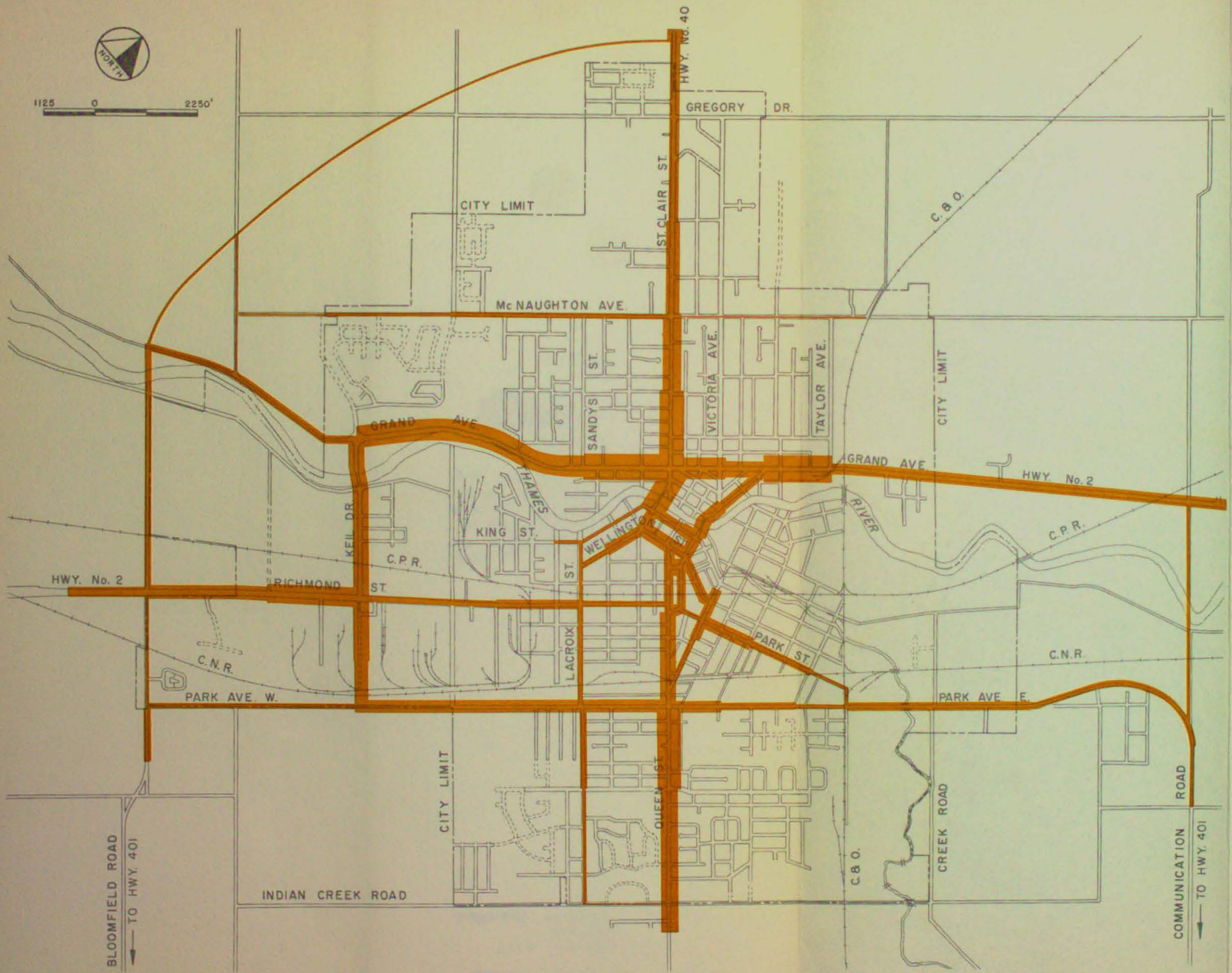
V/C > 1·00 — 1986

NOTE:

V = DESIGN HOUR VOLUME
C = DESIGN CAPACITY (LEVEL OF SERVICE C) BASED ON CAPACITY OF ADJACENT INTERSECTIONS.

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

EXHIBIT
16



LEGEND

3000 2000 1000 500

TRIPS PER P.M. PEAK HOUR

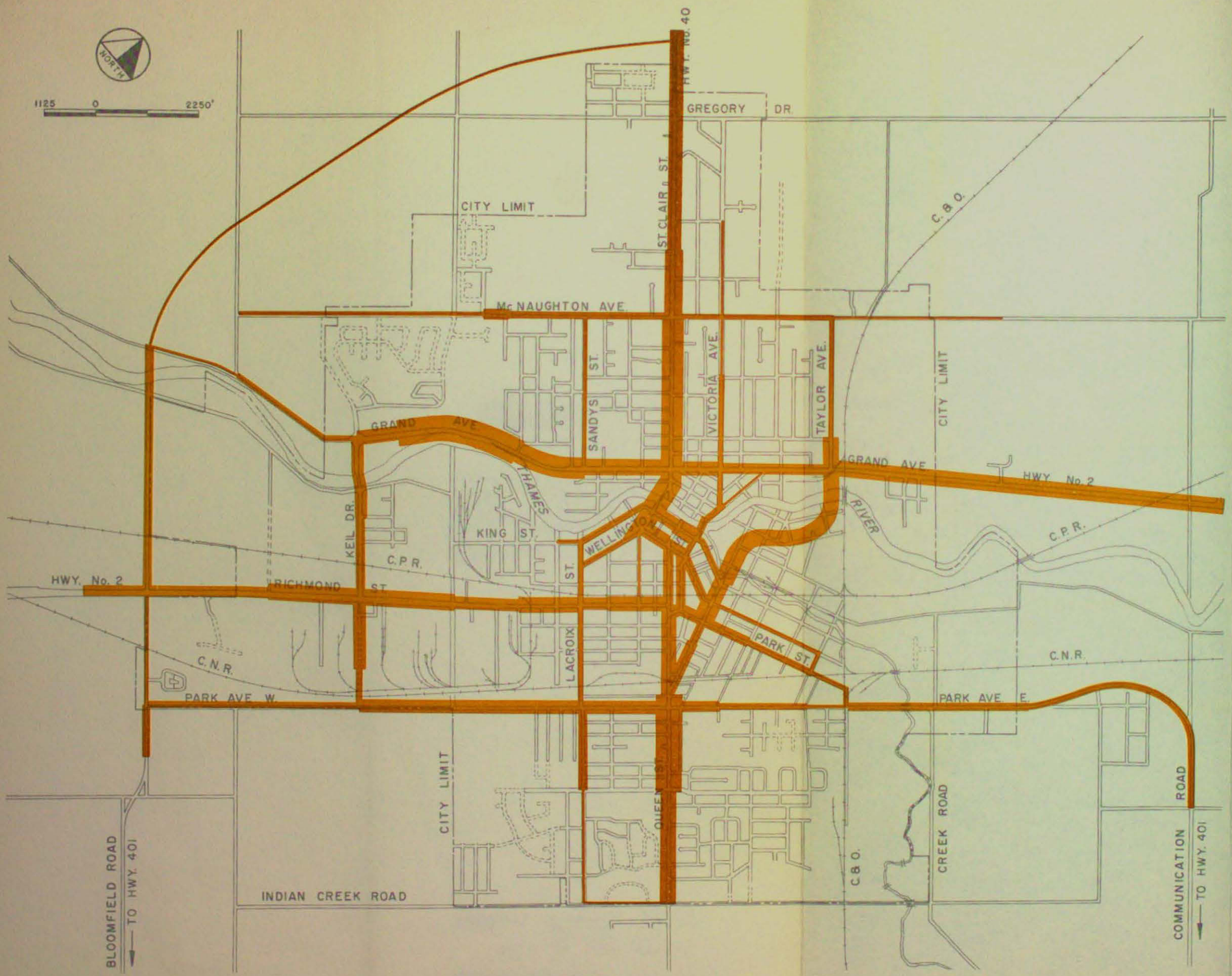
TRIPS ARE COMPUTED FROM AN AVERAGE MAY / JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

TRIAL SCHEME No. 1
1986 TRAFFIC ASSIGNMENT

De Leuw, Cather

EXHIBIT
17



LEGEND

3000 2000 1000 500

TRIPS PER P.M. PEAK HOUR

TRIPS ARE COMPUTED FROM AN AVERAGE MAY / JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

TRIAL SCHEME No. 2
1986 TRAFFIC ASSIGNMENT

De Leuw, Cather

EXHIBIT
18

LEGEND

3000 2000 1000 500

TRIPS PER P.M. PEAK HOUR

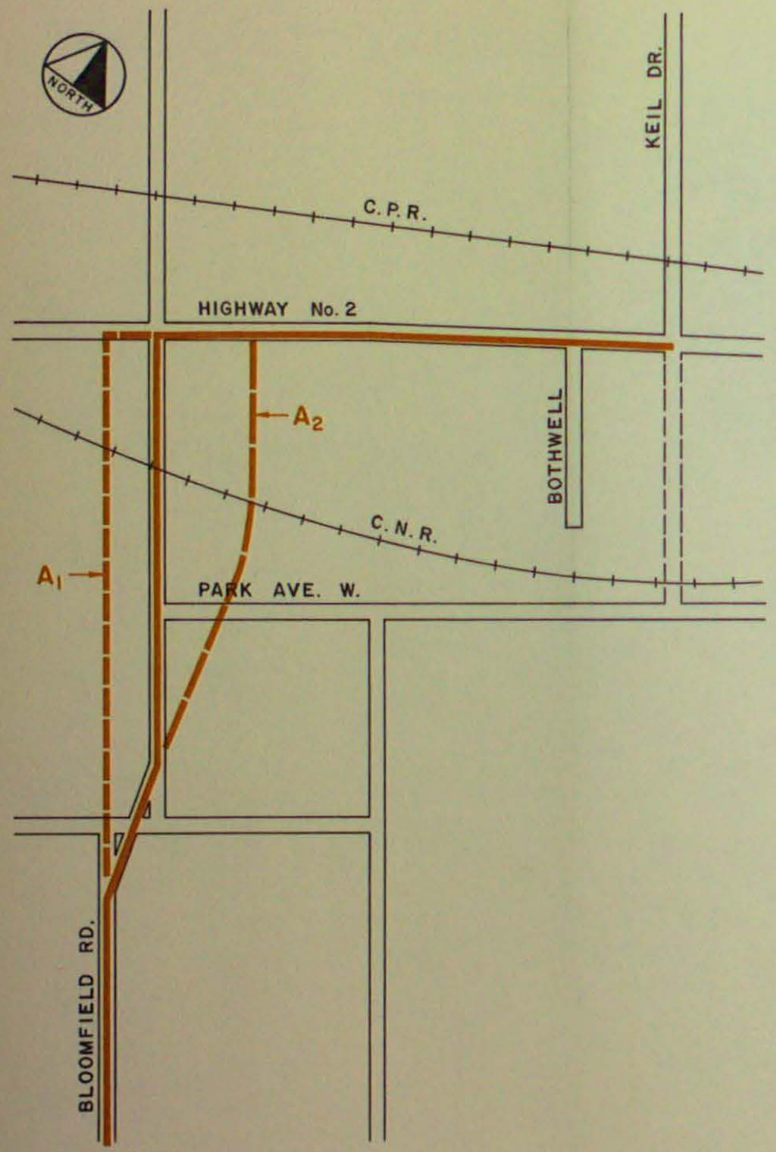
TRIPS ARE COMPUTED FROM AN AVERAGE MAY / JUNE WEEKDAY BY APPLYING A FACTOR OF 0·40 TO 4:00 P.M. – 7:00 P.M. VOLUMES. ALL VOLUMES REPRESENT TWO-WAY FLOW.

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

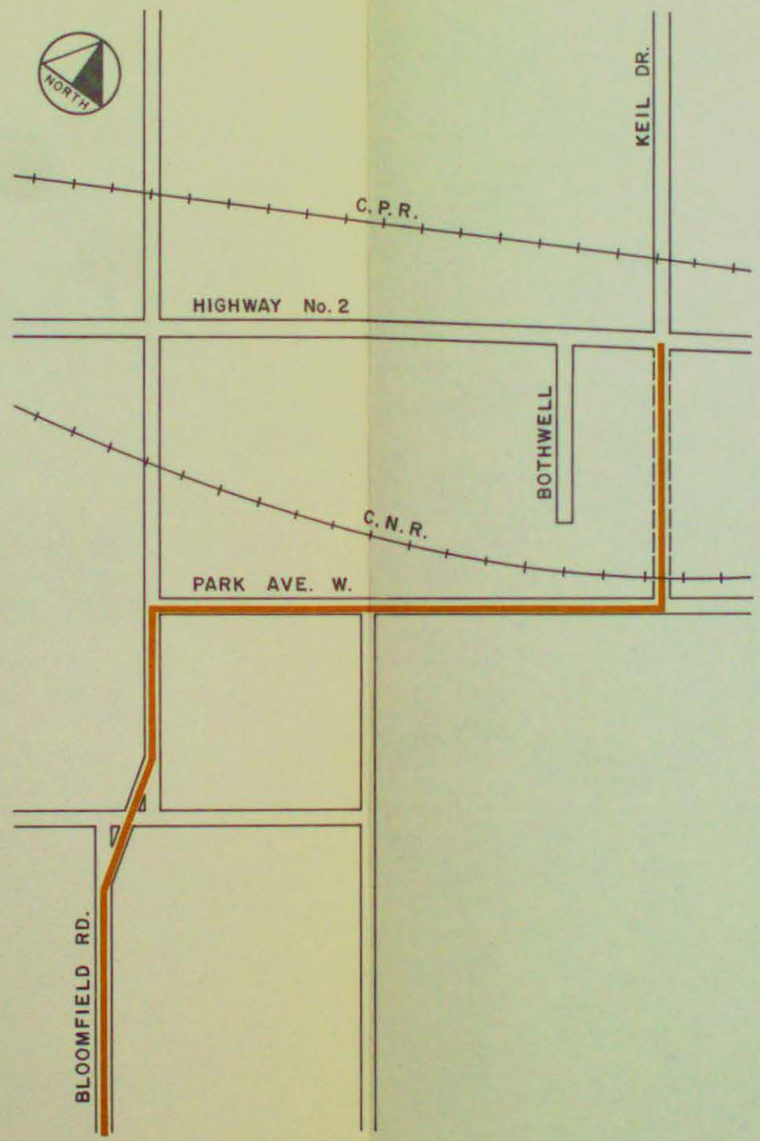
RECOMMENDED SCHEME 1986 TRAFFIC ASSIGNMENT

De Leuw, Cather

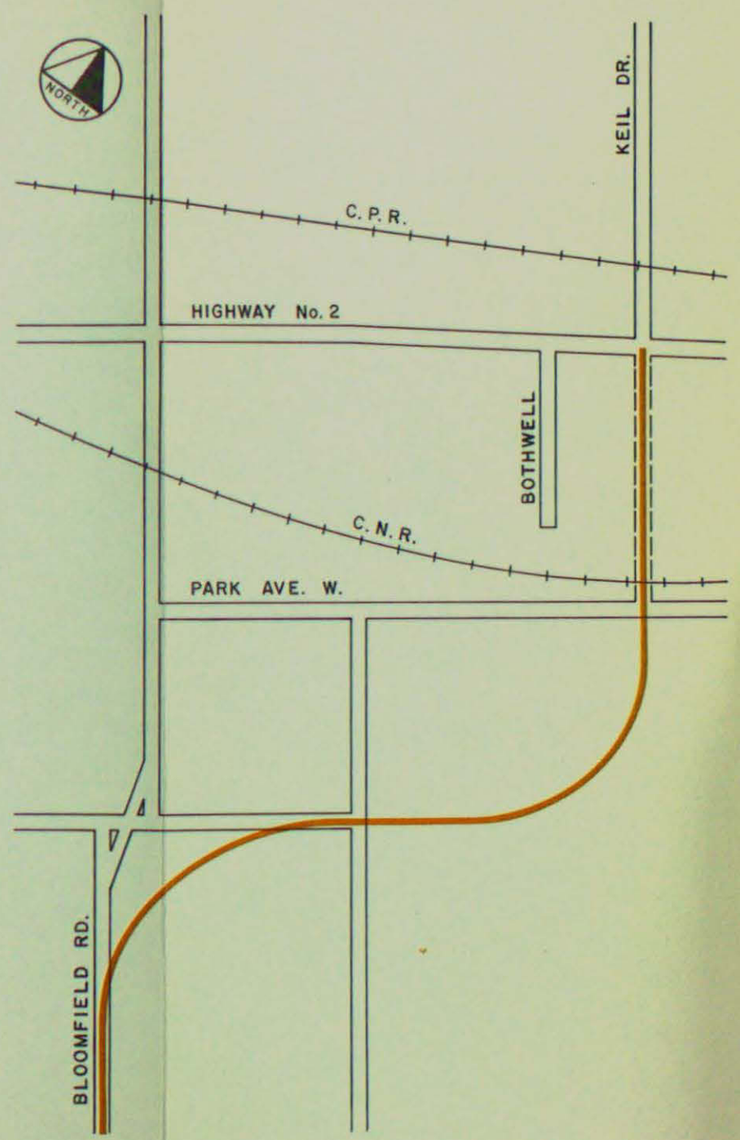
EXHIBIT
19



LINE A
N.T.S.



LINE B
N.T.S.



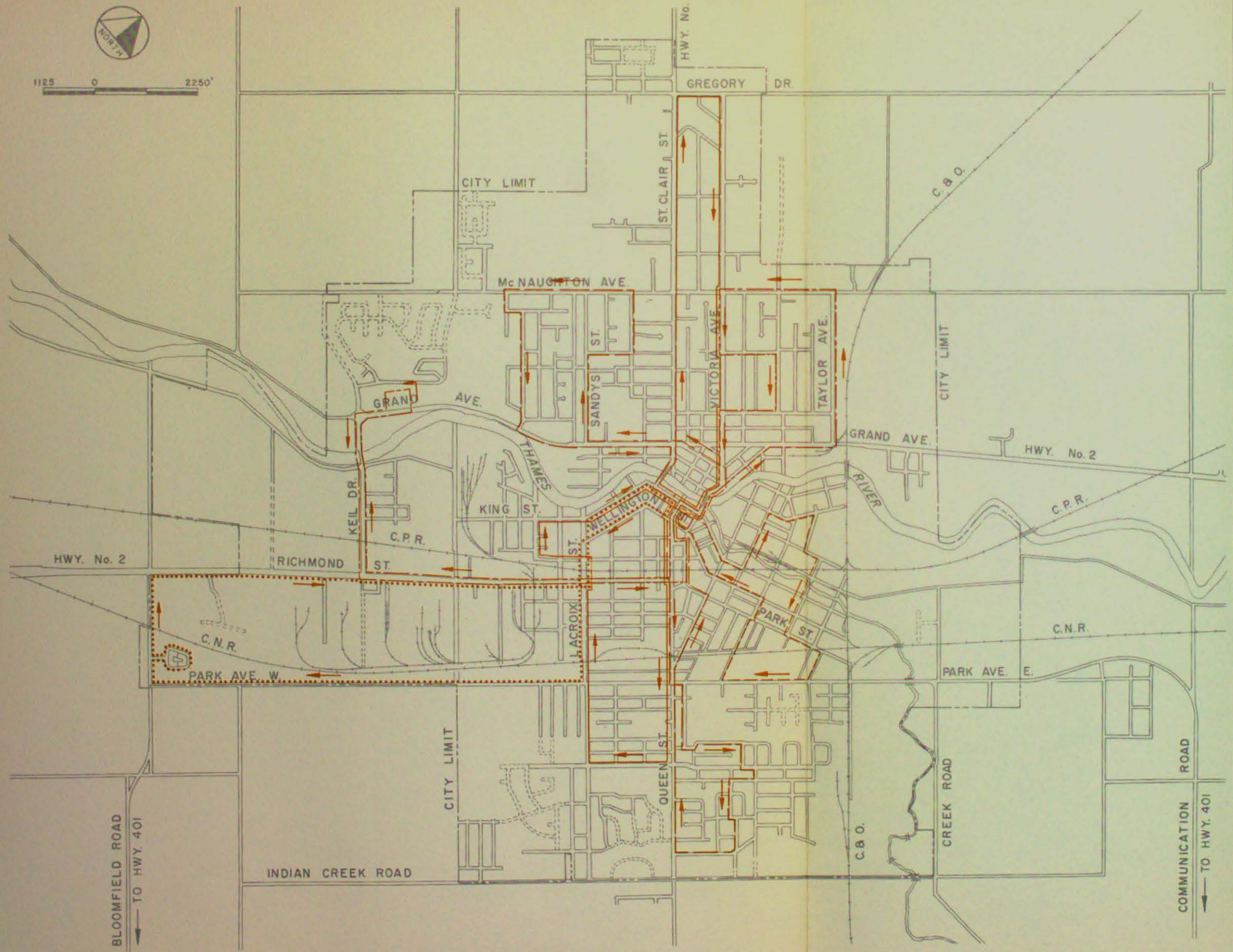
LINE C
N.T.S.

