

A PARKING STUDY IN WICHITA, KANSAS

by

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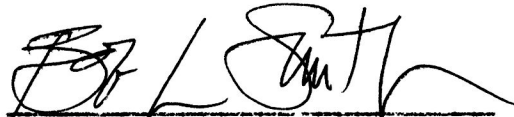

Major Professor

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CHAPTER 1

INTRODUCTION

Many urban areas have experienced large increases in population and car ownership in recent years. The ever-increasing use of the automobile, together with the shortage of parking spaces, has generated the parking problem, in the Central Business District of most major cities in this country in particular. Inadequate parking facilities and traffic congestion have seriously affected the downtown commercial development.

In order to plan for parking demands in an urban area, it is necessary to study factors influencing parking needs. The most satisfactory way to gather parking data for future planning is by conducting a comprehensive parking study. Methods for conducting this type of study are suggested in the National Committee on Urban Transportation (NCUT) Procedure Manual 3D, "Conducting A Comprehensive Parking Study" (1)*. This comprehensive study provided an intensive look at the present parking situation and served as a detailed base for projection, evaluation of future plans and improvements of parking facilities.

A. PURPOSE OF THE REPORT

The pupose of the non-thesis project is to develop a work

*See list of references

program for conducting a comprehensive parking study for the Central Business District of Wichita, Kansas. This paper describes techniques utilized for the determination of the parking supply and demand in the study area.

The following is a brief description of the contents by chapter.

- Chapter 1. Introduction: a brief discussion of the general parking situation, the purpose of this paper, and the glossary of terms used in the contents.
- Chapter 2. Goals and Objectives: a tentative goal statement for guiding the parking study.
- Chapter 3. Previous Parking Studies: parking data sources investigated within the City of Wichita.
- Chapter 4. Present Parking Study: the role of the author relating to this particular project, the scope of the study and the study area.
- Chapter 5. Parking Inventory: a detailed measurement and description of all parking in the study area.
- Chapter 6. Parking Utilization: techniques to measure the operational characteristics of parking facilities, the parking space usage, and the travel patterns of parkers in the study area.
- Chapter 7. Parking Needs: techniques to allocate parking demand to the available supply for the determination

of the present and future parking needs.

Chapter 8. Conclusion: a critical analysis to evaluate the strength and weakness of the project.

B. GLOSSARY OF TERMS

1. Center city: generally, the 450 block area bounded by Ninth Street, the Drainage Canal, Indianapolis Avenue, and Seneca Street. This is the general area included in the Center City Study, 1961, prepared by the Wichita-Sedgwick County Metropolitan Area Planning Department.

2. Central Business District: the downtown or major business district defined by the Wichita-Sedgwick County Metropolitan Area Planning Department, which is generally bounded by Central Avenue, Washington Avenue, Kellogg Street, Greenway Boulevard, and the Arkansas River.

3. Cordon Count: the simultaneous counting of all traffic entering and leaving a given area such as the study area.

4. Disutility: a generalized cost into which parking choice considerations are structured such that a single measure of inconvenience and/or cost is available for every potential parking location as viewed from each trip destination.

5. Goals: a set of statements defining an ideal environment towards which effort is to be directed. Goals are general statements of purpose that are always pursued, while objectives

are measurable ends that are realistically attainable.

6. Metered parking: parking space on curbside where the time limit and parking charge are regulated by a parking meter.

7. Municipal free space: space in parking lots operated by the City with no charge to the parker.

8. Municipal metered space: space in parking lots operated by the City which is regulated by a parking meter.

9. Municipal reserved space: space operated by the City and also reserved for City vehicles and City employees.

10. Objective: a number of specified policies derived from goals which are stated in a manner to permit appraisal of progress toward attaining goals. They are either measurable or can be subjectively described.

11. Parking accumulation: the total number of vehicles parked within a given area at a specific time.

12. Parking demand: the number of vehicles whose drivers desire to park at a specific location or in a general area.

13. Parking duration: the actual length of time a vehicle remains in one parking space.

14. Parking needs: the number of additional parking spaces required to offset the parking deficit in a specific geographical unit where the demand exceeds the supply.

15. Parking supply: the number of parking spaces for use

usually classified by geographical unit or by parking type.

16. Parking turnover: the number of different vehicles parked at a specific parking space during the study period.

17. Practical capacity: the number of vehicles that can be reasonably accomodated by a given facility. The number, which depends on size and type of facility, is usually 85 to 90 percent of the total capacity.

18. Private customer space: space reserved for customers and visitors of a particular business.

19. Private employee space: space provided by a business for their employees.

20. Private parking facility: a lot or garage containing less than five spaces or less than 20 percent of the facility's spaces in the public commercial category.

21. Private reserved space: space used by a business for special purpose other than customer or employee parking. Examples of this type of parking are spaces reserved by a business for company vehicles, or hotel facility spaces reserved for registered guests.

22. Public commercial space: space available for public use. A parking fee is charged on an hourly, daily, weekly, or monthly basis.

23. Public parking facility: a lot or garage containing at least five spaces, with more than 20 percent of the

facility's spaces in the public commercial category.

24. Trip purpose: the principal purpose of the parker in making the trip.

25. Turnover rate: the ratio of the number of different vehicles to available parking spaces within a certain period of time for a given area by parking type.

26. Unmetered parking: legal parking space on curbside not regulated by a parking meter.

27. Walking distance: the actual distance traveled on foot from the parking location to the parker's trip destination.

28. Work program: a workable and demonstrative procedure for implementing planning activities.

CHAPTER 2

GOAL AND OBJECTIVES

It was desirable to adopt goals and objectives as a guide in the preparation of the parking program. Every effort should be made to directly satisfy the objectives and attain the result as the final goal. A draft of "Goals and Objectives for the Wichita-Sedgwick County Metropolitan Area" has been prepared, but has not achieved final official approval by the Metropolitan Area Planning Commission.

In November 1969, a statement of general developmental goal for the Center City Plan for Wichita was adopted by the Center City Steering Committee. The goal for transportation planning stated that, "the circulation system should be developed so as to serve the center city and its activities in the best manner possible by providing quick, convenient, safe, and economical access to all areas". This goal statement could be considered as the general guideline for directing the parking program presently being conducted by MAPD.

Before initiating the parking study, it was desirable to establish a tentative goal for direction. After some consideration, the goal for the Parking Plan was established to provide for the adequate storage of vehicles in areas of concentrated "people activities" such as the Central Business District, terminals of various transportation modes and major outlying

institutional, commercial and employment centers.

To achieve this goal, it would be an objective of the Wichita Parking Plan for the Central Business District to:

1. Enhance and preserve the traffic carrying function of major streets by limiting onstreet parking.
2. Maximize the use of scarce land resources in appropriate areas by encouraging the development of parking structures rather than parking lots.
3. Encourage private enterprise to develop adequate offstreet parking at proper locations.
4. Provide for the establishment of facilities for an additional public parking lot east of the core area from which shuttle bus service could be implemented to the downtown area and connect with the existing service to the Lawrence Stadium parking lot.
5. Assure adequate parking space development in the metropolitan area through enforcement of the parking provisions established in adopted zoning ordinances.

CHAPTER 3

PREVIOUS PARKING STUDIES

Parking data sources within the City were investigated. It was noted that a number of parking studies had been made for the Central Business District of Wichita.