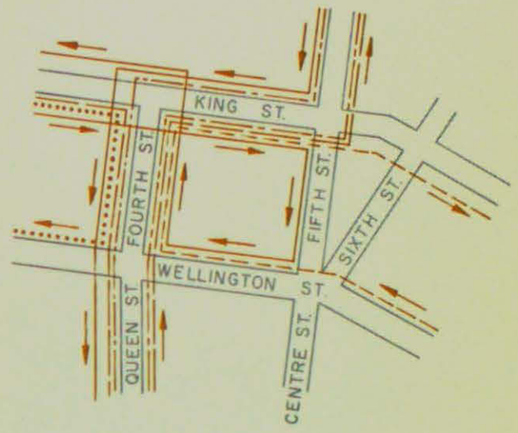
TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

WESTERN ACCESS ALTERNATIVE ALIGNMENTS

De Leuw, Cather

EXHIBIT
20





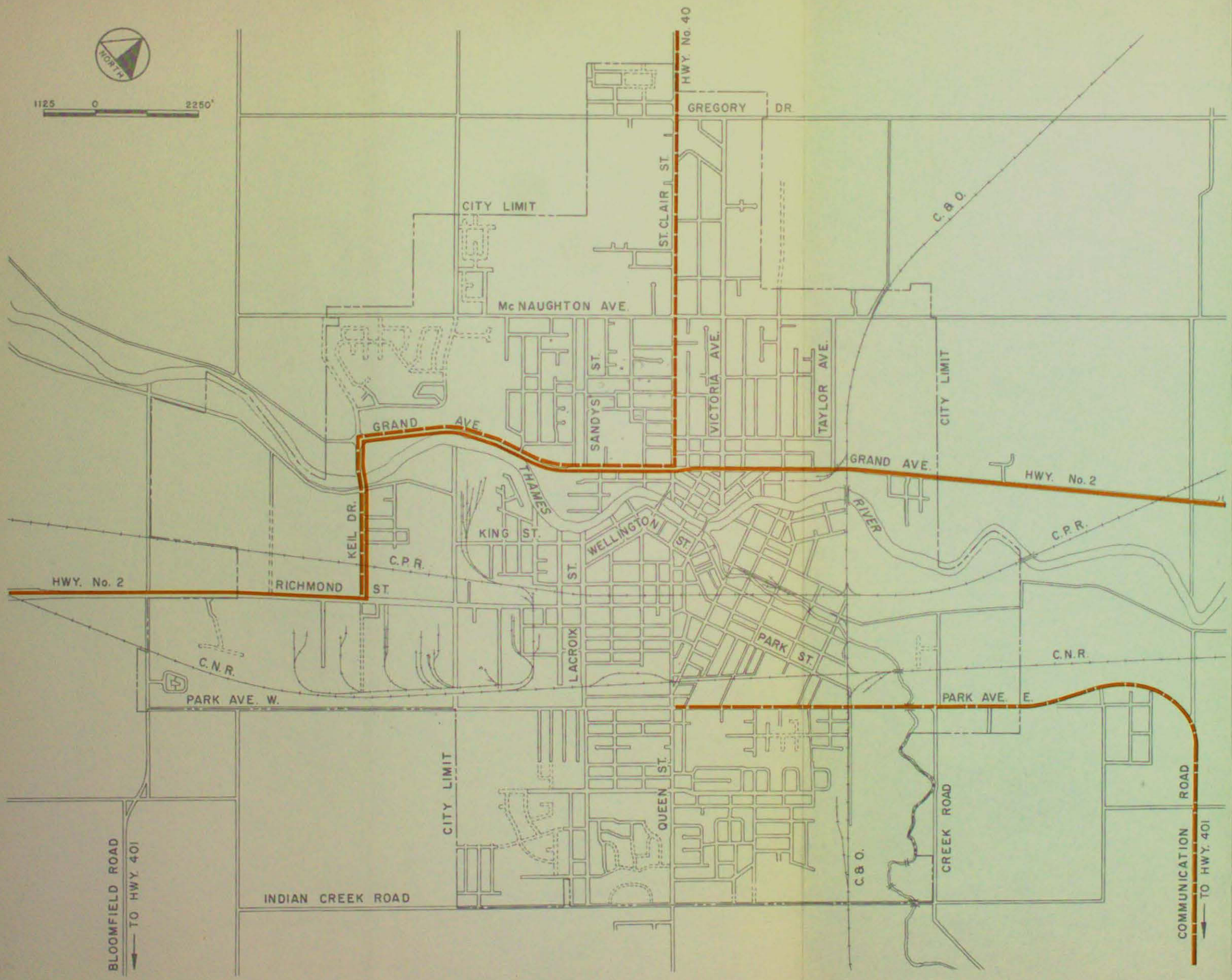
RECOMMENDED
FOURTH STREET
LOADING AREA

De Leuw, Cather

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

REVISED BUS ROUTES

EXHIBIT
21



LEGEND

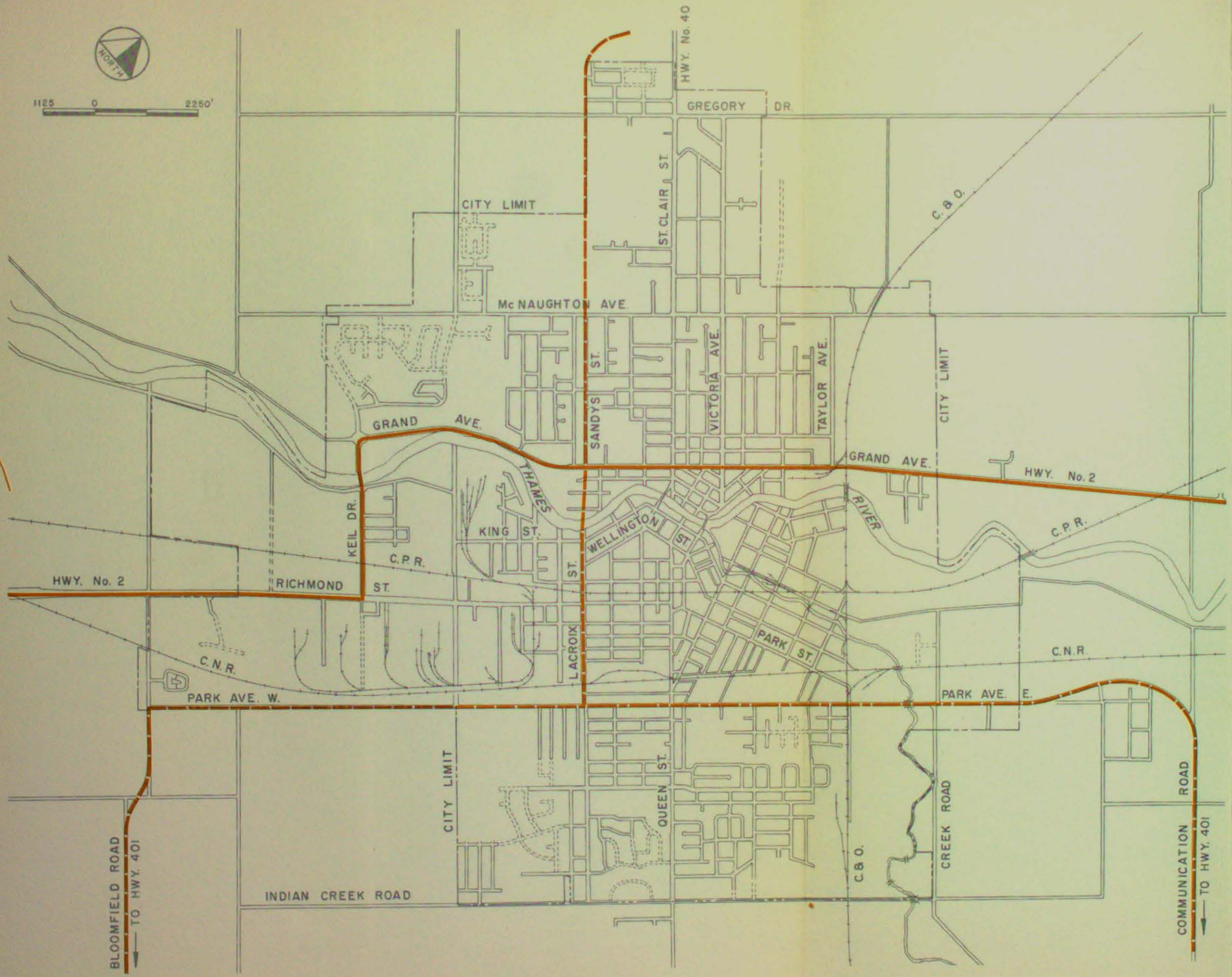
- HWY. No. 2
- HWY. No. 40
- NEW HIGHWAY (NOT YET DESIGNATED)

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

HIGHWAY CONNECTING LINKS
- 1966 -

De Leuw, Cather

EXHIBIT
22



LEGEND

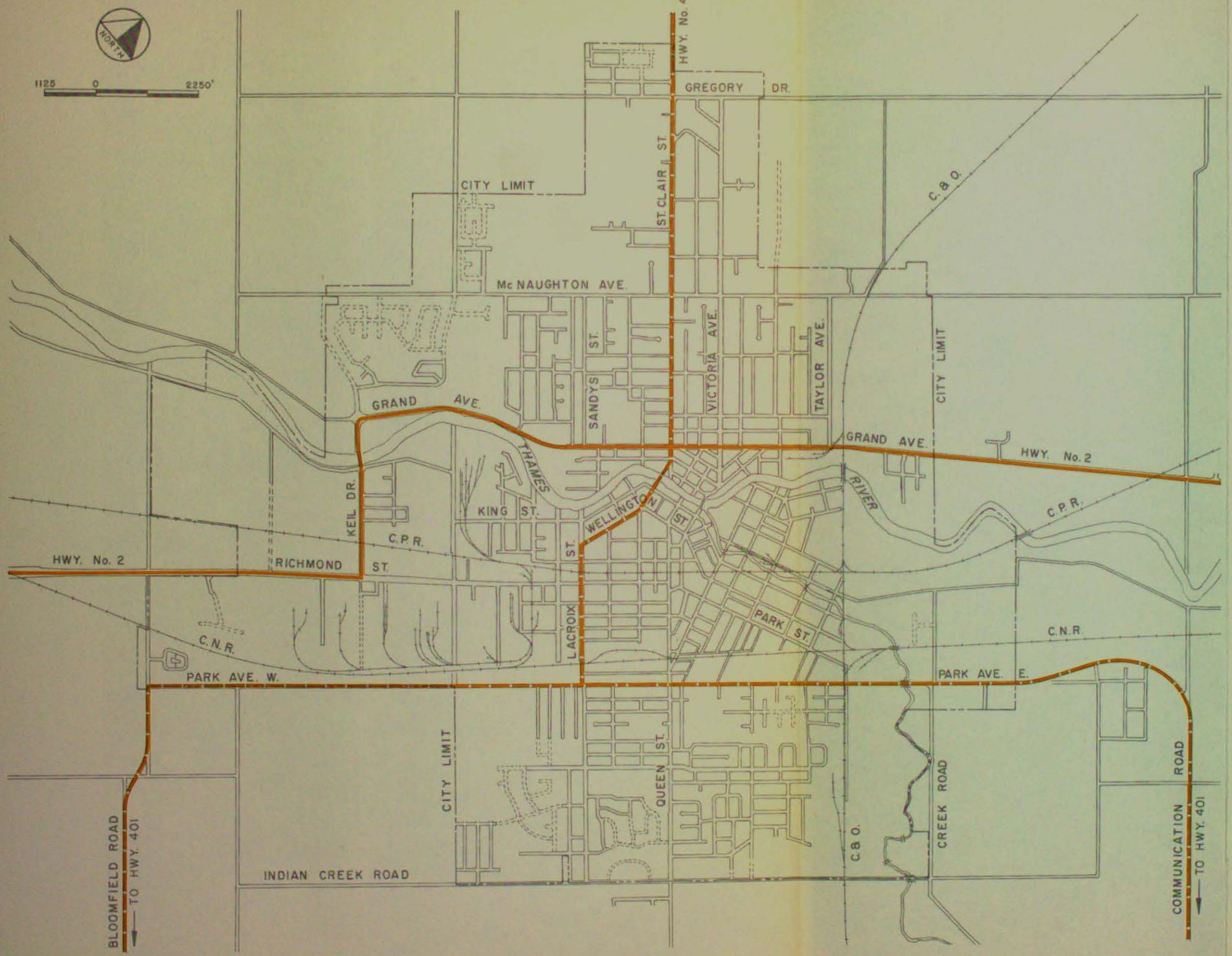
- HWY. No. 2
- HWY. No. 40
- NEW HIGHWAY (NOT YET DESIGNATED)

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

RECOMMENDED HIGHWAY CONNECTING LINKS -1986-

De Leuw, Cather

EXHIBIT
23



LEGEND

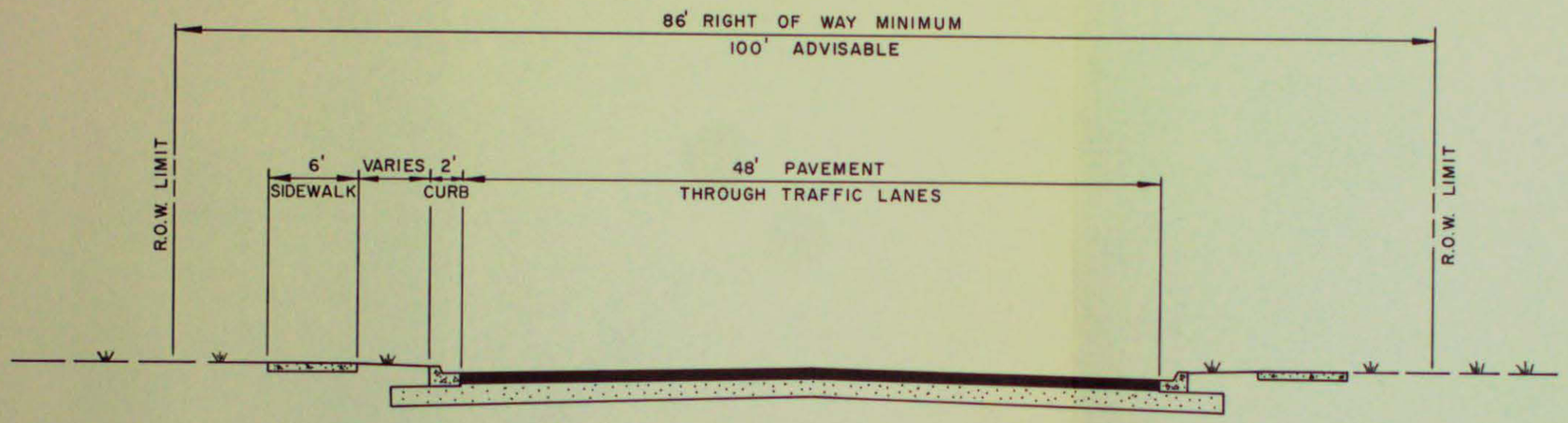
- HWY. No. 2
- HWY. No. 40
- NEW HIGHWAY (NOT YET DESIGNATED)

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERIM HIGHWAY CONNECTING LINKS 1972 TO 1980

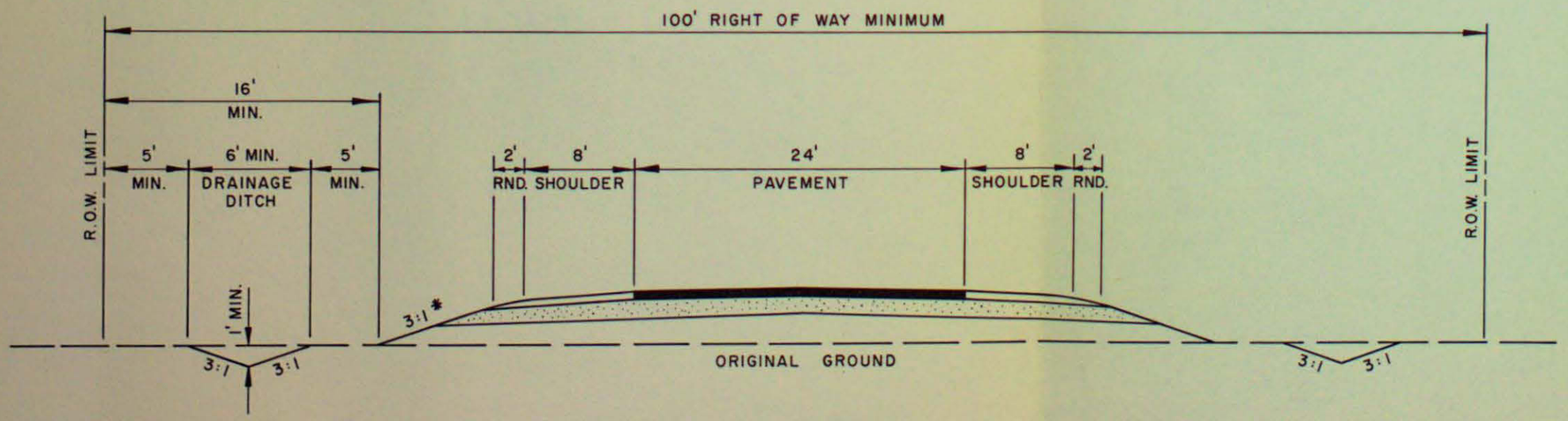
De Leuw, Cather

EXHIBIT
24



FOUR LANE URBAN STREET

SCALE: 1" = 10'