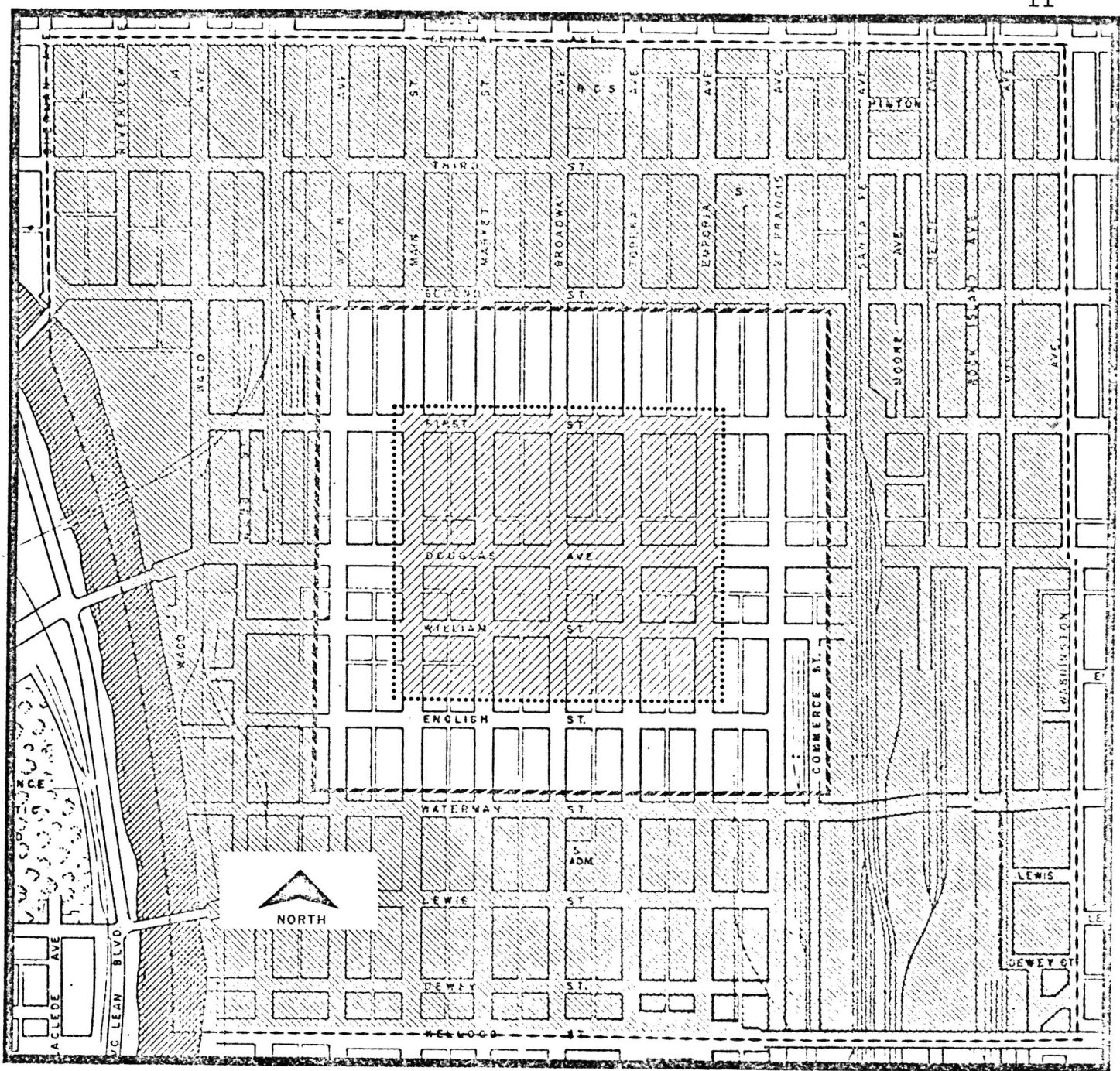
A. THE 1964 MAPD TRANSPORTATION STUDY

In 1964, the Wichita-Sedgwick County Metropolitan Area Planning Department (MAPD) completed a Transportation Study (2) which indicated a number of studies concerning parking in the Central Business District of Wichita from 1953 to 1963. In 1953, a consulting firm completed a parking study of the downtown core area bounded by Central Avenue, Santa Fe Avenue, Kellogg Street and Waco Avenue. The same firm provided additional service in a 1956 study regarding traffic and parking.

Between 1959 and 1961, the Wichita Traffic Engineering Division completed a series of parking studies for a smaller core area bounded by Second Street, Santa Fe Avenue, Kellogg Street and Waco Avenue. Data from these studies was recorded in the 1961 Center City Parking Report (3). The report revealed a total parking supply of 11,875 spaces in 1959-1960 for this particular area. Based on the accomodation of all parkers when total facilities operated at practical capacity, a 1960 parking demand of 9700 spaces was calculated for the entire area.

In 1963, the Metropolitan Area Planning Department completed a parking space survey for the Central Business District, bounded by Central Avenue, Washington Avenue, Kellogg Street, Sherman Avenue and the Arkansas River. The study area was divided into three parking analysis zones: A, B and C as shown in Figure 1. The survey revealed a total supply of 16,943 parking spaces. This figure was later adjusted in the 1964 MAPD Transportation Study to 16,529 spaces with the loss of 414 spaces due to the construction of the Civic Cultural Center. The total demand for this area was adjusted to 10,670 spaces assuming a 10 percent increase in demand from 1960 to 1963.

Future traffic volumes anticipated in the Central Business District in 1985 were projected by the Kansas State Highway Commission at 140,304 daily trips which was approximately 39 percent more than the 101,000 daily trips to and from the Central Business District in 1960. This 1985 projection reflected future population, land use and traffic generation rates which were developed by consultants and the Metropolitan Area Planning Department. It was assumed that parking demand would increase over time at the same ratio as the total number of trips to and from the Central Business District by 1985. As a result, the 1985 parking demand was estimated at the total of 13,475 spaces from the number of



PARKING ANALYSIS ZONES

- ZONE A
- ▨▨▨▨ ZONE B
- ▬▬▬▬ ZONE C

Figure 1

the 1960 parking demand plus the 39 percent increase.

B. RECENT STUDIES

Subsequent to the release of the 1964 MAPD Transportation Study, no comprehensive parking study had been conducted. In the past four years, several parking studies as described in the following have been conducted. However, the scope of these studies was limited to an inventory of the number of available spaces by location and functional usage.

In the 1969 MAPD Center City Study's Phase I Report, Land Use Inventory (4), 15,929 offstreet parking spaces were located by block and typed as commercial, employee or customer parking. The area was bounded by Central on the north, Santa Fe on the east, Kellogg on the south and the Arkansas River on the west.

In 1971, the Wichita Traffic Engineering Division (TED) completed an offstreet parking inventory entitled "Parking Lots and Garages in the CBD" (5). The area boundaries coincided with the area boundaries of the 1969 MAPD Center City Study. The total number of offstreet parking spaces recorded was 13,915. This number was 2,014 spaces less than the data for offstreet spaces recorded in the 1969 MAPD Center City Study. It was assumed that discrepancies between these two studies might be attributed to different methods of classifying spaces or actual miscounts.

Onstreet metered parking records were frequently updated by the Wichita Traffic Engineering Division's inventory and recorded in the Parking Meter Book (6). According to the Parking Meter Book of 1971, a total of 1,537 metered spaces existed in the Central Business District.

C. SUMMARY

The following table summarizes the zonal distribution of metered and offstreet parking spaces from 1960 to 1971 as referred to in previous parking studies even though their area boundaries varied. Parking demands for the years of

COMPARISON OF CBD ZONAL DISTRIBUTION
OF METERED AND OFFSTREET PARKING SPACES FROM 1960 to 1971
AND 1985 DEMAND

Year	Parking Type	Zones			Total
		A	B	C	
1960	Metered Parking	464	658	1099	2221
	Offstreet Parking	<u>1865</u>	<u>3994</u>	<u>3795</u>	<u>9654</u>
	Total	2329	4652	4894	11875
<hr/>					
1960 Demand		5100	2400	2200	9700
<hr/>					
1963	Metered Parking	374	476	769	1619
	Offstreet Parking	<u>2361</u>	<u>4623</u>	<u>7926</u>	<u>14910</u>
	Total	2735	5099	8695	16529
<hr/>					
1963 Demand		5610	2640	2420	10670
<hr/>					
1969	Metered Parking	286	532	719	1537
	Offstreet Parking	<u>3143</u>	<u>4443</u>	<u>8343</u>	<u>15929</u>
	Total	3429	4975	9062	17466
<hr/>					
1971	Metered Parking	286	532	719	1537
	Offstreet Parking	<u>3063</u>	<u>3374</u>	<u>7478</u>	<u>13519</u>
	Total	3349	3906	8197	15452
<hr/>					
1985 Demand		7085	3334	3056	13475

1960, 1963 and 1985 were also included for comparison purposes.

It was noted that the parking plan in the 1964 MAPD Transportation Study was out-of-date and needed revision.

The report itself even recommended that, "in order to analyze future parking demands in the Central Business District more adequately, a complete comprehensive parking study should be undertaken in the next three or four years" (2). No substantial efforts were made concerning an appropriate parking study until this time.

CHAPTER 4

PRESENT PARKING STUDY

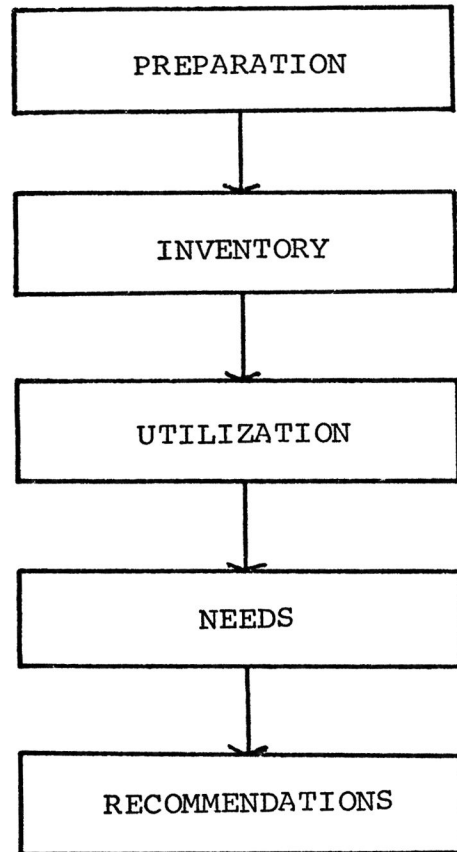
A. INITIATION OF THE PARKING STUDY

In the early fall of 1971, the author was assigned to initiate a parking study for the Central Business District of Wichita and was fully responsible for the entire project. The responsibility of the author included the determination of the study area, the preparation of forms and manuals, scheduling of operation, enlisting cooperation of interested agencies, supervising field work, the analysis of the data, making recommendations, etc.

In the late fall of 1971, the Metropolitan Area Planning Department hired additional personnel through the Emergency Employment Act to work on the transportation study. After initial organization and orientation, many of these personnel were assigned to collecting the large amount of data necessary for the parking study.

B. SCOPE OF THE PRESENT PARKING STUDY

The present parking study contained three phases: (1) a parking space inventory, (2) a utilization survey, and (3) the determination of parking needs. Figure 2 on the next page illustrates the major sequences for the parking study. Sections regarding the preparation of the project and the study recommendations are not included in this report.