* SLOPE = 2:1 FOR HEIGHT OF FILL > 4'

TWO LANE RURAL ROAD

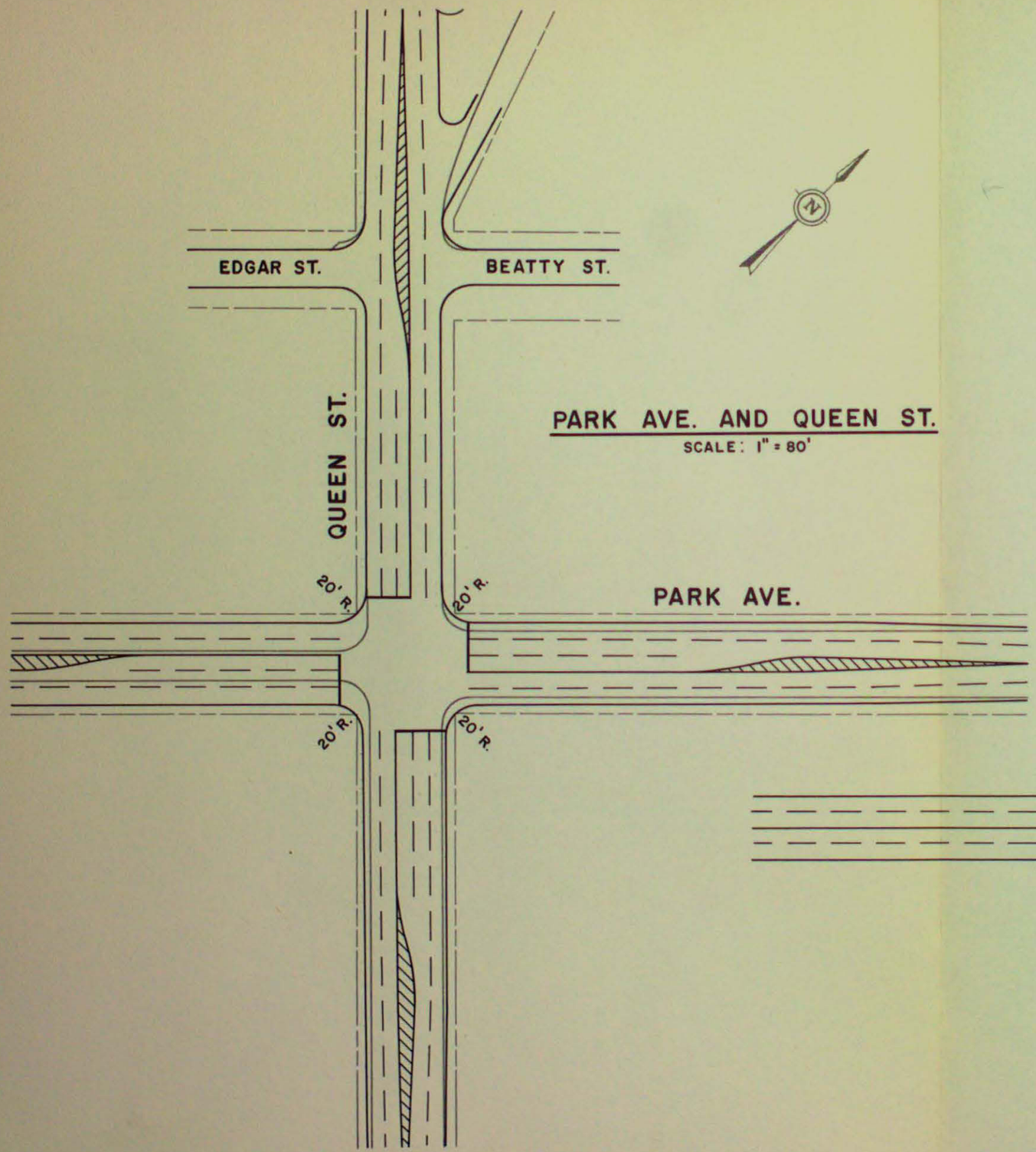
SCALE: 1" = 10'

De Leuw, Cather

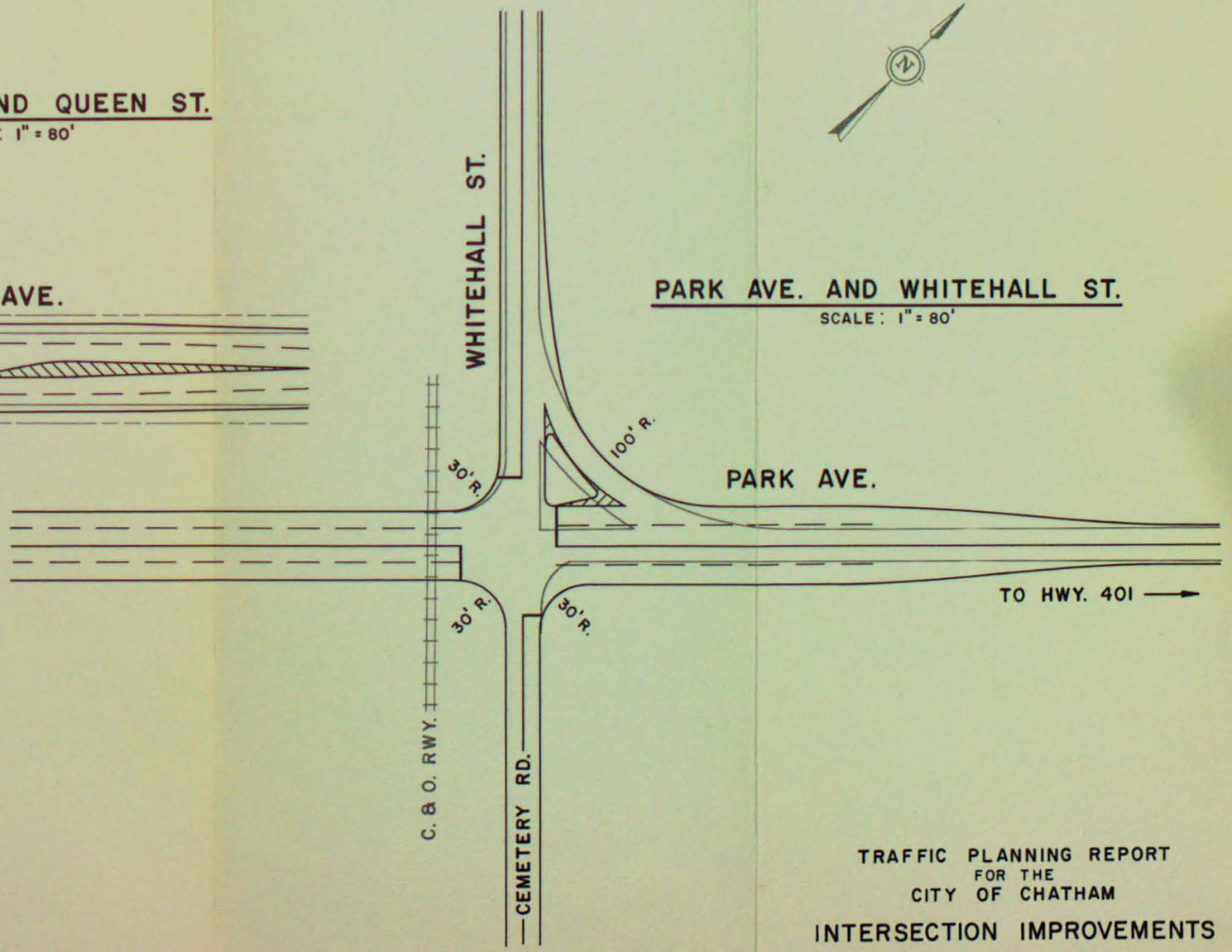
TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

TYPICAL SECTIONS

EXHIBIT
25



PARK AVE. AND QUEEN ST.
SCALE: 1" = 80'



PARK AVE. AND WHITEHALL ST.
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

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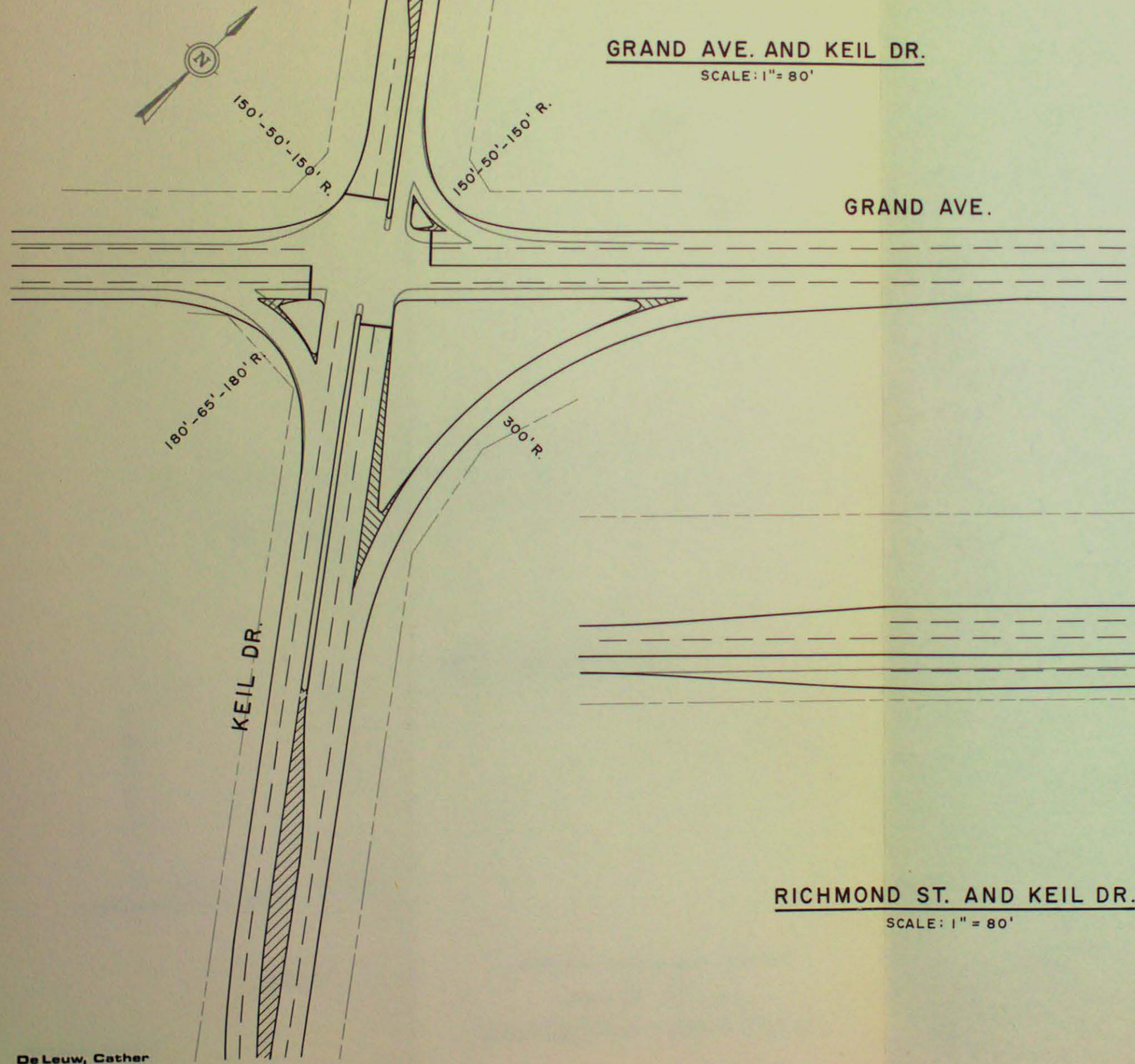
EXHIBIT
26

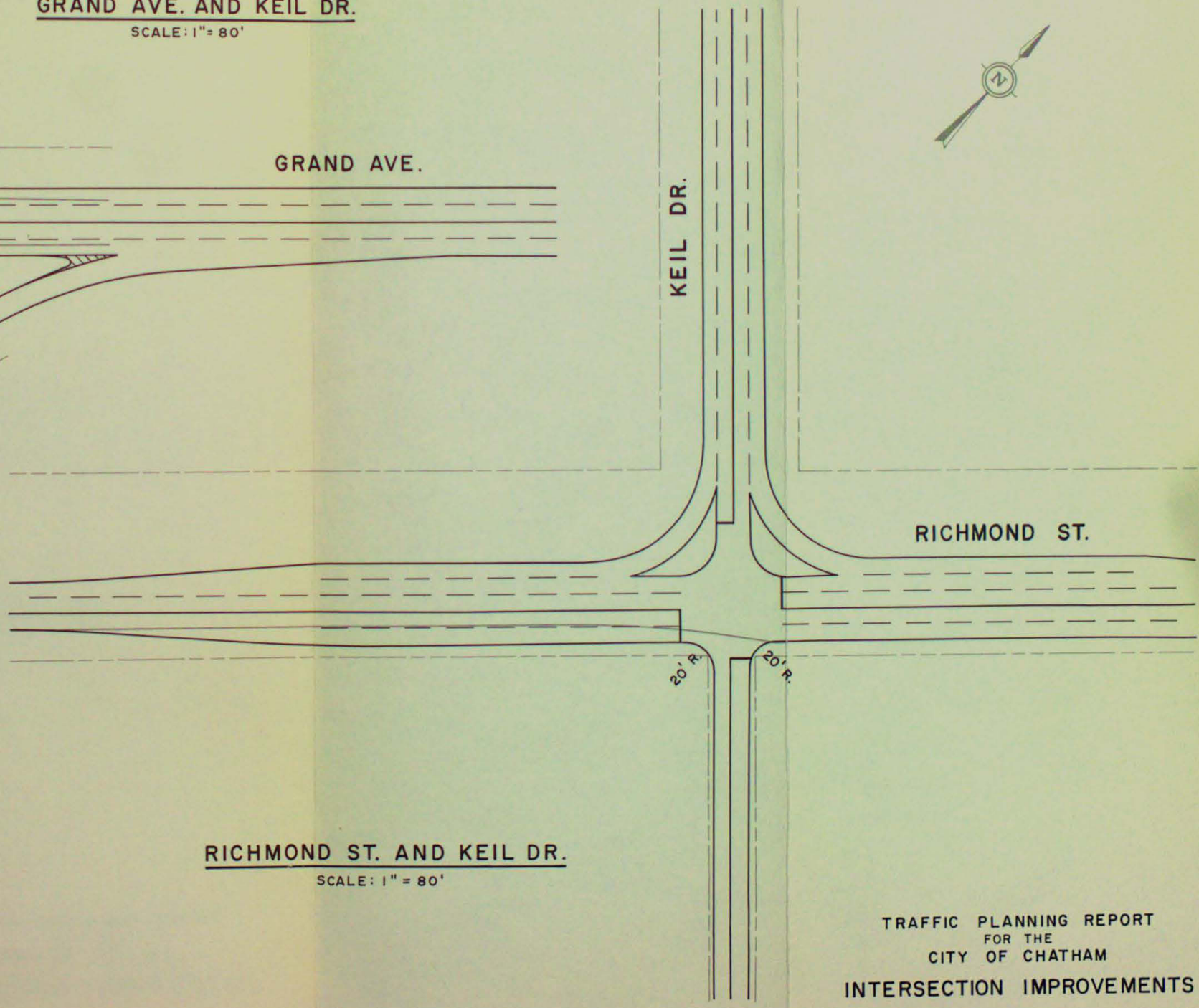
GRAND AVE. AND KEIL DR.

SCALE: 1" = 80'



RICHMOND ST. AND KEIL DR.

SCALE: 1" = 80'

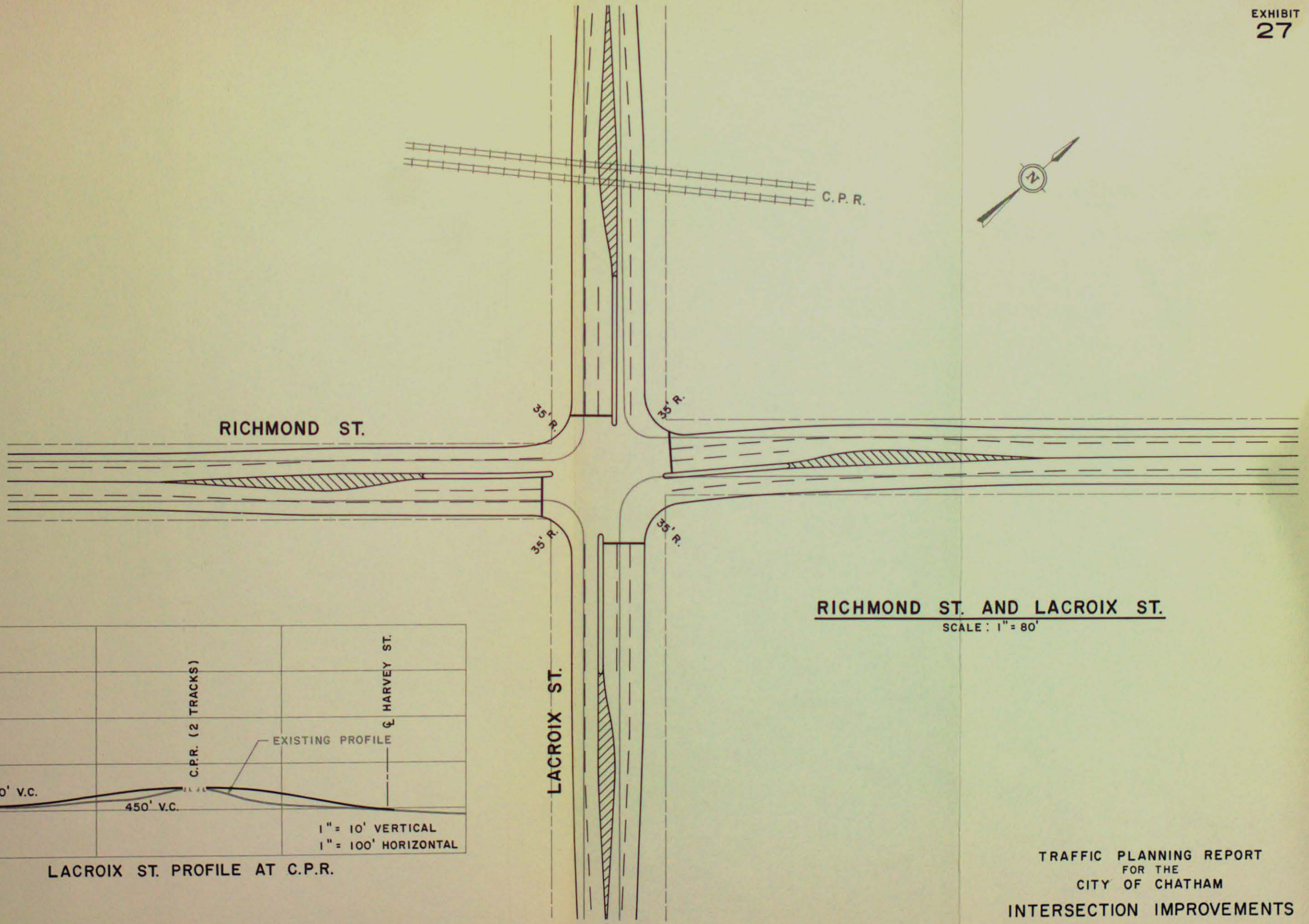


TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
27



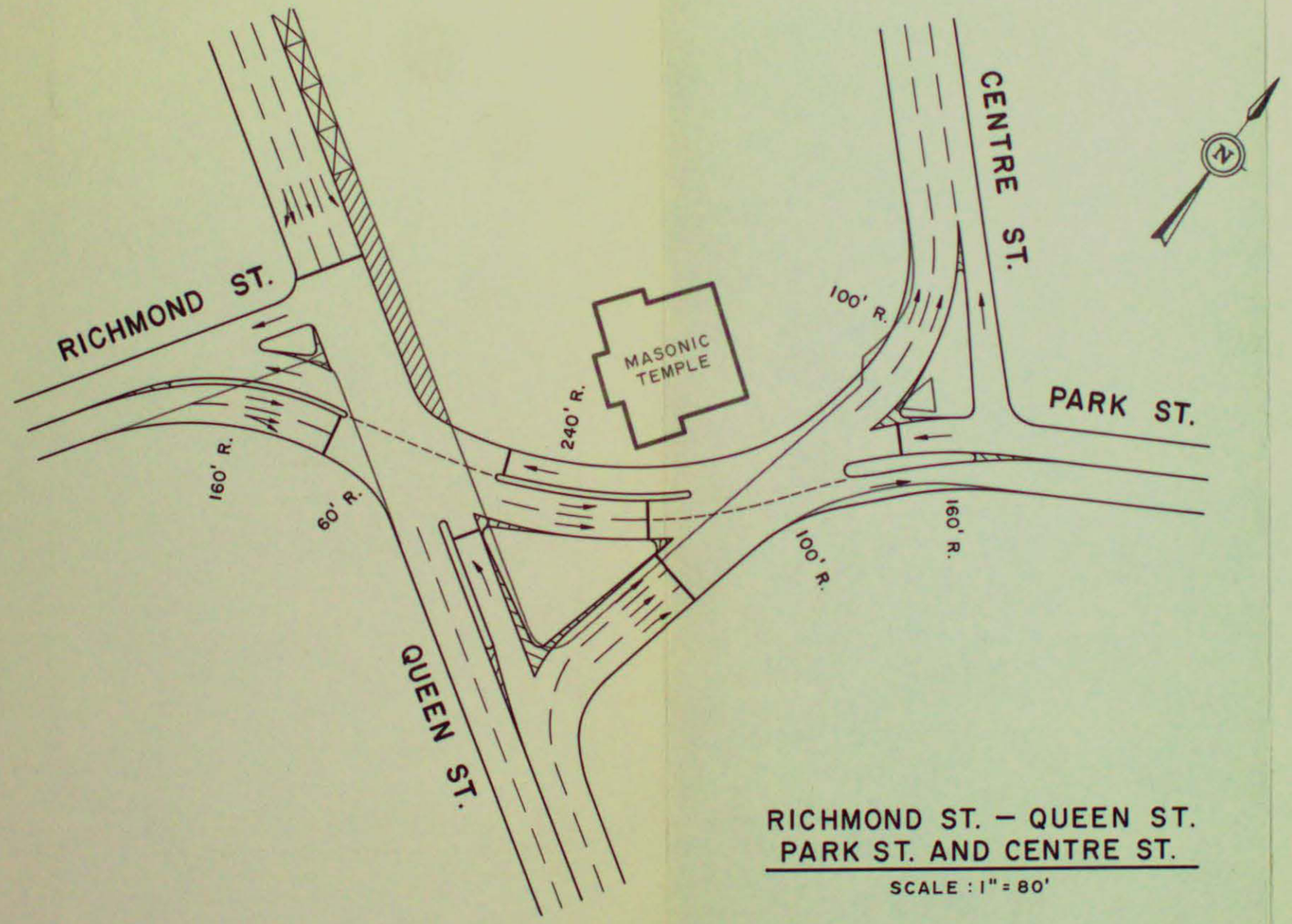
RICHMOND ST. AND LACROIX ST.
SCALE : 1" = 80'

LACROIX ST. PROFILE AT C.P.R.

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM
INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
28



RICHMOND ST. — QUEEN ST.
PARK ST. AND CENTRE ST.

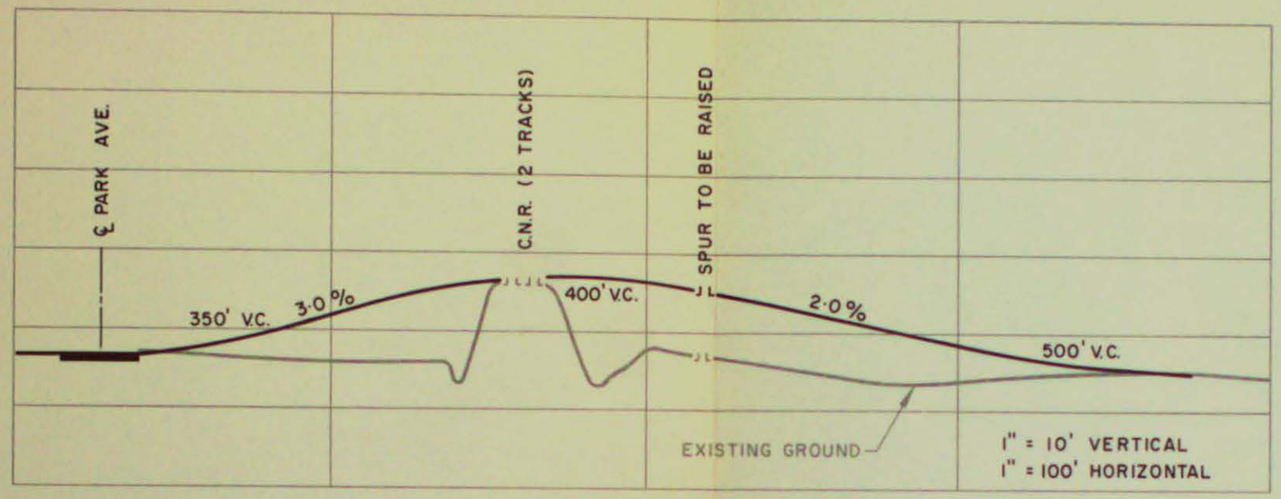
SCALE : 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

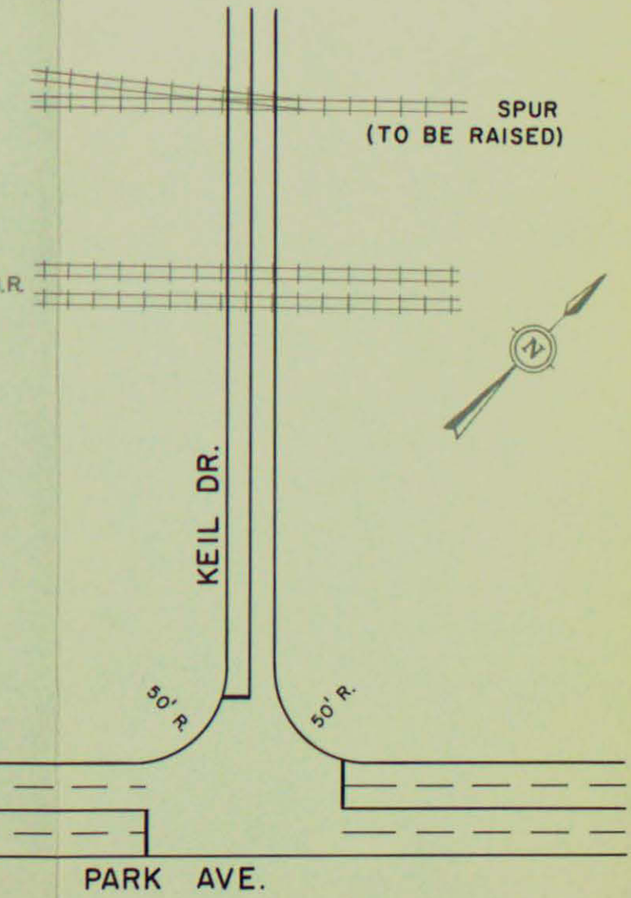
De Leuw, Cather

EXHIBIT
29



KEIL DR. EXTENSION AT C.N.R.

BLOOMFIELD RD. AND PARK AVE.
SCALE: 1" = 80'

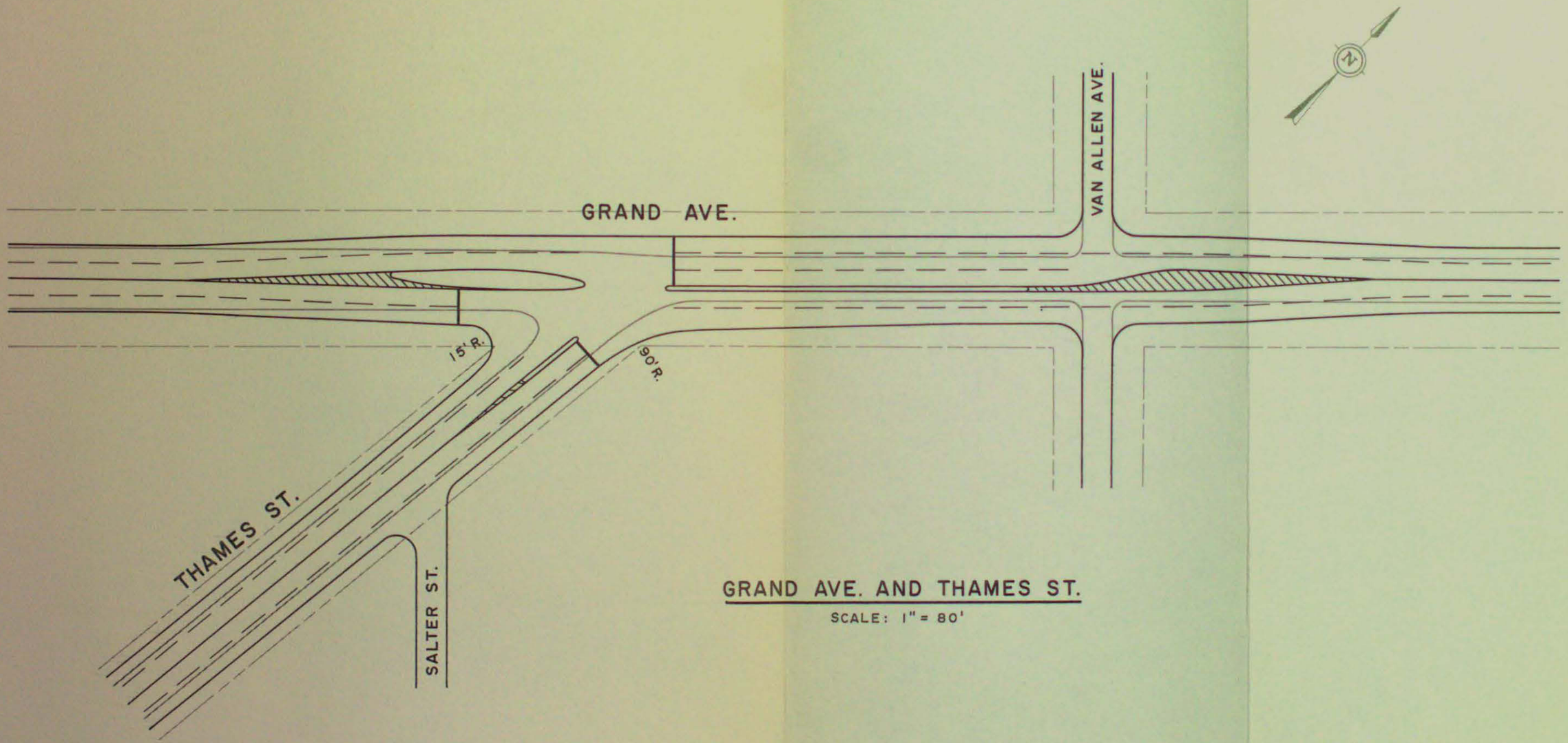


KEIL DR. AND PARK AVE.
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM
INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
30



GRAND AVE. AND THAMES ST.

SCALE: 1" = 80'

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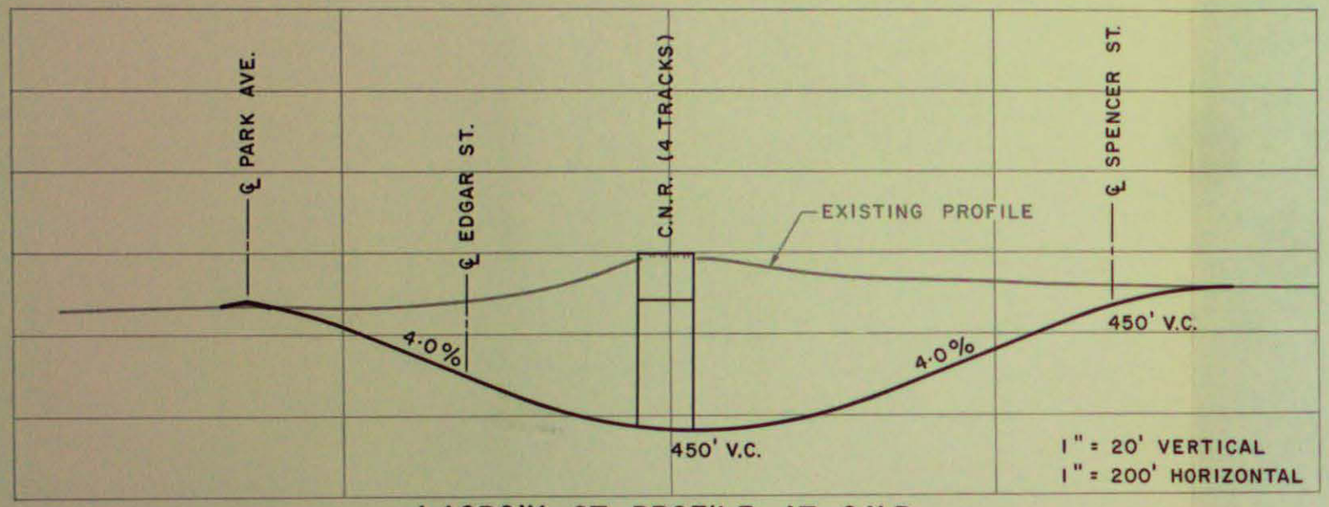
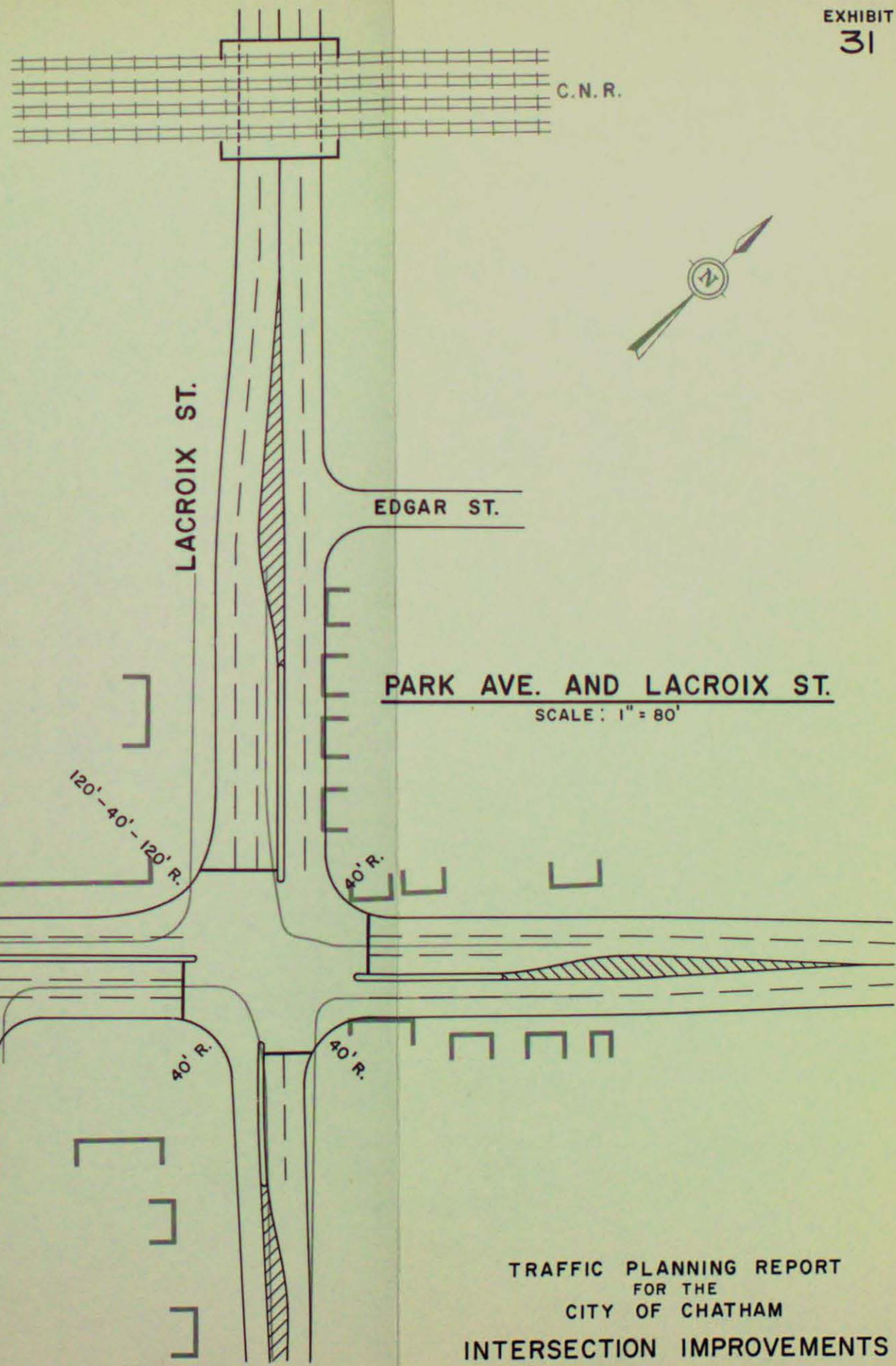
TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

EXHIBIT
31



LACROIX ST. PROFILE AT C.N.R.