MAJOR SEQUENCES FOR THE PARKING STUDY

Figure 2

The parking space inventory included a block by block investigation of parking in the study area. Both onstreet and offstreet parking facilities were inventoried to determine capacity, operating characteristics, physical features, and fee schedules. The utilization survey consisted of on-site surveys of parkers in the Central Business District to determine origin-destination information and trip purpose. The final phase of the study involved determining present and future parking needs in the study area.

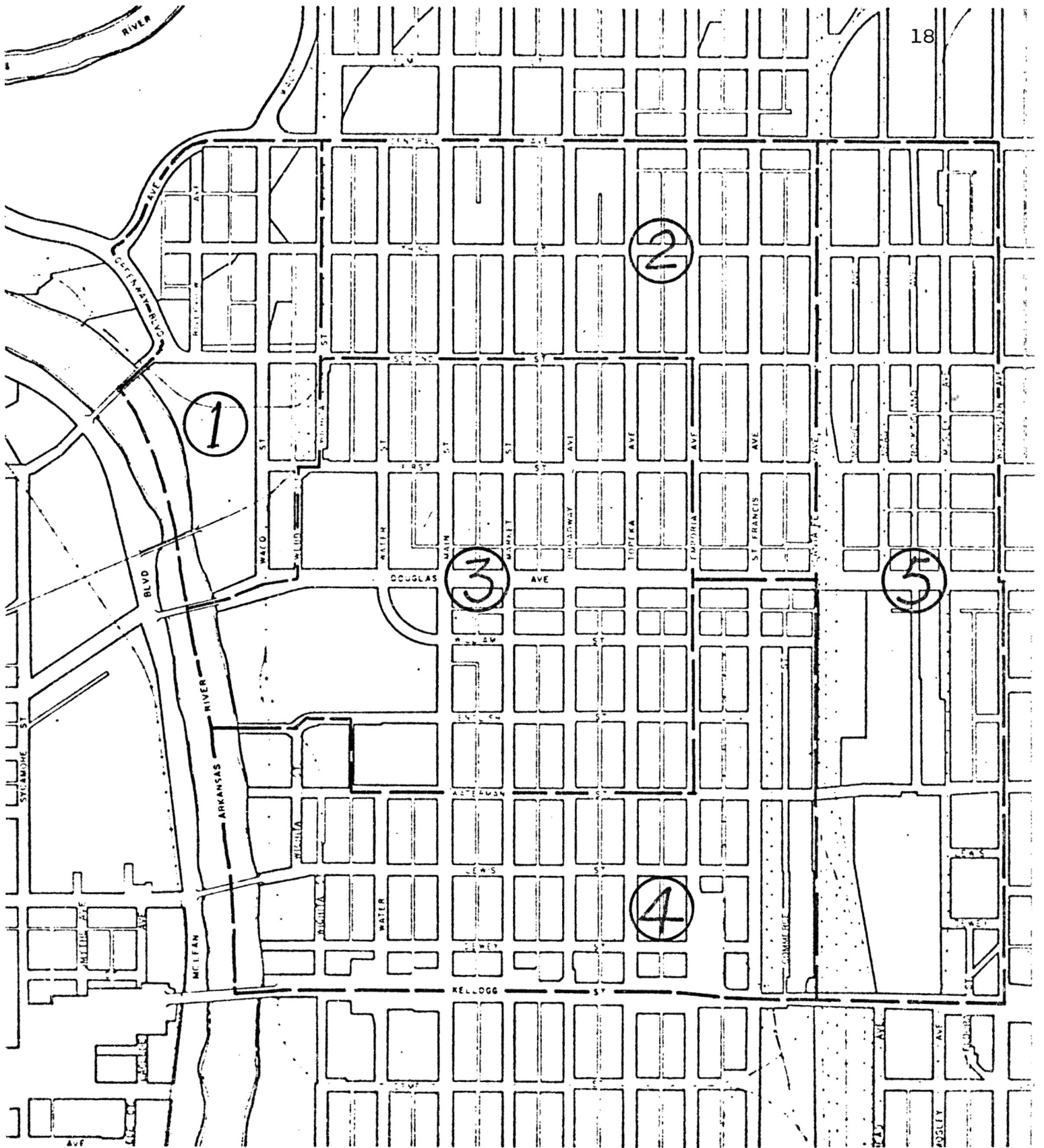
C. THE STUDY AREA

The area selected for the parking study was commonly referred to as the Central Business District. This area was bounded by Central on the north, Washington on the east, Kellogg on the south and Greenway Boulevard and the Arkansas River on the west. The area was chosen because of the nature of the parking demand in the area and its comparability to areas selected in previous studies. For purposes of analysis and comparison, the study area was divided into five sectors as shown in Fig. 3.

Sector 1: Bounded by Central Avenue, Wichita Street, Civic Center Place, Douglas Avenue and Greenway Boulevard. This area is one of scattered activity and includes large vacant land areas designated for urban renewal.

Sector 2: Bounded by Central Avenue, Santa Fe Avenue, Douglas Avenue, Emporia Avenue, Second Street, and Wichita Street. This sector is mainly commercial activity containing some industrial firms and several public agencies.

Sector 3: This is the dense commercial area of the city, including the large multi-story office buildings, banks and retail stores. The Civic Cultural Center, Public Library, government offices and major hotels are also located in this sector. It is bounded by Second Street, Emporia Avenue, Waterman Street, the alley between Main and Wichita Streets,



--- Sector boundaries

① Sector numbers

THE STUDY AREA

Figure 3

English Street, the Arkansas River, Douglas Avenue, Civic Center Place and Wichita Street.

Sector 4: This is an area of widely distributed commercial activity. It is less dense in terms of land use than Sector 2 and 3. However, it resembles Sector 2 in area size. The boundaries are Douglas Avenue, Santa Fe Avenue, Kellogg Street, the Arkansas River, English Street, the alley between Main and Wichita Streets, Waterman Street and Emporia Avenue.

Sector 5: This sector, containing mainly industrial, wholesale, loading and storage activities, is bounded by Central Avenue, Washington Avenue, Kellogg Street and Santa Fe Avenue.

CHAPTER 5

PARKING INVENTORY

Before making the inventory, existing records concerning parking were investigated to obtain the relevant data, and the inventory forms were designed separately for onstreet and off-street parking facilities. Master maps for the study area were prepared on appropriate scales. A numbering system developed by the 1969 Center City Study (4) was used to identify city blocks in the Central Business District. The inventory involved a detailed measurement and description of all parking in the study area. The findings were later summarized and represented by tables and maps.

A. ONSTREET PARKING

As previously mentioned, onstreet metered parking in the Central Business District was compiled in the Wichita Traffic Engineering Division's Parking Meter Book (6). The onstreet inventory was undertaken by extending the Parking Meter Book as the base.

The inventory sheet for onstreet parking, as shown in Appendix 1 for each block face or alley, consisted of identification and capacity. The identification included the city block number, the facility number, and the location. The capacity was investigated in terms of numbers of parking spaces and space hours by type or by footage. Onstreet parking included

metered, unmetered and restricted zones.

Metered parking varied with regard to time limits and rates. There are five types of metered parking spaces in the Central Business District. These five types are: (1) one-half-hour, (2) one-hour, (3) two-hour, (4) five-hour and (5) ten-hour. Various meter rates were also recorded in the study.

Curb space, other than metered parking, was measured by indicating the dimension in feet. In the unmetered zones, the number of parking spaces was determined on the basis of 22 feet of unobstructed space allowed per vehicle. There are three types of unmetered parking in the Central Business District described in terms of the length of time a vehicle could park in one particular space. These three types are: (1) spaces with no time limit, (2) those with a one-hour limit, and (3) spaces with a two-hour limit. Unmetered parking, in some areas, was regulated by time of day restrictions as well as parking restriction. Parking was prohibited on certain streets during peak traffic hours in order to relieve traffic congestion.

For both metered and unmetered parking, it was noted that parallel parking was the only type of onstreet parking existing in the Central Business District.

The restricted zones referred to loading zones, truck

loading zones, bus zones, taxi stands, and special permit areas reserved for fire, police and press vehicles. Restricted parking areas were measured and the results were stated in total feet of curbside per type. Loading zones referred to those areas where loading and unloading was allowed for a certain time period, regardless of vehicle type. Truck loading zones referred to those areas specified for trucks only. Truck loading areas were measured on the street and in alleys with a width of 16 feet or more*. Areas within alleys were recorded as truck loading zones only when there was no interference with converging driveways and other openings onto the alley.

The capacity of onstreet parking was determined in space-hours between 7:00 a.m. and 6:00 p.m. Time restriction during the eleven hour period was discounted against the capacity. Areas of "no parking 7:00 a.m. - 9:00 a.m.", for example, were counted as providing 9 space-hours for one space. Information collected from the inventory regarding location, capacity and type of parking was carefully examined to assign the needed manpower for the parking utilization survey.

*In any alley narrower than 16 feet, there would not be sufficient room for traffic movement along side a parked vehicle. The determination of what is legal parking for truck loading in such a case is unclear and dependent on the particular situation.

B. OFFSTREET PARKING

The offstreet inventory included all parking lots and garages in the Central Business District. Information regarding type of facility, name and location, owner and operator, property value, capacity (number of available spaces), functional use (type of spaces), operating characteristics, rates, appearance, and floor plan sketches of each facility was gathered on all offstreet parking areas. The inventory sheet is shown in Appendix 2. A parcel map of the Central Business District was developed by the 1969 Center City Study (4). Parking in this study area was identified by the parcel number along with other land use information.

When the facility was privately owned and operated the owner and/or the operator was contacted and asked to participate in the parking study. Each parking operator was officially informed by letter and personal contact before the inventory was taken. The actual value of the parking facility including land and structure, was obtained from the County Assessor's Office.

The parking capacity was measured by the field observer. The total parcel area and parking area were recorded during the field survey or through the use of available records to the Metropolitan Area Planning Department. The capacity of each facility was determined by counting the number of regular parking spaces or by referring to the layout when the stalls

were counted. The number of parking spaces was recorded by floor level for each facility and also indicated as either by clear aisle or by full aisle depending on how cars were stored. The number of parking spaces by parking type was also recorded.

The parking rate of public commercial facilities was recorded to determine the parking fee incurred for a parking duration. Special rates for all day, weekly, monthly, and night time patrons were also recorded.

Operating characteristics related to the average daily number of vehicles parked, the parking accumulation, and vehicular movements were measured through the facilities records, if possible, or otherwise through the estimations by field observers. This information was collected in order to assign necessary manpower for future interviews. It was very difficult to measure the parking accumulation, duration, and turnover due to the time limitation of the parking inventory. The parking demands and needs were determined by the parking utilization survey.

A visual survey was made of each public parking facility in the Central Business District. Each parking lot and garage was viewed in terms of the type and condition of surfacing; the presence of adequate signs to direct traffic flow; the numbers and locations of exits and entrances; the adequacy of stall, aisle, and driveway markings; and proper lighting. Pedestrian

safety in the facility was also considered in terms of visibility and walking space. Comments were made on landscaping, appropriate fencing, proper barricades and unusual obstructions. Poor conditions indicated the need for improving the facility. Lighting would contribute a safety factor if the facility operated during evening and night hours. Each facility was also investigated to see if fences or raised barriers were installed for pedestrian protection. One person was assigned to inventory the physical features of all public parking facilities.

The floor plans of garages were obtained from the Wichita Central Inspection Division and were traced on separate sheets. The layout of each parking lot was drawn on the reverse side of the inventory work sheet. The most important information on this work sheet was the location of entrances and exits and their relationship to the facility itself.

For purposes of inventory and analysis, offstreet parking spaces were classified into seven types: (1) public commercial, (2) private customer, (3) private employee, (4) private reserved, (5) municipal metered, (6) municipal free, and (7) municipal reserved. These categories were defined previously in the introduction chapter.

Parking facilities were also divided by type. Facilities were classified as: public, private, and municipal lots; and

public and private garages. These classifications were also defined in the introduction chapter.

C. SUMMARY OF INVENTORY

Offstreet parking was divided for analysis purposes into the sectors previously described. Each of these sectors functioned differently in terms of parking supply and demand, both within the sector and in relation to surrounding sectors and the entire study area. Parking types with significant representation in terms of total spaces and facilities within the sector was noted. By comparing the five sectors and number of spaces within each sector per parking space type, the distribution of types over the entire Central Business District was determined.

Based on the inventory data and observed characteristics of areas in the Central Business District, some statements concerning supply in regard to number, type and locations of parking space could be made. However, the number of spaces in an area in relation to the total parking demand was more difficult to judge by observation. Demand information, as measured by walking distances of parkers and the use of spaces by location, was ascertained during the utilization phase of the study.

CHAPTER 6

PARKING UTILIZATION

Since the parking demand was dependent on the behavior of the parkers who created the demand, it was necessary to survey the daily CBD parking situation. The purpose of the utilization survey was to determine the present use of available spaces in the Central Business District. Data required during this phase included the operating characteristics of parking facilities, the use of the parking spaces and the travel patterns of parkers surveyed at these locations.

In order to analyze a representative distribution of parking facilities, the Central Business District was divided into five sectors previously described in the inventory section. This division was made according to estimates of general parking characteristics in each area.

The utilization survey was conducted on selected parking facilities for a period of three months. This afforded operating advantages for a small crew of trained interviewers and produced a composite representative of an average day, after expanding the sample data up to the total capacity of parking facilities.

A. DATA COLLECTION

Three different procedures were used for data collection. Most of the information was gathered through personal interviews

of parkers at onstreet and offstreet facilities (8). At particular locations where vehicular movements prohibited interviewing, questionnaires were distributed to obtain travel pattern data from parkers. In conjunction with the interview and questionnaire methods, information was also collected by requesting employers to provide anonymous travel data regarding employees who used parking facilities provided for them by the employers.

1. The Personal Interview Method

Most of the travel pattern data obtained from parkers was gathered by the personal interview method. Interviews were conducted in all sectors of the Central Business District except Sector 5*. The number of onstreet and offstreet facilities selected for study in a sector was based on the amount and relative importance of parking in that area. Sampling was distributed to most accurately represent the parking situation within each sector.

Each of the selected onstreet and public offstreet facilities (including public commercial and municipal metered) was assigned an interviewing date. Interviews were conducted Monday through Friday for 11 hours per day (7:00 a.m. to 6:00 p.m.). Interviewers worked 5½-hour shifts, one group working between 7:00 a.m. and 12:30 p.m., the second group

*Sector 5 was the industrial sector of the downtown area and contained little public parking.

continuing the interview between 12:30 p.m. and 6:00 p.m. The interviews were not made on holidays, during severe weather, or any other days when parking habits were abnormal.

As a vehicle pulled into a curb space or an offstreet parking facility, the interviewer quickly approached and recorded the time of arrival. He then asked the driver certain questions and noted the answers on the field sheet. The home address of the parker, the trip origin (if different from the home address), the trip destination (where the parker was going to walk), and the principal purpose in making the trip were all recorded on the field sheet. The distance walked by each parker was computed from the parking location to his destination. Observed data included the license number, the type of vehicle and the type of parking. When the driver returned, the interviewer recorded the time of departure on the same line previously used if time allowed, before making another interview. If not, the license number and the departure time were recorded on a new line. The data was matched later in the office by license number. Also, the total time parked was computed for determining the parking duration.

The field sheet for interviewing (see Appendix 3) was prepared. Each interviewer carried a clip board with field sheets. After the interview, the field sheets for a given parking facility were attached together. The field sheet

identified each facility by map number, block number, facility name, number, and location. The names of the interviewers were included on the sheet for further references. Different types of parking were also identified, and were indicated on the field sheet by code.

The interviewer was instructed to contact as many parkers as possible. If a parker could not be reached when he pulled in to park, a notice card was placed under the vehicle's windshield wipers informing him of the parking study and seeking cooperation. The card also indicated that the parker had not been interviewed. When the driver who was not interviewed returned, the interviewer would approach him for interviewing. If a driver refused to cooperate or the interview was missed for other reasons, the field sheet was marked "refused" or "missed".

Before the field survey was actually taken, each selected parking facility was carefully examined for assignment of manpower. The number of persons required for interviewing was determined from the number of spaces, the operating activity and the physical characteristics of the various onstreet and offstreet facilities. For onstreet parking interviews, it was suggested, as a general rule, that one person could handle not over 12-15 curb spaces. Each lot or garage would require one or more persons, depending upon its size, number of entrances

and exits, and activity. The estimate was refined at the large offstreet facilities where at least one person per entrance and per exit was needed with additional help during the peak hours. In addition, approximately one supervisor for every four or five interviewers was needed to check on field operations, to relieve interviewers when necessary, and to handle emergency situations.

2. The Questionnaire Method

Another method used to obtain parkers' travel patterns involved handing each driver a questionnaire card. In addition to the interview field sheet, a questionnaire (see Appendix 4) with identification number was prepared for use at public offstreet facilities where traffic and time conditions did not permit interviewing. The interviewer distributed questionnaire cards to drivers as they entered the facility. Questions included the home address, the trip origin, the trip destination, and the principal purpose of making the trip. Each driver was asked to complete the card and return it to the facility exit when he departed.

The interviewer at the entrance recorded the card number of the questionnaire, the license number, the vehicle type, the type of parking, and the time-in on the field sheet. Each exit was assigned to a person that would pick up the questionnaire cards from drivers when they were leaving the parking facility.

The identification number on the questionnaire card was recorded again, as well as the license number and the time-out. In this case, the card number was especially designed and marked for matching purposes. Once the questionnaire was returned, the data was transferred to the field sheet in the office as the card number and license number were matched. Then the home address, the trip origin, the trip destination and the trip purpose could be included on the field sheet. The parking duration, the parking fee incurred and the walking distance were also calculated in the office. Data regarding the parker's travel pattern was transferred to the field sheet for compilation with other survey information.

3. The Employee List Method

Travel patterns of parkers who used many of the private employee parking facilities in the Central Business District were surveyed individually through employers. The employers were requested to furnish lists containing home address information for employees who used a parking space provided by the employers. In order to present complete travel pattern data for these employees, some information about parkers was assumed, based on the source of the lists and evident circumstances of the particular situation.

First of all, "passenger cars" were recorded for the vehicle type on all data sheets. Other types of vehicles

might have been used, but those vehicles actually functioned as passenger cars. Since this information represented all day trips to the Central Business District, the time-in and time-out were assigned according to the working hours of the business where the parker was employed. Parking rates were not recorded because parking was either subsidized fully or partially by the employer. The parking fee in this case was not compared with public commercial facilities.