PARK AVE. AND LACROIX ST.
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM
INTERSECTION IMPROVEMENTS

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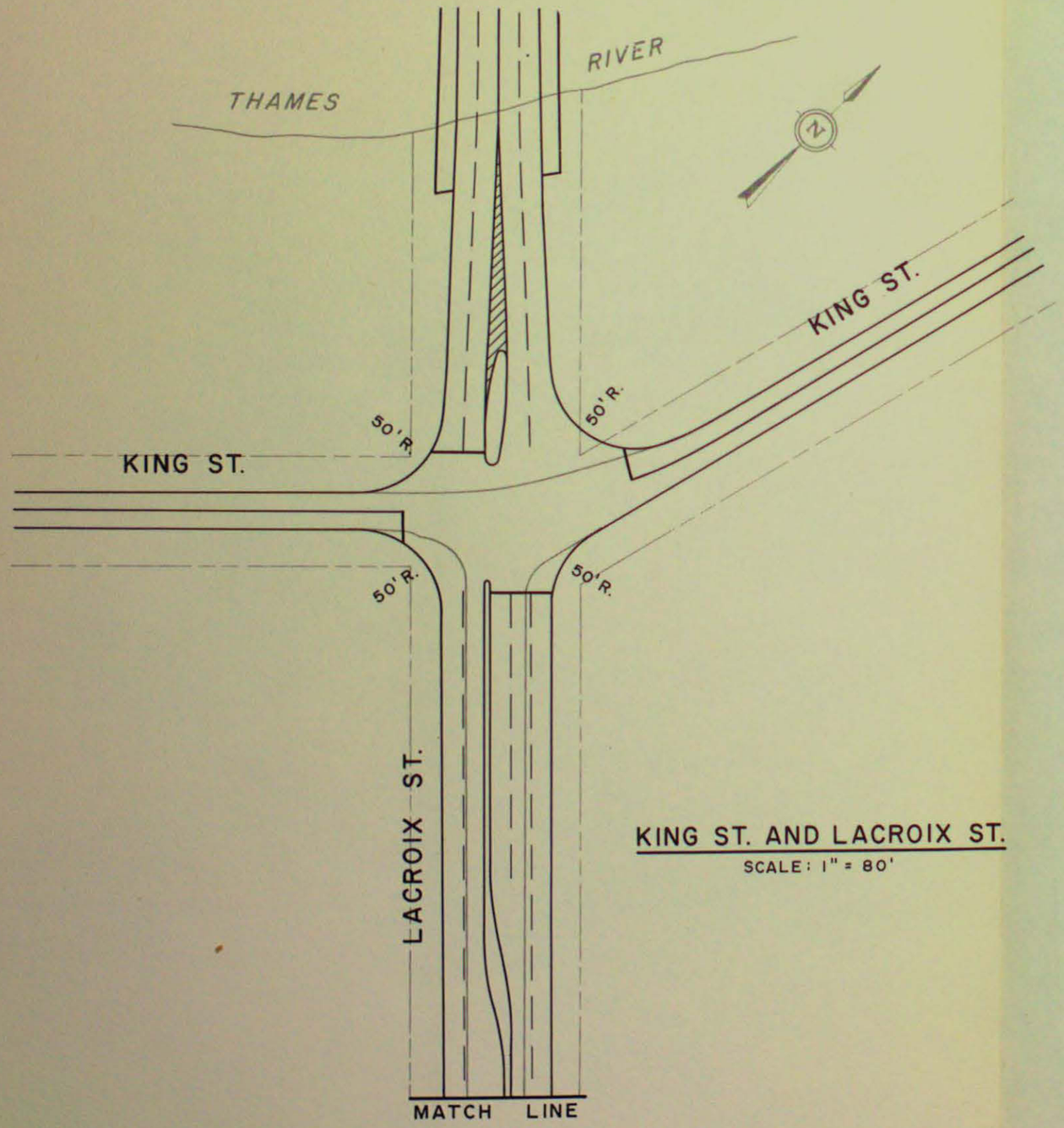
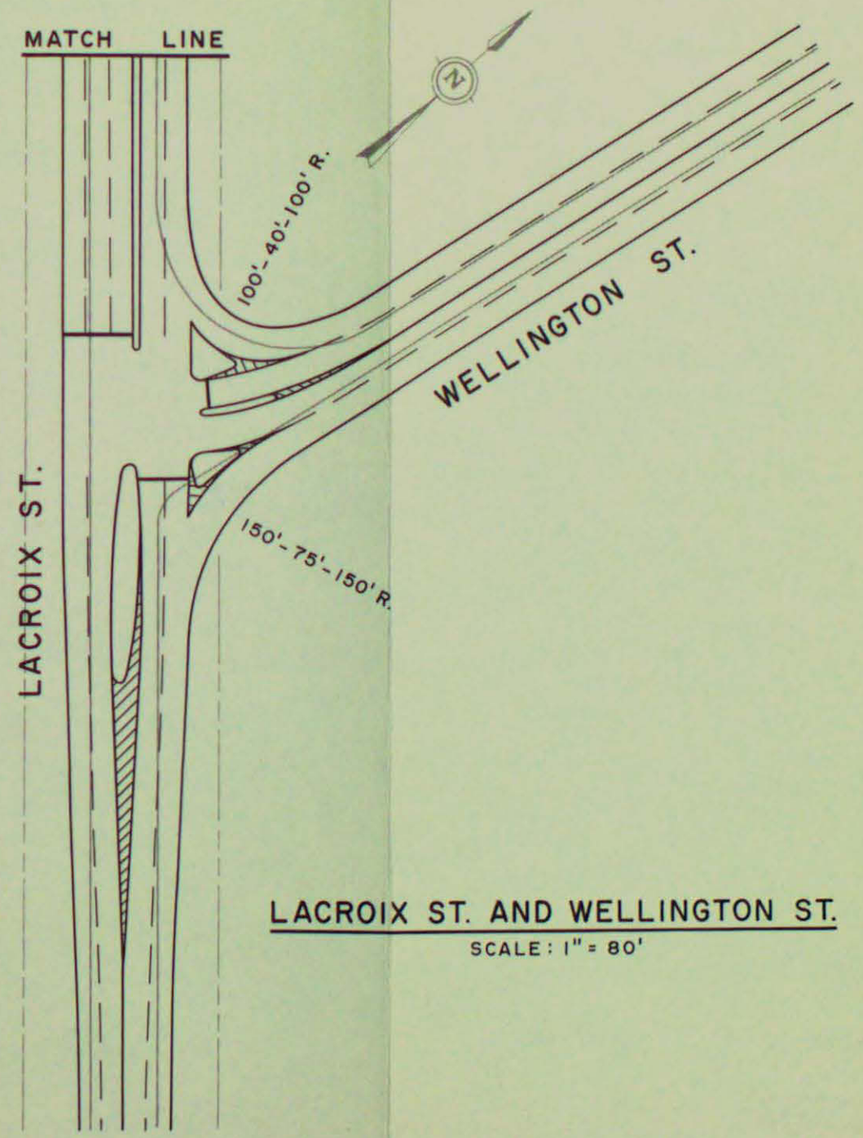
EXHIBIT
32



KING ST. AND LACROIX ST.
SCALE: 1" = 80'



LACROIX ST. AND WELLINGTON ST.
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM
INTERSECTION IMPROVEMENTS

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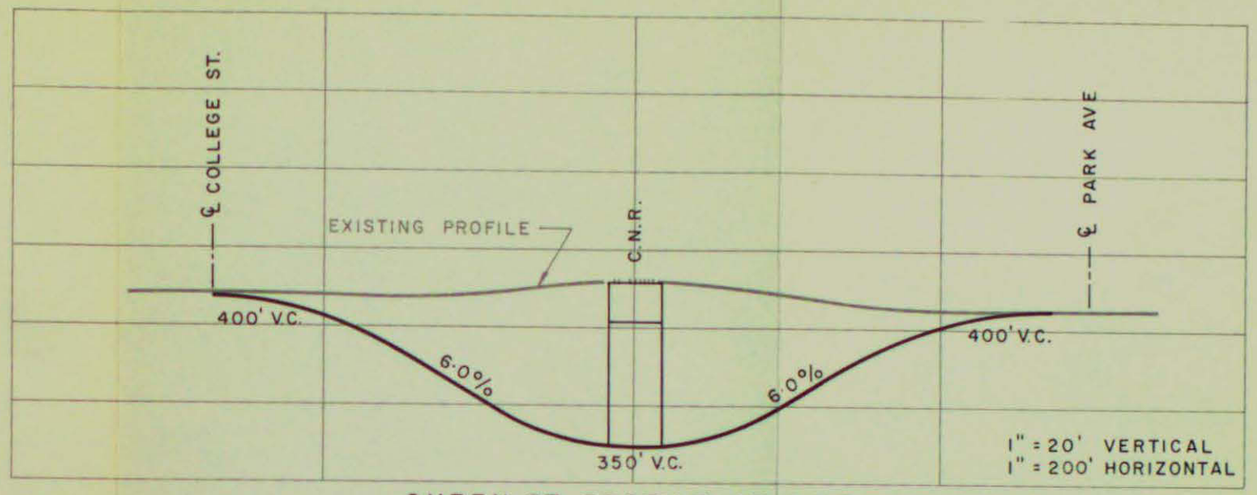
EXHIBIT
33



QUEEN ST. PROFILE AT C.N.R.

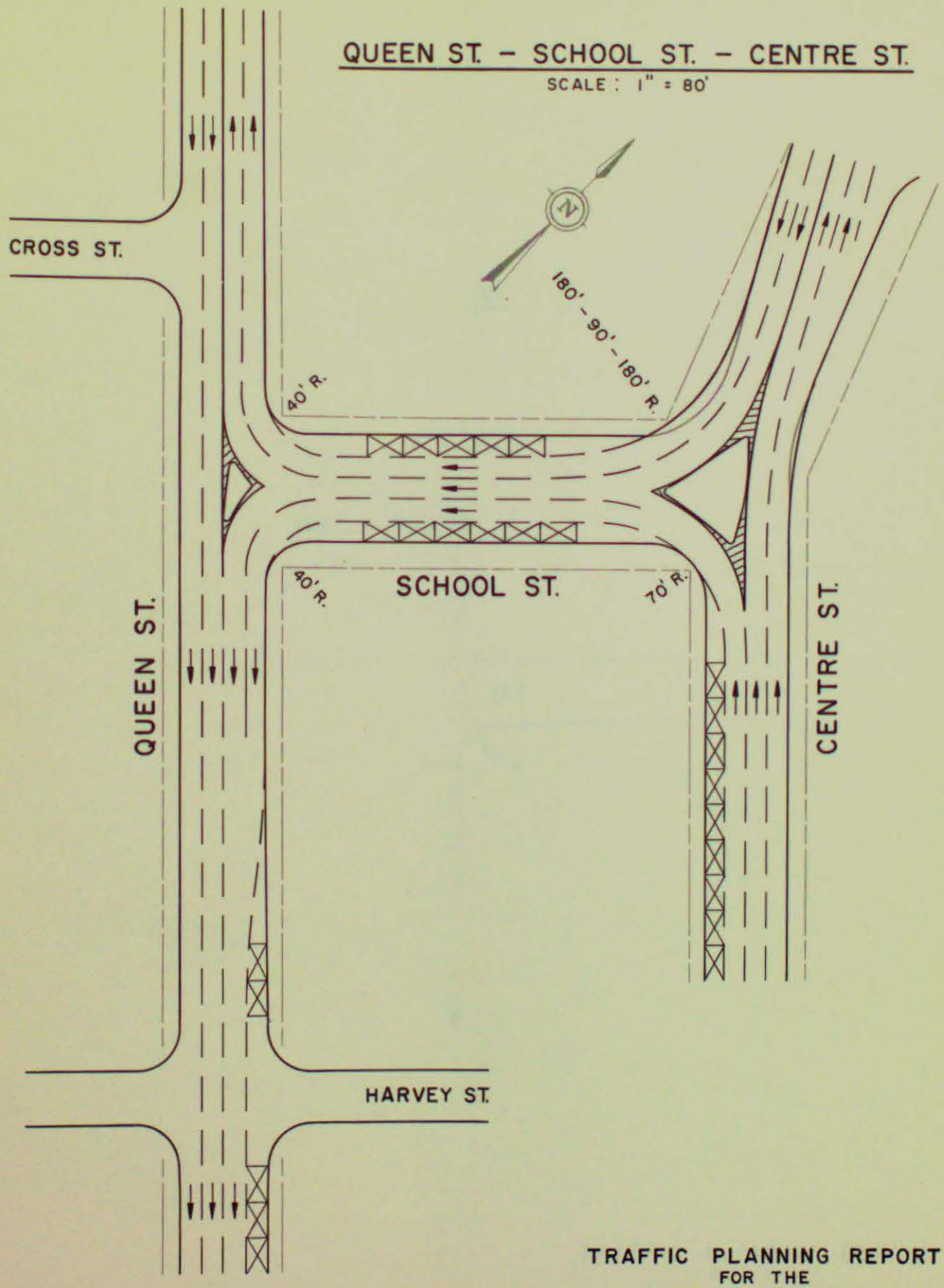
QUEEN ST. – WILLIAM ST. UNDERPASS OF C.N.R.
(INCLUDING CONNECTION TO WILLIAM ST. VIA COLLEGE ST.)
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
34

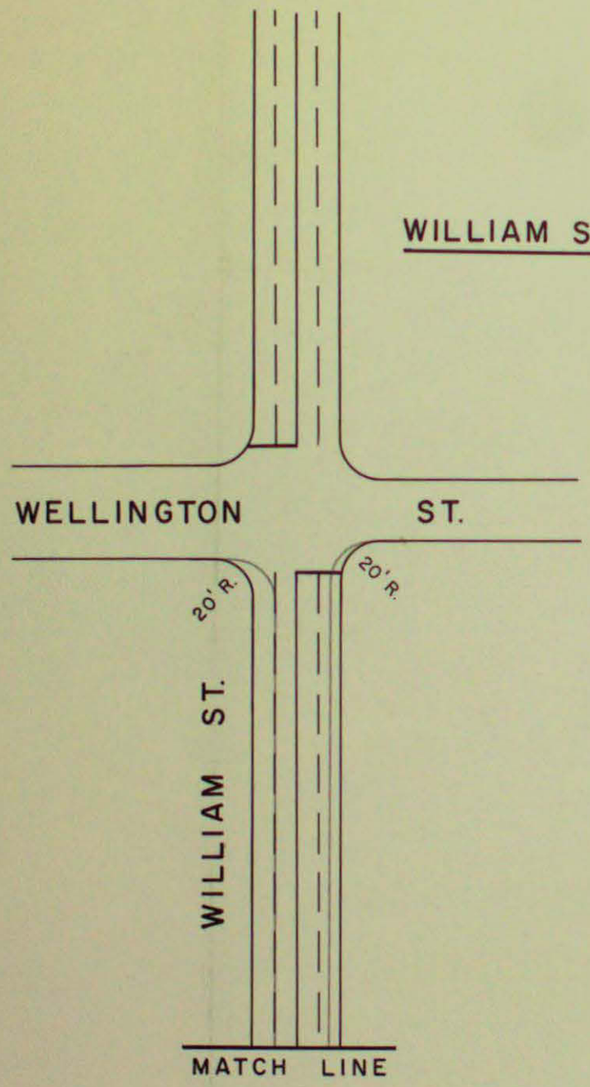


TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

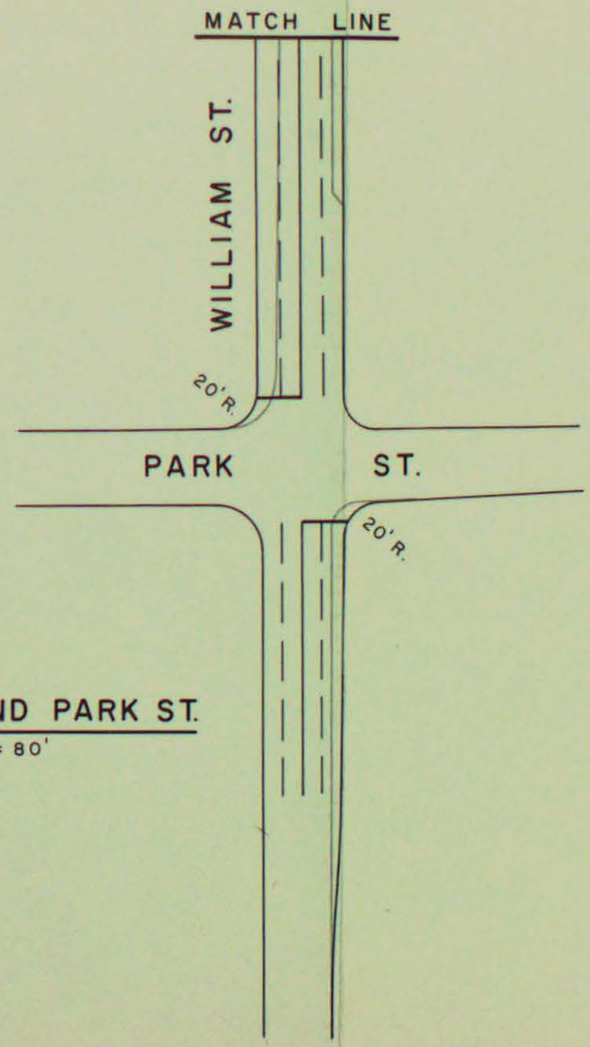
INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
35



WILLIAM ST. AND WELLINGTON ST.
SCALE 1" = 80'



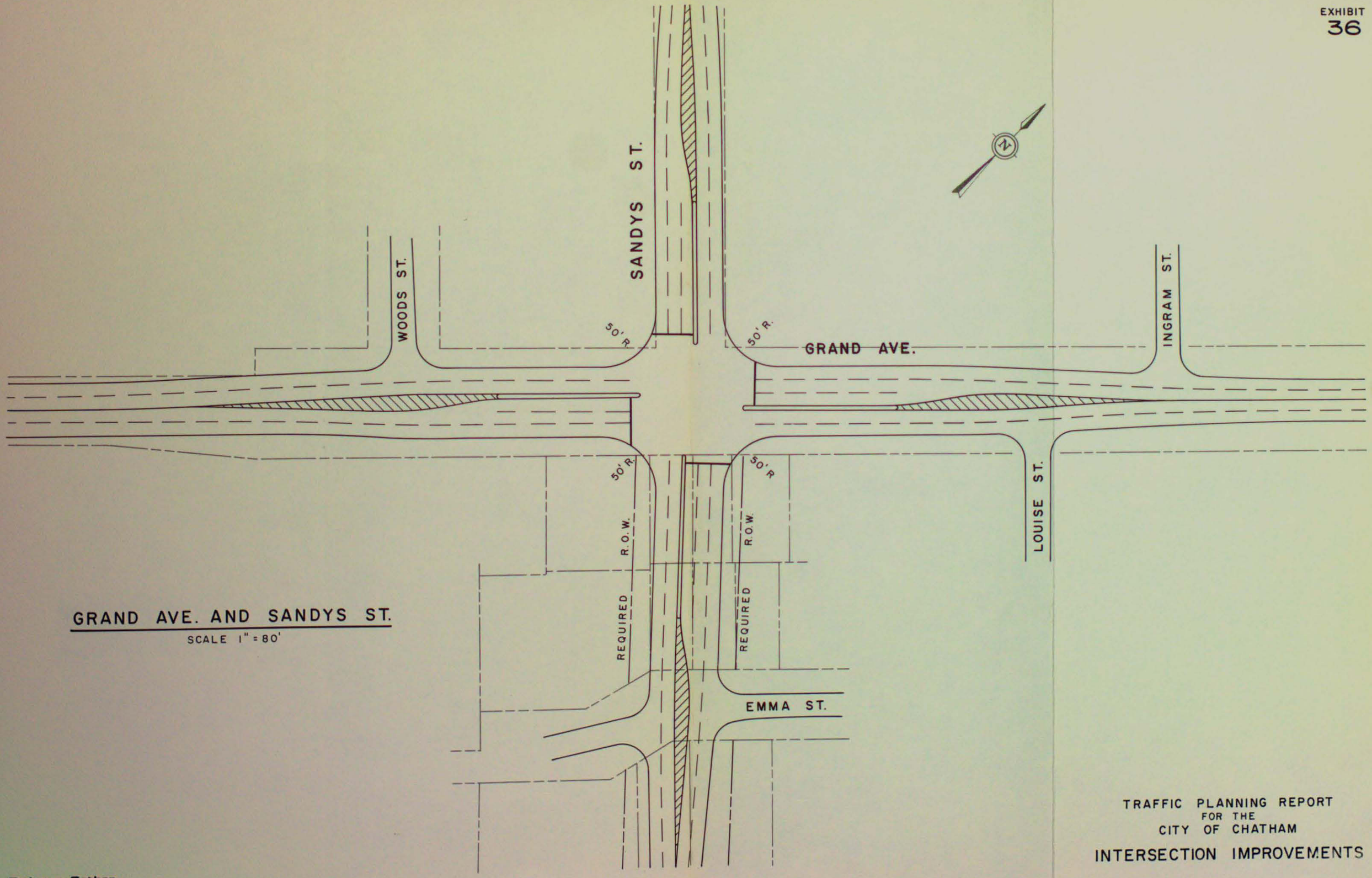
WILLIAM ST. AND PARK ST.
SCALE 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

De Leuw, Cather

EXHIBIT
36



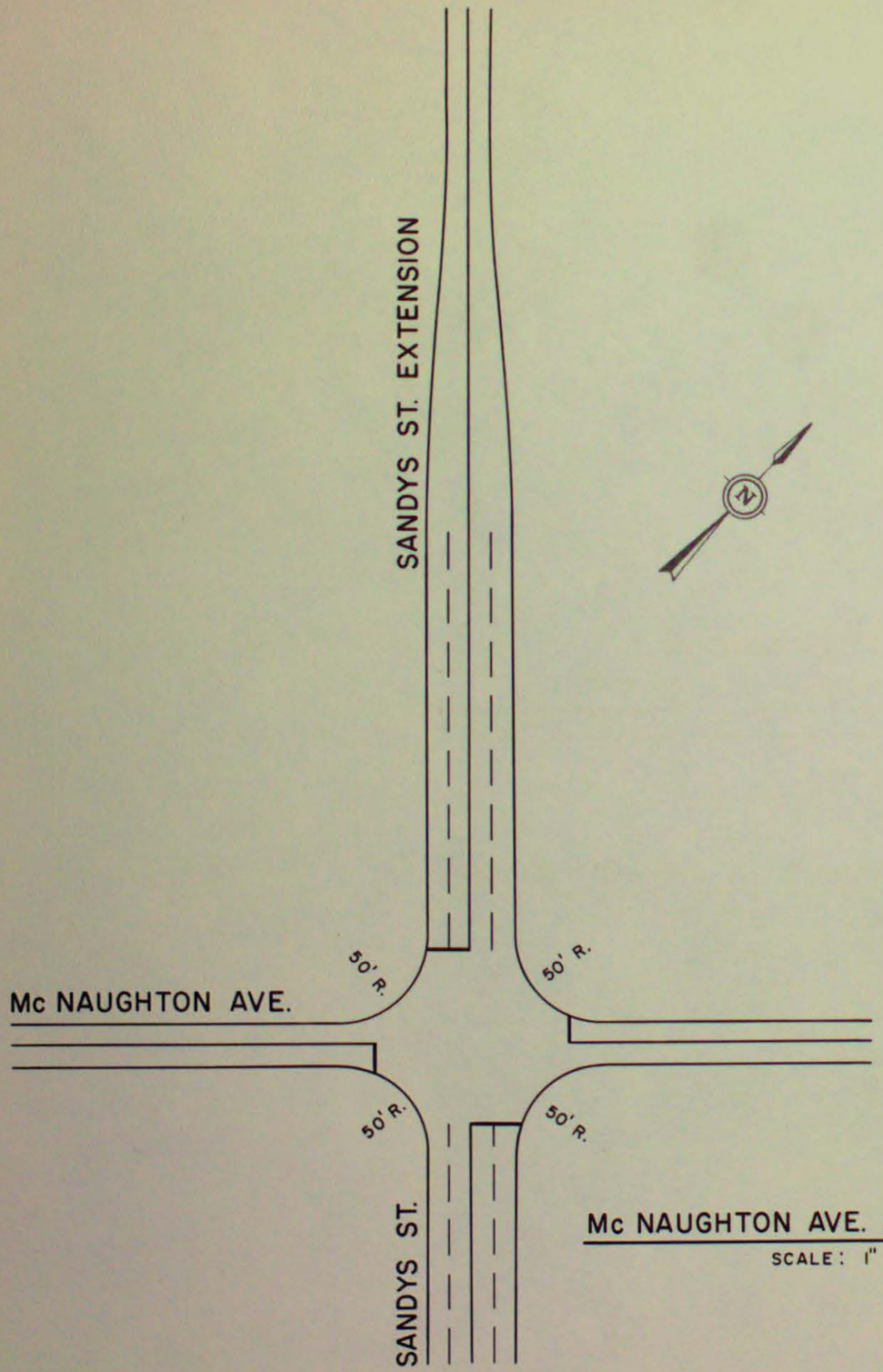
GRAND AVE. AND SANDYS ST.

SCALE 1" = 80'

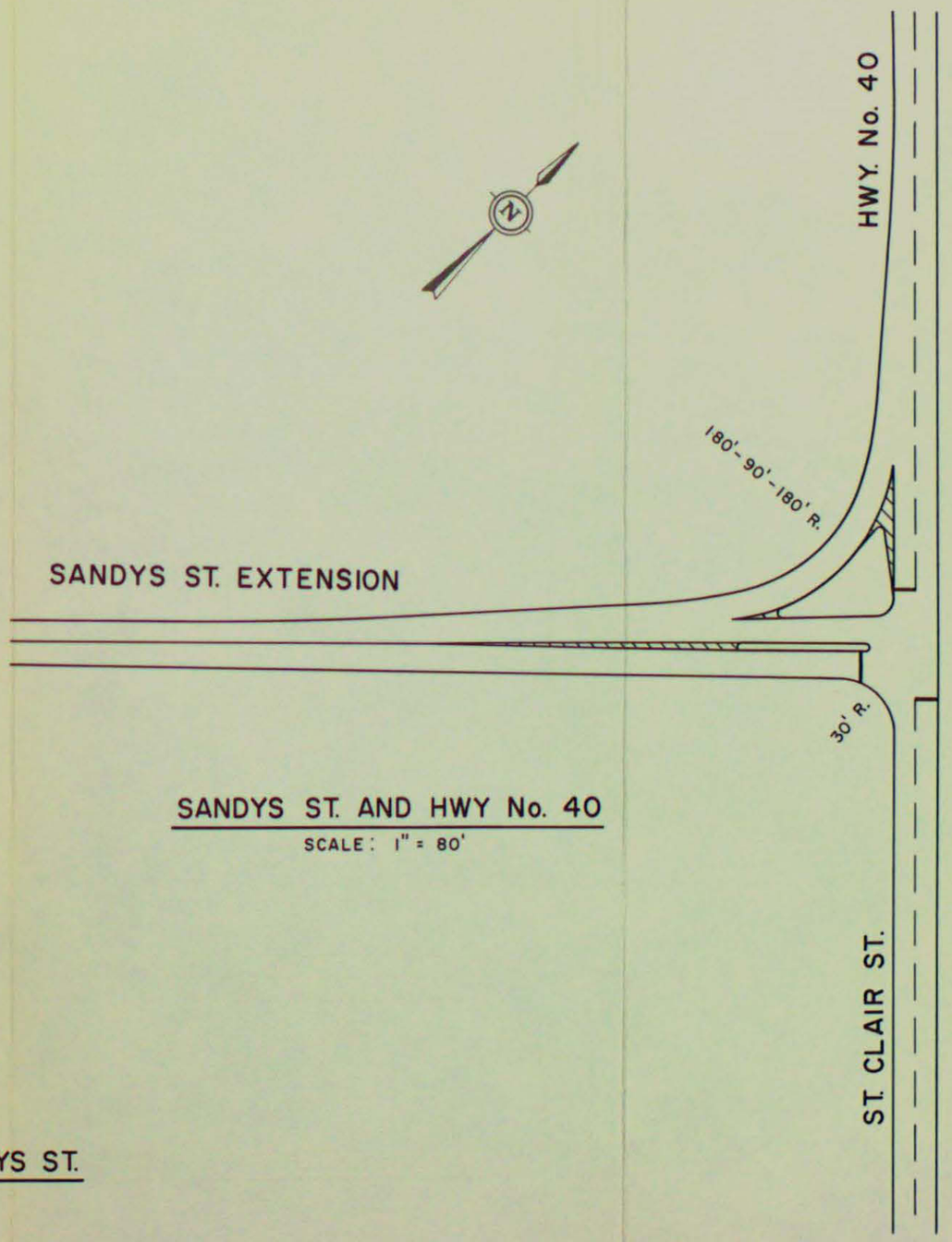
TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

De Leuw, Cather



Mc NAUGHTON AVE. AND SANDYS ST.
SCALE: 1" = 80'



SANDYS ST. AND HWY No. 40
SCALE: 1" = 80'

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

INTERSECTION IMPROVEMENTS

TABLE #A1

POPULATION, LAND USE AND EMPLOYMENT - 1966 & 1986

Zone	Population		Total Gross Acres		Residential Net Acres		Commercial Net Acres		Industrial Net Acres		Employment					
											Manufact.		Commercial		Total	
	1966	1986	1966	1986	1966	1986	1966	1986	1966	1986	1966	1986	1966	1986	1966	1986
111	1133	1613	504.0	504.0	96.0	130.0	1.1	3.0	42.0	118.0	42	400	33	68	75	468
112	901	781	87.5	87.5	34.0	28.0	1.5	2.0	41.6	47.0	390	410	155	188	545	598
113	2371	2520	216.0	216.0	130.3	140.0	28.3	28.3	11.7	4.0	20	10	90	163	110	173
114	408	500	182.0	182.0	14.6	30.0	9.9	9.9	-	30.0	5	100	11	32	16	132
115	268	310	82.8	82.8	54.8	54.8	2.0	3.0	-	-	14	14	20	60	34	74
121	1902	2500	210.7	210.7	97.1	125.0	10.0	13.6	0.3	-	10	-	60	103	70	103
122	1049	3161	315.0	315.0	57.6	174.0	21.0	24.0	13.3	16.0	15	50	79	124	94	174
123	619	800	85.6	85.6	38.1	50.7	1.0	3.0	8.0	16.0	66	90	115	163	181	253
124	371	430	206.0	206.0	46.0	60.0	-	-	-	-	6	6	15	38	21	44
211	430	230	38.2	38.2	2.5	-	20.0	22.6	3.0	3.0	150	150	1690	2010	1840	2160
212	391	150	36.0	36.0	6.7	3.3	17.1	22.5	-	-	21	10	614	1190	635	1200
221	1002	1323	56.0	56.0	40.1	37.8	3.5	5.8	-	-	7	-	30	110	37	110
231	700	753	63.3	63.3	21.0	20.1	5.6	6.5	6.0	6.0	70	100	160	180	230	280
232	926	1000	339.0	339.0	49.3	45.0	8.7	7.7	43.8	113.0	120	550	90	115	210	665
241	1736	1760	101.0	101.0	45.7	44.0	12.5	14.3	18.0	18.0	180	216	450	625	630	841
251	1212	1476	78.1	78.1	40.4	41.0	8.8	10.0	6.8	7.8	110	150	209	320	319	470
252	1507	1575	84.0	84.0	50.0	45.0	4.1	7.1	5.0	10.2	50	120	127	270	177	390
261	320	280	146.0	146.0	17.4	15.9	13.3	12.3	86.3	98.8	395	506	185	210	580	716
262	513	576	122.0	122.0	17.0	16.0	2.5	2.5	88.8	90.0	415	450	180	243	595	693
263	34	35	324.0	324.0	3.0	3.0	7.8	7.8	170.0	292.0	1490	1700	60	113	1550	1813
271	825	1080	129.0	129.0	43.6	50.4	9.7	9.7	33.0	49.0	20	50	170	212	190	262
272	440	860	226.0	226.0	16.5	48.2	11.7	22.7	39.0	95.0	35	50	97	470	132	520
273	15	200	239.0	239.0	-	11.4	-	-	120.0	206.0	700	850	-	-	700	850
311	1346	2120	336.0	336.0	163.8	212.0	19.3	19.3	-	-	20	-	150	270	170	270
312	756	3540	256.0	256.0	50.8	177.0	24.9	14.9	4.4	4.4	50	60	187	200	237	260
313	85	2500	153.0	153.0	16.9	100.0	14.6	20.0	-	-	-	-	30	120	30	120
314	215	250	403.8	403.8	33.0	33.0	-	-	-	-	-	-	-	-	-	-
321	—	550	82.2	82.2	-	4.0	45.0	58.0	-	-	-	-	618	825	618	825
322	1126	1252	96.0	96.0	62.6	62.6	12.4	12.4	1.1	1.1	33	40	35	100	68	140
323	777	996	79.0	79.0	33.8	49.8	5.0	5.9	0.9	-	30	70	25	60	55	130
324	125	3634	259.7	259.7	17.0	139.0	-	11.0	-	-	-	-	-	-	-	-
331	1450	1632	96.0	96.0	61.7	65.3	7.0	8.7	-	-	45	40	110	230	155	270
332	1530	1525	100.0	100.0	36.1	33.9	28.5	39.2	1.2	1.2	40	40	350	495	390	535
341	2230	2580	167.0	167.0	130.0	129.0	7.1	8.1	-	-	12	-	67	180	79	180
351	2052	2125	118.0	118.0	66.8	62.5	11.4	16.4	1.5	3.0	105	200	317	470	422	670
361	1155	3600	453.0	453.0	108.5	200.0	13.3	27.0	41.2	52.0	180	280	130	420	310	700
Totals	31920	50217	6470.9	6470.9	1702.7	2441.7	388.6	479.2	786.9	1281.5	4846	6712	6659	10377	11505	17089

TABLE #A2

MAJOR STREET INVENTORY

STREET	SECTION		R.O.W. Width (feet)	Pavement Width (feet)	Number of Lanes	Shoulders or Curbs	Parking	Surface Conditions
	FROM	TO						
Bloomfield Rd.	Highway 401	Park Avenue	66	21	2	S	No	Poor
	Park Avenue	Richmond Street	66	21	2	S	No	Fair to Good
Centre Street	Park Street	School Street	86	48	4	C	Yes (2 sides)	Good
	School Street	Wellington Street	86	48	4	C	No	Good
Grand Avenue	Keil Drive	Churchill Avenue	120	44	4	S	No	Good
	Churchill Avenue	Sandys Street	87	46	4	C	No	Good
	St. Clair Street	Thames Street	98	42	4	C	No	Fair to Good
	Thames Street	Van Allen Avenue	98	32	3	C	No	Good
	Van Allen Avenue	Taylor Avenue	98	42	2	C	No	Fair to Good
	Taylor Avenue	City Limits	98	22	2	S	No	Fair to Good
Keil Drive	Richmond Street	Riverview Drive	100	44-48	4	S	No	Good
	Riverview Drive	Grand Avenue	100	34-42	4	S	No	Fair to Good
King Street	Merritt Avenue	Lacroix Street	66	21	2	C	No	Good
	Lacroix Street	Second Street	66	21	2	C	No	Good to Excellent
	Second Street	Third Street	57	36	4	C	Yes (2 sides)	Good
	Third Street	Fifth Street	64-66	44-46	4	C	Yes (2 sides)	Good
	Fifth Street	William Street	66	44	4	C	Yes (2 sides)	Good
Lacroix Street	Indian Creek Rd.	Tweedsmuir Avenue	94	26	2	S	No	Good
	Tweedsmuir Avenue	Park Avenue	66	26	2	S	No	Good
	Park Avenue	Richmond Street	100	31-40	3	C	Yes	Good
	Richmond Street	King Street	100	35	3	C	No	Good to Excellent
McNaughton Avenue	Sandys Street	St.Clair Street	66	28	2	S	No	Good
	St.Clair Street	Victoria Avenue	83	22	2	S	No	Fair to Good
	Victoria Avenue	Taylor Avenue	66	22	2	S	No	Fair
Merritt Street	Richmond Street	Riverview Drive	68-94	30	2	S	No	Fair
Park Avenue	Bloomfield Road	Lacroix Street	68	26	2	S	No	Good
	Lacroix Street	Queen Street	68	30	3	C	No	Fair to Good
	*Queen Street	Whitehall Avenue	66	32	2	S	No	Under Construction
	Whitehall Avenue	City Limits	66-120	20	2	S	No	Fair
Park Street	Centre Street	William Street	69	38	4	C	No	Good
	William Street	Whitehall Avenue	66	20	2	C	No	Good
Queen Street	Indian Creek Rd.	Tweedsmuir Avenue	66-110	48	2-3	S	No	Good to Excellent
	Tweedsmuir Avenue	Park Avenue	66	48	3-4	C	No	Good to Excellent
	Park Avenue	Richmond Street	66	43	4	C	No	Good to Excellent
	Richmond Street	Wellington Street	66	46-48	4	C	Yes (1 side)	Fair to Good
Raleigh Street	Richmond Street	Wellington Street	66	28	2	C	Yes (1 side)	Good
Richmond Street	Bloomfield Road	Keil Drive	135	33-45	2-3	S	No	Good to Excellent
	Keil Drive	Byng Avenue	100-135	33	3	S	No	Good to Excellent
	Byng Avenue	Lacroix Street	66	33	3	C	No	Good to Excellent
	Lacroix Street	Queen Street	66	33	3	C	1 side (off peak)	Good to Excellent
Riverview Drive	Bloomfield Road	Keil Drive	75	22	2	S	No	Fair to Good
	Keil Drive	Merritt Avenue	75	20	2	S	No	Fair to Good
Sandys Street	Grand Avenue	McNaughton Avenue	66	24	2	S	No	Fair to Good
St. Clair Street	Dover Avenue	McNaughton Avenue	66-80	42-60	4	C	Yes	Good to Excellent
	McNaughton Avenue	Gregory Drive	100	44	4	C	No	Good to Excellent
	Gregory Drive	City Limits	95	22	2	S	No	Good to Excellent
Thames Street	Fifth Street	Victoria Avenue	66	43	4	C	No	Fair to Good
	Victoria Avenue	Grand Avenue	66	32	2	C	Yes	Fair to Good
Third Street	Wellington Street	King Street	59-66	42	4	C	No	Good to Excellent
	King Street	Dover Street	52-80	42-60	4	C	No	Good to Excellent
Fourth Street	Wellington Street	King Street	70	46	4	C	Yes (2 sides)	Good to Excellent
Victoria Avenue	Thames Street	Grand Avenue	72	24	2	C	No	Good to Excellent
	Grand Avenue	McNaughton Avenue	73	24	2	C	No	Good to Excellent
	McNaughton Avenue	Gregory Drive	73	24	2	S	No	Good to Excellent
Wellington Street	Lacroix Street	Raleigh Street	66	20	2	C	No	Good to Excellent
	Third Street	Fifth Street	66	48	4	C	Yes (2 sides)	Good to Excellent
	Fifth Street	William Street	66	48	4	C	Yes (2 sides)	Good to Excellent
Whitehall Avenue	Park Street	Park Avenue	66	20	2	S	No	Good
William Street	Queen Street	Park Street	65	34	2	C	Yes (1 side)	Good
	Park Street	Wellington Street	65	35	2	C	No	Good
	Wellington Street	Colborne Street	65	42	4	C	Yes (2 sides)	Good

* Currently being widened to 4 lanes with curbs.