The employee list method also assumed that the employee would come to the parking location directly from home, as this involved a daily work trip. The employer's business location was assigned as the employee's destination, and "going to work" was recorded as the trip purpose. This employee travel pattern data was then compiled and recorded on field sheets. By assuming certain data as a method of obtaining information, the cost of the survey was decreased and provided a substantial amount of travel data and a higher response rate.

4. Summary of Data Collection

Data gathered by the three collection methods resulted in a large representative sample of travel pattern information concerning parkers in the five sectors of the Central Business District. Although no interviewing was made in Sector 5, many employers furnished lists of travel pattern information for private employee parking facilities in this sector.

B. CORDON COUNT

Every two years the Wichita Traffic Engineering Division is responsible for making traffic counts of major arterials within the city limit. This traffic count is used to determine the annual average daily traffic for preparing the Traffic Volume Flow Map. A cordon count for parking accumulation is utilized as a part of the traffic count project. This included a count of all vehicles, inbound and outbound, on each street crossing the boundary of the Central Business District at 30-minute intervals during 24 hour time period. This method was used to measure the accumulation of vehicles inside the cordon line at any given time. The cordon line lay just inside the inner boundary of the study area, adjacent to Central Avenue, Washington Avenue, Kellogg Street, Greenway Boulevard, and the Arkansas River.

Automatic counters with printouts at 15-minute intervals were used to collect a continuous 24-hour record of traffic volume. A total of 27 cordon stations were selected. They were generally located about 50 feet away from the intersection to simplify counting. Alleys or streets carrying very little traffic were disregarded. Because of a good number of one-way streets across the cordon line, only 41 counters were needed for directional traffic counts. The count was conducted on four consecutive week days, using only 12 counters. This

enabled the field survey to cover all stations and represented the traffic of an average day. The cordon counts were evenly rotated from station to station when parking interviews were being made. No attempt was made to distinguish vehicles of different types because of limited personnel.

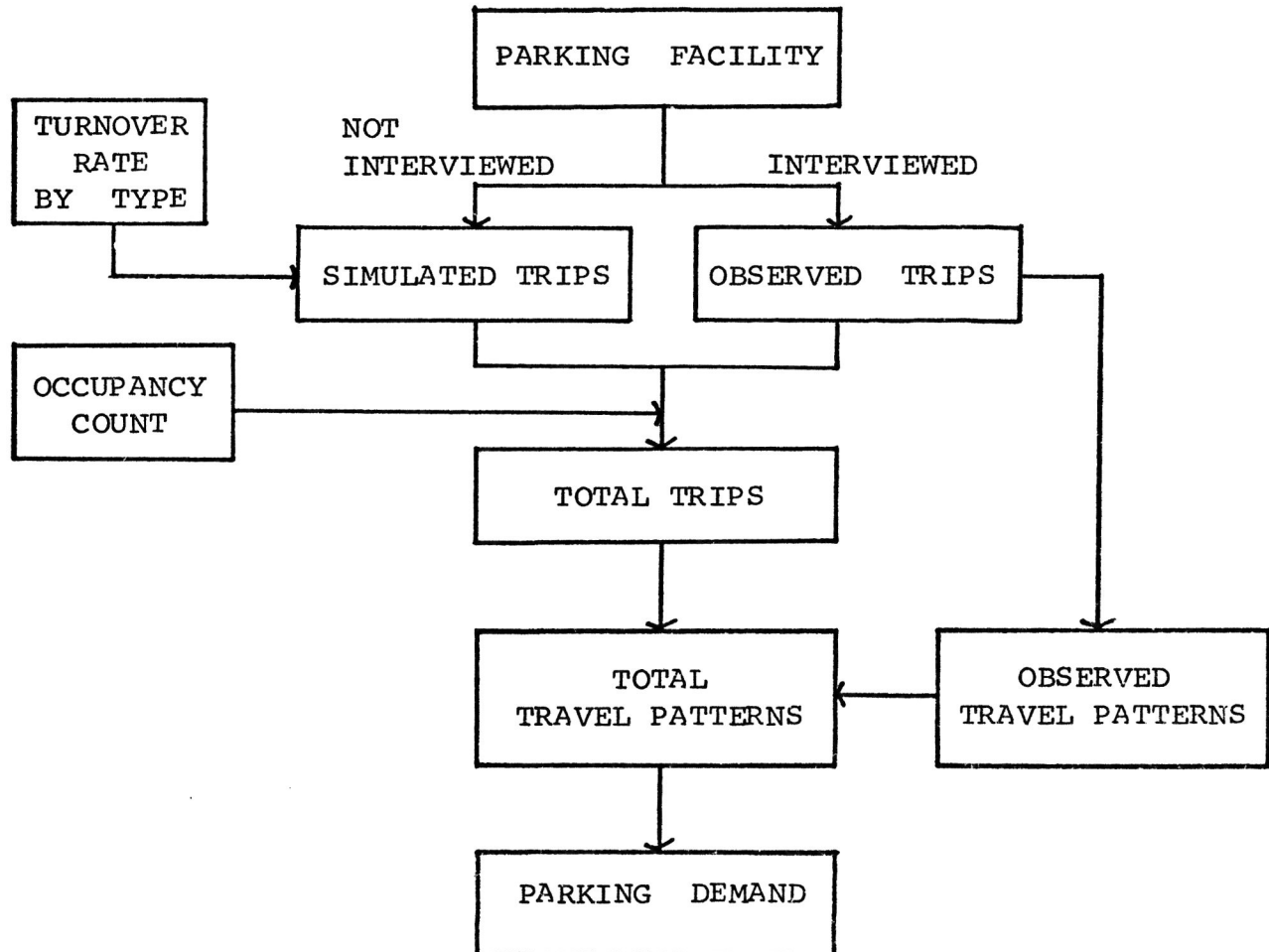
The vehicle counts were summarized and then the accumulation of vehicles within the cordon line was measured. Calculations included the net increase or decrease in each time interval and the number of vehicles within the cordon line at the moment. Upon the completion of all cordon counts, the total was tabulated and used to check parking accumulation. The results obtained were presented graphically by a map using the figures of total inbound and outbound traffic at every counting station (1).

C. ANALYSIS OF DATA

During the parking utilization phase, the field survey was conducted on selected parking facilities. Sample sizes were chosen proportionate to an estimate of the relative importance of parking found in each sector. Therefore, the sample of trips found from surveys at parking locations in the Central Business District needed to be expanded to represent the total number of vehicle trips. Expansion of the data was based upon two basic characteristics of parking demand for an average day, total trips attracted to the Central Business

District and the travel patterns of these trips.

According to the proportion of surveyed spaces to the total parking supply data concerning observed trips was expanded to simulate total vehicle trips to the Central Business District. The respective travel patterns of observed trips were also expanded to a predetermined level, the total trips. Figure 4 illustrates the basic procedure for expanding the number of trips and travel pattern information:



BASIC PROCEDURE FOR DATA EXPANSION

Figure 4

The expansion was based on the rationale that turnover rates of surveyed spaces were assumed to still hold true for those spaces not observed within a given sector. Turnover rate was defined as the ratio of trips to available spaces and computed for a given location or specific area by parking type. Preliminary rates were computed from the sample data during the utilization phase. Then, the trips generated on those unobserved spaces were simulated based on the number of spaces multiplied by the turnover rate. The numbers of trips for observed and unobserved spaces were then combined to produce the number of total trips.

An occupancy count of all parking facilities in the study area served as a good control total for the data expansion. The occupancy count was made from slides taken from a helicopter during the hours of peak accumulation, 1:00 p.m. to 3:00 p.m. as determined from the sample data. The slides were then projected and used for counting vehicles either on streets or in open parking lots. A special field count was also made at the same time for garages. This determined if the data expansion by turnover rate was reasonable by checking the peak parking accumulation of expanded total trips with the actual occupancy count.

The sector was used as the basic geographical unit for expanding sample trips since each block might not contain a

complete distribution of all parking types. However, surveyed travel patterns regarding parking times and origin-destination information were proportionately simulated for total trips on a block basis. Since origin-destination data was specifically related to the activity at one location on a particular block and because almost all CBD blocks were surveyed for this data, a complete representation resulted from a block analysis of travel pattern information.

Travel patterns were the factors which characterized different types of parkers. The trip origin and destination, parking duration, fee incurred, trip purpose, and walking distance were to be variables used in identifying travel patterns and would be used to analyze the parking demand.

Expansion of travel patterns was performed by calculating the sum of each specific variable multiplied by the ratio of total trips to observed trips within a given block. The total travel patterns then became the sum of the values for each block.

2. Parking Space Usage

The parking space usage was determined by geographical unit after the sampled trips and their travel patterns were expanded to represent the total number of trips on a normal weekday. The findings were summarized and analyzed using the following characteristics: parking accumulation, parking

duration, parking turnover and other factors such as trip purpose, parking fee incurred and walking distance (1, 8).

(a) Parking accumulation

Parking accumulation was determined by summarizing the number of vehicles starting to park, vehicles unparking, and the resulting accumulation at the end of each 30-minute period. Theoretically, the parking accumulation was smaller than the cordon count accumulation, because the latter included vehicles parked and vehicles were still travelling within the cordon line. The number of vehicles parking and unparking during each 30-minute period was charted to indicate the time of day maximum parking demand occurred.