TABLE #A3

TRAFFIC SIGNAL INVENTORY

Intersection	Signal Type	Cycle Length (Sec.)	Phasing
Grand Avenue - Victoria Avenue	Fixed time	70	2-phase
Grand Avenue - St. Clair Street	Fixed time	70	2-phase, advance green westbound
St. Clair Street - McNaughton Avenue	Semi-actuated	60	2-phase, McNaughton actuated
Grand Avenue - Thames Street	Fixed time	70	2-phase, advance green westbound left
King Street - William Street	Fixed time	50	2-phase
* King Street - Fifth Street	Fixed time	70	2-phase, advance green southbound
* Fifth Street - Wellington Street	Fixed time	70	3-phase
* Queen Street - School Street	Fixed time	70	2-phase, advance green southbound
Third Street - Wellington Street	Fixed time	70	2-phase, advance green southbound
King Street - Third Street	Fixed time	70	2-phase, advance green southbound
Richmond Street - Queen Street	Fixed time	70	2-phase
Queen Street - Park Avenue	Fixed time	80	2-phase
Keil Drive - Richmond Street	Fixed time	70	2-phase, advance green eastbound
Richmond Street - Lacroix Street	Fixed time	90	2-phase, advance green northbound

* Interconnected 75 second dial; 11:45 A.M. - 1:30 P.M.
5:00 P.M. - 6:30 P.M.

TABLE #A4

UNIT PRICES FOR COST ESTIMATES

Paving: H.L.3 or H.L.6	- $ 10.50/ton (in place)
Base course: Granular "A"	- $ 2.95/ton (in place)
Granular "B"	- $ 2.00/ton (in place)
Earth excavation	- $ 1.30/cu.yd.
Curb and gutter	- $ 2.00/lin.ft.
Curb only	- $ 1.25/lin.ft.
Sidewalk (6 ft. wide, 5 in. deep)	- $ 3.60/lin.ft.
Guiderail	- $ 5.20/lin.ft.
TOTAL ROADWAY COST	= SUM

Add 31% (incl. 8% miscellaneous, 15% drainage, 8% lighting)

Add costs of structures, retaining walls and railway relocation

TOTAL CONSTRUCTION COST = SUM

Add 15% (engineering and contingencies)

Land for roadway right-of-way - $5,000./acre

TABLE #B1

TRIP GENERATION EQUATIONS

Trip Purpose	Direction	* Employment								Automobile Ownership
		Manufacturing		Warehouse-Trans.		Commercial		Gov't-Prof.		
		Male	Female	Male	Female	Male	Female	Male	Female	
Work	Production	0.420	0.200	0.490	0.200	0.360 (CBD) 0.400	0.110 (CBD) 0.200	0.360	0.200 (CBD) 0.100	-
	Attraction	0.093	-	0.250	-	0.110	0.030 (CBD) 0.100	0.070	0.030	-
Home	Production	-	-	-	-	-	-	-	-	0.245
	Attraction	-	-	-	-	-	-	-	-	0.490

Trip Purpose	Direction	Total Commercial Employment by Zone Type			
		Central Bus.Dist.	Fringe C.B.D.	Shopping Centre	Other
Shop	Production	0.320	0.160	0.930	0.100
	Attraction	0.320	0.180	1.060	0.110

* The split of the two broad classes of employment, manufacturing and commercial, into four classes is made for each zone on the basis of the 1961 splits. The same is true for the estimation of male and female employees.

TABLE
B2

CHATHAM 1966 INTERZONAL MOVEMENTS
(4:00 – 7:00 P.M. AVERAGE MAY / JUNE WEEKDAY)

ZONE	111	112	113	114	115	121	122	123	124	211	212	221	231	232	241	251	252	261	262	263	271	272	273
111	0	13	0	0	0	7	0	6	7	22	41	9	0	0	11	0	16	9	0	0	0	15	0
112	17	26	41	5	6	13	10	7	5	80	6	5	16	10	42	8	10	19	8	14	11	10	5
113	9	44	35	2	2	31	10	5	14	49	46	0	5	8	22	22	21	0	9	23	6	11	9
114	0	3	0	0	0	2	0	2	1	7	13	3	0	0	3	0	5	2	0	0	0	3	0
115	0	3	0	0	0	2	0	1	1	6	11	2	0	0	2	0	5	2	0	0	0	3	0
121	0	3	17	0	0	14	7	0	6	62	19	3	15	7	19	5	10	3	7	15	7	0	5
122	8	6	11	2	2	11	5	7	10	11	23	3	0	0	9	0	0	10	0	18	8	0	6
123	9	8	0	2	2	0	5	22	0	32	0	3	0	0	0	7	0	7	0	31	0	11	10
124	9	5	5	8	3	3	0	3	0	14	0	0	0	0	5	0	9	3	0	0	0	5	0
211	33	62	88	11	25	96	54	35	14	132	31	40	28	26	114	66	71	33	51	31	34	17	10
212	34	33	40	10	11	30	35	0	7	67	40	6	25	10	31	36	7	0	56	0	9	15	0
221	10	3	0	3	3	2	0	0	0	23	6	0	0	3	6	9	5	3	1	0	3	0	0
231	10	6	11	2	3	8	0	0	2	42	0	0	3	0	3	8	0	0	0	0	8	7	0
232	0	15	19	0	0	5	0	0	0	18	26	7	0	7	34	6	9	0	0	0	0	0	0
241	24	31	49	8	8	28	6	10	8	64	6	14	10	11	0	24	5	31	10	14	6	0	5
251	32	18	21	11	10	5	13	7	0	33	7	11	0	15	23	41	11	15	13	0	0	0	0
252	0	17	16	0	0	3	13	0	5	46	14	27	7	8	18	13	10	5	19	0	14	0	0
261	13	3	7	3	5	16	6	6	3	15	9	5	9	6	15	23	10	9	24	80	21	7	26
262	26	38	25	8	9	6	14	8	0	39	21	21	0	16	0	13	8	46	24	26	7	8	10
263	0	10	57	0	0	39	24	10	11	49	15	15	7	28	17	16	30	26	11	88	16	14	30
271	0	10	14	0	0	13	2	0	0	5	3	0	14	0	5	5	0	8	10	0	7	0	0
272	7	6	0	6	6	0	0	0	0	0	6	0	2	0	0	0	2	2	0	11	5	0	11
273	0	7	38	2	0	26	15	7	8	33	10	9	5	18	11	11	21	18	8	57	10	0	9
311	0	7	6	0	0	6	0	15	10	22	10	6	0	0	0	0	6	7	10	0	6	11	0
312	0	0	22	0	0	7	0	10	0	31	0	8	0	9	16	0	0	9	0	0	0	0	0
313	0	0	1	0	0	0	0	1	0	3	0	1	0	0	1	0	0	1	0	0	0	0	0
314	0	0	1	0	0	0	0	1	0	3	0	1	0	0	1	0	0	1	0	0	0	0	0
321	50	31	58	8	6	63	31	25	5	28	41	59	25	24	129	48	59	22	49	10	46	5	2
322	0	6	0	0	0	0	0	0	8	32	0	0	0	0	6	0	0	0	0	0	10	0	0
323	0	0	0	0	0	0	0	0	0	5	9	0	5	5	11	6	6	6	0	0	9	0	0
324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
331	0	0	5	0	0	3	0	0	0	25	5	0	0	0	8	0	3	0	5	26	8	7	9
332	13	5	7	3	5	14	7	7	0	72	30	5	14	11	15	31	15	0	6	0	10	0	0
341	0	3	5	0	0	0	0	0	2	38	63	7	3	10	13	3	0	3	0	13	3	0	5
351	7	13	11	2	2	22	5	0	10	49	44	3	3	3	16	0	6	0	11	15	35	15	6
361	0	108	24	0	0	6	8	0	0	99	0	0	7	7	7	27	9	27	28	0	23	27	0
TOTAL INTERNAL	311	543	634	96	108	481	270	195	137	1256	555	273	203	242	613	428	369	327	360	473	322	191	158
001	6	17	28	1	2	13	5	3	3	128	50	24	20	13	36	39	23	19	8	9	39	2	2
005	13	30	33	2	2	39	14	5	3	92	8	21	31	17	50	36	22	19	16	25	33	8	6
008	1	8	8	0	0	17	5	5	3	36	15	9	0	3	18	14	6	6	11	17	8	8	5
009	0	11	0	0	0	0	0	0	0	19	26	0	5	0	5	7	8	0	0	3	6	7	1
010	27	27	23	5	6	31	8	1	7	105	10	5	19	8	25	20	14	29	10	22	40	4	5
011	0	5	15	0	0	13	30	10	0	53	9	3	12	6	14	12	6	14	5	11	21	1	3
014	34	59	57	5	7	33	16	7	19	129	22	24	20	16	46	44	26	15	8	14	23	0	3
016	38	8	17	6	8	5	2	1	2	67	16	5	18	10	14	35	21	6	8	0	7	2	0
TOTAL EXTERNAL	119	165	181	19	25	151	80	32	37	629	156	91	125	73	210	207	126	108	66	101	177	32	25
TOTAL	430	708	815	115	133	632	350	227	174	1885	711	364	328	315	823	635	495	435	426	574	499	223	183

ZONE	311	312	313	314	321	322	323	324	331	332	341	351	361	TOTAL INTERNAL	001	005	008	009	010	011	014	016	TOTAL EXTERNAL	TOTAL
111	0	27	2	5	26	0	8	0	8	0	0	0	21	253	11	8	3	0	3	16	11	28	80	333
112	14	0	0	0	24	5	7	0	14	9	5	26	95	573	60	5	24	3	23	7	73	43	238	811
113	10	0	0	0	44	0	0	0	1	0	8	16	32	494	13	10	3	0	13	6	40	17	102	596
114	0	8	0	0	6	0	3	0	2	0	0	0	7	70	2	2	0	0	0	4	2	6	16	86
115	0	8	0	0	3	0	1	0	2	0	0	0	5	57	2	2	0	0	0	2	2	6	14	71
121	0	0	0	0	48	0	0	0	0	8	0	3	0	283	32	2	9	5	23	11	52	9	143	426
122	0	0	0	0	23	0	0	0	0	14	8	0	0	195	6	8	2	3	0	34	50	11	114	309
123	0	0	0	0	23	0	0	0	0	7	5	0	0	184	1	2	1	1	1	10	10	5	31	215
124	3	8	1	2	3	0	0	0	0	0	0	0	0	89	5	2	7	0	5	0	9	2	30	119
211	43	40	3	7	23	25	8	0	36	30	68	97	74	1556	233	176	98	14	104	69	258	149	1101	2657
212	27	0	0	0	34	15	22	0	5	0	51	59	10	725	35	30	30	15	22	14	57	30	233	958
221	2	10	1	2	36	0	0	0	0	0	7	3	0	141	5	11	2	0	9	5	21	14	67	208
231	0	7	0	1	18	3	0	0	8	8	11	8	0	177	36	9	6	7	11	8	37	21	135	312
232	13	9	0	2	25	0	0	0	0	13	6	14	7	235	3	7	2	3	5	4	8	2	34	269
241	0	7	0	1	95	14	0	0	5	39	41	25	26	625	14	23	24	5	33	22	67	31	219	844
251	10	8	0	1	42	0	8	0	3	10	15	21	30	434	48	33	19	24	24	14	59	13	234	668
252	0	0	0	0	51	0	9	0	0	18	3	6	6	328	13	9	0	2	7	4	20	10	65	393
261	0	14	1	2	16	17	14	0	0	0	13	14	26	438	27	25	27	2	42	28	46	27	224	662
262	11	0	0	0	34	11	0	0	3	5	11	34	6	488	13	10	13	2	12	8	19	15	92	580
263	25	0	0	0	2	40	10	0	44	32	46	35	44	791	32	39	32	11	52	35	80	36	317	1108
271	6	9	1	1	28	0	5	0	6	4	6	17	9	188	52	41	3	14	20	13	77	7	227	415
272	3	0	0	0	57	6	0	1	2	3	0	3	6	144	0	2	2	1	2	1	1	0	9	153
273	17	0	0	0	2	25	7	1	30	21	30	23	28	507	3	5	3	1	6	3	9	5	35	542
311	11	0	0	0	6	6	0	0	10	18	8	0	8	189	3	17	0	3	1	1	10	2	37	226
312	7	23	2	5	34	22	0	0	22	17	44	15	42	345	10	64	10	5	11	7	33	8	148	493
313	1	1	0	0	6	2	0	0	1	1	3	1	3	27	0	1	0	0	0	0	0	0	1	28
314	1	1	0	0	5	2	0	0	1	1	3	1	3	26	0	0	0	0	0	0	0	0	0	26
321	46	33	7	6	0	56	66	19	80	91	111	133	71	1543	5	24	31	14	29	20	15	5	143	1686
322	0	0	0	0	57	11	0	0	8	21	5	17	7	188	6	6	1	2	4	2	5	0	26	214
323	5	14	1	2	38	2	0	0	5	0	7	14	5	155	0	2	2	2	1	0	3	1	11	166
324	0	0	0	0	8	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	9
331	3	18	1	3	55	2	10	0	3	3	5	17	16	240	13	24	7	0	6	3	11	13	77	317
332	17	15	1	2	83	14	17	0	15	14	0	17	0	465	78	91	65	31	70	49	120	43	547	1012
341	0	34	2	6	76	6	0	0	9	3	2	19	13	341	9	14	9	0	2	1	34	9	78	419
351	11	23	2	5	92	11	6	0	17	22	33	54	42	596	35	30	17	2	16	10	30	15	155	751
361	13	32	3	6	71	1	0	0	7	8	0	43	7	598	39	15	6	2	11	8	23	3	107	705
TOTAL INTERNAL	299	349	28	59	1194	294	201	21	347	420	555	735	649	13696	844	749	458	174	568	419	1292	586	5090	18786
001	7	16	0	1	10	10	6	0	24	38	27	48	52	729	0	13	1	0	73	49	23	26	185	914
005	31	72	1	5	32	11	9	0	31	63	28	35	18	861	23	0	0	0	32	22	66	35	178	1039
008	2	5	0	0	32	8	3	0	2	23	8	30	3	319	2	9	0	0	2	0	2	10	25	344
009	6	7	0	0	26	10	2	0	0	17	0	6	6	178	2	2	0	0	2	0	7	2	15	193
010	7	2	0	0	12	9	5	0	14	35	17	21	12	585	64	35	1	0	0	0	18	10	128	713
011	3	1	0	0	7	5	3	0	9	17	9	10	6	313	31	18	0	0	0	0	6	3	58	371
014	11	6	0	0	0	8	1	0	10	44	24	36	10	779	13	79	14	0	13	0	0	8	127	906
016	2	0	0	0	8	5	1	0	8	18	8	8	3	356	18	36	3	0	19	0	21	0	97	453
TOTAL EXTERNAL	69	109	1	6	127	66	30	-	98	255	121	194	110	4121	153	192	19	-	141	71	143	94	813	4934
TOTAL	368	458	29	65	1321	360	231	21	445	675	676	929	759	17817	997	941	477	174	709	490	1435	680	5903	23720

CHATHAM 1986 INTERZONAL MOVEMENTS
(4:00 – 7:00 P.M. AVERAGE MAY / JUNE WEEKDAY)

ZONE	111	112	113	114	115	121	122	123	124	211	212	221	231	232	241	251	252	261	262	263	271	272	273
111	0	16	1	1	1	23	2	19	14	24	111	31	0	0	29	0	44	10	1	1	0	68	1
112	24	26	41	5	6	14	26	7	5	80	6	6	15	13	42	8	10	19	8	14	11	16	5
113	19	44	51	5	5	52	39	7	15	49	60	0	6	16	27	33	27	0	11	31	8	27	15
114	1	6	0	0	0	0	1	7	3	10	30	9	0	0	9	0	13	2	0	1	0	16	1
115	0	3	0	0	0	3	0	2	2	7	18	3	0	0	3	0	8	2	0	0	0	10	0
121	1	3	31	0	0	30	33	0	8	71	33	8	23	17	31	8	18	3	11	24	13	0	11
122	36	8	41	8	8	47	42	24	26	14	72	11	0	0	27	0	0	13	0	56	25	1	22
123	22	8	0	5	5	0	16	38	0	32	0	7	0	0	0	11	0	8	0	43	0	31	19
124	23	5	8	15	7	6	0	8	0	15	0	0	0	0	7	0	15	3	0	0	0	13	0
211	48	62	88	11	27	113	114	41	14	132	31	44	26	34	113	67	71	33	51	31	34	27	13
212	66	33	54	15	17	47	123	0	7	67	49	8	28	18	35	50	8	0	65	1	10	32	0
221	28	3	0	7	7	5	0	0	0	26	10	0	0	7	8	17	8	3	1	0	6	0	0
231	15	4	14	3	5	11	0	0	2	38	0	0	5	0	3	9	0	0	0	0	8	13	0
232	1	18	54	1	0	16	1	0	0	22	63	23	0	22	57	17	20	0	0	1	0	1	1
241	42	31	59	10	11	40	17	14	8	64	7	19	10	17	0	30	5	31	10	16	6	0	7
251	59	18	27	16	16	7	43	11	0	33	8	17	0	25	26	56	15	15	15	0	0	0	0
252	1	17	29	0	0	8	62	0	7	51	23	56	9	17	27	23	17	6	31	1	22	1	0
261	16	3	7	3	5	17	13	7	3	15	9	5	8	7	15	23	10	9	24	80	21	11	30
262	34	38	27	9	10	6	27	10	0	39	20	26	0	23	0	15	8	46	24	26	7	14	13
263	0	10	57	0	0	40	40	10	11	48	15	15	6	32	17	16	30	26	11	89	16	18	31
271	0	10	25	0	0	25	11	0	0	6	6	0	19	0	8	8	0	9	16	0	10	0	0
272	32	8	1	19	19	1	2	1	0	0	16	1	7	1	1	1	7	2	1	21	13	1	41
273	0	7	38	2	0	30	29	8	8	33	10	10	5	23	11	11	20	18	8	57	10	0	10
311	0	7	9	0	0	11	0	25	11	22	15	11	0	0	0	0	9	7	12	1	8	28	0
312	1	0	26	0	0	9	0	14	0	31	0	11	0	13	16	0	0	9	0	1	0	0	0
313	0	10	1	0	0	0	11	1	19	66	0	1	0	0	17	0	0	1	0	0	31	0	0
314	0	0	1	0	0	0	0	1	0	3	0	1	0	0	1	0	0	1	0	0	0	0	0
321	87	31	71	10	7	90	99	33	5	29	46	75	25	36	132	60	68	22	52	10	49	9	3
322	1	6	0	0	0	0	0	0	11	32	0	0	0	0	9	0	0	0	0	0	16	0	0
323	1	0	0	0	0	0	1	0	0	5	17	0	8	10	18	11	10	7	0	1	15	0	0
324	0	8	0	0	0	0	11	0	18	59	0	0	0	0	14	0	0	0	0	1	27	0	0
331	0	0	7	0	0	5	0	0	0	25	6	0	0	0	10	0	5	0	5	32	11	15	15
332	22	5	8	5	6	19	21	9	0	72	32	7	14	17	16	38	16	0	6	0	11	0	0
341	0	3	7	0	0	0	0	0	2	38	86	13	5	19	16	6	0	3	0	16	5	0	8
351	14	13	15	3	3	32	16	0	9	49	51	6	3	6	17	0	7	0	14	17	41	30	8
361	2	212	82	1	1	25	86	0	0	219	1	5	19	29	19	100	31	67	89	1	71	155	1
TOTAL INTERNAL	596	676	880	154	166	732	886	297	208	1526	851	429	241	402	781	618	500	375	466	573	505	537	255
001	10	18	39	2	2	18	15	6	5	132	74	36	22	21	44	55	28	19	9	10	57	7	3
005	22	30	44	2	3	59	49	7	6	95	11	31	34	27	62	51	27	19	18	27	48	21	9
008	1	8	11	0	0	27	17	8	6	39	24	14	0	7	23	20	68	6	15	19	13	22	8
009	1	11	0	0	0	0	1	0	0	19	36	0	6	0	6	9	10	0	0	3	9	17	2
010	54	30	33	8	8	51	32	2	10	109	15	6	25	13	26	13	16	29	12	27	63	9	9
011	0	3	16	0	0	16	86	14	0	63	13	5	13	8	22	28	11	17	6	13	34	5	5
014	66	65	81	8	10	55	62	11	27	143	34	40	23	27	63	68	36	16	10	16	36	0	6
016	73	8	25	9	13	7	9	2	2	75	25	7	21	17	18	55	28	7	10	0	10	6	0
TOTAL EXTERNAL	227	173	249	29	36	233	271	50	56	675	232	139	144	120	264	299	224	113	80	115	270	87	42
TOTAL	823	849	1129	183	202	965	1157	347	264	2201	1083	568	385	522	1045	917	724	488	546	688	775	624	297