The parking accumulation by geographical unit was measured by the location of trip destination in this study. Corresponding to the legal capacity of parking facilities, the parking accumulation was used to measure surplus or deficiency of parking spaces for a given area at a particular period of time.

(b) Parking duration

Parking duration was defined as the total time which the vehicle parked at a given parking facility. When determined, this information would indicate the relative amount of available space used for various parking durations.

The parking duration also measured the degree to which

curb parking regulations were being enforced and obeyed. The duration data was summarized to show the numbers of vehicles parked for a certain length of time in each parking facility. The data was summarized and classified by sector, type of parking facility, and by breaking down all curbs, lots, garages, and grand total for the study area. The duration ranges were established by 30-minute intervals.

(c) Parking turnover

Parking turnover measured the utilization of a parking space. It indicated how many times the parking space was used by different vehicles during a specified time period. The turnover rate was previously defined as the number of trips per certain spaces, either by parking type, geographical unit or both, from 7:00 a.m. to 6:00 p.m. for eleven hours. Tables were used to summarize turnover for each block, for each classification of parking type, for all curbside parking, lots and garages, and for different geographical areas.

(d) Other factors

The following trip purposes were used and coded:

1. Going to work: parking in vicinity of employment during working hours.
2. Personal business: paying bills, banking, calling upon law, business or governmental offices.
3. Service or sales: salesman calling on client, service

repair or maintenance, mail delivery, messenger service, or police calls.

4. Shopping: retail, wholesale or window shopping.

5. Loading or Unloading: loading or unloading of materials or personnel.

6. Eating a meal: going to restaurant for a regular meal.

7. Social activity and recreation: theater, private club, or bowling.

8. Attending school: business college, technical school, or barber college.

9. Other: If specified trips other than those mentioned above had been significantly large, new categories would have been added. However, trip purposes 6 through 9 were later reclassified as "miscellaneous" because these four categories were relatively small.

The fee incurred was the approximate parking charge which was dependent upon each parking duration and its relevant rate structure. For monthly parkers, the parking charge was the result of the monthly rent divided by 20 for an entire day. This item was broken down by every ten cents.

The distance walked by parkers was calculated from the parking location to their destinations. It was measured by foot rather than by block for better accuracy. For tabulation

purposes, this item was also classified as the following: 1) 1-50, 2) 51-350, 3) 351-700, 4) 701-1050, 5) 1051-1400, 6) 1401-1750, and 7) over 1751.

(e) Summary

This was a section to investigate the characteristics of the parking facilities and parkers in the study area. Tables containing two or more factors were drawn for further detailed analysis.

Trip purpose was often related with parking duration, walking distance and parking rate. It was generally believed that working trips would have a longer parking duration. Also, many downtown workers were willing to park their cars further away from the employment location to reduce or avoid the parking charge. Therefore, working trips often had a longer walking distance. Downtown workers usually paid a lower rate through a daily or monthly discount offered by parking operators. However, parkers with nonworking purposes would pay less for shorter parking time even though they were paying higher rates. In addition, the parking accumulation by trip purpose, working or non-working, would indicate parking demand for long term or short term during the time of the day. This will be discussed in the next chapter on parking needs.

CHAPTER 7

PARKING NEEDS

A comprehensive parking study provides information necessary to determine present parking needs, even though the process is expensive and time-consuming. This study, however, ascertained both the characteristics and locations of parking demands. The following paragraphs outline the determination of present parking needs based on the existing relationship between supply and demand for each block in the study area. When future development proposals in the Central Business District were considered together with other factors such as future population, employment, social and economic changes, and transportation facilities, future parking needs were also characterized.

In general, the magnitude of the total demand for parking consisted of (1) the observable demand which was evidenced by the number of drivers legally parking, (2) the hidden demand which was evidenced by the number of the drivers who were occupying prohibited spaces illegally, and (3) the observable demand given by the number of drivers who parked just outside the study area, and either walked in or rode the shuttle bus from the fringe parking facilities. Parking demand was associated with the location of each parker's primary destination and where each actually desired to park.

The justification for distinguishing among different

functional types of parking accommodations was based upon the different parking habits or characteristics of parkers. In order to measure potential use of parking facilities, it was necessary to estimate the demand for short-term and long-term parkers.

A. PRESENT PARKING NEEDS

The first step in measuring present parking needs was to distribute the demand to the available supply by the geographical unit at the location of the parker's destination. The city block was used as the geographical unit in determining parking surplus or deficiency in this study. The surplus or deficiency within a block was determined for two categories of parkers, short-term or long-term.

The next step was to assume that where parking demand exceeded supply, the excess demand might be satisfied by surplus in adjacent blocks within normal walking distances. The net deficiencies which were not accommodated would then be translated into terms of total spaces per day.

Finally, adjustments were made to account for the attraction of a given parking facility, regarding parking charges, parking time limit, queuing time, safety concern, etc. This adjustment would be dependent on factors such as the parker's willingness to pay and the extent of surplus capacity depending on walking distances (9).

1. Present Parking Supply and Demand

Based on the inventory data, the present parking supply in terms of spaces (or space-hours) by type and by location was determined. The capacity of each parking facility was measured separately for short-term or long-term usage according to its location, function and fare structure.

In general, parking facilities located within Sector 3 were classified for short-term usage because of the highly concentrated parking demand. Parking in fringe areas was primarily used by long-term parkers.

Onstreet parking was generally utilized for short-term parkers. This was true for metered space and for unmetered space with time limits of one or two hours. Area containing curb parking with no restrictions where spaces might be taken by long-term parkers usually had more spaces than demand.

Lots or garages provided parking for both short-term and long-term usage. In Wichita most of the offstreet parking facilities were operated in such a way as to encourage long-term parkers to park in the core area either setting a charge limit for daily parking or leasing spaces on a monthly basis. Consequently, many offstreet parking spaces in the core area which could have been utilized for short-term parkers were used by long-term parkers instead.

Parking demand was measured by trip destination, where the

parker was going to walk. It was assumed that every driver would like to park close to his ultimate destination. Therefore, a comparison of the numbers of such destinations in each block was made with the present parking supply to reveal the surplus or deficiency in capacity.

Number of vehicles parked and vehicle-hours of parking in different types of parking facilities were classified according to block. Vehicle-hours were obtained by adding the recorded parking times of each vehicle.

2. Parking Allocation in Determining Parking Needs

Parking needs could generally be determined by allocating parking demand to the available supply. Up to the present time, two reliable procedures to measure parking needs were illustrated in the Procedure Manual 3D "Conducting A Comprehensive Parking Study" (1), the National Committee on Urban Transportation (NCUT) and in a special analysis computer program, the ALOCAT Model (10), as specified in the Urban Planning System 360 Program which had been developed and periodically updated by the Federal Highway Administration.

(a) NCUT Procedure Manual 3D

This manual indicated that tables and maps were needed to illustrate the practical supply and demand expressed in space-hours. Due to the time lost in each turnover and the fact that demand and supply were not parallel throughout the day, the

practical space-hours of the supply needed to be adjusted.

Neither onstreet parking nor offstreet parking spaces could be utilized to their full capacity. The practical space-hours which were revealed from actual spaces multiplied by eleven hours (from 7:00 a.m. to 6:00 p.m.) must be discounted somewhat by application of factors based upon the best performance that could be expected from each type of facility. The factor for onstreet parking was determined by comparing the supply in space-hours with the legal curb usage in space-hours for a few blocks in Sector 3 where it was known that the demand was heaviest and where it might be assumed that the maximum possible use was made of the space. Because of the influence of accessibility, rate structure, etc., it was not so easily applied to offstreet spaces, but a careful examination of the data on a few selected facilities would permit the determination of similar factors for lots and garages.

It was necessary to prepare a table showing practical space-hours of supply and demand by block. Using the same data, a map could be drawn to illustrate the supply and demand for each block in the study area. The comparison would make evident the net surplus or net deficit for each block in space-hours. It was noted that some blocks, showing a net deficit in space, might be adjacent or close to other blocks having a surplus of space. The extent to which surpluses in one block could be

applied to make up for deficits in another block depended upon the distance between the two. Several alternative distances were applied as criteria to determine whether those parking deficits could be offset by parking surpluses in other blocks. This allocation process by these alternative distances would aid decision makers to realize how the distance could affect the determination of parking needs. To determine areas of net deficit for the Central Business District, the allocation could be done by starting with a central block of the area; by applying its deficit to any surplus within the desirable distance (measuring distances along the paths which were allowed by walkers); and by continuing this procedure block by block until the study area boundaries were passed. The end result would show areas of net deficit. The procedure was also made on the principle that short-term parkers would be able to park their cars closer to their destination and long-term parkers would be required to walk longer distances.

(b) The ALOCAT Model

The Urban Planning System 360 program which had been developed and updated by the Federal Highway Administration was intended to meet the needs of the computer application within the urban transportation planning process. In addition to the basic programs set for traffic assignment and trip distribution, the current battery included several special analysis programs. A parking allocation model, which would simulate the behavior of parkers

in choosing among competing parking facilities, would be used to realistically allocate parking demand to the available supply. The ALOCAT Model was based on the assumption that arriving parkers would be allocated among alternative facilities. For a given population of parkers, defined by trip purpose, socio-economic status, and final destination block, some level of "disutility" could be associated with each parking facility. In formulating the disutility measure, it was hypothesized that a trade-off between parking price and the measures of inconvenience could be described and that the disutility associated with each choice was equal to the associated parking price plus a "substitution price" for the convenience incurred. Typical measures of inconvenience for which substitution prices might be developed included walking distance and parking delay time associated with particular types of parking. The allocation was made in such a way that the joint disutility for all parkers was minimal, subject to the satisfaction of all parkers' demands.

It was assumed that certain parameters influencing demand also influenced parking choice. Spatial separation, socio-economic variables and trip characteristics should be the principal dimensions in the stratification of the demand data.

Spatial separation characteristics were measured by the trip origin and destination. Socioeconomic variables contained income and occupation, which determined the ability of a parker

to pay for or accept a parking location. (In this study, socio-economic variables were excluded from the calibration process.) Trip characteristics described by purpose and parking duration, were related to the demand distribution throughout the day.

Information on the supply of parking was used in the calibration of model parameters. Parking inventory data was organized in a form suitable for input to the analysis during the supply configuration phase. Two sets of supply variables were required: (1) an interchange variable that described resistances associated with travel from a given parking facility to a given final destination zone; and (2) a parking facility variable which characterized a given facility including capacity, time varying restriction for parking, a rate schedule, and the waiting or queuing time at the facility.

A disutility function which combined resistance measures into a single value was formulated and parameters were defined in the calibration process. The relationship between particular variables such as parking cost and walking distance, was derived for each demand stratification to define a "trade-off" relationship. The parker, for example, might be willing to walk an additional distance to save an increment of parking cost for a particular stratification. The ALOCAT Model would produce two principal outputs: (1) a data deck of parking allocations and (2) an allocation summary by facility and final destination

block. The facility summary described the total spaces available and used for each arrival period. The final destination block summary itemized the number of parkers by each index of the demand data. The allocation was performed simultaneously for all parkers arriving in the study area during a given time period. After the allocation for each arrival period, the available capacity in each facility was recomputed, and the allocation for the next arrival period was performed. The model produced parking facility totals of parkers by destination block and by input category for each arrival time and departure time period combination.

3. Summary

In order to simplify the comparison of parking demand and supply, the time of the day when the peak demand occurred was chosen to determine parking needs. This was done so that the peak hour demands would represent the critical parking situation during the day. The procedure was different from the one suggested by the NCUT Procedure Manual. The Manual 3D proposed to utilize the practical supply hours to meet the demand for the entire day. However, in dealing with the peak hour conditions, the demand and supply would be presented in terms of the number of spaces. The peak demand hours were easily identified by checking with the largest parking accumulation.

The parking demand was determined according to the trip

destination on the block level. The parking facilities on each block were then summarized to accommodate the demand of the same block. Although the ALOCAT Program of the Federal Highway Administration had an advantage of fast data processing, the application of the program required to run under IBM's (full) Operating System (O.S.) which was not the system presently running in the City of Wichita. Therefore, the allocation of the demand to the supply would be done manually as described by the NCUT Manual without the utilization of computer programs.

B. FUTURE PARKING NEEDS

In forecasting the future parking demand, considerations were given to those factors which were known to play a vital role in influencing parking demand. At the present time, experience and judgement appeared to be the best basis for forecasting growth in parking volume.

1. General Assumptions

First of all, it was necessary to have general assumptions established. Possible future growth of parking demand would be related essentially to the economic growth of the community. Generally, it was assumed that major changes in economic, social and technical aspects would not be anticipated in the foreseeable future. Each of the following assumptions were considered:

- (a) No major war.
- (b) No severe economic depression.

- (c) Positive action toward maintaining and promoting Wichita's future economic growth.
- (d) Natural growth of population, motor vehicle registration, etc.
- (e) No dramatic development in science and technology affecting transportation.
- (f) Similar competition from outlying shopping centers.
- (g) Adequate supplies of natural resources.

2. Planning Policy Inputs

In general, the future parking demand could be analyzed by population, land use, employment, car ownership, downtown oriented trips, retail sales, etc. However, the planning policy would represent a major tool in the long range development in the Central Business District because the policy inputs with appropriate implementation would affect the land use pattern, the physical structure, and the transportation facilities of the future Central Business District.

The development goal for the Center City of Wichita was stated to retain the Center City as the primary culture, retailing and office center within the South Central Kansas Region as well as to make it a balanced neighborhood in which many additional people with different life styles could reside. Policies and goals regarding vehicular circulation and storage were to (11):

- (a) Recognize that the primary purpose of streets was for the movement of vehicular traffic rather than for the storage of vehicles.
- (b) Strive for the separation of pedestrian and vehicular traffic in the core area.
- (c) Encourage private enterprise to develop adequate offstreet parking at the proper location.
- (d) Recognize that a transportation system could give direction to urban growth.
- (e) Encourage maximum use of mass transit by those who did not need to use a private vehicle.
- (f) Pursue the full and accurate integration of the Center City circulation system with the entire system of the Metropolitan Area.

It was noted that the City did not commit itself to take an active role in developing the parking program in the Central Business District.

3. Future Parking Demand

Forecasting the overall parking demand in the Central Business District for a future year might involve one or more of the following factors (12,13):

- (a) The anticipated increase in the urban area population and car ownership.
- (b) The economic growth and market forecast in the Central

Business District.

- (c) The land use and employment forecast in the Central Business District.
- (d) The Total CBD person trips.
- (e) The daytime proportion of the total daily travel to and from the Central Business District.
- (f) The future average car occupancy.
- (g) The future modal split.

The parking survey provided a good guide for the estimation of traffic generation of land use. Demand was related to land or building area, to persons in occupancy such as employees or visitors, or to units such as homes, apartments, beds of a hospital, or seats of a restaurant. Future parking demands were also estimated by applying trip generation rates which were determined by the parking survey. However, these present trip generation rates by each space type were adjusted to the control total of the overall parking demand.

Land use projections, which would take population changes, employment forecasts, and alternative transportation systems into account, might be used in conjunction with parking generation rates to estimate future demand. First of all, employment forecasting data was the best indicator to estimate the long term parking primarily for working trips. Parking space generated by employment would be based on the maximum number of employees on

duty at any one time.

On the other hand, the floor area in terms of total square feet by space type (office, retail, etc.) would be used to determine the demand of non-working trips. Parking demand generated by buildings, besides by their employees, permitted derivation of parking demand ratio for different classes of buildings. Generation of parking demands could be made from the parking requirements of a particular building type by relating observed parking demand to the building floor area.

4. Summary

The future parking needs would be measured by allocating the future demand to the supply in the same manner as the determination of present parking needs. The future parking supply would be estimated at the best knowledge of existing parking spaces plus any type of future parking development.

Where parking facility's capacity is inadequate, backed-up traffic in street and excess hunting for parking space may adversely affect the circulation system in the downtown area. It should be recognized that the accessibility is the key element in evaluating the overall transportation system and is more important and meaningful than in providing more highways, more parking, or more buses. The major concern to improve parking is to regulate the supply and control the demand in the Central Business District.

CHAPTER 8

CONCLUSION

This chapter is a critical analysis section to evaluate the strength and weakness of this non-thesis project. The author intended to document major activities of the project in such a manner that anyone who was interested in the project or engaged in a similar parking study might benefit from the following discussions by making any appropriate revisions in order to improve the utilization of techniques involved in the parking analysis.

The work program of the parking study was prepared within two months before the field work was conducted. The preparation included the investigation of previous parking studies in Wichita, the literature research, the design of survey forms and manuals, and the training of personnel. Due to the pressure of scheduling with other projects, the field work was undertaken before the preparation was fully complete. Survey forms and manuals, for example, were distributed among participating personnel without adequate time for further reviews.

The procedures for undertaking a comprehensive parking study were not complicated. A complete inventory of total onstreet and offstreet parking facilities was essentially needed as the first step. The level of detail during this phase was easily controlled based on the manpower and the timing. Less manpower

would simply prolong the time for completion. This step was done without disturbance to the operation of parking facilities. With appropriate notice in advance, good cooperation from private parking operators was received.

The identification of offstreet parking facilities at accurate location on the map was a problem during the inventory phase. The aerial photos maintained by the Metropolitan Area Planning Department were taken in 1968. They were used to check with the inventory data. Slight inaccuracies occurred due to the time differential and changes that took place in the study area since 1968. The black-and-white photos presented problems of differentiating between the parking facilities and other land usage. Most of the personnel who inventoried offstreet parking facilities did not have a mapping background which would have been desirable. Had current aerial photos or color slides been taken from a helicopter, the problem of locating offstreet parking facilities would have been more readily solved.

The parking utilization had some operational problems. Time for making interviews usually was limited to one minute or less. The response from the parkers was not predictable. The control on the quality of response, therefore, could not be guaranteed. False responses might be utilized for data expansion that would make the estimation of parking demands less reliable. Closer field supervision and more careful data checks might have

improved the reliability of the data.

Sometimes it was difficult to locate a good spot for interviewing due to the poor circulation design in certain parking facilities. The condition might be too dangerous for interviewers to stand beside the driveway or the interview itself might disturb the operation of the parking facility. Through careful investigation of those facilities in advance, a better arrangements might have been established. The questionnaire method among other data collection procedures did solve this problem substantially, because the interview time was reduced.

However, the utilization survey was conducted on selected parking facilities. The sample data was expanded to represent the total trips. The analysis of data determined parking demands and also the nature of the parking situation. The parking needs, then, were measured by distributing the demand to the available supply, both present and future. Hopefully, the analysis would offer recommendations in order to improve the parking situation in downtown Wichita.