ZONE	311	312	313	314	321	322	323	324	331	332	341	351	361	TOTAL INTERNAL	001	005	008	009	010	011	014	016	TOTAL EXTERNAL	TOTAL
111	0	80	2	10	56	0	29	0	21	0	0	0	150	745	39	24	14	1	11	38	38	95	260	1005
112	16	0	1	0	24	5	8	8	14	9	5	26	128	651	68	5	29	3	26	6	81	48	266	917
113	19	0	0	0	44	0	0	0	2	0	14	19	115	760	19	15	6	0	19	6	60	25	150	910
114	0	24	1	0	7	0	10	0	5	0	0	0	43	199	6	6	1	0	0	9	6	15	43	242
115	0	15	0	0	3	0	3	0	3	0	0	0	22	107	5	3	0	0	0	3	3	10	24	131
121	1	0	0	0	55	0	0	0	0	11	0	6	0	450	55	5	16	7	40	14	86	16	239	689
122	0	0	1	0	56	0	0	1	0	34	30	0	1	604	19	26	10	13	1	90	174	39	372	976
123	0	0	0	0	23	0	0	0	0	7	8	0	0	283	2	5	1	1	1	14	18	7	49	332
124	8	16	1	2	5	0	0	0	0	0	0	0	0	157	9	5	14	0	8	0	17	3	56	213
211	57	41	40	7	23	28	10	46	37	30	74	97	139	1854	275	203	123	16	114	92	296	175	1294	3148
212	48	0	70	0	34	23	38	79	7	0	74	65	35	1206	58	48	52	23	30	29	91	47	378	1584
221	6	19	1	2	36	0	0	0	0	0	14	6	23	243	7	19	3	0	15	10	33	23	110	353
231	0	7	15	1	16	5	0	2	8	7	15	8	0	214	42	10	6	8	13	10	43	25	157	371
232	44	24	1	5	48	0	1	23	0	24	18	31	55	592	10	18	7	9	11	12	19	6	92	684
241	0	9	34	1	95	19	0	40	6	39	54	23	73	847	19	31	35	6	36	38	91	43	299	1146
251	18	11	0	1	42	0	15	0	5	10	22	23	99	653	72	48	30	34	20	31	87	19	341	994
252	0	0	0	0	57	0	21	0	0	23	8	8	24	549	21	16	0	3	13	9	34	17	113	662
261	0	23	2	2	16	19	17	38	0	0	13	14	51	536	33	30	35	2	52	37	55	34	278	814
262	16	14	0	0	34	15	0	25	5	5	14	34	10	594	15	13	16	3	10	13	24	18	112	706
263	30	34	0	0	2	40	13	84	44	32	46	35	80	978	39	47	41	14	64	45	94	44	388	1366
271	14	9	2	2	29	0	11	0	9	5	11	24	38	307	88	68	6	23	31	24	127	13	380	687
272	14	32	1	1	120	18	1	67	8	7	1	8	46	520	1	6	8	3	8	5	3	1	35	555
273	22	29	0	0	2	27	9	73	30	21	31	23	67	682	6	6	6	2	8	6	13	6	53	735
311	23	17	1	0	6	9	0	35	16	21	14	0	31	349	8	32	0	7	2	2	19	5	75	424
312	11	28	82	5	34	30	0	89	24	17	57	15	124	647	18	114	19	8	16	6	59	15	265	912
313	1	1	72	0	127	1	0	29	25	43	17	47	68	589	3	3	0	2	3	2	3	0	16	605
314	1	1	8	0	5	2	0	8	1	1	3	1	7	46	0	0	0	0	0	0	0	0	-	46
321	73	42	234	6	0	76	91	27	89	91	135	133	211	2257	7	33	46	19	44	29	21	6	205	2462
322	0	0	12	0	73	24	0	0	13	26	9	25	27	284	9	8	2	3	5	4	6	0	37	321
323	11	27	17	3	43	6	0	18	8	0	13	20	19	289	0	3	3	5	1	0	7	1	20	309
324	0	11	11	0	116	0	0	67	23	44	16	42	68	536	9	9	2	3	6	4	8	0	41	577
331	6	28	10	5	56	3	19	14	5	3	8	21	58	372	21	38	13	0	10	6	17	18	123	495
332	26	18	56	2	83	18	26	63	16	11	0	17	0	660	105	122	93	40	95	71	158	58	742	1402
341	0	54	31	7	78	10	1	34	13	3	4	24	47	533	14	22	15	0	4	2	54	15	126	659
351	20	30	49	5	92	17	10	58	22	19	46	55	135	912	52	42	26	2	24	17	42	22	227	1139
361	58	137	34	16	177	2	13	46	24	19	10	126	17	1895	122	47	18	6	36	27	68	10	334	2229
TOTAL INTERNAL	543	781	789	83	1717	397	346	974	483	562	784	976	2011	23100	1276	1130	696	266	779	719	1955	879	7700	30800
001	13	37	5	2	14	14	9	18	33	44	37	59	172	1089	0	25	2	0	146	98	46	52	369	1458
005	54	167	5	6	44	15	16	19	40	74	39	43	60	1284	46	0	0	0	64	43	132	71	356	1640
008	3	10	3	0	46	10	7	15	3	29	11	38	13	544	5	18	0	0	3	2	5	21	54	598
009	9	14	5	0	35	13	3	17	0	19	0	7	17	269	5	5	0	0	3	2	14	5	34	303
010	12	6	5	0	19	13	9	17	22	44	25	27	39	838	123	67	2	0	0	0	37	21	250	1088
011	6	3	2	0	10	6	5	9	11	22	13	14	23	502	69	40	0	0	0	0	11	7	127	629
014	22	15	3	0	0	11	3	16	15	57	35	48	38	1166	25	157	27	0	25	0	0	16	250	1416
016	3	0	2	0	13	7	1	9	11	23	13	11	10	530	37	73	7	0	39	0	41	0	197	727
TOTAL EXTERNAL	122	252	30	8	181	89	53	120	135	312	173	247	372	6222	310	385	38	0	280	145	286	193	1637	7859
TOTAL	665	1033	819	91	1898	486	399	1094	618	874	957	1223	2383	29322	1586	1515	734	266	1059	864	2241	1072	9337	38659

TRAFFIC PLANNING REPORT
FOR THE
CITY OF CHATHAM

ORIGIN – DESTINATION TABLES
1966 – 1986

TABLE #B3

EXPOSURE RATINGS OF LEVEL CROSSINGS

Railway	Street	Existing Protection	Trains per Day	Vehicles per Day (A.D.T.)		Exposure Factor Rating (000's)		Rating	
				1966	1986	1966	1986	1966	1986
C.N.R.	Keil		32	-	5,600	-	179	-	8
C.N.R.	Lacroix	Automatic gates	69	11,600	11,300	800	780	2	3
C.N.R.	Queen)	Manual gates)	73	18,600	31,900	1,358	2,329	1	1
C.N.R.	William)	Manual gates)							
C.P.R.	Keil	Bell & flashing light	23	13,700	7,500	315	173	4	9
C.P.R.	Merritt	Bell & flashing light	23	1,800	2,900	41	67	11	12
C.P.R.	Lacroix	Bell & wig-wag	38	5,100	21,900	194	832	7	2
C.P.R.	Queen	Automatic gates	38	16,300	17,500	619	665	3	4
C.P.R.	Centre	Automatic gates	38	3,500	16,300	133	619	8	5
C.P.R.	Wellington	Bell & wig-wag	38	6,100	11,900	232	452	6	7
C.P.R.	William	Manual gates	40	7,000	11,400	280	456	5	6
C.& O.	Park Ave.	Bell & flashing light	13	2,500	5,000	33	65	12	13
C.& O.	Park St.	Bell & wig-wag	13	3,400	6,300	44	82	10	11
C.& O.	Grand	Bell & flashing light	10	11,100	15,000	111	150	9	10

TABLE #B4

VOLUME/CAPACITY RATIOS-EXISTING NETWORK

Street	Section	Design Capacity	Design Hour Volume 1966	Design Hour Volume 1986	V/C 1966	V/C 1986
St.Clair St.	Grand-McNaughton	1240	1120	2060	0.90	1.66
Grand Avenue	Keil to Sandys	2350	1120	2370	0.48	1.01
	Sandys -St.Clair	2090	1200	2480	0.57	1.19
	St.Clair-Victoria	1350	780	1630	0.58	1.21
	Victoria-Thames	1400	560	1230	0.40	0.88
McNaughton Ave.	Sandys-St.Clair	670	340	710	0.51	1.06
Sandys St.	Grand-McNaughton	330	200	310	0.61	0.94
Thames St.	Victoria-Grand	1200	570	1240	0.47	1.03
Richmond St.	Bloomfield-Keil	1460	790	1810	0.54	1.24
	Keil-Lacroix	1250	1540	2180	1.23	1.75
	Lacroix-Queen	800	950	1520	1.19	1.90
Park Ave.	Bloomfield-Lacroix	450	230	380	0.51	0.85
	Lacroix-Queen	320	330	520	1.03	1.63
	Queen-Whitehall	550	430	720	0.78	1.31
Keil Dr.	Richmond-Riverview	1720	1050	1860	0.61	1.08
Lacroix St.	Park Ave.-Richmond	1100	950	1430	0.86	1.30
	Richmond-Wellington	870	470	680	0.54	0.78
	Wellington-King	520	330	530	0.64	1.04
Queen St.	Park Ave.-Richmond	2040	1300	1920	0.64	0.94
	Richmond-School	990	1250	2040	1.26	2.06
	School-Wellington	1080	890	1450	0.82	1.34
King St.	Lacroix-Third	750	300	520	0.40	0.69
	Third-Fifth	670	840	1120	1.26	1.67
	Fifth-William	740	1060	1400	1.43	1.89
Wellington St.	Lacroix-Raleigh	780	400	550	0.51	0.71
	Third-Fourth	860	790	1290	0.92	1.50
	Fourth-Fifth	630	660	1070	1.05	1.70
Centre St.	Park St.-Wellington	1340	600	980	0.45	0.73
William St.	Park St.-King	680	660	960	0.97	1.41
Park St.	Centre-William	950	390	610	0.41	0.64
	William-Whitehall	850	340	640	0.40	0.75
Third St.	Wellington-King	1150	1160	1880	1.01	1.63
Fifth St.	Wellington-King	770	1060	1630	1.38	2.12

TABLE B5

INTERSECTION TURNING MOVEMENTS

1966 Evening Peak Hour

INTERSECTION	APPROACH		TOTAL APPROACH VOLUME	TRAFFIC COMPOSITION % Left	% Through	% Right	% Trucks
Queen Street - Indian Creek Rd.	Queen	-N	410	5	85	10	2
	Indian Creek	-E	30	30	30	40	4
	Queen	-S	310	15	85	-	5
	Indian Creek	-W	150	15	5	80	4
Park Avenue - Bloomfield Rd.	Bloomfield	-N	160	20	80	-	11
	Park	-E	60	45	-	55	6
	Bloomfield	-S	100	-	75	25	16
Park Avenue - Lacroix St.	Lacroix	-N	560	15	65	20	4
	Park	-E	110	10	35	55	7
	Lacroix	-S	250	10	85	5	5
	Park	-W	170	50	25	25	6
Park Avenue - Queen St.	Queen	-N	830	10	80	10	4
	Park	-E	220	20	30	50	6
	Queen	-S	480	-	95	5	6
	Park	-W	170	35	55	10	9
Park Avenue - Whitehall St.	Whitehall	-N	150	100	-	-	3
	Park	-E	190	-	50	50	12
	Cemetery	-S	20	50	50	-	-
	Park	-W	90	-	100	-	5
Richmond Street- Bloomfield Rd.	Bloomfield	-N	20	-	50	50	6
	Richmond	-E	360	45	55	-	8
	Bloomfield	-S	120	10	-	90	13
	Highway 2	-W	210	-	90	10	13
Richmond St.- Keil Dr.	Keil	-N	480	65	-	35	8
	Richmond	-E	650	-	35	65	7
	Richmond	-W	440	35	65	-	9
Richmond Street- Merritt Ave.	Merritt	-N	50	60	-	40	4
	Richmond	-E	610	-	90	10	7
	Merritt	-S	310	30	15	55	1
	Richmond	-W	630	10	90	-	7
Richmond Street- Lacroix St.	Lacroix	-N	290	10	65	25	1
	Richmond	-E	380	10	85	5	7
	Lacroix	-S	380	45	20	35	5
	Richmond	-W	890	5	65	30	5
Richmond Street- Queen St.	Queen	-N	650	-	70	30	4
	Queen	-S	470	30	70	-	6
	Richmond	-W	580	50	-	50	6
Keil Drive- Riverview Dr.	Keil	-N	510	15	80	5	8
	Riverview	-E	110	10	10	80	4
	Keil	-S	570	5	85	10	6
	Riverview	-W	90	35	25	40	9
Lacroix Street- Wellington St.	Lacroix	-N	270	20	80	-	4
	Wellington	-E	160	80	-	20	5
	Lacroix	-S	180	-	55	45	-
Wellington Street- Third Street- Second Street- Raleigh Street-	Third	-N	490	45	50	5	5
	Wellington	-E	360	15	15	70	-
	Raleigh-Well.	-S	520	-	85	15	3
	Second	-W	130	40	40	20	5
Wellington Street- Queen Street- Fourth St.	Fourth	-N	240	15	60	25	2
	Wellington	-E	390	25	55	20	3
	Queen	-S	410	25	45	30	2
	Wellington	-W	430	15	45	40	3
Wellington Street- Fifth Street- Sixth Street- Centre Street	Fifth	-N	480	5	65	30	6
	Sixth	-N	220	10	65	25	-
	Wellington	-E	440	-	55	45	3
	Centre	-S	440	-	85	15	4
	Wellington	-W	270	-	70	30	-
Queen Street- School St.	Queen	-N	480	20	80	-	4
	School	-E	330	80	-	20	3
	Queen	-S	600	-	55	45	5

INTERSECTION	APPROACH		TOTAL APPROACH VOLUME	TRAFFIC COMPOSITION % Left	% Through	% Right	% Trucks
Queen Street- William St.	Queen	-N	710	-	100	-	3
	William	-E	150	100	-	-	5
	Queen	-S	600	-	70	30	6
William Street- Park St.	William	-N	400	30	45	25	-
	Park	-E	-	-	-	-	-
	William	-S	250	5	80	15	4
	Park	-W	280	30	60	10	6
Park Street- Centre St.	Centre	-N	180	55	-	45	6
	Park	-E	170	-	65	35	5
	Park	-W	250	25	75	-	8
William Street- Wellington St.	William	-N	280	5	75	20	5
	Wellington	-E	190	35	55	10	8
	William	-S	300	25	70	5	7
	Wellington	-W	290	30	25	45	5
William Street- King St.	William	-N	230	-	45	55	2
	King	-E	360	5	80	15	4
	William	-S	240	55	35	10	4
	King	-W	440	10	40	50	4
King Street- Fifth St.	Fifth	-N	600	15	50	35	4
	King	-E	620	-	40	60	3
	Fifth	-S	580	-	90	10	5
	King	-W	440	-	80	20	4
King Street- Third St.	Third	-N	680	30	60	10	4
	King	-E	400	-	35	65	1
	Third	-S	740	-	85	15	1
	King	-W	120	5	85	10	17
Lacroix Street- King St.	King	-E	210	45	55	-	5
	Lacroix	-S	120	70	-	30	5
	King	-W	350	-	55	45	7
Grand Avenue- Keil Dr.	Keil	-N	-	-	-	-	-
	Grand	-E	450	80	20	-	6
	Keil	-S	580	10	-	90	5
	Grand	-W	120	-	55	45	6
Grand Avenue- Sandys St.	Sandys	-N	100	35	-	65	7
	Grand	-E	570	-	95	5	5
	Grand	-W	710	15	85	-	6
Grand Avenue- St.Clair St.	St.Clair	-N	620	15	75	10	8
	Grand	-E	410	20	50	30	7
	St.Clair	-S	790	25	55	20	2
	Grand	-W	630	40	40	20	5
Grand Avenue- Victoria Ave.	Victoria	-N	190	15	70	15	10
	Grand	-E	270	10	80	10	6
	Victoria	-S	240	15	75	10	4
	Grand	-W	370	15	80	5	3
Grand Avenue- Thames St.	Grand	-E	410	55	45	-	5
	Thames	-S	290	-	-	100	5
	Grand	-W	290	-	95	5	6
St.Clair Street- McNaughton Ave.	St.Clair	-N	540	15	75	10	8
	McNaughton	-E	180	30	20	50	3
	St.Clair	-S	490	5	75	20	7
	McNaughton	-W	150	30	45	25	4
Victoria Avenue- McNaughton Ave.	Victoria	-N	100	25	60	15	1
	McNaughton	-E	190	15	75	10	6
	Victoria	-S	190	35	40	25	4
	McNaughton	-W	250	15	70	15	1
St.Clair Street- Gregory Dr.	St.Clair	-N	360	10	90	-	11
	Gregory	-E	60	35	10	55	22
	St.Clair	-S	370	10	80	10	15
	Gregory	-W	50	5	10	85	8