In general, the inventory data was very complete. There was no time lag between the inventory and utilization phases. Parking facilities sampled for the survey were selected according to the estimate of general parking characteristics without having full knowledge of the parking situation existing in the Central Business District. In addition, sample rates varied ranging from

20 to 94 percent by parking type. Because of different sample rates, each parking type had its own expansion factor. This resulted in some expansion problems for simulating the general travel patterns of parkers within a given area due to many calculations involved. If the sample rates had been maintained at the same level, the calculations could have been simpler.

The NCUT Manual 3D suggested the classification of offstreet parking based on the structure (lots or garages), usage and ownership (public, private or municipal), and rate (free or pay) without clear definitions on usage. In this study, usage was defined and classified into seven parking types for offstreet parking. The seven categories were large enough to cover the functional usage of all offstreet parking types in the study area. Time and manpower allowed for the utilization survey were limited. This classification offered a flexibility to select what types of parking would be considered for survey.

The effort to collect parking utilization data from a conventional parking study was very expensive. The special parking programs developed by the Federal Highway Administration were intended to utilize origin-destination (O-D) data from the home O-D interview survey to create a parking demand file containing information similar to that obtained by a parking interview procedure (10). At the present time, it is too early to evaluate the application of this special package because it

has not been fully distributed and tested. However, these special programs have a good possibility for wider utilization.

Based on findings of the parking study, it was apparent that an appropriate parking program must be initiated if the Central Business District was to maintain its dominant position as a focal point of business, civic and retail activities. New downtown parking facilities would have a significant impact on the development of the Central Business District. In implementing a parking program, policy considerations were essential in some major areas, such as the responsibility of development, zoning, and regulation of parking facilities (13).

In dealing with the downtown parking development, the City had never played an active role. Private enterprise developed most of the offstreet parking facilities. In general, the parking development of the private sector followed no planning guidelines. No coordination existed between the City and private enterprise.

Zoning requirements for parking is important in planning the development of a city. With proper applications, its provisions represented a major tool in the long range parking development. In Wichita, the Central Business District was not included in the parking requirement of the current zoning ordinance. A new zoning ordinance draft which was being reviewed by a special committee did not specify any parking requirement for the Central Business District which was tentatively bounded

by Second Street, Emporia Avenue, Waterman Street and the Arkansas River. This area was classified as "B-6" district in the proposed zoning ordinance.

Many cities have adopted ordinances providing for some regulation and control over existing parking facilities. Through the licensing of these facilities, the city could effect the desirable control. In Wichita, there was no regulation applied to the existing offstreet parking in the downtown area. For newly erected and substantially altered buildings or parking facilities, the City Building Code specified that the developer was required to submit plans to the Central Inspection Division of the Public Works Department for review. The Central Inspection Division often forwards plans to the Traffic Engineering Division for further examination regarding the traffic movement and parking situation of the facility. In other words, the parking development was partially monitored by the Central Inspection Division and the Traffic Engineering Division.

The City could have several options in administering the offstreet parking program. First of all, the function of parking program could be assigned to the existing City division or department. Secondly, the City might appoint a parking commission or assign an existing commission to coordinate the efforts of several City departments providing services for the parking program. Thirdly, as a First Class City in Kansas, the

City might establish a municipal parking authority by ordinance which would be a separate organization usually autonomous in the planning, financing, construction and operation of the offstreet parking program.

Regarding the size of the city and the magnitude of the parking situation in downtown Wichita, the City might assign an existing commission to coordinate private enterprise and City agencies in developing an effective parking program which would include the establishment of long range parking policies and the planning and implementation of short range parking plans. Public and private sectors should be coordinated together in order to provide for existing and future parking demands of the Central Business District.

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APPENDIX

1. Curb Space Inventory Form
2. Offstreet Parking Inventory Form
3. Parking Interview Field Sheet
4. Parking Survey Questionnaire Form

Appendix 1
 CITY OF WICHITA
 1972 Parking Study
 Curb Space Inventory

1. Map No. _____ Block No. _____ Facility No. _____

2. Location _____

3. <u>Metered Parking</u>	Rates	Spaces	Space-Hours
a. ½-hour	_____	_____	_____
b. 1-hour	_____	_____	_____
c. 2-hour	_____	_____	_____
d. 5-hour	_____	_____	_____
e. 10-hour	_____	_____	_____
TOTAL	_____	_____	_____

4. <u>Unmetered Parking</u>	Parking Time	Feet	Spaces	Space-Hours
a. 1-hour ()	10	_____	_____	_____
b. 2-hour ()	10	_____	_____	_____
c. No Parking				
- Anytime	0	_____	_____	_____
- 7 a.m.-7 p.m.	0	_____	_____	_____
- 8 a.m.-4 p.m.	2	_____	_____	_____
- 7 - 9, 4 - 6.	7	_____	_____	_____
- 3 p.m.-6 p.m.	7	_____	_____	_____
- 4 p.m.-6 p.m.	8	_____	_____	_____
- 7:30-9, 3 - 4.	8	_____	_____	_____
d. Unrestricted	10	_____	_____	_____
TOTAL	_____	_____	_____	_____

5. Grand Total _____

6. <u>Restricted Zones</u>	Feet
a. Loading Zones	_____
b. Truck Loading Zones	_____
c. Bus Zones	_____
d. Taxi Stands	_____
e. Special Permit	_____
TOTAL	_____

7. Remarks

Office Data Obtained _____ 197__ by _____
 Field Data Obtained _____ 197__ by _____

CITY OF WICHITA
1972 Parking Study
Offstreet Parking Inventory

1. Map No. _____ Block No. _____ Facility No. _____ Parcel No. _____
2. Location (Mailing Address) _____
3. Name of Facility _____
 Property Owner _____ Address _____ Phone No. _____
 Operator or Lessee _____ Address _____ Phone No. _____
4. Property Actual Value: Land \$ _____ Structure \$ _____
5. Total Parcel Area _____ sq.ft. Total Parking Area _____ sq.ft.
6. No. of Spaces by Floor:

	Clear Aisle	Full Aisle		Clear Aisle	Full Aisle
Basement	_____	_____	4th Floor	_____	_____
1st Floor	_____	_____	5th Floor	_____	_____
2nd Floor	_____	_____	6th Floor	_____	_____
3rd Floor	_____	_____	()	_____	_____
Roof (if used for parking)				_____	_____
TOTAL				_____	_____
7. No. of Spaces by Functional Use:
 Commercial _____ Customer _____ Employee _____ Other (specify) _____
8. No. of Spaces leased Monthly _____ Weekly _____
9. Rates: Day _____ Week _____ Month _____
 Night _____ after _____ p.m. Special _____
10. Park & Shop or Free _____ % of Parking
11. Peak Hour No. of Attendants _____ Self Park _____ or Attendant Park _____
12. Open from _____ a.m. to _____ p.m.
13. Average No. of Vehicles Parked Daily _____
 Hours of Peak Parking Accumulation _____
 Maximum Accumulation of Vehicles _____
 Hours of Greatest In-movement _____ Out-movement _____
14. Access: Entrances from _____
 Exits to _____
15. If Lot, Paved _____ or Unpaved _____ ?
 Fenced _____ or Walled _____ or Unprotected _____ ?
 If Garage, Open Deck _____ or Closed _____ ?
16. Physical conditions:
 Parking Surface _____
 Lighting _____
 Signs _____
 Markings _____
 Pedestrian Safety _____
 Other comments (i.e. landscaping) _____
17. Are there rest room facilities for the public? Yes _____ No _____
18. Sketch outlines of parking areas on reverse side showing entrances, exits, and their widths.

Office Data Obtained _____ 197 _____ by _____
 Field Data Obtained _____ 197 _____ by _____

PARKING SURVEY

FOR IDENTIFYING WICHITA'S DOWNTOWN PARKING PROBLEM, PLEASE ANSWER THE FOLLOWING QUESTIONS AND RETURN THIS CARD TO ONE OF OUR REPRESENTATIVES WHO WILL BE BY THE EXIT WHEN YOU DRIVE YOUR CAR FROM THIS FACILITY. THIS SURVEY IS BEING CONDUCTED BY THE WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING DEPARTMENT. IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT VIC SHEN OR ED BRANN, PHONE NUMBER 262-0611, EXTENSION 226.

A. Your home address (to nearest block)

_____ hundred block of _____, _____,
(street) (town or city) (state)

B. Where did you come from before parking here?

Home (as specified above)

Different from home address:

a. If in Wichita area,

(street address or business name, etc.)

b. If outside Wichita area,

(town or city, state)

C. I parked at this location for the following reason: (circle one)

1. Going to work (parking in vicinity of employment during working hours, etc.)
2. Shopping (retail, shopping, ordering from wholesalers, window shopping, etc.)
3. Personal business (paying bills, banking, calling upon doctor or lawyer, business, governmental offices, etc.)
4. Social activity and recreation (theater, private club, bowling, etc.)
5. Eating a meal (going to a restaurant, cafeteria, hamburger stand, etc. for a regular meal)
6. Sales or service (salesman calling on client, service repair or maintenance, sales-delivery, messengers, etc.)
7. Loading or unloading (loading or unloading of materials or personnel, etc.)
8. Attending school (business college, technical school, barber college, etc.)
9. Other (specify) _____

D. We are attempting to determine average walking distances after parking, therefore will you please specify the name or address of your primary destination?

THANK YOU